



west virginia department of environmental protection

Division of Air Quality
601 57th Street, SE
Charleston, WV 25304
Phone: (304) 926-0475 • Fax: (304) 926-0479

Earl Ray Tomblin, Governor
Randy C. Huffman, Cabinet Secretary
www.dep.wv.gov

ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.: R13-3092
Plant ID No.: 017-00057
Applicant: Crestwood Marcellus Midstream LLC
Facility Name: Perkins Compressor Station
Location: Near Salem, Doddridge County
NAICS Code: 221112
Application Type: Construction
Received Date: June 7, 2013
Engineer Assigned: Joe Kessler
Fee Amount: \$4,500
Date Received: June 12, 2013 (\$2,000); July 23, 2013 (\$2,500)
Complete Date: July 29, 2013
Due Date: October 27, 2013
Applicant's Ad Date: June 15, 2013
Newspaper: *The Exponent Telegram*
UTM's: Easting: 535.0208 km Northing: 4,344.4484 km Zone: 17
Latitude/Longitude: 39.24864/-80.59414
Description: Construction of a natural gas compressor station.

DESCRIPTION OF PROCESS

Crestwood Marcellus Midstream LLC (Crestwood) is proposing to construct a natural gas compressor station to be located approximately 3.0 miles southwest of Salem, Doddridge County, WV. The proposed Perkins Compressor Station will consist of ten (10) Waukesha, 7044 GSI 4-Stroke Rich Burn (4SRB) 1,627 horsepower (hp) compressor engines, two (2) NGEngine, 14.6L 4SRB 402 hp/300kW engine-generator sets, two (2) Valerus, GLY-ABS-48-PK 60 mmscf/day triethylene glycol (TEG) dehydration units (GDUs), and ten (10) storage tanks.

Raw natural gas produced in area wells will enter into the facility and, after passing through an inlet separator to removed produced liquids, will be compressed by the engines. Produced water and condensate removed from the natural gas shall be directed to one of the five (5) 16,800 gallon storage tanks (T-1 through T-5). Tank T-1 shall be used to store both produced water and condensate, tanks T-2 and T-3 shall be used for produced water only, and tanks T-4 and T-5 shall be used for condensate. Five smaller tanks of 1,500 gallons or less (T-6 through T-10) shall be used

at the site for miscellaneous storage (waste oil, bulk TEG storage, lube oil, coolant, and bulk oil storage). Vapors from the condensate/produced water storage tanks (working/breathing/flashing) will be captured by a Vapor Recovery Unit (VRU-1) and recycled back into facility for further processing. Any emissions from the miscellaneous tanks are, based on the vapor pressures of the materials stored, considered insignificant.

The engines (CE-1 through CE-10) are designed to compress the natural gas produced from the wells and send it through the GDUs for dehydration and then into a gathering pipeline for transport. The engines proposed for the Perkins Compressor Station will use catalytic converters (EMIT Technologies Model ELH-4200T-1616F-65CEE-362) to control CO, NO_x, VOC, CH₄, and formaldehyde emissions.

Glycol dehydration is a liquid desiccant system used for the removal of water from natural gas. In each GDU, lean, water-free glycol is fed to the top of an absorber (known as a "contactor") where it is contacted with the wet natural gas stream. The glycol removes water from the natural gas by physical absorption and is carried out the bottom of the column. The dry natural gas leaves the top of the absorption column and is fed into a pipeline for transportation.

After leaving the absorber, each glycol stream - now referred to as "rich" glycol - is fed to a flash vessel where flashed hydrocarbon vapors are captured and recycled back into facility for further processing. Any liquid hydrocarbons removed in the flash tank are sent to the storage tanks. After leaving the flash vessel, the rich glycol is fed to a Glycol Regenerator Column. Each Regenerator Column consists of a column, an overhead condenser, and the reboiler. The glycol is thermally regenerated to remove excess water and regain high purity. The heat for the regeneration is provided by two (2) 1.5 mmBtu/hr natural gas-fired reboilers (RBV-1, RBV-2). The hydrocarbons produced in each glycol regeneration process are sent to a condenser and then to the flame-zone of the reboiler for control (an estimated minimum 98% hydrocarbon destruction efficiency).

The hot, lean glycol is cooled by a heat-exchanger and is then fed to a pump where it is sent to the glycol absorber for reuse. Liquids produced in the regeneration process are sent to one of the facility storage tanks.

Additionally, the facility will utilize a truck loadout (LR-1) to remove condensate and produced water from the site (estimated to be a maximum of 176,400 gallons/year). Emissions from the truck rack will be uncontrolled. Two uncontrolled engine-generator sets (GEN-1 and GEN-2) will be used to produce primary and backup power, respectively for the facility.

SITE INSPECTION

On August 20, 2013, the writer conducted an inspection of the proposed location of the Perkins Compressor Station. The proposed Perkins site is located in a rural area of Doddridge County approximately 3.0 miles southwest of Salem, WV off of Greenbrier Road (County Route (CR) 17). The writer was accompanied on the inspection by Ms. Molly Wentworth, Environmental Advisor with Crestwood. Observations from the inspection include:

- The proposed facility will lie approximately 3.0 miles southwest of Salem, WV north of CR

17 in Doddridge County. The area is mountainous and rural in nature with scattered homes and farms within several miles of the proposed location. Much natural gas construction activity (pipelines, well-heads, etc.) is located in the County;

- At the time of the inspection, Crestwood was in the process of clearing and grading the top of the hill where the compressor station will sit. No emission units were visible at the proposed site; and
- The occupied dwelling located nearest to the proposed site was approximately 0.15 miles east of the proposed site at the base of the hill.

Directions: [Latitude: 39.24864, Longitude: -80.59414] Traveling south from Salem, WV on CR 29 (Patterson Fork Road), go approximately 2.5 miles and turn right onto Greenbrier Road (CR17). Proceed on Greenbrier Road for 1.4 miles to the site access road on the right. Follow the access road for 0.2 miles to the top of the hill.

AIR EMISSIONS AND CALCULATION METHODOLOGIES

Compressor Engines

Potential emissions from each of the ten (10) Waukesha, 7044 GSI 4SRB 1,627 hp compressor engines (CE-1E through CE-10E) were based on post-control emission factors provided by the catalytic converter manufacturer, the engine manufacturer, as given in AP-42, Section 3.2 (AP-42 is a database of emission factors maintained by USEPA), and as given in 40 CFR 98, Subpart C. Hourly emissions were based on the (as calculated using a fuel heat rating of 8,299 Btu/hp-hr) maximum design heat input (MDHI) of the engines of 13.50 mmBtu/hr and the maximum hp rating. Annual emissions were based on 8,760 hours of operation per year. The following table details the potential-to-emit (PTE) of each compressor engine:

Table 1: Per-Compressor Engine PTE

Pollutant	Emission Factor	Source	Hourly (lb/hr)	Annual (ton/yr)
CO ⁽¹⁾	0.30 g/hp-hr (controlled)	Catalyst Vendor	1.08	4.71
NO _x ⁽¹⁾	0.15 g/hp-hr (controlled)	Catalyst Vendor	0.54	2.36
PM _{2.5} ⁽²⁾	19.41 x 10 ⁻³ lb/mmBtu	AP-42, Table 3.2-3	0.26	1.15
PM ₁₀ ⁽²⁾	19.41 x 10 ⁻³ lb/mmBtu	AP-42, Table 3.2-3	0.26	1.15
PM ⁽²⁾	19.41 x 10 ⁻³ lb/mmBtu	AP-42, Table 3.2-3	0.26	1.15
SO ₂	5.88 x 10 ⁻⁴ lb/mmBtu	AP-42, Table 3.2-3	0.01	0.03
VOCs ⁽¹⁾	0.31 g/hp-hr (controlled)	Catalyst Vendor	1.11	4.87
Total HAPs	Various	AP-42, Table 3.2-3	0.21	0.94
Formaldehyde ⁽¹⁾	0.01 g/hp-hr (controlled)	Catalyst Vendor	0.04	0.16
CH ₄ ⁽¹⁾	0.74 g/hp-hr (controlled)	Catalyst Vendor	2.65	11.63

N ₂ O	2.21 x 10 ⁻⁴ kg/mmBtu	40 CFR Part 98, Subpart C, Table C-2	0.00	0.01
CO ₂	532 g/hp-hr	Engine Vendor	1,908.24	8,358.10
CO ₂ e ⁽³⁾	n/a	n/a	n/a	8,605.64

- (1) Based on post-control emission factor provided by the catalytic converter vendor.
(2) Includes condensables.
(3) Based on multiplying the mass amount of emissions for each of the six greenhouse gases by the gas's associated global warming potential published at Table A-1 to Subpart A of 40 CFR Part 98 - Global Warming Potentials. Used to determine major source status of facilities under 45CSR14.

Engine-Generators Sets

Emissions from the two (2) NGENE, 14.6L 4SRB 402 hp/300kW engine-generator sets (GEN-1E and GEN-2E) were based on the emission factors provided by the engine manufacturer, as given in AP-42, Section 3.2, and as given in 40 CFR 98, Subpart C. Hourly emissions were based on the (as calculated using a fuel heat rating of 8,660 Btu/hp-hr) MDHI of the engines of 3.48 mmBtu/hr and the maximum hp rating. Annual emissions were based on an annual operation of 8,760 hours for the primary engine (GEN-1) and 500 hours for the backup engine (GEN-2). The PTE generated by each engine-generator set and the emission factor/emission factor source are given in the following table:

Table 2: Engine-Generators Sets PTE

Pollutant	Emission Factor	Source	Hourly (lb/hr)	Annual (ton/yr)	
				GEN-1	GEN-2
CO	2.00 g/hp-hr	Vendor Information	1.77	7.76	0.44
NO _x	1.00 g/hp-hr	Vendor Information	0.89	3.88	0.22
PM _{2.5} ⁽¹⁾	19.41 x 10 ⁻³ lb/mmBtu	AP-42, Table 3.2-3	0.07	0.30	0.02
PM ₁₀ ⁽¹⁾	19.41 x 10 ⁻³ lb/mmBtu	AP-42, Table 3.2-3	0.07	0.30	0.02
PM ⁽¹⁾	19.41 x 10 ⁻³ lb/mmBtu	AP-42, Table 3.2-3	0.07	0.30	0.02
SO ₂	5.88 x 10 ⁻⁴ lb/mmBtu	AP-42, Table 3.2-3	0.00	0.01	0.00
VOCs	0.70 g/hp-hr	Vendor Information	0.62	2.72	0.16
Total HAPs	Various	AP-42, Table 3.2-3	0.12	0.51	0.03
Formaldehyde	2.05 x 10 ⁻² lb/mmBtu	AP-42, Table 3.2-3	0.07	0.31	0.02
CH ₄	1.0 x 10 ⁻³ kg/mmBtu	AP-42, Table 3.2-3	0.80	3.51	0.20
N ₂ O	2.21 x 10 ⁻⁴ kg/mmBtu	40 CFR Part 98, Subpart C, Table C-2	0.00	0.00	0.00
CO ₂	110 lb/mmBtu	AP-42, Table 3.2-3	382.80	1,676.66	95.70
CO ₂ e	n/a	n/a	n/a	1,751.33	99.96

- (1) Includes condensables.

Glycol Regenerator Column

Uncontrolled VOC, Hazardous Air Pollutant (HAP), and methane emissions from the glycol regenerator still vents (RSV-1E and RSV-2E) are based on the emissions calculation program GRI-GLYCalc Version 4.0. GRI-GLYCalc is a well-known program for estimating air emissions from glycol units using triethylene glycol (TEG). Included in the application is a copy of the appropriate GLY-Calc analysis sheets. As noted above, the uncontrolled emissions from the GDU Still Vent are sent to a condenser and then to the flame-zone of the reboiler for control. Therefore, a minimum hydrocarbon destruction efficiency of 98% was used to determine the controlled emission rate.

The PTE of emissions generated by each glycol regenerator (as controlled) and the emission factor/emission factor source are given in the following table:

Table 3: per-GDU PTE

Pollutant	Emission Factor	Source	Hourly (lb/hr)	Annual (ton/yr)
VOC	n/a	GLYCalc Results	0.62	2.72
Hexane	n/a	GLYCalc Results	0.01	0.05
Benzene	n/a	GLYCalc Results	0.05	0.22
Toluene	n.a	GLYCalc Results	0.09	0.40
Ethyl-benzene	n/a	GLYCalc Results	0.00	0.02
Xylene	n/a	GLYCalc Results	0.05	0.22
Total HAPs →			0.21	0.90
CH ₄	n/a	GLYCalc Results	1.03	4.49
CO _{2,e}	n/a	n/a	n/a	94.29

Reboiler Combustion Exhaust Emissions

Combustion emissions from each 1.50 mmBtu/hr reboiler (RBV-1E and RBV-2E) were based on the emission factors provided for natural gas combustion (and they are appropriate for also estimating emissions associated with the combustion of GDU still vent vapors) as given in AP-42 Section 1.4. Hourly emissions were based on the MDHI of the units (1.50 mmBtu/hr) and annual emissions were based on an annual operation of 8,760 hours. A natural gas heat content value of 1,081 Btu/ft³ was used in the calculations.

The PTE generated by the reboilers' combustion exhaust and the emission factor/emission factor source are given in the following table:

Table 4: Per-Reboiler Combustion Exhaust PTE

Pollutant	Emission Factor	Source	Hourly (lb/hr)	Annual (ton/yr)
NO _x	100 lb/mmscf	AP-42, Table 1.4-1	0.14	0.61
CO	84 lb/mmscf	AP-42, Table 1.4-1	0.12	0.51
VOC	5.5 lb/mmscf	AP-42, Table 1.4-2	0.01	0.03
PM ⁽¹⁾	7.6 lb/mmscf	AP-42, Table 1.4-2	0.01	0.05
SO ₂	0.6 lb/mmscf	AP-42, Table 1.4-2	0.00	0.00
CH ₄	2.3 lb/mmscf	AP-42, Table 1.4-2	0.00	0.01
N ₂ O	2.2 lb/mmscf	AP-42, Table 1.4-2	0.00	0.01
CO ₂	120,000 lb/mmscf	AP-42, Table 1.4-2	166.51	729.32
CO ₂ e	n/a	n/a	n/a	733.76

(1) All PM emissions are assumed to be PM_{2.5} or less and include condensables.

Fugitives

Crestwood calculated three sources of fugitive emissions at the proposed Perkins Compressor Station: equipment leaks, maintenance and emergency events, and truck loadouts.

Equipment Leaks

Crestwood based their VOC and methane fugitive equipment leak calculations on emission factors taken from the document EPA-453/R-95-017 - “Protocol for Equipment Leak Emission Estimates” Table 2-4 (VOCs). No control efficiencies, as based on a Leak Detection and Repair (LDAR) protocol, were applied.

Maintenance and Emergency Events

Crestwood also included in their fugitive emission estimate a certain number of scenarios where natural gas is released for emergency or maintenance purposes. Those included were compressor blowdown/startup events (120 events/year), station emergency shutdowns (2 events/year), and “pigging” events (52 events/year). VOC and methane emissions from these events were based on the average weight percent of VOCs/methane (10%/75%) expected in the natural gas.

Truck Loadouts

Air emissions from condensate/produced water truck loading operations occur as fugitive emissions generated by displacement of vapors when loading trucks (LR-1). The emission factor (12.0 lbs-loss/1,000 gallons loaded) used to generate the uncontrolled VOC/HAP emissions from this loading is based AP-42 Section 5.2, Table 5.2-5: “Submerged loading - Vapor balance serviced.” As this factor is for gasoline loading, it is considered conservative for the loading of condensate/produced water. Hourly emissions were based on a maximum loading rate of 67.5

gallons/hour and annual emissions were based on a maximum loading rate of 176,400 gallons/year of condensate/produced water. Emissions from the loding rack are fugitive in nature and are uncontrolled.

Emissions Summary

Based on the above estimation methodologies, which are determined to be reasonable, the PTE of the proposed Perkins Compressor Station is given in the following tables:

Table 6: Facility-Wide Aggregate Hourly (lb/hr) Criteria Pollutant PTE Summary.

Source	Emission Point	CO	NO _x	PM ⁽¹⁾	SO ₂	VOCs	HAPs
Compressor Engine	CE-1E	1.08	0.54	0.26	0.01	1.11	0.21
Compressor Engine	CE-2E	1.08	0.54	0.26	0.01	1.11	0.21
Compressor Engine	CE-3E	1.08	0.54	0.26	0.01	1.11	0.21
Compressor Engine	CE-4E	1.08	0.54	0.26	0.01	1.11	0.21
Compressor Engine	CE-5E	1.08	0.54	0.26	0.01	1.11	0.21
Compressor Engine	CE-6E	1.08	0.54	0.26	0.01	1.11	0.21
Compressor Engine	CE-7E	1.08	0.54	0.26	0.01	1.11	0.21
Compressor Engine	CE-8E	1.08	0.54	0.26	0.01	1.11	0.21
Compressor Engine	CE-9E	1.08	0.54	0.26	0.01	1.11	0.21
Compressor Engine	CE-10E	1.08	0.54	0.26	0.01	1.11	0.21
Engine/Generator	GEN-1E	1.77	0.89	0.07	~0.00	0.62	0.12
Engine/Generator	GEN-2E	1.77	0.89	0.07	~0.00	0.62	0.12
GDU Still Vent	RSV-1E	0.00	0.00	0.00	0.00	0.62	0.21
GDU Still Vent	RSV-2E	0.00	0.00	0.00	0.00	0.62	0.21
Reboiler Exhaust	RBV-1E	0.12	0.14	0.01	~0.00	0.01	~0.00
Reboiler Exhaust	RBV-2E	0.12	0.14	0.01	~0.00	0.01	~0.00
Equipment Leaks	Fugitive	0.00	0.00	0.00	0.00	1.91	0.19
Plant Events ⁽²⁾		0.00	0.00	0.00	0.00	n/a	n/a
Truck Loading		0.00	0.00	0.00	0.00	0.81	0.01
Facility-Wide Totals →		14.58	7.46	2.76	0.10	16.32	2.96

- (1) All particulate matter emissions are assumed to be less than 2.5 microns and include condensables.
- (2) These events will result in very large short-term emissions that occur very infrequently and are not included here.
- (3) As calculated by the writer.

Table 7: Facility-Wide Aggregate Annual (ton/yr) Criteria Pollutant/GHG PTE Summary.

Source	Emission Point	CO	NO _x	PM ⁽¹⁾	SO ₂	VOCs	HAPs ⁽²⁾	CO ₂ e
Compressor Engine	CE-1E	4.71	2.36	1.15	0.03	4.87	0.94	8,606
Compressor Engine	CE-2E	4.71	2.36	1.15	0.03	4.87	0.94	8,606
Compressor Engine	CE-3E	4.71	2.36	1.15	0.03	4.87	0.94	8,606
Compressor Engine	CE-4E	4.71	2.36	1.15	0.03	4.87	0.94	8,606
Compressor Engine	CE-5E	4.71	2.36	1.15	0.03	4.87	0.94	8,606
Compressor Engine	CE-6E	4.71	2.36	1.15	0.03	4.87	0.94	8,606
Compressor Engine	CE-7E	4.71	2.36	1.15	0.03	4.87	0.94	8,606
Compressor Engine	CE-8E	4.71	2.36	1.15	0.03	4.87	0.94	8,606
Compressor Engine	CE-9E	4.71	2.36	1.15	0.03	4.87	0.94	8,606
Compressor Engine	CE-10E	4.71	2.36	1.15	0.03	4.87	0.94	8,606
Engine/Generator	GEN-1E	7.76	3.88	0.30	0.01	2.72	0.51	1,677
Engine/Generator	GEN-2E	0.44	0.22	0.02	~0.00	0.16	0.03	100
GDU Still Vent	RSV-1E	0.00	0.00	0.00	0.00	2.72	0.90	94
GDU Still Vent	RSV-2E	0.00	0.00	0.00	0.00	2.72	0.90	94
Reboiler Exhaust	RBV-1E	0.51	0.61	0.05	~0.00	0.03	~0.00	734
Reboiler Exhaust	RBV-2E	0.51	0.61	0.05	~0.00	0.03	~0.00	734
Equipment Leaks	Fugitive	0.00	0.00	0.00	0.00	8.37	0.84	505
Plant Events		0.00	0.00	0.00	0.00	4.42	0.09	691
Truck Loading		0.00	0.00	0.00	0.00	0.81	0.01	0
Facility-Wide Totals →		56.32	28.92	11.92	0.31	70.68	12.68	90,686

- (1) All particulate matter emissions are assumed to be less than 2.5 microns. Includes condensables.
- (2) As the PTE of all individual HAPs are less than 10 TPY and the PTE of total HAPs is less than 25 TPY, the proposed Perkins Compressor Station is defined as a minor (area) source of HAPs for purposes of 40 CFR 61, 40CFR63, and Title V.
- (3) As calculated by the writer.

REGULATORY APPLICABILITY

The proposed Perkins Compressor Station is subject to the following substantive state and federal air quality rules and regulations: 45CSR2, 45CSR13, 40 CFR 60 Subpart JJJJ, and 40 CFR 63, Subparts HH and ZZZZ. Each applicable rule (and those that have questionable non-applicability) and Crestwood's compliance therewith will be discussed in detail below.

45CSR2: To Prevent and Control Particulate Air Pollution from Combustion of Fuel in Indirect

Heat Exchangers

Pursuant to the definition of “fuel burning unit” under 45CSR2 (“producing heat or power by indirect heat transfer”), 45CSR2 does not apply to the compressor engines or engine/generator sets.

The GDU Reboilers have been determined to each meet the definition of a “fuel burning unit” under 45CSR2 and are, therefore, subject to the applicable requirements therein. However, pursuant to the exemption given under §45-2-11, as the MDHI of the GDU Reboilers are less than 10 mmBtu/hr, the units are not subject to sections 4, 5, 6, 8 and 9 of 45CSR2. The only remaining substantive requirement is under Section 3.1 - Visible Emissions Standards.

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

45CSR10: To Prevent and Control Air Pollution from the Emission of Sulfur Oxides (NON APPLICABILITY)

Pursuant to the definition of “fuel burning unit” under 45CSR10 (“producing heat or power by indirect heat transfer”), the limitations on fuel burning units under 45CSR10 do not apply to the compressor engines or engine/generator sets.

45CSR10 has requirements limiting SO₂ emissions from “fuel burning units,” limiting in-stack SO₂ concentrations of “manufacturing processes,” and limiting H₂S concentrations in process gas streams. The only potential applicability of 45CSR10 to the Perkins Compressor Station is the limitations on fuel burning units. The GDU Reboilers have each been determined to meet the definition of a “fuel burning unit” under 45CSR10. However, pursuant to the exemption given under §45-10-10.1, as the MDHI of the GDU Reboilers are less than 10 mmBtu/hr, the units are not subject to the limitations on fuel burning units under 45CSR10.

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 Perkins Compressor Station has a potential to emit in excess of six (6) lbs/hour and ten (10) TPY of a regulated pollutant and, therefore, pursuant to §45-13-2.24, the construction 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, Crestwood is required to obtain a permit under 45CSR13 for the construction and operation of the facility.

As required under §45-13-8.3 (“Notice Level A”), Crestwood placed a Class I legal advertisement in a “newspaper of *general circulation* in the area where the source is . . . located.” The ad ran on June 15, 2013 in *The Exponent Telegram* and the affidavit of publication for this legal advertisement was submitted on June 26, 2013.

45CSR14: Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution for the Prevention of Significant Deterioration - (NON APPLICABILITY)

The Perkins Compressor Station is proposed to be located in Doddridge County, WV. Doddridge County is classified as "in attainment" with all National Ambient Air Quality Standards. Therefore, as the facility is not a "listed source" under §45-14-2.43, the individual major source applicability threshold for all pollutants is 250 TPY (and pursuant to 2.80(e)(1), 100,000 TPY of CO₂e). As given above in Table 8, the facility-wide PTE of the proposed Perkins Compressor Station is less than 250 TPY for all criteria pollutants and less than 100,000 TPY of CO₂e. Therefore, the facility is not defined as a "major stationary source" under either 45CSR14 and the rule does not apply.

45CSR27: To Prevent and Control the Emissions of Toxic Air Pollutants - (NON APPLICABILITY)

Pursuant to §45-27-3.1, the "owner or operator of a plant that discharges or may discharge a toxic air pollutant into the open air in excess of the amount shown in the Table A [of 45CSR27] shall employ [Best Available Technology] at all chemical processing units emitting the toxic air pollutant." As calculated from Table 1 above, the facility-wide PTE of formaldehyde is greater than 0.5 TPY - greater than the 1,000 pound per year threshold given in Table A of 45CSR27. However, internal combustion engines do not meet the definition of "chemical processing units" under §45-27-2.4 and, therefore, they are not subject to BAT under 45CSR27.

45CSR30: Requirements for Operating Permits - (NON APPLICABILITY)

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 Perkins Compressor Station 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 of any regulated pollutant does not exceed 100 TPY (and, in the case of CO₂e, does not exceed 100,000 TPY). Additionally, the facility-wide PTE does not exceed 10 TPY of any individual HAP or 25 TPY of aggregate HAPs.

However, as the facility is subject to a New Source Performance Standard (NSPS) - 40 CFR 60, Subpart JJJJ and a Maximum Achievable Control Technology (MACT) rule - 40 CFR 63, Subpart HH, the facility would, in most cases, be subject to Title V as a "deferred source." However, pursuant to §60.4230(c) and §63.760(h) as a non-major "area source," Crestwood is not required to obtain a Title V permit for the proposed facility. Therefore, the Perkins Compressor Station is not subject to 45CSR30.

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 - (NON APPLICABILITY)

Pursuant to §60.110b, 40 CFR 60, Subpart Kb applies to “each storage vessel with a capacity greater than or equal to 75 cubic meters (m³) that is used to store volatile organic liquids (VOL) for which construction, reconstruction, or modification is commenced after July 23, 1984.” The largest storage tanks proposed for the Perkins Compressor Station are each 16,800 gallons, or 64 m³. Therefore, Subpart Kb does not apply to any storage tanks at the proposed facility.

40 CFR 60 Subpart JJJJ: Standards of Performance for Stationary Spark Ignition Internal Combustion Engines.

Waukesha, 7044 GSI

Crestwood’s ten (10) Waukesha, 7044 GSI 4SRB 1,627 hp compressor engines proposed for the Perkins Compressor Station are defined under 40 CFR 60, Subpart JJJJ as stationary spark-ignition internal combustion engines (SI ICE) and are each, pursuant to §60.4230(a)(4)(i), subject to the applicable provisions of the rule. Pursuant to §60.4233(e): “Owners and operators of stationary SI ICE with a maximum engine power greater than or equal to 75 KW (100 HP) (except gasoline and rich burn engines that use LPG) must comply with the emission standards in Table 1 to this subpart for their stationary SI ICE.” Therefore, as the proposed Crestwood’s compressor engines are greater than 100 hp, each engine must comply with the emission standards under Table 1 for “Non-Emergency SI ICE ≥ 500 hp manufactured after July 1, 2010:” NO_x - 1.0 g/HP-hr, CO - 2.0 g/HP-hr, and VOC - 0.7 g/HP-hr. The emission standards and the proposed compliance therewith of the engines are given in the following table:

Table 8: Waukesha, 7044 GSI Subpart JJJJ Compliance

Pollutant	Standard (g/HP-hr)	Uncontrolled Emissions (g/bhp) ⁽¹⁾	Control Percentage	Controlled Emissions (g/bhp) ⁽¹⁾	JJJJ Compliant?
NO _x	1.0	13.90	98.92%	0.15	Yes
CO	2.0	12.70	97.64%	0.30	Yes
VOC	0.7	0.61	49.18%	0.31	Yes

(1) Based on the EMIT Technologies, Inc. Model ELS-4200T-1616F-60CEE-361 catalytic converter specification sheet included in the permit application. Controlled emissions of NO_x increased from 0.32 g/bhp by Crestwood to include a safety factor.

The Waukesha, 7044 GSI is not a “certified” engine under Subpart JJJJ so Crestwood will have to show compliance with the emission standards pursuant to §60.4243(b)(2)(ii): conducting an initial performance test and thereafter conducting subsequent performance testing every 8,760 hours or 3 years, whichever comes first, to demonstrate compliance. Performance testing requirements are given under §60.4244 of Subpart JJJJ. Crestwood will additionally have to meet all applicable monitoring, recording, and record-keeping requirements under Subpart JJJJ.

NGEngine, 14.6L

Crestwood’s two (2) NGENE, 14.6L 4SRB 402 hp/300kW engine-generator sets proposed

for the Perkins Compressor Station are defined under 40 CFR 60, Subpart JJJJ as stationary spark-ignition internal combustion engines (SI ICE) and are each, pursuant to §60.4230(a)(4)(iii), subject to the applicable provisions of the rule. Pursuant to §60.4233(e): “Owners and operators of stationary SI ICE with a maximum engine power greater than or equal to 75 KW (100 HP) (except gasoline and rich burn engines that use LPG) must comply with the emission standards in Table 1 to this subpart for their stationary SI ICE.” Therefore, as the proposed Crestwood’s engine-generator sets are greater than 100 hp, each engine must comply with the emission standards under Table 1 for “Non-Emergency SI Natural Gas “ between 100 hp and 500 hp manufactured after January 1, 2011: NO_x - 1.0 g/HP-hr, CO - 2.0 g/HP-hr, and VOC - 0.7 g/HP-hr. The emission standards and the proposed compliance therewith of the engines are given in the following table:

Table 9: NGE, 14.6L Subpart JJJJ Compliance

Pollutant	Standard (g/HP-hr)	Uncontrolled Emissions (g/bhp)	Control Percentage	Controlled Emissions (g/bhp)	JJJJ Compliant?
NO _x	1.0	1.00	n/a	n/a	Yes
CO	2.0	2.00	n/a	n/a	Yes
VOC	0.7	0.70	n/a	n/a	Yes

Crestwood has proposed to meet the emission standards under Table 9 pursuant to §60.4243(b)(1) - purchasing a certified engine (information was included in the permit application showing the proposed engine family is certified). They will still have to meet the monitoring and compliance demonstration requirements under §60.4243(a)(1), respectively, and the record-keeping and reporting requirements under §60.4245.

40 CFR 60, Subpart OOOO: Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution

On April 27, 2012, the USEPA issued a final rule (Federal Register Date: August 16, 2012) that consists of federal air standards for natural gas wells that are hydraulically fractured, along with requirements for several other sources of pollution in the oil and gas industry that currently are not regulated at the federal level. Each potentially applicable section of Subpart OOOO is discussed below.

Compressor Engines

Pursuant to §60.5365(c), “[e]ach reciprocating compressor affected facility, which is a single reciprocating compressor located between the wellhead and the point of custody transfer to the natural gas transmission and storage segment” that is constructed after August 23, 2011 is subject to the applicable provisions of Subpart OOOO. As the Perkins Compressor Station is located before the point of custody transfer, the compressor engines are applicable to Subpart OOOO. The substantive requirements for the engines are given under §60.5385(a): the engines’ “rod packing” must be replaced according to the given schedule and the engine must meet applicable MRR given under §60.5410(c), §60.5415(c), and §60.5420(b)(1).

Pneumatic Controllers - (NON APPLICABILITY)

Pursuant to §60.5365(d)(2), “[f]or the natural gas production segment (between the wellhead and the point of custody transfer to the natural gas transmission and storage segment and not including natural gas processing plants), each pneumatic controller affected facility, which is a single continuous bleed natural gas-driven pneumatic controller operating at a natural gas bleed rate greater than 6 scfh” that is constructed after August 23, 2011 is subject to the applicable provisions of Subpart OOOO. As the Perkins Compressor Station is located before the point of custody transfer, any pneumatic controllers that meet the above definition will be required to meet the substantive requirement for pneumatic controllers as given under §60.5390.

Storage Tanks - (NON APPLICABILITY)

Pursuant to §60.5365(e), for “[e]ach storage vessel affected facility, which is a single storage vessel, located in the oil and natural gas production segment, natural gas processing segment or natural gas transmission and storage segment” that is constructed after August 23, 2011 and, pursuant to §60.5395 has “VOC emissions equal to or greater than 6 tpy” must meet the control requirements under §60.5395 as of October 15, 2013. The substantive requirement is to “reduce VOC emissions by 95.0 percent or greater.” As Crestwood will use a closed-loop VRU to eliminate all potential emissions from the proposed storage tanks, the storage tanks are not subject to the control requirements of Subpart OOOO as the PTE of the storage tanks will be zero.

40 CFR 63 Subpart HH: National Emission Standards for Hazardous Air Pollutants From Oil and Natural Gas Production Facilities

On June 1, 2013 the DAQ took delegation of the area source provisions of 40 CFR 63, Subpart HH. Pursuant to §63.760(a)(3), as the Perkins Compressor Station - an area source of HAPs (see Table 7) - “process[es], upgrade[s], or store[s] natural gas prior to the point at which natural gas enters the natural gas transmission and storage source category or is delivered to a final end user,” it is defined as an area source subject to the applicable provisions under Subpart HH.

Pursuant to §63.760(b)(2), each TEG GDU located at an area source that meets the requirements under §63.760(a)(3) is defined as an affected facility under Subpart HH. The requirements for affected sources at area sources are given under §63.764(d). However, for a GDU, exemptions to these requirements are given under §63.764(e): if (1) “actual annual average flowrate of natural gas to the glycol dehydration unit is less than 85 thousand standard cubic meters [3 mmscf/day] per day” or (2) “actual average emissions of benzene from the glycol dehydration unit process vent to the atmosphere are less than 0.90 megagram [1 TPY] per year.”

As shown in Table 3 above, the maximum PTE of benzene emissions from the GDU process vents are 0.44 TPY. Therefore, the GDUs are exempt from the Subpart HH requirements given under §63.764(d).

40 CFR 63 Subpart ZZZZ: Standards of Performance for Stationary Spark Ignition Internal Combustion Engines

On June 1, 2013 the DAQ took delegation of the area source provisions of 40 CFR 63, Subpart ZZZZ. As the Perkins Compressor Station is defined as an areas source of HAPs (see Table 8), 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 JJJJ, for spark ignition engines.” Pursuant to §63.6590(a)(2)(iii), a “stationary RICE located at an area source of HAP emissions is new if [the applicant] commenced construction of the stationary RICE on or after June 12, 2006.” The engines (including the engine-generator sets) proposed for the Perkins Compressor Station are each defined as a new stationary RICE and, therefore, will show compliance with Subpart ZZZZ by meeting the requirements of 40 CFR 60, Subpart JJJJ. Compliance with Subpart JJJJ is discussed above.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

This section provides an analysis for those regulated pollutants that may be emitted from the proposed Perkins Compressor Station and that are not classified as “criteria pollutants.” Criteria pollutants are defined as Carbon Monoxide (CO), Lead (Pb), Oxides of Nitrogen (NO_x), Ozone, Particulate Matter (PM), Particulate Matter less than 10 microns (PM₁₀), Particulate Matter less than 2.5 microns (PM_{2.5}), and Sulfur Dioxide (SO₂). 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 federal and programs designed to limit their emissions and public exposure. These programs include federal source-specific Hazardous Air Pollutants (HAPs) limits promulgated under 40 CFR 61 (NESHAPS) and 40 CFR 63 (MACT). 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, with some revision since, were 188 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. As noted above, the proposed Perkins Compressor Station has the potential to emit the following HAPs: Hexane, Benzene, Toluene, Ethyl-benzene, Xylene, and Formaldehyde. The following table lists each HAP’s carcinogenic risk (as based on analysis provided in the Integrated Risk Information System (IRIS)):

Table 9: Potential HAPs - Carcinogenic Risk

HAPs	Type	Known/Suspected Carcinogen	Classification
Hexane	VOC	No	Inadequate Data

Benzene	VOC	Yes	Category A - Known Human Carcinogen
Toluene	VOC	No	Inadequate Data
Ethyl-benzene	VOC	No	Category D - Not Classifiable
Xylene	VOC	No	Inadequate Data
Formaldehyde	VOC	Yes	B1 - Probable Human Carcinogen

All HAPs have other non-carcinogenic chronic and acute effects. These adverse health effects 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 federal or state ambient air quality standards for these specific chemicals*. For a complete discussion of the known health effects of each compound refer to the IRIS database located at www.epa.gov/iris.

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 required. Additionally, based on the nature and location of the proposed source, an air quality impacts modeling analysis was not required under 45CSR13, Section 7.

MONITORING, COMPLIANCE DEMONSTRATIONS, REPORTING, AND RECORDING OF OPERATIONS

The following substantive monitoring, compliance demonstration, and record-keeping requirements (MRR) shall be required:

- For the purposes of demonstrating compliance with the maximum hours of operation limit set forth in 4.1.3(d) of the draft permit, Crestwood shall be required to monitor and record the monthly and rolling twelve month hours of operation of GEN-2;
- In order to demonstrate compliance with 4.1.4(a) of the draft permit, upon request of the Director, Crestwood shall be required to demonstrate compliance with the VOC/HAP emissions thresholds using GLYCalc Version 4.0 or higher. Crestwood shall be required to sample in accordance with GPA Method 2166 and analyze the samples utilizing the extended GPA Method 2286 as specified in the GRI-GLYCalc V4 Technical Reference User Manual and Handbook;
- For the purposes of demonstrating compliance with the maximum wet gas throughput limit set forth in 4.1.4(b) of the draft permit, Crestwood shall be required to monitor and record

the daily, monthly and rolling twelve month amounts of the wet gas throughput of each Glycol Dehydration Unit;

- For the purposes of demonstrating compliance with visible emissions limitations set forth in 4.1.5(d) of the draft permit, Crestwood shall be required to:
 - Conduct an initial Method 22 visual emission observation on the Reboilers exhaust to determine the compliance with the visible emission provisions. Crestwood shall be required to take a minimum of two (2) hours of visual emissions observations on the units;
 - Conduct monthly Method 22 visible emission observations of the Reboiler exhaust and flare to ensure proper operation for a minimum of ten (10) minutes each month the units are in operation;
 - In the event visible emissions are observed in excess of the limitations given under 4.1.5(d), Crestwood shall be required to take immediate corrective action;
 - Maintain records of the visible emission opacity tests conducted per Section 4.2.4. of the draft permit;
 - Any deviation(s) from the allowable visible emission requirement for any emission source discovered during observations using 40CFR Part 60, Appendix A, Method 9 or 22 shall be reported in writing to the Director of the Division of Air Quality as soon as practicable, but in any case within ten (10) calendar days of the occurrence and shall include at least 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.
- Crestwood shall be required to maintain records of all startups, shutdowns, and/or malfunctions of the condenser and reboiler. These records shall include the date, time, and duration of each event.
- For the purposes of demonstrating compliance with the truck loadout throughput limit set forth in 4.1.9(b) of the draft permit, Crestwood shall be required to monitor and maintain monthly and rolling twelve month records of the amount of liquids loaded out.
- Crestwood shall be required to meet all applicable Monitoring, Compliance Demonstration and Source-Specific Recordkeeping and Reporting Requirements as given under 45CSR2, 40 CFR 60, Subpart JJJJ, and 40 CFR 63, Subpart HH.

PERFORMANCE TESTING OF OPERATIONS

The following substantive performance testing requirements shall be required:

- At such reasonable time(s) as the Secretary may designate, in accordance with the provisions of 3.3 of the draft permit, Crestwood shall be required to conduct or have conducted test(s) to determine compliance with the emission limitations established in this permit and/or applicable regulations.
- Crestwood shall be required to, pursuant to the timing and other requirements of 40 CFR 60, Subpart JJJJ, conduct, or have conducted, performance testing on the compressor engines to determine the emission rates of CO, NO_x, and VOCs. The testing shall, in addition to meeting all applicable requirements under 40 CFR 60, Subpart JJJJ, be in accordance with 3.3.1. of the draft permit. Results of the this performance testing shall, unless granted in writing a waiver by the Director, be used to determine compliance with the CO, NO_x, and VOC emission limits given under 4.1.2(c) of the draft permit.
- Crestwood shall be required to meet all applicable Performance Testing Requirements as given under 45CSR2, 40 CFR 60, Subpart JJJJ, and 40 CFR 63, Subpart HH.

RECOMMENDATION TO DIRECTOR

The information provided in the permit application indicates that compliance with all applicable state and federal air quality regulations will be achieved. Therefore, I recommend to the Director the issuance of a Permit Number R13-3092 to Crestwood Resources Appalachian Corporation for the proposed construction and operation of the Perkins Compressor Station located near Salem, Doddridge County, WV.

Joe Kessler, PE
Engineer

Date