Received
August 7, 2025
WV DEP/Div of Air Quality

Division of Air Quality Permit Application Submittal

Please find attached a permit application for : MGS H2 1, LLC
[Company Name; Facility Location]

- DAQ Facility ID (for existing facilities only):
- Current 45CSR13 and 45CSR30 (Title V) permits associated with this process (for existing facilities only):

- Type of NSR Application (check all that apply):
  - ☑ Construction
  - ☐ Modification
  - ☐ Class I Administrative Update
  - ☐ Class II Administrative Update
  - ☐ Relocation
  - ☐ Temporary
  - ☐ Permit Determination

- Type of 45CSR30 (TITLE V) Application:
  - ☐ Title V Initial
  - ☐ Title V Renewal
  - ☐ Administrative Amendment**
  - ☐ Minor Modification**
  - ☐ Significant Modification**
  - ☐ Off Permit Change

****If the box above is checked, include the Title V revision information as ATTACHMENT S to the combined NSR/Title V application.**

- Payment Type:
  - ☑ Credit Card (Instructions to pay by credit card will be sent in the Application Status email.)
  - ☐ Check (Make checks payable to: WVDEP – Division of Air Quality)
    Mail checks to:
    WVDEP – DAQ – Permitting
    Attn: NSR Permitting Secretary
    601 57th Street, SE
    Charleston, WV 25304

Please wait until DAQ emails you the Facility ID Number and Permit Application Number. Please add these identifiers to your check or cover letter with your check.

- If the permit writer has any questions, please contact (all that apply):
  - ☑ Responsible Official/Authorized Representative
    - Name:
    - Email:
    - Phone Number:
  - ☑ Company Contact
    - Name: Jack Calhoun
    - Email: jack.calhoun@fidelisinfra.com
    - Phone Number:
  - ☑ Consultant
    - Name: Michael Dearing
    - Email: Michael.Dearing@erm.com
    - Phone Number:

MGS H2 1, LLC
109 North Post Oak Lane, Suite
440 Houston, TX 77024

August 4, 2025

Mr. Laura M. Crowder, Director
West Virginia DEP
DAQ – Permitting Section
601 57th Streat SE
Charleston, WV 25304

RE: Fidelis – R13 Air Permit Application

Dear Director Crowder:

MGS H2 1, LLC herein submits the enclosed initial Minor Source Air Permit Application for the proposed Hydrogen Plant to be located in Mason County, West Virginia. Section 2 of the application provides a detailed description of the project process. Based on the project emissions estimation, the facility will be considered a minor source. Therefore, MGS H2 1, LLC is submitting this application to obtain a Permit to Construct for the Hydrogen Plant in accordance with West Virginia Code of State Rules (CSR), Title 45, Series 13 (45CSR13).

If you have any questions or comments regarding this air permit application, please do not hesitate to call Mr. William (Jack) Calhoun at (281)917-8571 or send email to jack.calhoun@fidelisinfrra.com.

Sincerely,

Jack Calhoun

Environmental Manager

cc: Michael Dearing, Environmental Resources Management Inc (Michael.dearing@ERM.com)

Minor Source Air Quality Permit Application

For

MGS H2 1, LLC
Hydrogen Plant

Submitted to:
West Virginia Department of Environmental Quality
Division of Air Quality – Permitting Section
601 57th Streat SE
Charleston, WV 25304

Submitted by
MGS H2 1, LLC
109 North Post Oak Lane, Suite 440
Houston, TX 77024

August 2025

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1 Application Overview

MGS H2 1, LLC (MGSH2-1) is planning to build and operate a greenfield 265 million standard cubic feet per day (MMSCFD) hydrogen production facility located in Point Pleasant, Mason County, West Virginia. The CO_2 emissions from the hydrogen production process unit will be captured. With this application, MGSH2-1 is requesting a Permit to Construct for the Hydrogen facility in accordance with West Virginia Code of State Rules (CSR), Title 45, Series 13 (45CSR13).

Mason County is currently designated as "attainment" or "unclassified" for all regulated New Source Review (NSR) pollutants. As provided in the facility-wide emissions summary in Section 3 of this application, the facility will be a minor source with respect to the NSR permit program and the Title V operating permit program.

Section 2 of this application contains a process description. Section 3 presents an air emission source overview and air emission calculation methodology. Section 4 contains a state and federal regulatory applicability analysis for the proposed project.

The WVDAQ R13 application form and required Attachments A-S in the application form are included in Appendices A and B, respectively, at the end of the application. Appendix B contains the following West Virginia Department of Air Quality (WVDAQ) application components:

Attachment A: West Virginia Business Certificate
Attachment B: Maps
Attachment C: Installation and Start Up Schedule
Attachment D: Regulatory Discussion
Attachment E: Plot Plan
Attachment F: Detailed Block 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 (Not Applicable)
Attachment R: Authority Forms (Not Applicable)
Attachment S: Title V Permit Revision Information (Not Applicable)

2 Detailed Description of Proposed Operations

This section includes a detailed process description of the proposed hydrogen facility. Appendix B provides a process block flow diagram, as shown in Attachment F, for reference. In addition to its own turbines, electricity for the hydrogen production may receive support power from the Bioenergy with Carbon Capture and Storage (BECCS) facility that will be owned and operated by MGS CNP 1, LLC. or local micro grid. MGSH2-1 intends to commence construction of the hydrogen facility in 2026 with start-up operations in 2029. The proposed plant will include the following major processes:

- Hydrogenation and desulfurization
- Adiabatic pre-reforming
- Autothermal reforming
- CO Conversion and product purification
- CO_2 removal
- Steam production by waste heat recovery, and
- Supporting facilities including but not limited to:
    - Raw Water / Utility Water
    - Air Separation Unit
    - NG Startup Generator
    - Electric and Diesel Driven Firewater Pumps
    - Cooling Towers
    - Storage Tanks

The major emission sources that will be present on-site include:

- One Fired Heater equipped with Low NO_X burners (LNB) and SCR for NO_X control
- Two Combined Cycle Gas Turbines (CCGT) equipped with SCR for NO_X control and CO Oxidation Catalyst for CO control.
- Equipment Leaks
- One Auxiliary Boiler
- One Elevated Flare
- One Startup Generator
- One Fire Water Diesel Engine Pump
- One Mechanical Draft Evaporative Cooling Tower
- One Storage Tank – Amine Makeup Tank. According to Table 45-13B in 45CSR13, the diesel tank is a de minimis source and does not need to be included in this permit application.

The following facilities will also be installed on-site but are not expected to generate emissions:

- Air Separation Unit
- Heat recovery steam generators (HRSG) that use the steam generated from the hot flue gas without burning any additional fuel.
- Raw Water Tank and Raw Water Treatment Process including filtration, chemical dosing, and dissolved air flotation (DAF)
- Fire Water Tank
- Demineralized Water Tank and Demineralized Water Package consisting of ultrafiltration (UF), Granulated Activated Carbon (GAC), Reverse Osmosis (RO), and Electro-deionization (EDI)

- Wastewater Treatment Plant for treating water from boiler blowdown, cooling tower blowdown, and reject from the raw water and demineralized water treatment system
  - Equalization tank
  - Chemical dosing and mixing, DAF
  - Membrane bioreactor (MBR)
  - Storm water / equalization pond
  - Sludge dewatering unit
- Buildings

2.1 Hydrogen Production Process

The hydrogen production process is based on autothermal reforming of natural gas with carbon capture. The process is described in detail in the following sections.

2.1.1 Feed Preparation and Purification

Natural gas from the battery limit is mixed with a small amount of recycled hydrogen before entering the purification section. The feed gas mixture is heated to the required temperature for the hydrogenation in the feed gas preheat coil followed by medium pressure steam feed preheater.

The natural gas feedstock contains minor quantities of sulfur compounds which must be removed to avoid poisoning of the reforming catalyst in the pre-reformer and in the autothermal reformer.

There will be two sulfur absorbers loaded with a sulfide scavenger. The second absorber acts as a guard vessel in case of breakthrough from the first absorber or in case it is taken out of service for replacement of the catalyst. The process feed gas leaving the feed gas purification section is considered free of sulfur.

2.1.2 Reforming Section

The steam reforming takes place in two steps: first in the adiabatic pre-reformer and then in the autothermal reformer (ATR). The purified process feed is mixed with steam upstream of the pre-reformer. After mixing, the feed is preheated in the pre-reformer preheat coil to the required temperature.

The feed then enters the adiabatic pre-reformer loaded with catalyst where the hydrocarbons in the preheated process feed are decomposed into hydrogen (H_2), Carbon Monoxide (CO), and methane (CH_4). The pre-reformed process gas is then further heated to the required temperature in the reformer feed preheat coil and mixed with stripper steam from process condensate knock out drum before entering the ATR where the methane reforming takes place.

In the ATR, the pre-reformed natural gas mixture is reacted with oxygen in an oxidation reaction. The oxidation reaction converts a part of the hydrocarbons and provides heat for the endothermic steam reforming processes.

The oxygen is pre-heated in the oxygen preheater using saturated steam. In order to decrease the aggressiveness of oxygen, superheated high pressure steam is added to obtain the required oxygen concentration.

The chemical reactions taking place are a combination of combustion and steam reforming reactions. The reactor space can be divided into three reaction zones namely mixing zone, combustion zone and catalytic zone.

2.1.3 CO Conversion

The aim of the CO shift is to maximize production of H_2 through an exothermic catalytic reaction with steam. CO_2 is a by-product of this reaction.

The process gas leaving the ATR unit passes the waste heat boiler, the high temperature (HT) shift reactor, the steam superheater, the 2nd waste heat boiler, regeneration exchanger for the CO_2 removal section and the 1st boiler feed water (BFW) preheater to the low temperature (LT) shift converter. The shift reaction takes place in the HT shift converter followed by the LT shift converter.

Steam is added upstream of the shift converters to get a desired steam/dry gas ratio.

2.1.4 Process Gas Cooling

The heat contained in the reformed gas leaving the autothermal reformer is utilized for generation of high-pressure steam in the waste heat boiler. The reformed gas is cooled rapidly in the waste heat boiler to HT shift inlet. The heat in the process gas downstream the HT shift is used for steam superheating, steam generation in boiler, regeneration heat input for CO_2 removal and preheating the BFW before inlet to LT shift (LTS). Downstream the LTS the process gas passes through the BFW preheater, demineralized, air cooler and through the water cooler.

After cooling down of the process gas, the process condensate is separated in the process condensate separator before being sent to process condensate stripper.

2.1.5 Separation of CO_2

For removal of the CO_2, amine scrubbing process is used. Main equipment in the amine scrubbing process are the CO_2 absorber and the CO_2 stripper. The extracted CO_2 will be cooled to the required temperature and then delivered and compressed by a CO_2 compressor.

CO_2 is removed from the process gas by counter-current absorption in two stages using an activated amine solution. In the lower part of the absorber, flash-regenerated solution is used for bulk CO_2 removal. In the upper part of the absorber, regenerated amine solution is used for scrubbing.

In this way, CO_2 can be almost completely removed with very low heat consumption, leaving only approximately 2% of CO_2 in the treated gas.

The CO_2-free gas from CO_2 removal section is sent to the pressure swing adsorption (PSA) unit for H_2 purification. The CO_2 removal off-gas from the HP flash drum is recycled back to the process. The condensate from the CO_2 compressor is mixed with the process condensate in the bottom part of the process condensate separator and sent to the process condensate stripper.

2.1.6 H_2 Purification and Product Compression

For final purification of the hydrogen, a pressure swing adsorption system will be installed. It uses an adsorption system where gaseous impurities such as CO, CO_2 and CH_4 are adsorbed at high pressure and desorbed at low pressure. The process operates with repeating these basic steps without using any addition or removal of heat.

The hydrogen purity obtained by this system is greater than 99.9% by volume. The hydrogen product stream leaving the PSA is compressed by the hydrogen product compressor, further cooled to required temperature in a water cooler, then exported to battery limit. Part of the hydrogen-rich stream from the compressor discharge is recycled to the purification section.

The PSA off-gas, a H_2 rich fuel gas stream from H_2 purification, and flash gas from the HP flash drum in the CO_2 removal unit is used as fuel in the process fired heater.

2.1.7 Combustion and Convection Section

The preheating of feed to pre-reformer and ATR is done in the fired heater. CO_2 removal off-gas from the removal unit CO_2 and the PSA unit is used as primary fuel, whereas natural gas is used during startup and as secondary fuel during normal operation. The various coils in the fired heater will:

- Re-heat the hydrocarbon/steam mixture from the performer before entering the ATR
- Preheat the hydrocarbon/steam mixture to the pre-reformer
- Heat the natural gas to the desulphurization section

2.1.8 Generation of Medium-Pressure Steam

Process condensate from the process condensate separator is pumped by the process condensate pump and preheated in process condensate feed/effluent exchanger, before it is treated in process condensate stripper.

The stripped process condensate from steam condensate and import demineralized water (DMW) are added in deaerator to generate boiler feed water (BFW). The BFW is conditioned with chemicals to control the pH and alkalinity. BFW from the deaerator is pumped by BFW pump and sent through a series of BFW preheaters to the steam drum for waste heat steam generation.

The boiler water from the steam drum is used to produce steam in the two waste heat boilers. To ensure the quality of boiler water, a continuous blow-down is maintained by a special blow-down valve.

Major part of the saturated steam produced is superheated in steam superheater downstream the HT shift reactor and used as process steam. Part of the superheated steam is used to preheat the natural gas and hydrogen feed mix. The remaining steam is used to generate power.

2.2 Combined Cycle Gas Turbines (CCGTs)

Two (2) gas turbines, two (2) heat recovery steam generators (HRSGs), and one (1) steam turbine generator (STG) will be installed to meet the facility load requirements. The CCGTs are not connected to the utility grid. The CCGTs are designed to produce 100,575 horsepower (hp) of power to start the facility and meet the balance of power requirements for the proposed facility.

The flue gas from the gas turbine is directed to the HRSGs, where energy is recovered from the hot exhaust gas stream and transferred to boiler feed water to produce steam. Medium-pressure and low-pressure steam drums are included in HRSGs to produce saturated steam and superheaters are used to further heat the steam above the saturation temperature. The generated steam is supplied to the steam turbine.

The gas turbines extracts the energy from the high-temperature, high-pressure exhaust gas from the combustion chamber and convert it to mechanical work. The mechanical work is then converted to electrical power by the turbine generator.

The CCGTs exhaust will be equipped with a SCR system to reduce and control NOx emissions. There will also be an oxidation catalyst to reduce and control VOC, CO, and hazardous air pollutants (HAPs).

2.3 Auxiliary Boiler

An auxiliary boiler (part of Balance of Plant (BOP)) will be required to provide start-up/shutdown steam at rates and pressures provided by the licensor for the inside battery limits (ISBL) H_2 unit. The package auxiliary boiler will be supplied with boiler feed water from the deaerator and will be integrated with the H_2 plant steam system.

The auxiliary boiler will use natural gas as fuel. The boiler is designed for a heat input capacity of 213 MMBtu/hr. based on the high heating value of natural gas. The boiler will operate at full capacity only at plant startup. During normal operation, the boiler will be in turndown mode at approximately 10% design capacity.

2.4 Cooling Water

A dedicated open loop evaporative cooling system will be installed to provide cooling water for the process units. The cooling water will recirculate to reduce the raw water requirement. Make-up water for the cooling water system will come from the utility water, i.e., treated raw water.

2.5 Flare

An elevated flare will be installed to control startup, shutdown, and maintenance emissions. There is a natural gas fueled pilot that serves the flare.

2.6 Reciprocating Engine Generator for Process Start-up

A black start engine generator is required to start the CCGTs. Therefore, a 3,000-hp natural gas generator will be installed for plant start-up.

2.7 Diesel Engine Fire Water Pump

The facility will include a new fire water system for protection during emergencies. One diesel fire water pump will be installed.

2.8 Plant Operations

The plant operation consists of 1) normal operation, and 2) Startup, Shutdown, or Maintenance (SSM) conditions as described below.

2.8.1 Normal Operation

During normal operation, natural gas is converted to hydrogen in the pre-reformer and ATR. There are emissions from the heater flue gas stack from firing natural gas and process vent gas (a H_2 rich fuel gas stream from H_2 purification and CO_2 removal unit). There are also emissions from flare pilot combustion, gas turbines, auxiliary boiler, cooling tower, fixed roof storage tanks and equipment leaks.

2.8.2 Startup, Shutdown, and Maintenance Operations of the Pre-reformer and ATR (SSM)

The SSM operations consist of three cases: cold startup, hot startup, and a total unit trip. For this permit application, the table below provides the SSM duration per year for each relevant source,

Emission Source	Hours per Year
Fired Heater (111-H-2001) – Startup	48
CCTG1 (113-PKG-2011) – SCR Maintenance	36
CCTG1 (113-PKG-2011) – Startup	48
CCTG2 (113-PKG-2021) – SCR Maintenance	36
CCTG2 (113-PKG-2021) – Startup	48
Auxiliary Boiler (119-PKG-9201) – Startup	48
Flare (119-FL-9501) – SSM Activities	96

3 Emission Sources and Emission Calculations

3.1 Emission Source Description

MGSH2-1 plans to install the following air emission units during the construction of the proposed H_2 facility. Please note that the design information discussed in this application is based on best available information provided by vendors at the time of this application. A process flow diagram is included in Appendix B that identifies each emission source. Table 3-1 below summarizes emission points at the proposed facility.

Table 3-1 **Facility Emission Source ID and Description**

Emission Source	Source ID	Type	**Emission Source Description**
CCGT 2011	113-PKG-2011	Point	Combined Cycle **Combustion Turbine 1**
CCGT 2021	113-PKG-2021	Point	**Combined Cycle Combustion Turbine 2**
Heater	111-H-2001	Point	Fired Heater in Pre-reforming and **Reforming Sections**
Boiler	119-PKG-9201	Point	Auxiliary Boiler
Cooling Tower	119-CT-9301	**Fugitive**	Cooling Tower
Generator	119-PKG-0001	Point	Start-up NG Fired Engine Generator
Pump	119-P-9402	Point	Fire Water Diesel Engine Pump
Flare	119-FL-9501	Point	Flare
Equipment Leaks	H2-FUG	**Fugitive**	**Fugitive Components Leaks**
Fixed Roof Storage Tank	118-TK-9901	Point	Amine Makeup Tank

3.2 Emissions Rates and Calculation Methods

This section provides a project emission summary table and describes the method for determining emissions. In all cases, air emissions were estimated by one of the following methods: emission factors from U.S. EPA Compilation of Emission Factors AP-42, vendor data, engineering calculations, engineering process knowledge. Except for the auxiliary boiler, all emissions are based on maximum design capacity

and operating 8760 hours per year. The detailed emission calculations are included in Appendix B, Attachment N.

3.2.1 Proposed Project Emissions

Table 3-2 provides a summary of the potential annual emissions including particulate matter, particulate matter with an aerodynamic diameter of 10 microns or less, and particulate matter with an aerodynamic diameter of 2.5 microns or less ($PM/PM_{10}/PM_{2.5}$), nitrogen oxides (NO_X), sulfur dioxide (SO_2), carbon monoxide (CO), volatile organic compounds (VOC), and total hazardous air pollutants (HAPs). As mentioned above, the detailed emission calculations and supporting documentation is provided in Appendix B, Attachment N.

Table 3-2 Summary of Facility-Wide Potential Emissions in Tons Per Year

NO_X	CO	SO_2	VOC	PM	PM_{10}	$PM_{2.5}$	NH_3	Total HAPs
48.66	56.69	4.40	30.33	27.40	26.98	25.89	22.01	3.02

3.2.2 Emission Calculation Methods

Combined-cycle Combustion Turbines (CCGTs)

The CCGTs will burn natural gas only and will be equipped with SCR for NO_X emissions control and an oxidation catalyst for CO emission control.

During normal operation, maximum hourly NO_X, NH_3 and CO emissions from the turbines are estimated using vendor guaranteed emissions factors. Emissions of VOC, HAPs, and $PM/PM_{10}/PM_{2.5}$ are quantified using emission factors from AP-42 Section 3.1 for natural gas – fired turbines. Emission factor for SO_2 is based on the sulfur content of the natural gas. These factors are multiplied by the turbine's maximum firing rate of 298.10 MMBtu/hr. to derive the maximum hourly emission rate.

Annual emissions are estimated using the same emissions factors for each pollutant as in the hourly emissions estimates, turbine's annual average hourly firing rate of 298.10 MMBtu/hr. and the potential maximum annual operating hours of 8760.

During startup, the NO_X and CO emissions will be higher than normal because of the reduced performance of the SCR and CO Oxidation Catalyst. Their emissions are quantified using worst-case emission factors, the turbine's maximum firing rate, and the total annual startup hours.

Details of the calculations and the resulting emission estimates can be found in Tables N-1 in Appendix B, Attachment N.

Fired Heater for Pre-reformer and ATR

The fired heater will burn natural gas during startup and mainly burns process vent gas with high hydrogen content during normal operation, supplemented by natural gas. The fired heater will be equipped with low NO_X burner (LNB) and SCR for NO_X emissions control.

During normal operation, maximum hourly NO_X, NH_3 and CO emissions from the heater are estimated using vendor guaranteed emissions factors. Emissions of $PM/PM_{10}/PM_{2.5}$ are quantified using emission

factors from AP-42 Section 1.4 for natural gas combustion. Emission factor for SO_2 is based on the sulfur content of the natural gas. For VOC and HAPs, the emissions are quantified based on the emission factors in Section 1.4 of AP-42 adjusted to take into account that the process vent gas does not contain any VOCs. The emission factors for VOC and HAPs in Section 1.4 of AP-42 are adjusted downwards based on the percentage of process vent gas in the fuel gas mixture. These factors are multiplied by the heater's maximum firing rate of 200 MMBtu/hr. to derive the maximum hourly emission rate.

Annual emissions are estimated using the same emissions factors for each pollutant as in the hourly emissions estimates, heater's maximum hourly firing rate of 200 MMBtu/hr. and the potential maximum annual operating hours of 8760.

During startup, the NOx and CO emissions will be higher than normal because of the reduced performance of the SCR, and the combustion is unstable in transition phase. Their emissions are quantified using worst-case emission factors, the heater's maximum firing rate, and the total annual startup hours.

Details of the calculations and the resulting emission estimates can be found in Tables N-2 in Appendix B, Attachment N.

Auxiliary Boiler

The auxiliary boiler will burn natural gas only and will be equipped with ultralow NOx burner (ULNB) for NO_X emissions control.

During normal operation, maximum hourly NO_X and CO emissions from the auxiliary boiler are estimated using vendor guaranteed emissions factors. Emissions of VOC, HAPs, and $PM/PM_{10}/PM_{2.5}$ are quantified using emission factors from AP-42 Section 1.4 for natural gas combustion. Emission factor for SO2 is based on the sulfur content of the natural gas. These factors are multiplied by the boiler's maximum firing rate of 213.31 MMBtu/hr. to derive the maximum hourly emission rate.

Annual emissions are estimated using the same emissions factors for each pollutant as in the hourly emissions estimates, boiler's annual average hourly firing rate of 21.33 MMBtu/hr. and the potential maximum annual operating hours of 8760.

During startup, the NOx and CO emissions will be higher than normal due to unstable combustion in transition phase. Their emissions are quantified using worst-case emission factors, the boiler's maximum firing rate, and the total annual startup hours.

Details of the calculations and the resulting emission estimates can be found in Tables N-3 in Appendix B, Attachment N.

Cooling Tower

Emissions of total particulate matter were estimated using design circulation and drift elimination rates, as well as a worst-case Total Dissolved Solids (TDS) value for the water. Proposed emissions of PM are based on the expected TDS concentrations in the circulating cooling water and a design drift rate of 0.001% of the circulating water. Emissions of respirable and fine particulates (PM_{10} and $PM_{2.5}$) are not

expected to be equal to total PM and are calculated based on the method of Reisman and Frisbie [1] for calculating cooling tower particulate emissions after accounting for particulate size distribution.

The annual emissions for the cooling towers are based on operating 8,760 hours per year.

Details of the calculations and the resulting emission estimates can be found in Tables N-4 in Appendix B, Attachment N.

Natural Gas (NG) Startup Generator

There will be a 3000-hp NG - fired startup generator. Since there is no planned grid power to start the process, the NG startup generator will provide the required power before the CCGTs can operate properly. This generator will only run 100 hours per year.

Maximum hourly emissions were calculated based on operating/testing at the maximum engine capacity. Annual emissions were based on the maximum number of hours per year of operation (100 hrs./yr). Emissions for air contaminants other than SO_2 are calculated based on emission factors applying to NG fire engines (Table 1 to 40 CFR 60 Subpart JJJJ (40 CFR § 60.4233(e)) and the rated brake horsepower of the engine. Emissions of SO_2 are estimated based on the sulfur content of the natural gas and the assumed brake-specific fuel consumption of the engine.

Detailed emission calculations are included in Appendix B Attachment N as Tables N-5.

Fire Water Diesel Engine Pump

Emissions will occur from weekly testing of one 600-hp diesel-fired water pumps (119-P-9402). Maximum hourly emissions were calculated based on testing at the maximum engine capacity. Annual emissions were based on the maximum number of hours per year of operation (100 hrs./yr). Emissions for air contaminants other than SO_2 are calculated based on emission factors applying to diesel fire water pump engines after 2008 (Table 4 to 40 CFR 60 Subpart IIII (40 CFR § 60.4202(d) and § 60.4205(c)) and the rated brake horsepower of the engine. Emissions of SO_2 are estimated based on the use of Ultra-low Sulfur Diesel (40 CFR §60.4207 and 40 CFR §1090.305(b)) and the assumed brake-specific fuel consumption of the engine.

Detailed emission calculations are included in Appendix B Attachment N as Tables N-6.

Flare

The flare will be used to control the intermittent startup and shutdown streams. Emissions from this flare were estimated using the flow rates of the vent gas and the pilot gas and the emissions factors found in AP-42 Section 13.5 for NO_X and CO and Section 1.4 for VOC and $PM/PM_{10}/PM_{2.5}$.

The startup/shutdown gas streams within the ATR do not contain any sulfur. Emissions of SO_2 from natural gas combustion were estimated using the sulfur content of the natural gas.

Hourly emissions were estimated using the maximum hourly flow rate of the startup/shutdown gas stream and a natural gas pilot flow rate of 2104 scf/hr. Annual emissions from flaring startup/shutdown streams were estimated from the hourly emissions from flaring the startup/shutdown flow and assuming

[1] Joel Reisman and Gordon Frisbie, Calculating Realistic PM_{10} Emissions from Cooling Towers. July 2002. Environmental Progress 21(2): 127-130.

that the flare will be operating 12 hours per year to control each startup/shutdown stream. The pilot will operate for 8,760 hours, which is used to estimate the annual emissions from pilot gas combustion.

Detailed emission calculations are included in Appendix B Attachment N as Tables N-7.

Fixed Roof Tanks

Annual emissions from fixed roof storage tanks were estimated using equations and methodology in EPA Publication AP-42, Chapter 7[2]. AP-42 emission calculations require as inputs the physical properties of the material stored (i.e., molecular weight, vapor pressure function, and vapor phase molecular weight), meteorological conditions of the site, and the characteristics of the tank construction (e.g., paint color).

Maximum hourly emissions are determined based on TCEQ's guidelines for the use of AP-42 methodology to estimate short-term emissions from storage tanks.[3] The guideline generally requires the use of a maximum ambient temperature of 95 °F, which is conservative for this application. The calculations follow the TCEQ guideline in estimating emissions from storage tanks.

Detailed emission calculations are included in Appendix B Attachment N as Tables N-8.

Equipment Leaks

Potential fugitive emissions were estimated using factors from US EPA, 1995 Protocol for Equipment Leak Emission Estimates.[4] Since there is no LDAR program applicable to the proposed facility, no control efficiency was applied to these calculations.

Hourly emissions were estimated by taking the emissions factor and multiplying it by the number of components of each type and the weight percentage of each compound of concern in the gas stream.

Annual emissions were estimated assuming that these small fugitive emissions would be always occurring during operation, i.e., 8760 hours per year.

Detailed emission calculations are included in Appendix B Attachment N as Tables N-9.

[2] US EPA, AP-42 Section 7.1, Organic Liquid Storage Tanks. June 2020.
[3] Estimating Short Term Emissions Rates from Fixed Roof Tanks. February 2020. TCEQ Publication APDG 6250v3.
[4] https://www.epa.gov/sites/default/files/2020-09/documents/protocol_for_equipment_leak_emission_estimates.pdf

4 Regulatory Applicability

This section discusses the applicability of federal and state air permitting and regulatory requirements to the proposed H_2 plant. Specifically, this section discusses the applicability of Prevention of Significant Deterioration (PSD) Review, Nonattainment New Source Review (NNSR), New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAP), and relevant regulatory requirements in West Virginia 45 Code of State Rules (CSR).

4.1 Construction Permit Requirement

Construction permitting programs regulate new sources of pollutants under the New Source Review program. The H_2 Plant falls within the 28 listed source categories in 45 CSR Series 14 Section 2.43.a. (45CSR14-2.43.a) with a 100 tons per year (tpy) major source threshold. Since the quantified emissions of each regulated New Source Review (NSR) pollutant are less than 100 tpy, the project is not subject to PSD review.

The proposed H_2 facility will be in Mason County, which is currently designated as "attainment" or "unclassified" for all regulated NSR pollutants (see 40 CFR 81.349). Therefore, this application is not subject to NNSR review under 40 CFR 51.165 and 45CSR19.

4.2 Title V Operating Permit Requirement

40 CFR Part 70 establishes the federal Title V operating permit program. WVDAQ is delegated by U.S. EPA to implement a fully approved Part 70 operating permit program under 45CSR30 (see 40 CFR 70, Appendix A). In attainment area, the major source threshold for any air pollutant other than HAPs in the Title V permit program is 100 tpy. The major source threshold for HAPs is 10 tpy for a single HAP or 25 tpy for any combination of HAP. The potential emissions of the regulated pollutants don't exceed the corresponding threshold(s) at this facility. Therefore, the proposed H_2 Plant is classified as a minor source for Title V purposes and a Title V Operating permit is not required for this project.

4.3 New Source Performance Standards (NSPS)

The federal NSPS requires new, modified, or reconstructed sources to control emissions to the level achieved by the best demonstrated technology as specified in the applicable provisions of the rule. NSPS standards have been adopted by reference in 45CSR16 for standards in effect as of June 1, 2016. This section describes the applicability and non-applicability of NSPS subparts relevant to the H2 Plant.

4.3.1 NSPS Subpart A – General Provisions

Certain provisions of 40 CFR Part 60 Subpart A apply to the owner or operator of any stationary source subject to a NSPS. Since the auxiliary boiler (Subpart Db), the startup generator (Subparts JJJJ) and the fire water pump (Subpart IIII) will be subject to a NSPS, the Project will be required to comply with all applicable provisions of Subpart A.

4.3.2 NSPS Subpart D – Standards of Performance for Fossil-Fuel-Fired Steam Generators

The affected facilities of this subpart are each fossil-fuel-fired steam generating unit of more than 73 MW heat input rate (250 MMBtu/hr.) and each fossil-fuel and wood-residual-fired steam generating unit capable of firing fossil fuel at a heat input rate of more than 73 MW (250 MMBtu/hr.). Since the max heat input capacity of the auxiliary boiler is lower than 250 MMBtu/hr., it will not be subject to the requirements of this subpart.

The fired heater 111-H-2001 is a process heater and is not a steam generating unit as defined in 40 CFR 60.41. Therefore, NSPS subpart D does not apply to this fired heater.

4.3.3 NSPS Subpart Db – Standards of Performance for Industrial, Commercial, Institutional Steam Generating Units

Per 40 CFR 60.40b(a), 40 CFR Subpart Db applies to any industrial, commercial or institutional steam generating unit that commences construction, modification, or reconstruction after June 19, 1984, and that has a heat input capacity from fuels combusted in the steam generating unit of greater than 29 MW (100 MMBtu/hr.). The proposed auxiliary boiler will have a burner design heat input rate greater than 100 MMBtu/hr. and burn natural gas. Based on the fuel to be combusted and maximum heat input, the proposed auxiliary boiler will meet the applicability requirements of NSPS Subpart Db. The following Subpart Db requirements are applicable to the proposed auxiliary boiler:

<u>Emission Limitations:</u>

SO_2: Units firing gaseous fuels, or a mixture of gaseous fuel with other fuels with a potential SO_2 emission rate of 0.32 lbs/MMBtu heat input or less, are exempt from the SO_2 emission limit of 0.2 lbs/MMBtu (40 CFR 60.42b(k)(2)). The proposed boiler will achieve an SO_2 rate of less than 0.32 lbs/MMBtu, thus will satisfy the exemption criteria.

PM: No applicable limit

Opacity: No applicable limit

NO_X: 0.10 lbs/MMBtu (43 ng/J) heat input on a 30-day rolling average, pursuant to 40 CFR 60.44b(a) and 60.44b(i). The boiler is assumed to be a unit with low heat release rate (≤ 730,000 J/sec-m^3 (70,000 Btu/hr-ft^3)).

The NOx standard applies at all times including periods of startup, shutdown, or malfunction (60.44b(h))

The proposed auxiliary boiler will only combust natural gas.

<u>Monitoring</u>

SO_2 – Since the boiler will be demonstrating compliance under 60.45b(k), it is not subject to the emission monitoring requirements under 60.47b(a) if the owner or operator maintains fuel records as described in 60.49b(r) (60.47b(f)).

MGSH2-1 will maintain fuel records as described in 60.49b(r).

PM – No applicable requirements

Opacity – No applicable requirements

NO_X - To determine compliance with the emission limits for NO_X required under 60.44b, the owner or operator shall conduct performance test as required under 60.8 using the continuous system for monitoring NO_X under 60.48b (60.46b(c) and (e)).

Affected facilities subject to NO_X standards under 60.44b shall install, calibrate, maintain and operate continuous emission monitoring (CEM) for measuring NO_X and O_2 (or CO_2) emission discharged to the atmosphere (60.48b (b)(1)).

Compliance Testing

60.46b(c) and 60.46b(e) - To determine compliance with the emission limit for NO_X required under 60.44b, the owner or operator of an affected facility shall conduct the performance test as required under 60.8 using the continuous system for monitoring NO_X under 60.48(b).

Recordkeeping

60.45b(k) and 60.49b(r) – record from fuel supplier certifying gaseous fuel meets the definition of natural gas as defined in 60.41b and applicable sulfur limit. Reports shall be submitted to the Administrator certifying that only natural gas was combusted in the boiler during the reporting period.

60.48b(c) – (select to use CEMS) The CEMS shall be operated and data recorded during all periods of operation of the auxiliary boiler except for CEMS breakdowns and repairs. Data is recorded during calibration checks, and zero and span adjustments.

60.49b(d) - Record and maintain records of the amounts of each fuel combusted during each day and calculate the annual capacity factor.

60.49b(g) – Maintain records of the information for each steam generating unit operating day listed in 40 CFR 60.49b(g).

60.49b(o) - All records required under this section shall be maintained by the owner or operator of the affected facility for a period of 2 years following the date of such record.

Reporting

60.49b(a) - Submit notification of the date of initial startup.

60.49b(b) - Submit to the Administrator the performance test data from the initial performance test and the performance evaluation of the CEMS using the applicable performance specifications in appendix B of this part. Submit to the Administrator the maximum heat input capacity data from the demonstration of the maximum heat input capacity of the affected facility.

60.49b(h) - Submit excess emission reports for any excess emissions (i.e., opacity and NO_X emissions) that occurred during the reporting period.

60.49b(w) - The reporting period for the reports required under this subpart is each 6-month period. All reports shall be submitted to the Administrator and shall be postmarked by the 30th day following the end of the reporting period.

4.3.4 NSPS Subpart Kc – Performance Standards for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for which Construction, Reconstruction, or Modification Commenced After October 4, 2023

This subpart applies to each storage vessel with a capacity greater than or equal to 20,000 gallons (gal) (75.7 cubic meters (m^3)) that is used to store volatile organic liquids (VOL) for which construction, reconstruction, or a modification commenced after October 4, 2023. Of the two storage tanks to be installed at this facility, only the Amine Makeup Tank (118-TK-9901) will have a capacity greater than 20,000 gal and may potentially be subject to this subpart. However, the Amine Makeup Tank will store a

VOL with a maximum true vapor pressure less than 0.25 psia (1.7 kPa absolute). Therefore, it will not be subject to any requirements of 40 CFR Subpart Kc, pursuant to 40 CFR 60.110c(b)(8).

Based on the above, NSPS Subpart Kc does not apply to the facility.

4.3.5 NSPS Subpart GG – Performance Standards for Stationary Gas Turbines

Pursuant to 40 CFR §60.4305(b), stationary combustion turbines regulated under NSPS Subpart KKKK are exempt from the requirements of NSPS Subpart GG. Because the two CCGTs will be subject to NSPS Subpart KKKK, they are not subject to NSPS Subpart GG.

4.3.6 NSPS Subpart KKKK – Performance Standards for Stationary Combustion Turbines

Pursuant to 40 CFR §60.4305(a), Subpart KKKK applies to stationary combustion turbines with a heat input at peak load equal to or greater than 10.7 gigajoules (10 MMBtu) per hour, based on the higher heating value of the fuel, which commenced construction, modification, or reconstruction after February 18, 2005. Therefore, the Project's two combustion gas turbines are subject to 40 CFR 60 Subpart KKKK.

Emission Limitations:

SO_2: 110 nanograms per Joule (ng/J) (0.90 lb./MWh) gross output or 26 ng/J (0.060 lb. SO_2/MMBtu) heat input or 20 gr Sulfur/100 scf NG (338 ppmv) (60.4330(a)(1)and (2) and 60.4365 (a)).

MGSH2-1 will specify the maximum total sulfur content for natural gas used by the CCGTs less than or equal to 20 gr Sulfur/100 scf NG.

NO_X: 25 ppmvd at 15% O2 or 150 ng/J of useful output (1.2 lb./MWh) on a 30-day rolling average, pursuant to 40 CFR §60.4320(a) and Table 1 of the Subpart.

The proposed CCGTs will only combust natural gas.

Monitoring

60.4340(a) for NO_X – Perform annual performance tests in accordance with §60.4400 to demonstrate continuous compliance. If the NO_X emission result from the performance test is less than or equal to 75% of the NO_X emission limit for the turbine, the frequency of subsequent performance tests may be reduced to once every two (2) years (no more than 26 calendar months following the previous performance test). If the results of any subsequent performance test exceed 75% of the NO_X emission limit for the turbine, annual performance tests must be resumed.

60.4340(b) for NO_X – As an alternative, the owner or operator may install, calibrate, maintain and operate a continuous emission monitoring as described in 60.4335(b) and 60.4345, or a continuous parameter monitoring as required in 60.4340(b)(2).

MGSH2-1 will perform an annual emission test to demonstrate continuous compliance.

60.4415(a) for SO_2 - MGSH2-1 will comply with the performance testing requirement using a current valid purchase contract, tariff sheet, or transportation contract for the fuel specifying the maximum total sulfur content of the natural gas combusted in the CCGTs.

Compliance Testing

40 CFR §60.4400(a) for NO_X - Conduct initial performance test as required in 40 CFR §60.8. Subsequent NO_X performance tests shall be conducted on an annual basis (no more than 14 calendar months following the previous performance test.

40 CFR §60.4400(b) for NO_X - The performance test must be done at any load condition within plus or minus 25 percent of 100 percent of peak load. Testing may be performed at the highest achievable load point, if at least 75 percent of peak load cannot be achieved in practice. Conduct three separate test runs for each performance test. The minimum time per run is 20 minutes.

60.4415(a)(1) for SO_2 - Conduct initial performance test as required in 40 CFR §60.8. Subsequent SO2 performance tests shall be conducted on an annual basis (no more than 14 calendar months following the previous performance test. There are four methodologies that can be used to conduct the performance tests.

MGSH2-1 will use a current valid purchase contract, tariff sheet, or transportation contract for the fuel specifying the maximum total sulfur content of the natural gas combusted in the CCGTs.

Record Keeping

60.4370(b) – Not applicable since the total sulfur content of the natural gas will be specified to be less than 20 gr Sulfur/100 scf in accordance with 60.4365(a).

Reporting

60.4375(b) for NO_X – submit a written report of the results of each performance test before the close of business on the 60th day following the completion of the performance test.

4.3.7 NSPS Subpart TTTT – Performance Standards for Greenhouse Gas Emissions for Electric Generating Units- not applicable

Pursuant to 40 CFR §60.5509(a), Subpart TTTT applies to stationary combustion turbines that begin construction after January 8, 2014, that have a base load rating greater than 260 GJ/h (250 MMBtu/hr.) of fossil fuel (either alone or in combination with any other fuel) and that serves a generator or generators capable of selling more than 25 MW of electricity to a utility power distribution system. Because the electricity generated by the proposed project's two CCGTs will be used only by the proposed project and no electricity will be sold to any utility power distribution system, they are not subject to the provisions of this Subpart.

4.3.8 NSPS Subpart IIII – Performance Standards for Stationary Compression Ignition Internal Combustion Engines

This subpart applies to stationary compression ignition (CI) internal combustion engines (ICE) that commence construction after July 11, 2005, where the CI ICE are manufactured after April 1, 2006 (and are not fire pump engines) or manufactured after July 1, 2006 (for certified National Fire Protection Association fire pump engines).

NSPS Subpart IIII specifies emission limitations, monitoring, reporting, and recordkeeping requirements for NO_X, CO, nonmethane hydrocarbons (NMHC), and PM.

Applicable NSPS IIII emission standards for the firewater pump CI ICEs are summarized as follows:

• 40 FR 60.4205(c) - Owners and operators of fire pump engines with a displacement of less than 30 liters per cylinder must comply with the emission standards in Table 4 to NSPS Subpart IIII, for all pollutants. The applicable emission limits are:

- NMHC + NO_X: 4.0 g/kW-hr (3.0 g/hp-hr.)
- CO: 3.5 g/kW-hr (2.6 g/hp-hr.)
- PM/PM10/PM2.5: 0.2 g/kW-hr (0.15 g/hp-hr.)

- 40 CFR 60.4207 - NSPS Subpart IIII also stipulates specific sulfur requirements for diesel fuels. Beginning October 1, 2010, engines with a displacement of less than 30 liters/cycle and use a diesel fuel must meet a sulfur content of 0.0015% by weight.

  MGSH2-1 will be utilizing diesel fuel with a sulfur content of 0.0015 % by weight or less.

The proposed emergency engine must also meet the operating hour requirements of 40 CFR 60.4211(f) which include:

- No time limit on use in emergency situations
- Up to 100 hours per year for maintenance checks / readiness testing
- 50 hours (of the 100) per year can be for non-emergency operation. The 50 hours per calendar year for non-emergency situations cannot be used for peak shaving or non-emergency demand response, or to generate income for a facility to an electric grid or otherwise supply power as part of a financial arrangement with another entity. Detailed requirements on use of the 50 hours for non-emergency operation is contained in 40 CFR 60.4211(f)(3)(i).

The firewater pump CI ICE will comply with the applicable requirements of NSPS Subpart IIII.

4.3.9 NSPS Subpart JJJJ – Performance Standards for Stationary Spark Ignition Internal Combustion Engines

40 CFR 60 Subpart JJJJ applies to stationary spark ignition (SI) internal combustion engines. The provisions of this subpart are applicable to a SI ICE with a maximum engine power greater than or equal to 500 HP manufactured on or after July 1, 2007. The startup generator is driven by a 3000-hp natural gas engine.

40 CFR 60.4233(e) – Owners and operators of stationary SI ICE with a maximum engine power greater or equal to 75 kW (100 HP) must comply with the emission standards in Table 1 to 40 CFR 60 Subpart JJJJ for their stationary SI ICE. The applicable emission limits are:

Engine Type and Fuel	Emission Standards					
	g/HP-hr.			ppmvd at 15% O_2		
Non-Emergency SI Natural Gas	NO_X	CO	VOC [1]	NO_X	CO	VOC
	1.0	2.0	0.7	82	270	60

[1] As indicated in *40 CFR 60 Subpart JJJJ, Table 1, Note d,* the VOC in 40 CFR 60 Subpart JJJJ does not include formaldehyde. However, as shown in Table N-5 in Appendix B, for completeness, the VOC emissions from NG starter generators do include formaldehyde.

60.4243(b) – demonstrate compliance according to one of the methods specified in paragraphs (b)(1) and (2).

(1) Purchasing an engine certified according to procedures for the same model year and demonstrating compliance according to one of the methods specified in 60.4243(a).

(2) Purchasing a non-certified engine and demonstrate compliance with the applicable emission standards and according to the requirements specified in 60.4244, as applicable, and must keep a maintenance plan and records of conducted maintenance and must, to the extent practicable, maintain and operate the engine in a manner consistent with good air pollution control practice for minimizing emissions. In addition, the operator must conduct an initial performance test within 1 year of engine startup and conduct subsequent performance testing every 8,760 hours or 3 years, whichever comes first.

4.4 National Emission Standards for Hazardous Air Pollutants (NESHAP)

NESHAP promulgated prior to the Clean Air Act Amendments (CAAA) of 1990, found in 40 CFR Part 61, apply to specific compounds emitted from specific processes. None of the pollutant specific Part 61 NESHAPs apply to the Project.

Maximum achievable control technology (MACT)-based NESHAPs contained in 40 CFR Part 63 require sources that are "major" for HAPs to control emissions to the level achievable by the best demonstrated technology as specified in the applicable provisions. A major source is defined in 40 CFR 63.2 as follows,

"…any stationary source or group of stationary sources located within a contiguous area and under common control that emits or has the potential to emit considering controls, in the aggregate, 10 tons per year or more of any hazardous air pollutant or 25 tons per year or more of any combination of hazardous air pollutants…"

Generally available control technology (GACT)-based NESHAPs contained in 40 CFR Part 63 require area (i.e., non-major) sources to control emissions to the level achievable using generally available control technologies or management practices to reduce HAPs emissions.

As demonstrated in Section 3 above, the H_2 Plant does not have the potential to emit more than ten (10) tpy of a single HAP or 25 tpy of combined HAPs. As such, the H_2 Plant is considered an area source of HAPs. Therefore, MGSH2-1 has evaluated the potential applicability of GACT requirements for area sources for the proposed H_2 Plant.

4.4.1 40 CFR 63 Subpart ZZZZ – National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (RICE)

40 CFR 63 Subpart ZZZZ applies to facilities that operate stationary reciprocating internal combustion engines (RICE). The natural gas startup generator (119-PKG-0001) and the emergency diesel fire water pump (119-P-9402) at the H_2 Plant will satisfy the requirements of Subpart ZZZZ by complying with the applicable requirements of NSPS Subpart IIII and Subpart JJJJ pursuant to 40 CFR 63.6590(c)(1). No other requirements apply under this subpart.

4.4.2 40 CFR 63 Subpart JJJJJJ – Area Sources: Industrial, Commercial, and Institutional Boilers

This subpart applies to an industrial, commercial, or institutional boiler as defined in 40 CFR 63.11237 that is located at, or is part of, an area sources of hazardous air pollutants (HAP), as defined in 40 CFR 63.2, except as specified in 40 CFR 63.1195. In accordance with 40 CFR 63.1195(e), a gas-fired boiler is not subject to the requirements of this subpart. The auxiliary boiler (119-PKG-9201) meets the definition

of a gas-fired boiler in 40 CFR 63.11237. Therefore, it is not subject to the requirements of 40 CFR 63 Subpart JJJJJJ.

4.5 Compliance Assurance Monitoring (CAM)

Pursuant to requirements concerning enhanced monitoring and compliance certification under the Clean Air Act Amendments of 1990, the EPA promulgated regulations codified at 40 CFR Part 64 to implement compliance assurance monitoring (CAM) for major stationary air pollution sources. The proposed H_2 Plant is a minor stationary air pollution source; therefore, the CAM requirements do not apply.

4.6 Acid Rain Provisions

The US EPA's Acid Rain Program's goal is to reduce the amount of SO_2 and NO_X released to the atmosphere from power plants. The requirements of this program have been established in 40 CFR Parts 72 through 78. The CCGTs, HRSGs, and STG to be installed will only provide power to on-site equipment and will not sell electricity to the grid. Therefore, they do not meet the definition of electric generating units and will not be subject to the provisions of 40 CFR Parts 72 through 78.

4.7 Cross-State Air Pollution Rule (CSAPR) – 40 CFR Part 97

The CSAPR replaced EPA's 2005 Clean Air Interstate Rule (CAIR), following the direction of a 2008 court decision that required EPA to issue a replacement regulation. CSAPR implementation began on January 1, 2015. On September 7, 2016, the EPA revised the CSAPR ozone season NO_X program by finalizing an update to CSAPR for the 2008 ozone National Ambient Air Quality Standards, known as the CSAPR Update. The CSAPR Update ozone season NO_X program will largely replace the original CSAPR ozone season NO_X program starting on May 1, 2017.

The CSAPR requires fossil fuel-fired electric generating units at coal-, gas-, and oil-fired facilities in 27 states to reduce SO_2 and NO_X emissions to help downwind areas attain fine particle and/or ozone NAAQS. West Virginia is required to reduce emissions of NO_X during the ozone season for 2008 Ozone NAAQS and is required to reduce annual emissions of SO_2 and NO_X for both 1997 annual $PM_{2.5}$ NAAQS and 2006 24-hr $PM_{2.5}$ NAAQS.

As discussed in Section 4.6, the CCGTs, HESGs, and SGT to be installed do not meet the definition of electric generating units; Therefore, CSAPR does not apply to this facility.

4.8 Chemical Accident Prevention Provisions – 40 CFR Part 68

EPA has promulgated specific regulations to prevent chemical accidents from occurring at industrial type facilities. These regulations are contained in 40 CFR Part 68 of the Code of Federal Regulations.

This regulation applies to any owner or operator of a stationary source that has more than a threshold quantity of a regulated substance in a process. The threshold quantity is listed in 40 CFR 68.130. A process is defined as any activity involving a regulated substance including any use, storage, manufacturing, handling, or on-site movement of such substances, or combination of these activities. Compliance with the requirements established by the regulation must be achieved by the date on which a regulated substance is first present above a threshold quantity in a process.

MGSH2-1 is subject to this rule for the following reasons:

- It will produce 265 million standard cubic feet hydrogen per day (633 metric tons of hydrogen per day), which exceeds the threshold quantity for hydrogen specified in Table 3 of 40 CFR 68.130 (10,000 lbs. per year).
- MGSH2-1 is proposing to use the following chemicals listed in this regulation:
  Ammonia will be utilized in the SCR control technology system proposed for the two CCGTs and the fired heater. MGSH2-1 will be utilizing an aqueous ammonia which will contain greater than 20 % ammonia. Subsequently, the use of aqueous ammonia will meet the applicability requirements of this regulation.

Table 4-1 Accidental Release Program Threshold Quantities

Compound	**Threshold Quantity (**lbs.)
Ammonia, aqueous (conc. ≥ 20% by wt.)	20,000
Hydrogen	10,000

4.9 Greenhouse Gas Reporting Program

The Greenhous Gas Reporting Program (GHGRP), codified in 40 CFR Part 98, requires facilities belonging to certain source categories to report their annual GHG emissions to EPA. Hydrogen production is included on EPA's list of affected source categories. Such affected facilities must report their annual GHG emissions from not only the hydrogen production unit, but from all stationary fuel combustion sources (excluding portable and emergency equipment) located at the facility. Thus, the hydrogen production process units, CCGTs, fired heater, auxiliary boiler, NG startup generator, and the flare will be subject to 40 CFR Part 98 and MGSH2-1 will report to EPA the Project's annual GHG emissions as applicable.

4.10 State of West Virginia Regulatory Applicability

The facility is required to comply with the requirements contained in the applicable provisions of the following regulations.

4.10.1 45CSR2 – To Prevent and Control Particulate Matter Air Pollution from Combustion of Fuel in Indirect Heat Exchangers

45CSR2 establishes emission limitations for smoke and particulate matter which are discharged from fuel burning units. "Fuel Burning Unit" means and includes any furnace, boiler apparatus, device, mechanism, stack or structure used in the process of burning fuel or other combustible material for the primary purpose of producing heat or power by indirect heat transfer. Additionally, the definition of "indirect heat exchanger" specifically excludes process heaters, which are defined as "a device that is primarily used to heat a material to initiate or promote a chemical reaction in which the material participates as a reactant or catalyst."

Based on these definitions, 45CSR2 will not apply to Fired Heater 111-H-2001 as its primary function is to provide heat for the reforming reaction in the pre-reformer and ATR.

The definition also excludes the two CCGTs from 45CSR2 applicability, as the combustion process in the units does not constitute indirect heat transfer.

The auxiliary boiler is categorized as a type 'b' fuel burning unit because its primary purpose is to generate steam but not to produce electricity for sale. Per §45-2-3.1, emission of smoke and/or

particulate matter into the open air from the auxiliary boiler shall not exceed ten (10) percent opacity based on a six-minute block average. Per §45-2-4.1.b, 19.20 lb./hr. (0.09 * 213.31 MMBtu/hr.) of particulate matter is allowed to be discharged to the open air. This limit represents filterable PM only and does not include condensable PM. The exemption of condensable PM is located within the 45CSR2 Appendix - which establishes compliance test procedures - by not requiring measurement of the condensable PM. The auxiliary boiler will only burn natural gas with a proposed particulate matter emission rate of 1.59 lb./hr., which includes condensable PM and is still well below the amount allowed by this rule.

According to 45CSR2-8.4.2 and 45CSR2A-3, the owner or operator of a fuel burning unit(s) which combusts only natural gas shall be exempt from the requirements of subdivision 45CSR2-8.1.a and subsection 45CSR2-8.2 and sections 45CSR2A-5 and 45CSR2A-6. These (sub) sections specify the testing and monitoring requirements for the owner and operator of fuel burning units. Since the auxiliary boiler combusts only natural gas, MGSH2-1 is exempt from the testing and monitoring requirements of this rule for the auxiliary boiler.

MGSH2-1 will comply with all the applicable reporting and recordkeeping requirements contained in 45CSR2A. 45CSR2A-7.1.a.1 indicates that for units burning only pipeline quality natural gas, the record-keeping requirements are limited to the date and time of start-up and shutdown, and the quantity of fuel consumed on a monthly basis. According to 45CSR2A-7.1.b, these records shall be maintained on-site for a period of at least five (5) years. Furthermore, the auxiliary boiler must also meet the requirements for start-ups, shutdowns, and malfunction provided in 45CSR2-9.2.

4.10.2 45CSR4 – To prevent and control the discharge of air pollutants into the open air which causes or contributes to an objectionable odor or odors.

45 CSR 4 prohibits the discharge of air pollutants that cause or contribute to an objectionable odor at any location occupied by the public. The Project will comply with the provisions of this regulation through good operating practices.

4.10.3 45CSR6- To prevent and control air pollution from combustion of refuse

"Refuse" means the useless, unwanted or discarded solid, liquid or gaseous waste materials resulting from community, commercial, industrial or citizen activities. "Incinerator" means any device used to accomplish incineration.

Particulate matter to be discharged from any incinerator into the open air should be less than or equal to the quantity determined by use of the following formula listed in 45CSR6-4.1:

Emissions (lb./hr.) = F x Incinerator Capacity (tons/hr.)

Incinerator Capacity Factor	F
A. Less than 15,000 lbs./hr.	5.43
B. 15,000 lbs./hr. or greater	2.72

The flare associated with facility startup and shutdown are subject to the requirements of this section and will comply with the hourly particulate matter emission limit calculated as specified in the table above. The emission limit is calculated by multiplying the factor, F, by the hourly flare capacity to obtain an hourly particulate matter emission limit. Using the maximum flow rate of 2,203,393 scf/hr. for the

flare along with composition of the flow and the ideal gas law, MGSH2-1 calculates a PM limit of 130.29 lb./hr., which is much higher than the proposed emission limit of 16.95 lbs./hr.

$$2{,}203{,}393\frac{scf}{hr} \times \frac{lbmol}{379.48\,scf} \times 16.50\frac{lb}{lbmol} = 95{,}805\frac{lb}{hr} = 47.9\frac{tons}{hr}$$

$$Emissions\ \left(\frac{lb}{hr}\right) = 2.72 \times 47.9 = 130.29\ lb/hr$$

The flare is also subject to the opacity requirements of 45CSR6-4.3 and 4.4, which limits the opacity from smoke emitted from the flare to less than 20%, except for eight (8) minutes per start-up where the smoke emitted from the flare must be limited to less than 40% opacity.

4.10.4 45CSR7- To prevent and control particulate matter air pollution from manufacturing processes and associated operations.

45CSR7 sets state-imposed opacity and particulate matter mass emission standards for manufacturing process and associated operations. "Manufacturing Process" means any action, operation or treatment, embracing chemical, industrial or manufacturing efforts … that may emit smoke, particulate matter or gaseous matter. 45CSR7 has three substantive requirements potentially applicable to the particulate matter-emitting "source operations" at the proposed H_2 Plant. These are the opacity requirements under Section 3, the mass emission standards under Section 4, and the fugitive emission standards under Section 5.

For the purposes of 45CSR7, a source of particulate matter emissions that is solely the result of the combustion of gaseous fuels is not considered a "source operation" as defined under §45-7-2.40. Based on the definition that states a source operation is one that "*result in the separation of air contaminants from the process materials or in the conversion of the process materials into air contaminants.*" Gaseous fuels do not meet the reasonable definition of a "process material". Additionally, the particulate matter limits given under 45CSR7 only address filterable particulate matter, which are only about 25% of total natural gas particulate matter emissions (and similarly with other gaseous fuels). This definition excludes all gaseous combustion sources from 45CSR7 applicability, including Fired Heater 111-H-2001, Auxiliary Boiler 119-PKG-9201, CCGT 113-PKG-2011, CCGT 113-PKG-2021, Flare 119-FL-9501, and NG Startup Generator 119-PKG-0001.

Because the proposed firewater emergency engine serves the sole purpose of fire suppression and does not support any manufacturing activities, the engine does not meet the definition of a manufacturing process pursuant to 45CSR7-2.40. Therefore, the firewater emergency engine is not subject to 45CSR7.

For this proposed facility, 45CSR7 will be applied only to the cooling tower and haul roads as required under Section 5.

The requirements of 45CSR7-5 apply to sources of fugitive particulate matter, including the paved/unpaved roadways and the cooling tower. MGSH2-1 complies with the requirements of 45CSR7-5.2 by applying appropriate control measures (i.e., paving and/or water/chemical dust suppressants) to plant roadways to minimize particulate emissions. MGSH2-1 will also comply with the requirements of 45CSR7 for the cooling tower. 45CSR7-5.1 stipulates that the cooling tower is equipped with a system (which may include process equipment design, control equipment design, or operation and maintenance

procedures) to minimize emissions of fugitive particulate emissions. MGSH2-1 will utilize a drift eliminator installed on the cooling tower to minimize particulate emissions.

4.10.5 45CSR10 – Prevention and Control of Sulfur Oxide Emissions

45CSR10-3 establishes emission standards for sulfur oxides from fuel burning units and sets forth the registration, permitting, reporting, testing, recordkeeping and exemption requirements. "Fuel Burning Unit" means and include any furnace, boiler apparatus, device, mechanism, stack or structure used in the process of burning fuel or other combustible material for the primary purpose of producing heat or power by indirect heat transfer. As defined in 45 CSR 10-2.9, "indirect heat exchanger" does not include process heaters as defined in 45 CSR 10-2.18.

The proposed fired heater 111-H-2001 is a process heater used to heat the feed to the pre-reformer and ATR and start the reactions. Therefore, it is not subject to 45CSR10.

The definition of "Fuel Burning Unit" also excludes the two CCGTs from 45CSR10 applicability, as the combustion process in the units does not constitute indirect heat transfer.

The primary purpose of the auxiliary boiler is to generate startup/shutdown steam at rates and pressures required by the ISBL H_2 unit. The auxiliary boiler is defined as type 'b' fuel burning units under 45CSR10. For type 'b' units, 45CSR10 specifies SO_2 limits in pounds per hour for all stacks located at one plant as the product of 3.2 and the total design heat inputs in MMBtu/hr. for such units. The proposed total SO_2 emissions in pounds per hour for the auxiliary boiler is 0.34 lb./hr., well below the emission limit allowed by 45CSR10.

45CSR10-4.1 states that "*No person shall cause, suffer, allow or permit the emission into the open air from any source operation an in-stack sulfur dioxide concentration exceeding 2,000 parts per million by volume from existing source operations . . .*" MGSH2-1 has estimated the amount of SO_2 emissions from the fired heater (fueled by NG and process vent gas), the two CCGTs (fueled by NG), the NG startup generator (fueled by NG) and the fire water pump engine (fueled by ultra-low sulfur diesel). MGSH2-1 meets this in-stack SO_2 concentration limit.

45CSR10-5.1 states that "*No person shall cause, suffer, allow or permit the combustion of any refinery process gas stream or any other process gas stream that contains hydrogen sulfide [H_2S] in a concentration greater than 50 grains per 100 cubic feet of gas . . .*" The process vent gas combusted in either the fired heater or the flare is not expected to contain any H_2S since the feed NG will be desulfurized before entering the reforming process. Additionally, any natural gas that is combusted will be below the H_2S limits. MGSH2-1 is therefore in compliance with the H_2S limit under 45CSR19-5.1.

Section 8 of Rule 45CSR10 requires performance testing for initial compliance with the limits therein, monitoring for continued compliance, and record-keeping of that compliance. The Testing, Monitoring, Record-keeping & Reporting requirements are clarified under 45CSR10A. Pursuant to 45CSR10-10A-3.1(b), for fuel burning units that combust "natural gas, wood or distillate oil, alone or in combination," the units are not subject to the Testing and MRR Requirements under 45CSR10A and no SO_2 -specific testing, monitoring or record-keeping for these units will be required.

4.10.6 45CSR11 – Prevention of Air Pollution Emergency Episodes

45 CSR 11 sets forth actions that must be taken in the event of air pollution episodes. Because the project will not emit 100 tpy or more of any pollutant, the Project will, if requested by the Director,

prepare a Standby Plan, that will outline procedures to be taken to comply with the provisions of this regulation.

4.10.7 45CSR13 – Permitting Requirements for the Construction, Modification, Relocation and Operation of Minor Stationary Sources

45 CSR 13 sets forth the criteria and procedures for obtaining an air permit for a minor modification or relocation of an existing stationary source or for the construction of a new minor stationary source of air pollutants. This regulation does not apply to "de minimis" sources identified in Table 45-13B or sources which have emissions of regulated air pollutants below the thresholds established in 45-13-2.24. The Project is submitting this permit application pursuant to the permitting provisions of 45CSR13 because emissions of all NSR pollutants are below the major source thresholds.

As required under 45CSR45-13-8.3 ("Notice Level A"), MGSH2-1 will place a Class I legal advertisement in a "newspaper of general circulation in the area where is the source is … located." The advertisement shall contain at a minimum, the name of the applicant, the type and location of the source, the type and amount of air pollutants that will be discharged, the nature of the permit being sought, the proposed start-up date for the source and a contact telephone number for more information.

4.10.8 45CSR14- Prevention of Significant Deterioration Permitting Requirements for the Construction of a Major Stationary Source

The proposed Project is not a "major stationary source" since it potentially emits of all regulated air pollutant less than 100 tons per year. As a result, the Project is not subject to PSD requirements under 45CSR14.

4.10.9 45 CSR16- Standards of Performance for New Stationary Sources

45CSR16 adopts the federal emission standards for new stationary sources (40 CFR Part 60) by reference. As stated in section 4.3, the Project's CCGTs, auxiliary boiler, NG startup generator and emergency firewater pump engine will be subject to Subparts KKKK, Db, JJJJ and IIII, respectively.

4.10.10 45CSR17 – Fugitive Emissions from Material Handling / Fugitive Sources

The purpose of the rule is to prevent and control particulate matter air pollution from material handling, preparation, storage and other sources of fugitive particulate matter. Sources that are subject to the fugitive particulate matter emission requirements of 45CSR2, 45CSR3, 45CSR5 and 45CSR7 shall be exempt from the provisions of this rule, provided that such sources shall not be exempt from the provisions of W. Va. Code §§22-5-1 et seq., including the provisions of §22-5-3 relating to statutory air pollution. The proposed facility is not subject to 45CSR17 since the haul roads are covered under 45CSR7.

4.10.11 45CSR19- Permits for construction and major modification of major stationary sources which cause or contribute to nonattainment areas

The proposed facility will be located in Mason County, which is designated attainment for all criteria pollutants. Therefore, the proposed project is not subject to NA-NSR for any pollutants.

4.10.12 45CSR22 – Air Quality Management Fee Program

45 CSR 22 specifies a program to collect fees for certificates to operate and for permits to construct, modify or relocate sources. The fees are assessed according to which regulations the new or modified source is subject. According to the requirements of 45-22-3, the fee for the permit-to-construct is $2,000

which includes 45CSR13, NSPS and NESHAPS fee requirements (Application fee $1,000 and NSPS Requirements $1,000).

The proposed facility is a minor source and is not subject to 45CSR30. MGSH2-1 is, therefore, required to pay the appropriate annual fees and keep their certificate to operate current under the program outlined under 45CSR22.

4.10.13 45CSR27 – To Prevent and Control the Emissions of Toxic Air Pollutants

The facility includes a chemical processing unit, but will not discharge air toxic pollutants from the "chemical processing units" as defined in 45CSR27-2.4 in excess of the amount listed on Table A, therefore the proposed facility is not subject to 45CSR27.

4.10.14 45CSR30 – Title V Operating Permit Requirements

45 CSR 30 applies to the requirements of the federal Title V operating permit program (40 CFR 70). The major source thresholds with respect to the West Virginia Title V operating permit program regulations are 10 tons per year (tpy) of a single HAP, 25 tpy of any combination of HAP, and 100 tpy of all other regulated pollutants. The facility is not a major source with respect to Title V Operating Permit Program; therefore, no Title V Operating permit is required to operate the facility.

4.10.15 45CSR30A – Deferral of Nonmajor and Area Sources from Permitting Requirements

The facility is a minor stationary emission source and currently is not required to obtain a permit under WV 45CSR30.

4.10.16 45CSR33 – Acid Rain Permits

As discussed in Section 4.6, the CCGTs, HRSGs, and STG to be installed will only provide power to on-site equipment and will not sell electricity to the grid. Therefore, they do not meet the definition of electric generating units in the acid rain program and will not be subject to the provisions of 45CSR33.

4.10.17 45CSR34 – Emission Standards for Hazardous Air Pollutants

45 CSR 34 adopts the federal emission standards for hazardous air pollutants (40 CFR Parts 61 and 63 and Section 112 of the Clean Air Act) by reference. Please see Section 4.4 for the MACT standards that may apply to the H_2 Plant.

Appendix A WVDAQ Application Form for NSR Permit

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):*
MGS H2 1, LLC

2. Federal Employer ID No. ***(FEIN):***
92-0923775

3. Name of facility *(if different from above):*
MGS H_2 Plant

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

5A. Applicant's mailing address:
109 North Post Oak Lane, Suite 140
Houston, TX 77024

5B. Facility's present physical address:
1451 Airport Rd,
Point Pleasant, WV 25550

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: **Fidelis New Energy, LLC**

8. Does the applicant own, lease, have an option to buy or otherwise have control of the *proposed site?* ☒ **YES** ☐ **NO**

- If **YES,** please explain: **The site is under option to buy**
- 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.): **H_2 production plant**

10. North American Industry Classification System **(NAICS)** code for the facility:
325120

11A. DAQ Plant ID No. (for existing facilities only):
N/A

11B. List all current 45CSR13 and 45CSR30 (Title V) permit numbers associated with this process (for existing facilities only):
NA

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**.

The site can be reached by heading north on WV-62 N / Jefferson Blvd and turning right on Airport Road. The entrance of the site is located straight ahead after 0.5 miles of travel.

12.B. New site address (if applicable):	12C. Nearest city or town:	12D. County:
1451 Airport Rd, Point Pleasant, WV 25550	**Point Pleasant**	**Mason County**
12.E. UTM Northing (KM): **4308.120**	12F. UTM Easting (KM): **404.834**	12G. UTM Zone:**17**

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

14A. Provide the date of anticipated installation or change: **6/1/2029** – 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: **6/1/2029**

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 Feed Purification, Reforming Section, CO Conversion Section, CO_2 Separation, H_2 Purification and Product Compression, combined cycle gas turbines, emergency generator, fire water pump

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 SCR system and CO Oxidation Catalyst

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

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

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

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

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

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

☐ **YES** ☐ **NO**

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

Section III. Certification of Information

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

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

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

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

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

Certification of Truth, Accuracy, and Completeness

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

Compliance Certification

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

SIGNATURE _____ DATE: 8/6/2025

(Please use blue ink) *(Please use blue ink)*

35B. Printed name of signee: **William D Calhoun**		35C. Title: **Vice President HSE**
35D. E-mail: **Jack.Calhoun@fidelisinfra.com**	36E. Phone: 281-917-8571	36F. FAX:
36A. Printed name of contact person (if different from above):		36B. Title:
36C. E-mail:	36D. Phone:	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.

Insert the Application Form – Application for NSR Permit and Title V Permit Revision (Optional)

Appendix B West Virginia Permit Application Attachments

Attachment A**: West Virginia Business Certificate**

Attachment B: Maps

Attachment C**: Installation and Start**-up Schedule

Attachment D: Regulatory Discussion

Attachment E: Plot Plan

Attachment F: Detailed Block Flow Diagrams

A**ttachment** 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: Emission Unit Data Sheets

Attachment M**: Air Pollution Control Device Sheets**

Attachment N**: Supporting Emission Calculations**

Attachment O**: Monitoring/Recordkeeping/Reporting/Testing Plans**

Attachment P**: Public Notice**

Attachment Q**: Business Confidential Claims (Not Applicable)**

Attachment R: Authority Forms (Not Applicable)

Attachment S**: Title V Permit Revision Information (Not Applicable)**

Attachment A**: West Virginia Business Certificate**

State of West Virginia

Certificate

I, Mac Warner, Secretary of State of the State of West Virginia, hereby certify that

MGS H2 1, LLC

Control number: 9B6JE

a limited liability company formed under the laws of Delaware

has filed its "Application for Certificate of Authority" in my office according to the provisions of West Virginia Code §31B-10-1002. I hereby declare the organization to be registered as a foreign limited liability company from its effective date of September 20, 2023 until the expiration of the term or dissolution of the company.

Therefore, I hereby issue this

CERTIFICATE OF AUTHORITY OF A FOREIGN LIMITED LIABILITY COMPANY

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

Given under my hand and the Great Seal of the State of West Virginia on this day of September 20, 2023

Mac Warner

Secretary of State

566309

WEST VIRGINIA APPLICATION FOR CERTIFICATE OF AUTHORITY OF LIMITED LIABILITY COMPANY

Form LLF-1
Rev. 06/5/2019

West Virginia Secretary of State
Business & Licensing Division
Tel: (304)558-8000
Fax: (304)558-8381
Website: www.wvsos.gov

FILED

SEP 20 2023

IN THE OFFICE OF
WV SECRETARY OF STATE

FILE ONE ORIGINAL
(Two if you want a filed stamped copy returned to you.)

FILING FEE: $150 *Fee Waived for Veteran-owned organization

Control # _____

*** **The undersigned, having authority to transact business on behalf of a foreign (out-of-state) registered entity, agrees to comply with the requirements of West Virginia Code §31B-10-1002 to apply for Certificate of Authority.** ***

1. The **name** of the **limited liability company** as registered in its home state is: MGS H2 1, LLC

   and the **State or Country of organization** is: Delaware

☑ **CHECK HERE to indicate you have obtained and submitted with this application a CERTIFICATE OF EXISTENCE (GOOD STANDING), dated during the current tax year, from your home state of original formation as required to process your application. The certificate may be obtained by contacting the Secretary of State's Office in the home state of original formation.**

2. The **business name** to be used in **West Virginia** will be: [The **name must contain one of the required terms** such as "limited liability company" or abbreviations such as "LLC" or "PLLC." See instructions for complete list of acceptable terms and requirements for use of Trade Name.]

   ☑ **Home State name as listed in Section 1. above,** if available in West Virginia
   (If name is not available, check **DBA Name** box below and follow special instructions in **Section 2.** attached.)

   ☐ **DBA Name** _____
   (See special instructions in **Section 2.** regarding the **Letter of Resolution** attached to this application. View a sample Letter of Resolution.)

3. The **company will be a**: [See instructions for limitations on professions which may form **PLLC** in WV. All members must have WV professional license. See (*) note at the right.]

   ☑ **Regular LLC**

   ☐ **Series LLC** [WV Code §41-1A-14(c)]

   ☐ **Professional LLC*** for the profession of: _____
   *(See **Section 3.** of the attached instructions for list of accepted professions.)*

   ☐ **Professional business organizations**: CHECK BOX indicating you have attached the state licensing board **Verification of Eligibility** (Form VOE) to these Articles if your profession meets the requirements as defined by **Chapter 30** of WV Code. **Your application will be rejected if the VOE signed by the board is not attached.**

4. The **address** of the **principal office** of the company will be:

   Street: 109 N Post Oak Ln., Ste 140

   City: Houston State: TX Zip Code: 77024

   Located in the **County** of (required): County: Out of State

   The **mailing address** of the above location, if different, will be:

   Street: _____

   City: _____ State: _____ Zip Code: _____

5. The **address** of the initial **designated** (physical) office of the company in West Virginia, if any, will be:

   Street: _____

   City: _____ State: _____ Zip Code: _____

   Located in the **County** of: County: _____

RECEIVED
SEP 2 [illegible] 2023

603098

5. (*Continued from previous page....*)

The **mailing address** of the above location, if different, will be:

Street: _____

City: _____ State: _____ Zip Code: _____

6. **Agent of Process:** may be sent, if any, will be:

Name: Corporation Service Company

Street: 209 West Washington Street

City: Charleston State: WV Zip Code: 25302

7. **E-mail address** where business correspondence may be received: info@fidelisinfra.com

8. **Website address** of the business, if any (*ex: yourdomainname.com*): fidelisinfra.com

9. Do you **own or operate more than one business in West Virginia**? ☐ **Yes** * *Answer **a.** and **b.** below.* ☐ **No** ☑ **Decline to answer**

If "**Yes**"... a. How many businesses? _____ b. Located in how many West Virginia counties? _____

10. The company will be - CHECK ONE (required):
- ■ an **AT-WILL** company, conducting business for an indefinite period.
- ☐ a **TERM** company, conducting business for the term of _____ years.

11. The company will be - CHECK ONE (required):
- ■ **MEMBER**-MANAGED [List the names and addresses of all **MEMBERS** below.]
- ☐ **MANAGER**-MANAGED [List the names and addresses of all **MANAGERS** below.]

. List the **name(s) and address(es) of the MEMBER(S) [if member-managed] or the MANAGER(S) [if manager-managed]** of the company (required; Note: The application will be rejected if the information is not provided below. Attach additional pages if necessary.):

Name	No. & Street Address	City	State	Zip Code
Mountaineer Gigasystem, LLC	109 N Post Oak Ln., Ste 140	Houston	TX	77024

12. All or specified members of a limited liability company are **liable in their capacity as members** for all or specified debts, obligations or liabilities of the company (required):
- ■ **No** - All debts, obligations and liabilities are those of the company.
- ☐ **Yes** - Those persons who are liable in their capacity as members for all debts, obligations or liability of the company have consented in writing to the adoption of the provision or to be bound by the provision.

13. a. The **purpose(s) for which this limited liability company is formed** is as follows:
[Describe the type(s) of business activity which will be conducted, for example, "real estate," "construction of residential and commercial buildings," "commercial painting," "professional practice of law" (see **Section 2.** for acceptable "professional" business activities). Purpose may conclude with words "…including the transaction of any or all lawful business for which corporations may be incorporated in West Virginia."]

Investment Holding Company

b. Will the above purpose include any business activity conducted as a **consumer litigation financier** pursuant to WV Code §46A-6N?

☐ **Yes** [By checking "Yes," the applicant affirms the above **purpose includes the required statement that the organization shall be designated as a litigation financier** pursuant to WV Code §46A-6N. You are also affirming that you have included with this application an original completed copy of the **required** Application for Registration as a Litigation Financier (Form LF-1) with the associated requisite filing fee.]

■ **No** [Proceed to 14.]

14. Is the business a **Scrap Metal Dealer**?

☐ **Yes** [If "**Yes**," you must complete the **Scrap Metal Dealer Registration Form** (Form SMD-1) and proceed to Section 15.]

■ **No** [Proceed to Section 15.]

15. Other provisions which may be set forth in the operating agreement or matters not inconsistent with law:
[See instructions for further information; use extra pages if necessary.]

16. The number of pages attached and included in these Articles is: _____

17. The **requested effective date** is:
[Requested date ***may not be earlier than filing nor later than 90 days after filing in our office.***]

■ the **date and time of filing** in the Secretary of State's Office.

☐ the following date _____ and time _____ .

18. Is the organization a "**veteran-owned**" organization?

Effective **JULY 1, 2015**, to meet the requirements for a "**veteran-owned**" organization, the entity filing the registration must meet the following criteria per West Virginia Code §59-1-2a:

1. A "**veteran**" must be honorably discharged or under honorable conditions, and
2. A "**veteran-owned business**" means a business that meets one of the following criteria:
   - o Is at least fifty-one percent (51%) unconditionally owned by one or more veterans; or
   - o In the case of a publicly owned business, at least fifty-one percent (51%) of the stock is unconditionally owned by one or more veterans.

☐ **Yes** (If "**Yes**," attach **Form DD214**) ➡ ☐ **CHECK BOX** indicating you have attached **Veteran Affairs Form DD214**

■ **No**

You may obtain a copy of your Veterans Affairs Form DD214 by contacting:

National Personnel Records Center
Military Personnel Records
1 Archives Drive
St. Louis, MO 63138
Toll free: 1-86-NARA-NARA or 1-866-272-6272
Phone: 314-801-0800
www.archives.gov/veterans/military-service-records

Per WV Code 59-1-2(j) effective July 1, 2015, the **registration fee is waived** for entities that meet the requirements as a "**veteran-owned**" organization. See attached instructions to determine if the organization qualifies for this waiver. In addition, a "**veteran-owned**" entity will have **four (4) consecutive years of Annual Report fees waived** AFTER the organization's initial formation [see WV Code 59-1-2a(m)].

19. **Contact and Signature Information*** (See below ***Important Legal Notice Regarding Signature***):

a. Contact person to reach in case there is a problem with filing: _____ Phone: _____

b. Print or type name of signer: Brett Buchanan Title/Capacity of signer: Authorized Person

c. **Signature:** Brett Buchanan **Date:** 08/14/2023

Important Legal Notice Regarding Signature: Per **West Virginia Code** §31B-2-209. **Liability for false statement in filed record.** If a record authorized or required to be filed under this chapter contains a false statement, one who suffers loss by reliance on the statement may recover damages for the loss from a person who signed the record or caused another to sign it on the person's behalf and knew the statement to be false at the time the record was signed.

Important Note: This form is a public document. Please **do NOT provide any personal identifiable information on this form** such as social security number, bank account numbers, credit card numbers, tax identification or driver's license numbers.

Reset Form Print Form

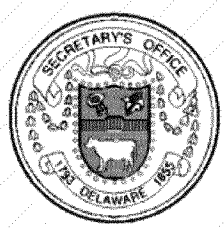
Delaware

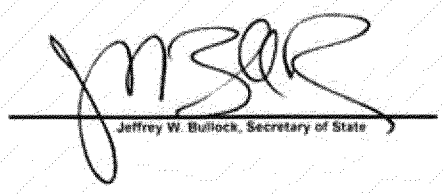
The First State

I, JEFFREY W. BULLOCK, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY "MGS H2 1, LLC" IS DULY FORMED UNDER THE LAWS OF THE STATE OF DELAWARE AND IS IN GOOD STANDING AND HAS A LEGAL EXISTENCE SO FAR AS THE RECORDS OF THIS OFFICE SHOW, AS OF THE FIFTEENTH DAY OF AUGUST, A.D. 2023.

AND I DO HEREBY FURTHER CERTIFY THAT THE SAID "MGS H2 1, LLC" WAS FORMED ON THE TWENTY-FIRST DAY OF OCTOBER, A.D. 2022.

AND I DO HEREBY FURTHER CERTIFY THAT THE ANNUAL TAXES HAVE BEEN PAID TO DATE.





7097644 8300

SR# 20233250425

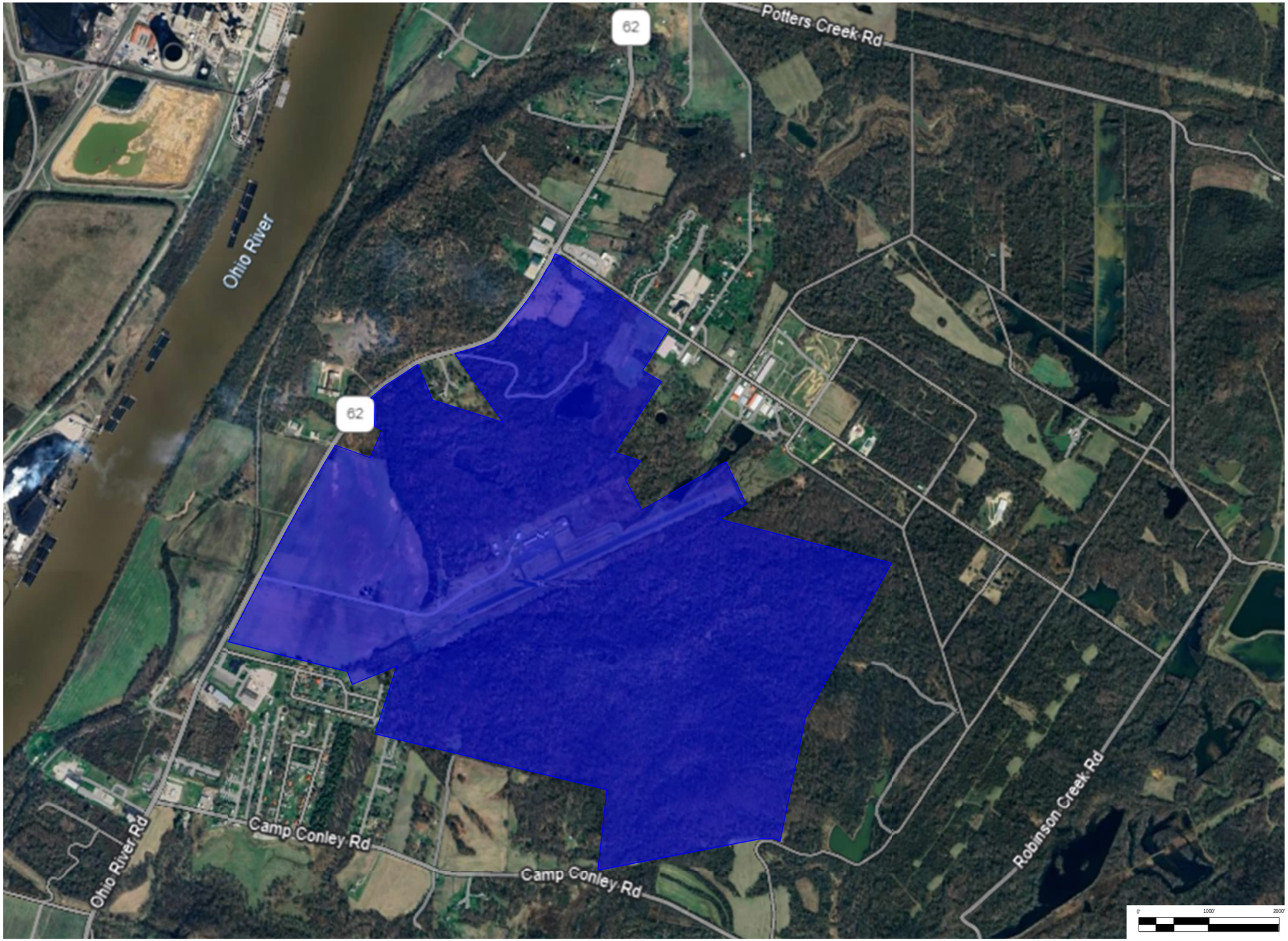
Authentication: 203965029

Date: 08-15-23

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

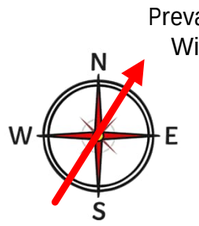
Attachment B: Maps

Figure on next page provides a general map of the proposed facility location, showing roads and proximity to major geographical features such as the Ohio River.



NOTES

1. The Unit spaces are approximate and based on earlier studies and will be checked and optimized in the next phase of the project after a site has been chosen.
2. Equipment shown within unit boxes are shown for illustrative purposes only. Equipment location / spacing within individual units have not been optimized.



Graphic Legend

- Site Boundary
- Piperack
- Road

X		Draft (for Review)	DC					
	DATE	DESCRIPTION	BY	CHK	ENG	PEM	PM	

DRAWN BY D. Contino DATE

CHECKED BY DATE

ENGINEER DATE

PROJECT ENGINEERING MANAGER DATE

PROJECT MANAGER DATE

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THE MOUNTAINEER GIGASYSTEM

CLIENT/PROJECT TILE

Mountaineer Gigasystem - Fidelis

PROJECT NO.

418162-47975

Site Boundary – Hydrogen Plant

SCALE

DWG.NO.

REVISION

X

Attachment C: Installation and Start-up Schedule

Section 2 of the application narrative provides a summary of the proposed emission units with the proposed installation and start-up schedule for the H_2 Plant. Specifically, MGSH2-1 wishes/expects to obtain WVDAQ air permit approval by December 31st to provide sufficient/adequate time for financing, equipment ordering, fabrication, construction, and installation, and achieve commercial operation by 2029.

Attachment D: Regulatory Discussion

Section 4 of the application narrative provides a federal and state regulatory applicability analysis and summary of regulatory requirements that will apply to the H_2 Plant.

Attachment E: Plot Plan

Figure E-1 H_2 Plant Plot Plan (Site Layout Plan)

NOTES

1. The Unit spaces are approximate and and at the conceptual study level. Site and equipment locations will be optimized in the pre-FEED and FEED stages of the project.
2. Equipment shown within unit boxes are shown for illustrative purposes only. Equipment location / spacing within individual units have not been optimized.
3. Piping right of way has not been determined. Hydrogen, Carbon Dioxide, natural gas and raw water final disposition and source to be determined in the next phase of engineering.

Prevailing Wind

Graphic Legend

- Site Boundary
- Piperack
- Road

B1	17-Dec-24	Re-Issued for Permit	DC	DM			AR
B	30-Aug-24	Issued for Permit	DC	DM			AR
A1	08-Aug-24	Re-Issued for Review	DC	DM			AR
A	26-Jun-24	Issued for Review	DC	DM			AR
	DATE	DESCRIPTION	BY	CHK	ENG	PEM	PM

DRAWN BY D. Contino	DATE 17-Dec-24
CHECKED BY D. Minicucci	DATE 17-Dec-24
ENGINEER	DATE
PROJECT ENGINEERING MANAGER	DATE
PROJECT MANAGER A. Rockwell	DATE 17-Dec-24

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THE MOUNTAINEER GIGASYSTEM

CLIENT/PROJECT TILE

Mountaineer Gigasystem

PROJECT NO.

418162-54129

Conceptual Plot Layout – Hydrogen Plant

SCALE

DWG.NO.

MNT1-MH1-110-PR-PLT-00-0101

REVISION

B1

Attachment F: Detailed Block Flow Diagrams

1 x 640 MTPD HYDROGEN PRODUCTION PLANT (ATR)

To atm
SCR and Stack (Note 1) (11120)
Flue Gas
Oxygen
211.3 klb/hr
ASU (11200) (By Others)
CO2 Removal Off gas
Fired Heater / Feed Preheater (11120)
0.08 MMSCFD
NG Fuel
Natural Gas Pretreatment (11110)
Pre-Reformer (11130)
ATR (11130)
CO Conversion & WH Recovery (11140)
CO2 Removal (11150)
PSA (11160)
Hydrogen Compression (11170)
265 MMSCFD (640 MTPD)
H2 Pipeline (81030)
Process Cond.
Process Condensate Stripper (11192)
Steam Turbine Generator (11180)
POWER
CO2 Compression (11150)
98.1 MMSCFD (5,175 MTPD)
CO2 Pipeline (81020)
Process Feed
94.7 MMSCFD
Electrical Power
DMW
BFW
MPS
LPS
Stripped Cond.
Steam Cond.
CWS
CWR
0.05 MMSCFD
Flares (11995)
Condensate
To atm
Caustic System (11999)
Potable Water (11994)
From ASU
Natural Gas (81010)
104 MMSCFD
Natural Gas System (11998)
Demineralized Water System (11991)
DMW
Deaerator (ISBL) (Note 2) (11192)
BFW
Steam Generation (ISBL) + Aux Boiler (11192 / 11992)
Steam Distribution (ISBL/OSBL) (11192 / 11992)
Plant Nitrogen System (11997)
Plant / Instrument Air System (11996)
8.9 MMSCFD
0.5 MMSCFD
Blowdown
Buildings
Sanitary Waste
Sanitary Water Treatment (11000)
Well Water (19991)
930.0 klb/h
Raw Water Treatment (11991)
To atm
To atm
Infrastructure (Roads, Fences, Lighting, etc) (11000)
Gas Turbine (11310)
Flue Gas
Heat Recovery Steam Generator (11320)
Utility Water Distribution (11994)
Fire Water System / Diesel Pump (11994)
Cooling Water Tower (11993)
Blowdown
Reject
Reject
Wastewater Treatment (11700)
Steam
Cond.
First Flush
First Flush Pond (11910)
Waste Oil (by truck)
POWER
Steam Turbine Generator (11330)
To atm
To atm
Storm Water Sewers (11000)
Diversion Block (11000)
Storm Water Pond (11910)
244.2 klb/h
To Outfall
Water Return (19910)
POWER from BECCS
Electrical Substation / Switchyard (11900)
POWER
Electrical Distribution (11900)
Startup Generator (11900)
MAC Contract / Automation (11900)
Telecommunication / Security System (11900)

BALANCE OF PLANT

Licensor Scope
Infrastructure
Balance of Plant
Buildings

NOTES:

1. SCR is not included in licensor design. However, SCR will be included in the project to reduce NOx emissions.
2. Deaerator for hydrogen plant is within the licensor scope of supply.

HOLDS:

	DATE	DESCRIPTION	BY	CHK	ENG	REM	PM
B3	12-Nov-24	Re-issued for Permit	DC	DM			AR
B2	23-Aug-24	Re-issued for Permit	DC	DM			AR
B1	14-Jun-24	Re-issued for Permit	DC	DM			AR
B	29-Apr-24	Issued for Permit	DC	DM			AR
A	17-Apr-24	Issued for Review	AR	DM			AR

DRAWN BY	D. Contino 12-Nov-24
CHECKED BY	D. Minicucci 12-Nov-24
ENGINEER	
PROJECT ENGINEERING MANAGER	
PROJECT MANAGER	A. Rockwell 12-Nov-24

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THE MOUNTAINEER GIGASYSTEM

CLIENT/PROJECT TILE
Mountaineer Gigasystem

PROJECT NO.
418162-54129

Block Flow Diagram
Hydrogen

SCALE

DWG.NO.
418162-54129-PR-DBD-10001
MNT1-MH1-110-PR-BFD-00-0101

REVISION
B3

HYDROGEN PRODUCTION WATER TREATMENT

Storm Water Sewers (11910)
Diversion Block (11910)
Storm Water Pond (11910)
To Outfall
Water Return (19910)
First Flush
First Flush Pond (11910)
Waste Oil (by Truck)
Waste Water from First Flush Sump
ATR (11130)
Boiler Blowdown Drum Blowdown
Steam / Condensate / BFW (11192)
Backflush from Condensate Filter (NNF)
To Deaerator (11192)
Demin Water Storage (11991)
Electrodeionization (11991)
EDI Reject
Reverse Osmosis (11991)
RO Reject
Granular Activated Carbon (11991)
Spent UF + RO CIP (NNF)
Ultrafiltration (11991)
UF Reject
External Carbon Source Dosing (12730)
Well Water (19991)
Chemical Dosing and Mxing (11991)
Dissolved Air Flotation (11991)
Utility Water Storage (11991)
Equalization Tank (11710)
Chemical Dosing and Mixing (11720)
Dissolved Air Flotation (DAF) (11720)
Membrane Bioreactor (MBR) (11730)
Cooling Water Tower (11993)
Cooling Tower Blowdown
HRSG Blowdown
Aux Boiler (11992)
Aux Boiler Blowdown
HRSG (11320)
Sludge from DAF
Sludge from MBR
Dewatering Liquid Phase
Sludge Tank (11700)
Filter Cakes (by Truck)
Dewatering Unit (11700)

Licensor Scope
Balance of Plant
Infrastructure
Buildings

B1	23-Aug-24	Issued for Permit	AR	DC			AR
B	14-June-24	Issued for Permit	AR	DC			AR
A	24-May-24	Issued for Review	AR	DC			AR
	DATE	DESCRIPTION	BY	CHK	ENG	REM	PM

DRAWN BY: A. Rockwell — DATE: 23-Aug-24
CHECKED BY: D. Contino — DATE: 23-Aug-24
ENGINEER — DATE
PROJECT ENGINEERING MANAGER — DATE
PROJECT MANAGER: A. Rockwell — DATE: 23-Aug-24

worley consulting
THE MOUNTAINEER GIGASYSTEM

CLIENT/PROJECT TILE
Mountaineer Gigasystem

PROJECT NO.
418162-54129

Block Flow Diagram
Hydrogen Water Treatment

SCALE

DWG NO.
418162-54129-PR-DBD-10002
MNT1-MH1-117-PR-BFD-00-0101

REVISION
B1

Attachment G: **Process Description**

Section 2 of the application narrative provides a detailed process description for each of the proposed H_2 Plant emission units.

Attachment H: Material Safety Data Sheets (MSDS)

Methane or Natural Gas

Ammonia

Diesel

Amine

SAFETY DATA SHEET

Aqua Ammonia (20-30%)

Airgas
an Air Liquide company

Section 1. Identification

GHS product identifier : Aqua Ammonia (20-30%)

Other means of identification : Aqua Ammonia, Ammonium Hydroxide

Product type : Liquid.

Product use : Synthetic/Analytical chemistry.

Synonym : Aqua Ammonia, Ammonium Hydroxide

SDS # : 001195

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

24-hour telephone : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : SKIN CORROSION - Category 1B
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3
AQUATIC HAZARD (ACUTE) - Category 1

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : May displace oxygen and cause rapid suffocation.
Causes severe skin burns and eye damage.
May cause respiratory irritation.
Very toxic to aquatic life.

Precautionary statements

General : Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand.

Prevention : Wear protective gloves. Wear protective clothing. Wear eye or face protection. Use only outdoors or in a well-ventilated area. Avoid release to the environment. Avoid breathing vapor.

Response : Collect spillage. Immediately call a POISON CENTER or doctor. IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Storage : Store locked up. Store in a well-ventilated place. Keep container tightly closed.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Other means of identification : Aqua Ammonia, Ammonium Hydroxide

Product code : 001195

CAS number/other identifiers

CAS number : Not available.

Ingredient name	%	CAS number
ammonium hydroxide	100	1336-21-6
ammonia	20-30	7664-41-7
WATER	70-80	7732-18-5

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Get medical attention immediately. Call a poison center or physician. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician.

Inhalation : Get medical attention immediately. Call a poison center or physician. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Skin contact : Get medical attention immediately. Call a poison center or physician. Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Get medical attention immediately. Call a poison center or physician. Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : May cause respiratory irritation.

Skin contact : Causes severe burns.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Section 4. First aid measures

Ingestion : No known significant effects or critical hazards.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:, pain, watering, redness

Inhalation : Adverse symptoms may include the following:, respiratory tract irritation, coughing

Skin contact : Adverse symptoms may include the following:, pain or irritation, redness, blistering may occur

Ingestion : Adverse symptoms may include the following:, stomach pains

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : In a fire or if heated, a pressure increase will occur and the container may burst. This material is very toxic to aquatic life. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
nitrogen oxides

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities. Collect spillage.

Section 6. Accidental release measures

Methods and materials for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Do not get in eyes or on skin or clothing. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Avoid release to the environment. Do not ingest. Empty containers retain product residue and can be hazardous. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Do not reuse container. Do not breathe vapor or mist.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
ammonium hydroxide	None.

Appropriate engineering controls : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Section 8. Exposure controls/personal protection

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

Appearance

Physical state : Liquid.

Color : Clear.

Odor : Pungent.

Odor threshold : 5 ppm

pH : Approx. 11.6 for 1 N Sol'n. in water

Melting point : -35ºF (20% solution) to -115ºF(30% solution)

Boiling point : Lowest known value: 38°C (100.4°F) (ammonium hydroxide).

Critical temperature : Not available.

Flash point : Not available.

Evaporation rate : Not available.

Flammability (solid, gas) : Extremely flammable in the presence of the following materials or conditions: Oxidizing

Lower and upper explosive (flammable) limits : Lower: 16%
Upper: 25%

Vapor pressure : 3-10 PSI @ 16 ◦C

Vapor density : Vapor density 0.6 (Air = 1) (ammonia)

Specific Volume (ft ^{3}/lb) : 20.79

Gas Density (lb/ft ^{3}) : 0.0481

Relative density : 0.6

Solubility : Soluble in water. Soluble in alcohol and ether.

Solubility in water : Complete 540 g/l

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : 651°C (1203.8°F)

Decomposition temperature : Not available.

Viscosity : Not available.

Flow time (ISO 2431) : Not available.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : No specific data.

Incompatible materials : Yellow Metals (brass & copper)

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
ammonium hydroxide	LD50 Oral	Rat	350 mg/kg	-

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
ammonium hydroxide	Eyes - Severe irritant Eyes - Severe irritant	Rabbit Rabbit	- -	250 ug 0.5 minutes 1 mg	- -

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
ammonium hydroxide	Category 3	-	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Section 11. Toxicological information

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : May cause respiratory irritation.

Skin contact : Causes severe burns.

Ingestion : No known significant effects or critical hazards.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:, pain, watering, redness

Inhalation : Adverse symptoms may include the following:, respiratory tract irritation, coughing

Skin contact : Adverse symptoms may include the following:, pain or irritation, redness, blistering may occur

Ingestion : Adverse symptoms may include the following:, stomach pains

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
ammonium hydroxide	Acute LC50 37 ppm Fresh water	Fish - Gambusia affinis - Adult	96 hours

Persistence and degradability

Not available.

Bioaccumulative potential

Section 12. Ecological information

Not available.

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN2672	UN2672	UN2672	UN2672	UN2672
UN proper shipping name	Ammonium Hydroxide or Ammonia solutions	AMMONIA SOLUTION	AMMONIA SOLUTION	AMMONIA SOLUTION	Ammonia solution
Transport hazard class(es)	8 	8 	8 	8 	8 
Packing group	III	III	III	III	III
Environmental hazards	No.	Yes.	Yes. The environmentally hazardous substance mark is not required.	Yes.	Yes. The environmentally hazardous substance mark is not required.

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Additional information

DOT Classification : **Reportable quantity** 1000 lbs / 454 kg [2493.4 gal / 9438.7 L]. Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.

TDG Classification : Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.40-2.42 (Class 8), 2.7 (Marine pollutant mark).
The marine pollutant mark is not required when transported by road or rail.

IMDG : The marine pollutant mark is not required when transported in sizes of ≤5 L or ≤5 kg.

IATA : The environmentally hazardous substance mark may appear if required by other transportation regulations.

Section 14. Transport information

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to IMO instruments : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

Clean Water Act (CWA) 311: ammonium hydroxide

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Refer to Section 2: Hazards Identification of this SDS for classification of substance.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	ammonium hydroxide	1336-21-6	100
Supplier notification	ammonium hydroxide	1336-21-6	100

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts : The following components are listed: AMMONIUM HYDROXIDE; AMMONIUM WATER

New York : The following components are listed: Ammonium hydroxide

New Jersey : The following components are listed: AMMONIUM HYDROXIDE

Pennsylvania : The following components are listed: AMMONIUM HYDROXIDE

California Prop. 65

This product does not require a Safe Harbor warning under California Prop. 65.

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Section 15. Regulatory information

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

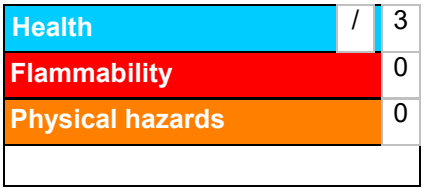
Not listed.

Inventory list

Australia	:	All components are listed or exempted.
Canada	:	All components are listed or exempted.
China	:	All components are listed or exempted.
Europe	:	All components are listed or exempted.
Japan	:	**Japan inventory (ENCS)**: All components are listed or exempted. **Japan inventory (ISHL)**: All components are listed or exempted.
New Zealand	:	All components are listed or exempted.
Philippines	:	All components are listed or exempted.
Republic of Korea	:	All components are listed or exempted.
Taiwan	:	All components are listed or exempted.
Thailand	:	Not determined.
Turkey	:	All components are listed or exempted.
United States	:	All components are active or exempted.
Viet Nam	:	All components are listed or exempted.

Section 16. Other information

Hazardous Material Information System (U.S.A.)



Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

National Fire Protection Association (U.S.A.)

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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Procedure used to derive the classification

Section 16. Other information

Classification	Justification
SKIN CORROSION - Category 1B SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3 AQUATIC HAZARD (ACUTE) - Category 1	Expert judgment Calculation method Calculation method

History

Date of printing : 1/14/2021

Date of issue/Date of revision : 1/14/2021

Date of previous issue : 2/15/2018

Version : 1

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

SAFETY DATA SHEET

SECTION 1) CHEMICAL PRODUCT AND SUPPLIER'S IDENTIFICATION

CAS Number:	105-59-9		
Product Name:	Methyldiethanolamine (MDEA)		
Revision Date:	Apr 03, 2018	**Date Printed:**	Apr 03, 2018
Version:	1.0	**Supersedes Date:**	N.A.
Manufacturer's Name:	Thames River Chemical Corp.		
Address:	5230 Harvester Road Burlington, ON, CA, L7L 4X4		
Emergency Phone:	CHEMTREC (800) 424-9300		
Information Phone Number:	905-681-5353		
Fax:	905-681-5377		

Product/Recommended Uses: Feed additive and diet supplement

SECTION 2) HAZARDS IDENTIFICATION

Classification

Eye Irritation - Category 2A

Pictograms

Signal Word

Warning

Hazard Statements - Health

Causes serious eye irritation

Precautionary Statements - General

If medical advice is needed, have product container or label at hand.

Keep out of reach of children.

Read label before use.

Precautionary Statements - Prevention

Wash thoroughly/Wash hands thoroughly after handling.

Wear protective gloves/protective clothing/eye protection/face protection.

Precautionary Statements - Response

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

If eye irritation persists: Get medical advice/attention.

Precautionary Statements - Storage

No precautionary statement available.

Precautionary Statements - Disposal

No precautionary statement available.

Physical Hazards Not Otherwise Classified

No Data Available

Health Hazards Not Otherwise Classified

No Data Available

SECTION 3) COMPOSITION/INFORMATION ON INGREDIENTS

CAS	Chemical Name	% By Weight
0000105-59-9	METHYL DIETHANOLAMINE	98% - 100%

Specific chemical identity and/or exact percentage (concentration) of the composition has been withheld to protect confidentiality.

SECTION 4) FIRST-AID MEASURES

Inhalation

Remove source of exposure or move person to fresh air and keep comfortable for breathing. If experiencing respiratory symptoms: Call a POISON CENTER/doctor.

Eye Contact

Direct contact with liquid or vapor will cause serious eye irritation. Immediately flush the contaminated eye(s) with lukewarm, gently flowing water for several minutes, while holding the eyelid(s) open. Neutral saline solution may be used as soon as it is available. Take care not to rinse contaminated water into the unaffected eye or onto face. If irritation persists, obtain medical attention.

Skin Contact

Take off contaminated clothing, shoes and leather goods (e.g. watchbands, belts). Rinse/wash with lukewarm, gently flowing water and mild soap for 5 minutes or until product is removed. If skin irritation occurs or you feel unwell: Get medical advice/attention.
Wash contaminated clothing before re-use or discard.

Ingestion

Swallowing can cause irritation of the digestive tract with abdominal and chest pain, nausea, vomiting and diarrhea.
Never give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing. Have victim rinse mouth thoroughly with water. DO NOT INDUCE VOMITING. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration. Have victim rinse mouth with water again. Immediately obtain medical advice.

Most Important Symptoms and Effects, Both Acute and Delayed

No Data Available

Indication of Any Immediate Medical Attention and Special Treatment Needed

No Data Available

SECTION 5) FIRE-FIGHTING MEASURES

Suitable Extinguishing Media

Small Fire : Dry chemical, foam, carbon dioxide, water-spray or alcohol-resistant foam. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Large Fire: Water spray, fog or alcohol-resistant foam.

Unsuitable Extinguishing Media

Do not use straight stream of water. High pressure water streams may scatter hot liquid.

Specific Hazards in Case of Fire

During a fire, the chemical components may vaporize; these components can be severely irritating to eyes and respiratory tract. Hazardous combustion products may include and are not limited to: nitrogen oxides, hydrogen cyanide, carbon monoxide, and carbon dioxide.

Fire-fighting Procedures

Isolate immediate hazard area and keep unauthorized personnel out. Move undamaged containers from immediate hazard area if it can be done safely.

Special Protective Actions

Wear positive pressure self-contained breathing apparatus (SCBA) and full turnout gear.

SECTION 6) ACCIDENTAL RELEASE MEASURES

Emergency Procedure

Isolate hazard area and keep unauthorized personnel away. Stay uphill and/or upstream. Do not touch damaged containers or spilled materials unless wearing appropriate protective clothing. Ventilate closed spaces before entering.

Recommended Equipment

Wear chemical protective clothing.

Personal Precautions

Avoid breathing vapor or mist. Avoid contact with skin, eye or clothing.

Environmental Precautions

Stop spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems and natural waterways by using sand, earth, or other appropriate barriers. Dike far ahead of liquid spill for later disposal.

Methods and Materials for Containment and Cleaning up

Absorb Liquids in vermiculite, dry sand, earth, or similar inert material and deposit in sealed containers for disposal.

SECTION 7) HANDLING AND STORAGE

General

Avoid contact with eyes, skin and clothing. Avoid generating mists and vapors. Avoid breathing vapors. Ensure that engineering controls are operating and that protective equipment requirements are being followed.

Inspect containers for leaks before handling. Prevent damage to containers. Keep containers closed when not in use. Assume that empty containers contain residues which are hazardous.

Discard all contaminated leather items such as watchbands, shoes and belts.
Never perform any welding, cutting, soldering, drilling or other hot work on an empty vessel, container or piping until all liquid and vapors have been cleared.

Ventilation Requirements

Use only with adequate ventilation to control air contaminants to their exposure limits.

Storage Room Requirements

Store in dry, cool areas, out of direct sunlight and away from other sources of heat. Empty container retain residue and may be dangerous.

Keep containers tightly closed.

SECTION 8) EXPOSURE CONTROLS/PERSONAL PROTECTION

Eye protection

Wear indirect-vent, impact and splash resistant goggles when working with liquids

Skin Protection

Use of gloves approved to relevant standards made from the following materials may provide suitable chemical protection: PVC, neoprene or nitrile rubber gloves. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, glove thickness, dexterity. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory Protection

If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker, a respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 should be followed. Check with respiratory protective equipment suppliers.

Appropriate Engineering Controls

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.

Chemical Name	CANsmg	CANsppm	CANtmg	CANtppm	OSHA STEL (mg/m3)	OSHA STEL (ppm)	OSHA TWA (mg/m3)	OSHA TWA (ppm)	OSHA Carcinogen	OSHA Tables (Z1, Z2, Z3)	OSHA Skin designation	ACGIH STEL (mg/m3)
No applicable chemical	-	-	-	-	-	-	-	-	-	-	-	-

Chemical Name	ACGIH STEL (ppm)	ACGIH TWA (mg/m3)	ACGIH TWA (ppm)	ACGIH TLV Basis	ACGIH Carcinogen	ACGIH Notations
No applicable chemical	-	-	-	-	-	-

SECTION 9) PHYSICAL AND CHEMICAL PROPERTIES

Physical and Chemical Properties

Density	8.66 lb/gal
Specific Gravity	1.04

Appearance	pale yellow viscous liquid
Odor Description	amine odor
Odor Threshold	N/A
pH	strong base
Melting Point	No Data Available
Low Boiling Point	240 °C
High Boiling Point	N/A
Flash Point	131 °C
Vapor Pressure	0.000262 (25°C) hPa
Vapor Density	4
Evaporation Rate	N/A
Upper Explosion Level	N/A
Lower Explosion Level	N/A
Water Solubility	completely soluble
Coefficient Water/Oil	Kow = -1.08 (25°C)
Viscosity	No Data Available

SECTION 10) STABILITY AND REACTIVITY

Reactivity

No Data Available

Stability

Stable under normal storage and handling conditions.

Conditions to Avoid

Avoid high temperatures and contact with sources of ignition. Avoid direct sunlight.

Hazardous Reactions/Polymerization

Contact with nitrosating agents, under acidic conditions such as nitrous acid, nitrite or nitrogen oxides, can form nitrosamines some of which are potent carcinogens.

Alkanolamine substances are oxidized by air slowly with evolution of heat. This reaction may lead to spontaneous combustion if the substance is on an adsorbent or on a high surface area material (e.g. absorbent material or thermal insulation).

Incompatible Materials

Avoid contact with strong acids, strong oxidizing agents, halogenated hydrocarbons and nitrating agents.

Hazardous Decomposition Products

Decomposition products may include nitrogen oxides, ammonia, irritating aldehydes and ketones. Hazardous decomposition products depend upon temperature, air supply and the presence of other materials.

SECTION 11) TOXICOLOGICAL INFORMATION

Likely Route of Exposure

Inhalation, ingestion, skin absorption

Acute Toxicity

LD50 Oral(rat): 1945 mg/kg
LD50 Dermal(rabbit): 6230 mg/kg
LC50 Inhalation(4 hrs.): Not available

Aspiration Hazard

No Data Available

Carcinogenicity

No Data Available

Germ Cell Mutagenicity

No Data Available

Reproductive Toxicity

No Data Available

Respiratory/Skin Sensitization

No Data Available

Serious Eye Damage/Irritation

Causes serious eye irritation

Skin Corrosion/Irritation

No Data Available

Specific Target Organ Toxicity - Repeated Exposure

No Data Available

Specific Target Organ Toxicity - Single Exposure

No Data Available

SECTION 12) ECOLOGICAL INFORMATION

Toxicity

Algae:

72 Hr EC50 Desmodesmus subspicatus: 37 mg/L
96 Hr EC50 Desmodesmus subspicatus: 20 mg/L
Freshwater fish:
96 Hr LC50 Leusciscus idus: 1000-2200 mg/L
96 Hr LC50 Pimephales promelas: >1000 mg/L
48 Hr EC50 Daphnia magna: 230 mg/L

Mobility in Soil

Henry's Law Constant (H) is estimated to be 3.38E-19 atm m^3/mole at 25°C.
Potential for mobility in soil is very high (Koc between 0 and 50).
Log soil organic carbon partition coefficient (log Koc) is estimated to be 0.48.

Bio-accumulative Potential

Bioconcentration potential is low (BCF <100; and log Pow <3). Log Pow is estimated using the Pomona-MedChem structural fragment method to be -1.202.

Persistence and Degradability

Product is expected to biodegrade readily under aerobic conditions.

Other Adverse Effects

No Data Available

SECTION 13) DISPOSAL CONSIDERATIONS

Waste Disposal

Empty Containers retain product residue which may exhibit hazards of material, therefore do not pressurize, cut, glaze, weld or use for any other purposes. It is the responsibility of the user of the product to determine at the time of disposal whether the product meets local criteria for hazardous waste. Waste management should be in full compliance with national, provincial and local laws.

SECTION 14) TRANSPORT INFORMATION

Transport Canada Information

UN number: Not Regulated

Proper shipping name: N/A

Hazard class: N/A

Packaging group: N/A

U.S. DOT Information

UN number: Not Regulated

Proper shipping name: N/A

Hazard class: N/A

Packaging group: N/A

SECTION 15) REGULATORY INFORMATION

CAS	Chemical Name	% By Weight	Regulation List
0000105-59-9	METHYL DIETHANOLAMINE	98% - 100%	DSL,TSCA

SECTION 16) OTHER INFORMATION

Glossary

ACGIH- American Conference of Governmental Industrial Hygienists; ANSI- American National Standards Institute; Canadian TDG- Canadian Transportation of Dangerous Goods; CANsmg or CANsppm - Canadian Short Term Exposure Level in mg/L or in ppm; CANtmg or CANtppm - Canadian Time Weighted Average in mg/L or in ppm; CAS- Chemical Abstract Service; Chemtrec- Chemical Transportation Emergency Center(US); CHIP- Chemical Hazard Information and Packaging; DSL- Domestic Substances List; EC- Equivalent Concentration; EH40 (UK)- HSE Guidance Note EH40 Occupational Exposure Limits; EPCRA- Emergency Planning and Community Right-To-Know Act; ESL Effects screening levels; HMIS- Hazardous Material Information Service; LC- Lethal Concentration; LD- Lethal Dose; NFPA- National Fire Protection Association; OEL- Occupational Exposure Limits; OSHA- Occupational Safety and Health Administration, US Department of Labor; PEL- Permissible Exposure Limit; SARA (Title III)- Superfund Amendments and Reauthorization Act; SARA 313- Superfund Amendments and Reauthorization Act, Section 313; SCBA- Self Contained Breathing Apparatus; STEL-Short Term Exposure Limit; TCEQ Texas Commission on Environmental Quality; TLV- Threshold Limit Value; TSCA- Toxic Substances Control Act Public Law 94-469; TWA Time Weighted Value; US DOT- US Department of Transportation; WHMIS- Workplace Hazardous Materials Information System.

Version 1.0:

Revision Date: Oct 04, 2017

Version 1.0

DISCLAIMER

To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist. The above information pertains to this product as currently formulated, and is based on the information available at this time. Addition of reducers or other additives to this product may substantially alter the composition and hazards of the product. Since conditions of use are outside our control, we make no warranties, express or implied, and assume no liability in connection with any use of this information.

[redacted]

SAFETY DATA SHEET

Natural Gas (Sweet)

Date of Preparation: March 8, 2022

Section 1: IDENTIFICATION

Product Name: Natural Gas (Sweet)

Synonyms: Marsh Gas; Methane (CH4); Fuel Gas.

Product Use: Fuel Gas.

Restrictions on Use: Not available.

[redacted]

Manufacturer/Supplier:

Emergency Phone:

[redacted]

Date of Preparation of SDS: March 8, 2022

Section 2: HAZARD(S) IDENTIFICATION

GHS INFORMATION

Classification:
Flammable Gases, Category 1
Gases Under Pressure - Compressed Gas
Simple Asphyxiant, Category 1

LABEL ELEMENTS

Hazard Pictogram(s):

Signal Word: Danger

Hazard Statements:
Extremely flammable gas.
Contains gas under pressure; may explode if heated.
May displace oxygen and cause rapid suffocation.

Precautionary Statements

Prevention: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

Response: Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
In case of leakage, eliminate all ignition sources.

Storage: Store in a well-ventilated place.
Protect from sunlight.

Disposal: Not applicable.

Hazards Not Otherwise Classified: Not applicable.

Ingredients with Unknown Toxicity: None.

This material is considered hazardous by the OSHA Hazard Communication Standard, (29 CFR 1910.1200). This material is considered hazardous by the Hazardous Products Regulations.

[redacted]

Section 3: COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous Ingredient(s)	Common name / Synonyms	CAS No.	% vol./vol.
Natural gas	Not available.	8006-14-2	100
Methane	Not available.	74-82-8	90 - 99
Ethane	Not available.	74-84-0	0 - 6
Propane	Not available.	74-98-6	0 - 3
Butane	Not available.	106-97-8	0 - 3
Propane, 2-methyl-	Isobutane	75-28-5	0 - 3
Pentane	Not available.	109-66-0	0 - 3
Butane, 2-methyl-	Isopentane	78-78-4	0 - 3
Nitrogen	Not available.	7727-37-9	0 - 3
Carbon dioxide	Not available.	124-38-9	0 - 3
Helium	Not available.	7440-59-7	0 - 3

Section 4: FIRST-AID MEASURES

Inhalation:

If inhaled: Call a poison center or doctor if you feel unwell.

Acute and delayed symptoms and effects: May displace oxygen and cause rapid suffocation. Central nervous system depression can occur if product is present in concentrations that will reduce the oxygen content of air below 18 % (vol). Symptoms may include headache, lightheadedness, drowsiness, disorientation, vomiting and seizures. Unconsciousness and death may occur with severe oxygen deprivation. May cause respiratory irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain.

Eye Contact:

If in eyes: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor.

Acute and delayed symptoms and effects: Contact with rapidly expanding or liquefied gas may cause irritation and/or frostbite. The pain after contact with liquid can quickly subside. Permanent eye damage or blindness could result.

Skin Contact:

Contact with rapidly expanding or liquefied gas may cause irritation and/or frostbite. If on skin: Wash with plenty of water. Get immediate medical advice/attention. Thaw frosted parts with lukewarm water. Do not rub affected area. Remove non-adhering contaminated clothing. Do not remove adherent material or clothing.

Acute and delayed symptoms and effects: Contact with rapidly expanding or liquefied gas may cause irritation and/or frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after contact with liquid can quickly subside.

Ingestion:

Not a normal route of exposure.

General Advice:

Acute and delayed symptoms and effects: Not a normal route of exposure. In case of accident or if you feel unwell, seek medical advice immediately (show the label or SDS where possible).

Note to Physicians: Symptoms may not appear immediately.

Section 5: FIRE-FIGHTING MEASURES

FLAMMABILITY AND EXPLOSION INFORMATION

Extremely flammable gas. Contains gas under pressure; may explode if heated. Will be easily ignited by heat, sparks or flames. Will form explosive mixtures with air. Vapors from liquefied gas are initially heavier than air and spread along ground. Methane is lighter than air and will rise. Vapors may travel to source of ignition and flash back. Cylinders exposed to fire may vent and release flammable gas through pressure relief devices. Containers may explode when heated. Ruptured cylinders may rocket. DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.

If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.

Fire involving Tanks: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Do not direct water at source of leak or safety devices; icing may occur. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

Sensitivity to Mechanical Impact: This material is not sensitive to mechanical impact.
Sensitivity to Static Discharge: This material is sensitive to static discharge.

MEANS OF EXTINCTION

Suitable Extinguishing Media: Small Fire: Dry chemical or CO_2.

Large Fire: Water spray or fog. Move containers from fire area if you can do it without risk.

Unsuitable Extinguishing Media: Not available.

Products of Combustion: Oxides of carbon.

Protection of Firefighters: Leaking gas fire: Do not extinguish, unless leak can be stopped safely. In case of leakage, eliminate all ignition sources. Vapors may cause dizziness or asphyxiation without warning. Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite. Fire may produce irritating and/or toxic gases. Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection. Always wear thermal protective clothing when handling refrigerated/cryogenic liquids.

Section 6: ACCIDENTAL RELEASE MEASURES

Emergency Procedures: As an immediate precautionary measure, isolate spill or leak area for at least 100 meters (330 feet) in all directions. Keep unauthorized personnel away. Stay upwind. Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks). Keep out of low

	areas. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). All equipment used when handling the product must be grounded.
Personal Precautions:	Do not touch or walk through spilled material. Use personal protection recommended in Section 8.
Environmental Precautions:	Not normally required.
Methods for Containment:	Stop leak if you can do it without risk. If possible, turn leaking containers so that gas escapes rather than liquid. Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material. Do not direct water at spill or source of leak.
Methods for Clean-Up:	Prevent spreading of vapors through sewers, ventilation systems and confined areas. Isolate area until gas has dispersed.
Other Information:	See Section 13 for disposal considerations.

Section 7: HANDLING AND STORAGE

Handling:
Avoid breathing gas. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Do not pierce or burn, even after use. See Section 8 for information on Personal Protective Equipment.

Storage:
Store in a well-ventilated place. Protect from sunlight. Store away from incompatible materials. See Section 10 for information on Incompatible Materials. Keep out of the reach of children.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines
Component

Natural gas [CAS No. 8006-14-2]
ACGIH: Simple asphyxiant; Explosion hazard
OSHA: No PEL established.

Methane [CAS No. 74-82-8]
ACGIH: Simple asphyxiant; Explosion hazard
OSHA: No PEL established.

Ethane [CAS No. 74-84-0]
ACGIH: Simple asphyxiant; Explosion hazard
OSHA: No PEL established.

Propane [CAS No. 74-98-6]
ACGIH: Simple asphyxiant; Explosion hazard
OSHA: 1000 ppm (TWA), 1800 mg/m³ (TWA);

Butane [CAS No. 106-97-8]

ACGIH: 1000 ppm (STEL); Explosion hazard (2012)

OSHA: 800 ppm (TWA) [Vacated];

Isobutane [CAS No. 75-28-5]

ACGIH: 1000 ppm (STEL); Explosion hazard (2012)

OSHA: No PEL established.

Pentane [CAS No. 109-66-0]

ACGIH: 1000 ppm (TWA); (2013)

OSHA: 1000 ppm (TWA), 2950 mg/m³ (TWA); 600 ppm (TWA); 750 ppm (STEL) [Vacated];

Isopentane [CAS No. 78-78-4]

ACGIH: 1000 ppm (TWA); (2013)

OSHA: No PEL established.

Nitrogen [CAS No. 7727-37-9]

ACGIH: Simple asphyxiant

OSHA: No PEL established.

Carbon dioxide [CAS No. 124-38-9]

ACGIH: 5000 ppm (TWA); 30000 ppm (STEL); (1983)

OSHA: 5000 ppm (TWA), 9000 mg/m³ (TWA);

Helium [CAS No. 7440-59-7]

ACGIH: Simple asphyxiant

OSHA: No PEL established.

PEL: Permissible Exposure Limit
TLV: Threshold Limit Value
TWA: Time-Weighted Average
STEL: Short-Term Exposure Limit

Engineering Controls: Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapour, gas, etc.) below recommended exposure limits.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Eye/Face Protection: Wear safety glasses. Use equipment for eye protection that meets the standards referenced by CSA Standard CAN/CSA-Z94.3:20 and OSHA regulations in 29 CFR 1910.133 for Personal Protective Equipment.

Hand Protection: Wear protective gloves. Wear cold insulating gloves. Consult manufacturer specifications for further information.

Skin and Body Protection: Wear protective clothing. Flame resistant clothing that meets

	the NFPA 2112 and CAN/CGSB 155.20-2017 standards is recommended in areas where material is stored or handled.
Respiratory Protection:	If engineering controls and ventilation are not sufficient to control exposure to below the allowable limits then an appropriate NIOSH/MSHA approved air-purifying respirator that meets the requirements of CSA Standard CAN/CSA-Z94.4-18, or self-contained breathing apparatus must be used. Supplied air breathing apparatus must be used when oxygen concentrations are low or if airborne concentrations exceed the limits of the air-purifying respirators.
General Hygiene Considerations:	Handle according to established industrial hygiene and safety practices. Consult a competent industrial hygienist to determine hazard potential and/or the PPE manufacturers to ensure adequate protection.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Colourless gas.
Colour:	Colourless.
Odour:	Slight hydrocarbon odour not detectable by all people.
Odour Threshold:	Not available.
Physical State:	Gas.
pH:	Not available.
Melting Point / Freezing Point:	-187 to -182 °C (-304.6 to -295.6 °F)
Initial Boiling Point:	Not available.
Boiling Range:	-162 °C (-259.6 °F)
Flash Point:	Not available.
Evaporation Rate:	> 1 (n-BuAc = 1) at 20 °C (68 °F)
Flammability (solid, gas):	Extremely flammable gas.
Lower Flammability Limit:	4.4 % (Natural Gas) 5% (Methane) 3% (Ethane) 2.1% (Propane) 1.8% (Butane & Isobutane)
Upper Flammability Limit:	16.4 % (Natural Gas) 15% (Methane) 12.5% (Ethane) 9.5% (Propane) 8.4% (Butane & Isobutane)
Vapor Pressure:	> 1000 mmHg at 20 °C (68 °F)

Vapor Density:	0.6 (Air = 1) at 20 °C (68 °F) (Methane)
Relative Density:	Not available.
Solubilities:	Negligible solubility in water.
Partition Coefficient: n-Octanol/Water:	Not available.
Auto-ignition Temperature:	537 °C (998.6 °F)
Decomposition Temperature:	Not available.
Viscosity:	Not available.
Percent Volatile, wt. %:	100
VOC content, wt. %:	Not available.
Density:	Not available.
Coefficient of Water/Oil Distribution:	Not available.

Section 10: STABILITY AND REACTIVITY

Reactivity:	Contact with incompatible materials. Sources of ignition. Exposure to heat.
Chemical Stability:	Stable under normal storage conditions.
Possibility of Hazardous Reactions:	None known.
Conditions to Avoid:	Contact with incompatible materials. Sources of ignition. Exposure to heat.
Incompatible Materials:	Strong oxidizers.

Hazardous Decomposition Products: Not available.

Section 11: TOXICOLOGICAL INFORMATION

EFFECTS OF ACUTE EXPOSURE

Product Toxicity

Oral: Not available.

Dermal: Not available.

Inhalation: Not available.

Component Toxicity

Component	CAS No.	LD_{50} oral	LD_{50} dermal	LC_{50}
Natural gas	8006-14-2	Not available.	Not available.	Not available.
Methane	74-82-8	Not available.	Not available.	Not available.
Ethane	74-84-0	Not available.	Not available.	Not available.
Propane	74-98-6	Not available.	Not available.	Not available.
Butane	106-97-8	Not available.	Not available.	658000 mg/m³ (rat); 4H
Isobutane	75-28-5	Not available.	Not available.	570000 ppm (rat); 15M

Pentane	109-66-0	400 mg/kg (rat)	Not available.	364000 mg/m³ (rat); 4H
Isopentane	78-78-4	Not available.	Not available.	Not available.
Nitrogen	7727-37-9	Not available.	Not available.	Not available.
Carbon dioxide	124-38-9	Not available.	Not available.	Not available.
Helium	7440-59-7	Not available.	Not available.	Not available.

Likely Routes of Exposure: Eye contact. Skin contact. Inhalation.

Target Organs: Skin. Eyes. Respiratory system. Cardiovascular system. Bone marrow. Liver. Kidneys. Central nervous system.

Symptoms (including delayed and immediate effects)

Inhalation: May displace oxygen and cause rapid suffocation. Central nervous system depression can occur if product is present in concentrations that will reduce the oxygen content of air below 18 % (vol). Symptoms may include headache, lightheadedness, drowsiness, disorientation, vomiting and seizures. Unconsciousness and death may occur with severe oxygen deprivation. May cause respiratory irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain.

Eye: Contact with rapidly expanding or liquefied gas may cause irritation and/or frostbite. The pain after contact with liquid can quickly subside. Permanent eye damage or blindness could result.

Skin: Contact with rapidly expanding or liquefied gas may cause irritation and/or frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after contact with liquid can quickly subside.

Ingestion: Not a normal route of exposure.

Skin Sensitization: Not available.

Respiratory Sensitization: Not available.

Medical Conditions Aggravated By Exposure: Not available.

EFFECTS OF CHRONIC EXPOSURE (from short and long-term exposure)

Target Organs: Skin. Eyes. Respiratory system. Cardiovascular system. Bone marrow. Liver. Kidneys. Central nervous system.

Chronic Effects: Prolonged exposure to Natural gas can lead to hypoxia, bluish colouration to the skin, numbness, damage to the nervous system, heart sensitization, reduced consciousness and death. Prolonged or repeated inhalation of Isopentane may cause dizziness, weakness, weight loss, anemia, nervousness, pains in the limbs and peripheral numbness.

Carcinogenicity: This product does not contain any carcinogens or potential carcinogens above reportable thresholds as listed by ACGIH, IARC, OSHA, or NTP.

Mutagenicity: Not available.

Reproductive Effects: Not available.

Developmental Effects

Teratogenicity: Not available.

Embryotoxicity: Not available.

Toxicologically Synergistic Materials: Not available.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity: Not available.

Persistence / Degradability: Not available.

Bioaccumulation / Accumulation: Not available.

Mobility in Environment: Not available.

Other Adverse Effects: Not available.

Section 13: DISPOSAL CONSIDERATIONS

Disposal Instructions: Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

Section 14: TRANSPORT INFORMATION

U.S. Department of Transportation (DOT)

Proper Shipping Name: UN1971, NATURAL GAS, COMPRESSED, 2.1

Class: 2.1

UN Number: UN1971

Packing Group: Not applicable.

Label Code:

Canada Transportation of Dangerous Goods (TDG)

Proper Shipping Name: UN1971, NATURAL GAS, COMPRESSED, 2.1

Class: 2.1

UN Number: UN1971

Packing Group: Not applicable.

Label Code:

Section 15: REGULATORY INFORMATION

Chemical Inventories

US (TSCA)

The components of this product are in compliance with the chemical notification requirements of TSCA.

Canada (DSL)
The components of this product are in compliance with the chemical notification requirements of the NSN Regulations under CEPA, 1999.

Federal Regulations

United States
This SDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SARA Title III

Component	Section 302 (EHS) TPQ (lbs.)	Section 304 EHS RQ (lbs.)	CERCLA RQ (lbs.)	Section 313	RCRA CODE	CAA 112(r) TQ (lbs.)
Methane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	10000
Ethane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	10000
Propane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	10000
Butane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	10000
Isobutane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	10000
Pentane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	10000
Isopentane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	10000

State Regulations
Massachusetts
US Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

Component	CAS No.	RTK List
Natural gas	8006-14-2	Listed.
Methane	74-82-8	Listed.
Ethane	74-84-0	Listed.
Propane	74-98-6	Listed.
Butane	106-97-8	Listed.
Isobutane	75-28-5	Listed.
Pentane	109-66-0	Listed.
Isopentane	78-78-4	Listed.
Nitrogen	7727-37-9	Listed.
Carbon dioxide	124-38-9	Listed.
Helium	7440-59-7	Listed.

Note: E = Extraordinarily Hazardous Substance

New Jersey
US New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

Component	CAS No.	RTK List
Methane	74-82-8	SHHS
Ethane	74-84-0	SHHS
Propane	74-98-6	SHHS
Butane	106-97-8	SHHS
Isobutane	75-28-5	SHHS
Pentane	109-66-0	SHHS

Isopentane	78-78-4	SHHS
Nitrogen	7727-37-9	Listed.
Carbon dioxide	124-38-9	Listed.
Helium	7440-59-7	Listed.

Note: SHHS = Special Health Hazard Substance

Pennsylvania

US Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

Component	CAS No.	RTK List
Natural gas	8006-14-2	Listed.
Methane	74-82-8	Listed.
Ethane	74-84-0	Listed.
Propane	74-98-6	Listed.
Butane	106-97-8	Listed.
Isobutane	75-28-5	Listed.
Pentane	109-66-0	Listed.
Isopentane	78-78-4	Listed.
Nitrogen	7727-37-9	Listed.
Carbon dioxide	124-38-9	Listed.
Helium	7440-59-7	Listed.

California

California Prop 65: This product does not contain chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

Section 16: OTHER INFORMATION

Disclaimer:

The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for their own particular use.

Date of Preparation of SDS: March 8, 2022

Version: 2.1

GHS SDS Prepared by: [redacted]

1. IDENTIFICATION

Product Identifier	Diesel Fuel
Synonyms:	Diesel Fuel, Motor Vehicle Diesel Fuel, Dyed Diesel, * DieselOne®, * DieselOne® w/Platinum Plus DFX, Low Sulfur Diesel (LSD), Ultra Low Sulfur Diesel (ULSD)
Intended use of the product:	Fuel
Contact:	Global Companies LLC Water Mill Center 800 South St. Waltham, MA 02454-9161 www.globalp.com
Contact Information:	EMERGENCY TELEPHONE NUMBER (24 hrs): CHEMTREC (800) 424-9300 COMPANY CONTACT (business hours): 800-542-0778

2. HAZARD IDENTIFICATION

According to OSHA 29 CFR 1910.1200 HCS

Classification of the Substance or Mixture

Classification (GHS-US):

Flam. Liquid	Category 3	H226
Skin Corrosion/Irritation	Category 2	H315
Aspiration Hazard	Category 1	H304
STOT SE	Category 3	H336
Carcinogenicity	Category 2	H350
Aquatic Chronic	Category 2	H411
Serious Eye Damage/ Irritation	Category 2B	H319

Labeling Elements

Signal Word (GHS-US):	**Danger**
Hazard Statements (GHS-US):	H226 – Flammable liquid and vapor. H315 – Causes Skin irritation. H304 – May be fatal if swallowed and enters airways. H336 – May cause drowsiness or dizziness. H350 – May cause cancer. H411 – Toxic to aquatic life with long lasting effects. H319 – May cause eye damage/irritation.
Precautionary Statements (GHS-US):	P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking. P233 - Keep container tightly closed. P240 – Ground/bond container and receiving equipment.

P241 – Use explosion-proof electrical/ventilating/lighting equipment pursuant to applicable electrical code.
P242 – Use only non-sparking tools.
P243 – Take precautionary measures against static discharge.
P261 – Avoid breathing dust/fume/gas/mist/vapors/spray.
P264 – Wash skin thoroughly after handling.
P271 – Use only outdoors or in a well-ventilated area.
P273 – Avoid release to the environment.
P280 - Wear protective gloves/protective clothing/eye protection/face protection.
P303+361+353 - If on skin (or hair): Take off immediately all contaminated clothing. Rinse with water/shower.
P308+311 - If exposed or concerned: Get medical advice/attention.
P301+310 - If swallowed: Immediately call a poison center/doctor/…
P331 - Do NOT induce vomiting.
P370+P378 – In case of fire use firefighting foam or other appropriate media for Class B fires to extinguish.
P403+235 - Store in a well-ventilated place. Keep cool.
P405 - Store locked up.
P501 – Dispose of contents/container in accordance with local/regional/national/international regulation.

Other information:

NFPA 704
Health: 1
Fire: 2
Reactivity: 0

3. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Composition Information
Mixture

Name	Product Identifier (CAS#)	% (w/w)	Classification
Diesel Fuel	68476-34-6	100	Flam Liq. 3, H226; Skin Irrit. 2, H315; Aspiration 1, H304; STOT SE 3, H336; Carc.2. H350; Aquatic chronic 2, H411
Naphthalene	91-20-3	<0.1	Carc. 2, H351; Acute Tox. 4, H302; Aquatic Acute 1, H400; Aquatic Chronic 1, H410

Additional Formulation Information:
Diesel Fuel consists of C9+ hydrocarbons resulting from distillation of crude oil.

Low Sulfur Diesel Fuel typically contains less than 500 ppm of sulfur

Ultra Low Sulfur Diesel Fuel typically contains less than 15 ppm of sulfur

4. FIRST AID MEASURES

Route	Measures
Inhalation	Remove person to fresh air. If person is not breathing, ensure an open airway and provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

Route	Measures
Ingestion	Aspiration Hazard: DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Ingestion may cause gastrointestinal disturbances including irritation, nausea, vomiting, and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory failure, and death.
Eye Contact	In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention. In case of contact lenses, remove immediately.
Skin Contact	Remove contaminated clothing and shoes. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops. Thermal burns require immediate medical attention depending on the severity and of the area of the body burned.

Most Important Symptoms
Contact with eyes and face may cause irritation. Long-term exposure may cause dermatitis (itching, irritation, pain and swelling).

Inhalation may cause irritation and significant or long term exposure could cause respiratory insufficiency and pulmonary edema.

Ingestion may cause aspiration, gastrointestinal disturbance, and CNS effects.

Immediate Medical Attention and Special Treatment
For contact with skin or eyes, immediately wash or flush contaminated eyes with gently flowing water. If possible, irrigate each eye continuously with 0.9% saline (NS). If ingested, rinse mouth. Do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs).

If inhaled, administer oxygen or establish a patent airway if breathing is labored. Suction if necessary. Monitor closely, anticipate seizures. Consider orotracheal or nostracheal intubation of airway control if patient is unconscious or is in severe respiratory distress.

Discard any clothing or shoes contaminated as they may be flammable.

5. FIRE-FIGHTING MEASURES

Extinguishing Media
Foam, carbon dioxide, dry chemical are most suitable

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, C02, water spray, firefighting foam, or Halon. Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other firefighting equipment.

LARGE FIRES: Foam, carbon dioxide, dry chemical. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

Specific Hazards / Products of Combustion
Moderate fire hazard when exposed to heat or flame with a very low flash point. Product is flammable and easily ignited when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

Combustion may produce smoke, carbon monoxide and other products of incomplete combustion.

Special Precautions and Protective Equipment for Firefighters
Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied firefighting foam.

Fighting Equipment/Instructions
Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH- approved pressure-demand self-contained breathing apparatus with full face piece and protective clothing.

Refer to Section 9 for fire properties of this chemical including flash point, auto ignition temperature, and explosive limits.

6. ACCIDENTAL RELEASE MEASURES

ACTIVATE FACILITY SPCC, SPILL CONTINGENCY or EMERGENCY PLAN.

Personal Precautions
Due to high vapor density, flammable / toxic vapors may be present in low lying areas, dikes, pits, drains, or trenches. Vapors may accumulate in low lying areas and reach ignitable concentrations. Ventilate the area. Use of non-sparking tools and intrinsically safe equipment is recommended. Potential for flammable atmosphere should be monitored using a combustible gas indicator positioned downwind of the spill area. Refer to Sections 2 and 7 for further hazard warnings and handling instructions.

Use appropriate personal protective equipment to prevent eye/skin contact and absorption. Use NIOSH approved respiratory protection, if warranted, to prevent exposures above permissible limits. Refer to Section 8. Contaminated clothing should not be near sources of ignition.

Emergency Measures
As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions. Consider wind direction. Secure all ignition sources (flame, spark, hot work, hot metal, etc.) from area. Evaluate the direction of product travel, diking sewers, etc. to confirm spill areas. Do not touch or walk-through spilled material. For large spills, isolate initial action distance downwind 1,000 ft. (300 m).

Environmental Precautions
Stop the spill to prevent environmental release if it can be done safely. Product is toxic to aquatic life. Take action to isolate environmental receptors including drains, storm sewers and natural water bodies. Keep on impervious surface if at all possible. Use water sparingly to prevent product from spreading. Foam and absorbents may be used to reduce / prevent airborne release.

Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Follow federal, state or local requirements for reporting environmental release where necessary. Refer to Section 15 for further information.

Containment and Clean-Up Methods
Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of firefighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with dry earth, sand or other non-combustible, inert oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container with clean, non-sparking tools for reclamation or disposal. Response and cleanup crews must be properly trained and must utilize proper protective equipment. Refer to Section 8 for appropriate protective equipment.

7. HANDLING AND STORAGE

USE ONLY AS A FUEL.
DO NOT SIPHON BY MOUTH.

Handling Precautions
Handle as a flammable liquid. Keep away from heat, sparks, and open flame. No smoking. Electrical equipment should be approved for classified area. Bond and ground containers during product transfer pursuant to NFPA 70 and API RP 2003 to reduce the possibility of static-initiated fire or explosion. Follow precautions to prevent static initiated fire.

Use good personal hygiene practices. Use only with protective equipment specified in Section 8. Avoid repeated and/or prolonged skin exposure. Use only outdoors or in well ventilated areas. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this

product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves. Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API RP 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents."

Storage

Large quantities of diesel fuel are stored in tanks or portable containers at an ambient storage temperature. Separate from incompatible chemicals (Refer to Section 10) by distance or secondary containment. Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers that are clearly labeled. Label all secondary containers that this material is transferred into with the chemical name and associated hazard(s). Empty product containers or vessels may contain flammable vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Storage tanks should have a venting system. If stored in small containers, the area should be well ventilated, away from ignition sources and protected from potential damage or vehicular traffic. Post “No Smoking” signs in product storage areas. This storage area should comply with NFPA 30 “Flammable and Combustible Liquid Code” or applicable building code. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 “Cleaning Mobile Tanks in Flammable and Combustible Liquid Service” and API RP 2015 “Safe Entry and Cleaning of Petroleum Storage Tanks”.

Incompatibles

Keep away from strong oxidizers, ignition sources and heat.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational Exposure Limits

Component	CAS #	List	Value
Diesel Fuel	68476-34-6	ACGIH TLV-TWA	100 mg/m3*
Naphthalene	91-20-3	ACGIH TLV-TWA OSHA PEL ACGIH STEL	10 ppm 10 ppm 15 ppm

*Critical effects; Skin; A3; CNS impairment.

Engineering Controls

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces. Intrinsically safe equipment and non-sparking tools shall be used in circumstances where concentrations may exceed lower flammable limits. Grounding and bonding shall be used to prevent accumulation and discharge of static electricity. Emergency shower and eyewash should be provided in proximity to handling areas in the event of exposure to decontaminate.

Personal Protective Equipment

Exposure	Equipment
Eye / Face	Wear appropriate chemical protective glasses or goggles or face shields to prevent skin and eye contact especially caused from splashing.
Skin	Wear appropriate personal protective clothing to prevent skin contact. Gloves constructed of nitrile, neoprene or PVC are recommended when handling this material. Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure.

Exposure	Equipment
Respiratory	A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, ANSI Z88.2-1992, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection and limitations. Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.
Thermal	Product is stored at ambient temperature. No thermal protection is required except for emergency operations involving actual or potential for fire. Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

9. PHYSICAL AND CHEMICAL PROPERTIES

Property	Value	
Appearance	Clear or straw-colored liquid. May be dyed red for distribution.	
Odor	Mild characteristic petroleum distillate odor.	
Odor Threshold	<1 ppm	
pH	Not available	
Melting Point	-22 to -0.4 ˚F (-30 to -18 ˚C)	
Boiling Point Range	320 to 690 ˚F (160 to 366 ˚C)	
Flash Point	> 125.6 ˚F (52 ˚C) PMCC	
Evaporation Rate	Slow, varies with conditions	
Flammability	Flammable liquid (OSHA defined)	
Flammable Limits	0.6 % - 6.5%	
Vapor Pressure	0.009 psia @ 70 ˚F	
Vapor Density	> 1	(air=1)
Specific Gravity	0.83-0.86 @ 60 ˚F (16 ˚C)	(water=1)
Solubility	Insoluble in water; miscible with other petroleum solvents.	
Partition Coefficient (N-octanol/water)	Log Kow range of 3.3 to >.6.0	
Autoignition Temperature	494 ˚F (257 ˚C)	
Decomposition Temperature	When heated it emits acrid smoke and irritating vapors.	
Viscosity	<3 cSt	
Percent Volatiles	100	

10. STABILITY AND REACTIVITY

Stability
This is a stable material that is flammable liquid (OSHA/GHS hazard category 3). Stable during transport.

Reactivity
Material is not self-reacting. Flammable concentrations may be present in air. Compound can react with oxidizing materials.

Possibility of Hazardous Reactions
Hazardous polymerization will not occur.

Incompatibility
Keep away from strong oxidizers such as nitric and sulfuric acids.

Conditions to Avoid
Avoid high temperatures, open flames, sparks, static electricity, welding, smoking and other ignition sources.

Hazardous Decomposition Products
Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

11. TOXICOLOGICAL INFORMATION

Acute Toxicity:
Acute Toxicity (Inhalation LC50)
Diesel Fuel (68476-34-6)
LC50 Inhalation Rat >6 mg/l/4h

Acute Toxicity (Dermal LD50)
Diesel Fuel (68476-34-6)
LD50 Dermal Rabbit >5000 mg/kg

Acute Toxicity (Oral LD50)
Diesel Fuel (68476-34-6)
LD50 Oral Rabbit >5000 mg/kg

Skin Corrosion/Irritation: Prolonged and repeated contact may cause skin irritation leading to dermatitis. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are exposed repeatedly.

Serious Eye Damage/Irritation: Causes serious eye irritation.

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Teratogenicity: Not available

Carcinogenicity: OSHA: NO, IARC: Group 3, NTP: NO, ACGIH: NOIC:A3, NIOSH: NO

IARC: Group 3 – Not classifiable as to their carcinogenicity to humans ACGIH: A3 – Confirmed animal carcinogen with unknown relevance to humans

Studies have shown that similar products produce skin tumors in laboratory animals following repeated applications without washing or removal. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation.

IARC classifies whole diesel fuel exhaust particulates (byproduct of combustion of this material) carcinogenic to humans (Group 1) and NIOSH regards diesel fuel exhaust particulate as a potential occupational carcinogen.

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Repeated Exposure): Not classified

Specific Target Organ Toxicity (Single Exposure): Inhalation exposure may cause drowsiness or dizziness by inhalation exposure.

Aspiration Hazard: The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Potential Health Effects: Vapor irritating to skin, eyes, nose, and throat. Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

WARNING: The burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of

combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

12. ECOLOGICAL INFORMATION

Toxicity:
This material is expected to be toxic to aquatic organisms and may cause long-term adverse effects in the aquatic environment.

Data for Component: Diesel Fuel (68476-34-6)

Material is toxic to aquatic organisms based on an acute basis (LC50/EC50 >1 but ≤ 10 mg/L in the most sensitive species tested).

Material is a long-term aquatic hazard based on a chronic basis (LC50/EC50 >1 but ≤ 10 mg/L in the most sensitive species tested).

Persistence and Degradation: This material is not expected to be readily biodegradable.

Bioaccumulative Potential: Not available

Mobility in Soil: Not available

Other Adverse Effects: None known

Other Information: Avoid release to the environment.

13. DISPOSAL CONSIDERATIONS

Consult federal, state and local waste regulations to determine appropriate disposal options. May be considered a hazardous waste if disposed. Direct solid waste (landfill) or incineration at a solid waste facility is not permissible. Do not discharge to sanitary or storm sewer. Personnel handling waste containers should follow precautions provided in this document.

Shipping containers must be DOT authorized packages. Follow licensure and regulations for transport of hazardous material and hazardous waste as applicable.

14. TRANSPORT INFORMATION

US DOT

UN Identification Number	NA 1993
Proper Shipping Name	Diesel fuel
Hazard Class and Packing Group	3, PGIII
Shipping Label	Flammable liquid
Placard / Bulk Package	Flammable liquid, 1993
Emergency Response Guidebook Guide Number	128

This product may be re-classified as a “Combustible Liquid” meeting the definition in 49 CFR 173.120 unless transported by vessel or aircraft.
Specific placard requirements must be met for shipments of this product as a Combustible Liquid by rail (See 49 CFR 172.332).
Non-bulk packages (<= 119 gal) of Combustible Liquids in package sizes less than the product reportable quantity are not regulated as hazardous materials if the material does not meet any other hazard class.

IATA Information

UN Identification Number	UN 1202
Proper Shipping Name	Diesel fuel
Hazard Class and Packing Group	3, PGIII
ICAO Label	3
Packing Instructions Cargo	310
Max Quantity Per Package Cargo	220L
Packing Instructions Passenger	309Y
Max Quantity per Package Passenger	60L

ICAO

UN Identification Number	UN 1202
Shipping Name / Description	Diesel fuel
Hazard Class and Packing Group	3, PG III
IMDG Label	3

IMDG

UN Identification Number	UN 1202
Shipping Name / Description	Diesel fuel
Hazard Class and Packing Group	3, PGIII
IMDG Label	3
EmS Number	F-E-S-E
Marine Pollutant	Yes

15. REGULATORY INFORMATION

U.S. Federal, State, and Local Regulatory Information
Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other federal, state, or local regulations; consult those regulations applicable to your facility/operation.

OSHA Hazard Communication Standard
This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning And Community Right-to-Know Act of 1986) Sections 311 and 312

Immediate (Acute) Health Hazard	Yes
Delayed (Chronic) Health Hazard	Yes
Fire Hazard	Yes
Reactive Hazard	No
Sudden Release of Pressure Hazard	No

Clean Water Act (Oil Spills)
Any spill or release of this product to “navigable waters” (Essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) or, if not practical, the U.S. Coast Guard with follow up to the National Response Center, as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

CERCLA Section 103 and SARA Section 304 (Release to the Environment)
The CERCLA definition of hazardous substances contains a “petroleum exclusion” clause which exempts this material. This product does not contain any chemicals subject to the reporting requirements of CERCLA Section 103 or SARA 304.

SARA Section 313- Supplier Notification
This product does not contain any chemicals subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372.

EPA Notification (Oil Spills)
If the there is a discharge of more than 1,000-gallons of oil into or upon navigable waters of the United States, or if it is the second spill event of 42 gallons or more of oil into water within a twelve (12) month period, a written report must be submitted to the Regional Administrator of the EPA within sixty days of the event.

Pennsylvania Right to Know Hazardous Substance list:
The following product components are cited in the Pennsylvania Special Hazardous Substance List, and are present at levels which require reporting.

Component	CAS	Amount
Diesel Fuel	68476-34-6	100%

New Jersey Right to Know Hazardous Substance list:
The following product components are cited in the New Jersey Right to Know Hazardous Substance List, and are present at levels which require reporting.

Component	CAS	Amount
Diesel Fuel	68476-34-6	100%

California Proposition 65 WARNING: This product contains chemicals known to the State of California to cause Cancer or Reproductive Toxicity.

Component	CAS	Amount
Naphthalene	91-20-3	<0.1%

U.S. Toxic Substances Control Act
All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements under 40 CFR 720.30.

CEPA - Domestic Substances List (DSL)
All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.

Canadian Regulatory Information (WHMIS)
Class B3 – Combustible Liquid
Class D2A – Materials causing other toxic effects. (Very Toxic)

16. OTHER INFORMATION

Version	5
Issue Date	June 26, 2019
Prior Issue Date	May 20, 2016

Description of Revisions
Update viscosity information in Section 9. Update transportation information in Section 14 to clarify US DOT re-classification option as a Combustible Liquid.

Abbreviations

˚F	Degrees Fahrenheit (temperature)
<	Less than
=	Equal to
>	Greater than
AP	Approximately
C	Centigrade (temperature)
kg	Kilogram
L	Liter
mg	Milligrams
mL	Milliliter
mm^2	Square millimeters
mmHg	Millimeters of mercury (pressure)
N/A	Not applicable
N/D	Not determined
ppm	Parts per million
sec	Second
ug	Micrograms

Acronyms

ACGIH	American Conference of Governmental Industrial Hygienists
AIHA	American Industrial Hygiene Association
AL	Action Level
ANSI	American National Standards Institute
API	American Petroleum Institute
CAS	Chemical Abstract Service
CERCLA	Comprehensive Emergency Response, Compensation, and Liability Act
DOT	U.S. Department of Transportation
EC50	Ecological concentration 50%
EPA	U.S. Environmental Protection Agency
ERPG	Emergency Response Planning Guideline
GHS	Global Harmonized System

HMIS	Hazardous Materials Information System
IARC	International Agency for Research On Cancer
IATA	International Air Transport Association
IMDG	International Maritime Dangerous Goods
Koc	Soil Organic Carbon
LC50	Lethal concentration 50%
LD50	Lethal dose 50%
MSHA	Mine Safety and Health Administration
NFPA	National Fire Protection Association
NIOSH	National Institute of Occupational Safety and Health
NOIC	Notice of Intended Change
NTP	National Toxicology Program
OPA	Oil Pollution Act of 1990
OSHA	U.S. Occupational Safety & Health Administration
PEL	Permissible Exposure Limit (OSHA)
RCRA	Resource Conservation and Recovery Act Reauthorization Act of 1986 Title III
REL	Recommended Exposure Limit (NIOSH)
RVP	Reid Vapor Pressure
SARA	Superfund Amendments and
SCBA	Self Contained Breathing Apparatus
SPCC	Spill Prevention, Control, and Countermeasures
STEL	Short Term Exposure Limit (generally 15 minutes)
TLV	Threshold Limit Value (ACGIH)
TSCA	Toxic Substances Control Act
TWA	Time Weighted Average (8 hr.)
UN	United Nations
UNECE	United Nations Economic Commission for Europe
WEEL	Workplace Environmental Exposure Level (AIHA)
WHMIS	Canadian Workplace Hazardous Materials Information System

Disclaimer of Expressed and Implied Warranties

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

** End of Safety Data Sheet **

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]
Startup/Shutdown Streams from ISBL (Sulfure Absorber, Prereformer, Waste Heater Boiler, Vent Downstream LTS)		Startup and shutdown streams from Feed Purification Section, Reformer Section, ATR Section, and CO Conversion Section		n/a	New	Flare 119-FL-9501
113-PKG-2011	113-PKG-2011-STK	CCGT 2011		298.10 MMBtu/hr	New	1C, 2C
113-PKG-2021	113-PKG-2021-STK	CCGT 2021		298.10 MMBtu/hr	New	3C, 4C
111-H-2001	111-H-2001-STK	Fired Heater		200 MMBtu/hr	New	5C
119-PKG-9201	119-PKG-9201-STK	Auxiliary Boiler		213.31 MMBtu/hr	New	NA
119-CT-9301	119-CT-9301	Cooling Tower		69,801 gpm	New	NA
119-PKG-0001	119-PKG-0001	NG Startup Generator		3000 HP	New	NA
119-P-9402	119-P-9402	Fire Water Pump Diesel Engine		600 HP	New	NA
119-FL-9501	119-FL-9501	Flare		2203 MSCFH	New	NA
118-TK-9901	118-TK-9901	Amine Makeup Tank		1,381,748 gal (max capacity)	New	NA

[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

MGSH2-1 - H2 Plant
Attachment J - Emission Points Data Summary Sheet

Emission Point ID	Emission Point Type [1]	Emission Units Vented Through this Point		Air Pollution Control Device		Vent Time for Emission Unit (chemical processes only)		Pollutant Chemical Name/CAS (See Emission Calculations for Speciate VOCs & HAPs) [3]	Maximum Uncontrolled Emissions [4]		Maximum Controlled Emissions [5]		Emission Form or Phase (At Exit Condition)	Est. Method Used [6]	Emission Concentration [7]	Inner Diameter	Exit Gas Temp.	Exit Gas Volumetric Flow [8]	Exit Gas Velocity	Ground Level (Height above Mean Sea Level)	Stack Height above Ground Level [9]	UTM Northing	UTM Easting
		Emission Unit ID	Emission Unit Description	Control Device ID	Control Device Type	Short Term [2]	Max (hr/yr)		lb/hr	tpy	lb/hr	tpy			(ppmv or mg/m^3)	(ft)	(°F)	(ACFM)	(fps)		(ft)	(km)	(km)
113-PKG-2011-STK	Upward Vertical Stack	113-PKG-2011	CCGT 2011	1C, 2C	1C - SCR 2C - CO Oxidation Catalyst	C	C	NO_X	27.4	120.05	2.74	13.04	Gas	EE	2.5 ppmvd @ 15% O2	8	200	196410	65.12	636	120	4037.989	404.637
								CO	6.7	29.9	0.67	3.71	Gas		1 ppmvd@ 15% O2								
								SO_2	0.48	2.10	0.48	2.10	Gas		0.314 ppmvd @ 15% O2								
								VOC	0.63	2.74	0.63	2.74	Gas		0.031 mg/dscf @ 15% O2 and 1 atm & 68 F								
								PM	1.97	8.62	1.97	8.62	Solid/Gas		0.097 mg/dscf @ 15% O2 and 1 atm & 68 F								
								PM_{10}	1.97	8.62	1.97	8.62	Solid/Gas		0.097 mg/dscf @ 15% O2 and 1 atm & 68 F								
								$PM_{2.5}$	1.97	8.62	1.97	8.62	Solid/Gas		0.097 mg/dscf @ 15% O2 and 1 atm & 68 F								
								Lead	-	-	-	-	-		-								
								NH_3	2.03	8.88	2.03	8.88	Gas		5 ppmvd @ 15% O2								
								Total HAPs	0.31	1.34	0.31	1.34	Gas		0.015 mg/dscf @ 15% O2 and 1 atm & 68 F								
113-PKG-2021-STK	Upward Vertical Stack	113-PKG-2021	CCGT 2021	3C, 4C	3C - SCR 4C - CO Oxidation Catalyst	C	C	NO_X	27.4	120.05	2.74	13.04	Gas	EE	2.5 ppmvd @ 15% O2	8	200	196410	65.12	636	120	4308.006	404.623
								CO	6.7	29.9	0.67	3.71	Gas		1 ppmvd@ 15% O2								
								SO_2	0.48	2.10	0.48	2.10	Gas		0.314 ppmvd @ 15% O2								
								VOC	0.63	2.74	0.63	2.74	Gas		0.031 mg/dscf @ 15% O2 and 1 atm & 68 F								
								PM	1.97	8.62	1.97	8.62	Solid/Gas		0.097 mg/dscf @ 15% O2 and 1 atm & 68 F								
								PM_{10}	1.97	8.62	1.97	8.62	Solid/Gas		0.097 mg/dscf @ 15% O2 and 1 atm & 68 F								
								$PM_{2.5}$	1.97	8.62	1.97	8.62	Solid/Gas		0.097 mg/dscf @ 15% O2 and 1 atm & 68 F								
								Lead	-	-	-	-	-		-								
								NH_3	2.03	8.88	2.03	8.88	Gas		5 ppmvd @ 15% O2								
								Total HAPs	0.31	1.34	0.31	1.34	Gas		0.015 mg/dscf @ 15% O2 and 1 atm & 68 F								

MGSH2-1 - H2 Plant
Attachment J - Emission Points Data Summary Sheet

Emission Point ID	Emission Point Type [1]	Emission Units Vented Through this Point		Air Pollution Control Device		Vent Time for Emission Unit (chemical processes only)		Pollutant Chemical Name/CAS (See Emission Calculations for Speciate VOCs & HAPs) [3]	Maximum Uncontrolled Emissions [4]		Maximum Controlled Emissions [5]		Emission Form or Phase (At Exit Condition)	Est. Method Used [6]	Emission Concentration [7]	Inner Diameter	Exit Gas Temp.	Exit Gas Volumetric Flow [8]	Exit Gas Velocity	Ground Level (Height above Mean Sea Level)	Stack Height above Ground Level [9]	UTM Northing	UTM Easting
		Emission Unit ID	Emission Unit Description	Control Device ID	Control Device Type	Short Term [2]	Max (hr/yr)		lb/hr	tpy	lb/hr	tpy			(ppmv or mg/m^3)	(ft)	(°F)	(ACFM)	(fps)		(ft)	(km)	(km)
111-H-2001-STK	Upward Vertical Stack	111-H-2001	Fired Heater	5C	5C - SCR	C	C	NO_X	14.4	66.71	1.44	10.73	Gas	EE	15 mg/Nm^3 @ 3% O_2, dry	6	248	107845	63.57	636	TBD	4308.019	404.748
								CO	4.78	208.91	4.78	22.25	Gas		50 mg/Nm^3 @ 3% O_2, dry								
								SO_2	0.01	0.03	0.01	0.03	Gas		0.037 ppmvd @ 3% O_2 (0.105 mg/Nm^3@ 3% O_2, dry)								
								VOC	0.01	0.06	0.01	0.06	Gas		0.105 mg/Nm3 @ 3% O2, dry								
								PM	1.49	6.53	1.49	6.53	Solid/Gas		15.58 mg/Nm^3 @ 3% O_2, dry								
								PM_{10}	1.49	6.53	1.49	6.53	Solid/Gas		15.58 mg/Nm^3 @ 3% O_2, dry								
								$PM_{2.5}$	1.49	6.53	1.49	6.53	Solid/Gas		15.58 mg/Nm^3 @ 3% O_2, dry								
								Lead	< 0.01	< 0.01	< 0.01	< 0.01	Solid		< 0.085 mg/Nm^3 @ 3% O_2, dry								
								NH_3	0.36	1.59	0.36	1.59	Gas		5 ppmvd @ 3% O2								
								Total HAPs	0.37	0.01	0.37	0.01	Solid/Gas		3.14 mg/Nm^3 @ 3% O_2, dry								
119-PKG-9201-STK	Upward Vertic	119-PKG-9201	Auxiliary Boiler	N/A	N/A	C	C	NO_X	18.01	8.34	18.01	8.34	Gas	EE	143 mg/Nm^3 @ 3% O_2, dry	5	475	81330	69.04	636	199	4307.958	404.684
								CO	9.45	5.63	9.45	5.63	Gas		75 mg/Nm^3 @ 3% O_2, dry								
								SO_2	0.34	0.15	0.34	0.15	Gas		0.95 ppmvd @ 3% O_2								
								VOC	1.15	0.50	1.15	0.50	Gas		9.13 mg/Nm^3 @ 3% O_2, dry								
								PM	1.59	0.70	1.59	0.70	Solid/Gas		12.62 mg/Nm^3 @ 3% O_2, dry								
								PM_{10}	1.59	0.70	1.59	0.70	Solid/Gas		12.62 mg/Nm^3 @ 3% O_2, dry								
								$PM_{2.5}$	1.59	0.70	1.59	0.70	Solid/Gas		12.62 mg/Nm^3 @ 3% O_2, dry								
								Lead	< 0.01	< 0.01	< 0.01	< 0.01	Solid		< 0.079 mg/Nm^3 @ 3% O_2, dry								
								Total HAPs	0.40	0.18	0.40	0.18	Solid/Gas		3.14 mg/Nm^3 @ 3% O_2, dry								
119-CT-9301	Upward Vertical Stack	119-CT-9301	Cooling Tower	N/A	N/A	C	C	NO_X	-	-	-	-	-	-	-	30 [10]	100	1369180 [10]	32.28	636	56	4307.877	404.795
								CO	-	-	-	-	-	-	-								
								SO_2	-	-	-	-	-	-	-								
								VOC	-	-	-	-	-	-	-								
								PM	1.75	2.60	1.75	2.60	Solid	EE	0.0097 mg/acf								
								PM_{10}	1.28	2.17	1.28	2.17	Solid	EE	0.0071 mg/acf								
								$PM_{2.5}$	0.58	1.09	0.58	1.09	Solid	EE	0.0032 mg/acf								
								Lead	-	-	-	-	-	-	-								
								Total HAPs	-	-	-	-	-	-	-								

MGSH2-1 - H2 Plant
Attachment J - Emission Points Data Summary Sheet

Emission Point ID	Emission Point Type [1]	Emission Units Vented Through this Point		Air Pollution Control Device		Vent Time for Emission Unit (chemical processes only)		Pollutant Chemical Name/CAS (See Emission Calculations for Speciate VOCs & HAPs) [3]	Maximum Uncontrolled Emissions [4]		Maximum Controlled Emissions [5]		Emission Form or Phase (At Exit Condition)	Est. Method Used [6]	Emission Concentration [7]	Inner Diameter	Exit Gas Temp.	Exit Gas Volumetric Flow [8]	Exit Gas Velocity	Ground Level (Height above Mean Sea Level)	Stack Height above Ground Level [9]	UTM Northing	UTM Easting
		Emission Unit ID	Emission Unit Description	Control Device ID	Control Device Type	Short Term [2]	Max (hr/yr)		lb/hr	tpy	lb/hr	tpy			(ppmv or mg/m^3)	(ft)	(°F)	(ACFM)	(fps)		(ft)	(km)	(km)
119-PKG-0001	Upward Vertical Stack	119-PKG-0001	NG Startup Generator	N/A	N/A	20 min/week for readiness check; 30 min/startup.	100	NO_X	6.61	0.33	6.61	0.33	Gas	EE	NA	2.5	846	19297	65.52	636	30	4307.969	404.678
								CO	13.23	0.66	13.23	0.66	Gas		NA								
								SO_2	0.03	< 0.01	0.03	< 0.01	Gas		NA								
								VOC	5.67	0.28	5.67	0.28	Gas		NA								
								PM	0.20	0.01	0.20	0.01	Solid/Gas		NA								
								PM_{10}	0.20	0.01	0.20	0.01	Solid/Gas		NA								
								$PM_{2.5}$	0.20	0.01	0.20	0.01	Solid/Gas		NA								
								Lead	-	-	-	-	-		NA								
								Total HAPs	1.43	0.07	1.43	0.07	Gas		NA								
119-P-9402	Upward Vertical Stack	119-P-9402	Fire Water Diesel Engine Pump	N/A	N/A	20 min/week for readiness check	100	NO_X	3.95	0.2	3.95	0.2	Gas	EE	NA	1	909	3200	67.91	636	12	4307.822	404.863
								CO	3.45	0.17	3.45	0.17	Gas		NA								
								SO_2	0.01	< 0.01	0.01	< 0.01	Gas		NA								
								VOC	3.95	0.20	3.95	0.20	Gas		NA								
								PM	0.20	0.01	0.20	0.01	Solid/Gas		NA								
								PM_{10}	0.20	0.01	0.20	0.01	Solid/Gas		NA								
								$PM_{2.5}$	0.20	0.01	0.20	0.01	Solid/Gas		NA								
								Lead	-	-	-	-	-		NA								
								Total HAPs	0.02	< 0.01	0.02	< 0.01	Gas		NA								
119-FL-9501	Upward Vertical Stack	119-FL-9501	Startup and Shutdown Streams routed to Flare	N/A	N/A	Continuous pilot flame; Will be used to control startup and shutdown streams (12 hrs for startup and 12 hrs for shutdown)	C	NO_X	154.68	5.29	154.68	5.29	Gas	EE	NA	TBD	TBD	36,723 (max startup and shutdown flow)	TBD	636	150	4308.068	404.651
								CO	724.57	18.53	724.57	18.53	Gas		NA								
								SO_2	0.61	0.02	0.61	0.02	Gas		NA								
								VOC	21.22	0.27	21.22	0.27	Gas		NA								
								PM	16.95	0.58	16.95	0.58	Solid/Gas		NA								
								PM_{10}	16.95	0.58	16.95	0.58	Solid/Gas		NA								
								$PM_{2.5}$	16.95	0.58	16.95	0.58	Solid/Gas		NA								
								Lead	-	-	-	-	-		NA								
								Total HAPs	4.89	0.08	4.89	0.08	Gas		NA								
118-TK-9901	Upward Vertical Stack	118-TK-9901	Amine Makeup Tank	N/A	N/A	C	C	NO_X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
								CO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
								SO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
								VOC	< 0.01	< 0.01	< 0.01	< 0.01	Gas	EE	NA	0.0625	Ambient	6.684	36.31	636	48	4307.989	404.799
								PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
								PM_{10}	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
								$PM_{2.5}$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
								Lead	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
								Total HAPs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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).
The lb/hr in the table represents the maximum hourly emission rate under normal operating conditions; tpy in the table represents the maximum annual emissions, including emissions under normal operating conditions and emissions under startup, shutdown and maintenance conditions.

[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).

[8] Give at operating conditions. Include inerts.

[9] Release height of emissions above ground level.

[10] The cooling tower will have 6 cells. The diameter and volumetric exhaust flow rate are for each cell.

Note: Information labeled as "to be determined (TBD)" will be provided once specified equipment vendors have been selected.

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						
Unpaved Haul Roads						
Storage Pile Emissions						
Loading/Unloading Operations						
Wastewater Treatment Evaporation & Operations						
Equipment Leaks	VOC CO NH3	Does not apply	20.52 7.58 2.65	Does not apply	20.52 7.58 2.65	EE
General Clean-up VOC Emissions						
Other						

[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 Sheets (form for different types of emission units such as boiler (in direct heat exchanger), tanks, turbines, engines, general, etc.)

Attachment L
Emission Unit Data Sheet
(INDIRECT HEAT EXCHANGER)

Control Device ID No. (must match List Form): 119-PKG-9201

Equipment Information

1. Manufacturer: TBD	2. Model No. TBD Serial No. TBD
3. Number of units: 1	4. Use Generate steam for startup/shutdown of the ISBL H2 Plant. During normal operation, the steam will be used by the STG.
5. Rated Boiler Horsepower: 6373 hp	6. Boiler Serial No.: TBD
7. Date constructed:	8. Date of last modification and explain: NA
9. Maximum design heat input per unit: 213.31 $\times 10^6$ BTU/hr	10. Peak heat input per unit: 213.31 $\times 10^6$ BTU/hr
11. Steam produced at maximum design output: 159,400 LB/hr 625 psig	12. Projected Operating Schedule: Hours/Day 24 Days/Week 7 Weeks/Year 52
13. Type of firing equipment to be used: ☐ Pulverized coal ☐ Spreader stoker ☐ Oil burners ☒ Natural Gas Burner ☐ Others, specify	14. Proposed type of burners and orientation: ☐ Vertical ☐ Front Wall ☐ Opposed ☐ Tangential ☐ Others, specify
15. Type of draft: ☐ Forced ☐ Induced	16. Percent of ash retained in furnace: %
17. Will flyash be reinjected? ☐ Yes ☐ No	18. Percent of carbon in flyash: %

Stack or Vent Data

19. Inside diameter or dimensions: 5 ft.	20. Gas exit temperature: 475 °F
21. Height: 213 ft.	22. Stack serves: ☒ This equipment only ☐ Other equipment also (submit type and rating of all other equipment exhausted through this stack or vent)
23. Gas flow rate: 81330 ft^3/min	
24. Estimated percent of moisture: %	

Fuel Requirements

25.	Type	Fuel Oil No.	Natural Gas	Gas (other, specify)	Coal, Type:	Other:
	Quantity (at Design Output)	gph@60°F	202,959 ft^3/hr	ft^3/hr	TPH	
	Annually	$\times 10^3$ gal	202,959 $\times 10^6$ ft^3/hr	$\times 10^6$ ft^3/hr	tons	
	Sulfur	Maximum: wt. % Average: wt. %	0.59 gr/100 ft^3	gr/100 ft^3	Maximum: wt. %	
	Ash (%)				Maximum	
	BTU Content	BTU/Gal. Lbs/Gal.@60°F	1051 BTU/ft^3	BTU/ft^3	BTU/lb	
	Source		TBD			
	Supplier		TBD			
	Halogens (Yes/No)		No			
	List and Identify Metals		NA			

26. Gas burner mode of control:
☐ Manual ☐ Automatic hi-low
☐ Automatic full modulation ☐ Automatic on-off

27. Gas burner manufacture:

28. Oil burner manufacture:

29. If fuel oil is used, how is it atomized? ☐ Oil Pressure ☐ Steam Pressure ☐ Compressed Air ☐ Rotary Cup ☐ Other, specify

30. Fuel oil preheated: ☐ Yes ☐ No

31. If yes, indicate temperature: °F

32. Specify the calculated theoretical air requirements for combustion of the fuel or mixture of fuels described above actual cubic feet (ACF) per unit of fuel:
@ °F, PSIA, % moisture

33. Emission rate at rated capacity: lb/hr

34. Percent excess air actually required for combustion of the fuel described: %

Coal Characteristics

35. Seams:

36. Proximate analysis (dry basis): % of Fixed Carbon: % of Sulfur:
% of Moisture: % of Volatile Matter:
% of Ash:

Emissions Stream

37. What quantities of pollutants will be emitted from the boiler before controls?

Pollutant	Pounds per Hour lb/hr	grain/ACF	@ °F	PSIA
CO	9.45			
Hydrocarbons				
NO_x	18.01			
Pb	0.000105			
PM_{10}	1.59			
SO_2	0.34			
VOCs	1.15			
Other (specify)				

38. What quantities of pollutants will be emitted from the boiler after controls?

Pollutant	Pounds per Hour lb/hr	grain/ACF	@ °F	PSIA
CO				
Hydrocarbons				
NO_x				
Pb				
PM_{10}				
SO_2				
VOCs				
Other (specify)				

39. How will waste material from the process and control equipment be disposed of?

40. Have you completed an *Air Pollution Control Device Sheet(s)* for the control(s) used on this Emission Unit.

41. Have you included the ***air pollution rates*** on the Emissions Points Data Summary Sheet?

42. **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 PLAN: Please list (1) describe the process parameters and how they were chosen (2) the ranges and how they were established for monitoring to demonstrate compliance with the operation of this process equipment operation or air pollution control device.

Maintain fuel records as described in 60.49b(r); Install CEMS to monitor NOx emissions.

TESTING PLAN: Please describe any proposed emissions testing for this process equipment or air pollution control device.

In accordance with 40 CFR 60 Subpart Db, conduct performance test as required under 60.8.

RECORDKEEPING: Please describe the proposed recordkeeping that will accompany the monitoring.

Follow the recordkeeping requirements in 40 CFR 60 Subpart Db.

REPORTING: Please describe the proposed frequency of reporting of the recordkeeping.

Follow the reporting requirements in 40 CFR 60 Subpart Db.

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

TBD - The final design has not been completed. Operating ranges and maintenance procedures will be determined during the final design. The operating and maintenance procedures provided by the vendor will be followed.

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	2. Tank Name Amine Makeup Tank
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) 118-TK-9901	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 118-TK-9901
5. Date of Commencement of Construction (for existing tanks) n/a	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) n/a	
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). n/a	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): n/a	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. max 1,381,748 gal	
9A. Tank Internal Diameter (ft) 70	9B. Tank Internal Height (or Length) (ft) 48
10A. Maximum Liquid Height (ft) 38.4	10B. Average Liquid Height (ft) 19.2
11A. Maximum Vapor Space Height (ft) 47.73	11B. Average Vapor Space Height (ft) 29.53
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 1,105,398 gal	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
1,315,398	1714

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 1.19

15. Maximum tank fill rate (gal/min): 50

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

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)

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

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): 50

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

23. Operating Pressure Range (psig): -0.03 to 0.03

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. Huntington, WV	
28. Daily Average Ambient Temperature (°F)	55.75
29. Annual Average Maximum Temperature (°F)	65.3
30. Annual Average Minimum Temperature (°F)	46.2
31. Average Wind Speed (miles/hr)	5.6
32. Annual Average Solar Insulation Factor (BTU/(ft^2·day))	1250
33. Atmospheric Pressure (psia)	14.26

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

34. Average daily temperature range of bulk liquid: 0			
34A. Minimum (°F) 50		34B. Maximum (°F) 50	
35. Average operating pressure range of tank: 0.06			
35A. Minimum (psig) -0.03		35B. Maximum (psig) 0.03	
36A. Minimum Liquid Surface Temperature (°F) 50		36B. Corresponding Vapor Pressure (psia) 0.15	
37A. Average Liquid Surface Temperature (°F) 50		37B. Corresponding Vapor Pressure (psia) 0.15	
38A. Maximum Liquid Surface Temperature (°F) 50		38B. Corresponding Vapor Pressure (psia) 0.15	
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	MEA/MDEA		
39B. CAS Number	141-43-5/105-59-9		
39C. Liquid Density (lb/gal)	8.46		
39D. Liquid Molecular Weight (lb/lb-mole)	28.80		
39E. Vapor Molecular Weight (lb/lb-mole)	18.06		

Maximum Vapor Pressure 39F. True (psia) 39G. Reid (psia)	0.15 n/a		
Months Storage per Year 39H. From 39I. To	January to December		

VI. EMISSIONS AND CONTROL DEVICE DATA (required)

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

- ☐ Carbon Adsorption[1]
- ☐ Condenser[1]
- ☐ Conservation Vent (psig)

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

[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		Annual Loss (lb/yr)	Estimation Method[1]
		Amount	Units		
MEA/141-43-5	< 0.01	< 0.01	lb/hr	0.22	EPA
MDEA/105-59-9	< 0.01	< 0.01	lb/hr	0.04	EPA

[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*):

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

The H2 manufacturing process mainly includes feed preparation and purification, steam mehtane reforming (including an adiabatic pre-reformer and an autothermal reformer), CO conversion, process gas cooling, separation of CO2, H2 purification and production compression, combustion and convection (the fired heater), and medium-pressure steam generation. For details, please refer to section 2 of the application report.

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:

Natural gas and water

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

H2, with a production of 265 million standard cubic feet per day (MMSCFD).

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

Please refer to section 2 in the application report.
During normal operation, the process does not have point source emissions; during startup/shutdown, gases may be directed to flare 119-FL-9501. This scenario is addressed in the Flare Emissions Summary Unit Data Sheet.
The fired heater will burn process vent gas and natural gas, which will produce pollutants such as NOx, CO, SO2, VOC, and PM.

* 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:

For the fired heater under normal operation:
Process vent gas plus natural gas: 571,809 scf/hr
For the fired heater during startup/shutdown:
Natural gas: 193,224 scf/hr

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

See emission calculations for the fired heater in Attachment N of Appendix B. Detailed fuel composition is included in the calculations.

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

@ °F and psia.

(d) Percent excess air:

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

Fired heater: Gas burner, with a heat input capacity of 200 MMBtu/hr based on HHV.

(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:

n/a

(g) Proposed maximum design heat input: 200 $\times 10^6$ BTU/hr.

7. Projected operating schedule:

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

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

@ °F and psia

a.	NO_X	1.44	lb/hr	grains/ACF
b.	SO_2	0.01	lb/hr	grains/ACF
c.	CO	4.78	lb/hr	grains/ACF
d.	PM_{10}	1.49	lb/hr	grains/ACF
e.	Hydrocarbons		lb/hr	grains/ACF
f.	VOCs	0.01	lb/hr	grains/ACF
g.	Pb		lb/hr	grains/ACF
h.	Specify other(s)			
			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 opacity and visible emissions from the fired heater stack. Install fuel flow meter to monitor flow rate of the process vent gas and natural gas sent to the fired heater.	Maintain record of opacity and visible emissions. Maintain logs of fuel flow meters. Track and record SSM events.
REPORTING	**TESTING**
None proposed.	Complete NOx and CO stack testing within 180 days after startup. Results will be provided to the WV Division of Air Quality.

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

The final design has not been completed. Operating ranges and maintenance procedures will be determined during the final design. The operating and maintenance procedures provided by the vendor will be followed.

ATTACHMENT L – INTERNAL COMBUSTION ENGINE DATA SHEET

Complete this data sheet for each internal combustion engine at the facility. Include manufacturer performance data sheet(s) or any other supporting document if applicable. Use extra pages if necessary. *Generator(s) and microturbine generator(s) shall also use this form.*

Emission Unit ID#[1]	113-PKG-2011	113-PKG-2021	
Turbine Manufacturer/Model	TBD	TBD	
Manufacturers Rated bhp/rpm	105,868	105,868	
Source Status[2]	NS	NS	
Date Installed/ Modified/Removed/Relocated[3]	2025	2025	
Engine Manufactured /Reconstruction Date[4]	2025	2025	
Check all applicable Federal Rules for the engine (include EPA Certificate of Conformity if applicable)[5]	☐40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☐40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources	☐40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☐40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources	☐40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☐40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources
Engine Type[6]			
APCD Type[7]	SCR, OxCat	SCR, OxCat	
Fuel Type[8]	PQ	PQ	
H_2S (gr/100 scf)	0.25	0.25	
Operating bhp/rpm	105,868	105,868	
BSFC (BTU/bhp-hr)	5631.52	5631.52	
Hourly Fuel Throughput	283,635 ft^3/hr gal/hr	283,635 ft^3/hr gal/hr	ft^3/hr gal/hr
Annual Fuel Throughput (Must use 8,760 hrs/yr unless emergency generator)	2484.64 $MMft^3$/yr gal/yr	2484.64 $MMft^3$/yr gal/yr	$MMft^3$/yr gal/yr
Fuel Usage or Hours of Operation Metered	Yes ☒ No ☐	Yes ☒ No ☐	Yes ☐ No ☐

Calculation Methodology[9]	**Pollutant[10]**	**Hourly PTE (lb/hr)[11]**	**Annual PTE (tons/year)[11]**	**Hourly PTE (lb/hr)[11]**	**Annual PTE (tons/year)[11]**	**Hourly PTE (lb/hr)[11]**	**Annual PTE (tons/year)[11]**
MD	NO_x	2.74	13.04	2.74	13.04		
MD	CO	0.67	3.71	0.67	3.71		
AP	VOC	0.63	2.74	0.63	2.74		
OT	SO_2	0.48	2.10	0.48	2.10		
AP	PM_{10}	1.97	8.62	1.97	8.62		
AP	Formaldehyde	0.21	0.93	0.21	0.93		
AP	Total HAPs	0.31	1.34	0.31	1.34		
	GHG (CO_2e)						

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

2 Enter the Source Status using the following codes:

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

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

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

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

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

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

2SLB	Two Stroke Lean Burn	4SRB	Four Stroke Rich Burn
4SLB	Four Stroke Lean Burn		

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

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

8 Enter the Fuel Type using the following codes:

PQ	Pipeline Quality Natural Gas	RG	Raw Natural Gas /Production Gas	D	Diesel

9 Enter the Potential Emissions Data Reference designation using the following codes. Attach all reference data used.

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

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

11 PTE for engines shall be calculated from manufacturer's data unless unavailable.

ATTACHMENT L – INTERNAL COMBUSTION ENGINE DATA SHEET

Complete this data sheet for each internal combustion engine at the facility. Include manufacturer performance data sheet(s) or any other supporting document if applicable. Use extra pages if necessary. *Generator(s) and microturbine generator(s) shall also use this form.*

Emission Unit ID#[1]	119-PKG-0001	119-P-9402	
Engine Manufacturer/Model	TBD	TBD	
Manufacturers Rated bhp/rpm	3,000	600	
Source Status[2]	NS	NS	
Date Installed/ Modified/Removed/Relocated[3]	2025	2025	
Engine Manufactured /Reconstruction Date[4]	2025	2025	
Check all applicable Federal Rules for the engine (include EPA Certificate of Conformity if applicable)[5]	☒40CFR60 Subpart JJJJ ☒JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☐40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources	☐40CFR60 Subpart JJJJ ☐JJJJ Certified? ☒40CFR60 Subpart IIII ☒IIII Certified? ☐40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources	☐40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☐40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources
Engine Type[6]	4SLB		
APCD Type[7]			
Fuel Type[8]	PQ	D	
H_2S (gr/100 scf)	0.25		
Operating bhp/rpm	3000	600	
BSFC (BTU/bhp-hr)	6589	8084.64	
Hourly Fuel Throughput	18,808 ft^3/hr gal/hr	ft^3/hr 35.90 gal/hr	ft^3/hr gal/hr
Annual Fuel Throughput (Must use 8,760 hrs/yr unless emergency generator)	1.88 $MMft^3$/yr gal/yr	$MMft^3$/yr 3590 gal/yr	$MMft^3$/yr gal/yr
Fuel Usage or Hours of Operation Metered	Yes ☒ No ☐	Yes ☒ No ☐	Yes ☐ No ☐

Calculation Methodology[9]	**Pollutant[10]**	**Hourly PTE (lb/hr)[11]**	**Annual PTE (tons/year)[11]**	**Hourly PTE (lb/hr)[11]**	**Annual PTE (tons/year)[11]**	**Hourly PTE (lb/hr)[11]**	**Annual PTE (tons/year)[11]**
OT	NO_x	6.61	0.33	3.95	0.20		
OT	CO	13.23	0.66	3.45	0.17		
OT	VOC	5.67	0.28	3.95	0.20		
OT	SO_2	0.03	0.002	0.01	< 0.01		
OT	PM_{10}	0.20	0.01	0.20	0.01		
AP	Formaldehyde	1.04	0.05	0.006	0.0003		
AP	Total HAPs	1.43	0.07	0.02	0.001		
	GHG (CO_2e)						

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

2 Enter the Source Status using the following codes:

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

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

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

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

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

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

2SLB	Two Stroke Lean Burn	4SRB	Four Stroke Rich Burn
4SLB	Four Stroke Lean Burn		

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

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

8 Enter the Fuel Type using the following codes:

PQ	Pipeline Quality Natural Gas	RG	Raw Natural Gas /Production Gas	D	Diesel

9 Enter the Potential Emissions Data Reference designation using the following codes. Attach all reference data used.

MD	Manufacturer's Data	AP	AP-42	
GR	GRI-HAPCalc™	OT	Other 40 CFR 60 JJJJ / IIII	(please list)

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

11 PTE for engines shall be calculated from manufacturer's data unless unavailable.

Attachment M**: Air Pollution Control Device Sheets** (Flare, **SCR, CO Oxidation Catalyst,** etc.)

Attachment M
Air Pollution Control Device Sheet
(FLARE SYSTEM)

Control Device ID No. (must match Emission Units Table): 119-FL-9501

Equipment Information

1. Manufacturer: TBD

   Model No. TBD

2. Method: ☒ Elevated flare ☐ Ground flare ☐ Other
   Describe

3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.

4. Method of system used:
   ☐ Steam-assisted ☒ Air-assisted ☐ Pressure-assisted ☐ Non-assisted

5. Maximum capacity of flare:
   36,723 scf/min
   2,203,393 scf/hr

6. Dimensions of stack:
   Diameter ft.
   Height 150 ft.

7. Estimated combustion efficiency:
   (Waste gas destruction efficiency)
   Estimated: 99 %
   Minimum guaranteed: 99 %

8. Fuel used in burners:
   ☒ Natural Gas
   ☐ Fuel Oil, Number
   ☐ Other, Specify:

9. Number of burners:
   Rating: 2010000 BTU/hr

10. Will preheat be used? ☐ Yes ☒ No

11. Describe method of controlling flame:

12. Flare height: 150 ft

13. Flare tip inside diameter: ft

14. Natural gas flow rate to flare pilot flame per pilot light: 35.07 scf/min
    2104 scf/hr

15. Number of pilot lights:
    Total BTU/hr

16. Will automatic re-ignition be used?
    ☒ Yes ☐ No

17. If automatic re-ignition will be used, describe the method:

18. Is pilot flame equipped with a monitor? ☒ Yes ☐ No
    If yes, what type? ☒ Thermocouple ☐ Infra-Red
    ☐ Ultra Violet ☐ Camera with monitoring control room
    ☐ Other, Describe:

19. Hours of unit operation per year: 8,760

Steam Injection

20. Will steam injection be used? ☐ Yes ☒ No	21. Steam pressure PSIG Minimum Expected: Design Maximum:
22. Total Steam flow rate: LB/hr	23. Temperature: °F
24. Velocity ft/sec	25. Number of jet streams
26. Diameter of steam jets: in	27. Design basis for steam injected: LB steam/LB hydrocarbon
28. How will steam flow be controlled if steam injection is used?	

Characteristics of the Waste Gas Stream to be Burned

29.

Name	Quantity Grains of H_2S/100 ft^3	Quantity (LB/hr, ft^3/hr, etc)	Source of Material
Startup Streams		See Emission Calcs	
Shutdown Streams		See Emission Calcs	

30. Estimate total combustible to flare: 2,203,393 scf/hr LB/hr or ACF/hr (Maximum mass flow rate of waste gas) scfm	
31. Estimated total flow rate to flare including materials to be burned, carrier gases, auxiliary fuel, etc.: 2,203,393 scf/hr LB/hr or ACF/hr	
32. Give composition of carrier gases: n/a	
33. Temperature of emission stream: °F Heating value of emission stream: BTU/ft^3 Mean molecular weight of emission stream: MW = lb/lb-mole	34. Identify and describe all auxiliary fuels to be burned. 955 (LHV) BTU/scf BTU/scf BTU/scf BTU/scf
35. Temperature of flare gas: °F	36. Flare gas flow rate: scf/min
37. Flare gas heat content: BTU/ft^3	38. Flare gas exit velocity: scf/min
39. Maximum rate during emergency for one major piece of equipment or process unit: scf/min	
40. Maximum rate during emergency for one major piece of equipment or process unit: BTU/min	
41. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):	
42. Describe the collection material disposal system: There is no material disposal system for this flare.	
43. Have you included ***Flare Control Device*** in the Emissions Points Data Summary Sheet? Yes	

44. **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 opcacity by Method 9. Continuously monitor the presence of pilot flame by a thermocouple, infrared monitor, or ultraviolet monitor. Monitor the flow rate and calorific value of the gas stream to the flare.	Record the time, date, and duration of any loss of pilot flame
REPORTING: None proposed.	TESTING: None proposed.

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 or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

45. Manufacturer's Guaranteed Capture Efficiency for each air pollutant.

46. Manufacturer's Guaranteed Control Efficiency for each air pollutant.
99% for CO and 98% for VOCs

47. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.
The final design has not been completed. Operating ranges and maintenance procedures will be determined during the final design. The operating and maintenance procedures provided by the vendor will be followed.

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table):1C/2C for 113-PKG-2011, 3C/4C for 113-PKG-2021

Equipment Information

1. Manufacturer: TBD Model No.	2. Control Device Name: SCR (1C and 3C), OxyCat (2C and 4C) Type: SCR and Oxidation Catalyst
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected: 90% for SCR, 90% for CO	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: SCFM	10. Capacity:
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any.	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse of disposal.	

Gas Stream Characteristics

14. Are halogenated organics present?	☐ Yes	☒ No
Are particulates present?	☒ Yes	☐ No
Are metals present?	☐ Yes	☒ No

15. Inlet Emission stream parameters:	**Maximum**	**Typical**
Pressure (mmHg):		
Heat Content (BTU/scf):		
Oxygen Content (%):		
Moisture Content (%):		
Relative Humidity (%):		

16. Type of pollutant(s) controlled: ☐ SO_x ☐ Odor
☐ Particulate (type): ☒ Other NOx and CO

17. Inlet gas velocity: ft/sec

18. Pollutant specific gravity:

19. Gas flow into the collector:
ACF @ °F and PSIA

20. Gas stream temperature:
Inlet: °F
Outlet: °F

21. Gas flow rate:
Design Maximum: ACFM
Average Expected: ACFM

22. Particulate Grain Loading in grains/scf:
Inlet:
Outlet:

23. Emission rate of each pollutant (specify) into and out of collector: **emissions below are for one CCGT**

Pollutant	IN Pollutant		Emission Capture Efficiency %	OUT Pollutant		Control Efficiency %
	lb/hr	grains/acf		lb/hr	grains/acf	
A NOx			100	2.74		90%
B CO			100	0.67		90%
C						
D						
E						

24. Dimensions of stack: Height ft. Diameter ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

26. Complete the table:	Particle Size Distribution at Inlet to Collector	Fraction Efficiency of Collector
Particulate Size Range (microns)	**Weight % for Size Range**	**Weight % for Size Range**
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):

28. Describe the collection material disposal system:

29. Have you included ***Other Collectores Control Device*** in the Emissions Points Data Summary Sheet? Yes

30. **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: see section 4.3.6 in the report	RECORDKEEPING: see section 4.3.6 in the report
REPORTING: see section 4.3.6 in the report	TESTING: see section 4.3.6 in the report

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 or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

31. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.
The final design has not been completed. Operating ranges and maintenance procedures will be determined during the final design. The operating and maintenance procedures provided by the vendor will be followed.

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table):5C

Equipment Information

1. Manufacturer: TBD Model No.	2. Control Device Name: SCR Type: SCR
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected: 90% for SCR	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: SCFM	10. Capacity:
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any.	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse of disposal.	

Gas Stream Characteristics

14. Are halogenated organics present?	☐ Yes	☒ No
Are particulates present?	☒ Yes	☐ No
Are metals present?	☐ Yes	☒ No

15. Inlet Emission stream parameters:	**Maximum**	**Typical**
Pressure (mmHg):		
Heat Content (BTU/scf):		
Oxygen Content (%):		
Moisture Content (%):		
Relative Humidity (%):		

16. Type of pollutant(s) controlled: ☐ SO_x ☐ Odor
☐ Particulate (type): ☒ Other NOx

17. Inlet gas velocity: ft/sec

18. Pollutant specific gravity:

19. Gas flow into the collector:
ACF @ °F and PSIA

20. Gas stream temperature:
Inlet: °F
Outlet: °F

21. Gas flow rate:
Design Maximum: ACFM
Average Expected: ACFM

22. Particulate Grain Loading in grains/scf:
Inlet:
Outlet:

23. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	IN Pollutant		Emission Capture Efficiency %	OUT Pollutant		Control Efficiency %
	lb/hr	grains/acf		lb/hr	grains/acf	
A NOx			100	1.44		90%
B						
C						
D						
E						

24. Dimensions of stack: Height ft. Diameter ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

26. Complete the table:	Particle Size Distribution at Inlet to Collector	Fraction Efficiency of Collector
Particulate Size Range (microns)	Weight % for Size Range	Weight % for Size Range
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):

28. Describe the collection material disposal system:

29. Have you included ***Other Collectores Control Device*** in the Emissions Points Data Summary Sheet? Yes

30. **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: Complete NOx and CO stack testing within 180 days after startup.	RECORDKEEPING: Maintain logs of NOx and CO. Track and record SSM events.
REPORTING: Stack testing results will be provided to the WV Division of Air Quality.	TESTING: Stack testing of CO and NOx to be completed within 180 days after startup.

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 or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

31. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.
The final design has not been completed. Operating ranges and maintenance procedures will be determined during the final design. The operating and maintenance procedures provided by the vendor will be followed.

Attachment N**: Supporting Emission Calculations**

Fidelis New Energy
H2 Plant
July 2025
Facility PTE

Source	Annual Emissions (tpy)															
	NOx		CO		VOC		SO_2		$PM/PM_{10}/PM_{2.5}$		NH_3		Formaldehyde		Total HAPs	
	Max Hourly (lb/hr)	Annual (tons/yr)	Max Hourly (lb/hr)	Annual (tons/yr)	Max Hourly (lb/hr)	Annual (tons/yr)	Max Hourly (lb/hr)	Annual (tons/yr)	Max Hourly (lb/hr)	Annual (tons/yr)	Max Hourly (lb/hr)	Annual (tons/yr)	Max Hourly (lb/hr)	Annual (tons/yr)	Max Hourly (lb/hr)	Annual (tons/yr)
113-PKG-2021, 113-PKG-2021 Turbines	54.80	26.31	66.73	7.45	1.25	5.48	0.96	5.80	3.93	17.23	4.06	17.77	0.42	1.85	0.61	2.68
111-H-2001 Fired Heater	177.12	10.79	59.04	22.25	1.08	0.06	0.32	0.03	1.49	6.53	<0.01	1.58	0.36	<0.01	0.37	0.02
119-PKG-9201 Auxiliary Boiler	20.78	8.34	62.97	5.63	1.15	0.50	0.34	0.15	1.60	0.69	-	-	<0.01	<0.01	0.04	0.17
119-CT-9301 Cooling Tower	-	-	-	-	-	-	-	-	0.59	2.60	-	-	-	-	-	-
119-PKG-0001 Startup Generator	6.61	0.33	13.23	0.66	5.67	0.28	0.02	<0.01	0.20	<0.01	-	-	1.04	0.05	1.45	0.07
119-P-9402 Fire Water Diesel Engine Pump	3.07	0.15	3.33	0.17	0.11	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.01	<0.01	0.02	<0.01
119-FL-9501 Flare	154.68	2.98	835.45	16.97	21.22	0.27	0.61	0.02	16.95	0.33	-	-	<0.01	<0.01	4.89	0.08
H2-FUG Equipment Leaks	-	-	1.73	7.58	5.37	23.54	-	-	-	-	0.60	2.65	-	-	-	-
118-TK-9901 Amine Makeup Tank	-	-	-	-	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-
Proposed PTE[1]	417.07	48.90	1,042.47	60.70	35.87	30.13	2.25	6.00	24.77	27.40	4.66	21.99	1.84	1.92	7.38	3.02

Notes:
1. Formaldehyde is the single HAP with the highest emissions.

Fidelis New Energy
H2 Plant
July 2025
Facility HAPs PTE

Source	Total HAPs		Methanol		Formaldehyde		Hexane		Benzene		Toluene		Ethylbenzene		Xylene		2,2,4-Trimethylpentane		Acetaldehyde		Acrolein		1,3-Butadiene	
	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
113-PKG-2021, 113-PKG-2021 Turbines	0.61	2.68	-	-	0.42	1.85	-	-	<0.01	0.03	0.08	0.34	0.02	0.08	0.04	0.17	-	-	0.02	0.10	<0.01	0.02	<0.01	<0.01
111-H-2001 Fired Heater	0.37	0.02	-	-	0.36	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	-	-
119-PKG-9201 Auxiliary Boiler	0.04	0.17	-	-	<0.01	<0.01	-	-	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	-	-
119-CT-9301 Cooling Tower	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
119-PKG-0001 Startup Generator	1.45	0.07	0.05	<0.01	1.04	0.05	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.17	<0.01	0.10	<0.01	<0.01	<0.01
119-P-9402 Fire Water Diesel Engine Pump	0.02	<0.01	-	-	<0.01	<0.01	-	-	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
119-FL-9501 Flare	4.89	0.08	-	-	<0.01	<0.01	-	-	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	-	-
H2-FUG Equipment Leaks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
118-TK-9901 Amine Makeup Tank	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Proposed PTE[1]	7.38	3.02	0.05	<0.01	1.84	1.92	0.02	0.01	0.02	0.03	0.09	0.34	0.02	0.08	0.04	0.17	<0.01	<0.01	0.19	0.11	0.11	0.02	<0.01	<0.01

Notes:

List of Tables in Attachment N - Emission Calculations

Fidelis
H2 Plant
July 2025
113-PKG-2011 and 113-PKG-2021 Turbines
Table N-1

Normal Operating Hours	8,676	
SCR Maintenance Hours	36	
Startup Hours	48	
Manufacturer	TBD	
Model	TBD	
Power	26,467	hp
Brake Specific Fuel Consumpt	5,632	Btu/bhp-hr
Total Heat Input	298.10	MMBtu/hr
Natural Gas Heat Content	1,035.1	Btu/scf
Fuel Throughput	288,001.00	scf/hr
	2498.70	MMscf/yr
Quantity	2	

113-PKG-2011 and 113-PKG-2021 Turbines

Emissions for All Operating Modes for One Unit			Emissions for Two Units	
Pollutant	**Max lb/hr**	**tpy**	**Max lb/hr**	**tpy**
NO_x	27.40	13.15	54.80	26.31
CO	33.36	3.72	66.73	7.45
SO_2	0.48	2.90	0.96	5.80
VOC	0.63	2.74	1.25	5.48
PM/PM10/PM2.5	1.97	8.62	3.93	17.23
NH3	2.03	8.88	4.06	17.77
1,3-Butadiene	<0.01	<0.01	<0.01	<0.01
Acetaldehyde	0.01	0.05	0.02	0.10
Acrolein	<0.01	<0.01	<0.01	0.02
Benzene	<0.01	0.02	<0.01	0.03
Ethylbenzene	<0.01	0.04	0.02	0.08
Formaldehyde	0.21	0.93	0.42	1.85
Naphthalene	<0.01	<0.01	<0.01	<0.01
PAH	<0.01	<0.01	<0.01	<0.01
Propylene Oxide	<0.01	0.04	0.02	0.08
Toluene	0.04	0.17	0.08	0.34
Xylenes	0.02	0.08	0.04	0.17
Total HAPs	0.31	1.34	0.61	2.68

SCR Maintenance Operations

Pollutant	Emission Factor	Emission Factor Units	EF Basis	Total Heat Input (MMBtu/h)	Annual Operating Hours	Max. Hourly Emissions (lb/hr)	Max. Annual Emissions (tpy)
Nox	9.19E-02	lb/MMBtu	25 ppmvd in stack @ 15% O2	298	36	27.40	0.49

Startup Operations

Pollutant	Emission Factor	Emission Factor Units	Calculation Basis	Total Heat Input (MMBtu/h)	Annual Operating Hours	Max. Hourly Emissions (lb/hr)	Max. Annual Emissions (tpy)
NOx	9.19E-02	lb/MMBtu	25 ppmvd in stack @ 15% O2	298	48	27.40	0.66
CO	1.12E-01	lb/MMBtu	50 ppmvd in stack @ 15% O2	298	48	33.36	0.80

Normal Operations

Pollutant	Emission Factor	Emission Factor Units	Calculation Basis	Total Heat Input (MMBtu/h)	Annual Operating Hours	Max. Hourly Emissions (lb/hr)	Max. Annual Emissions (tpy)
NO_x	9.19E-03	lb/MMBtu	2.5 ppmvd in stack @ 15% O2	298	8,760	2.74	12.00
CO	2.24E-03	lb/MMBtu	1.0 ppmvd in stack @ 15% O2	298	8,760	0.67	2.92
SO_2	1.61E-03	lb/MMBtu	10 ppmvd in stack @ 15% O2	298	8,760	0.48	2.10
VOC	2.10E-03	lb/MMBtu	AP-42 Table 3.1-2a	298	8,760	0.63	2.74
PM/PM10/PM2.5	6.60E-03	lb/MMBtu	AP-42 Table 3.1-2a	298	8,760	1.97	8.62
NH3	6.80E-03	lb/MMBtu	5 ppmvd in stack @ 15% O2	298	8,760	2.03	8.88
1,3-Butadiene	4.30E-07	lb/MMBtu	AP-42 Table 3.1-3	298	8,760	<0.01	<0.01
Acetaldehyde	4.00E-05	lb/MMBtu	AP-42 Table 3.1-3	298	8,760	0.01	0.05
Acrolein	6.40E-06	lb/MMBtu	AP-42 Table 3.1-3	298	8,760	<0.01	<0.01
Benzene	1.20E-05	lb/MMBtu	AP-42 Table 3.1-3	298	8,760	<0.01	0.02
Ethylbenzene	3.20E-05	lb/MMBtu	AP-42 Table 3.1-3	298	8,760	<0.01	0.04
Formaldehyde	7.10E-04	lb/MMBtu	AP-42 Table 3.1-3	298	8,760	0.21	0.93
Naphthalene	1.30E-06	lb/MMBtu	AP-42 Table 3.1-3	298	8,760	<0.01	<0.01
PAH	2.20E-06	lb/MMBtu	AP-42 Table 3.1-3	298	8,760	<0.01	<0.01
Propylene Oxide	2.90E-05	lb/MMBtu	AP-42 Table 3.1-3	298	8,760	<0.01	0.04
Toluene	1.30E-04	lb/MMBtu	AP-42 Table 3.1-3	298	8,760	0.04	0.17
Xylenes	6.40E-05	lb/MMBtu	AP-42 Table 3.1-3	298	8,760	0.02	0.08
Total HAPs						0.31	1.34

$$E = C_d F_d \frac{20.9}{(20.9 - \%O_{2d})} \qquad \text{Eq. 19-1}$$

Notes:

1. Emission Factors for NOx, CO, SO_2, & NH_3 calculated based on Method 19 Equation 19-1 in Appendix A-7 to 40 CFR 60, shown above
2. NOx emissions will be controlled by LNB and SCR to achieve 90% control efficiency during normal operations
3. CO emission will be controlled by CO catalyst with a control efficiency of 90%.
4. Assumed 36 hours for SCR Maintenance
5. Assumed 48 hours for Startup
6. Conservatively assumed 8,760 hours for Normal Operations
7. A gas analysis from a representative facility was used to provide the natural gas heat content for these PTE calculations. See Gas Analysis for further breakdown of the natural gas composition.
8. Max Hourly Emissions = Average Hourly Emissions =Emission Factor (lb/MMBtu) *Max Heat Input Capacity (MMBtu/hr)
9. Maximum Potential Annual Emission Rate (tpy) = Hourly Emissions (lb/hr) * Annual Hours (hr/yr) * (1 ton/2000 lb).
10. SO_2 emissions are based on the sulfur content in the fuel.
11. The emission factors for VOC and particulate matter in the table are based on AP-42 Table 3.1-2a.
12. HAPs emissions are quantified using the emissions factors in Table 3.1-3 of AP-42.

Fidelis
H2 Plant
July 2025
111-H-2001 Fired Heater
Table N-2

Manufacturer	TBD
Model	TBD
Normal Operating Hours	8,676
SCR Maintenance Hours	36
Startup Hours	48
Quantity	1

Quality	Natural Gas	Hydrogen Gas	Units
Total Heat Input	200	200	MMBtu/hr
Operating Hours	48	8,712	hours
Gas Heat Content	1,035.1	349.8	Btu/scf
Fuel Throughput	193,224.43	571,808.96	scf/hr
	9.27	4981.60	MMscf/yr

111-H-2001 Fired Heater

Emissions for All Operating Modes for One Unit

Pollutant	Max lb/hr	tpy
NO_x	177.12	10.79
CO	59.04	22.25
SO_2	0.32	0.03
VOC	1.08	0.06
PM/PM10/PM2.5	1.49	6.53
NH_3	<0.01	1.58
Formaldehyde	0.36	<0.01
Total HAPs	0.37	0.02

SCR Maintenance Operations, Process Vent Gas[1,3]

Pollutant	Emission Factor	Emission Factor Units	Calculation Basis	Total Heat Input (MMBtu/h)	Annual Operating Hours	Max. Hourly Emissions (lb/hr)	Max. Annual Emissions (tpy)
NO_x[1]	7.18E-02	lb/MMBtu	Vendor data	200	36	14.35	0.26
CO[1]	2.39E-02	lb/MMBtu	Vendor data	200	36	4.78	0.09
SO_2	2.94E-05	lb/MMBtu	0.06 ppmv total S in fuel	200	36	<0.01	<0.01
VOC[8]	3.34E-05	lb/MMBtu	0.62% of AP-42 Factor	200	36	<0.01	<0.01
PM/PM10/PM2.5	7.45E-03	lb/MMBtu	AP-42 Table 1.4-2	200	36	1.49	0.03
NH_3	0.00E+00	lb/MMBtu	0.0 ppmvd in stack @ 3% O_2	200	36	<0.01	<0.01
Total HAPs[8]	1.15E-05	lb/MMBtu	0.62% of AP-42 Factor	200	36	<0.01	<0.01

Startup Operations, Natural Gas[1,2]

Pollutant	Emission Factor	Emission Factor Units	Calculation Basis	Total Heat Input (MMBtu/h)	Annual Operating Hours	Max. Hourly Emissions (lb/hr)	Max. Annual Emissions (tpy)
NO_x[1]	8.86E-01	lb/MMBtu	Vendor data	200	48	177.12	4.25
CO[1]	2.95E-01	lb/MMBtu	Vendor data	200	48	59.04	1.42
SO_2	1.61E-03	lb/MMBtu	10 ppmvd total S in fuel	200	48	0.32	<0.01
VOC[8]	5.39E-03	lb/MMBtu	AP-42 Table 1.4-2	200	48	1.08	0.03
PM/PM10/PM2.5	7.45E-03	lb/MMBtu	AP-42 Table 1.4-2	200	48	1.49	0.04
NH_3	0.00E+00	lb/MMBtu	0 ppmvd in stack @ 3% O2	200	48	<0.01	<0.01
Total HAPs	1.85E-03	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	200	48	0.37	<0.01

Normal Operations, Process Vent Gas[1,3]

Pollutant	Emission Factor	Emission Factor Units	Calculation Basis	Total Heat Input (MMBtu/h)	Annual Operating Hours	Max. Hourly Emissions (lb/hr)	Max. Annual Emissions (tpy)
NO_x	7.18E-03	lb/MMBtu	Vendor Data	200	8,760	1.44	6.29
CO	2.39E-02	lb/MMBtu	Vendor Data	200	8,676	4.78	20.75
SO_2	2.94E-05	lb/MMBtu	0.6 ppmvd in stack @ 15% O2	200	8,676	<0.01	0.03
VOC	3.34E-05	lb/MMBtu	0.62% of AP-42 Factor	200	8,676	<0.01	0.03
PM/PM10/PM2.5	7.45E-03	lb/MMBtu	AP-42 Table 1.4-2	200	8,676	1.49	6.46
NH_3	1.82E-03	lb/MMBtu	0 ppmvd in stack @ 15% O2	200	8,676	0.36	1.58
2-Methylnaphthalene	1.46E-10	lb/MMBtu	AP-42 Table 1.4-3	200	8,676	<0.01	<0.01
3-Methylchloranthrene	1.09E-11	lb/MMBtu	AP-42 Table 1.4-3	200	8,676	<0.01	<0.01
7,12-Dimethylbenz(a)anthracene	9.73E-11	lb/MMBtu	AP-42 Table 1.4-3	200	8,676	<0.01	<0.01
Acenaphthene	1.09E-11	lb/MMBtu	AP-42 Table 1.4-3	200	8,676	<0.01	<0.01
Anthracene	1.46E-11	lb/MMBtu	AP-42 Table 1.4-3	200	8,676	<0.01	<0.01
Benzo(a)anthracene	1.09E-11	lb/MMBtu	AP-42 Table 1.4-3	200	8,676	<0.01	<0.01
Benzene	1.28E-08	lb/MMBtu	AP-42 Table 1.4-3	200	8,676	<0.01	<0.01
Benzo(a)pyrene	7.29E-12	lb/MMBtu	AP-42 Table 1.4-3	200	8,676	<0.01	<0.01
Benzo(b)fluoranthene	1.09E-11	lb/MMBtu	AP-42 Table 1.4-3	200	8,676	<0.01	<0.01
Benzo(g,h,i)perylene	7.29E-12	lb/MMBtu	AP-42 Table 1.4-3	200	8,676	<0.01	<0.01
Benzo(k)fluoranthene	1.09E-11	lb/MMBtu	AP-42 Table 1.4-3	200	8,676	<0.01	<0.01
Chrysene	1.09E-11	lb/MMBtu	AP-42 Table 1.4-3	200	8,676	<0.01	<0.01
Dibenzo(a,h)anthracene	7.29E-12	lb/MMBtu	AP-42 Table 1.4-3	200	8,676	<0.01	<0.01
Dichlorobenzene	7.29E-09	lb/MMBtu	AP-42 Table 1.4-3	200	8,676	<0.01	<0.01
Fluoranthene	1.82E-11	lb/MMBtu	AP-42 Table 1.4-3	200	8,676	<0.01	<0.01
Fluorene	1.70E-11	lb/MMBtu	AP-42 Table 1.4-3	200	8,676	<0.01	<0.01
Formaldehyde	4.56E-07	lb/MMBtu	AP-42 Table 1.4-3	200	8,676	<0.01	<0.01
Hexane	1.09E-05	lb/MMBtu	AP-42 Table 1.4-3	200	8,676	<0.01	<0.01
Indeno(1,2,3-cd)pyrene	1.09E-11	lb/MMBtu	AP-42 Table 1.4-3	200	8,676	<0.01	<0.01
Naphthalene	3.71E-09	lb/MMBtu	AP-42 Table 1.4-3	200	8,676	<0.01	<0.01
Phenanthrene	1.03E-10	lb/MMBtu	AP-42 Table 1.4-3	200	8,676	<0.01	<0.01
Pyrene	3.04E-11	lb/MMBtu	AP-42 Table 1.4-5	200	8,676	<0.01	<0.01
Toluene	2.07E-08	lb/MMBtu	AP-42 Table 1.4-6	200	8,676	<0.01	<0.01
Lead	3.04E-09	lb/MMBtu	AP-42 Table 1.4-7	200	8,676	<0.01	<0.01
Arsenic	1.22E-09	lb/MMBtu	AP-42 Table 1.4-8	200	8,676	<0.01	<0.01
Beryllium	7.29E-11	lb/MMBtu	AP-42 Table 1.4-3	200	8,676	<0.01	<0.01
Cadmium	6.69E-09	lb/MMBtu	AP-42 Table 1.4-3	200	8,676	<0.01	<0.01
Chromium	8.51E-09	lb/MMBtu	AP-42 Table 1.4-3	200	8,676	<0.01	<0.01
Cobalt	5.11E-10	lb/MMBtu	AP-42 Table 1.4-3	200	8,676	<0.01	<0.01
Manganese	2.31E-09	lb/MMBtu	AP-42 Table 1.4-3	200	8,676	<0.01	<0.01
Mercury	1.58E-09	lb/MMBtu	AP-42 Table 1.4-3	200	8,676	<0.01	<0.01
Nickel	1.28E-08	lb/MMBtu	AP-42 Table 1.4-3	200	8,676	<0.01	<0.01
Selenium	1.46E-10	lb/MMBtu	AP-42 Table 1.4-3	200	8,676	<0.01	<0.01
Total HAPs	1.15E-05	lb/MMBtu				<0.01	<0.01

$$E = C_d F_d \frac{20.9}{(20.9 - \%O_{2d})} \qquad \text{Eq. 19-1}$$

Notes:

1. The heater will use two fuel compositions: natural gas during startup or fuel gas with 0.62% natural gas and 99.38% process vent gas during normal operation and SCR maintenance
2. Emission Factors for NOx and CO are from supplied vendor data
3. NOx emission will be controlled by LNB and SCR during normal operation to achieve 90% control efficiency.
4. Startup NOx emission factor is conservatively assumed to be 10 times of vendor provided NOX emission factor for normal operation without SCR control.
5. Startup CO emission factor during startup is conservatively assumed to 10 times of the CO emission factor for normal operation provided by the vendor.
3. Emission Factors for SO_2 & NH_3 calculated based on Method 19 Equation 19-1 in Appendix A-7 to 40 CFR 60, shown above
4. The emission factors for VOC and HAPS during normal operations are 0.62% of the EF in AP-42 Table 1.4-2 as NG only accounts for 0.62% of the total fuel stream and the process vent gas does not contain any VOCs.
5.Assumed 36 hours for SCR Maintenance
6. Assumed 48 hours for Startup
7. Max Hourly Emissions = Average Hourly Emissions =Emission Factor (lb/MMBtu) *Max Heat Input Capacity (MMBtu/hr)
8. Maximum Potential Annual Emission Rate (tpy) = Hourly Emissions (lb/hr) * Annual Hours (hr/yr) * (1 ton/2000 lb).

Fidelis
H2 Plant
July 2025
119-PKG-9201 Auxiliary Boiler
Table N-3

Manufacturer	TBD	
Model	TBD	
Max Heat Input	213.31	MMBtu/hr
Average Heat Input	21.33	
Natural Gas Heat Content	1,035.1	Btu/scf
Fuel Throughput	206,086.36	scf/hr
	1805.32	MMscf/yr
Startup Hours	48	
Normal Operating Hours	8712	

119-PKG-9201 Boiler

Emissions for All Operating Modes for One Unit

Pollutant	lb/hr	tpy
NO_x	20.78	8.34
CO	62.97	5.63
SO_2	0.34	0.15
VOC	1.15	0.50
PM/PM10/PM2.5	1.60	0.69
Formaldehyde	<0.01	<0.01
Total HAPs	0.04	0.17

Startup Operations

Pollutant	Emission Factor	Emission Factor Units	Calculation Basis	Total Heat Input (MMBtu/h)	Annual Operating Hours	Max. Hourly Emissions (lb/hr)	Max. Annual Emissions (tpy)
NOx	9.74E-02	lb/MMBtu	165 mg/Nm3 @ 3% O2, dry	213	48	20.78	0.50
CO	2.95E-01	lb/MMBtu	500 mg/Nm3 @ 3% O2, dry	213	48	62.97	1.51
SO_2	0.0016	lb/MMBtu	10 ppmvd total S in fuel	213	48	0.34	<0.01
VOC	0.0054	lb/MMBtu	AP-42 Table 1.4-2	213	48	1.15	0.03
PM/PM10/PM2.5	0.0075	lb/MMBtu	AP-42 Table 1.4-2	213	48	1.60	0.04

Normal Operations

Pollutant	Emission Factor	Emission Factor Units	Calculation Basis	Total Heat Input (MMBtu/h)	Annual Operating Hours	Max. Hourly Emissions (lb/hr)	Max. Annual Emissions (tpy)
NO_x	8.44E-02	lb/MMBtu	143 mg/Nm3 @ 3% O2, dry	21	8,712	1.80	7.84
CO	4.43E-02	lb/MMBtu	75 mg/Nm3 @ 3% O2, dry	21	8,712	0.94	4.11
SO_2	1.61E-03	lb/MMBtu	10 ppmvd in stack @ 15% O2	21	8,712	0.03	0.15
VOC	5.39E-03	lb/MMBtu	AP-42 Table 1.4-2	21	8,712	0.12	0.50
PM/PM10/PM2.5	7.45E-03	lb/MMBtu	AP-42 Table 1.4-2	21	8,712	0.16	0.69
2-Methylnaphthalene	2.35E-08	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
3-Methylchloranthrene	1.76E-09	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
7,12-Dimethylbenz(a)anthracene	1.57E-08	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Acenaphthene	1.76E-09	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Anthracene	2.35E-09	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Benzo(a)anthracene	1.76E-09	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Benzene	2.06E-06	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Benzo(a)pyrene	1.18E-09	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Benzo(b)fluoranthene	1.76E-09	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Benzo(g,h,i)perylene	1.18E-09	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Benzo(k)fluoranthene	1.76E-09	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Chrysene	1.76E-09	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Dibenzo(a,h)anthracene	1.18E-09	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Dichlorobenzene	1.18E-06	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Fluoranthene	2.94E-09	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Fluorene	2.75E-09	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Formaldehyde	7.35E-05	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Hexane	1.76E-03	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	0.04	0.16
Indeno(1,2,3-cd)pyrene	1.76E-09	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Naphthalene	5.98E-07	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Phenanthrene	1.67E-08	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Pyrene	4.90E-09	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Toluene	3.33E-06	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Lead	4.90E-07	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Arsenic	1.96E-07	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Beryllium	1.18E-08	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Cadmium	1.08E-06	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Chromium	1.37E-06	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Cobalt	8.24E-08	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Manganese	3.73E-07	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Mercury	2.55E-07	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Nickel	2.06E-06	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Selenium	2.35E-08	lb/MMBtu	AP-42 Table 1.4-3, 1.4-4	21	8,712	<0.01	<0.01
Total HAPs	1.85E-03					0.04	0.17

Notes:

1. NOx, CO, SO_2 & NH_3 emissions are calculated based on Method 19 Equation 19-1 in Appendix A-7 to 40 CFR 60
2. Average fuel input is used for normal operating conditions. Average fuel input is estimated to be 10% of max fuel input, as the unit operated on standby mode during normal operations
3. Assumed 48 hours for Startup
4. A gas analysis from a representative facility was used to provide the natural gas heat content for these PTE calculations. See Gas Analysis for further breakdown of the natural gas composition.
5. Max Hourly Emissions = Average Hourly Emissions =Emission Factor (lb/MMBtu) *Max Heat Input Capacity (MMBtu/hr)
6. Maximum Potential Annual Emission Rate (tpy) = Hourly Emissions (lb/hr) * Annual Hours (hr/yr) * (1 ton/2000 lb).
7. SO_2 emissions are based on the sulfur content in the fuel.
8. The emission factors for VOC and particulate matter in the table are based on AP-42 Table 1.4-2.
9. HAPs emissions are quantified using the emissions factors in AP-42 Tables 1.4-3 and 1.4-4

Cooling Tower

One open recirculating, induced draft and counterflow cooling tower will be installed to support the facility's operation. The cooling tower will have 6 cells.

Table N-4 Emission Calculation for Cooling Tower

		Cooling Tower	Notes
	Emission Unit ID	119-CT-9301	
	EPN	119-CT-9301	
Input	Recirculation Rate (gpm)	69,801	Rated capacity, Design Info
	Drift (%)[2]	0.001	Design Info
	Maximum TDS (ppm)	5000	
	Annual Average TDS (ppm)	1700	
	Annual operating hours	8760	
Calculated Emissions	Avg. PM (lb/hr)	0.59	
	Max. PM (lb/hr)	1.75	
	PM (tpy)	2.60	
	Avg. PM10 (lb/hr)	0.50	
	Max. PM10 (lb/hr)	1.28	
	PM10 (tpy)	2.17	
	Avg. PM2.5 (lb/hr)	0.25	
	Max. PM2.5 (lb/hr)	0.58	
	PM2.5 (tpy)	1.09	

Cooling Tower Water Info:

concentration ratio:	5		Design Info
TDS (average) make up water:	340	ppmw	Design Info
TDS (maximum) make up water:	1,000	ppmw	
Maximum TDS:	5,000	ppmw	
Annual Average TDS:	1700	ppmw	

Recirculation Rate:	15,891	m3/hr
Water density:	8.34	lb/gal
	997	kg/m3
1 lb =	453.59	grams
1 hr =	60	min
1 kg =	1000	grams

Equation: PM = Recirculation Rate, gpm * Drift% * 8.34 lb/gal * 60 min/hr * TDS ppm/1000000 Reference (1)

Particle Size Calculation (Hourly Max.)[3]

Cooling Tower Droplet Size			Particle Size		
Droplet (Dd, microns)	**Mean (Dd, microns)**	**Distribution (% Mass Smaller Than)**	**(Dp, microns)**	**PM 10 %Mass**	**PM2.5 %Mass**
< 15	7.5	20.00	0.986		33.16
15 - 35	25	40.00	3.287		
35 - 65	50	60.00	6.574	73.03	
65 - 115	90	80.00	11.833		
115 - 170	142.5	90.00	18.735		
170 - 230	200	95.00	26.295		
230 - 275	252.5	99.00	33.198		
275 - 525	400	99.80	52.591		
> 525	525	100.00	69.025		

Particle Size Calculation (Annual Emis.)[3]

Cooling Tower Droplet Size			Particle Size		
Droplet (Dd, microns)	**Mean (Dd, microns)**	**Distribution (% Mass Smaller Than)**	**(Dp, microns)**	**PM 10 %Mass**	**PM2.5 %Mass**
< 15	7.5	20.00	0.688		
15 - 35	25	40.00	2.294		41.79
35 - 65	50	60.00	4.588		
65 - 115	90	80.00	8.259	83.61	
115 - 170	142.5	90.00	13.076		
170 - 230	200	95.00	18.353		
230 - 275	252.5	99.00	23.171		
275 - 525	400	99.80	36.706		
> 525	525	100.00	48.176		

Dp = Dd * [(pd/pp) * (TDS) / 1,000,000)] ^ 1/3

where: Density of Water (pd)= 1
Density of TDS (pp) = 2.2
TDS is assumed to be sodium chloride.

Equations and Example Calculations:

Max. PM Hourly Emissions (lb/hr) = Cooling Water Circulation Rate (gpm) * Drift (%) * 60 * 8.34 * Max. TDS in Circulating Water (ppm)/1000000

$$= \frac{69{,}801\ \text{gal}}{\text{min}} \times \frac{0.0010\%}{} \times \frac{60\ \text{min}}{\text{hr}} \times \frac{8.34\ \text{lb}}{\text{gal}} \times \frac{5000\ \text{parts}}{1000000\ \text{parts}} = \frac{1.75\ \text{lb}}{\text{hr}}$$

PM Annual Emissions (tpy) = Average PM Emissions (lb/hr) * Maximum Hours of Operation * Conversion (1 ton/2000 lb)

$$= \frac{0.59\ \text{lb}}{\text{hr}} \times \frac{8760\ \text{hrs}}{\text{yr}} \times \frac{1\ \text{ton}}{2000\ \text{lbs}} = \frac{2.60\ \text{tons}}{\text{yr}}$$

Max. PM10 Hourly Emissions (lb/hr) = Max. PM Hourly Emissions (lb/hr) * Mass of drift with PM10 (%)

$$= \frac{1.75\ \text{lb}}{\text{hr}} \times \frac{73.03\%}{} = \frac{1.28\ \text{lbs}}{\text{hr}}$$

PM10 Annual Emissions (tpy) = Average PM10 Hourly Emissions (lb/hr) *Maximum Hours of Operation (hr/yr) * (1 ton/2000 lb)

$$= \frac{0.50\ \text{lb}}{\text{hr}} \times \frac{8760\ \text{hrs}}{\text{yr}} \times \frac{1\ \text{ton}}{2000\ \text{lbs}} = \frac{2.17\ \text{tons}}{\text{yr}}$$

Max. PM2.5 Hourly Emissions (lb/hr) = Max. PM Hourly Emissions (lb/hr) * Mass of drift with PM2.5 (%)

$$= \frac{1.75\ \text{lb}}{\text{hr}} \times \frac{33.16\%}{} = \frac{0.58\ \text{lbs}}{\text{hr}}$$

PM2.5Annual Emissions (tpy) = Average PM2.5 Hourly Emissions (lb/hr) *Maximum Hours of Operation (hr/yr) * (1 ton/2000 lb)

$$= \frac{0.25\ \text{lb}}{\text{hr}} \times \frac{8760\ \text{hrs}}{\text{yr}} \times \frac{1\ \text{ton}}{2000\ \text{lbs}} = \frac{1.09\ \text{tons}}{\text{yr}}$$

References

1. AP-42 Chapter 13.4 Cooling Towers.
2. 0.001% Drift is based on design.
3. Calculation Methodology is based on "Calculating Realistic PM10 Emissions from Cooling Towers", Joel Reisman and Gordon Frisbie, Greystone Environmental Consultants, Sacramento, CA.

Fidelis
H2 Plant
July 2025
119-PKG-0001 Startup Generator
Table N-5

Manufacturer	TBD	
Model	TBD	
Horsepower	3,000	hp
Engine Output	2,237	kW
Brake Specific Fuel Consumption	8,836	Btu/kW-hr
Total Heat Input	19.77	MMBtu/hr
Operating Hours	100	hr/yr
Natural Gas Heat Content	1,051	Btu/scf
Fuel Consumption	1.88	MMscf/yr
	18,807	scf/hr

Pollutant	Emission Factor		Emission Rate		Emission Factor Reference
	lb/MMBtu	lb/bhp-hr	lb/hr	ton/yr	
NO_x		2.20E-03	6.61	0.33	40 CFR 60 Subpart JJJJ Table 1
CO		4.41E-03	13.23	0.66	40 CFR 60 Subpart JJJJ Table 1
PM/PM10/PM2.5	9.99E-03		0.20	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
VOC		1.54E-03	4.63	0.28	40 CFR 60 Subpart JJJJ Table 1
SO_2 (Maximum Hourly)		1.06E-05	0.02	<0.01	10 ppm sulfur in NG
1,1,2,2-Tetrachloroethane	4.00E-05		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
1,1,2-Trichloroethane	3.18E-05		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
1,3-Butadiene	2.67E-04		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
1,3-Dichloropropene	2.64E-05		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
2-Methylnaphthalene	3.32E-05		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
2,2,4-Trimethylpentane	2.50E-04		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Acenaphthene	1.25E-06		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Acenaphthylene	5.53E-06		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Acetaldehyde	8.36E-03		0.17	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Acrolein	5.14E-03		0.10	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Benzene	4.40E-04		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Benzo(b)fluoranthene	1.66E-07		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Benzo(e)pyrene	4.15E-07		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Benzo(g,h,i)perylene	4.14E-07		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Biphenyl	2.12E-04		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Carbon Tetrachloride	3.67E-05		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Chlorobenzene	3.04E-05		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Chloroform	2.85E-05		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Chrysene	6.93E-07		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Ethylbenzene	3.97E-05		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Ethylene Dibromide	4.43E-05		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Fluoranthene	1.11E-06		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Fluorene	5.67E-06		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Formaldehyde	5.28E-02		1.04	0.05	AP-42 Table 3.2-2 (7/00) - 4SLB
Methanol	2.50E-03		0.05	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Methylcyclohexane	1.23E-03		0.02	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Methylene Chloride	2.00E-05		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
n-Hexane	1.11E-03		0.02	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Naphthalene	7.44E-05		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
PAH	2.69E-05		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Phenanthrene	1.04E-05		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Phenol	2.40E-05		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Pyrene	1.36E-06		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Styrene	2.36E-05		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Tetrachloroethane	2.48E-06		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Toluene	4.08E-04		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Vinyl Chloride	1.49E-05		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Xylene	1.84E-04		<0.01	<0.01	AP-42 Table 3.2-2 (7/00) - 4SLB
Total HAPs	2.62E-04		1.45	0.07	AP-42 Table 3.2-2 (7/00) - 4SLB

Notes:
1. NOx, CO, and VOC emission factors are from Table 1 to 40 CFR 60 Subpart JJJJ for engines with rated power greater than or equal to 500 hp
2. Emission factor for SO_2 based on 10 ppmv sulfur in NG.
3. Max. Annual Emissions based upon Max. Hourly Emissions @ 100 hr/yr.

Table N-6 Emission Calculation for Diesel Engines - Fire Water Pump (119-P-9402)
Clarke C18H0-UFAD42

There will be one diesel-fired fire water pump, with rating @ 600 hp.
Sulfur content of fuel used in engines will be 15 ppm sulfur or less.
Annual non-emergency operating hours will be limited to 100 hr/yr.
Engines will be new (model year 2024 or later).

FIN: 119-P-9402 EPN: 119-P-9402

Fuel Type:	**Diesel**	
Year	2024	
Total Engines:	1	
Fuel Consumption per Engine:	35.90	gal/hr
Diesel Density [1]	7.001	lb/gal
Fuel Consumption per Engine:	251.34	lbs/hr
Diesel Fuel Heat Content (HHV): [1]	19,300	Btu/lb
Heat Input (HHV) per Engine:	4.85	MMBtu/hr
Engine Horsepower Output:	614	hp
Engine Output:	458	kW
Annual Operation:	100	hr/yr
Engine Load:	100%	
Displacement per Cylinder	< 30 L per cylinder	
Brake Specific Fuel Consumptions: [2]	7900.30	Btu/hp-hr

Notes:
[1] 19,300 Btu/lb is the average heating value of diesel and 7.001 lb/gal is the density of diesel as provided by vendor.
[2] Brake specific fuel consumption per hour = (Heat Input (HHV)) / (Engine Horsepower Output (hp)).

Water Pump Diesel Engine Emission Rates

Pollutant	**Emission Factor** [1,2,3]		**Emissions Rates**		
			Max. Hourly	**Annual Average** [4]	**Annual**
			lb/hr	**lb/hr**	**tpy**
NOX [1]	3.04	g/kw-hr	3.07	0.04	0.15
CO [1]	3.30	g/kw-hr	3.33	0.04	0.17
PM10 [1,3]	0.113	g/kw-hr	0.11	0.001	0.01
PM2.5 [1,3]	0.113	g/kw-hr	0.11	0.0013	0.01
VOC [1]	0.11	g/kw-hr	0.11	0.00	0.01
SO2 [2]	1.23E-05	lb/hp-hr	0.01	0.00	<0.01

Notes:

1. NOx, CO, PM, and VOC emission factors are from 40 CFR 60.4205(c) for engines with rated power greater than or equal to 600 hp (450 kW) but less than or equal to 750 hp (560 kW). NSPS Subpart IIII specifies to use emission factors from Table 4 to 40 CFR Subpart IIII.
2. Emission factors for SO2 based on 15 ppmw ULSD.
3. All PM is assumed to be less than 1.0 µm in diameter. Therefore, the PM emission factor is used to estimate emissions of PM10 and PM2.5.
4. Annual average hourly emission rates are (annual emissions in tpy)*2000 lb/ton*1 year/8760 hours.

Example Calculation:

$$\text{Hourly } NO_X = \frac{3.0\text{ g}}{\text{kW-hr}} \times 457.87\text{ kW} \times \frac{1\text{ lb}}{453.59\text{ g}} = \frac{3.07\text{ lb}}{\text{hr}}$$

$$\text{Annual } NO_X = \frac{3.07\text{ lb}}{\text{hr}} \times \frac{100\text{ hrs}}{\text{yr}} \times \frac{1\text{ ton}}{2000\text{ lbs}} = \frac{0.15\text{ ton}}{\text{yr}}$$

HAP Emissions from Engines

HAP Emission Estimation

Max Input = 4.85 MMBtu/hr each engine
Annual Hours @ Max Rating = 100.0 hrs/yr
Hourly Emissions = (Max Heat Input - MMBtu/hr) x (EF - lb/MMBtu)
Annual Emissions = (Max Heat Input - MMBtu/hr) x (EF - lb/MMBtu) x (Annual Operating Hours) / (2,000 lb/Ton)

Pollutant	EF [1] (lb/MMBtu)	Source	§112 HAP? [2]	Max. Hourly Emission [3] (lb/hr)	Annual Emission (lb/yr) [4]	Annual Emissions (tpy) [5]
Benzene	9.33E-04	AP42; Table 3.3-2; 10/96.	YES	4.53E-03	4.53E-01	2.26E-04
Toluene	4.09E-04	AP42; Table 3.3-2; 10/96.	YES	1.98E-03	1.98E-01	9.92E-05
Xylenes	2.85E-04	AP42; Table 3.3-2; 10/96.	YES	1.38E-03	1.38E-01	6.91E-05
Propylene	2.58E-03	AP42; Table 3.3-2; 10/96.	NO	1.25E-02	1.25E+00	6.26E-04
1,3-Butadiene	<3.91E-05	AP42; Table 3.3-2; 10/96.	YES	1.90E-04	1.90E-02	9.48E-06
Formaldehyde	1.18E-03	AP42; Table 3.3-2; 10/96.	YES	5.72E-03	5.72E-01	2.86E-04
Acetaldehyde	7.67E-04	AP42; Table 3.3-2; 10/96.	YES	3.72E-03	3.72E-01	1.86E-04
Acrolein	<9.25E-05	AP42; Table 3.3-2; 10/96.	YES	4.49E-04	4.49E-02	2.24E-05
Total PAH	<1.68E-04	AP42; Table 3.3-2; 10/96.	YES	8.15E-04	8.15E-02	4.07E-05
Naphthalene	8.48E-05	AP42; Table 3.3-2; 10/96.	YES	4.11E-04	4.11E-02	2.06E-05
Acenaphthylene	<5.06E-06	AP42; Table 3.3-2; 10/96.	YES	2.45E-05	2.45E-03	1.23E-06
Acenaphthene	<1.42E-06	AP42; Table 3.3-2; 10/96.	YES	6.89E-06	6.89E-04	3.44E-07
Fluorene	2.92E-05	AP42; Table 3.3-2; 10/96.	YES	1.42E-04	1.42E-02	7.08E-06
Phenanthrene	2.94E-05	AP42; Table 3.3-2; 10/96.	YES	1.43E-04	1.43E-02	7.13E-06
Anthracene	1.87E-06	AP42; Table 3.3-2; 10/96.	YES	9.07E-06	9.07E-04	4.54E-07
Fluoranthene	7.61E-06	AP42; Table 3.3-2; 10/96.	YES	3.69E-05	3.69E-03	1.85E-06
Pyrene	4.78E-06	AP42; Table 3.3-2; 10/96.	YES	2.32E-05	2.32E-03	1.16E-06
Benzo(a)anthracene	1.68E-06	AP42; Table 3.3-2; 10/96.	YES	8.15E-06	8.15E-04	4.07E-07
Chrysene	3.53E-07	AP42; Table 3.3-2; 10/96.	YES	1.71E-06	1.71E-04	8.56E-08
Benzo(b)fluoranthene	<9.91E-08	AP42; Table 3.3-2; 10/96.	YES	4.81E-07	4.81E-05	2.40E-08
Benzo(k)fluoranthene	<1.55E-07	AP42; Table 3.3-2; 10/96.	YES	7.52E-07	7.52E-05	3.76E-08
Benzo(a)pyrene	<1.88E-07	AP42; Table 3.3-2; 10/96.	YES	9.12E-07	9.12E-05	4.56E-08
Indeno(1,2,3-cd)pyrene	<3.75E-07	AP42; Table 3.3-2; 10/96.	YES	1.82E-06	1.82E-04	9.10E-08
Dibenzo(a,h)anthracene	<5.83E-07	AP42; Table 3.3-2; 10/96.	YES	2.83E-06	2.83E-04	1.41E-07
Benzo(g,h,I)perylene	<4.89E-07	AP42; Table 3.3-2; 10/96.	YES	2.37E-06	2.37E-04	1.19E-07
Total §112 HAP =	3.87E-03			1.88E-02	1.88E+00	9.39E-04

[1] Emission factors obtained from US EPA AP-42 Section 3.3 Gasoline and Diesel Engines (10/96), Table 3.3-2.
[2] Listed US EPA Hazardous Air Pollutants.
[3] Max. Hourly Emissions = Emission Factor (lb/MMBtu) *Max Heat Input Capacity per Engine (MMBtu/hr)
[4] Maximum Annual Emission Rate (lb/yr) = Hourly Emissions (lb/hr) * Annual Operating Hours (hr/yr)
[5] Maximum Potential Annual Emission Rate (tpy) = Hourly Emissions (lb/hr) * Annual Hours (hr/yr) ((1 ton/2000 lb).

Table N-7 Emission Calculation for Flare (119-FL-9501)

One flare will be installed to control the startup/shutdown emissions. The flare is an air-assisted hydrogen flare since the H2 content in the flare gas is greater than 8.0% by volume.

Emission Summary for Flare (Total) [1]

Pollutant	Hourly Emission Rate (lb/hr)		Annual Emissions [3]
	Max. Hourly [2]	Average hourly [3]	(TPY)
NOX	154.68	0.68	2.98
CO	835.45	3.87	16.97
VOC	21.22	0.06	0.27
PM	16.95	0.07	0.33
PM10	16.95	0.07	0.33
PM2.5	16.95	0.07	0.33
CO2e	-	-	2506.77
SO2	6.14E-01	5.12E-03	0.02
H2S	3.89E-03	2.34E-05	1.03E-04
HAPs [4]	4.89	0.02	0.08

[1] The flare is used to control startup/shutdown emissions. The four startup streams will be sent to the flare sequentially rather than simultaneously; three of the four shutdown streams (the streams from the waste heat boiler, the pre-reformer, and the sulfur absorber) may be sent to the flare simultaneously.

[2] The hourly maximum corresponds to the situation where the pilot stream and startup stream or shutdown stream are burning simultaneously.

[3] Annual emissions include emissions from combustion of pilot gas and startup/shutdown streams.
Average hourly emissions are calculated as (annual emissions, tpy)*(2000 lbs/ton) / (8760 hr/yr).

[4] Include the HAP remaining after flare control due to the presence of HAP in the flare stream as well as the HAP emissions from combustion.

Emission Summary for Flare (SUSD) [1]

Pollutant	Hourly Emission Rate (lb/hr)		Annual Emissions [3]
	Max. Hourly [2]	Average hourly [3]	(TPY)
NOX	154.53	0.53	2.31
CO	834.83	3.25	14.24
VOC	21.21	-	0.21
PM	16.93	0.06	0.25
PM10	16.93	0.06	0.25
PM2.5	16.93	0.06	0.25
SO2	0.61	1.57E-03	0.01
H2S	0.004	8.42E-06	0.00004
HAPs	0.678	1.53E-03	0.00671

[1] The flare is used to control plant startup and shutdown streams.
[2] The hourly maximum corresponds to combustion of the startup stream or shutdown stream.
[3] Annual emissions include emissions from combustion of startup and shutdown streams only.
Average hourly emissions are calculated as (annual emissions, tpy)*(2000 lbs/ton) / (8760 hr/yr).

Emission Summary for Flare (Pilot) [1]

Pollutant	Hourly Emission Rate (lb/hr)		Annual Emissions [2]
	Max. Hourly [2]	Average hourly	(TPY)
NOX	0.15	0.15	0.66
CO	0.62	0.62	2.73
VOC	0.01	0.01	0.06
PM	0.02	0.02	0.07
PM10	0.02	0.02	0.07
PM2.5	0.02	0.02	0.07
SO2	3.55E-03	0.004	0.02
H2S	1.50E-05	1.50E-05	6.58E-05
HAPs	6.69E-04	6.69E-04	2.93E-03

[1] During normal operation, the flare will burn pilot gas (natural gas) only.
[2] Maximum hourly and annual emissions correspond to emissions from combustion of pilot gas.
Average hourly emissions are calculated as (annual emissions, tpy)*(2000 lbs/ton) / (8760 hr/yr).

Heat Release Rate from the Flare

Maximum hourly (HHV):	2274.71	MMBtu/hr
Maximum hourly (LHV):	2052.51	MMBtu/hr
Annual (HHV):	87547.96	MMBtu/yr
Annual (LHV):	78990.76	MMBtu/yr

Below are Detailed Emission Calculations for Flare (119-FL-9501)

Pilot Gas (natural gas)

	Pilot/Purge Gas	Notes
Flow Rate (kg/hr):	43	1 pilot
Flow Rate (scf/hr):	2104.07	
Hourly Heat Input (LHV, MMBtu/hr):	2.01	
Low Heat Content (Btu/scf):	953.93	
Hourly Heat Input (HHV, MMBtu/hr)	2.22	
High Heat Content (Btu/scf):	1056.44	
Annual Operating Hours (hrs/yr):	8760	
Annual Heat Input (LHV, MMBtu/yr):	17582.59	
Annual Heat Input (HHV, MMBtu/yr):	19471.98	

Engineering Standard Temperature: 60 °F (15.56 °C)
Standard Pressure: 1 atm
Standard Volume: 379.48 ft3/lbmol

Flare Criteria and Other Pollutant Emission Factors

Pollutant	Emission Factor	Unit	Source	Notes
NOX	0.068	lb/MMBtu	AP-42, Section 13.5, Table 13.5-1	based on HHV
CO	0.31	lb/MMBtu	AP-42, Section 13.5, Table 13.5-2	based on LHV
VOC [1]	5.5	lb/MMScf	AP-42, Section 1.4, Table 1.4-1	based on HHV
PM/PM10/PM2.5 [2]	7.6	lb/MMScf	AP-42, Section 1.4, Table 1.4-1	based on HHV
SO2 [3]	10.00	ppmv S	Fuel Selection	based on sulfur content in the fuel

[1] VOC is calculated using the AP-42 emission factor. However, the emission rate for permitting is the higher of the two emission rates quantified using the AP-42 emission factor and the 98% destruction efficiency. Please refer to the table below.
[2] All particulate matter is conservatively assumed to be less than 1 µm per AP-42, Table 1.4-1, footnote c.
[3] Combustion of fuel with a sulfur content no greater than that in pipeline quality natural gas.

Criteria Pollutants Emissions from the Flare Pilot Gas

Pollutant	**Hourly Emission Rate [1,2]**	**Annual Emissions**
	(lb/hr)	**(TPY)**
NOX	0.15	0.66
CO	0.62	2.73
VOC	0.01	0.06
PM	0.02	0.07
PM10	0.02	0.07
PM2.5	0.02	0.07
CO2e [3]	-	2506.77
SO2 [4]	3.55E-03	0.02
H2S	1.50E-05	6.58E-05

[1] Average hourly emission rate = maximum hourly emission rate
[2] Summary includes pilot only
[3] CO2e emissions quantified in subsequent table using the flare gas composition. Use of 40 CFR 98 emission factors results in lower emissions than calculating the CO2e emissions from flare gas combustion using the flare gas composition.
[4] 100% conversion of sulfur to sulfur dioxide

Example Calc.

$$\text{Hourly } NO_x = \frac{0.068 \text{ lb}}{\text{MMBtu}} \times \frac{2.22 \text{ MMBtu}}{\text{hr}} = \frac{0.15 \text{ lb}}{\text{hr}}$$

$$\text{Annual } NO_x = \frac{0.15 \text{ lb}}{\text{MMBtu}} \times \frac{8760 \text{ hrs}}{\text{yr}} \times \frac{\text{ton}}{2000 \text{ lbs}} = 0.66 \text{ tpy}$$

Non-criteria Pollutant Emissions from the Flare Pilot Gas

Component	**HHV**	**MW**	**Natural Gas**	**Flow Rate**					**Heat Input (HHV)**		**DRE, % [1]**	**Emissions**	
	Btu/scf	**lb/lbmol**	**mol%**	**scfh @ 60 °F**	**lbmol/hr**	**lb/hr**	**scfy**	**ton/yr**	**MMBtu/hr**	**MMBtu/yr**		**lb/hr [2]**	**tpy [3]**
Nitrogen	0	28.01	0.35	7.36	0.019	0.54	64510.93	2.38	0.00	0.00	0	-	-
Carbon Dioxide	0	44.01	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00
Methane	1009.15	16.04	93.10	1958.89	5.162	82.80	17159906.39	362.66	1.98	17316.84	99	0.83	3.63
Ethane	1768.85	30.07	5.99	126.03	0.332	9.99	1104058.42	43.74	0.22	1952.92	99	0.10	0.44
Propane	2590.00	44.1	0.33	6.94	0.018	0.81	60824.59	3.53	0.02	157.54	99	0.01	0.04
Iso-Butane	3255.62	58.12	0.02	0.42	0.001	0.06	3686.34	0.28	0.00	12.00	98	0.00	0.01
n-Butane	3263.43	58.12	0.03	0.63	0.002	0.10	5529.51	0.42	0.00	18.05	98	0.00	0.01
Iso-Pentane	4002.54	72.15	0.01	0.15	0.000	0.03	1290.22	0.12	0.00	5.16	98	0.00	0.00
n-Pentane	4009.95	72.15	0.004	0.08	0.000	0.02	737.27	0.07	0.00	2.96	98	0.00	0.00
n-Hexane	4755.42	86.18	0.01	0.15	0.000	0.03	1290.22	0.15	0.00	6.14	98	0.00	0.00
Mercaptan	1822.96	48.11	0.00	0.02	0.000	0.00	184.32	0.01	0.00	0.34	98	0.00	0.00
Hydrogen Sulfide	637.62	34.08	0.00	0.01	0.000	0.00	73.29	0.00	0.00	0.05	98	0.000	0.00
Oxygen	0.00	32.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0	-	-
VOC [4]			0.399	8.40	0.022		73542.46					0.01	0.06
HAP [5]			0.007	0.15	0.000		1290.22					0.0007	0.0029
TOTAL	1056.44	17.02	99.84	2100.70	5.54		18402091.49	413.37	2.22	19471.98		-	-

[1] The assumed destruction rate efficiency (DRE) of the flare is 98% for all compounds except H2S, Methane and Ethane. For H2S, 99.9% conversion of H2S to SO2 is assumed. For Methane and Ethane, 99% DRE is assumed.
[2] Hourly emissions from flare, lb/hr = Mole Fraction * hourly flow rate in scf/hr / standard volume * MW * (1- DRE).
[3] Annual emission rate = hourly rate (lb/hr) * annual operating hours (hrs/yr) * (1 ton/2000 lb)
[4] Total VOC is the sum of non-methane and non-ethane hydrocarbons.
[5] HAP is the sum of emissions of all hazardous air pollutants from this stream. Table 45-13A lists 19 specific air toxics which are also included in US EPA's list of HAPs.

Startup Vent Gas - Outlet Sulfur Absorber

Flow Rate (scf/hr):	2203393	Engineering Standard Temperature:	60	°F	15.56 °C
Hourly Heat Input (LHV, MMBtu/hr):	2050.50	Standard Pressure:	1	atm	
Low Heat Content (Btu/scf):	930.61	Standard Volume:	379.48	ft3/lbmol	
Hourly Heat Input (HHV, MMBtu/hr)	2272.48				
High Heat Content (Btu/scf):	1031.36				
Annual Operating Hours (hrs/yr):	12				
Annual Heat Input (LHV, MMBtu/yr):	24606.00				
Annual Heat Input (HHV, MMBtu/yr):	27269.79				

Flare Criteria and Other Pollutant Emission Factors

Pollutant	Emission Factor	Unit	Source	Notes
NOX	0.068	lb/MMBtu	AP-42, Section 13.5, Table 13.5-1	based on HHV
CO	0.31	lb/MMBtu	AP-42, Section 13.5, Table 13.5-2	based on LHV
VOC [1]	-	lb/MMScf	-	-
PM/PM10/PM2.5 [2]	7.6	lb/MMScf	AP-42, Section 1.4, Table 1.4-1	based on HHV
SO2 [3]	0	ppmv S	Fuel Selection	no sulfur in the stream

[1] VOC emissions were calculated based on the amount of VOC in the flare stream and a destruction efficiency of 98%.
[2] All particulate matter is conservatively assumed to be less than 1 µm per AP-42, Table 1.4-1, footnote c.
[3] The vent gas does not contain any sulfur.

Criteria Pollutants Emissions from Flaring this Startup Stream

Pollutant	Hourly Emission Rate [1]	Annual Emissions
	(lb/hr)	(TPY)
NOX	154.53	0.93
CO	635.65	3.81
VOC	21.21	0.13
PM	16.93	0.10
PM10	16.93	0.10
PM2.5	16.93	0.10
SO2 [2]	0.00	0.00

[1] Summary includes the emissions from flaring this vent gas only
[2] CO2e emissions quantified in subsequent table using the vent gas composition
[2] The vent gas does not contain any sulfur.

Non-criteria Pollutant Emissions from Flaring this Startup Stream

Component	LHV	HHV	MW	Startup Vent Gas - Outlet Sulfur Absorber	Flow Rate					Heat Input				DRE, % [1]	Emissions	
	Btu/scf @ 60 °F	Btu/scf @ 60 °F	lb/lbmol	mol%	scfh @ 60 °F	lbmol/hr	lb/hr	scfy	ton/yr	LHV (MMBtu/hr)	LHV (MMBtu/yr)	HHV (MMBtu/hr)	HHV (MMBtu/yr)		lb/hr [2]	tpy [3]
Hydrogen	275.15	325.15	2.02	3.67	80946.68	213.31	430.88	971360.18	2.59	22.27	267.27	26.32	315.84	98	8.62	0.05
Nitrogen	0.00	0.00	28.01	0.34	7524.07	19.83	555.36	90288.83	3.33	0.00	0.00	0.00	0.00	0	555.36	3.33
Argon	0.00	0.00	39.95	0.00	32.29	0.09	3.40	387.46	0.02	0.00	0.00	0.00	0.00	0	3.40	0.02
Water	0.00	0.00	18.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00
Methane	909.60	1009.15	16.04	89.80	1978548.63	5213.78	83629.03	23742583.62	501.77	1799.70	21596.36	1996.64	23959.72	98	1672.58	10.04
Ethane	1619.01	1768.85	30.07	5.80	127846.88	336.90	10130.47	1534162.60	60.78	206.99	2483.83	226.14	2713.71	98	202.61	1.22
Propane	2385.00	2590.00	44.1	0.32	7043.10	18.56	818.48	84517.20	4.91	16.80	201.57	18.24	218.90	98	16.37	0.10
Butane	3014.09	3263.43	58.12	0.05	1067.20	2.81	163.45	12806.40	0.98	3.22	38.60	3.48	41.79	98	3.27	0.02
Pentane	3710.70	4009.95	72.15	0.01	235.19	0.62	44.72	2822.28	0.27	0.87	10.47	0.94	11.32	98	0.89	0.01
Hexane	4406.37	4755.42	86.18	0.01	149.26	0.39	33.90	1791.08	0.20	0.66	7.89	0.71	8.52	98	0.68	0.00
CO	322.40	322.40	28.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	98	0.00	0.00
CO2	0.00	0.00	44.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00
VOC [4]	-	-	-	0.386	8494.746	22.385	1060.539	101936.957	6.363	-	-	-	-	98	21.211	0.127
HAP [5]	-	-	-	0.007	149.257	0.393	33.896	1791.084	0.203	-	-	-	-	98	0.678	0.004
TOTAL	930.61	1031.36	16.50	100.00	2203393.30	5806.28		26440719.66	574.86	2050.50	24606.00	2272.48	27269.79	-	-	-

[1] The assumed destruction rate efficiency (DRE) of the flare is 98%.
[2] Hourly emissions from flare, lb/hr = Mole Fraction * hourly flow rate in scf/hr / standard volume * MW * (1- DRE).
[3] Annual emission rate = hourly rate (lb/hr) * annual operating hours (hrs/yr) * (1 ton/2000 lb)
[4] VOCs include non-methane and non-ethane hydrocarbons.
[5] HAPs are compounds designated as hazardous air pollutants by the US EPA.

Startup Vent Gas - Outlet Pre-reformer

Flow Rate (scf/hr):	2147742	Engineering Standard Temperature:	60 °F	15.56 °C
Hourly Heat Input (LHV, MMBtu/hr):	1192.63	Standard Pressure:	1 atm	
Low Heat Content (Btu/scf):	555.30	Standard Volume:	379.48 ft3/lbmol	
Hourly Heat Input (HHV, MMBtu/hr)	1325.49			
High Heat Content (Btu/scf):	617.15			
Annual Operating Hours (hrs/yr):	12			
Annual Heat Input (LHV, MMBtu/yr):	14311.59			
Annual Heat Input (HHV, MMBtu/yr):	15905.83			

Flare Criteria and Other Pollutant Emission Factors

Pollutant	Emission Factor	Unit	Source	Notes
NOX	0.068	lb/MMBtu	AP-42, Section 13.5, Table 13.5-1	based on HHV
CO	0.31	lb/MMBtu	AP-42, Section 13.5, Table 13.5-2	based on LHV
VOC [1]	-	lb/MMScf	-	-
PM/PM10/PM2.5 [2]	7.6	lb/MMScf	AP-42, Section 1.4, Table 1.4-1	based on HHV
SO2 [3]	0	ppmv S	Fuel Selection	no sulfur in the stream

[1] The gas stream does not contain any VOCs.
[2] All particulate matter is conservatively assumed to be less than 1 µm per AP-42, Table 1.4-1, footnote c.
[3] The vent gas does not contain any sulfur.

Criteria Pollutants Emissions from Flaring this Startup Stream

Pollutant	Hourly Emission Rate [1]	Annual Emissions
	(lb/hr)	(TPY)
NOX	90.13	0.54
CO	369.72	2.22
VOC	0.00	0.00
PM	9.88	0.06
PM10	9.88	0.06
PM2.5	9.88	0.06
SO2 [2]	0.00	0.00

[1] Summary includes the emissions from flaring this vent gas only
[2] CO2e emissions quantified in subsequent table using the vent gas composition
[2] The vent gas does not contain any sulfur.

Non-criteria Pollutant Emissions from Flaring this Startup Stream

Component	LHV	HHV	MW	Startup Vent Gas - Outlet Sulfur Absorber	Flow Rate					Heat Input				DRE, % [1]	Emissions	
	Btu/scf @ 60 °F	Btu/scf @ 60 °F	lb/lbmol	mol%	scfh @ 60 °F	lbmol/hr	lb/hr	scfy	ton/yr	LHV (MMBtu/hr)	LHV (MMBtu/yr)	HHV (MMBtu/hr)	HHV (MMBtu/yr)		lb/hr [2]	tpy [3]
Hydrogen	275.15	325.15	2.02	5.54	118955.84	313.47	633.20	1427470.08	3.80	32.73	392.77	38.68	464.14	98	12.66	0.08
Nitrogen	0.00	0.00	28.01	0.20	4289.38	11.30	316.60	51472.50	1.90	0.00	0.00	0.00	0.00	0	316.60	1.90
Argon	0.00	0.00	39.95	0.00	18.84	0.05	1.98	226.09	0.01	0.00	0.00	0.00	0.00	0	1.98	0.01
Water	0.00	0.00	18.02	33.05	709875.21	1870.63	33708.76	8518502.51	202.25	0.00	0.00	0.00	0.00	0	33708.76	202.25
Methane	909.60	1009.15	16.04	59.36	1274903.59	3359.57	53887.45	15298843.08	323.32	1159.66	13915.90	1286.56	15438.76	98	1077.75	6.47
Ethane	1619.01	1768.85	30.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	98	0.00	0.00
Propane	2385.00	2590.00	44.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	98	0.00	0.00
Butane	3014.09	3263.43	58.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	98	0.00	0.00
Pentane	3710.70	4009.95	72.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	98	0.00	0.00
Hexane	4406.37	4755.42	86.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	98	0.00	0.00
CO	322.40	322.40	28.01	0.04	756.95	1.99	55.87	9083.38	0.34	0.24	2.93	0.24	2.93	98	1.12	0.01
CO2	0.00	0.00	44.01	1.81	38942.03	102.62	4516.23	467304.37	27.10	0.00	0.00	0.00	0.00	0	4516.23	27.10
VOC [4]	-	-	-	0.000	0.000	0.000	0.000	0.000	0.000	-	-	-	-	98	0.000	0.000
HAP [5]	-	-	-	0.000	0.000	0.000	0.000	0.000	0.000	-	-	-	-	98	0.000	0.000
TOTAL	555.30	617.15	16.45	100.00	2147741.83	5659.63		25772902.01	558.72	1192.63	14311.59	1325.49	15905.83	-	-	-

[1] The assumed destruction rate efficiency (DRE) of the flare is 98%.
[2] Hourly emissions from flare, lb/hr = Mole Fraction * hourly flow rate in scf/hr / standard volume * MW * (1- DRE).
[3] Annual emission rate = hourly rate (lb/hr) * annual operating hours (hrs/yr) * (1 ton/2000 lb)
[4] VOCs include non-methane and non-ethane hydrocarbons.
[5] HAPs are compounds designated as hazardous air pollutants by the US EPA.
The stream does not contain any VOCs and HAPs.

Startup Vent Gas - Outlet Waste Heat Boiler

Flow Rate (scf/hr):	2141422	Engineering Standard Temperature:	60 °F	15.56 °C
Hourly Heat Input (LHV, MMBtu/hr):	671.02	Standard Pressure:	1 atm	
Low Heat Content (Btu/scf):	313.35	Standard Volume:	379.48 ft3/lbmol	
Hourly Heat Input (HHV, MMBtu/hr)	728.47			
High Heat Content (Btu/scf):	340.18			
Annual Operating Hours (hrs/yr):	12			
Annual Heat Input (LHV, MMBtu/yr):	8052.29			
Annual Heat Input (HHV, MMBtu/yr):	8741.69			

Flare Criteria and Other Pollutant Emission Factors

Pollutant	Emission Factor	Unit	Source	Notes
NOX	0.068	lb/MMBtu	AP-42, Section 13.5, Table 13.5-1	based on HHV
CO	0.31	lb/MMBtu	AP-42, Section 13.5, Table 13.5-2	based on LHV
VOC [1]	-	lb/MMScf	-	-
PM/PM10/PM2.5 [2]	7.6	lb/MMScf	AP-42, Section 1.4, Table 1.4-1	based on HHV
SO2 [3]	1.69	ppmv S	Fuel Selection	no sulfur in the stream

[1] VOC emissions were calculated based on the amount of VOC in the flare stream and a destruction efficiency of 98%.
[2] All particulate matter is conservatively assumed to be less than 1 µm per AP-42, Table 1.4-1, footnote c.
[3] When this gas is flared, NG will be used as supplemental fuel. The sulfur content of the gas stream comes from the NG.

Criteria Pollutants Emissions from Flaring this Startup Stream

Pollutant	Hourly Emission Rate [1]	Annual Emissions
	(lb/hr)	(TPY)
NOX	49.54	0.30
CO	208.02	1.25
VOC	5.40	0.03
PM	5.43	0.03
PM10	5.43	0.03
PM2.5	5.43	0.03
SO2 [2]	0.61	0.004

[1] Summary includes the emissions from flaring this vent gas only
[2] CO2e emissions quantified in subsequent table using the vent gas composition
[2] When this gas is flared, NG will be used as supplemental fuel. The sulfur content of the gas stream comes from the NG.

Non-criteria Pollutant Emissions from Flaring this Startup Stream

Component	LHV	HHV	MW	Startup Vent Gas - Outlet Sulfur Absorber	Flow Rate					Heat Input				DRE, % [1]	Emissions	
	Btu/scf @ 60 °F	Btu/scf @ 60 °F	lb/lbmol	mol%	scfh @ 60 °F	lbmol/hr	lb/hr	scfy	ton/yr	LHV (MMBtu/hr)	LHV (MMBtu/yr)	HHV (MMBtu/hr)	HHV (MMBtu/yr)		lb/hr [2]	tpy [3]
Hydrogen	275.15	325.15	2.02	0.05	1068.97	2.82	5.69	12827.70	0.03	0.29	3.53	0.35	4.17	98	0.11	0.00
Nitrogen	0.00	0.00	28.01	0.28	6056.81	15.96	447.06	72681.69	2.68	0.00	0.00	0.00	0.00	0	447.06	2.68
Argon	0.00	0.00	39.95	0.17	3572.05	9.41	376.05	42864.62	2.26	0.00	0.00	0.00	0.00	0	376.05	2.26
Water	0.00	0.00	18.02	49.55	1061169.02	2796.34	50390.11	12734028.20	302.34	0.00	0.00	0.00	0.00	0	50390.11	302.34
Methane	909.60	1009.15	16.04	24.42	522969.39	1378.10	22104.80	6275632.69	132.63	475.70	5708.34	527.75	6333.03	98	442.10	2.65
Ethane	1619.01	1768.85	30.07	1.52	32524.00	85.71	2577.17	390288.04	15.46	52.66	631.88	57.53	690.36	98	51.54	0.31
Propane	2385.00	2590.00	44.1	0.08	1792.17	4.72	208.27	21506.04	1.25	4.27	51.29	4.64	55.70	98	4.17	0.02
Butane	3014.09	3263.43	58.12	0.01	271.49	0.72	41.58	3257.92	0.25	0.82	9.82	0.89	10.63	98	0.83	0.00
Pentane	3710.70	4009.95	72.15	0.00	59.83	0.16	11.38	717.98	0.07	0.22	2.66	0.24	2.88	98	0.23	0.00
Hexane	4406.37	4755.42	86.18	0.00	37.97	0.10	8.62	455.65	0.05	0.17	2.01	0.18	2.17	98	0.17	0.00
CO	322.40	322.40	28.01	19.83	424605.79	1118.90	31340.43	5095269.43	188.04	136.90	1642.74	136.90	1642.74	98	626.81	3.76
CO2	0.00	0.00	44.01	4.08	87292.16	230.03	10123.54	1047505.87	60.74	0.00	0.00	0.00	0.00	0	10123.54	60.74
H2S	587.78	637.62	34.08	0.0001	2.16	0.01	0.19	25.87	0.001	0.00	0.02	0.00	0.02	98	3.87E-03	2.32E-05
VOC [4]	-	-	-	0.101	2161.466	5.696	269.848	25937.598	1.619	-	-	-	-	98	5.397	0.032
HAP [5]	-	-	-	0.002	37.971	0.100	8.623	455.648	0.052	-	-	-	-	98	0.172	0.001
TOTAL	313.35	340.18	20.85	100.00	2141419.65	5642.97		25697035.83	705.81	671.02	8052.28	728.47	8741.68	-	-	-

[1] The assumed destruction rate efficiency (DRE) of the flare is 98%.
[2] Hourly emissions from flare, lb/hr = Mole Fraction * hourly flow rate in scf/hr / standard volume * MW * (1- DRE).
[3] Annual emission rate = hourly rate (lb/hr) * annual operating hours (hrs/yr) * (1 ton/2000 lb)
[4] VOCs include non-methane and non-ethane hydrocarbons.
[5] HAPs are compounds designated as hazardous air pollutants by the US EPA.

Startup Vent Gas - Vent Downstream LTS

Flow Rate (scf/hr):	1418431	Engineering Standard Temperature:	60 °F	15.56 °C
Hourly Heat Input (LHV, MMBtu/hr):	426.05	Standard Pressure:	1 atm	
Low Heat Content (Btu/scf):	300.37	Standard Volume:	379.48 ft3/lbmol	
Hourly Heat Input (HHV, MMBtu/hr)	484.97			
High Heat Content (Btu/scf):	341.91			
Annual Operating Hours (hrs/yr):	12			
Annual Heat Input (LHV, MMBtu/yr):	5112.58			
Annual Heat Input (HHV, MMBtu/yr):	5819.68			

Flare Criteria and Other Pollutant Emission Factors

Pollutant	Emission Factor	Unit	Source	Notes
NOX	0.068	lb/MMBtu	AP-42, Section 13.5, Table 13.5-1	based on HHV
CO	0.31	lb/MMBtu	AP-42, Section 13.5, Table 13.5-2	based on LHV
VOC [1]	-	lb/MMScf	-	-
PM/PM10/PM2.5 [2]	7.6	lb/MMScf	AP-42, Section 1.4, Table 1.4-1	based on HHV
SO2 [3]	1.76	ppmv S	Fuel Selection	no sulfur in the stream

[1] VOC emissions were calculated based on the amount of VOC in the flare stream and a destruction efficiency of 98%.
[2] All particulate matter is conservatively assumed to be less than 1 µm per AP-42, Table 1.4-1, footnote c.
[3] When this gas is flared, NG will be used as supplemental fuel. The sulfur content of the gas stream comes from the NG.

Criteria Pollutants Emissions from Flaring this Startup Stream

Pollutant	Hourly Emission Rate [1]	Annual Emissions
	(lb/hr)	(TPY)
NOX	32.98	0.20
CO	132.07	0.79
VOC	2.49	0.01
PM	3.61	0.02
PM10	3.61	0.02
PM2.5	3.61	0.02
SO2 [2]	0.42	0.003

[1] Summary includes the emissions from flaring this vent gas only
[2] CO2e emissions quantified in subsequent table using the vent gas composition
[2] When this gas is flared, NG will be used as supplemental fuel. The sulfur content of the gas stream comes from the NG.

Non-criteria Pollutant Emissions from Flaring this Startup Stream

Component	LHV	HHV	MW	Startup Vent Gas - Outlet Sulfur Absorber	Flow Rate					Heat Input				DRE, % [1]	Emissions	
	Btu/scf @ 60 °F	Btu/scf @ 60 °F	lb/lbmol	mol%	scfh @ 60 °F	lbmol/hr	lb/hr	scfy	ton/yr	LHV (MMBtu/hr)	LHV (MMBtu/yr)	HHV (MMBtu/hr)	HHV (MMBtu/yr)		lb/hr [2]	tpy [3]
Hydrogen	275.15	325.15	2.02	45.82	649930.20	1712.67	3459.59	7799162.42	20.76	178.83	2145.95	211.33	2535.90	98	69.19	0.42
Nitrogen	0.00	0.00	28.01	0.19	2697.27	7.11	199.09	32367.25	1.19	0.00	0.00	0.00	0.00	0	199.09	1.19
Argon	0.00	0.00	39.95	0.11	1564.88	4.12	164.74	18778.60	0.99	0.00	0.00	0.00	0.00	0	164.74	0.99
Water	0.00	0.00	18.02	19.97	283205.84	746.29	13448.16	3398470.07	80.69	0.00	0.00	0.00	0.00	0	13448.16	80.69
Methane	909.60	1009.15	16.04	16.97	240771.24	634.47	10176.89	2889254.89	61.06	219.01	2628.08	242.97	2915.68	98	203.54	1.22
Ethane	1619.01	1768.85	30.07	1.06	14998.66	39.52	1188.48	179983.96	7.13	24.28	291.40	26.53	318.37	98	23.77	0.14
Propane	2385.00	2590.00	44.1	0.06	826.47	2.18	96.04	9917.66	0.58	1.97	23.65	2.14	25.69	98	1.92	0.01
Butane	3014.09	3263.43	58.12	0.01	125.20	0.33	19.18	1502.41	0.12	0.38	4.53	0.41	4.90	98	0.38	0.00
Pentane	3710.70	4009.95	72.15	0.00	27.59	0.07	5.25	331.10	0.03	0.10	1.23	0.11	1.33	98	0.10	0.00
Hexane	4406.37	4755.42	86.18	0.00	17.51	0.05	3.98	210.13	0.02	0.08	0.93	0.08	1.00	98	0.08	0.00
CO	322.40	322.40	28.01	0.31	4346.44	11.45	320.81	52157.29	1.92	1.40	16.82	1.40	16.82	98	6.42	0.04
CO2	0.00	0.00	44.01	15.50	219918.96	579.52	25504.69	2639027.54	153.03	0.00	0.00	0.00	0.00	0	25504.69	153.03
H2S	587.78	637.62	34.082	0.00	0.99	0.00	0.09	11.93	0.00	0.00	0.01	0.00	0.01	98	1.79E-03	1.07E-05
VOC [4]	-	-	-	0.070	996.775	2.627	124.442	11961.298	0.747	-	-	-	-	98	2.489	0.015
HAP [5]	-	-	-	0.001	17.510	0.046	3.977	210.125	0.024	-	-	-	-	98	0.080	0.000
TOTAL	300.37	341.91	14.60	100.00	1418430.28	3737.78		17021163.33	327.52	426.05	5112.57	484.97	5819.68	-	-	-

[1] The assumed destruction rate efficiency (DRE) of the flare is 98%.
[2] Hourly emissions from flare, lb/hr = Mole Fraction * hourly flow rate in scf/hr / standard volume * MW * (1- DRE).
[3] Annual emission rate = hourly rate (lb/hr) * annual operating hours (hrs/yr) * (1 ton/2000 lb)
[4] VOCs include non-methane and non-ethane hydrocarbons.
[5] HAPs are compounds designated as hazardous air pollutants by the US EPA.

Shutdown Vent Gas - Outlet LT Shift Converter

Flow Rate (scf/hr):	385935	Engineering Standard Temperature:	60 °F	15.56 °C
Hourly Heat Input (LHV, MMBtu/hr):	115.92	Standard Pressure:	1 atm	
Low Heat Content (Btu/scf):	300.36	Standard Volume:	379.48 ft3/lbmol	
Hourly Heat Input (HHV, MMBtu/hr)	131.95			
High Heat Content (Btu/scf):	341.91			
Annual Operating Hours (hrs/yr):	12			
Annual Heat Input (LHV, MMBtu/yr):	1391.05			
Annual Heat Input (HHV, MMBtu/yr):	1583.44			

Flare Criteria and Other Pollutant Emission Factors

Pollutant	Emission Factor	Unit	Source	Notes
NOX	0.068	lb/MMBtu	AP-42, Section 13.5, Table 13.5-1	based on HHV
CO	0.31	lb/MMBtu	AP-42, Section 13.5, Table 13.5-2	based on LHV
VOC [1]	-	lb/MMScf	-	-
PM/PM10/PM2.5 [2]	7.6	lb/MMScf	AP-42, Section 1.4, Table 1.4-1	based on HHV
SO2 [3]	1.76	ppmv S	Fuel Selection	no sulfur in the stream

[1] VOC emissions were calculated based on the amount of VOC in the flare stream and a destruction efficiency of 98%.
[2] All particulate matter is conservatively assumed to be less than 1 µm per AP-42, Table 1.4-1, footnote c.
[3] When this gas is flared, NG will be used as supplemental fuel. The sulfur content of the gas stream comes from the NG.

Criteria Pollutants Emissions from Flaring this Shutdown Stream

Pollutant	Hourly Emission Rate [1]	Annual Emissions
	(lb/hr)	(TPY)
NOX	8.97	0.05
CO	35.94	0.22
VOC	0.68	0.00
PM	0.98	0.01
PM10	0.98	0.01
PM2.5	0.98	0.01
SO2 [2]	0.11	0.00

[1] Summary includes the emissions from flaring this vent gas only
[2] CO2e emissions quantified in subsequent table using the vent gas composition
[2] When this gas is flared, NG will be used as supplemental fuel. The sulfur content of the gas stream comes from the NG.

Non-criteria Pollutant Emissions from Flaring this Shutdown Stream

Component	LHV	HHV	MW	Startup Vent Gas - Outlet Sulfur Absorber	Flow Rate					Heat Input				DRE, % [1]	Emissions	
	Btu/scf @ 60 °F	Btu/scf @ 60 °F	lb/lbmol	mol%	scfh @ 60 °F	lbmol/hr	lb/hr	scfy	ton/yr	LHV (MMBtu/hr)	LHV (MMBtu/yr)	HHV (MMBtu/hr)	HHV (MMBtu/yr)		lb/hr [2]	tpy [3]
Hydrogen	275.15	325.15	2.02	45.82	176837.30	465.99	941.31	2122047.64	5.65	48.66	583.88	57.50	689.99	98	18.83	0.11
Nitrogen	0.00	0.00	28.01	0.19	733.89	1.93	54.17	8806.64	0.33	0.00	0.00	0.00	0.00	0	54.17	0.33
Argon	0.00	0.00	39.95	0.11	425.78	1.12	44.82	5109.41	0.27	0.00	0.00	0.00	0.00	0	44.82	0.27
Water	0.00	0.00	18.02	19.97	77056.52	203.06	3659.06	924678.19	21.95	0.00	0.00	0.00	0.00	0	3659.06	21.95
Methane	909.60	1009.15	16.04	16.97	65509.45	172.63	2768.94	786113.37	16.61	59.59	715.05	66.11	793.30	98	55.38	0.33
Ethane	1619.01	1768.85	30.07	1.06	4080.86	10.75	323.36	48970.31	1.94	6.61	79.28	7.22	86.62	98	6.47	0.04
Propane	2385.00	2590.00	44.1	0.06	224.87	0.59	26.13	2698.41	0.16	0.54	6.44	0.58	6.99	98	0.52	0.00
Butane	3014.09	3263.43	58.12	0.01	34.06	0.09	5.22	408.78	0.03	0.10	1.23	0.11	1.33	98	0.10	0.00
Pentane	3710.70	4009.95	72.15	0.00	7.51	0.02	1.43	90.09	0.01	0.03	0.33	0.03	0.36	98	0.03	0.00
Hexane	4406.37	4755.42	86.18	0.00	4.76	0.01	1.08	57.17	0.01	0.02	0.25	0.02	0.27	98	0.02	0.00
CO	322.40	322.40	28.01	0.31	1182.61	3.12	87.29	14191.30	0.52	0.38	4.58	0.38	4.58	98	1.75	0.01
CO2	0.00	0.00	44.01	15.50	59837.00	157.68	6939.48	718044.05	41.64	0.00	0.00	0.00	0.00	0	6939.48	41.64
H2S	587.78	637.62	34.082	0.00	0.27	0.00	0.02	3.25	0.00	0.00	0.00	0.00	0.00	98	4.86E-04	2.92E-06
VOC [4]	-	-	-	0.070	271.204	0.715	33.858	3254.448	0.203	-	-	-	-	98	0.677	0.004
HAP [5]	-	-	-	0.001	4.764	0.013	1.082	57.171	0.006	-	-	-	-	98	0.022	0.000
TOTAL	300.36	341.91	14.60	100.00	385934.61	1017.00		4631215.35	89.11	115.92	1391.05	131.95	1583.44	-	-	-

[1] The assumed destruction rate efficiency (DRE) of the flare is 98%.
[2] Hourly emissions from flare, lb/hr = Mole Fraction * hourly flow rate in scf/hr / standard volume * MW * (1- DRE).
[3] Annual emission rate = hourly rate (lb/hr) * annual operating hours (hrs/yr) * (1 ton/2000 lb)
[4] VOCs include non-methane and non-ethane hydrocarbons.
[5] HAPs are compounds designated as hazardous air pollutants by the US EPA.

Shutdown Vent Gases - Outlet Waste Heat Boiler + Outlet Pre-reformer + Outlet Sulfur Absorber

Flow Rate (scf/hr):	1143755	Engineering Standard Temperature:	60 °F	15.56 °C
Hourly Heat Input (LHV, MMBtu/hr):	661.22	Standard Pressure:	1 atm	
Low Heat Content (Btu/scf):	578.12	Standard Volume:	379.48 ft3/lbmol	
Hourly Heat Input (HHV, MMBtu/hr)	729.63			
High Heat Content (Btu/scf):	637.92			
Annual Operating Hours (hrs/yr):	12			
Annual Heat Input (LHV, MMBtu/yr):	7934.67			
Annual Heat Input (HHV, MMBtu/yr):	8755.56			

Flare Criteria and Other Pollutant Emission Factors

Pollutant	Emission Factor	Unit	Source	Notes
NOX	0.068	lb/MMBtu	AP-42, Section 13.5, Table 13.5-1	based on HHV
CO	0.31	lb/MMBtu	AP-42, Section 13.5, Table 13.5-2	based on LHV
VOC [1]	-	lb/MMScf	-	-
PM/PM10/PM2.5 [2]	7.6	lb/MMScf	AP-42, Section 1.4, Table 1.4-1	based on HHV
SO2 [3]	0	ppmv S	Fuel Selection	no sulfur in the stream

[1] VOC emissions were calculated based on the amount of VOC in the flare stream and a destruction efficiency of 98%.
[2] All particulate matter is conservatively assumed to be less than 1 µm per AP-42, Table 1.4-1, footnote c.
[3] The vent gas does not contain any sulfur.

Criteria Pollutants Emissions from Flaring this Shutdown Stream

Pollutant	Hourly Emission Rate [1]	Annual Emissions
	(lb/hr)	(TPY)
NOX	49.61	0.30
CO	204.98	1.23
VOC	5.21	0.03
PM	5.44	0.03
PM10	5.44	0.03
PM2.5	5.44	0.03
SO2 [2]	0.00	0.00

[1] Summary includes the emissions from flaring this vent gas only
[2] CO2e emissions quantified in subsequent table using the vent gas composition
[2] The vent gas does not contain any sulfur.

Non-criteria Pollutant Emissions from Flaring this Shutdown Stream

Component	LHV	HHV	MW	Startup Vent Gas - Outlet Sulfur Absorber	Flow Rate					Heat Input				DRE, % [1]	Emissions	
	Btu/scf @ 60 °F	Btu/scf @ 60 °F	lb/lbmol	mol%	scfh @ 60 °F	lbmol/hr	lb/hr	scfy	ton/yr	LHV (MMBtu/hr)	LHV (MMBtu/yr)	HHV (MMBtu/hr)	HHV (MMBtu/yr)		lb/hr [2]	tpy [3]
Hydrogen	275.15	325.15	2.02	2.82	32211.98	84.88	171.46	386543.80	1.03	8.86	106.36	10.47	125.69	98	3.43	0.02
Nitrogen	0.00	0.00	28.01	0.29	3282.35	8.65	242.27	39388.23	1.45	0.00	0.00	0.00	0.00	0	242.27	1.45
Argon	0.00	0.00	39.95	0.08	869.22	2.29	91.51	10430.60	0.55	0.00	0.00	0.00	0.00	0	91.51	0.55
Water	0.00	0.00	18.02	28.63	327444.68	862.87	15548.87	3929336.21	93.29	0.00	0.00	0.00	0.00	0	15548.87	93.29
Methane	909.60	1009.15	16.04	54.15	619297.35	1631.94	26176.38	7431568.22	157.06	563.32	6759.79	624.96	7499.53	98	523.53	3.14
Ethane	1619.01	1768.85	30.07	2.74	31375.25	82.68	2486.15	376502.98	14.92	50.80	609.56	55.50	665.98	98	49.72	0.30
Propane	2385.00	2590.00	44.1	0.15	1728.47	4.55	200.87	20741.59	1.21	4.12	49.47	4.48	53.72	98	4.02	0.02
Butane	3014.09	3263.43	58.12	0.02	261.90	0.69	40.11	3142.85	0.24	0.79	9.47	0.85	10.26	98	0.80	0.00
Pentane	3710.70	4009.95	72.15	0.01	57.72	0.15	10.97	692.62	0.07	0.21	2.57	0.23	2.78	98	0.22	0.00
Hexane	4406.37	4755.42	86.18	0.00	36.63	0.10	8.32	439.55	0.05	0.16	1.94	0.17	2.09	98	0.17	0.00
CO	322.40	322.40	28.01	8.94	102230.25	269.39	7545.68	1226762.96	45.27	32.96	395.51	32.96	395.51	98	150.91	0.91
CO2	0.00	0.00	44.01	2.18	24958.76	65.77	2894.55	299505.12	17.37	0.00	0.00	0.00	0.00	0	2894.55	17.37
VOC [4]	-	-	-	0.182	2084.719	5.494	260.270	25016.623	1.562	-	-	-	-	98	5.205	0.031
HAP [5]	-	-	-	0.003	36.630	0.097	8.318	439.555	0.050	-	-	-	-	98	0.166	0.001
TOTAL	578.12	637.92	18.39	100.00	1143754.56	3013.97		13725054.74	332.50	661.22	7934.67	729.63	8755.56	-	-	-

[1] The assumed destruction rate efficiency (DRE) of the flare is 98%.
[2] Hourly emissions from flare, lb/hr = Mole Fraction * hourly flow rate in scf/hr / standard volume * MW * (1- DRE).
[3] Annual emission rate = hourly rate (lb/hr) * annual operating hours (hrs/yr) * (1 ton/2000 lb)
[4] VOCs include non-methane and non-ethane hydrocarbons.
[5] HAPs are compounds designated as hazardous air pollutants by the US EPA.

Table N-7 Flare (119-FL-9501)

119-FL-9501 will use natural gas as fuel for the pilot burner, and control the startup / shutdown streams.

Name: Flare Emission Unit ID: 119-FL-9501

Max. Fuel Input	2274.71	MMBtu/hr
Annual Fuel Input	71642.14	MMBtu/yr

Emission Summary

HAP Emission Estimation from Combined Flare (H7401)

Emission Unit ID : H7401

Hourly Heat Input = 2274.71 MMBtu/hr

Annual Heat Input = 71642.14 MMBtu/yr

				HAP			
Pollutant	**EF [1]**	**EF [2]**	**§112 HAP? [3]**	**Max Hourly [4]**	**Avg. Hourly [5]**	**Annual [6]**	**Annual [7]**
	(lb/MMSCF)	**(lb/MMBtu)**		**(lb/hr)**	**(lb/hr)**	**(lb/yr)**	**(TPY)**
2-Methylnaphthalene	0.000024	2.35E-08	YES	5.35E-05	1.92E-07	1.69E-03	8.43E-07
3-Methylchloranthrene	0.0000018	1.76E-09	YES	4.01E-06	1.44E-08	1.26E-04	6.32E-08
7,12-Dimethylbenz(a)a	0.000016	1.57E-08	YES	3.57E-05	1.28E-07	1.12E-03	5.62E-07
Acenaphthene	0.0000018	1.76E-09	YES	4.01E-06	1.44E-08	1.26E-04	6.32E-08
Anthracene	0.0000024	2.35E-09	YES	5.35E-06	1.92E-08	1.69E-04	8.43E-08
Benzo(a)anthracene	0.0000018	1.76E-09	YES	4.01E-06	1.44E-08	1.26E-04	6.32E-08
Benzene	0.0021	2.06E-06	YES	4.68E-03	1.68E-05	1.47E-01	7.37E-05
Benzo(a)pyrene	0.0000012	1.18E-09	YES	2.68E-06	9.62E-09	8.43E-05	4.21E-08
Benzo(b)fluoranthene	0.0000018	1.76E-09	YES	4.01E-06	1.44E-08	1.26E-04	6.32E-08
Benzo(g,h,i)perylene	0.0000012	1.18E-09	YES	2.68E-06	9.62E-09	8.43E-05	4.21E-08
Benzo(k)fluoranthene	0.0000018	1.76E-09	YES	4.01E-06	1.44E-08	1.26E-04	6.32E-08
Butane	2.1	2.06E-03	NO	4.68E+00	1.68E-02	1.47E+02	7.37E-02
Chrysene	0.0000018	1.76E-09	YES	4.01E-06	1.44E-08	1.26E-04	6.32E-08
Dibenzo(a,h)anthracer	0.0000012	1.18E-09	YES	2.68E-06	9.62E-09	8.43E-05	4.21E-08
Dichlorobenzene	0.0012	1.18E-06	YES	2.68E-03	9.62E-06	8.43E-02	4.21E-05
Ethane	3.1	3.04E-03	NO	6.91E+00	2.49E-02	2.18E+02	1.09E-01
Fluoranthene	0.000003	2.94E-09	YES	6.69E-06	2.41E-08	2.11E-04	1.05E-07
Fluorene	0.0000028	2.75E-09	YES	6.24E-06	2.25E-08	1.97E-04	9.83E-08
Formaldehyde	0.075	7.35E-05	YES	1.67E-01	6.01E-04	5.27E+00	2.63E-03
Hexane	1.8	1.76E-03	YES	4.01E+00	1.44E-02	1.26E+02	6.32E-02
Indeno(1,2,3-cd)pyren	0.0000018	1.76E-09	YES	4.01E-06	1.44E-08	1.26E-04	6.32E-08
Naphthalene	0.00061	5.98E-07	YES	1.36E-03	4.89E-06	4.28E-02	2.14E-05
Pentane	2.6	2.55E-03	NO	5.80E+00	2.08E-02	1.83E+02	9.13E-02
Phenanthrene	0.000017	1.67E-08	YES	3.79E-05	1.36E-07	1.19E-03	5.97E-07
Propane	1.6	1.57E-03	NO	3.57E+00	1.28E-02	1.12E+02	5.62E-02
Pyrene	0.000005	4.90E-09	YES	1.12E-05	4.01E-08	3.51E-04	1.76E-07
Toluene	0.0034	3.33E-06	YES	7.58E-03	2.73E-05	2.39E-01	1.19E-04
Lead	0.0005	4.90E-07	YES	1.12E-03	4.01E-06	3.51E-02	1.76E-05
Arsenic	0.0002	1.96E-07	YES	4.46E-04	1.60E-06	1.40E-02	7.02E-06
Barium	0.0044	4.31E-06	NO	9.81E-03	3.53E-05	3.09E-01	1.55E-04
Beryllium	0.000012	1.18E-08	YES	2.68E-05	9.62E-08	8.43E-04	4.21E-07
Cadmium	0.0011	1.08E-06	YES	2.45E-03	8.82E-06	7.73E-02	3.86E-05
Chromium	0.0014	1.37E-06	YES	3.12E-03	1.12E-05	9.83E-02	4.92E-05
Cobalt	0.000084	8.24E-08	YES	1.87E-04	6.74E-07	5.90E-03	2.95E-06
Copper	0.00085	8.33E-07	NO	1.90E-03	6.82E-06	5.97E-02	2.99E-05
Manganese	0.00038	3.73E-07	YES	8.47E-04	3.05E-06	2.67E-02	1.33E-05
Mercury	0.00026	2.55E-07	YES	5.80E-04	2.08E-06	1.83E-02	9.13E-06
Molybdenum	0.0011	1.08E-06	NO	2.45E-03	8.82E-06	7.73E-02	3.86E-05
Nickel	0.0021	2.06E-06	YES	4.68E-03	1.68E-05	1.47E-01	7.37E-05
Selenium	0.000024	2.35E-08	YES	5.35E-05	1.92E-07	1.69E-03	8.43E-07
Vanadium	0.0023	2.25E-06	NO	5.13E-03	1.84E-05	1.62E-01	8.08E-05
Zinc	0.029	2.84E-05	NO	6.47E-02	2.33E-04	2.04E+00	1.02E-03
			Total § 112 HAPs	4.21E+00		132.64	0.07

Notes:

1. Emission factors obtained from US EPA AP-42 Section 1.4 Natural Gas Combustion (7/98), Tables 1.4-3 and 1.4-4.
2. Emission factors (lb/MMBtu) = Emission factors (lb/MMScf)/(1020 MMBtu/MMScf).
3. Listed US EPA Hazardous Air Pollutants.
4. Max Hourly Emissions = Emission Factor (lb/MMBtu) *Max Heat Input Capacity (MMBtu/hr)
5. Average Hourly Emissions = Annual Emissions (lb/yr) / (8760 hrs/yr)
6. Maximum Annual Emission Rate (lb/yr) = Emission Factor (lb/MMBtu) * Heat Input Capacity (MMBtu/yr)
7. Maximum Potential Annual Emission Rate (tpy) = Annual Emissions (lb/yr) * ((1 ton/2000 lb).

Table N-8 Fixed Roof Tanks Emissions
MGS H2 1, LLC

Fixed roof tank emissions:
Breathing and working losses from fixed roof tanks were estimated using equations and methodology from AP-42 Chapter 7.
Emissions are based on the anticipated annual throughput for each tank along with the material composition to be stored.

Equipment ID	Description	Tank Type	Throughput	Maximum Filling Rate	Working Volume		Shell Height/Length	Max. Liquid Height	Diameter	Heated/Insulated		Control
			(bbl/yr)	(bbl/hr)	(bbl)	(gal)	(ft)	(ft)	(ft)	(Y/N)	°F	
118-TK-9901	Amine Makeup Tank	Vertical	31,319.01	71.43	26,319	1,105,398	48	38.4	70	Y	50	to atmosphere
TOTAL	1											

Table N-8 Fixed Roof Tank Emissions

Company Name	MGS H2 1, LLC
Site Name	H2 Plant
Emission Unit ID	118-TK-9901
Description	Amine Makeup Tank

INPUT DATA

Tank Data

Tank Type (Vertical or Horizontal)				Vertical Fixed Roof
Diameter, D	D	ft		70.00
Height, H (or length for horizontal tanks)	H_S	ft		48.00
Roof Type				Cone
Cone Roof Slope (cone roof only), S_R	S_R	dimensionless, default 0.0625		0.0625
Shell Paint Color				White
Shell Paint Condition				Good
Roof Paint Color				White
Roof Paint Condition				Good
Breather Vent Pressure Setting, P_{BP}	P_{BP}	psig (default is 0.03)		0.03
Breather Vent Vacuum Setting, P_{BV}	P_{BV}	psig (default is - 0.03)		-0.03
Pressure of Vapor Space at Normal Conditions, P_I	P_I	psig (default is 0)		0
Maximum Liquid Height, H_{LX}	H_{LX}	ft		38.40
Minimum Liquid Height, H_{LN}	H_{LN}	ft		1
Average Liquid Height, H_{LA}	H_{LA}	ft	H_{LX}/2	19.20
Maximum Hourly Throughput, Q_{MAX}	Q_{MAX}	bbl/hr		71.43
Annual Throughput, Q_{ANN}	Q_{ANN}	bbl/yr		31319.01
Control Type				NA
Control Efficiency				NA
Tank insulated?				Yes
	T_{LA}, T_B, T_{LX}, T_{LN}	°R		509.67
Tank Maximum Liquid Volume, V_{LX}	V_{LX}	Gal		1076686.71

Meteorological Data

Daily Min. Ambient Temp, T_{AN}	T_{AN}	°F		46.2
Daily Max. Ambient Temp, T_{AX}	T_{AX}	°F		65.3
Daily Total Solar Insolation, I	I	Btu/(ft^2-day)		1250
Atmospheric Pressure, P_A	P_A	psia (default is 14.7)		14.26

Material Data

Working Loss Product Factor, K_P	K_P	dimensionless (0.75 for crude oils, 1.0 for all other organic liquids)	1

Table N-8 Fixed Roof Tanks Emissions
MGS H2 1, LLC

Total Losses, L_T (Eq. 1-1)	L_T	tpy	$L_T = L_S + L_W$	0.04
Total Losses, L_T (Eq. 1-1)	L_T	lb/yr	$L_T = L_S + L_W$	83.06
Standing Storage Losses, L_S (Eq. 1-4)	Ls	lb/yr	$L_S = 365V_VW_VK_EK_S$	0.00
Tank Vapor Space Volume, V_V (Eq. 1-3)	V_V	ft^3	$V_V = ((\pi/4)D_E^2)H_{VO}$	113641.55
Vapor Space Outage, H_{VO} (Eq. 1-16)	H_{VO}	ft	$H_{VO} = H_S - H_L + H_{RO}$ (vertical tanks)	29.53
Cone Roof Outage, H_{RO} (Eq. 1-17)	H_{RO}	ft	$H_{RO} = H_R/3$ (cone roof)	0.73
Cone Tank Roof Height, H_R (Eq. 1-18)	H_R	ft	$H_R = S_RR_S$ (cone roof)	2.19
Vapor Space Expansion Factor, K_E (Eq. 1-5)	K_E	dimensionless	$K_E = \Delta T_V/T_{LA} + (\Delta P_V - \Delta P_B)/(P_A - P_{VA})$	0.00
Vapor Space Expansion Factor, K_E (Eq. 1-12)	K_E	dimensionless	$K_E = 0.0018\Delta T_V$	0.00
Average Daily Vapor Temperature Range, ΔT_V (Eq. 1-6)	ΔT_V	°R	$\Delta T_V = (1\text{-}0.8/(2.2*(Hs/D)+1.9))\Delta T_A + (0.042\alpha_RI+0.026(Hs/D)\alpha_SI)/(2.2(Hs/D)+1.9)$	0.00
Average Daily Vapor Temperature Range, ΔT_V (Eq. 1-7)	ΔT_V	°R	$\Delta T_V = 0.7\Delta T_A + 0.02\alpha I$	0.00
Paint Solar Absorptance, α (Table 7.1-6)		dimensionless		0.17
Average Daily Ambient Temperature Range, ΔT_A (Eq. 1-11)	ΔT_A	°R	$\Delta T_A = T_{AX} - T_{AN}$	19.10
Average daily liquid Surface Temperature, T_{LA} (Eq. 1-27)	T_{LA}	°R	$T_{LA} = (0.5\text{-}0.8/(4.4(Hs/D)+3.8))T_{AA} + (0.5 + 0.8/(4.4(Hs/D)+3.8))T_B + (0.021\alpha_RI + 0.013 (Hs/D)\alpha_sI)/(4.4(Hs/D)+3.8))$	509.67
		°F		50.00
		°C		10.00
		K		283.15
Average daily Liquid Surface Temperature, T_{LA} (Eq. 1-28)	T_{LA}	°R	$T_{LA} = 0.4T_{AA} + 0.6T_B+0.005\alpha I$	509.67
		°F		50.00
		°C		10.00
		K		283.15
Liquid Bulk Temperature, T_B (Eq. 1-31)	T_B	°R	$T_B = T_{AA} + 0.003\alpha I$	509.67
		°F		50.00
Average Daily Ambient Temperature, T_{AA} (Eq. 1-30)	T_{AA}	°R	$T_{AA} = (T_{AX} + T_{AN})/2$	515.42
Average Daily Minimum Liquid Surface Temperature, T_{LN} (Fig 7.1-17)	T_{LN}	°R	$T_{LN} = T_{LA} - 0.25\Delta T_V$	509.67
		°F		50.00
		°C		10.00
		K		283.15
Average Daily Maximum Liquid Surface Temperature, T_{LX} (Fig. 7.1-17)	T_{LX}	°R	$T_{LX} = T_{LA} + 0.25\Delta T_V$	509.67
		°F		50.00
		°C		10.00
		K		283.15

Table N-8 Fixed Roof Tanks Emissions
MGS H2 1, LLC

Daily Vapor Pressure Range, ΔP_V (Eq. 1-9)	ΔP_V	psia	$\mathbf{\Delta} P_V = P_{VX} - P_{VN}$	0.000
Is the fixed roof tank is of bolted or riveted construction?				Yes
Breather Vent Pressure Setting Range, ΔP_B (Eq. 1-10)	ΔP_B	psig	$\mathbf{\Delta} P_B = P_{BP} - P_{BV}$	0
Vented Vapor Saturation Factor, K_S (Eq. 1-21)	K_S	dimensionless	$K_S = 1/(1 + 0.053 P_{VA} H_{VO})$	0.81
Vapor Pressure at the Average Daily Liquid Surface Temp., P_{VA} (Eq. 1-24)	P_{VA}	psia		0.1451
Stock Vapor Density, W_V (Eq. 1-22)	W_V	lb/ft^3	$W_V = (M_V P_{VA})/(RTv)$	4.73E-04
Vapor Molecular Weight, M_V (Eq. 1-23)	M_V	lb/lb-mol		18.06
Average Vapor Temperature, T_V (Eq. 1-32)	T_V	°R	$T_V = ((2.2(Hs/D)+1.1)T_{AA} + 0.8T_B + 0.021\boldsymbol{\alpha}_R I + 0.013(Hs/D)\boldsymbol{\alpha}_s I)/(2.2(Hs/D)+1.9)$	515.94
Average Vapor Temperature, T_V (Eq. 1-33)	T_V	°R	$T_V = 0.7T_{AA} + 0.3T_B + 0.009\alpha I$	509.67
Working Loss, L_W (Eq. 1-29)	L_W	lb/yr	$L_W = V_Q K_N K_P W_V K_B$	83.06
Number of Turnovers per Year, N (Eq. 1-30)	N	dimensionless	$N = 5.614Q/V_{LX}$	1.22
Working Loss Turnover (saturation) factor, K_N	K_N	dimensionless		1.00
Working Loss Product Factor, K_P	K_P	dimensionless		1
Tank Maximum Liquid Volume, V_{LX} (Eq. 1-31)	V_{LX}	ft^3	$V_{LX} = (\boldsymbol{\pi}/4)D^2(H_{LX}-H_{LN})$	143932.07
Vent Setting Correction Factor Test (Eq. 1-40)			$K_N(P_{BP} + P_A)/(P_I + P_A) > 1.0$	1.002
Vent Setting Correction Factor, K_B (Eq. 1-41)	K_B	dimensionless		0.998
Vent Setting Correction Factor, K_B	K_B	dimensionless	$K_B = (((P_I + P_A)/K_N) - P_{VA})/(P_{BP} + P_A - P_{VA})$	0.998

MAXIMUM HOURLY EMISSIONS (TCEQ GUIDANCE DOCUMENT "ESTIMATING SHORT TERM EMISSION RATES FROM FIXED ROOF TANKS", 02/20)

Maximum Short-Term Emission Rate, L_{MAX} (Eq. 1)	L_{MAX}	lb/hr	$L_{MAX} = (M_V \times P_{VA} \times FR_M)/(R \times T)$	0.28
Vapor Molecular Weight of the Compound, M_V		lb/lbmol		28.80
Maximum Filling Rate, FR_M		gal/hr		3000.00
Ideal Gas Constant, R	R	[(psia × gal)/(lbmol × ° R)]		80.27
Worst Case Liquid Surface Temperature, T	T_{LX} + 10	°R	input or 95 as max. ambient	554.67
Vapor Pressure of the Tank Contents at T_{MAX}	P_{VA}	psia		0.15

Speciated Emissions (118-TK-9901)

					118-TK-9901 Uncontrolled Emissions	
	Vapor Phase @ T_{LA}	Vapor Phase @ T_{LX}	Vapor Phase @ T_{LN}	Vapor Phase @ T_{max}		
Components	wt%	wt%	wt%	wt%	(lb/hr)	(tpy)
MEA	0.27	0.27	0.27	0.27	7.47E-04	1.10E-04
MDEA	0.05	0.05	0.05	0.05	0.0001	2.21E-05
Water	99.68	99.68	99.68	99.68	0.2807	0.0414

Table N-9 Equipment Leaks
MGS H2 1, LLC

Input Data:

Property	Value	Units
Hours of Operation	8760	Hours

Emissions Summary:

Pollutant	Fugitive Emissions	
	Hourly Emissions (lb/hr)	Annual Emissions (tpy)
VOC	5.37	23.54
CO	1.73	7.58
Ammonia	0.60	2.65

Equations:
1. TOC Emission Rate (lb/hr) = Component Count * TOC Emission Factor (kg/comp-hr) * 2.2
2. Hourly VOC Emissions (lb/hr) = TOC Emission Rate (lb/hr) * %wt VOC
3. Hourly Ammonia Emissions (lb/yr) = TOC Emission Rate (lb/hr) *%wt NH3

Calculation:

System	Product	Phase	Component	Component Count[2]	TOC Emission Factor (kg/comp-hr)[1]	Emission Rate (lb/hr)	VOC weight %	NH3 weight %	CO weight %[3]	Hourly VOC Emissions (lb/hr)	Hourly CO Emissions (lb/hr)	Annual VOC Emissions (tpy)	Annual CO Emissions (tpy)	Hourly Ammonia Emissions (lb/hr)	Annual Ammonia emissions (tpy)
1	Hydrogen	Gas/Vapor	Valves	151	0.00597	1.987	0	0	0	0.000	0.000	0.000	0.000	0.000	0.000
			Pump Seal	0	0	0.000	0	0	0	0.000	0.000	0.000	0.000	0.000	0.000
			Compressor Seal	2	0.228	1.005	0	0	0	0.000	0.000	0.000	0.000	0.000	0.000
			PSVs	11	0.104	2.522	0	0	0	0.000	0.000	0.000	0.000	0.000	0.000
			Flange	492	0.00183	1.985	0	0	0	0.000	0.000	0.000	0.000	0.000	0.000
			Open-ended Line [4]	35	0	0.000	0	0	0	0.000	0.000	0.000	0.000	0.000	0.000
2	Natural Gas	Gas/Vapor	Valves	117	0.00597	1.540	11.69	0	0	0.180	0.000	0.788	0.000	0.000	0.000
			Pump Seal	0	0	0.000	11.69	0	0	0.000	0.000	0.000	0.000	0.000	0.000
			Compressor Seal	0	0.228	0.000	11.69	0	0	0.000	0.000	0.000	0.000	0.000	0.000
			PSVs	8	0.104	1.834	11.69	0	0	0.214	0.000	0.939	0.000	0.000	0.000
			Flange	380	0.00183	1.533	11.69	0	0	0.179	0.000	0.785	0.000	0.000	0.000
			Open-ended Line [4]	27	0	0.000	11.69	0	0	0.000	0.000	0.000	0.000	0.000	0.000
3	Process Gas	Gas/Vapor	Valves	48	0.00597	0.632	0	0	0.06	0.000	0.000	0.000	0.002	0.000	0.000
			Pump Seal	0	0	0.000	0	0	0.06	0.000	0.000	0.000	0.000	0.000	0.000
			Compressor Seal	0	0.228	0.000	0	0	0.06	0.000	0.000	0.000	0.000	0.000	0.000
			PSVs	5	0.104	1.146	0	0	0.06	0.000	0.001	0.000	0.003	0.000	0.000
			Flange	148	0.00183	0.597	0	0	0.06	0.000	0.000	0.000	0.002	0.000	0.000
			Open-ended Line [4]	14	0	0.000	0	0	0.06	0.000	0.000	0.000	0.000	0.000	0.000
4	Reformed Process Gas	Gas/Vapor	Valves	30	0.00597	0.395	0	0	46.06	0.000	0.182	0.000	0.797	0.000	0.000
			Pump Seal	0	0	0.000	0	0	46.06	0.000	0.000	0.000	0.000	0.000	0.000
			Compressor Seal	0	0.228	0.000	0	0	46.06	0.000	0.000	0.000	0.000	0.000	0.000
			PSVs	3	0.104	0.688	0	0	46.06	0.000	0.317	0.000	1.388	0.000	0.000
			Flange	92	0.00183	0.371	0	0	46.06	0.000	0.171	0.000	0.749	0.000	0.000
			Open-ended Line [4]	8	0	0.000	0	0	46.06	0.000	0.000	0.000	0.000	0.000	0.000
5	Shifted Process Gas	Gas/Vapor	Valves	72	0.00597	0.948	0	0	7.85	0.000	0.074	0.000	0.326	0.000	0.000
			Pump Seal	0	0	0.000	0	0	7.85	0.000	0.000	0.000	0.000	0.000	0.000
			Compressor Seal	0	0.228	0.000	0	0	7.85	0.000	0.000	0.000	0.000	0.000	0.000
			PSVs	5	0.104	1.146	0	0	7.85	0.000	0.090	0.000	0.394	0.000	0.000
			Flange	236	0.00183	0.952	0	0	7.85	0.000	0.075	0.000	0.327	0.000	0.000
			Open-ended Line [4]	18	0	0.000	0	0	7.85	0.000	0.000	0.000	0.000	0.000	0.000
6	Syngas	Gas/Vapor	Valves	129	0.00597	1.698	0	0	0.74	0.000	0.013	0.000	0.055	0.000	0.000
			Pump Seal	0	0	0.000	0	0	0.74	0.000	0.000	0.000	0.000	0.000	0.000
			Compressor Seal	0	0.228	0.000	0	0	0.74	0.000	0.000	0.000	0.000	0.000	0.000
			PSVs	11	0.104	2.522	0	0	0.74	0.000	0.019	0.000	0.082	0.000	0.000
			Flange	412	0.00183	1.662	0	0	0.74	0.000	0.012	0.000	0.054	0.000	0.000
			Open-ended Line [4]	33	0	0.000	0	0	0.74	0.000	0.000	0.000	0.000	0.000	0.000
7	PSA Offgass	Gas/Vapor	Valves	91	0.00597	1.198	0	0	15.47	0.000	0.185	0.000	0.812	0.000	0.000
			Pump Seal	0	0	0.000	0	0	15.47	0.000	0.000	0.000	0.000	0.000	0.000
			Compressor Seal	2	0.228	1.005	0	0	15.47	0.000	0.156	0.000	0.681	0.000	0.000
			PSVs	7	0.104	1.605	0	0	15.47	0.000	0.248	0.000	1.088	0.000	0.000
			Flange	298	0.00183	1.202	0	0	15.47	0.000	0.186	0.000	0.815	0.000	0.000
			Open-ended Line [4]	22	0	0.000	0	0	15.47	0.000	0.000	0.000	0.000	0.000	0.000

Table N-9 Equipment Leaks
MGS H2 1, LLC

System	Product	Phase	Component	Component Count[2]	TOC Emission Factor (kg/comp-hr)[1]	Emission Rate (lb/hr)	VOC weight %	NH3 weight %	CO weight %[3]	Hourly VOC Emissions (lb/hr)	Hourly CO Emissions (lb/hr)	Annual VOC Emissions (tpy)	Annual CO Emissions (tpy)	Hourly Ammonia Emissions (lb/hr)	Annual Ammonia emissions (tpy)
8	Captured CO2	Gas/Vapor	Valves	200	0.00597	2.632	0	0	0.01	0.000	0.000	0.000	0.001	0.000	0.000
			Pump Seal	0	0.000	0.000	0	0	0.01	0.000	0.000	0.000	0.000	0.000	0.000
			Compressor Seal	7	0.228	3.519	0	0	0.01	0.000	0.000	0.000	0.002	0.000	0.000
			PSVs	18	0.104	4.127	0	0	0.01	0.000	0.000	0.000	0.002	0.000	0.000
			Flange	650	0.00183	2.622	0	0	0.01	0.000	0.000	0.000	0.001	0.000	0.000
			Open-ended Line [4]	52	0	0.000	0	0	0.01	0.000	0.000	0.000	0.000	0.000	0.000
9	Rich Amine	Heavy Liquid	Valves	44	0.00023	0.022	39	0	0.01	0.009	0.000	0.038	0.000	0.000	0.000
			Pump Seal	1	0.00862	0.019	39	0	0.01	0.007	0.000	0.032	0.000	0.000	0.000
			Compressor Seal	0	0	0.000	39	0	0.01	0.000	0.000	0.000	0.000	0.000	0.000
			PSVs	3	0.104	0.688	39	0	0.01	0.268	0.000	1.175	0.000	0.000	0.000
			Flange	151	0.00183	0.609	39	0	0.01	0.238	0.000	1.041	0.000	0.000	0.000
			Open-ended Line [4]	10	0	0.000	39	0	0.01	0.000	0.000	0.000	0.000	0.000	0.000
10	Semi Lean Amine	Heavy Liquid	Valves	86	0.00023	0.044	44.2	0	0	0.019	0.000	0.084	0.000	0.000	0.000
			Pump Seal	4	0.00862	0.076	44.2	0	0	0.034	0.000	0.147	0.000	0.000	0.000
			Compressor Seal	0	0	0.000	44.2	0	0	0.000	0.000	0.000	0.000	0.000	0.000
			PSVs	7	0.104	1.605	44.2	0	0	0.709	0.000	3.107	0.000	0.000	0.000
			Flange	308	0.00183	1.243	44.2	0	0	0.549	0.000	2.406	0.000	0.000	0.000
			Open-ended Line [4]	22	0	0.000	44.2	0	0	0.000	0.000	0.000	0.000	0.000	0.000
11	Lean Amine	Heavy Liquid	Valves	82	0.00023	0.042	64.35	0	0	0.027	0.000	0.117	0.000	0.000	0.000
			Pump Seal	2	0.00862	0.038	64.35	0	0	0.024	0.000	0.107	0.000	0.000	0.000
			Compressor Seal	0	0	0.000	64.35	0	0	0.000	0.000	0.000	0.000	0.000	0.000
			PSVs	7	0.104	1.605	64.35	0	0	1.033	0.000	4.524	0.000	0.000	0.000
			Flange	278	0.00183	1.122	64.35	0	0	0.722	0.000	3.161	0.000	0.000	0.000
			Open-ended Line [4]	22	0	0.000	64.35	0	0	0.000	0.000	0.000	0.000	0.000	0.000
O1	Natural Gas	Gas/Vapor	Valves	82	0.00597	1.079	11.69	0	0	0.126	0.000	0.553	0.000	0.000	0.000
			Pump Seal	0	0	0.000	11.69	0	0	0.000	0.000	0.000	0.000	0.000	0.000
			Compressor Seal	2	0.228	1.005	11.69	0	0	0.118	0.000	0.515	0.000	0.000	0.000
			PSVs	4	0.104	0.917	11.69	0	0	0.107	0.000	0.470	0.000	0.000	0.000
			Flange	228	0.00183	0.920	11.69	0	0	0.108	0.000	0.471	0.000	0.000	0.000
			Open-ended Line [4]	12	0	0.000	11.69	0	0	0.000	0.000	0.000	0.000	0.000	0.000
O2	Aqueous Ammonia	Light Liquid	Valves	61	0.00403	0.542	0	25	0	0.000	0.000	0.000	0.000	0.135	0.593
			Pump Seal	2	0.0199	0.088	0	25	0	0.000	0.000	0.000	0.000	0.022	0.096
			Compressor Seal	0	0	0.000	0	25	0	0.000	0.000	0.000	0.000	0.000	0.000
			PSVs	4	0.104	0.917	0	25	0	0.000	0.000	0.000	0.000	0.229	1.004
			Flange	216	0.00183	0.871	0	25	0	0.000	0.000	0.000	0.000	0.218	0.954
			Open-ended Line [4]	14	0	0.000	0	25	0	0.000	0.000	0.000	0.000	0.000	0.000
O3	Diesel	Heavy Liquid	Valves	29	0.00023	0.015	100	0	0	0.015	0.000	0.064	0.000	0.000	0.000
			Pump Seal	1	0.00862	0.019	100	0	0	0.019	0.000	0.083	0.000	0.000	0.000
			Compressor Seal	0	0	0.000	100	0	0	0.000	0.000	0.000	0.000	0.000	0.000
			PSVs	1	0.104	0.229	100	0	0	0.229	0.000	1.004	0.000	0.000	0.000
			Flange	109	0.00183	0.440	100	0	0	0.440	0.000	1.926	0.000	0.000	0.000
			Open-ended Line [4]	6	0	0.000	100	0	0	0.000	0.000	0.000	0.000	0.000	0.000

[1] Emission factors taken from protocol for equipment leak emission estimates, EPA-453/R-95-017, November 1995, Table 2-1 (SOCMI Average Emission Factors)
[2] Component Count estimated based on similar projects.
[3] Trace Compositions were assumed to be 0.01% by weight
[4] Open-ended Lines will be equipped with a cap, blind flange, plug, or a second valve; therefore a 100% control credit is taken.
[5] Sampling connections will be closed-purge connections; therefore a 100% control credit is taken.

Fidelis
H2 Plant
Natural Gas Composition

Representative Composition of Natural Gas

Natural Gas Composition	Molar Fraction[(1)] (mole %)	Molecular Weight (lb/lb-mole)	Weighted Sum (lb/lb-mole)	Weight Fraction (weight %)
Nitrogen	0.35	28.01	0.0980	0.5734
Carbon Dioxide	0.17	44.01	0.0757	0.4427
Methane	93.10	16.04	14.9360	87.3466
Ethane	5.99	30.07	1.8012	10.5335
Propane	0.33	44.10	0.1455	0.8510
i-Butane	0.02	58.12	0.0116	0.0680
n-Butane	0.03	58.12	0.0174	0.1020
i-Pentane	0.01	72.15	0.0051	0.0295
n-Pentane	0.00	72.15	0.0029	0.0169
C_{6+} Components	0.01	89.09	0.0062	0.0365
Total	100.0	-	17.10	100.00

Mass Fraction Conversion Data

Compound	Mol Weight (g/mol)	Mass in Gas Sample (g)	Mass Fraction	Mass %
CO2	44.01	7.57	0.0044	0.4427
N2	28.02	9.81	0.0057	0.5736
Methane	16.04	1493.32	0.8734	87.3386
Ethane	30.07	180.12	0.1053	10.5345
Propane	44.09	14.55	0.0085	0.8510
I-Butane	58.12	1.16	0.0007	0.0680
N-Butane	58.12	1.74	0.0010	0.1020
I-Pentane	72.15	0.51	0.0003	0.0295
N-Pentane	72.15	0.29	0.0002	0.0169
Other hexanes	86.18	0.60	0.0004	0.0353
n-hexane	86.18	0.11	0.0001	0.0066
2,2,4 - Trimethylpentane	114.23	0.01	0.0000	0.0005
Benzene	78.11	0.01	0.0000	0.0004
Toluene	92.14	0.01	0.0000	0.0003
Ethylbenzene	106.17	0.000	0.0000	0.0000
Xylenes	106.17	0.00	0.0000	0.0002

Notes:

(1) Natural gas analysis obtained from gas chromatograph readings from site data sheet.

Fidelis
H2 Plant
Fuel Gas Composition

Representative Composition of Process Vent Gas

Natural Gas Composition	Molar Fraction[(1)] (mole %)	Molecular Weight (lb/lb-mole)	Weighted Sum (lb/lb-mole)	Weight Fraction (weight %)
CO2	1.81	28.01	0.5073	0.6648
N2	6.49	44.01	2.8561	3.7425
Carbon Monoxide	4.89	28.01	1.3696	1.7947
Hydrogen	76.28	2.06	1.5721	2.0600
Argon	1.51	39.95	0.6035	0.7908
Methane	8.98	16.04	1.4409	1.8881
Ethane	0.04	30.07	0.0111	0.0146
Total	100.0	-	76.31	100.00

Mass Fraction Conversion Data

Compound	Mol Weight (g/mol)	Mass in Gas Sample (g)	Mass Fraction	Mass %
CO2	44.01	285.61	0.0866	8.6569
N2	28.02	50.74	0.0154	1.5380
Carbon Monoxide	16.04	78.43	0.0238	2.3772
Hydrogen	30.07	2293.64	0.6952	69.5197
Argon	44.09	66.60	0.0202	2.0187
Methane	58.12	522.09	0.1582	15.8243
Ethane	58.12	2.15	0.0007	0.0652
Total	278.47	3299.27	1.00	100.00

Notes:

(1) Hydrogen gas analysis obtained from gas chromatograph readings from site data sheet.

Attachment O: **Monitoring/Recordkeeping/Reporting/Testing Plans**

Section 4 of the application narrative provides an analysis of the applicability of state and federal regulations applicable to the facility and a summary of compliance requirements. MGSH2-1 will work with the Division of Air Quality to identify and address required Monitoring, Recordkeeping, Reporting, and Testing Plans. Requirements identified in the permit will be implemented.

Attachment P: Public Notice

(Affidavit of Publication to be provided)

AIR QUALITY PERMIT NOTICE
Notice of Application

Notice is given that MGS H2 1, LLC has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a Construction Permit for a Hydrogen Production Plant located at 1451 Airport rd. near Point Pleasant, in Mason County, West Virginia. The latitude and longitude coordinates are: 38.91338, -82.10118.

The applicant estimates the potential to discharge the following Regulated Air Pollutants will be: Nitrogen Oxides, 4.90 tons per year (TPY); Carbon Monoxide, 56.72 TPY; Volatile Organic Compounds, 30.13 TPY; Sulfur Dioxide, 6.00 TPY; Particulate Matter-10, 27.40 TPY; Total Hazardous Air Pollutants, 3.02 TPY.

Startup of operation is planned to begin on or about the 15th day of November, 2028. 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. Written comments will also be received via email at DEPAirQualityPermitting@WV.gov.

Any questions regarding this permit application should be directed to the DAQ at (304) 926-0499, extension 41281, during normal business hours.
Dated this the 10th day of August 2025.

By: MGS H2 1, LLC
Jack Calhoun
Vice President
109 Post Oak Lane, Suite 140
Houston, TX 77024

Attachment Q: Business **Confidential Claims** (Not Applicable)

Much of the equipment and technology is proprietary; However, there is no information in this permit application that is confidential.

Attachment R: Authority Forms (Not Applicable)

Authority Forms are only required when someone other than the responsible official signs the application.

Attachment S: Title V Permit Revision Information (Not Applicable)