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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.:	R13-3106A
Plant ID No.:	017-00060
Applicant:	Antero Midstream LLC
Facility Name:	New Milton Compressor Station
Location:	Near New Milton, Doddridge County
NAICS Code:	221210
SIC Code:	4923
Application Type:	Modification
Received Date:	January 7, 2015
Engineer Assigned:	Joe Kessler
Fee Amount:	$2,000
Date Received:	$1,000 (1/13/15), $1,000 (2/23/15)
Complete Date:	February 23, 2015
Due Date:	May 24, 2015
Applicant's Ad Date:	January 20, 2015
Newspaper:	*The Herald Record*
UTM's:	Easting: 526.978 km Northing: 4,342.232 km Zone: 17
Latitude/Longitude:	39.22896/-80.68743
Description:	Modification to address various as-built changes to the facility.

On December 3, 2013, Antero Midstream LLC (Antero), at the time Antero Resources Corporation, was issued Permit Number R13-3106 for the construction of the New Milton Compressor Station located in a rural area of Doddridge County approximately 0.30 miles west of New Milton, WV east of State Route (SR) 18.

DESCRIPTION OF PROCESS/MODIFICATION

Existing Facility

The existing (as originally permitted) New Milton Station receives natural gas from surrounding wells via pipelines and separates, dehydrates, and compresses the gas before sending it via pipeline to other facilities for further processing or distribution. To effect this, the facility

consists of six (6) 1,680 horsepower (hp) Waukesha 7044 GSI Compressor Engines, two (2) 60 mmscf/day triethylene glycol (TEG) dehydration units (GDU), a small 0.50 mmBtu/hr fuel gas pre-heater, two (2) 200 kW_e Capstone C200 NG Microturbine Generators, and eleven (11) storage tanks.

Proposed Modifications

Antero has now submitted a permit application to:

- Update the emissions profile of the compressor engines to reflect site-specific catalyst vendor emissions data;
- Update emissions from the storage tanks to account for flashing emissions in the settling tank;
- Update the flare emissions to account for operation at a maximum heat input of 4.80 mmBtu/hr;
- Update emissions from the GDU reboiler and the fuel gas pre-heater to account for a combustion efficiency of 80%;
- Update emissions from the GDU flash tank to account for a combustion in the reboiler at a 95% efficiency;
- Update truck loadout emissions to account for produced water loading;
- Update the emissions from the microturbines by removing the buffer for rich gas usage;
- Update of all greenhouse gas emissions to account for the revised global warming potentials (GWPs); and
- Update the list of small de minimis storage tanks in the permit application (only four (4) were installed instead of six).

Post-Modification Process Description

Raw natural gas produced in area wells will enter into the facility and, after passing through a slug catcher to removed condensate/produced water, will be compressed by the engines. All of the condensate and produced water that enters the station from pigging or drops out in vessels is routed to a tank battery (five (5) 16,800 gallon tanks). The combined liquids are directed to a settling tank (T03) for natural separation and then directed to homogenous tanks for storage (Tanks T01 and T02 will hold produced water and Tanks T04 and T05 will hold condensate). Four (three (3) 2,000 and one (1) 1,000 gallon) storage tanks are used at the site for miscellaneous storage (waste oil, bulk TEG storage, lube oil storage, and bulk coolant storage). Emissions from the condensate/produced water storage tanks (working/breathing/flashing) are routed to a vapor recovery unit (VRU) for control. Flashing emissions only occur in the settling tank. The VRU captures and recycles the vapors back into the process prior to the inlet separator. Emissions from the other storage tanks are nominal. The VRU has a calculated capture efficiency of 98%. Any emissions from the miscellaneous tanks are, based on the vapor pressures of the materials stored, considered insignificant.

The gas, compressed in the engines (CE-01 through CE-06), is directed to two coalescing filter separators and then allowed to pass through the GDUs (RBV-1 and RBV-2) where it is dehydrated to the desired level. The compressor engines are each controlled (NO_x, CO, VOCs, and formaldehyde) by an EMIT Technologies Model ELH-4200T-1616F-65CEE-361 catalytic converter (C-02 through C-07).

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. The dehydrator still vent gases are each sent to the flare (C-01) for destruction. Additionally, each GDU contains several TEG storage tanks. However, the storage tanks are defined as *de minimis* sources under Table 45-13B of 45CSR13 as they are each less than 10,000 gallons and TEG has an extremely low vapor pressure (<0.01 mm Hg).

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 are sent to one of the two 1.5 mmBtu/hr reboilers as fuel. 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 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.

A portion of the gas is withdrawn after dehydration but before the station outlet metering and sent to the fuel gas system. The fuel gas is directed through a fuel gas scrubber and metering before being directed to the compressor engines and other gas-powered equipment. A 0.5 mmBtu/hr direct-fired gas heater (HTR-1) will be used in the fuel gas system to prevent the formation of hydrates and to minimize condensate dropout from the pressure reduction. Lastly, the process gas is sent through small vertical conditioning scrubbers and final custody transfer metering before leaving the compressor station.

Additionally, the facility will utilize a truck loadout (EPLOR) to remove condensate and produced water from the site (estimated to be a maximum of 3,219,300 gallons of condensate per year and 1,057,770 gallons of produced water per year). Emissions from the truck rack will be uncontrolled. Two 200 kWe uncontrolled Microturbines (GEN-1 and GEN-2) will be used to produce primary and backup power, respectively for the facility.

SITE INSPECTION

On September 18, 2013, the writer conducted an inspection of the (at the time) proposed location of the New Milton Compressor Station. The New Milton site is located in a rural area of

Doddridge County approximately 0.30 miles west of New Milton, WV east of State Route (SR) 18. The writer was accompanied on the inspection by Mr. Don Grey, Environmental and Regulatory Manager with Antero. Observations from the inspection included:

- The facility lies atop a hill approximately 0.30 miles west of New Milton, WV east of SR 18 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, Antero was in the process of building an access road to the top of the hill where the compressor station will sit. No emission units were visible at the site during the visit; and

- The occupied dwelling located nearest to the site is approximately 0.25 miles north of the site at the base of the hill.

Directions: [Latitude: 39.22896, Longitude: -80.68743] From the intersection of United States (US) Route 50 and SR 18, travel south on SR 18 for approximately 7.5 miles to the access road on the left. Follow the access road for 1.0 miles to the compressor station at the top of the hill.

AIR EMISSIONS AND CALCULATION METHODOLOGIES

Antero provided an updated and revised facility-wide air emissions estimate for the New Milton Compressor Station. The proposed revisions were noted above. The following will only discuss in detail only those emission units proposed to be modified as part of this permitting process.

Compressor Engines

Potential emissions from each of the six (6) Waukesha, L7044 GSI 4SRB 1,680 hp compressor engines (10E through 16E) were based on post-control emission factors provided by the catalytic converter vendor, the engine vendor, 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 8,324 Btu/hp-hr) maximum design heat input (MDHI) of the engines of 13.98 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)]	0.51 g/hp-hr (controlled)	Catalyst Vendor	1.90	8.32
NO_X[(1)]	0.54 g/hp-hr (controlled)	Catalyst Vendor	2.00	8.78
$PM_{2.5}$[(2)]	19.41 x 10^{-3} lb/mmBtu	AP-42, Table 3.2-3	0.27	1.19
PM_{10}[(2)]	19.41 x 10^{-3} lb/mmBtu	AP-42, Table 3.2-3	0.27	1.19

Pollutant	Emission Factor	Source	Hourly (lb/hr)	Annual (ton/yr)
PM[2]	19.41 x 10^{-3} lb/mmBtu	AP-42, Table 3.2-3	0.27	1.19
SO_2	5.88 x 10^{-4} lb/mmBtu	AP-42, Table 3.2-3	0.01	0.04
VOCs[1]	0.17 g/hp-hr (controlled)	Catalyst Vendor	0.61	2.68
Total HAPs	Various	AP-42, Table 3.2-3	0.21	0.93
Formaldehyde[1]	0.01 g/hp-hr (controlled)	Catalyst Vendor	0.04	0.20
CH_4	0.47 g/hp-hr	Engine Vendor	1.74	7.62
N_2O	1.00 x 10^{-4} kg/mmBtu	40 CFR Part 98, Subpart C, Table C-2	0.00	0.01
CO_2	525 g/hp-hr	Engine Vendor	1,944.48	8,516.81
CO_2e[3]	n/a	n/a	1,988.91	8,711.44

(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.

Microturbines

Emissions from the two (2) 2.06 mmBtu/hr Capstone C200 NG 200kW_e Microturbines (16E and 17E) were based on the emission factors provided by the vendor. Hourly emissions were based on the maximum electrical output and annual emissions were based on an annual operation of 8,760 hours. The PTE generated by each microturbine and the emission factor/emission factor source are given in the following table:

Table 2: Per-Microturbine PTE

Pollutant	Emission Factor	Source	Hourly (lb/hr)	Annual (ton/yr)
NO_x	0.40 lb/MWe-hr	Vendor Information	0.08	0.35
CO	1.10 lb/MWe-hr	Vendor Information	0.22	0.96
VOC	0.10 lb/MWe-hr	Vendor Information	0.02	0.09
CO_2	1,330 lb/MWe-hr	Vendor Information	266.00	1,165.08
CO_2e	n/a	n/a	n/a	1,165.08

Glycol Regenerator Column

Un controlled VOC, HAPs, and methane emissions from the glycol regenerator still vents (19E and 21E) are based on ProMax Simulation Software. ProMax software is chemical process simulator for design and modeling of amine gas treating and glycol dehydration units. Based on a

detailed input gas analysis and the components of the facility, the software can simulate and model the inputs and outputs of the system.

As noted above, the uncontrolled emissions from the GDU Still Vent are sent to a flare for control. Therefore, a minimum hydrocarbon destruction efficiency of 98% was used to determine the controlled emission rate. An electronic copy (Excel File) of the ProMax run was submitted to the DAQ to verify the accuracy of the GDU emissions. Annual emissions were based on 8,760 hours of operation per year.

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

Table 3: Per-GDU Still Vent PTE

Pollutant	Emission Factor	Source	Hourly (lb/hr)[1]	Annual (ton/yr)
VOC	**n/a**	**ProMax Results**	**1.10**	**4.83**
n-Hexane	*n/a*	*ProMax Results*	*0.03*	*0.15*
Benzene	*n/a*	*ProMax Results*	*0.02*	*0.10*
Toluene	*n.a*	*ProMax Results*	*0.12*	*0.52*
Ethyl-benzene	*n/a*	*ProMax Results*	*0.01*	*0.07*
Xylene	*n/a*	*ProMax Results*	*0.17*	*0.73*
		Total HAPs →	**0.35**	**1.55**
CH_4	n/a	ProMax Results	0.86	3.77
CO_2e	**n/a**	**n/a**	**n/a**	**94.17**

(1) Based on one half of the process stream "Water Vapor" values of the ProMax Simulation (the simulation modeled one 120 mmscf/day units rather than two 60 mmscf/day units).

Glycol Dehydration Unit Flash Tank

Uncontrolled VOC, HAPs, and methane emissions from the GDU Flash Tank (as emitted from the GDU reboiler stacks) are based on ProMax Simulation Software. As noted above, the uncontrolled emissions from the GDU Still Vent are sent to the reboilers as fuel. Therefore, a minimum hydrocarbon destruction efficiency of 95% was used to determine the controlled emission rates. An electronic copy (Excel File) of the ProMax run was submitted to the DAQ to verify the accuracy of the GDU emissions. Annual emissions were based on 8,760 hours of operation per year.

The PTE of emissions generated by each GDU flash Tank (as controlled by combustion in the reboilers) and the emission factor/emission factor source are given in the following table:

Table 4: Per-GDU Flash Tank PTE

Pollutant	Emission Factor	Source	Hourly (lb/hr)	Annual (ton/yr)
VOC	**n/a**	**ProMax Results**	**0.84**	**3.67**
n-Hexane	*n/a*	*ProMax Results*	*0.02*	*0.09*
Benzene	*n/a*	*ProMax Results*	*~0.00*	*~0.00*
Toluene	*n.a*	*ProMax Results*	*<0.01*	*0.01*
Ethyl-benzene	*n/a*	*ProMax Results*	*~0.00*	*~0.00*
Xylene	*n/a*	*ProMax Results*	*<0.01*	*0.01*
		Total HAPs →	**0.02**	**0.11**
CH_4[(1)]	n/a	ProMax Results	1.13	4.93
CO_2e	**n/a**	**n/a**	**n/a**	**123.25**

(1) Based on one half of the process stream "Flash Gas" values of the ProMax Simulation (the simulation modeled one 120 mmscf/day units rather than two 60 mmscf/day units).

Flare Combustion Exhaust Emissions

Emissions created from the combustion of the hydrocarbons (coming from the GDU Still Vents) at the flare were based on emission factors provided for flare combustion as given un AP-42 Section 13.5. Hourly emissions were based on the revised MDHI of the flare (4.80 mmBtu/hr) and annual emissions were based on an operation of 8,760 hours.

Reboiler Combustion Exhaust Emissions

Combustion emissions from each 1.50 mmBtu/hr reboiler (18E and 20E) were based on the emission factors provided for natural gas combustion (deemed to be appropriate to estimate emissions from use of GDU flash gas as fuel) as given in AP-42 Section 1.4 and as given in 40 CFR 98, Subpart C. 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 1,020 Btu/ft^3 and a heater efficiency of 80% was used in the calculations.

Fuel Gas Pre-Heater

Combustion emissions from the 0.50 mmBtu/hr Fuel Gas Pre-Heater (34E) were based on the emission factors provided for natural gas combustion as given in AP-42 Section 1.4 and as given in 40 CFR 98, Subpart C. Hourly emissions were based on the MDHI of the unit (0.50 mmBtu/hr) and annual emissions were based on an annual operation of 8,760 hours. A natural gas heat content value of 1,020 Btu/ft^3 and a heater efficiency of 80% was used in the calculations.

Storage Tanks

Antero provided an estimate of the uncontrolled emissions produced from the five (5) 16,880 gallon (22E through 26E) produced water and condensate storage tanks using the TANKS 4.09d

program (working/breathing losses) as provided under AP-42, Section 7 and using ProMax Simulation Software (flashing losses from the settling tank). Produced water was conservatively estimated to contain 10% by weight of VOCs. However, as noted above, emissions from the tanks shall be routed to a VRU for control. The VRU will capture and recycle all the vapors back into the into inlet separator. Therefore, according to DAQ policy for use of VRUs, the PTE from these tanks shall be based on a 98% capture efficiency (when used in conjunction with the procedures as outlined under 4.1.10(c) through 4.1.10(e) of the draft permit). Based on the size of tanks and the material stored, potential emissions from the other bulk material storage tanks will be nominal.

Truck Loadouts

Air emissions from condensate and produced water truck loading operations (EPLOR) occur as fugitive emissions generated by displacement of vapors when loading trucks. The emission factor used to generate the VOC emissions is based on Equation (1) of AP-42 Section 5.2-4. In this equation, Antero used variables specific to the liquids loaded and to the method of loading - in this case "submerged filling - dedicated normal service." Additionally, worst-case annual emissions were based on a maximum loading rate of 3,219,300 gal/year of condensate and 1,057,770 gal/year of produced water. Maximum hourly loadout emissions were based on loading out one (1) 10,920 gallon condensate and one (1) 10,920 produced water truck/hour. Produced water was conservatively estimated to contain 10% by weight of VOCs.

Emissions Summary

Based on the above revised estimation methodologies, which are determined to be reasonable, the post-modification PTE of the New Milton Compressor Station is given in Attachment A to this evaluation.

The change in annual facility-wide PTE as a result of the modifications evaluated herein is given in the following table:

Table 5: Change In Facility-Wide Annual PTE

Pollutant	R13-3106[1]		R13-3106A		Change	
	lbs/hour	tons/year	lbs/hour	tons/year	lbs/hour	tons/year
CO	10.63	46.61	13.98	61.23	3.35	14.62
NO_X	4.26	18.61	12.94	56.69	8.68	38.08
PM[2]	1.64	7.26	1.69	7.37	0.05	0.11
SO_2	0.06	0.24	0.08	0.33	0.02	0.09
VOCs	31.31	56.86	69.71	62.29	38.40	5.43
HAPs	1.90	8.44	2.93	9.14	1.03	0.70
CO_2e	--	55,989	--	60,206	--	4,217

(1) Emissions taken from R13-3106 Fact Sheet.
(2) All particulate matter emissions are assumed to be less than 2.5 microns. Includes condensables.

REGULATORY APPLICABILITY

The following will discuss only the regulatory applicability of general rules and specific rules to the emission units that have been proposed to be substantively modified as part of this permitting action.

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 microturbines.

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 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

Antero has proposed flaring for control of the waste gas produced from GDU and combustion in the reboiler for control of vapors produced in the GDU flash tank. The flare and the reboiler both meet the definition of an "incinerator" under 45CSR6 and are, therefore, subject to the requirements therein. The substantive requirements applicable to the 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 included in the application, the maximum vapor mass sent to the flare from the GDU Vents will be 760.41 lb/hr (0.38 tons/hour). Based on the above equation (and conservatively using the lower F Factor), the particulate matter limit of the flare is 0.39 lbs/hr. As

the flare is of smokeless design, particulate matter emissions from the flare are expected to be negligible and in compliance with the limit calculated under Section 4.1.

Additionally, based on information included in the application, the maximum vapor mass sent to each reboiler from each GDU flash tank will be 112.39 lb/hr (0.06 tons/hour). Based on the above equation (and conservatively using the lower F Factor), the particulate matter limit of each reboiler is 0.16 lbs/hr. The particulate matter emissions from each reboiler are estimated to be 0.01 lbs/hr, or 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 flare and the reboiler have a 20% limit on opacity during operation. As the flare is of smokeless design, proper design and operation of the flare should prevent any substantive opacity from the flares. As the reboiler is combusting methane and ethane-rich flash gas which will facilitate complete combustion, no substantive opacity is expected from the reboilers.

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 microturbines.

45CSR10 has requirements limiting SO_2 emissions from "fuel burning units," limiting in-stack SO_2 concentrations of "manufacturing processes," and limiting H_2S concentrations in process gas streams. The only potential applicability of 45CSR10 to the New Milton 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 changes to the New Milton Compressor Station have the potential to increase the PTE of the facility in excess of six (6) lbs/hour and ten (10) TPY of a regulated pollutant (see Table 5 above) and, therefore, pursuant to §45-13-2.17, the changes are defined as a "modification" under 45CSR13. Pursuant to §45-13-5.1, "[n]o person shall cause, suffer, allow or permit the construction, modification, relocation and operation of any stationary source to be commenced without . . . obtaining a permit to construct." Therefore, Antero is required to obtain a permit under 45CSR13 for the modification of the facility.

As required under §45-13-8.3 ("Notice Level A"), Antero placed a Class I legal advertisement in a "newspaper of *general circulation* in the area where the source is . . . located."

The ad ran on January 20, 2015 in *The Herald Record* and the affidavit of publication for this legal advertisement was submitted on January 28, 2015.

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

The New Milton Compressor Station is 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. As given in Attachment A, the post-modification facility-wide PTE of the New Milton Compressor Station remains less than 250 TPY for all criteria pollutants. Therefore, the facility is not defined as a "major stationary source" under either 45CSR14 and is not subject to review requirements therein.

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 modified New Milton 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 (see Attachment A) 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 facility is subject to two New Source Performance Standard (NSPS) - 40 CFR 60, Subpart JJJJ and Subpart OOOO - and two Maximum Achievable Control Technology (MACT) rules - 40 CFR 63, Subpart ZZZZ and 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), §60.5370(c), §63.6585(d), and §63.760(h) as a non-major "area source," Antero is not required to obtain a Title V permit for the proposed facility. Therefore, the New Milton Compressor Station is not subject to 45CSR30.

40 CFR 60 Subpart GG: Standards of Performance for Stationary Gas Turbines - (NON APPLICABILITY)

Pursuant to §60.330(a), 40 CFR 60, Subpart GG applies to "[a]ll stationary gas turbines with a heat input at peak load equal to or greater than 10.7 gigajoules (10 million Btu) per hour, based on the lower heating value of the fuel fired." The microturbines located at the New Milton Compressor Station are each rated at 2.06 mmBtu/hr and are not, therefore, subject to Subpart GG.

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

Antero's six (6) Waukesha, L7044 GSI 4SRB 1,680 hp compressor engines located at the New Milton 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 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 6: Waukesha, L7044 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	13.50	96.00%	0.54	Yes
CO	2.0	12.80	96.02%	0.51	Yes
VOC	0.7	0.33	48.48%	0.17	Yes

(1) Based on the EMIT Technologies, Inc. Model ELH-4200T-1616F-65CEE-361 catalytic converter specification sheet included in the permit application.

The Waukesha, 7044 LGSI is not a "certified" engine under Subpart JJJJ so Antero 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. Antero will additionally have to meet all applicable monitoring, recording, and record-keeping requirements under Subpart JJJJ.

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 (with amendments finalized on 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 New Milton 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 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).

Storage Tanks - (CONDITIONAL 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." Antero has proposed the use of a closed-loop VRU to eliminate all potential emissions from the proposed storage tanks. Pursuant to §60.5365(e), "[a]ny vapor from the storage vessel that is recovered and routed to a process through a VRU designed and operated as specified in [§60.5365] is not required to be included in the determination of VOC potential to emit for purposes of determining affected facility status, provided you comply with the requirements in paragraphs (e)(1) through (4) of [§60.5365]." Therefore, if the proposed VRU complies with §60.5365(e)(1) through (e)(4), storage tanks are not subject to Subpart OOOO.

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 New Milton 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 Tables 3 and 4 above, the maximum aggregate PTE of benzene emissions from the GDU process vents and flash tank are approximately 0.20 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 New Milton Compressor Station is defined as an area source of HAPs (see Table 7), 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 proposed for the New Milton Compressor Station are each defined as a new stationary RICE (application states manufacture date of engines is July 2013) 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 New Milton 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 (PM_{10}), Particulate Matter less than 2.5 microns ($PM_{2.5}$), 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 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 New Milton 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 affects 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 increase in emissions are less than applicability thresholds that would define the proposed modification as "major" under 45CSR14 and, therefore, no air quality impacts modeling analysis was required. Additionally, based on the nature of the modification and the location of the source, an air quality impacts modeling analysis was not required under 45CSR13, Section 7.

MONITORING, COMPLIANCE DEMONSTRATIONS, REPORTING, AND RECORDING OF OPERATIONS

The only substantive change to the monitoring, compliance demonstrations, reporting, and recording of operations in the draft permit was the addition of the boilerplate MRR requirements relating to the use of the VRU (to achieve a 98% capture percentage) on the storage tank emissions.

PERFORMANCE TESTING OF OPERATIONS

There was no change in the performance testing requirements.

CHANGES TO PERMIT R13-3106

The substantive changes made changes to R13-3106 were limited to:

- The emission limits of the compressor engines in Table 4.1.2(c) of the draft permit were revised;
- The MDHI of the microturbines was revised in 4.1.3(a) and the emission of the microturbines were rives in Table 4.1.3(b);
- Language was added under 4.1.5(b) to route vapors from the GDU Flash Tank to the reboilers as fuel;
- The MDHI of the flare was revised in 4.1.8(a);

- Requirements 4.1.10, 4.2.5., 4.2.6., 4.4.4. through 4.4.8., and 4.5.2. were added (boilerplate language) necessary to allow a 98% capture efficiency for the VRUs controlling emissions from the storage tanks; and

- The truck loadout throughputs under 4.1.11(b) were revised.

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 R13-3106A to Antero Midstream LLC for the proposed modification of the New Milton Compressor Station located near New Milton, Doddridge County, WV.

Joe Kessler, PE
Engineer

2/27/15
Date

Attachment A: Facility-Wide PTE

Antero Midstream, LLC: New Milton Compressor Station
Permit Number R13-3106A: Facility ID 017-00060

Emission Unit	EP ID	CO		NO_x		PM[1]		SO_x		VOC		CO_2e		HAPs	
		lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
Compressor Engine	10E	1.90	8.32	2.00	8.78	0.27	1.19	0.01	0.04	0.61	2.68	1,989	8,711	0.21	0.93
Compressor Engine	11E	1.90	8.32	2.00	8.78	0.27	1.19	0.01	0.04	0.61	2.68	1,989	8,711	0.21	0.93
Compressor Engine	12E	1.90	8.32	2.00	8.78	0.27	1.19	0.01	0.04	0.61	2.68	1,989	8,711	0.21	0.93
Compressor Engine	13E	1.90	8.32	2.00	8.78	0.27	1.19	0.01	0.04	0.61	2.68	1,989	8,711	0.21	0.93
Compressor Engine	14E	1.90	8.32	2.00	8.78	0.27	1.19	0.01	0.04	0.61	2.68	1,989	8,711	0.21	0.93
Compressor Engine	15E	1.90	8.32	2.00	8.78	0.27	1.19	0.01	0.04	0.61	2.68	1,989	8,711	0.21	0.93
Microturbines	16E	0.22	0.96	0.08	0.35	0.01	0.06	0.01	0.03	0.02	0.09	266	1,165	~0.00	~0.00
Microturbines	17E	0.22	0.96	0.08	0.35	0.01	0.06	0.01	0.03	0.02	0.09	266	1,165	~0.00	~0.00
Dehydrator #1 Still Vent[2]	14E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.10	4.83	22	94	0.35	1.55
Dehydrator #1 Flash Tank[3]	15E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.84	3.67	28	123	0.02	0.11
Dehydrator #1 Reboiler[4]	16E	0.15	0.68	0.18	0.81	0.01	0.04	~0.00	~0.00	0.01	0.04	176	771	~0.00	~0.00
Dehydrator #2 Still Vent[2]	17E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.10	4.83	22	94	0.35	1.55
Dehydrator #2 Flash Tank[3]	18E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.84	3.67	28	123	0.02	0.11
Dehydrator #2 Reboiler[4]	19E	0.15	0.68	0.18	0.81	0.01	0.04	~0.00	~0.00	0.01	0.04	176	771	~0.00	~0.00
Storage Tanks	20E-24E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.54	6.76	11	48	0.02	0.09
Truck Loadout	25E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	59.31	8.21	459	59	0.85	0.12
Flare Combustion[5]	26E	1.78	7.79	0.33	1.44	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	563	2,465	<0.01	<0.01
Catalytic Heater	27E	0.05	0.23	0.06	0.27	0.01	0.02	~0.00	~0.00	<0.01	0.01	59	257	<0.01	0.01
Component Leaks	Fugitive	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.23	5.39	30	133	<0.01	0.02
Venting	Fugitive	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n/a	8.61	n/a	668	n/a	0.02
Facility-Wide Total →		***13.98***	***61.23***	***12.94***	***56.69***	***1.69***	***7.37***	***0.08***	***0.33***	***69.71***	***62.29***	***14,039***	***60,206***	***2.93***	***9.14[5]***

(1) All particular matter emissions are assumed to be 2.5 microns or less.
(2) As emitted at the flare after 2% pass-through.
(3) As emitted at the reboiler stack after 5% pass-through.
(4) Combustion exhaust only.
(5) No individual HAP has a PTE over 10 TPY. As the PTE of all individual HAPs are less than 10 TPY and the PTE of total HAPs is less than 25 TPY, the New Milton Compressor Station is defined as a minor (area) source of HAPs for purposes of 40 CFR 61, 40CFR63, and Title V.