



west virginia department of environmental protection

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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.: R13-2974
Plant ID No.: 049-00150
Applicant: Purdys Run Energy LLC
Facility Name: Purdys Run Electric Generating Station
Location: Near Fairmont, Marion County
NAICS Code: 221112
Application Type: Construction
Received Date: August 27, 2012
Engineer Assigned: Joe Kessler
Fee Amount: \$2,000
Date Received: August 29, 2012 (\$1,000)
October 18, 2012 (\$1,000)
Complete Date: November 29, 2012
Due Date: February 27, 2013
Applicant's Ad Date: November 13, 2012
Newspaper: *Times West Virginian*
UTM's: Easting: 565.424 km Northing: 4,365.725 km Zone: 17
Description: Construction of an electric generating station consisting of two (2) 4,350 horsepower (hp) natural gas-fired Waukesha Model 16V275GL 4-Stroke Lean-Burn (4SLB) engines.

DESCRIPTION OF PROCESS

On August 29, 2012, Purdys Run Energy LLC (Purdys Run) applied for a permit to construct and operate a small 6.22 mW (output) electric generating station to be located near the junction of County Route (CR) 27 and Manley Chapel Road just outside of Fairmont, Marion County, WV. The facility will use two (2) 4,350 hp natural gas-fired Waukesha Model 16V275GL 4SLB engines each connected to a 3.11 mW generator to sell electricity to the power grid. The CO, VOC, and formaldehyde emissions produced by the engines will be controlled (94.9%, 70.0%, and 89.2%, respectively) by the use of an EmeraChem Performax ADCAT™ Oxidation Catalyst on each engine. The engines will be the only air emissions sources at the proposed facility.

SITE INSPECTION

On September 20, 2012 the writer conducted an inspection of the proposed location of the Purdys Run Electric Generating Station. At the time of the inspection, no site preparation activities were underway. Observations from the inspection include:

- The proposed facility will lie on a hill behind Reiss Viking Corporation's Monogah Plant (Permit Number R13-0852A - apparently now permanently shut down).
- While the area is rural in nature, there are many occupied residences and farms within 0.25 - 0.5 miles of the proposed facility scattered along CR 27 and Manley Chapel Road.

Directions: [Latitude: 39.43860, Longitude: -80.23974] From the intersection of United States (US) 250 and US 19, travel west on US 19 for 6.8 miles and turn left onto CR 27. Proceed south on CR 27 for 0.6 miles to the (proposed) facility access road on the right. The facility is proposed to be located approximately 0.25 miles up on the hill west of CR27.

AIR EMISSIONS AND CALCULATION METHODOLOGIES

Potential emissions from each of the two (2) 4,350 hp natural gas-fired Waukesha Model 16V275GL 4SLB engines were based on post-control emission factors provided by the catalyst manufacturer (EmeraChem) and as given in AP-42, Section 3.2 (AP-42 is a database of emission factors maintained by USEPA). Hourly emissions were based on maximum design heat input (MDHI) of the engine of 27.8 mmBtu/hr. Annual emissions were based on 8,760 hours of operation per year. The following table details the potential-to-emit (PTE) of each engine:

Table 1: Per- Engine PTE

Pollutant	Emission Factor	Source	Hourly (lb/hr)	Annual (ton/yr)
CO ⁽¹⁾	0.08 g/hp-hr (controlled)	Catalyst Vendor	0.77	3.36
NO _x	0.50 g/hp-hr	Catalyst Vendor	4.79	20.98
PM _{2.5} ⁽²⁾	9.99 x 10 ⁻³ lb/mmBtu	AP-42, Table 3.2-2	0.28	1.23
PM ₁₀ ⁽²⁾	9.99 x 10 ⁻³ lb/mmBtu	AP-42, Table 3.2-2	0.28	1.23
PM ⁽²⁾	9.99 x 10 ⁻³ lb/mmBtu	AP-42, Table 3.2-2	0.28	1.23
SO ₂	5.88 x 10 ⁻⁴ lb/mmBtu	AP-42, Table 3.2-2	0.02	0.07
VOCs ⁽¹⁾	0.08 g/hp-hr (controlled)	Catalyst Vendor	0.77	3.36
Formaldehyde ⁽¹⁾	0.02 g/hp-hr (controlled)	Catalyst Vendor	0.19	0.84
Non-CH ₂ O HAPs ⁽³⁾	6.10 x 10 ⁻³ lb/mmBtu (controlled)	AP-42, Table 3.2-2	0.17	0.74
Total HAPs	n/a	n/a	0.36	1.58

Pollutant	Emission Factor	Source	Hourly (lb/hr)	Annual (ton/yr)
CH ₄	4.6 g/hp-hr	Catalyst Vendor	44.12	193.25
CO ₂	399 g/hp-hr	Catalyst Vendor	3,827.10	16,762.70
CO ₂ e ⁽³⁾	n/a	n/a	n/a	20,820.86

- (1) Based on post-control emission factors provided by oxidation catalyst vendor.
- (2) Filterable + Condensable.
- (3) An aggregate of all HAPs with AP-42 Table 3.2-2 emission factors of 1.00 x 10⁻³ lb/mmBtu (uncontrolled) or greater: Acetaldehyde, Acrolein, Methanol, and n-Hexane. Controlled factor is based on VOC emission control percentage.
- (4) 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.

By doubling the PTE of one engine as given above, the following table details the facility-wide PTE.

Table 2: Facility-Wide PTE

Pollutant	Hourly (lb/hr)	Annual (ton/yr)
CO	1.54	6.75
NO _x	9.58	41.96
PM _{2.5}	0.56	2.45
PM ₁₀	0.56	2.45
PM	0.56	2.45
SO ₂	0.04	0.18
VOCs	1.54	6.75
Formaldehyde ⁽¹⁾	0.38	1.66
Total HAPs ⁽¹⁾	0.72	3.15
CH ₄	88.24	386.49
CO ₂	7,654.20	33,525.40
CO ₂ e ⁽⁴⁾	n/a	41,641.71

- (1) As the PTE of all individual HAPs is less than 10 TPY and the PTE of total HAPs is less than 25 TPY, the proposed Purdys Run Electric Generating Station is defined as a minor source of HAPs for purposes of 40 CFR 61, 40CFR63, and Title V.

REGULATORY APPLICABILITY

The proposed Purdys Run Electric Generating Station is subject to the following substantive state and federal air quality rules and regulations: 45CSR13 and 40 CFR 60 Subpart JJJJ. Each applicable rule (and those that have questionable non-applicability), and Purdys Run'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 - NON APPLICABILITY

Pursuant to the definition of "fuel burning unit" under 45CSR2 ("producing heat or power by indirect heat transfer"), 45CSR2 does not apply to the engines.

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 engines.

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 Purdys Run Electric Generating Station has a potential to emit in excess of six (6) lbs/hour and ten (10) tons/year (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, Purdys Run 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"), Purdys Run placed a Class I legal advertisement in a "newspaper of general circulation in the area where the source is . . . located." The ad ran on November 13, 2012 in the *Times West Virginian* and the affidavit of publication for this legal advertisement was submitted on November 20, 2012.

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

The Purdys Run Electric Generating Station is proposed to be located in Marion County, WV. Marion 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 criteria pollutants is 250 TPY (100,000 TPY for CO₂e). As

given above in Table 2, the facility-wide PTE of the proposed facility 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 shown in Table 2 above, the facility-wide PTE of formaldehyde is 1.66 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 (note, however, that Purdys Run did submit a BAT analysis in Attachment N of the permit application).

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 Purdys Run Electric Generating 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 - the facility would, in many cases, be subject to Title V as a “deferred source.” However, pursuant to §60.4230(c), as a non-major “area source,” Purdys Run is not required to obtain a Title V permit for the proposed facility. Therefore, the Purdys Run Electric Generating Station is not subject to 45CSR30.

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

Purdys Run’s two (2) 4,350 hp natural gas-fired Waukesha Model 16V275GL 4SLB engines proposed for the Purdys Run Electric Generating 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 Purdys Run’s 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:

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Purdys Run Energy LLC
Purdys Run Electric Generating Station

Table 3: Subpart JJJJ Compliance

Pollutant	Standard (g/HP-hr)	Uncontrolled Emissions (g/bhp) ⁽¹⁾	Control Percentage ₍₁₎	Controlled Emissions (g/bhp)	JJJJ Compliant?
NO _x	1.0	0.50	0.00%	0.50	Yes
CO	2.0	1.60	94.90%	0.08	Yes
VOC	0.7	0.25	70.00%	0.08	Yes

(1) Based on engine-specific information supplied by EmeraChem - the oxidation catalyst vendor.

Purdys Run has proposed to meet the emission standards under Table 1 pursuant to §60.4243(b)(1) - installing a certified engine (information was included in the permit application showing the proposed engine is certified even without the use of oxidation catalysts). They will still have meet the record-keeping and reporting requirements under §60.4245(a).

40 CFR 63 Subpart ZZZZ: Standards of Performance for Stationary Spark Ignition Internal Combustion Engines - (NON-DELEGATION)

The proposed Waukesha Model 16V275GL engines appear to be subject to the area source (as shown above in Table 2, the individual and aggregate HAP emission rates of the facility define the proposed facility as an "area source" of HAPs) requirements of 40 CFR 63, Subpart ZZZZ. However, the DAQ has not been delegated authority from USEPA to enforce the area source requirements of this rule. Therefore, unless otherwise stated, DAQ did not formally determine whether the permittee is subject to an area source air toxics standard requiring Generally Achievable Control Technology (GACT) promulgated after January 1, 2007 pursuant to 40 CFR 63, including the area source air toxics provisions of 40 CFR 63, Subpart ZZZZ.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

This section provides an analysis for those regulated pollutants that may be emitted from the proposed Purdys Run Electric Generating 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. Based on AP-42, the proposed Purdys Run Electric Generating Station has the potential to emit - in substantive amounts - the following HAPs: Formaldehyde, Acetaldehyde, Acrolein, Methanol, and n-Hexane. The following table lists each HAP's carcinogenic risk (as based on analysis provided in the Integrated Risk Information System (IRIS)):

Table 4: Potential HAPs - Carcinogenic Risk

HAPs	Type	Known/Suspected Carcinogen	Classification
Formaldehyde	VOC	Yes	B1 - Probable Human Carcinogen
Acetaldehyde	VOC	Yes	B2 - Probable Human Carcinogen
Acrolein	VOC	No	Inadequate Data
Methanol	VOC	No	Not Assessed
n-Hexane	VOC	No	Inadequate Data

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:

- Purdys Run shall be required to monitor the temperature to the inlet of the catalyst and in

accordance with manufacturer's specifications a high temperature alarm shall shut off the engine before thermal deactivation of the catalyst occurs. Purdys Run shall be required to maintain these records for five (5) years;

- Purdys Run shall be required to regularly inspect, properly maintain and/or replace catalytic reduction devices and auxiliary air pollution control devices to ensure functional and effective operation of the engine's physical and operational design. Purdys Run shall be required to ensure proper operation, maintenance and performance of catalytic reduction devices and auxiliary air pollution control devices by:
 - (1) Maintaining proper operation of the automatic air/fuel ratio controller or automatic feedback controller;
 - (2) Following operating and maintenance recommendations of the catalyst element manufacturer.
- Purdys Run shall be required to meet all applicable Monitoring, Compliance Demonstration and Source-Specific Recordkeeping Requirements as given under 40 CFR 60, Subpart JJJJ.

As noted above, the hourly PTE (and, therefore, the hourly permit limits) of the engines were based on emission factors specific to the engine/oxidation catalyst model and the MDHI of the engines. Further, the annual PTE (and, therefore, the annual permit limits) was based on operation of the engines at 8,760 hours per year. Therefore, compliance with the emission limits is based on Purdys Run using only the specific model of engine/oxidation catalyst as applied for and appropriate monitoring of the catalyst. As annual emissions were based on 8,760 hours, there is no requirement for annual fuel or hours of operation tracking.

PERFORMANCE TESTING OF OPERATIONS

The following substantive performance testing requirements shall be required:

- Within 60 days after achieving the maximum rate at which each engine will be operated, but not later than 180 days after initial startup of each engine, Purdys Run shall be required to conduct, or have conducted, a performance test on each engine to determine compliance with the emission limits of CO, VOCs, and Formaldehyde listed in Table 4.1.2(c) of the draft permit and in accordance with 3.3.1 of the draft permit. Purdys Run shall be required to use the test methods specified in Table 4.3.1(a) of the draft permit unless granted approval in writing by the Director to use an alternative test method in a protocol submitted pursuant to 3.3.1(c) of the draft permit;
- At such reasonable time(s) as the Secretary may designate, in accordance with the provisions of 3.3 of the draft permit, Purdys Run 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; and

- Purdys Run shall be required to meet all applicable Performance Testing Requirements as given under 40 CFR 60, Subpart JJJJ.

RECOMMENDATION TO DIRECTOR

The information provided in the permit application indicates that compliance with all applicable air quality regulations will be achieved. Therefore, I recommend to the Director the issuance of a Permit Number R13-2974 to Purdys Run Energy LLC for the proposed construction and operation of the Purdys Run Electric Generating Station located near Fairmont, Marion County, WV.

Joe Kessler, PE
Engineer

Date

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Purdys Run Energy LLC
Purdys Run Electric Generating Station