west virginia department of environmental protection

Division of Air Quality
601 57th Street, SE
Charleston, WV 25304
Phone: (304) 926-0475

Harold D. Ward, Cabinet Secretary
dep.wv.gov

ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.:	R13-3625
Plant ID No.:	029-00091
Applicant:	Form Energy, Inc.
Facility Name:	Weirton Plant
Location:	Weirton, Hancock County
SIC/NAICS Code:	3691/335910
Application Type:	Construction
Received Date(s):	July 7, 2023 (Original) October 19, 2023 (Final)
Engineer Assigned:	Joe Kessler
Fee Amount:	$2,000
Dates Received:	July 17, 2023 ($1,000) July 26, 2023 ($1,000)
Complete Date:	October 19, 2023
Due Date:	January 18, 2024
Applicant's Ad Date:	July 21, 2023
Newspaper:	*Weirton Daily Times*
UTM's:	534.561 km Easting • 4,474.479 km Northing • Zone 17
Latitude/Longitude:	40.42022/-80.59261
Description:	Construction of a 50mW/year Iron-Air Battery Production Plant.

DESCRIPTION OF PROCESS

Form Energy, Inc. (FEI) is proposing to construct an Iron-Air Battery Production Plant at a portion of the former site of the Weirton Steel plant at 1725 Main Street, Weirton, WV. Iron-Air batteries are an alternative to using lithium-based batteries for long-term energy storage to help the power grid utilize intermittent renewable sources of energy such as solar and wind.

Iron-Air Battery Overview

Iron-air batteries are a type of metal-air battery that generate electrical energy by the reaction between iron (Fe) and oxygen (O_2). These batteries operate by utilizing the oxidation and reduction

reactions of iron to convert chemical energy into electrical energy. Generally, the basic components of an iron-air battery include an anode (negative electrode) made of iron, a cathode (positive electrode) made of a catalyst to facilitate the oxygen reaction, and an electrolyte that allows the flow of ions between the anode and cathode.

During battery discharge, when the iron-air batteries generate electricity, the iron anode undergoes oxidation (loses electrons), producing $Fe2^{+}$ ions. At the same time, oxygen from the ambient air is reduced (gains electrons) at the cathode, typically by using a carbon-based catalyst. This reaction produces hydroxyl ions (OH^{-}) when combined with water from the air. The overall reaction is: $2\ Fe + O_2 + 4H2O \rightarrow 2\ Fe(OH)_2$. The generated hydroxyl ions then migrate through the electrolyte to the anode, where they react with the Fe2+ ions to form iron hydroxide ($Fe(OH)_2$) in the following reaction: $2\ Fe(OH)_2 \rightarrow 2\ Fe(OH)_3 + 2e^{-}$. This reaction releases electrons, which flow through an external circuit, providing the desired electrical energy for powering devices.

During the battery charging process, an external power source is used to reverse the reactions by supplying electrons to the iron anode. The iron hydroxide layers on the anode are converted back to iron and oxygen is released from the cathode. This process allows the battery to be recharged and ready for subsequent discharge cycles.

FEI Process Description

FEI is proposing to construct a maximum 50mW/year iron-air battery plant, with the specific production of 1,000 individual 5 kW battery cells per year. FEI stated in their application that installation will occur in two phases simultaneously, the construction of a 5mW/year module and the full production 50mW/year process line. The 5mW/year line will be integrated into the full production line and the maximum production will not exceed 50mW/year. FEI also stated that a future upscale to a 500 mW/yr line is possible in 2029 subject to additional permitting and an analysis of the major source applicability of the modified source.

Similar to the general process above, the FEI facility can be broken down into its component parts: Anode Process Line, Cathode 1 Process Line, Cathode 2 Process Line, Module and Cell Assembly, and Auxiliary Operations.

The Anode Process Line (1S-1) involves blending, compacting, and drying various feedstocks (main powder, powder additive, oil additives, and nitrogen) to produce the anode. The powdered feedstocks (main powder and powder additives) are received in super sacks and then emptied into small containers for use in the production process. The process line also uses up to four (4) electrically-powered 120 kW_e electric Furnaces (1S-2 through 1S-5) to provide heat to the process. The material handling operations utilize a Dust Collector (1C-1) for control of the Anode Process Line. This dust collection system uses hoods to capture dust (at a minimum of 85%) produced at the various mixing and blending stations and evacuate it to the control device.

The Cathode 1 Process Line (2S-1) is similar in that it also involves blending, compacting, and drying various feedstocks (lubricant, carbon black, binders, and thermal oil) to produce the cathode. Again the powdered feedstocks (carbon black) are received in super sacks. However, this line does not utilize furnaces. The material handling operations also uses a dust collection system and a Dust Collector (2C-1) for control of the potential particulate matter emissions. An 8.00 mmBtu/hr natural gas-fired Recuperative Thermal Oxidizer (2C-2) is also used in this process line to control

VOCs evaporated from some of the feedstock materials with a minimum destruction and removal efficiency (DRE) of 95%.

The Cathode 2 Process Line (3S-2) is used for the application of coatings to additional parts of the cathode side of the battery. Isopropyl alcohol (IPA), which is defined as a VOC, is used as part of this process and will be stored in one of three (3) 2,200 gallon storage tanks (3S-2). These tanks represent the only VOL storage tanks at the facility above 500 gallons. The maximum annual throughput of IPA at the facility will be 79,125 gallons/yr. The materials and coatings, including IPA, are applied in a mixing and dip tank (3S-1). The VOC emissions from this process are collected in a closed system and sent to an 8.00 mmBtu/hr natural gas-fired Recuperative Thermal Oxidizer (3C-1) for control also with a minimum DRE of 95%. Drying of the coatings occur in two (2) natural gas-fired Ovens (3S-3: 1.00 mmBtu/hr, 3S-4: 4.00 mmBtu/hr).

Finally, in the Module and Cell Assembly (4S-1) area, all the component parts are brought together and assembled. This area does not have a vent to the outside of the assembly area room and only some remaining VOCs are considered to evaporate and escape from the materials as fugitive emissions. While emitted inside the Building, they are assumed to escape and get emitted into the ambient air.

Auxiliary Operations (labeled the "Central Energy Plant") include:

- The use of two (2) 4,100 gallons/minute direct contact Chiller Cooling Towers (5S-1, 5S-2) and two (2) 1,800 gallons/minute (non-contact) Process Cooling Towers (5S-3, 5S-4);
- Three (3) 6.00 mmBtu/hr natural gas-fired Boilers (5S-5 through 5S-7) to provide process steam; and
- One (1) 1,500 kW_e diesel-fired Emergency Generator (5S-8).

Natural Gas Combustion Units

As noted above, the proposed facility includes various natural gas combustion units providing direct or indirect process heat in various areas of the plant as shown in the following table:

Table 1: Natural Gas Combustion Devices

Emission Unit ID(s)	Emission Point ID(s)	Number of Units	Unit Description	MDHI(1) (mmBtu/hr)	MDHI(2) (mmBtu/hr)
3S-3	3E-3	1	Oven 1	1.00	1.00
3S-4	3E-4	1	Oven 2	4.00	4.00
5S-5 though 5S-7	5E-3	3	Boilers	6.00	18.00
2S-2 3S-5	2E-2 3E-2	2	RCO Burners	8.00	16.00

(1) Individual unit MDHI.
(2) Aggregate MDHI of all specified units. Aggregate MDHI of all units facility-wide = 39.00 mmBtu/hr..

Cooling Towers

FEI has proposed the use of two (2) sets of Cooling Towers, each with two cooling cells, that will provide contact (5S-1, 5S-2) and non-contact (5S-3, 5S-4) cooling water to various processes throughout the facility. A cooling tower extracts waste heat into the atmosphere through the evaporative cooling of a water stream to a lower temperature. A direct contact (or open-circuit) cooling tower (DCW) operates by having the cooling water come into direct contact with the material being cooled. A non-contact (or closed-circuit) cooling tower (ICW) operates without the cooling water coming into direct contact with the material being cooled. Emissions are possible with cooling towers as particulate matter may become entrained with the water droplets of the vapor cloud as it released into the ambient air. Each of the Cooling Towers will be constructed with a high efficiency drift eliminator (rated to limit the vapor escape of only 0.005% of the total water vapor) to mitigate the drift of the entrained droplets. The Cooling Towers proposed for the facility are shown in the following table:

Table 2: Cooling Tower Information

Emission Unit ID No.	Emission Point ID No.	Description	Contact/ Non-Contact	Max Design Capacity Water Circulation Pump (gal/min)
5S-1	5E-1	Chiller Cooling Tower 1	Contact	4,100 gpm
5S-2		Chiller Cooling Tower 2		4,100 gpm
5S-3	5E-2	Process Cooling Tower Closed Circuit 1	Non-Contact	1,800 gpm
5S-4		Process Cooling Tower Closed Circuit 2		1,800 gpm

Control Devices

As noted the proposed facility will utilize various control devices as listed in the following table:

Table 3: Control Device Information

Control Device ID	Emission Point ID	Type	Sources	Pollutant(s) Controlled	Control Percentage
1C-1	1E-1	Dust Collector	Anode Process Line (1S-1)	PM	90%
2C-1	2E-1	Dust Collector	Cathode 1 Process Line (2S-1)	PM	90%
2C-2	2E-2	Recuperative Thermal Oxidizer	Cathode 1 Process Line (2S-1)	VOCs	95%
3C-1	3E-2	Recuperative Thermal Oxidizer	Cathode 2 Process Line (3S-1)	VOCs	95%

SITE INSPECTION

On August 16, 2023, the writer conducted an inspection of the proposed location of FEI's Weirton Plant. The proposed site is within the footprint of the former area of the Weirton Steel facility and will specifically utilize fifty-five (55) acres surrounding Weirton Steel's former (but still in existence) "Open Hearth Building." The writer was accompanied on the inspection by Mr. Matthew Caprarese from FEI. Observations from the inspection include:

- The proposed facility will be located 1425 Main Street in Weirton at a fifty-five (55) acre brownfield site that was once the location of the Weirton Steel/ArcelorMittal blast furnace, oxygen plant, and many other structures related to the steel mill. This area was included in approximately 1,100 acres of idled property sold by ArcelorMittal to the Frontier Group (Frontier) in 2017. Frontier is a corporation which specializes in cleanup and redevelopment of large industrial and commercial sites and which has, since that time, demolished and cleared areas of the proposed site that had not been previously demolished. The "Open Hearth Building," however, remains and will not be demolished and is proposed to be re-purposed by Form for a use as yet to be determined;

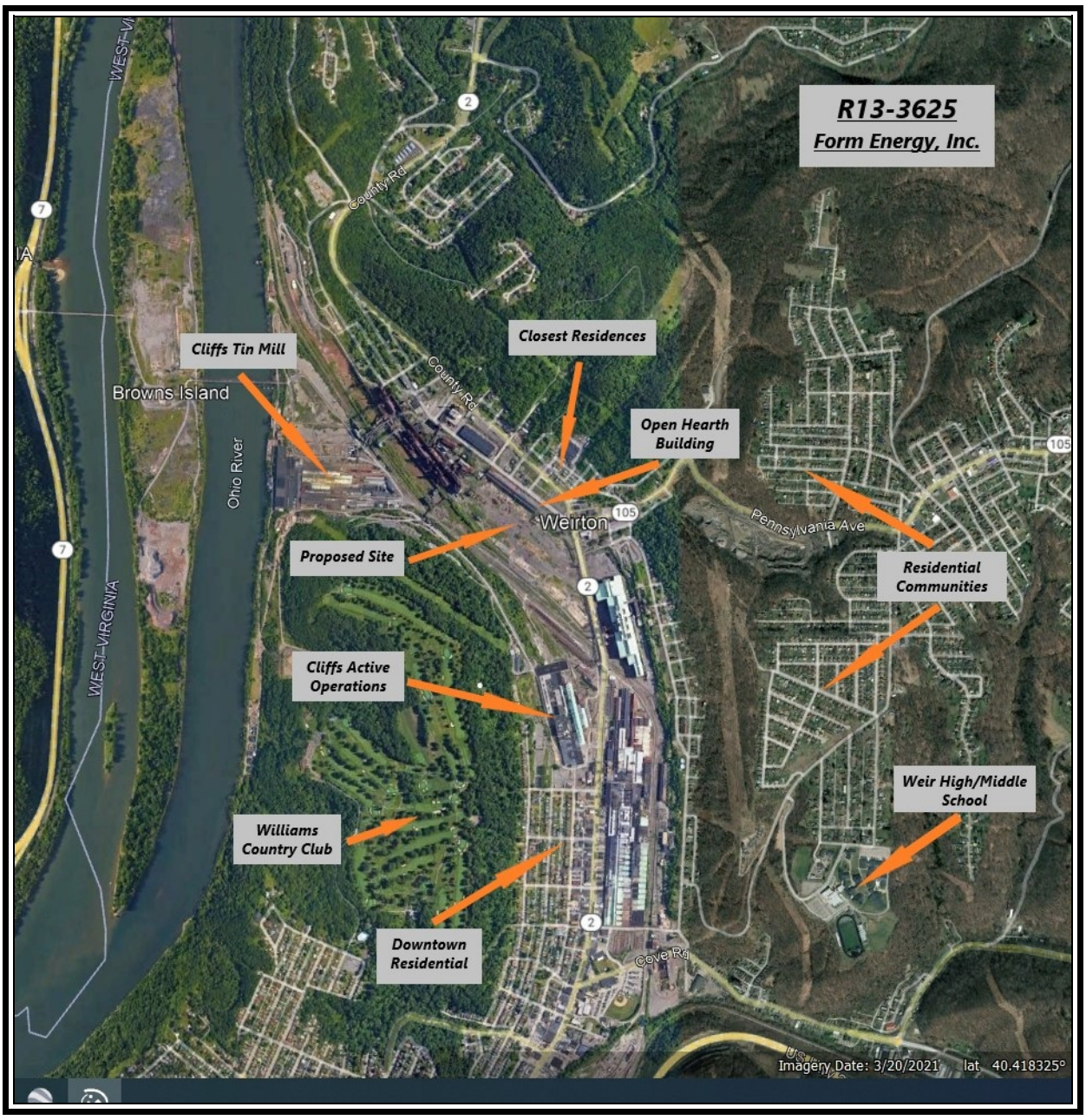
- The proposed site generally runs from southeast to northwest and is roughly 0.50 miles long and 0.25 miles wide along its length. The site is bounded on the southeast by WV State Route 2, to the northeast by Main Street, to the southwest by the hills that rise up to the Maryland Heights and by the still operating tin mill (Cleveland-Cliffs Weirton, Title V Permit Number R30-02900001-2022), and to the northwest by additional areas of existing structures scheduled for demolishing by Frontier. Other operations maintained by Cleveland-Cliffs are located directly south of the proposed site (same permit number). The Ohio River, split by Brown's Island, lies approximately 0.55 miles to the west of the site. The Weir High and Middle School complex lies approximately 1.20 miles to the southeast;

- This area of Weirton has been historically one of the most densely industrialized areas in the state of WV and the proposed site remains heavily industrialized. Since is operation began in 1909, Weirton Steel rapidly expanded to encompass most of the surrounding area. While much of the steel mill has been demolished, most of the area is being re-purposed for industrial activity;

- At the time of the inspection, FEI was heavily engaged in site preparation and construction activities. Specifically, a significant amount of steel had been erected for the large multi-purpose building. No emission units were determined to be on-site. A concrete batch plant operated by Lindy Paving Inc. (Facility ID Number: 029-00090, General Permit Number: G50-C128) was located at the northwest side of the site; and

- The nearest occupied residences are located along WV State Route 2 approximately 200 yards from the proposed site of the facility. The more densely populated areas near the proposed location include the downtown area approximately 0.50 miles south of the facility and the suburban communities located on the hills east of WV State Route 2 approximately 0.60 miles away.

The following is labeled satellite imagery (3/20/21) of the proposed site of the FEI Weirton Facility:



Directions: [Latitude: 40.42022, Longitude: -80.59261] The proposed site is located at 1725 Main Street, Weirton, WV. The access road is just south of the existing "Open Hearth Building"heading north on Main Street.

AIR EMISSIONS AND CALCULATION METHODOLOGIES

FEI included in Attachment N of the permit application air emissions calculations for the proposed Weirton Plant. The following will summarize the calculation methodologies used by FEI to calculate the potential-to-emit (PTE) of the proposed facility.

Process Line Emissions

Particulate Matter Emissions

Particulate matter is emitted from the Anode and the Cathode 1 Process Lines only, as the Cathode 2 Process Line and the Cell and Module Assembly areas do not generate any particulate matter other than trace amounts from the combustion of natural gas (discussed below). The particulate matter emitted from each of the Anode and the Cathode 1 Process Lines are generated in the process lines through the use of the powdered feedstocks. Hoods are located over the workstations where the feedstocks are used and any escaping particulate matter is captured by the hoods and pulled to the dust collectors for control. FEI has estimated that the hoods capture 85%/90% of generated particulate matter in the Anode/Cathode 1 Process Lines (15%/20% is therefore conservatively emitted as fugitive emissions) and evacuate the captured material to dust collectors (1C-1 and 2C-1) that emit (1E-1 and 2E-1) outside of the building.

The uncontrolled particulate matter emissions from Anode and Cathode 1 Process Lines were each based on mass balance calculations assuming 0.10% (engineering estimate) of the feedstock materials were lost in the manufacturing process. From that calculation, the uncaptured fugitive emissions were based on 15%/20% as mentioned above. The particulate matter emissions as emitted from the each process' dust collector was calculated independently of the uncontrolled emission calculations and was instead based on the maximum guaranteed outlet grain loading (0.005 gr/dscf) of each dust collector and the volumetric flow rate of each dust collection system (Anode - 17,000 acfm, Cathode 1 - 9,000 acfm). The aggregate particulate matter emissions from each of the process lines is the total uncaptured emissions and the emissions from the dust collector. All particulate matter emissions are conservatively assumed as $PM_{2.5}$ or less.

VOC Emissions

VOC emissions occur as volatiles flash off and evaporate from the use of various non-powdered feedstocks and coatings. The VOCs are captured and controlled by RCOs in the Cathode 1 and Cathode 2 Process Lines, and are uncontrolled from the Anode (1E-2) and Cell and Module Assembly (4E) areas. The uncontrolled VOC emissions from these areas are based on complex mass balance calculations as outlined in Attachment N of the permit application. These calculations use controlling variables (material usage rates, percent volatility, evaporation rates, material densities, etc.) to estimate the maximum amount of VOC evaporation rates from the materials used. Controlled VOC emissions from the Cathode 1 (2E-2) and Cathode 2 (3E-2) Process Lines are reduced by 95% to account for the DRE of the thermal oxidizers. No VOC-HAPs were identified by FEI as emitted from the process lines.

Other Emissions

Other pollutants (CO, NO_x, and SO_2) are formed when carbon, nitrogen, and sulfur are oxidized and driven off of the feedstock materials in the ovens and heaters. Similarly, hydrogen chloride (HCl) is also formed when chloride in some of the coatings flashes off and emitted as HCl. The calculations for each of these emissions are generally conservative in nature and assume that all of the constituents are driven off as pollutants. CO emissions, however, are based on 90% of all free carbon being emitted primarily as CO (even though there is expectation that some of the carbon will be emitted as CO_2).

Process Line Emission Summary

The maximum hourly emissions of the process lines are based on the expected maximum production levels for a 50mW/year facility. All of the process line annual emissions are conservatively based on an operation of 8,760 hrs/yr. Emissions from the process lines are given in the following table:

Table 4: Process Line Emissions

Emission Source (Point)		CO		PM[1]		NO_x		SO_2		VOCs		HAPs	
		lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
Anode	1E-1	n/a	n/a	1.54	6.76	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	1E-2	31.31	34.29	n/a	n/a	n/a	n/a	5.43	5.95	7.98	34.93	n/a	n/a
Cathode 1	2E-1	n/a	n/a	1.25	5.49	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	2E-2[2]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2.38	10.40	n/a	n/a
Cathode 2	3E-2[2]	n/a	n/a	n/a	n/a	2.25	9.86	0.85	3.72	7.60	33.40	1.56[3]	6.84[3]
Cell & Module Assembly[4]		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.02	0.08	0.00	0.00

(1) All particulate matter is considered $PM_{2.5}$ or less and includes condensables.
(2) Does not include RTO combustion exhaust emissions. These limits are given under Table 4.1.6(a).
(3) HCl emissions only.
(4) No external stack, emissions inside the building only.

Natural Gas Combustion

Ovens 1 and 2 (3E-3, 3E-4), the RCO Burners (2E-2, 3E-2), and Boilers 1 though 3 (5E-3) are fueled by natural gas and have emissions associated with the products of combustion. Potential emissions from these units were based on emission factors as given in AP-42, Section 1.4 - "Natural Gas Combustion." Hourly emissions were based on the maximum design heat input (MDHI) of each unit. Individual unit annual emissions were based on 8,760 hours of operation per year. A conventional natural gas heat content of 1,020 Btu/scf was used in the calculations. The specific emission factors taken from AP-42 are given in Table 5 below and the emissions associated with each specific type of unit is given in Attachment A.

Table 5: Natural Gas Emission Factors

Pollutant	Natural Gas Combustion	
	lb/mmscf[(1)]	lb/mmBtu[(2)]
CO	84.00	0.082
NO_x	100.00	0.098
$PM_{2.5}$	7.60	0.007
PM_{10}	7.60	0.007
PM_{FILT}	1.90	0.002
PM_{TOT}	7.60	0.007
SO_2	0.60	0.001
VOCs	5.50	0.005
Total HAPs	1.89	0.0019

(1) AP-42, Table 1.4-1 "Small Boilers, <100 mmBtu/hr.
(2) Calculated pursuant to footnote (a) of Table 1.4-1 using a natural gas heat content of 1,020 Btu/scf.

Cooling Towers

FEI has proposed the use of two (2) sets of Cooling Towers, each with two cooling cells, that will provide contact (5E-1) and non-contact (5E-2) cooling water to various processes throughout the facility. Emissions are possible with cooling towers as particulate matter may become entrained within the water droplets of the vapor cloud as it released into the ambient air. FEI calculated the potential emissions from the cooling towers based on the following variables: (1) expected worst-case total dissolved solids in the cooling water (TDS - 600 ppm_v), (2) the maximum flow rate of water used in the cooling tower (4,100 gpm), and (4) the maximum drift loss of water used in the cooling towers of 0.005%. Annual emissions from the cooling towers are based on operations of 8,760 hours per year. The aggregate annual cooling tower emissions are calculated at 0.36 lbs-PM/hr and 1.58 tons-PM/yr. FEI did not include a particle size analysis so all particulate matter emissions are considered $PM_{2.5}$ or less.

IPA Storage Tank

FEI provided an estimate of the emissions of VOCs produced from the three (3) 2,200 gallon IPA Storage Tanks (3E-1) proposed for the facility. The VOC emissions for the storage tanks were calculated using the methodology and equations for fixed roof tanks taken from AP-42, Section 7.1 - "Organic Liquid Storage Tanks." The total "routine" emissions from each fixed roof storage tank are the combination of the calculated "standing loss" and "working loss." The standing loss refers to the loss of vapors as a result of tank vapor space breathing (resulting from temperature and pressure differences) that occurs continuously when the tank is storing liquid. The working loss refers to the loss of vapors as a result of tank filling or emptying operations. Standing losses are

independent of storage tank throughput while working losses are dependent on throughput. The equations use many variables based on the size and construction of the tank, the vapor pressure of IPA, the annual throughput of IPA (79,125 gallons/yr), and the temperature data at the site of the tank. The aggregate VOC emissions from the storage tanks is calculated to be 50.46 lbs/yr.

Vehicle Activity

FEI included in their application an estimate of fugitive emissions created by truck traffic on-site at the facility. As the roadways and mobile work areas around the plant site will include some paved and unpaved areas, FEI used the equations given in AP-42 Sections 13.2.1 - "Paved Roads" and 13.2.2 - "Unpaved Roads" (with appropriate variables) to estimate potential emissions from vehicle activity. The aggregate annual emissions from vehicle activity are calculated to be 1.02 tons-$PM_{2.5}$/yr, 1.02 tons-PM_{10}/yr, and 1.02 tons-PM/yr.

Emergency Engine

Potential emissions from the proposed 1,500 kW_e diesel-fired Emergency Engine (5E-4) to generate backup power at the facility in the event of a power disruption were primarily based, where applicable, on the standards given under 40 CFR 60, Subpart IIII and on AP-42, Section 3.4 - "Large Stationary Diesel And All Stationary Dual-fuel Engines." As no specific emission standards are given for NO_x and VOCs (NMHC + NO_x only) in Subpart IIII, FEI just conservatively used the NMHC + NO_x standard for both the emissions of NO_x and VOCs. The emissions of SO_2 and HAPs were based on emission factors given in AP-42, Section 3.4, Tables 3.4-1 (SO_2), 3.4-3, and 3.4-4 (HAPs). The emissions from the unit are given in the following table:

Table 6: Emergency Generator (5E-4) PTE

Pollutant	Emission Factor(1)		Source	Hourly (lb/hr)	Annual (ton/yr)
	Value	Units			
CO	3.50	g/kW_e-hr	Subpart IIII	11.57	0.58
NO_X	6.40	g/kW_e-hr	Subpart IIII	21.16	1.06
$PM_{2.5}$/PM_{10}/PM(2)	0.20	g/kW_e-hr	Subpart IIII	0.66	0.03
SO_2	7.36e-06(2)	kg/kW_e-hr	AP-42, Table 3.4-1	2.43e-02	1.22e-03
VOCs	6.40	g/kW_e-hr	Subpart IIII	21.16	1.06
Total HAPs	1.89e-05	kg/kW_e-hr	AP-42, Tables 3.4-3/4	6.25e-02	3.13e-03

(1) AP-42 lb/hp-hr emission factors converted to kg/kW_e where applicable as directed in Table 3.4 footnote by multiplying factor by 0.608.

(2) Based on a fuel sulfur content of 15 ppm (0.0015%).

Emissions Summary

Based on the above estimation methodology as submitted in Attachment N of the permit application, the facility-wide annual PTE of the proposed Weirton Plant is given in the following table (PTE is broken down in more detail in Attachment A to this document).

Table 7: Facility-Wide Annual PTE

Pollutant	TPY
CO	48.94
NO_x	27.67
$PM_{2.5}$(1)	15.23
PM_{10}(1)	15.94
PM(1)	15.94
SO_2	9.78
VOC	80.45
Total HAPs	7.16

(1) Including condensables.

REGULATORY APPLICABILITY

The proposed Weirton Plant is subject to substantive requirements in the following state and federal air quality rules and regulations:

Table 8: Applicable State and Federal Air Quality Rules and Regulations

State Air Quality Rules	
Emissions Standards	
45CSR2	To Prevent and Control Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers
45CSR6	To Prevent and Control Particulate Air Pollution from Combustion of Refuse
45CSR7	To Prevent and Control Particulate Air Pollution from Manufacturing Process Operations
45CSR10	To Prevent and Control Air Pollution from the Emission of Sulfur Oxides
Permitting Programs and Administrative Rules	
45CSR13	Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, and Procedures for Evaluation
45CSR22	Air Quality Management Fee Program

Federal Air Quality Regulations	
New Source Performance Standards (NSPS) - 40 CFR 60	
Subpart IIII	Standards of Performance for Stationary Compression Ignition Internal Combustion Engines
Maximum Achievable Control Technology (MACT) - 40 CFR 63[(1)]	
Suboart ZZZZ	National Emission Standard for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines

(1) As the facility-wide PTE does not exceed 10 TPY of any individual HAP or 25 TPY of aggregate HAPs, the proposed FEI facility is defined as a non-major "area source" for the purposes of 40 CFR 63 applicability. Therefore, only certain MACTs that apply to area sources have potential applicability to the proposed source.

Each applicable rule (and any rule that warrants a discussion of non-applicability) and FEI's proposed compliance therewith will be summarized below.

WV State Air Quality Rules

45CSR2: To Prevent and Control Particulate 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.*" A fuel burning unit is defined under 45CSR2 as 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 only apply to the Boilers (5S-5 through 5S-7) at the proposed facility. However, pursuant to the exemption given under §45-2-11 - "*[a]ny fuel burning unit(s) having a heat input under ten (10) million B.T.U.'s per hour will be exempt from sections 4, 5, 6, 8 and 9"* - the only substantive section of 45CSR2 the proposed Boilers are subject to are the opacity standards given under Section 3.1.

45CSR2 Opacity Standard - Section 3.1

Pursuant to 45CSR2, Section 3.1, the Boilers are subject to an opacity limit of 10%. Proper maintenance and operation of the units (and the use of natural gas as fuel) should keep the opacity of the units well below 10% during normal operations.

45CSR6: To Prevent and Control Particulate Air Pollution from Combustion of Refuse

FEI has proposed the use of two (2) Recuperative Thermal Oxidizers (2C-2, 3C-1) for control of various waste gas streams. Each unit meets the definition of an "incinerator" under 45CSR6 and is, therefore, subject to the requirements therein. The substantive requirements applicable to the enclosed flare are discussed below.

45CSR6 Emission Standards for Incinerators - Section 4.1

Section 4.1 limits PM emissions from incinerators to a value determined by the following formula:

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

Where, the factor, F, is as indicated in Table I below:

Table I: Factor, F, for Determining Maximum Allowable Particulate Emissions

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

Based on information in the permit application, the RTOs (2C-2, 3C-1) will have a capacity of 435 lbs/hour (0.22 tons/hour). Using this value in the above equation produces a particulate matter emission limit of 1.19 lbs/hr. FEI estimated emission rates of 0.06 lbs/hour of particulate matter from each of the units which is far below the 45CSR6 limit.

45CSR6 Opacity Limits for - Section 4.3, 4.4

Pursuant to Section 4.3, and subject to the exemptions under 4.4, the RTOs each will have a 20% limit on opacity during operation. Proper design and operation of the units should prevent any substantive opacity from the units.

45CSR7: To Prevent and Control Particulate Air Pollution from Manufacturing Process Operations

45CSR7 has requirements to prevent and control particulate matter air pollution from manufacturing processes and associated operations. Pursuant to §45-7-2.20, a "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 Weirton Plant. These are the opacity requirements under Section 3, the mass emission standards under Section 4, and the fugitive emission standards under Section 5. Each of these sections will be discussed below.

45CSR7 Opacity Standards - Section 3

§45-7-3.1 sets an opacity limit of 20% on all "process source operations." Pursuant to §45-6-2.38, a "source operation" means the "*last operation in a manufacturing process preceding the emission of air contaminants [in] which [the] operation results in the separation of air contaminants from the process materials or in the conversion of the process materials into air contaminants and is not an air pollution abatement operation.*" This language would define all particulate matter emitting sources (excluding combustion exhaust sources) as "source operations" under 45CSR7 and, therefore, these sources would be subject to the opacity limit (after any applicable control device). At the proposed FEI facility, these sources would be limited to the particulate matter emissions from

the Anode and Cathode 1 Process Lines (as emitted from the dust collectors). Based on the FEI's proposed use of dust collectors for the control of all the particulate matter from these sources, these measures shall reasonably allow FEI to operate in compliance with the 20% opacity limit.

45CSR7 Weight Emission Standards - Section 4

§45-7-4.1 requires that each manufacturing process source operation or duplicate source operation meet a maximum allowable "stack" particulate matter limit based on the weight of material processed through the source operation. As the limit is defined as a "stack" limit (under Table 45-7A), the only applicable emission units are those that can be defined as non-fugitive in nature. Additionally, pursuant to §45-7-4.1, any manufacturing process that has "*a potential to emit less than one (1) pound per hour of particulate matter and an aggregate of less than one thousand (1000) pounds per year for all such sources of particulate matter located at the stationary source*" is also exempt from Section 4.1.

For the purposes of Section 4.1, 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 §45-7-2.38. This is 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. This determination excludes all natural gas (only) sources from 45CSR7 applicability. Based on the definitions and exemptions discussed above, see the following table for the 45CSR7 compliance demonstration.

Table 9: 45CSR7 Section 4.1 Compliance

Source Operation(s)	EP ID	Source Type	Aggregate PWR (lb/hr)	Table 45-7A Limit (lb/hr)	PTE (lb/hr)	Control Device
Anode Process Line	1E-1	A	5,512	5.20	1.54	DC
Cathode 1 Process Line	2E-1	A	717	0.86	1.25	DC
Cooling Towers(1)	Various	A	5,897,640	50.00	0.36	Drift Eliminator

(1) The Cooling Towers are not definitively a Section 4.1 source, but are included here as an aggregate entry for informational purposes.

§45-7-4.2 requires that HCl (as a mineral acid) shall not be released from a manufacturing process source operation or duplicate source operation in excess of 210 mg/dscm. However, as the defined limit is a "stack" limit (under Table 45-7B), the only applicable emission units are those that can be defined as non-fugitive in nature. The source of HCl at the FEI facility is a dip tank where some of the Chlorine in a coating may be released as HCl. The direct emissions of HCl in this process are fugitive in nature, and therefore not considered appropriate for a stack limit that applies to Table 45-7B. Additionally, the source type of the dip tank under 45CSR7 is, pursuant to §45-7-2.39, a type 'd' source. Based on footnote (2) of Table 45-7A, "*Type 'd' source operation stack emission rates do not apply to MINERAL ACIDS*," the HCl emissions are not subject to the limitations under Table 45-7B. However, for informational purposes, the writer performed a calculation to determine the worst-case HCl concentration at the stack to compare to the Rule 7 limit. This calculation, based on

a volumetric flow rate of 18,000 acfm, an exhaust temperature (after heat has been recovered) of 500 °F (estimated), and a moisture content of (5%estimated), resulted in an HCl concentration of 44.29 mg/dscm.

45CSR7 Fugitive Emissions - Section 5

Pursuant to §45-7-5.1 and 5.2, each manufacturing process or storage structure generating fugitive particulate matter must include a system to minimize the emissions of fugitive particulate matter. The two sources of potential fugitive particulate matter are from (1) uncaptured feedstock handling that is done inside of the manufacturing building and (2) vehicle activity at the facility. As particulate matter generated in the manufacturing process is captured and directed by hoods to a dust collector and the uncaptured emissions occur inside the building, this method of control is clearly a well-designed system to minimize fugitive particulate matter. Additionally, FEI has stated that haulroads shall be paved where possible, and based on the nature of the facility (non-aggregate handling), paving and general upkeep on other mobile work areas of the facility is adequate to minimize dust from vehicle activity.

45CSR7 Reporting and Testing - Section 8

Pursuant to §45-7-8.1, performance testing is only required per the Director's request. The required initial and continuing performance testing required for the proposed facility is given under Section 4.3 of the draft permit.

45CSR10: To Prevent and Control Air Pollution from the Emission of Sulfur Oxides

The purpose of 45CSR10 is to "*prevent and control air pollution from the emission of sulfur oxides.*" 45CSR10 has requirements (Section 3) limiting SO_2 emissions from "fuel burning units," limiting in-stack SO_2 concentrations (Section 4) of "manufacturing process source operations," and limiting H_2S concentrations(Section 5) in "process gas" streams that are combusted. Sections 3 and 4 are potentially applicable to operations at the proposed FEI Facility. Concerning Section 3, based on the same applicability definitions as discussed above under 45CSR2, only the Boilers are defined as fuel burning units. However, pursuant to the exemption given under §45-10-10 - "*[a]ny fuel burning units having a design heat input under ten (10) million BTU's per hour will be exempt from section 3 and sections 6 through 8"* - the Boilers are not subject to the requirements of 45CSR10.

Concerning Section 4, §45-10-4.1 states that "*[n]o 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. . .*" DEI has estimated worst-case emissions of SO_2 from the Anode Process of 5.43 lbs/hr, as emitted in aggregate from the four (4) furnaces servicing the Anode Process. Considering a worst-case scenario that all of the emissions are vented from just one furnace (5.43 lbs/hr), and conservatively estimating other variables that were not available (5,000 acfm, 800 °F exhaust temperature) in the permit application, the writer estimated an SO_2 concentration of 260.20 ppm_v. Small amounts of SO_2 will also be emitted from the Cathode 2 Process Line (0.85) lbs/hr, as emitted from one of the oven stacks. As the stack characteristics can be assumed to be similar and the emission rate is significantly less than the Anode 1 Process, the SO_2 emissions should be far under the Rule 10 limitation from this process as well.

45CSR13: Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, and Procedures for Evaluation

The proposed construction of the Weirton Plant has the potential to emit a regulated pollutant in excess of six (6) lbs/hour and ten (10) TPY (see Attachment A) and, therefore, pursuant to §45-13-2.24, the proposed facility is defined as a "stationary source" under 45CSR13. Pursuant to §45-13-5.1, "*[n]o person shall cause, suffer, allow or permit the construction . . . and operation of any stationary source to be commenced without . . . obtaining a permit to construct.*" Therefore, FEI is required to obtain a permit under 45CSR13 for the construction and operation of the proposed facility.

As required under §45-13-8.3 ("Notice Level A"), FEI placed a Class I legal advertisement in a "newspaper of *general circulation* in the area where the source is . . . located." The ad ran on July 21, 2023 in the *Weirton Daily Times* and the affidavit of publication for this legal advertisement was submitted on July 24, 2023.

45CSR14: Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution for the Prevention of Significant Deterioration - (Not Applicable)

45CSR14 establishes and adopts a preconstruction permit program for the construction and major modification of major stationary sources in areas of attainment with the National Ambient Air Quality Standards (NAAQS). Hancock County is currently classified as in attainment with the NAAQS and, therefore, a proposed new "major stationary source" in Hancock County would be subject to the provisions of 45CSR14. As the proposed Weirton Plant is not one of the sources listed under §45-14-2.43(a), the threshold that would define the source as a "major stationary source" under 45CSR14 is a PTE of 250 TPY of any regulated pollutant. The proposed facility, however, does not have a PTE of any regulated pollutant in excess of 250 TPY (see Table 7 above) and is, therefore, not defined as a major stationary source and is not subject to the provisions of 45CSR14.

45CSR22: Air Quality Management Fee Program

45CSR22 establishes a program to collect fees for certificates to operate (CTO) and for permits to construct, modify or relocate sources of air pollution. The proposed Weirton Plant is defined as a minor source and is not subject to 45CSR30 (see below). FEI is therefore required to pay the appropriate annual fees and keep their CTO current under the program outline under 45CSR22. The proposed facility will be classified under 45CSR22 and assessed fees based on Fee Class 9M which is used to classify all source types that are not specifically referenced under 45CSR22.

45CSR30: Requirements for Operating Permits

45CSR30 provides for the establishment of a comprehensive air quality permitting system consistent with the requirements of Title V of the Clean Air Act. The proposed Weirton Plant does not meet the definition of a "major source under §112 of the Clean Air Act" as outlined under §45-30-2.26 and clarified (fugitive policy) under 45CSR30b. The proposed facility-wide PTE (see Table 7 above) of any regulated pollutant does not exceed 100 TPY. Additionally, the facility-wide PTE

does not exceed 10 TPY of any individual HAP or 25 TPY of aggregate HAPs. However, as the proposed facility is subject to a New Source Performance Standard (NSPS) - 40 CFR 60, Subpart IIII, and a National Emission Standard for Hazardous Air Pollutants (NESHAP) rule (40 CFR 63, Subpart ZZZZ), the facility would, in most cases, be subject to Title V as a "deferred source." However, pursuant to §60.4230(c) and §63.6585(d), respectively, as a non-major source, FEI is not required to obtain a new Title V permit for the facility and is not considered a deferred source. Therefore, the facility is not subject to 45CSR30 and is subject to 45CSR22 as noted above.

Federal Air Quality Regulations

40 CFR 60, Subpart Kb: Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984 - (Not Applicable)

Subpart Kb of 40 CFR 60 is the NSPS for storage tanks containing Volatile Organic Liquids (VOLs) which construction commenced after July 23, 1984. The Subpart applies to storage vessels used to store volatile organic liquids with a capacity greater than or equal to 75 m^3 (19,813 gallons). However, storage tanks with a capacity greater than or equal to 151 m^3 (39,890 gallons) storing a liquid with a maximum true vapor pressure less than 3.5 kilopascals (kPa) or with a capacity greater than or equal to 75 m^3 but less than 151 m^3 storing a liquid with a maximum true vapor pressure less than 15.0 kPa are exempt from Subpart Kb. Additionally, pursuant §60.110b(b)(2), "*[p]ressure vessels designed to operate in excess of 204.9 kPa and without emissions to the atmosphere*" are exempt from Subpart Kb.

FEI is proposing three (3) 2,200 gallon Isopropyl Alcohol (IPA) storage tanks (3S-2). While IPA is defined as a VOL, the size of the storage tanks are below the threshold that would define it as an affected facility under Subpart Kb. Therefore, Subpart Kb does not apply to the proposed IPA storage tank.

40 CFR 60, Subpart IIII: Standards of Performance for Stationary Compression Ignition Internal Combustion Engines

Subpart IIII of 40 CFR 60 is the NSPS for stationary compression ignition internal combustion engines (diesel-fired engines). Section §60.4200 states that "*provisions of [Subpart IIII] are applicable to manufacturers, owners, and operators of stationary compression ignition (CI) internal combustion engines (ICE).*" Specifically, §60.4200(a)(2) states that Subpart IIII applies to "*[o]wners and operators of stationary CI ICE that commence construction after July 11, 2005, where the stationary CI ICE are:*

(i) Manufactured after April 1, 2006, and are not fire pump engines, or
(ii) Manufactured as a certified National Fire Protection Association (NFPA) fire pump engine after July 1, 2006."

FEI has proposed the installation of one (1) 1,500 kW_e (~2,000 horsepower) diesel-fired Emergency Engine (5S-1) to generate backup power at the facility in the event of a power disruption. The engine shall be one that was manufactured after 2007. As an applicable engine, Subpart IIII has, or references, emission standards for this engine and they are given in the following table:

Table 10: Subpart IIII Standards

Duty	Size (kW_m)	Displacement (L/cyl)	Source	Emission Standards - g/kW-hr (g/hp-hr)				
				NO_x	HC	NMHC + NO_x	CO	PM
Emergency	kW>560	<30	§1039.1 Table 2(1)	n/a	n/a	6.4 (4.8)	3.5 (2.6)	0.20 (0.15)

(1) Logic train is as follows: §60.4205(b) ➜ §60.4202(a)(2) ➜ Appendix I to Part 1039 (Table 2)

FEI has stated they will purchase an engine that is certified to meet the above requirements and the potential emission rates of the NMHC+NO_x, CO and PM were based on emission standards given above. Additionally, Subpart IIII has operational (§60.4207), monitoring (§60.4209), compliance demonstration (§60.42011), reporting (§60.4214), and performance testing (§60.4212) requirements.

Importantly, these include, but are not limited to the following:

- Pursuant to §60.4207(b), that in turn references §1090.305, the diesel fuel used in any applicable ICE must not exceed 15 ppm;

- Pursuant to §60.4209(a), to qualify for the emission standards applicable to "emergency" duty engines, the operator must install a non-resettable hour meter prior to startup of the engine; and

- Pursuant to §60.4211(f), there are use limitations for an engine to be qualify for the emission standards applicable to "emergency" duty engines. Specifically, while there are no limitations on the use of emergency stationary ICE in emergency situations, engines are limited to 100 hours of use in non-emergency situations with up to a maximum of 50 hours use for purposes other than maintenance and testing.

40 CFR 63, Subpart ZZZZ: National Emission Standard for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines

40 CFR 63, Subpart ZZZZ is a federal MACT that establishes national emission limitations and operating limitations for HAPs emitted from stationary reciprocating internal combustion engines (RICE) located at major and area sources of HAP emissions. As the proposed battery manufacturing facility is defined as an area source of HAPs (see Attachment A), the facility is subject to applicable requirements of Subpart ZZZZ. Pursuant to §63.6590(c):

> An affected source that meets any of the criteria in paragraphs (c)(1) through (7) of this section must meet the requirements of this part by meeting the requirements of 40 CFR part 60 subpart IIII, for compression ignition engines or 40 CFR part 60 subpart JJJJ, for spark ignition engines. No further requirements apply for such engines under this part.

§63.6590(c)(1) specifies that "[a] *new or reconstructed stationary RICE located at an area source*" is defined as a RICE that shows compliance with the requirements of Subpart ZZZZ by

"*meeting the requirements of . . . 40 CFR part 60 subpart IIII, for compression ignition engines.*" Pursuant to §63.6590(a)(2)(iii), a "[a] *stationary RICE located at an area source of HAP emissions is new if you commenced construction of the stationary RICE on or after June 12, 2006.*" The 1,500 1,500 kW_e diesel-fired Emergency Engine (5S-1) proposed for the Weirton Plant is defined as a new stationary RICE and, therefore, compliance is shown with Subpart ZZZZ by meeting the requirements of 40 CFR 60, Subpart IIII. Compliance with Subpart IIII is discussed above.

ANALYSIS OF NON-CRITERIA REGULATED POLLUTANTS

This section provides information on those regulated pollutants that may be emitted from the proposed Weirton Plant and that are not classified as "criteria pollutants." Criteria pollutants are defined as Carbon Monoxide (CO), Lead (Pb), Oxides of Nitrogen (NO_x), Ozone (inclusive of VOCs), Particulate Matter (PM_{10} and $PM_{2.5}$), and Sulfur Dioxide (SO_2). These pollutants have National Ambient Air Quality Standards (NAAQS) set for each that are designed to protect the public health and welfare. Other pollutants of concern, although designated as non-criteria *and without national concentration standards*, are regulated through various state and federal programs designed to limit their emissions and public exposure. These programs include federal source-specific HAP regulations promulgated under 40 CFR 61 and 40 CFR 63 (NESHAPS/MACT), and WV Legislative Rule 45CSR27 that regulates certain HAPs defined as Toxic Air Pollutants (TAPs). Any potential applicability to these programs were discussed above under REGULATORY APPLICABILITY.

The majority of non-criteria regulated pollutants fall under the definition of HAPs which are compounds identified under Section 112(b) of the Clean Air Act (CAA) as pollutants or groups of pollutants that EPA knows or suspects *may* cause cancer or other serious human health effects. These adverse health affects, however, may be associated with a wide range of ambient concentrations and exposure times and are influenced by source-specific characteristics such as emission rates and local meteorological conditions. Health impacts are also dependent on multiple factors that affect variability in humans such as genetics, age, health status (e.g., the presence of pre-existing disease) and lifestyle. As stated previously, *there are no applicable federal or state ambient air quality standards for these specific chemicals*. For a complete discussion of the potential health effects of each compound listed in this section, refer to the IRIS database located at www.epa.gov/iris. It is important to note that the USEPA does not divide the various HAPs into further classifications based on toxicity or if the compound is a suspected carcinogen.

Table 11 lists each HAP currently identified in the permit application as potentially emitted in an amount greater than 10 lbs/year (0.005 tons/yr) from the Weirton facility. Additionally, information concerning the pollutant, and the associated carcinogenic risk (as based on analysis provided in the Integrated Risk Information System (IRIS)), and any potentially applicable MACT is provided in Attachment B.

Table 11: Non-Criteria Pollutants

Pollutant	CAS #	PTE (tons/yr)
Formaldehyde	50-00-0	0.013
n-Hexane	110-54-3	0.301
Hydrochloric Acid	7647-01-0	6.84

AIR QUALITY IMPACT ANALYSIS

The estimated maximum emissions of the proposed facility are less than applicability thresholds that would define the proposed facility as "major" under 45CSR14 and, therefore, no air quality impacts modeling analysis was performed.

MONITORING, COMPLIANCE DEMONSTRATIONS, REPORTING, AND RECORDING OF OPERATIONS

Monitoring and Compliance Demonstrations

The primary purpose of emissions monitoring is to determine continuous compliance with emission limits and operating restrictions in the permit over a determined averaging period. Emissions monitoring may include any or all of the following:

- Real-time continuous emissions monitoring to sample and record pollutant emissions (CEMS, COMS);
- Monitoring of plant-wide variables to limit the scope of the plant as applied for;
- Parametric monitoring of variables pre-determined to be proportional (at a known ratio) to emissions (recording of material throughput, fuel usage, production, etc.);
- Real-time tracking of materials and pollutant percentages used in processes where evaporation emissions are expected;
- Monitoring of control device performance indicators (pressure drops, liquid flow rates, oxidizer temperatures, etc.) to guarantee efficacy of pollution control equipment; and
- Visual stack observations to monitor opacity.

It is the permittee's responsibility to record, certify, and report the monitoring results so as to verify compliance with the emission limits. Where emissions are based on the maximum rated short and long-term capacity of units, generally no continuous emissions or parametric monitoring is required as compliance with the emission limits is based on the specific limited capacity of the units.

For the proposed FEI facility, a mix of the above methods are used to give a reasonable assurance that continuous compliance with emission limits is being maintained. Specifically, some examples include:

- Monitoring of the usage and throughput of a number of different feedstock materials and the final product [Table 4.2.3];

- Control device monitoring on the RTOs [4.2.4]; and

- Visible emissions monitoring, both based on statutory requirements and source specific requirements, will be required on all applicable sources with opacity requirements [Table 4.2.5].

In addition to site-specific monitoring and compliance demonstrations, FEI is required to meet all applicable statutory requirements including those given under 40 CFR 60 Subpart IIII. Refer to Section 4.2 of the draft permit for all the unit-specific monitoring, compliance demonstration, reporting, and record-keeping requirements (MRR).

Record-Keeping

FEI will be required to follow the standard record-keeping boilerplate language as given under Section 4.4 of the draft permit. This will require FEI to maintain records of all data monitored in the permit and keep the information for a minimum of five years. All collected data will be available to the Director upon request. FEI will also be required to follow all the record-keeping requirements as applicable under the variously applicable state and federal rules and regulations.

Reporting

Beyond the requirement to follow all reporting requirements as applicable under the variously applicable state and federal rules and regulations, FEI will be required to submit the following substantive reports:

- The results of stack testing within sixty (60) days of completion of the test. The test report shall provide the information necessary to document the objectives of the test and to determine whether proper procedures were used to accomplish these objectives [3.3.1(d)];

- When necessary, any deviation of the allowable visible emission requirement for any emission source discovered during observation using 40 CFR Part 60, Appendix A, Method 9 must be reported in writing to the Director of the DAQ as soon as practicable, but within ten (10) calendar days, of the occurrence and shall include, at a minimum, the following information: the results of the visible determination of opacity of emissions, the cause or suspected cause of the violation(s), and any corrective measures taken or planned [4.2.6(d)];

- A report detailing all required monitoring on or before September 15 for the reporting period January 1 to June 30 and March 15 for the reporting period July 1 to December 31. All instances of deviation from permit requirements must be clearly identified in such reports [4.5.1(a)]; and

- On or before March 15, a certification of compliance with all requirements of the draft permit for the previous calendar year ending on December 31 [4.5.1(b)].

PERFORMANCE TESTING OF OPERATIONS

Performance testing is required to verify, where reasonable and appropriate, the emissions or emission factors used to determine emission units' potential-to-emit and to show initial or periodic compliance with permitted emission limits. Performance testing must be conducted in accordance with accepted test methods and according to a protocol approved by the Director prior to testing (as outlined under 3.3 of the draft permit). The draft permit outlines specific initial and periodic performance testing for certain process line emission factors under Section 4.3.2 and 4.3.3 of the draft permit. The suite of emission factors chosen for performance testing were determined to be critical in verifying the accuracy of the process line emissions. In addition, testing is required on the cooling water to determine the total dissolved solids present to confirm the relevant emissions from the cooling towers under Section 4.3.4 of the draft permit.

Refer to Section 4.3 of the draft permit for all performance testing requirements.

RECOMMENDATION TO DIRECTOR

The information provided in permit application R13-3625 indicates that compliance with all applicable state and federal air quality regulations will be achieved. Therefore, I recommend to the Director that the DAQ go to public notice with a preliminary determination to issue Permit Number R13-3625 to Form Energy, Inc. for the construction of their Weirton Plant located in Weirton, Hancock County, WV.

Joseph Kessler

Digitally signed by: Joseph Kessler
DN: CN = Joseph Kessler email = joseph.r.kessler@wv.gov C = US O = WV Department of Environmental Protection OU = Division of Air Quality
Date: 2023.10.27 09:12:12 -04'00'

Joe Kessler, PE
Engineer

Attachment A: Facility-Wide PTE

FEI: Weirton Plant

Permit Number R13-3625: Facility ID 029-00091

Emission Unit(s)	EP ID	CO		NO_x		$PM_{2.5}$[1]		PM_{10}[1]		PM[1]		SO_x		VOC		Total HAPs[2]	
		lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
Anode Process Line	1S-1	31.31	34.29	0.00	0.00	1.54	6.76	1.54	6.76	1.54	6.76	5.43	5.95	7.98	34.93	0.00	0.00
Cathode 1 Process Line	2S-1	0.00	0.00	0.00	0.00	1.25	5.49	1.25	5.49	1.25	5.49	0.000	0.000	2.38	10.40	0.00	0.00
RTO 1 Burner	2S-2	0.66	2.89	0.78	3.44	0.06	0.26	0.06	0.26	0.06	0.26	0.01	0.02	0.00	0.01	0.02	0.07
Cathode 2 Process Line	3S-1	0.00	0.00	2.25	9.86	0.00	0.00	0.00	0.00	0.00	0.00	0.85	3.72	7.60	33.40	1.56	6.84
IPA Storage Tank	3S-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.00	0.00
Ovens	3S-3, 3S-4	0.41	1.80	0.49	2.15	0.04	0.16	0.04	0.16	0.04	0.16	0.00	0.01	0.03	0.12	0.01	0.04
RTO 2 Burner	3S-5	0.66	2.89	0.78	3.44	0.06	0.26	0.06	0.26	0.06	0.26	0.01	0.02	0.00	0.01	0.02	0.07
Module and Cell Assembly	4S-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.08	0.00	0.00
Cooling Towers	5S-1 to 5S-4	0.00	0.00	0.00	0.00	0.36	1.58	0.36	1.58	0.36	1.58	0.00	0.00	0.00	0.00	0.00	0.00
Boilers	5S-5 to 5S-7	1.48	6.49	1.77	7.73	0.13	0.59	0.13	0.59	0.13	0.59	0.01	0.05	0.10	0.43	0.03	0.15
Paved Haulroads	Fugitive	0.00	0.00	0.00	0.00	0.99	0.09	8.77	0.80	8.77	0.80	0.00	0.00	0.00	0.00	0.00	0.00
Emergency Generator	5S-8	11.57	0.58	21.16	1.06	0.66	0.03	0.66	0.03	0.66	0.03	0.02	0.01	21.16	1.06	0.06	0.003
Facility-Wide Total[3] ➜		***46.09***	***48.94***	***27.24***	***27.67***	***5.09***	***15.23***	***12.87***	***15.94***	***12.87***	***15.94***	***6.33***	***9.78***	***39.27***	***80.45***	***1.69***	***7.16***

(1) Includes condensables.

(2) As the PTE of all individual HAPs are less than 10 TPY (the single HAP with the highest emission rate is HCl at 6.84 TPY) and the PTE of total HAPs is less than 25 TPY, the proposed Weirton Plant is defined as a minor (area) source of HAPs for purposes of 40 CFR 61 and 40CFR63. HAP emissions from the RTO Burners and Ovens calculated by the writer.

(3) Totals may be slightly different than those given in Attachment N of the permit application due to rounding and the addition of natural gas combustion HAP emissions from the Ovens and the RTOs. This Attachment is considered definitive.

Attachment B: Non-Criteria Regulated Pollutant Information

FEI: Weirton Plant

Permit Number R13-3625: Facility ID 051-00341

Pollutant	CAS #	PTE (tons/yr)	Source	Known/Suspected Carcinogen	Classification	MACT[1]
Formaldehyde	50-00-0	0.013	PNG/Diesel Combustion	Yes	B1 - Probable Human Carcinogen[2]	None
n-Hexane	110-54-3	0.301	PNG Combustion	No	Inadequate Data[3]	None
Hydrochloric Acid	7647-01-0	6.84	Mixing/Dip Tank	No	Not included in IRIS database.[4]	None

(1) Does a MACT apply to this specific HAP for any emission unit at the facility? See "Regulatory Applicability" section for discussion.

(2) [**Formaldehyde**] From IRIS: "*Based on limited evidence in humans, and sufficient evidence in animals. Human data include nine studies that show statistically significant associations between site-specific respiratory neoplasms and exposure to formaldehyde or formaldehyde-containing products. An increased incidence of nasal squamous cell carcinomas was observed in long-term inhalation studies in rats and in mice. The classification is supported by in vitro genotoxicity data and formaldehyde's structural relationships to other carcinogenic aldehydes such as acetaldehyde.*"

(3) [**n-Hexane**] From IRIS: *"Under the Guidelines for Carcinogen Risk Assessment, there is inadequate information to assess the carcinogenic potential of n-hexane.*"

(4) **[Hydrochloric Acid**] From IRIS: "*Not assessed under the IRIS Program.*"