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

Austin Caperton, Cabinet Secretary
www.dep.wv.gov

Pursuant to §45-14-17.2

PRELIMINARY DETERMINATION/FACT SHEET

for the

Major Modification

of

Pleasants Energy, LLC's
Waverly Power Plant

located in

Waverly, Pleasants County, WV.

Permit Number: R14-0034A
Facility Identification Number: 073-00022

Date: January 18, 2018

BACKGROUND INFORMATION

Application No.:	R14-0034A
Plant ID No.:	073-00022
Applicant:	Pleasants Energy, LLC
Facility Name:	Waverly Power Plant
Location:	Pleasants County
NAICS Code:	221112
Application Type:	PSD Major Modification
Received Date:	October 16, 2017
Engineer Assigned:	Steven R. Pursley, PE
Fee Amount:	$7,000
Date Received:	October 19, 2017
Complete Date:	November 30, 2017
Due Date:	May 28, 2018
Applicant Ad Date:	October 18, 2017
Newspaper:	*St. Marys Oracle*
UTM's:	Easting: 468.63 km Northing: 4,353.57 km Zone: 17

On November 29, 1999 Pleasants Energy, LLC submitted a permit application to construct a 300 MW, natural gas fired, simple cycle peaking power facility near Waverly, WV (Pleasants County). The plant included two General Electric (GE) 7FA class simple cycle combustion turbines, each nominally rated at 167.8 MW (while firing natural gas at an ambient temperature of 59° F and 60% relative humidity) including generator, exciter, and associated auxiliary mechanical and electrical systems. The primary fuel was natural gas, and low sulfur distillate fuel oil was to be the backup fuel. The electrical output tied directly into the Allegheny Power transmission system which is located on the property.

The original 1999 application proposed limiting emissions from the facility to less than 250 tons per year of each criteria pollutant in order to avoid constructing a "major" source per 45CSR14 and thereby undergoing PSD review procedures. The resulting permit (R13-2373) limited annual criteria pollutant emissions to the following:

Pollutant	TPY
Oxides of Nitrogen	241
Sulfur Dioxide	53
PM-10	75
Volatile Organic Compounds	12
Carbon Monoxide	116

The permit made those limits practically enforceable primarily by limiting the amount of fuel which could be consumed by the turbines and requiring Pleasants Energy to install and operate a Continuous Emissions Monitoring System (CEMS) for NO_x. Construction of the facility was completed and the plant began operating in 2001.

On June 25, 2015, Pleasants Energy submitted an application to modify the facility by adding "TurboPhase" engines to the turbines. The permit was issued November 24, 2015.

On September 18, 2015, Pleasants Energy submitted an application to modify the facility. Specifically, Pleasants wished to increase the permitted amount of fuel which can be combusted by the facility. This modification resulted in emissions from the facility increasing over the major source threshold of 250 tons per year of both NO_x and CO. Per 40 CFR 52.21(r)(4);

"At such time that a particular source or modification becomes a major stationary source or major modification solely by virtue of a relaxation in any enforceable limitation which was established after August 7, 1980, on the capacity of the source or modification otherwise to emit a pollutant, such as a restriction on hours of operation, then the requirements or paragraphs (j) through (s) of this section shall apply to the source or modification as though construction had not yet commenced on the source or modification."

Therefore, the application submitted by Pleasants Energy on September 18, 2015, was subject to all requirements of PSD review.

Emission sources associated with the permit were:

* Two General Electric (GE) Model 7FA simple cycle combustion turbines (CTs).

The potential emissions of Carbon Monoxide (CO), and Oxides of Nitrogen (NO_x), were above the "major source" thresholds that require the application to be reviewed under the Prevention of Significant Deterioration (PSD) program administered in WV under 45CSR14. Emissions of PM, PM_{10} and $PM_{2.5}$ were less than PSD major source thresholds but above PSD significance thresholds. Therefore they will also were reviewed under the PSD program. The emission rates of VOC's, Sulfur Dioxide (SO_2), Lead (Pb) and Sulfuric Acid Mist (H_2SO_4) were below the "significance" threshold and, therefore, the application was also concurrently reviewed under the WV minor source program administered under 45CSR13.

Subsequently, Pleasants Energy decided not to install the TurboPhase engines and instead upgrade the existing turbines with "Advanced Gas Path" technology. Because this physical change triggered a "past actual to future potential" netting analysis under 45SCR14, PSD review was required despite the fact that potential emissions generally decrease.

The following document will outline the DAQ's preliminary determination that the modification of the Pleasants Energy, LLC facility will meet the emission limitations and conditions set forth in the DRAFT permit and will comply with all current applicable state and federal air quality rules and standards.

PUBLIC REVIEW PROCEDURES

Public review procedures for a major modification application dual-reviewed under 45CSR13 and 45CSR14 require action items at the time of application submission and at the time a draft permit is prepared by the DAQ. The following details compliance with the statutory and accepted procedures for public notification with respect to permit application R14-0034A.

Actions Taken at Application Submission

Pursuant to §45-13-8.3 and §45-14-17.1, Pleasants Energy, LLC placed a Class I legal advertisement in the following newspaper on the specified date notifying the public of the

submission of a permit application:

- *St. Marys Oracle* (October 18, 2017)

A link to the electronic copy of the application was sent to the following organizations:

- The U.S Environmental Protection Agency - Region 3 (November 27, 2017)
- The National Park Service (October 23, 2017)
- The US Forest Service (October 23, 2017)

The application was also available at the DAQ Headquarters in Charleston (Kanawha City) for review and at the DAQ website at http://dep.wv.gov/daq/Pages/NSRPermitsforReview.aspx.

Actions Taken at Completion of Preliminary Determination

Pursuant to §45-13-8.5 and §45-14-17.4, upon completion (and approval) of the preliminary determination and draft permit, a Class 1 legal advertisement will be placed in the following newspapers stating the DAQ's preliminary determination regarding R14-0034A:

- *The Parkersburg News*

A copy of the preliminary determination and draft permit shall be forwarded to EPA Region 3. Pursuant to §45-13-8.7, copies of the application, complete file, preliminary determination and draft permit shall be available for public review during the public comment period at the WVDEP Headquarters in Charleston. Further, the U.S. Forest Service and the National Park Service will receive copies of the preliminary determination and draft permit upon request. All other requests by interested parties for information relating to permit application R14-0034A shall be provided upon request. Additionally, the preliminary determination and draft permit will be posted on WVDAQ's webpage.

A public meeting to accept written and oral comments concerning the preliminary determination and draft permit may take place on a date to be determined at the time the public notice is published (at the Directors discretion).

Actions Taken at Completion of Final Determination

Pursuant to §45-14-17.7, and 17.8 upon reaching a final determination concerning R14-0034A, the DAQ shall make such determination and the permit (if issued) available for review at WVDEP Headquarters in Charleston and at the DAQ website at http://dep.wv.gov/daq/Pages/NSRPermitsforReview.aspx.

DESCRIPTION OF PROPOSED FACILITY

Pleasants Energy installed two simple-cycle GE 7FA combustion turbines at the Pleasants Energy facility in 2001 and operates under Title V permit number R30-07300022-2014. The facility

received a minor source air construction permit in 2015 for the installation of TurboPhase engines to increase the output of the combustion turbines. In January 2017, Pleasants Energy also received a Prevention of Significant Deterioration (PSD) air construction permit to lift the original synthetic minor source limits and increase both natural gas and fuel oil (ultra-low sulfur diesel) operation for the two combustion turbines. Since the synthetic minor source limits were lifted, the facility required a PSD permit as if a permit never originally existed for the combustion turbines.

Pleasants Energy is now proposing to not install TurboPhase to increase output of the combustion turbines but would like to perform an uprate on the combustion turbines while maintaining the increase in fuel consumption and hours of operation associated with the previous PSD permit. The Project will modify the combustion turbines from the 7FA.03 configuration to the 7FA.04 configuration and increase output during the summer peak season. Since the Project will physically modify the combustion turbines and due to the permitting history of the site, this Project will be subject to PSD. The facility also includes five Tier IV diesel generators that will operate in emergency situations for black start capabilities for the combustion turbines. These generators were changed to non-emergency status in the Turbophase construction permit, but will now be used for emergency purposes only.

SITE INSPECTION

A new site inspection was not required since one was performed by the writer less than 18 months ago. The following comes directly from Preliminary Determination R14-0034:

"On July 13, 2016 the writer conducted a site inspection of the location of the Pleasants Energy, LLC plant. The following observations were made during the inspection:

- The site of the plant is located less than one mile east of Waverly, WV but in Pleasants County, WV.
- The power generation facility lies just south of State Route 2. The plant is close to other industrial and commercial facilities.
- The general topography of the area is a river valley (approximately 1 mile wide). Ground level of the site will be approximately 630 feet above sea level. The surrounding mountains rise to over 900 feet above sea level. Stack height will be approximately 180 feet above ground level.
- The following pictures were taken the day of the site inspection:"


DANGER
HIGH
VOLTAGE

PROPOSED EMISSIONS

The modified Pleasants Energy, LLC Plant will have the following potential-to-emit of the specified pollutants:

Table 1: Facility-wide PTE

Pollutant	tons/year[(2)(3)]
CO	477.40
NO_x	465.80
PM	83.50
PM_{10}	83.50
$PM_{2.5}$	83.50
SO_2	13.81
VOCs	21.00
H_2SO_4	2.10
Lead	0.01
CO_2e	1,140,748
Total HAPs	5.29

(1) Annual emissions are based on the scenario which gives the highest rate for each individual pollutant.
(2) As determined by rolling 12-month totals.
(3) Annual emissions include start up and shut down emissions.

EMISSIONS CALCULATION METHODOLOGIES

The following section will detail the emission calculation methodologies used by Pleasants Energy, LLC to calculate the potential-to-emit of the facility.

Combustion Turbines

Emissions from the combustion turbines can be broken down into steady state operation emissions (firing natural gas or fuel oil) and startup/shutdown emissions.

Steady State Operations

Potential emissions of NO_x, and CO were based on BACT emission levels while SO_2, VOC, sulfuric acid (H_2SO_4), lead and greenhouse gasses (GHGs) from the combustion turbines were based on vendor specifications provided by GE and 40 CFR Part 98. PM, PM_{10}, and $PM_{2.5}$ were based on stack testing of similar units.

Emissions from the F-Class combustion turbines are dependent on the ambient temperature conditions and the turbine's operating load, which can vary from 60 percent to 100 percent and 100 percent load. To account for representative seasonal climatic variations, potential emissions from the proposed combustion turbines were analyzed at 60 and 100 percent load conditions as well as 100 percent load for ambient temperatures ranging from negative (-)10 degrees Fahrenheit (°F) to 100 °F. Projected emissions were based on data provided by GE for the 7FA combustion turbine and information from the TurboPhase vendor, as well as AP-42 emission factors.

The permit will require testing/CEMs to confirm compliance with the emission rates.

Table 2: Steady State Turbine Emission Factor Source (natural gas operation/per turbine)

Pollutant	Emission Rate	Emission Factor Source	Comments
CO	9 ppm	BACT	33.9 lb/hr
NO_x	9 ppm	BACT	68.9 lb/hr Includes Low NO_x Burners
PM	15.9 lb/hr	Stack Testing on same model & generation of Turbines	Includes both filterable and condensable PM
PM_{10}			
$PM_{2.5}$			
SO_2	2.7 lb/hr	Mass Balance	
VOCs	3.2 lb/hr	Manufacturer	
GHGs	223,611 lb/hr	AP-42 & 40 CFR 98 Subpart A	CO_2e Basis
H_2SO_4	0.41 lb/hr	Mass Balance	Assumes 10% of SO_2 is converted to SO_3 & 100% of SO_3 is converted to H_2SO_4
HAPs	0.94 lb/hr	AP-42	

Table 3: Steady State Turbine Emission Factor Source (fuel oil operation/per turbine)

Pollutant	Emission Rate	Emission Factor Source	Comments
CO	20 ppm	BACT	76 lb/hr
NO_x	42 ppm	BACT	470 lb/hr (utilizing water injection)
PM	41 lb/hr	Vendor Data	Includes both filterable and condensable PM
PM_{10}			
$PM_{2.5}$			
SO_2	3.27 lb/hr	Mass Balance	based on ULSD

VOCs	20 lb/hr	Vendor Data	
GHGs	337,813 lb/hr	AP-42 & 40 CFR 98 Subpart A	CO_2e Basis
H_2SO_4	0.6 lb/hr	Mass Balance	Assumes 10% of SO_2 is converted to SO_3 & 100% of SO_3 is converted to H_2SO_4
HAPs	2.63 lb/hr	AP-42	

Start-Up and Shut-Down Emissions

Each combustion turbine may start up to 365 times per year which may include up to 30 starts on fuel oil. For natural gas combustion, potential start-up and shut-down emissions were based on a start-up profile and conservatively assumed that there would be up to 365 cold start-ups and 365 shut-down events per turbine per year on natural gas. One start-up and shut-down event is equivalent to one start-up (0 percent load to when the turbine is in "Mode 6", which is approximately 60 percent load or minimum load for steady state operation and emissions compliance) plus one shut-down (60 percent load or minimum load for steady state operation and emissions compliance to 0 percent load). Start-up is assumed to take 120 minutes while shut-down shall take 60 minutes for a total of 180 minutes for one start-up and shut-down event.

Potential fuel oil start-up and shut-down emissions were based on a start-up profile and conservatively assumed that there would be 30 cold start-ups and 30 shut-down events per turbine per year on fuel oil. One fuel oil start-up and shut-down event is equivalent to one start-up (0 percent load to when the turbine is in "Mode 6", which is approximately 60 percent load or minimum load for steady state operation and emissions compliance) plus one shut-down (60 percent load or minimum load for steady state operation and emissions compliance to 0 percent load).

Table 4: Start-Up & Shut-down Turbine Emissions (natural gas operation/per turbine)

Pollutant	Start-Up Emission Rate (lb/hr)	Shut-Down Emission Rate (lb/hr)	Total Emissions Per Event (lbs)
CO	386.33	146.33	918.99
NO_x	125.46	107.22	358.14
PM	18.00	18.00	54.0
PM_{10}			
$PM_{2.5}$			
SO_2	2.70	2.70	8.1
VOCs	7.03	6.39	20.45
GHGs	223,611	223,611	670,833
H_2SO_4	0.41	0.41	1.23

Table 5: Start-Up & Shut-down Turbine Emissions (fuel oil operation/per turbine)

Pollutant	Start-Up Emission Rate (lb/hr)	Shut-Down Emission Rate (lb/hr)	Total Emissions Per Event (lbs)
CO	234.37	199.68	668.42
NO_x	561.64	543.09	1,666.37
PM	41.0	41.0	123.0
PM_{10}			
$PM_{2.5}$			
SO_2	3.27	3.27	9.81
VOCs	21.14	20.95	63.23
GHGs	337,813	337,813	1,013,439
Lead	0.03	0.03	0.09
H_2SO_4	0.6	0.6	0.18

Annual turbine emissions (two turbines combined) are based on the maximum of each pollutant under several different operating scenarios.

Table 6: Maximum Annual Turbine Emissions:

Pollutant	Annual Emission Rate (tpy)
CO	471.1
NO_x	464.60
PM	83.3
PM_{10}	
$PM_{2.5}$	
SO_2	13.8
VOCs	20.3
GHGs	1,138,402
Lead	0.01
H_2SO_4	2.1

The turbines are the only equipment being physically modified in this permitting action. However, the black start engines are being changed from non-emergency status to emergency status.

Blackstart Generators

The maximum potential-to-emit (PTE) from Pleasant Energy's emergency generators is summarized in the table below. Emissions were based on the applicable NSPS limits, (NOx, NMHC, CO and PM) and on factors obtained from AP-42, Section 3.4 (VOCs, SO_2 and HAPs). Fuel consumption was based on information provided by the vendor and a fuel heat content of 137,000 Btu/gal was used in the calculations. The permit will limit the facility to 100 hours of operation per year per engine.

Table 8: Maximum Blackstart Generator Emissions (Per Engine)

Pollutant	Emission Factor	Source	Hourly (lb/hr)	Annual (ton/yr)
CO	2.61 g/bhp-hr	Subpart IIII	25.18	1.26
NO_X	0.50 g/bhp-hr	Subpart IIII	4.82	0.24
VOC	0.3 g/bhp-hr	Subpart IIII	2.88	0.14
$PM/PM_{10}/PM_{2.5}$	0.07 g/bhp-hr	Subpart IIII	0.72	0.04
SO_2[1]	0.0000121 lb/hp-hr	AP-42, Table 3.4-1	0.05	0.01
Total HAPs	0.0045 lb/mmbtu[(2)]	AP-42, Table 3.4-3	0.13	0.01

(1) Based on 15 ppm sulfur
(2) Sum of all HAPs in AP-42Tables 3.4-3 & 3.4-4

Table 9: Maximum Blackstart Generator Emissions (All five Engines combined)

Pollutant	Hourly (lb/hr)	Annual (ton/yr)
CO	125.90	6.29
NO_X	24.10	1.21
VOCs	14.39	0.72
$PM/PM_{10}/PM_{2.5}$	3.60	0.18
SO_2	0.27	0.01
Total HAPs	0.65	0.04

Emissions from the existing facility are taken directly from the engineering evaluation for R14-0034.

Table 10: Existing Emissions from the Facility

Source[1]	CO	NO_x	VOCs	$PM/PM_{10}/PM_{2.5}$	SO_2
	tpy	tpy	tpy	tpy	tpy
Turbines	509.54	464.6	23.84	100.10	39.03
TP engines	8.66	39.4	2.36	2.60	0.12
Generators	31.47	6.03	3.60	0.90	0.07
Total	**549.67**	**510.03**	**29.8**	**103.6**	**39.22**

[1]Two turbines combined, 8 TurboPhase engines combined and 5 generators combined.

Comparing Table 10 and Table 1 give the change in potential emissions due to this modification.

Table 11: Change in Emissions

CO	NO_x	VOCs	$PM/PM_{10}/PM_{2.5}$	SO_2
tpy	tpy	tpy	tpy	tpy
-72.27	-44.23	-8.8	-20.1	-25.41

HAP emissions from the modified facility will be as shown in Table 12 (all emissions based on AP-42 except for natural gas formaldehyde emissions from the combustion turbines which are based on the 08/21/2001 Roy Sims EPA Memo). Individual HAP emissions were calculated based on the worst case fuel scenario for that HAP. Total HAPs were calculated by simply summing those individual HAP emissions. Therefore, total HAP emissions were calculated in a very conservative manner. Only HAPs emitted in an amount of at least 0.01 tons per year (rounded) are listed here, although all HAPs emitted are included in the facility wide total.

Table 12: Facility Wide HAP Emissions

Pollutant	Turbines		Generators		Total	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Acetaldedyde	0.15	0.39	--	--	0.15	0.39
Acrolein	0.02	0.06	--	--	0.02	0.06
Benzene	0.05	0.12	0.11	0.01	0.16	0.13
1,3-Butadiene	0.07	0.01	--	--	0.07	0.01
Ethyl Benzene	0.12	0.31	--	--	0.12	0.31
Formaldehyde	0.78	1.97	--	--	0.78	1.97

Manganese	3.2	0.42	--	--	3.2	0.42
Naphthalene	0.14	0.03	--	--	0.14	0.03
PAHs	0.17	0.04	--	--	0.17	0.04
Selenium	0.10	0.01	--	--	0.10	0.01
Toluene	0.50	1.27	--	--	0.50	1.27
Xylene	0.24	0.62	--	--	0.24	0.62
Total	5.26	5.26	0.65	0.03	**5.91**	**5.29**

DAQ Review of Emissions Methodology

All emission factors and calculation methodologies were deemed appropriate. With the use of CEMS and compliance testing, the ultimate validity of the emission factors will be tested repeatedly on a periodic post-issuance basis.

REGULATORY APPLICABILITY

The Pleasants Energy, LLC facility is subject to a variety of substantive state and federal air quality rules and regulations. They are as follows: 45CSR13, 45CSR14, 45CSR16, 45CSR30, 45CSR33, 45CSR34, 40 CFR 60 - Subpart KKKK, 40 CFR 60 Subpart III, and 40 CFR 63 - Subpart ZZZZ. It should be noted that Subparts IIII (emergency generators),and Subpart ZZZZ (generators) apply to equipment that is not being affected by this modification. Those rules were addressed in previous permitting actions and therefore will not be addressed here.

Each applicable rule, and Pleasants proposed compliance thereto, will be discussed in detail below. Additionally, those rules that have questionable applicability but do not apply will also be discussed.

WV State-Implementation-Program (SIP) Regulations

45CSR2: To Prevent and Control Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers. *(Not Applicable)*

The combustion turbines themselves do not meet the definition of “fuel burning unit“ because they do not produce power through *indirect heat transfer*.

45CSR10: To Prevent and Control Air Pollution from the Emission of Sulfur Oxides *(Not Applicable)*

The combustion turbines themselves do not meet the definition of "fuel burning unit" because they do not produce power through *indirect heat transfer*.

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 modification of the Pleasants Energy, LLC Plant is defined as a modification of a major source under 45CSR14. The project will be either major or "significant" as defined in 45CSR14 for all criteria pollutants (and Greenhouse Gasses) with the exception of VOCs and SO_2. Therefore, the proposed VOC and SO_2 emissions will be permitted under the procedures of Rule 13.

As required under §45-13-8.3, Pleasants Energy, LLC placed a Class I legal advertisement in a "newspaper of general circulation in the area where the source is . . . located." The ad ran on October 18, 2017 in the *St. Mary Oracle* and the affidavit of publication for this legal advertisement was submitted on October 24, 2017.

45CSR14: Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution for the Prevention of Significant Deterioration

45CSR14 sets the requirements for the modification of "major stationary sources" (as defined under §45-14-2.43) of air pollution, on a pollutant-by-pollutant basis, in areas that are in attainment with the National Ambient Air Quality Standards (NAAQS). Pursuant to §45-14-7.1, PSD review additionally applies to each pollutant proposed to be emitted in "significant" (as defined under §45-14-2.74) amounts.

Pursuant to 45CSR14, Pleasants compared future potential post-modification annual emissions of the Waverly Plant with average actual annual emissions from the following periods:

24 month time period	Pollutants
May 2014-May 2016	NO_x, CO, VOC, $PM/PM_{10}/PM_{2.5}$, CO_{2e}
March 2013-March 2015	SO_2
September 2013-September 2015	Pb
June 2014-June 2016	H_2SO_4

They then compared the difference with the significance thresholds under Section 2.46 to determine which pollutants would be required to undergo PSD review. The summary of this analysis is presented in tabular form here:

Table 13: Net Emissions Increase

Pollutant	Annual Emissions (TPY)		Difference (TPY)	Significance Level (TPY)	PSD (Y/N)
	Past Actuals	Future Potential			
CO	84.10	471.10	387.0	100	Y
NO_x	126.00	464.60	338.6	40	Y
PM_{10}	13.60	83.30	69.7	15	Y
TSP	39.60	83.30	43.8	25	Y
$PM_{2.5}$[1]	39.60	83.30	43.8	10	Y
VOCs	0.80	20.30	19.5	40	N
SO_2	2.10	13.80	11.7	40	N
H_2SO_4	0.90	2.10	1.2	7	N
Lead	0.0013	0.0065	0.0052	0.6	N
CO_{2e}	490,512	1,139,578	649,066	75,000	Y

[1]Having PM2.5 emissions higher than PM10 emissions is obviously impossible. The difference is possibly due to different testing methods (perhaps $PM_{2.5}$ included condensibles while PM_{10} did not). However, since the net emission increase of all forms of particulate exceeded the significance level, it is moot.

The facility is located in Pleasants County, WV, which is classified as in attainment with all NAAQS. The modification of the facility is defined as a major modification to an existing "major stationary source" under 45CSR14 and PSD review is required for the pollutants of CO, NO_x, $PM_{2.5}$, PM_{10}, TSP, and Greenhouse Gasses. The substantive requirements of a PSD review includes a best available control technology (BACT) analysis, a modeling analysis, and an additional impacts analysis; each of these will be discussed in detail under the section PSD REVIEW REQUIREMENTS.

45CSR16: Standards of Performance for New Stationary Sources

45CSR16 incorporates by reference applicable requirements under 40 CFR 60. 40 CFR 60 Subpart KKKK now applies to the facility.

The combustion turbines are currently subject to Subpart GG which applies to combustion turbines constructed prior to 2006. However, with this modification, the combustion turbines meet the definition of "modified" per Subpart A. Therefore, Subpart KKKK will now apply to the turbines instead of Subpart GG.

45CSR30: Requirements for Operating Permits

45CSR30 provides for the establishment of a comprehensive air quality permitting system consistent with the requirements of Title V of the Clean Air Act. The Pleasants Energy, LLC facility is subject to the requirements Title V and changes authorized by this permitting action must also be incorporated into the facility's Title V operating permit. Commencement of the operations authorized by this permit shall be determined by the appropriate timing limitations associated with Title V permit revisions per 45CSR30.

45CSR33: Acid Rain Provisions and Permits

45CSR33 incorporates by reference applicable requirements under 40 CFR 72-77. The proposed combustion turbines will be subject to the Acid Rain Program including emissions standards (40 CFR 72.9), monitoring requirements (40 CFR 75) and permitting provisions (40 CFR 72.3).

FEDERAL REGULATIONS

40 CFR 60, Subpart KKKK: Standards of Performance for Stationary Combustion Turbines

Subpart KKKK has requirements relating to limiting the emissions of NO_x and SO_2 from combustion turbines. The following discusses the substantive applicable requirements of Subpart KKKK relating to the turbines.

Subpart KKKK Applicability - Section §60.4305(a)

Pursuant to §60.4305(a), Subpart KKKK applies to stationary combustion turbines with a heat input at peak load equal to or greater than 10.7 gigajoules (10 mmbtu) per hour, based on the higher heating value of the fuel, which commenced construction, modification, or reconstruction after February 18, 2005. The modifications proposed by this application meet the definition of "modification" in Subpart A. Therefore, the combustion turbines are subject to 40 CFR 60 Subpart KKKK.

Subpart KKKK Pollutant Emission Standards - Section §60.4320 and §60.4330

Pursuant to 40 CFR §60.4320(a) and Table 1 of Subpart KKKK, the NSPS NO_x limit applicable to the combustion turbine, when firing fuel oil, is 42 parts per million (ppm) at 15 percent oxygen or 160 nanogram per Joule (ng/J) of useful output (1.3 pound per megawatt-hour [lb/MW-hr]) on a 30-day average. The permit will have a NO_x limit of 42 ppm at 15 percent oxygen on a rolling 30-day average when combusting fuel oil. When combusting natural gas, Table 1 in Subpart KKKK states that new or modified combustion turbines must meet a limit of 15 ppm at 15 percent oxygen or 54 ng/J of useful output (0.43 lb/MWh). When combusting natural gas, the permit will require the combustion turbines will meet a limit of 9 ppm at 15 percent O_2, and will therefore meet this limit. In accordance with Subpart KKKK, Pleasants Energy will demonstrate compliance with the NO_x emission limit by conducting performance testing pursuant to §60.4340(a), or alternatively, by installing, calibrating, maintaining, and operating a continuous monitoring system (i.e., CEM or continuous parameter monitor) in accordance with §60.4340(b).

Subpart KKKK Other Requirements

Subpart KKKK includes general compliance requirements (60.4333), monitoring requirements (60.4335-60.4370), reporting requirements (60.4375-60.4395), and performance testing requirements (60.4400-60.4415).

40 CFR 60, Subpart TTTT: Standards of Performance for Greenhouse Gas Emissions for Electric Generating Units - **Not Applicable**

Subpart TTTT sets standards of performance for Greenhouse Gas emissions for EGUs that commenced construction after January 8, 2014 or reconstruction after June 18, 2015. The Pleasants Energy turbines were constructed before January 8, 2014 and these modifications do not meet the definition of reconstruction per Subpart A. Additionally, per §60.5509 (a), non steam generating ECUs are not subject to the rule by simply modifying the turbines.

PSD REVIEW REQUIREMENTS

In 1977 Congress passed the Clean Air Act Amendments (CAAA), which included the Prevention of Significant Deterioration (PSD) program. This program was designed to allow industrial development in areas that were in attainment with the NAAQS without resulting in a non-attainment designation for the area. The program, as implied in the name, permits the deterioration of the ambient air in an area (usually a county) as long as it is within defined limits (defined as increments). The program, however, does not allow for a significant (as defined by the rule) deterioration of the ambient air. The program prevents significant deterioration by allowing concentration levels to increase in an area within defined limits - called pollutant increments - as long as they never increase enough to exceed the NAAQS. Projected concentration levels are calculated using complex computer simulations that use meteorological data to predict impacts from the source's potential emission rates. The concentration levels are then, in turn, compared to the NAAQS and increments to verify that the ambient air around the source does significantly deteriorate (violate the increments) or violate the NAAQS. The PSD program also requires application of best available control technology (BACT) to new or modified sources, protection of Class 1 areas, and analysis of impacts on soils, vegetation, and visibility.

WV implements the PSD program as a SIP-approved state through 45CSR14. As a SIP-approved state, WV is the sole issuing authority for PSD permits. EPA has reviewed 45CSR14 and concluded that it incorporates all the necessary requirements to successfully meet the goals of the PSD program as discussed above. EPA retains, however, an oversight role in WV's administration of the PSD program.

As stated above, the modification of the Pleasants Energy, LLC Plant is defined as a major modification of an existing major stationary source under 45CSR14 and PSD review is required for the pollutants of CO, NO_x, $PM_{2.5}$, PM_{10}, TSP, and Greenhouse Gasses. The substantive requirements of a PSD review includes a best available control technology (BACT) analysis, a modeling analysis, and an additional impacts analysis - each of which will be discussed below.

BACT Analysis - Section 8.2

Pursuant to 45CSR14, Section 8.2, Pleasants Energy, LLC is required to apply BACT to each emission source that is constructed and emits a PSD pollutant. BACT is defined under §45-14-2.12 as:

". . .an emissions limitation (including a visible emissions standard) based on the maximum degree of reduction for each regulated NSR pollutant which would be emitted from any proposed major stationary source or major modification which the Secretary, on a case-by-case basis, taking into account energy, environmental and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any federally enforceable emissions limitations or emissions limitations enforceable by the Secretary. If the Secretary determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment work practice, operational standard or combination thereof, may be prescribed instead to satisfy the requirement for the application of best available control technology. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice or operation, and shall provide for compliance by means which achieve equivalent results."

A determination of an appropriate BACT emission limit is conducted by using a "top-down" analysis. The key steps in performing a "top-down" BACT analysis are the following: 1) Identification of all applicable control technologies; 2) Elimination of technically infeasible options; 3) Ranking remaining control technologies by control effectiveness; 4) Evaluation of most effective controls and documentation of results; and 5) the selection of BACT. Also included in the BACT selection process is the review of BACT determinations at similar facilities using the RACT/BACT/LAER Clearinghouse (RBLC). The RBLC is a database of RACT, BACT, and LAER determinations maintained by EPA and updated by the individual permitting authorities. It can be accessed online at http://cfpub.epa.gov/rblc/. Pleasants Energy, LLC included a BACT analysis in their permit application generally using the top-down approach as described above. Their complete analysis, including appropriate economic calculations, is included in the Pleasants Energy, LLC permit application and amendments and revisions thereto.

The following table summarizes the Pleasants Energy, LLC BACT selections.

Table 14: BACT Selection

Source	PSD Pollutant(1)							
	CO		NO_x		$PM_{2.5}/PM_{10}/PM$(2)		GHGs	
	Limit	Tech.(3)	Limit	Tech.(3)	Limit	Tech.(3)	Limit (CO_{2e})	Tech.(3)
Turbines(4)	9 ppm 20 ppm	CP	9.0 ppm 42 ppm	DLNB, Water Inject	15.9 lb.hr 41 lb/hr	AF, NG, ULSD	1,300 lb/ MW-hr 1,900 lb/ MW-hr	NG, GE7FA

(1) Emission rates at loads of 60% or higher.
(2) PM emission rates are given in total particulate (filterable + condensable) matter
(3) CP=Good Combustion Practices; DLNB = Dry Low NOx Burners; AF = inlet air filtration; NG = Use of Natural Gas as a fuel; ULSD = use of Ultra Low Sulfur Diesel as a fuel; GE7FA = use of GE Frame 7FA. turbines.
(4) The upper limit is when firing natural gas and the bottom limit is when firing fuel oil.

Combustion Turbines

NO_x

(1) Technology Identification: Pleasants Energy, LLC identified the following as potential NO_x control technologies applicable to the Combustion Turbines;

* Xonon™
* Water or Steam Injection
* Dry Low NO_x Burners
* SCR
* SNCR
* $SCONO_x$™ (aka EM_x™)

(2) Technically Infeasible Determinations: The only technologies that were determined to be technically infeasible under (1) above was the use of Xonon, $SCONO_x$ and SNCR. Xonon systems have not had wide-scale applications. It has been demonstrated on a 1.5 MW baseload unit in California, however, testing data to apply this technology to other types and sizes of turbines in currently unavailable. As the Pleasants turbines are expected to experience repeated start ups and shut downs, it is unclear how the changing load conditions would affect the Xonon system.

$SCONO_x$ systems operate most effectively at temperatures ranging from 300° to 700° F. Additionally, it uses steam to periodically regenerate the catalyst bed. Since the Pleasants facility is a simple cycle system its exhaust is significantly hotter (around 1,000°F) and has no steam readily available. Therefore, the technology was considered infeasible.

SNCRs operate most effectively at temperatures ranging from 1,600°F to 2,100°F. At operations below these temperatures the reagent will not react with the NO_x and ammonia slip will be very high. The flue gases from the combustion turbines have an exhaust temperature of around 1,000°F. Therefore, the technology was considered infeasible.

(3) Effectiveness Ranking of Remaining Technologies: Pleasants Energy, LLC ranked SCR as the top control technology with a resulting NO_x emission rate of between 2.0 and 5.0 ppmvd @ 15% O_2 for natural gas and 9 to 24 ppm for fuel oil. After SCR, Dry Low NO_x burners (natural gas) and water injection (fuel oil) were selected which result in NO_x emissions of 9 ppm and 42 ppm respectively.

(4) Economically Infeasible Determinations: Pleasants Energy, LLC performed an economic analysis of the cost to install SCRs at its Waverly facility. Per 40 CFR 52.21(r)(4) the analysis looked only at the cost of installing the equipment at a new facility and ignored retrofit costs. WVDAQ reviewed the analysis and determined that it seems to comply with the OAQPS Control Cost Manual (EPA 2002). The analysis indicated that the capital cost to install an SCR system at the facility would be approximately $19,015,000 with an annualized cost of $2,899,000 while reducing NO_x emissions by 168 tons per year. It should be noted that you cannot calculate the NO_x reduction by simply applying a 78% (the reduction from a steady state

emission level of 9ppm to 2ppm) control efficiency to the entire annual NO_x emissions. This is because a disproportionate amount of NO_x emissions occur during start up when the SCR could not be used. Using the annualized cost shown above, and a emissions reduction of 168 tons per year, this equates to an incremental cost of $17,255.95 per ton of NO_x removed. In the writers opinion, this is not economically feasible.

(5) DAQ Review of RBLC: The following table was constructed using data for the 5 most recent entries for large gas fired simple cycle combustion turbines from the RBLC (note only final entries based on BACT, with NO_x emissions stated as ppm were considered):

Natural Gas

RBLC ID	Date	Company	BACT Emission Rate
TX-0819	06/30/2017	SW Public Service Co.	9 ppm
LA-0316	02/17/2017	Cameron LNG, LLC	15 ppm
IN-0264	01/06/2017	AES Ohio Generation	25 ppm
TX-0794	04/07/2016	Brazos Elec. Coop.	9 ppm
TX-0788	03/24/2016	APEX Texas Power	9 ppm
Avg. Emission Rate			13.4 ppm

Fuel Oil

RBLC ID	Date	Company	BACT Emission Rate
IN-0264	01/06/2017	AEX Ohio Generation	42 ppm
IL-0121	09/27/2016	INVENERGY	42 ppm
TX-0794	04/07/2016	Brazos Elec. Coop.	42 ppm
WI-0240	01/26/2006	Wisconsin Elec. Power	65 ppm
NV-0036	05/05/2005	Newmont Nevada Energy	6 ppm
Avg. Emission Rate			39.4 ppm

With respect to NO_x emissions, Pleasants Energy, LLC's proposed emission rate of 9 ppmvd for natural gas firing is exactly the same as some other recent RBLC entries and lower than two recent entries.. None of the other units employed any NO_x control technology other than DLNB. Pleasants proposed emission rate of 42 ppm when firing fuel oil is similar to the average of the last five entries into the RBLC. It should be noted that the one entry (NV-0036) that is significantly lower than the Pleasants proposed rate is for a facility that used simple cycle turbines as a backup at a coal fired plant. Because the turbines are located at a coal fired plant, an SCR system is already available making it more cost effective than it would be for Pleasants Energy, LLC. Other than NV-0036, no other facility requires any control except for water injection. If NV-0036 is excluded the average of the other four facilities is 47.75 ppm.

CO

(1) Technology Identification: Pleasants Energy, LLC identified Oxidation Catalysts and SCONO$_x$ as the only potential post combustion control technologies.

(2) Technically Infeasible Determinations:Pleasants Energy, LLC determined that SCONO$_x$ was not considered feasible for reasons discussed under "NO$_x$".

(3) Effectiveness Ranking of Remaining Technologies: Oxidation Catalyst is the only remaining control technology.

(4) Economically Infeasible Determinations: Pleasants Energy, LLC performed an economic analysis of the cost to install an Oxidation Catalyst at its Waverly facility. WVDAQ reviewed the analysis and determined that it seems to comply with the OAQPS Control Cost Manual (EPA 2002). The analysis indicated that the capital cost to install an Oxidation Catalyst system at the facility would be approximately $8,568,400 with an annualized cost of $1,219,400 while reducing CO emissions by 67 tons per year. It should be noted that you cannot calculate the CO reduction by simply applying a 78% (the reduction from a steady state emission level of 9ppm to 2ppm) control efficiency to the entire annual CO emissions. This is because a disproportionate amount of CO emissions occur during start up when the Oxidation Catalyst could not be used. Using the annualized cost shown above, and a emissions reduction of 67 tons per year, this equates to an incremental cost of $18,200 per ton of CO removed. In the writers opinion, this is not economically feasible.

(5) DAQ Review of RBLC: The following table was constructed using data for the 5 most recent entries for large gas fired simple cycle combustion turbines from the RBLC (note only BACT based final entries with CO emissions stated as ppm were considered):

Natural Gas

RBLC ID	Date	Company	BACT Emission Rate
TX-0819	06/30/2017	SW Public Service Co.	9 ppm
LA-0316	02/17/2017	Cameron LNG, LLC	15 ppm
TX-0794	04/07/2016	Brazos Elec. Coop.	9 ppm
TX-0788	03/24/2016	APEX Texas Power	9 ppm
TX-0777	12/09/2015	Navasota South	9 ppm
Avg. Emission Rate			10.2 ppm

Fuel Oil

RBLC ID	Date	Company	BACT Emission Rate
TX-0794	04/07/2016	Brazos Elec. Coop.	20 ppm
NV-0036	05/05/2005	Newmont Nevada Energy	6 ppm
MD-0031	04/01/2005	Mirant Mid Atlantic	20 ppm
MS-0072	12/10/2004	TVA-Kemper	20 ppm
Fl-0261	10/26/2004	City of Tallahasse	6 ppm
Avg. Emission Rate			14.4 ppm

With respect to CO emissions, Pleasants Energy, LLC's proposed emission rate of 9 ppmvd for natural gas firing is exactly the same as most other recent RBLC entries. None of the other units employed any CO control technology other than good combustion practices. Pleasants proposed emission rate of 20 ppm when firing fuel oil is similar to the average of the last five entries into the RBLC. It is exactly the same as three of the last five, while being higher than the other two. It should be noted that the two entries (NV-0036 & FL-0261) that are significantly lower than the Pleasants proposed rate are for turbines that co-located with non turbine generating sources. In the case of NV-0036 the turbines are used as a backup at a coal fired plant. In the case of Fl-0261 the turbines are used along side much larger natural gas fired boilers. Because the turbines are located at facilities with other types of sources, an Oxidation Catalyst system is likely more cost effective than it would be for Pleasants Energy, LLC. Other than NV-0036 and Fl-0261, no other facility requires any control except for good combustion practices.

$PM/PM_{10}/PM_{2.5}$

(1) Technology Identification: Pleasants Energy, LLC identified the following as potential particulate control technologies applicable to the Combustion Turbines;

* Fabric Filters/Baghouses
* Electrostatic Precipitators (ESPs)
* Good Combustion Practices/high efficiency filtration of the turbine inlet and SCR dilution air.
* Replacement of existing turbines with newer, more efficient turbines.

(2) Technically Infeasible Determinations: Each of the post-combustion control technologies (i.e. baghouses and ESPs) are generally available. However, none of the technologies are considered practical or technically feasible for installation on gaseous fuel or oil fired combustion turbines.

Baghouses, ESPs, and scrubbers have never been applied to commercial combustion turbines burning gaseous fuels or oil fuels. Baghouses, ESPs, and scrubbers are typically used on solid fuel fired sources with high PM emission concentrations, and are not used in gaseous fuel-fired applications, which have inherently low PM emission concentrations. None of these control technologies is appropriate for use on gaseous or fuel oil fired combustion turbines because of their very low PM emissions levels, and the small aerodynamic diameter of PM from gaseous fuel combustion. Review of the RBLC, indicates that post-combustion controls have not been required as BACT for gaseous or fuel oil fired combustion

turbines. Therefore, the use of baghouses, ESPs, and scrubbers is not considered technically feasible.

(3) Effectiveness Ranking of Remaining Technologies: The only remaining technologies are 1)replacement of existing turbines with newer (GE FA.05) ones and 2) filtration of the turbine inlet air.

(4) Economically Infeasible Determinations: Pleasants Energy, LLC performed an economic analysis of the cost to install two new GE 7FA.05 turbines at its Waverly facility. Per 40 CFR 52.21(r)(4) the analysis looked only at the cost of installing the equipment at a new facility and ignored demolition costs. WVDAQ reviewed the analysis and determined that it seems to comply with the OAQPS Control Cost Manual (EPA 2002). The analysis indicated that the capital cost to install the new turbines at the facility would be approximately $73,609,000 with an annualized cost of $5,932,000 while reducing PM emissions by 47.63 tons per year. It should be noted that Pleasants calculated a reduction of only 18.3 tons per year, but apparently assumed that fuel oil emissions from the new turbines would remain at 39 pounds per hour. This is obviously erroneous so the writer performed his own calculations to obtain the annual emissions reductions using the following method:

The writer used the scenario from Appendix C of the application that results in the highest PM (100% natural gas usage) and thus would be expected to see the greatest reduction. It may seem counterintuitive that the highest PM emissions occur under the scenario in which no fuel oil is used. However, this occurs because the permit will contain a condition which reduces the amount of natural gas which can be used for each gallon of fuel oil used. This has the effect of severely reducing the annual hours of operation whenever fuel oil is used. As can be seen in Appendix C, the turbines can operate a maximum of 5,096 hours each if only natural gas is used but can only operate 260 hours each if the maximum amount of fuel oil is used.

Using the above scenario, new turbines would emit:

(5096hrs/yr*7.0 lbs/hr*1ton/2000lbs) = 17.84 tons per year per turbine or 35.67 tons per year total.

As can be seen from Table 6 above, PM emissions from the existing turbines will be 83.3 tons per year.

83.3 tpy - 35.67 tpy = 47.63 tpy

Using the annualized cost shown above, and a emissions reduction of 47.63 tons per year, this equates to an incremental cost of $124,543.35 per ton of PM removed. In the writers opinion, this is not economically feasible.

(5) DAQ Review of RBLC: The following table was constructed using data for the 5 most recent entries for large gas fired simple cycle combustion turbines from the RBLC. Note that only entries with either particulate emissions stated as lb/hr or with enough information to easily convert limits to lb/hr were considered:

Natural Gas

RBLC ID	Date	Company	BACT Emission Rate
IN-0261	02/28/2017	Duke Energy Indiana	5 lb/hr
LA-0316	02/17/2017	Cameron LNG, LLC	8.12 lb/hr
TX-0794	04/07/2016	Brazos Elec. Coop.	14.0 lb/hr
TX-0788	03/24/2016	APEX Texas Power	13.4 lb/hr
TX-0777	12/09/2015	Navasota South	8.6 lb/hr
Avg. Emission Rate			9.82 lb/hr

Fuel Oil

RBLC ID	Date	Company	BACT Emission Rate
TX-0794	04/07/2016	Brazos Elec. Coop.	9.8 lb/hr
MI-0400	06/29/2011	Wolverine Power Supply	16.2 lb/hr
OH-0333	12/03/2009	Dayton Power & Light	29 lb/hr[1]
TX-0506	04/19/2006	NRG Texas	15 lb/hr
OH-0253	03/07/2006	Dayton Power & Light	15 lb/hr[1]
Avg. Emission Rate			17 lb/hr

[1]Filterable only.

With regards to PM, Pleasants Energy, LLCs proposed BACT emission rate of 15.9 pounds per hour when firing natural gas and 41 pounds per hour when firing fuel oil is significantly higher than the average of the past five entries in the RBLC for each fuel type. This can be explained by noting that two of the fuel oil entries for filterable PM only while the Pleasants limit applies to total particulate (filterable and condensible). Additionally, the turbines are newer and likely a more efficient generation of turbines. As shown above, it is economically infeasible for Pleasants to replace the existing units with new turbines.

GHGs

1) Technology Identification: Pleasants Energy, LLC identified two broad strategies for reducing GHG emissions from combustion turbines: 1) minimize the production of GHGs through the use of low carbon fuels and energy efficient design; and 2) carbon capture and sequestration (CCS).

2) Technically Infeasible Determinations:

In the application, Pleasants states the following:

"...existing CO_2 capture technologies have not been applied at large power plants, as the energetic costs are prohibitive, and while more efficient approaches are being investigated, none have currently been developed past the pilot-stage. Even though post-combustion technology for CO_2 capture has not been demonstrated on a simple-cycle combustion turbine, the EPA has stated that it is considered technologically feasible, however this Project will not have a pure CO_2 stream as it is a peaking plant and will ramp up and down and start-up and shut-down daily when it operates. However, a published cost estimate for a 235 MW slipstream pilot project in West Virginia is $668 million, so scaling that linearly to a size capable of handling the approximate 300 net MW capacity of this Project would be over $852 million. Potential carbon sequestration sites in West Virginia may exist, but the technologies to use them are mostly still in the pilot-scale phase of development, and Pleasants Energy would need to do much more investigation in order to discover where the sites are, if any, and characterize them enough to demonstrate the long-term viability of the locations. When looking at cost to construct a pipeline that may not need to be more than 50 miles, as determined from another power project (IPL Ottumwa Generating Station –in Iowa) using an average cost of approximately $1.4 million/mile of pipeline this cost is over $70 million. The capital costs would also need to include costs for gas compression, additional injection and monitoring wells necessary to handle the volume of CO_2 produced, pipeline right-of-way, operation and maintenance costs, etc.

The facts are that the qualitative cost estimate of capture and sequestration is quite high, the technological effectiveness for the capture equipment for a unit of this size has not been demonstrated in practice yet, and there is uncertainty as to whether locations capable of storing the large amounts of CO_2 that would be produced per year exist within a closer radius of the plant, and the fact that the Pleasants Energy facility does not have a pure CO_2 stream are sufficient to eliminate this option without requiring a more detailed site-specific technological or economic analysis."

(3) Effectiveness Ranking of Remaining Technologies: Pleasants Energy, LLC ranked using thermally efficient turbines in conjuction with lower carbon fuels as the top control technology. They proposed a resulting GHG emission rate of 1,900 lb CO_{2e}/MW-hr when firing fuel oil and 1,300 lb CO_{2e}/MW-hr when firing natural gas.

(4) Economically Infeasible Determinations: Since Pleasants Energy, LLC selected the top technically feasible control technologies, no economic determinations are necessary.

(5) DAQ Review of RBLC: The following table was constructed using data for the 5 most recent entries for large gas fired simple cycle combustion turbines from the RBLC (note that only entries with GHG emission limits in lb/MW-hr were used):

Natural Gas

RBLC ID	Date	Company	BACT Emission Rate
TX-0824	06/30/2017	Southern Power	1316 lb/MW-hr
TX-0819	04/28/2017	Southwestern Pub. Serv. Co.	1300 lb/MW-hr
TX-0794	04/07/2016	Brazos Elec. Coop.	1,434 lb/MW-hr

TX-0788	03/24/2016	APEX Texas Power	1,341 lb/MW-hr
TX-0778	12/16/2015	Navasota South	1,461 lb/MW-hr
Avg. Emission Rate			1,370 lb/MW-hr

Fuel Oil[1]

RBLC ID	Date	Company	BACT Emission Rate
IL-0121	09/27/2016	INVENERGY	1,934 lb/MW-hr
TX-0794	04/07/2016	Brazos Elec. Coop.	1,434 lb/MW-hr
FL-0355	09/10/2015	Florida Power & Light	1,874 lb/MW-hr
Avg. Emission Rate			1,747 lb/MW-hr

[1]The writer could only find three GHG limits in the RBLC for large, simple cycle combustion turbines firing fuel oil.

Comparisons among the various combustion turbines are somewhat complicated in that different bases can be used to establish certain parameters. For example, combustion turbine outputs can be specified on a net or gross basis, and can vary based on fuel, load, ambient temperature, and other factors. GHG emission rates can be specified on a LHV or HHV basis. Nevertheless, in context, the Pleasants Energy, LLC combustion turbines compare very favorably with other recent combustion turbine projects when firing natural gas. Although the proposed rate is slightly higher than the three most recent entries for fuel oil firing, it is very close to one of the entries and slightly lower than another. Given the lack of available data in the RBLC for GHG emissions when firing fuel oil, 1,900 lb/MW-hr seems reasonable.

DAQ Conclusion on BACT Analysis

The DAQ has concluded that, with the exceptions noted above and corrected for, Pleasants Energy, LLC correctly conducted a BACT analysis using the top-down analysis and eliminated technologies for appropriate reasons. The DAQ concludes that the emission rates under Table 14 are achievable, are consistent with recent applicable BACT determinations on the RBLC, and are accepted as BACT. Further, the DAQ accepts the selected technologies and proposed efficiency rates as BACT.

Modeling Analysis - 45CSR14 Section 9 and Section 10

45CSR14 Section 9 requires subject sources to demonstrate that "allowable emission increases from the proposed source or modification, in conjunction with all other applicable emission increases or reductions would not cause or contribute to " a NAAQS violation or an exceedance of a maximum allowable increase over the baseline concentration in any area. This typically includes modeling of effects in both "Class I" and "Class II" areas.

Pleasants Energy, LLC was required to do a modeling analysis to determine the potential impacts on Class I and Class II areas. The pollutants required to be modeled were the pollutants undergoing PSD review: CO, NO_x, $PM_{2.5}$ and PM_{10}. Greenhouse gases are not modeled as part of the PSD application review process. The results of the modeling analyses are summarized below. More detailed descriptions of these modeling analyses and quantitative results are contained in reports attached to this evaluation as Attachment A. The reports were prepared by Jon McClung of DAQs Planning Section.

Class I Modeling

As part of the Clean Air Act Amendments (CAA) of 1977, Congress designated a list of national parks, memorial parks, wilderness areas, and recreational areas as federal Class I air quality areas. Federal Class I areas are defined as national parks over 6,000 acres, and wilderness areas and memorial parks over 5,000 acres. As part of this designation, the CAA gives the Federal Land Managers (FLM's) an affirmative responsibility to protect the natural and cultural resources of Class I areas from the adverse impacts of air pollution. The impacts on a Class I area from an emissions source are determined through complex computer models that take into account the source's emissions, stack parameters, meteorological conditions, and terrain.

If an FLM demonstrates that emissions from a proposed source will cause or contribute to adverse impacts on the air quality related values (AQRV's) of a Class I area, and the permitting authority concurs, the permit will be denied. The AQRVs typically reviewed, in the case of evaluating adverse impacts, are visibility (both regional and direct plume impact) and acid deposition (including both nitrogen and sulfur).

Additionally, the Class I Increments designated under National Ambient Air Quality Standards (NAAQS) may not be exceeded. Class I Increments are limits to how much the air quality may deteriorate from a reference point (called the baseline). There are Class I Increments for NO_2, PM_{10}, and SO_2.

There are generally four Class I areas that may have to be considered when conducting PSD reviews in West Virginia. These are, in West Virginia, the Otter Creek Wilderness Area and the Dolly Sods Wilderness Area; both of which are managed by the US Forest Service. The Shenandoah National Park, managed by the National Park Service, and the James River Face Wilderness Area, managed by the US Forest Service, are in Virginia. The Pleasants Energy, LLC facility is approximately 81 miles from the Otter Creek Wilderness Area, 99 miles from the Dolly Sods Wilderness Area, 124 miles from the Shenandoah National park, and 157 miles from the James River Face Wilderness Area.

The Federal Land Managers responsible for evaluating affects on Air Quality Related Values (AQRVs) for federally protected Class I areas were consulted for the proposed project for the PSD Permit R14-0034, which was issued in January 2017. The FLMs required a modeling analyses specific to Class I areas for the proposed project for the PSD Permit Application R14-0034. CALPUFF was used to model the visibility and deposition effects on the Class I areas of Otter Creek Wilderness and Dolly Sods Wilderness in West Virginia and Shenandoah National Park and James River Face Wilderness in Virginia. The CALPUFF modeling results indicated that the project was not expected to have any noticeable affect on visibility and is not expected to have adverse impacts resulting from deposition.

A Class I increment analysis was also completed for Permit Application R14-0034. CALPUFF was used to demonstrate that the impacts from the project will be below Class I significant impact levels (SIL) for the Class I areas.

On October 23, 2017, WVDAQ provided details of Pleasants Energy, LLCs proposed project to both the US Forest Service and the National Park Service. Given that no substantive changes to the facility-wide PTE are proposed for Permit Application R14-0034A relative to R14-0034, on December 11, 2017, the US Forest Service indicated that they "anticipate no significant impacts to any air quality related values (AQRVs) at Class I Areas administered by the Forest Service".

Class II Modeling

A Class II Modeling analysis can require up to three runs to determine compliance with Rule 14. First, the proposed source is modeled by itself, on a pollutant by pollutant basis, to determine if it produces a "significant impact;" an ambient concentration published by US EPA. If the dispersion model determines that the proposed source produces significant impacts, then the demonstration proceeds to the second stage. If the model finds that the proposed source produces "insignificant impacts", no further modeling is needed. The modeling indicated that only the 1 hour standard for NO_2 and 24 hour standard for $PM_{2.5}$ were "significant" (see Table 15) thereby requiring the applicant to proceed to the next stage of the modeling process for those pollutants.

Table 15

Pollutant	Averaging Period	Year	Maximum Modeled Concentration ($\mu g/m^3$)	Significant Impact Level (SIL) ($\mu g/m^3$)
NO_2	Annual	2015	0.1	1
	1-hour	5 years	**49.2**[1]	7.5
CO	1-hour	2016	179.0	2000
	8-hour	2012	66.6	500
PM_{10}	Annual	2015	0.02	1
	24-hour	2016	2.7	5
$PM_{2.5}$	Annual	5 years	0.02	0.2
	24-hour	5 years	**1.6**[1]	1.2

[1]Value exceeded the SIL

The next tier for those standards which exceed the SIL (in this case the 1 hour NO_2 standard and 24 hour $PM_{2.5}$ standard) of the modeling analysis is to determine if the proposed facility in combination with the existing sources will produce an ambient impact that is less than the National Ambient Air Quality Standards (NAAQS).

As shown in Tables 16, although the maximum modeled concentration in the form of the standard for each scenario exceeds the NAAQS, Pleasants Energy, LLC's contribution is less than

the Significant Impact Limit (SIL) paired in time and space. Per Jon McClung "It has been EPA and WVDAQs longstanding policy that a facility does not 'cause or contribute to' an exceedance of the NAAQS if its contribution is less than the SIL."

Table 16

Pollutant and Averaging Period		**Maximum Modeled Concentration**	**Background Concentration**	**Total Concentration**	**NAAQS**	**Pleasants Energy Contribution**	**SIL**
		($\mu g/m^3$)					
NO_2	1-hr	139.3	68.9	208.2	188	0.019	7.5
$PM_{2.5}$	24-hr	574.1	19.0	593.1	35	0.073	1.2

The last stage is usually to determine how much of the PSD Increment the proposed construction of the facility consumes, along with all other increment consuming sources. This value may not exceed the PSD Increment. PSD Increments are the maximum concentration increases above a baseline concentration that are allowed. However, an increment for the 1 hour NO_2 standard has not been established. Therefore, only the 24 hour $PM_{2.5}$ standard was evaluated. As can be seen in Table 17, Pleasants Energy's contribution to the maximum increment exceedance, and all increment exceedances at all modeled receptors, was below the SIL.

Table 17

Pollutant and Averaging Period		Maximum Modeled Concentration	PSD Class II Increment	Pleasants Energy Contribution	SIL
		($\mu g/m^3$)			
$PM_{2.5}$	24-hr	882.6	9	0.093	1.2

The applicant therefore passes all the required Air Quality Impact Analysis tests as required under 45CSR14. Attached to this evaluation is a report prepared by Jon McClung on January 30, 2018 that details the above analysis.

Additional Impacts Analysis - 45CSR14 Section 12

Section 12 of 45CSR14 requires an applicant to provide "an analysis of the impairment to visibility, soils, and vegetation that would occur as a result of the source or modification and general commercial, residential, industrial, and other growth associated with the source or modification." It also requires the applicant to perform "an analysis of the air quality impact projected for the area as a result of general commercial, residential, industrial and other growth associated with the source or modification." No quantified thresholds are promulgated for comparison to the additional impacts analysis

Pleasants Energy, LLC provided an extensive Additional Impacts Analysis in the application. In their analysis, they looked at potential impacts of economic growth associated with the proposed facility, as well as potential impacts on soils, vegetation and local visibility. Additionally, as discussed above, the applicant has also previously performed deposition and visibility modeling for Class I areas. The conclusions of their analysis are included below. Pleasants full analysis is available in the application and included in the file.

"As shown by the results presented in this section of the application and additional supplemental information, the Project will not have a significant adverse impact on the air quality, soils, vegetation, visibility and or growth in the surrounding area."

Minor Source Baseline Date (Pleasants County, WV) - Section 2.42.b

On April 18, 2016 the permit application R14-0034 was deemed complete. This action, as per 45CSR14, Section 2.42.b, triggered the minor source baseline date (MSBD) for PM2.5 in both Pleasants and Wood Counties. This application does not result in the triggering of any additional minor source baseline dates.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

This section provides general toxicity information for those pollutants not classified as "criteria pollutants." Criteria pollutants are defined as Carbon Monoxide (CO), Lead (Pb), Oxides of Nitrogen (NO_x), Ozone, Particulate Matter (PM), 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 state programs designed to limit their emissions and public exposure. These programs include federal source-specific HAP limits promulgated under 40 CFR 61 (NESHAPS) and 40 CFR 63 (MACT).

The majority of non-criteria regulated pollutants fall under the definition of Hazardous Air Pollutants (HAPs). All non-criteria regulated pollutants proposed to be emitted by the facility with the exception of sulfuric acid mist (H_2SO_4) are defined as Hazardous Air Pollutants (HAPs). HAPS and H_2SO_4 will be discussed separately below.

HAPs

Section 112(b) of the Clean Air Act (CAA) identifies 188 compounds as pollutants or groups of pollutants that EPA knows or suspects may cause cancer or other serious human health effects. The combustion of both natural gas and fuel oil have the potential to produce HAPs. However, the potential HAP emissions from the facility are below the levels that define a major HAP source. Therefore, the facility is considered a minor (or area) HAP source, and no source-specific major source NESHAP or MACT standards apply. The following table lists each HAP potentially emitted by the facility in excess of 20 pounds/year (0.01 tons/year) and the carcinogenic risk associated thereto (as based on analysis provided in the Integrated Risk Information System (IRIS)):

Table 18: Potential HAP Carcinogenic Risk

HAPs	Type	Known/Suspected Carcinogen	Classification
Acetaldehyde	VOC	Yes	B2 - Probable Human Carcinogen
Acrolein	VOC	No	Not Assessed
Benzene	VOC	Yes	A - Human Carcinogen
Ethylbenzene	VOC	No	D-Not Classifiable
Formaldehyde	VOC	Yes	B1 - Probable Human Carcinogen
Naphthalene	VOC	Yes	C-Possible Human Carcinogen
PAHs[1]	VOC	Yes	B2 - Probable Human Carcinogen
Toluene	VOC	No	Inadequate Data
Xylene	VOC	No	Inadequate Data
2,2,4-Trimethylpentane	VOC	No	Not Classified
1,3-Butadiene	VOC	Yes	Carcinogenic by Inhalation
Selenium	PM	No	D-Not Classifiable
Manganese	PM	No	D-Not Classifiable

[1]Polycyclic Aromatic Hydrocarbons (PAHs) defines a broad class of compounds some of which include compounds classified as B2-probable human carcinogens.

All HAPs also 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 refer to the IRIS database located at www.epa.gov/iris.

Sulfuric Acid Mist (H_2SO_4)

The compound of H_2SO_4 is regulated under 45CSR14 with a significance level that can trigger BACT for each source that contributes H_2SO_4 emissions. As discussed above, the potential H_2SO_4 emissions from the facility did not trigger a BACT analysis for the compound. H_2SO_4 is not represented in the IRIS database and is not listed as a HAP. Concerning the carcinogenity of sulfuric acid, the Agency for Toxic Substances and Disease Registry (ATSDR) states that "[t]he ability of sulfuric acid to cause cancer in laboratory animals has not been studied. The International Agency for Research on Cancer (IARC) has determined that occupational exposure to strong inorganic acid mists containing sulfuric acid is carcinogenic to humans. IARC has not classified pure sulfuric acid for its carcinogenic effects."

MONITORING, REPORTING, AND RECORD-KEEPING OF OPERATIONS

Emissions Monitoring

The primary purpose of emissions monitoring is to guarantee the permittee's compliance with emission limits and operating restrictions in the permit on a continuous basis. Emissions monitoring may include any or all of the following:

* Real-time continuous emissions monitoring to sample and record pollutant emissions (CEMS, COMS);

* Parametric monitoring of variables used to determine potential emissions (recording of material throughput, fuel usage, production, etc.);

* Monitoring of control device performance indicators (pressure drops, catalyst injection rates, etc.) to guarantee efficacy of pollution control equipment;

* Visual stack observations to monitor opacity.

* It is the permittee's responsibility to record, certify, and report the monitoring results so as to verify compliance with the emission limits. Specific emissions monitoring requirements for each emissions unit at the Pleasants Energy, LLC facility are discussed below.

Pleasants Energy, LLC shall be required to show continuous compliance with the turbine emission limits by using the monitoring specified in the following table:

Table 19

Pollutant	Monitoring Method	Permit/Rule Citation	Comment
CO	Initial stack test + fuel usage+records of start ups and shutdowns	Permit	Method 10 or 10B
NO_x	CEMS	40 CFR 75	Pursuant to §75.10
$PM/PM_{10}/PM_{2.5}$	Initial stack test, fuel usage	Permi	Method 5 & Method 202 or other as approved

SO_2	Fuel usage + fuel sulfur content	Subpart KKKK	Fuel S content Pursuant §60.4360
VOCs	Initial stack test, fuel usage	Permit	Method 18 or 25 as approved or other as approved
Lead	Fuel usage	Permit	
H_2SO_4	Fuel usage + fuel sulfur content	Permit	Fuel S content Pursuant to §60.4360
GHGs	Initial stack test + fuel usage	Permit	CEMS, Method 3A or 3C as approved for CO_2. Calcs for non CO_2 GHGs.
HAPs	Fuel usage	Permit	
Opacity	Monthly VE readings	Permit	Method 22

The CEMS will provide a continuous and real-time method of determining compliance with the emission limits specified in the permit. The CEMS will be installed and operated according to the applicable provisions of 40 CFR 60. Parametric monitoring will also be used to show compliance with emissions limits. This will include monitoring fuel combusted in the turbines and sampling the fuel to determine its constituent characteristics.

Record-Keeping

Pleasants Energy, LLC will be required to follow the standard record-keeping boilerplate in the permit. This will require them to maintain records of all data monitored in the permit and keep the information for five years. All collected data will be available to the Director upon request. Pleasants Energy, LLC will also be required to follow all the record-keeping requirements as applicable in the 40 CFR 60 Subpart KKKK. The existing natural gas fired and fuel oil fired engines shall continue to follow the record-keeping requirements of 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ.

Reporting

Pleasants Energy, LLC will also be required to follow all the reporting requirements as applicable in the 40 CFR 60 Subpart KKKK for the turbine. The existing natural gas fired and fuel oil fired engines shall continue to follow the reporting requirements of 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ.

PERFORMANCE TESTING

Performance testing is required to verify the emission factors used to determine the units' potential-to-emit and show compliance with permitted emission limits. Performance testing must be conducted in accordance with accepted test methods and according to a protocol approved by the Director prior to testing. All units subject to a standard under 40 CFR 60 are required to perform an initial performance test according to the applicable Subpart. Periodic testing may be required thereafter depending on the specifics of the emissions unit in question. Under the WV SIP, testing is required at the discretion of the Director.

Initial and periodic testing is required on each turbine stack to determine compliance with the following emission limits using the test methods approved by WVDAQ.

Performance testing after the initial test will be required on a schedule set forth in the permit. The permittee shall also be required to test and verify initial compliance with BACT limits in the permit for the turbines and thereafter on a schedule set forth in the permit.

Black Start Generators

Performance testing for black start generator engines are limited to those required under 40 CFR 60, Subpart IIII.

RECOMMENDATION TO DIRECTOR

The WVDAQ has preliminarily determined that the modification of the Pleasants Energy, LLC, natural gas fired power plant near Waverly, but In Pleasants County will meet the emission limitations and conditions set forth in the DRAFT permit and will comply with all current applicable state and federal air quality rules and standards including 45CSR14, the WV Legislative Rule implementing the Prevention of Significant Deterioration program. A final decision regarding the DRAFT permit will be made after consideration of all public comments. It is the recommendation of the undersigned, upon review and approval of this document and the DRAFT permit, that the WVDAQ, pursuant to §45-14-17, go to public notice on permit application R14-0034A.

Steven R. Pursley, PE
Engineer

January 31, 2018

R14-0034A
Pleasants Energy, LLC
Waverly Power Plant

Attachment A: Modeling Analyses