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Pursuant to §45-14-17.2

PRELIMINARY DETERMINATION/FACT SHEET

for the

Construction

of

Pleasants Energy, LLC's
Waverly Power Plant

located in

Waverly, Pleasants County, WV.

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

Date: September 29, 2016

BACKGROUND INFORMATION

Application No.:	R14-0034
Plant ID No.:	073-00022
Applicant:	Pleasants Energy, LLC
Facility Name:	Waverly Power Plant
Location:	Pleasants County
NAICS Code:	221112
Application Type:	PSD Major Construction
Received Date:	September 18, 2015
Engineer Assigned:	Steven R. Pursley, PE
Fee Amount:	$11,000
Date Received:	September 21, 2015
Complete Date:	April 18, 2016
Due Date:	October 14, 2016
Applicant Ad Date:	September 26, 2015
Newspaper:	*Pleasants County Leader*
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 September 18, 2015, Pleasants Energy submitted an application to modify the facility. Specifically, Pleasants wishes to increase the permitted amount of fuel which can be combusted by the facility. This modification results 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, will be subject to all requirements of PSD review.

Emission sources associated with the permit are:

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

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

The following document will outline the DAQ's preliminary determination that the construction 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 new major construction 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 R14-0034.

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:

- *The Pleasants County Leader* (September 26, 2015)

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

- The U.S Environmental Protection Agency - Region 3 (July 12, 2016)
- The National Park Service (October 7, 2015)

- The US Forest Service (October 7, 2015)

The application was also available at the DAQ Headquarters in Charleston (Kanawha City) for review.

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 R14-0034:

- *The Pleasants County Leader*

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 R14-0034 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 R14-0034, the DAQ shall make such determination available for review at WVDEP Headquarters in Charleston.

DESCRIPTION OF PROPOSED FACILITY

Pleasants Energy plans to increase the hours of operation of its two simple-cycle GE-7FA combustion turbines at the Pleasants Energy facility located near Waverly, West Virginia. The facility is located in Pleasants County, which is currently designated as attainment/unclassified for all criteria pollutants.

The existing Pleasants Energy facility is a 300 MW simple cycle electric generating peaking stations. The facility includes two GE 7FA simple cycle combustion turbines each rated at 167.8 MW (natural gas, 59°F, 60% humidity). The turbines primary fuel is natural gas but low sulfur distillate fuel oil is utilized as a backup fuel. In 2015, Pleasants equipped each turbine with a TurboPhase system that injects externally supplied air into the combustion turbine after compressor discharge at the inlet to the combustor. This increases air mass flow through the turbines and, consequently, generator output.

In the event of a catastrophic blackout, the Pleasants facility can supply power to the grid which would provide the necessary power to allow other, larger, power plants to restart. To provide this capability, Pleasants Energy must be able to startup from "black start" conditions. Therefore, in 2014 Pleasants installed five (5) diesel-fired Caterpillar Model C175-16 4,376 brake-horsepower (bhp) reciprocating internal combustion engine (RICE) paired with a 3 MW generator. Pleasants existing permit limited each generator to 500 hours of operation per year. This limit will be retained in the PSD permit.

The facility also has a fuel oil storage tank on site which is considered de minimis per 45CSR13 Table 45-13B item 58.

Each combustion turbine has its own exhaust stack. Each stack is 114.5 feet above grade.

SITE INSPECTION

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 very 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:

PROPOSED EMISSIONS

The 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	549.70
NO_x	510.00
PM	103.60
PM_{10}	103.60
$PM_{2.5}$	103.60
SO_2	39.20
VOCs	29.80
H_2SO_4	6.00
Lead	0.01
CO_{2e}	1,263,362.00
Total HAPs	12.90

(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 (with and without TurboPhase operations and 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 with TurboPhase operation. 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 with TurboPhase 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	32 lb/hr w/o TurboPhase (TP) 36 lb/hr w/ TurboPhase
NO_x	9 ppm	BACT	65 lb/hr w/o TP 75 lb/hr w/ TP Includes Low NO_x Burners
PM	15 lb/hr w/o TP 17.2 lb/hr w/ TP	Stack Testing on same model & generation of Turbines	Includes both filterable and condensable PM
PM_{10}			
$PM_{2.5}$			
SO_2	2.5 lb/hr w/o TP 2.8 lb/hr w/ TP	Mass Balance	
VOCs	3.0 lb/hr w/o TP 3.4 lb/hr w/ TP	Manufacturer	
GHGs	183,961 lb/hr w/o TP 212,291 lb/hr w/ TP	AP-42 & 40 CFR 98 Subpart A	CO_{2e} Basis
H_2SO_4	0.38 lb/hr w/o TP 0.44 lb/hr w/TP	Mass Balance	Assumes 10% of SO_2 & 100% of SO_3 is converted to H_2SO_4
HAPs	0.77 b/hr	AP-42	

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

Pollutant	Emission Rate	Emission Factor Source	Comments
CO	20 ppm	BACT	72 lb/hr
NO_x	42 ppm	BACT	470 lb/hr
PM	39 lb/hr	Vendor Data	Includes both filterable and condensable PM
PM_{10}			
$PM_{2.5}$			
SO_2	103 lb/hr	Mass Balance	
VOCs	8 lb/hr	Vendor Data	
GHGs	256,873 lb/hr	AP-42 & 40 CFR 98 Subpart A	CO_{2e} Basis
H_2SO_4	15.8 lb/hr	Mass Balance	Assumes 10% of SO_2 & 100% of SO_3 is converted to H_2SO_4
HAPs	2.00 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 20 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 20 cold start-ups and 20 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 80 percent load or minimum load for steady state operation and emissions compliance) plus one shut-down (80 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	384.4	144.4	913.2
NO_x	121.2	103.3	345.7
PM	15.0	15.0	45.0
PM_{10}			
$PM_{2.5}$			
SO_2	2.50	2.50	7.5
VOCs	6.80	6.20	19.8
GHGs	183,961	183,771	551,313
H_2SO_4	0.38	0.38	1.14

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	230.4	195.7	656.5
NO_x	561.6	543.1	1,666.3
PM	39.0	39.0	117.0
PM_{10}			
$PM_{2.5}$			
SO_2	103.0	103.0	309.0
VOCs	9.10	9.0	27.2
GHGs	256,873	255,995	767,985
Lead	0.02	0.02	0.06
H_2SO_4	15.8	15.8	47.4

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	509.54
NO_x	464.60
PM	100.10
PM_{10}	
$PM_{2.5}$	
SO_2	39.03
VOCs	23.84
GHGs	1,231,632.52
Lead	0.01
H_2SO_4	6.02

The turbines are the only equipment being modified in this permitting action. However, as explained below under Regulatory Applicability, emissions from the rest of the facility must be examined to make sure that they should not also undergo PSD review.

TurboPhase Engines

Each of the two turbines is connected to TurboPhase system. Each TurboPhase system consists of four 2,750 hp spark ignition, natural gas fired engines. The TurboPhase system injects externally supplied air into the combustion turbine after compressor discharge at the inlet to the combustor.

Estimates of NO_x, CO, PM, and VOC emissions from the TurboPhase engines are based on vendor data. SO_2 emissions are based on AP-42 Section 3.4. Greenhouse gasses are based on 40 CFR Part 98. Annual emissions are based on each engine operating 3,250 hours per year. This limitation is included in their existing permit and will be folded in to the new PSD permit.

Table 7: Maximum TurboPhase Engine Emissions.

Source	CO		NO_x		VOCs		$PM/PM_{10}/PM_{2.5}$		SO_2	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
TP engines[1]	5.34	8.66	24.26	39.4	1.46	2.36	1.60	2.60	0.08	0.12

[1]Both TurboPhase systems (all 8 engines) combined.

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 existing permit limits the facility to 500 hours per year of operation per engine. The new permit will retain this limit.

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	6.29
NO_X	0.50 g/bhp-hr	Subpart IIII	4.82	1.21
NMHC	0.3 g/bhp-hr	Subpart IIII	2.89	0.73
$PM/PM_{10}/PM_{2.5}$	0.07 g/bhp-hr	Subpart IIII	0.72	0.18
SO_{21}	0.0000121 lb/hp-hr	AP-42, Table 3.4-1	0.05	0.02
VOCs	0.000642 lb/hp-hr	AP-42, Table 3.4-1	2.88	0.72
Total HAPs	0.0045 lb/mmbtu(3)	AP-42, Table 3.4-3	0.13	0.04

(1) Based on 15 ppm sulfur
(2) Based on TOCs being 91% Non methane (see footnote f of table 3.4-1)
(3) 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	31.47
NO_X	24.10	6.03
NMHC	14.39	3.60
$PM/PM_{10}/PM_{2.5}$	3.60	0.90
SO_{21}	0.27	0.07
VOCs	14.39	3.60
Total HAPs	0.04	0.17

Emissions from the existing facility are taken directly from the engineering evaluation for R13-2373B.

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	116.0	241.0	12.0	75.0	53.0
TP engines	8.66	39.4	2.36	2.60	0.12
Generators	31.47	6.03	3.60	0.90	0.07
Total	**156.13**	**286.43**	**17.96**	**78.5**	**53.19**

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

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

Table 11: Increase in Emissions

CO	NO_x	VOCs	$PM/PM_{10}/PM_{2.5}$	SO_2
tpy	tpy	tpy	tpy	tpy
393.57	223.57	11.84	25.1	-13.99

It should be noted that SO_2 emissions decrease because the existing permit contains an indirect fuel oil limit (it contains a direct natural gas limit which is reduced for each gallon of fuel oil used thus resulting in an indirect fuel oil limit) of 15,770,000 gallons per year. The new permit will contain an explicit fuel oil limit of 4,205,357 gallons per year for both turbines combined (as per the permit application).

Total 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). Emissions are based on the turbines burning the maximum permitted amount of natural gas because that scenario results in the highest total HAP emissions.

Table 12: Facility Wide HAP Emissions

Pollutant	Turbines		Generators		TurboPhase Engines		Total	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
2,2,4-Trimethylpentane	--	--	--	--	0.02	0.03	0.02	0.03
Acetaldedyde	0.13	0.39	--	--	0.57	0.92	0.70	1.31
Acrolein	0.02	0.06	--	--	0.35	0.57	0.37	0.63
Benzene	0.04	0.12	0.11	0.03	0.03	0.05	0.18	0.20
Biphenyl	--	--	--	--	0.01	0.02	0.01	0.02
1,3-Butadiene	--	--	--	--	0.02	0.03	0.02	0.03
Ethyl Benzene	0.10	0.31	--	--	--	--	0.10	0.31
Formaldehyde	0.64	2.00	0.01	0.01	3.60	5.83	4.25	7.84
Hexane	--	--	--	--	0.08	0.12	0.08	0.12
Methanol	--	--	--	--	0.17	0.28	0.17	0.28
Naphthalene	0.01	0.01	0.02	0.01	--	--	0.03	0.02
PAHs	0.01	0.02	--	--	--	--	0.01	0.02
Propylene	--	--	0.40	0.10	--	--	0.40	0.10
Toluene	0.40	1.30	0.04	0.01	0.03	0.05	0.47	1.36
Xylene	0.20	0.62	0.03	0.01	0.01	0.02	0.24	0.65
Total	1.55	4.83	0.61	0.16	4.89	7.94	**7.05**	**12.92**

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 GG, 40 CFR 60 Subpart III, 40 CFR 60 Subpart JJJJ and 40 CFR 63 - Subpart ZZZZ. It should be noted that Subparts IIII (emergency generators), Subpart JJJJ (turbophase engines) and Subpart ZZZZ (generators and turbophase engines) apply to equipment that is not being effected 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 construction 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 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 September 26, 2015 in the *Pleasants County Leader* and the affidavit of publication for this legal advertisement was submitted on October 8, 2015.

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 new construction 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. Although the Pleasants Energy, LLC facility is an existing source it will treated as the construction of a new major stationary source 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."

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 construction of a "major stationary source" under 45CSR14 (see above) and PSD review is required for the pollutants of CO, NO_x, $PM_{2.5}$, PM_{10}, TSP, and Greenhouse Gasses (see Table 6). Note that the major source threshold for simple cycle gas fired turbines is 250 tons per year. Therefore emission of both CO and NO_x classify the facility as "major". Additionally, since the facility is considered a major source, emissions exceeding 25 tpy, 15 tpy and 10 tpy of PM, PM_{10} and $PM_{2.5}$ respectively subject those pollutants to PSD review since the are defined as "significant". 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.

It is important to note that only the combustion turbines are undergoing PSD review under 45CSR14. This is because if we look back at the additions of, 1) the black start generators and 2) the TurboPhase engines, we can see that neither project would have triggered PSD review even if it was assumed that the facility had been an existing major stationary source.

Specifically, installation of the generators increased emissions as follows:

Table 13: Generator Emissions (all 5 engines combined, per G60C-067)

Pollutant	PSD Sig. Threshold	Annual (ton/yr)	PSD (Y/N)
CO	100 tpy	31.47	N
NO_X	40 tpy	6.03	N
PM	25.00	0.90	N
PM_{10}	15.00	0.90	N
$PM_{2.5}$	10.00	0.90	N
VOCs	40.00	3.60	N
SO_2	40.00	0.07	N
GHG's (CO_{2e})	75,000.00	5,850.00	N

Similarly, installation of the TurboPhase engines increased emissions as follows:

Table 14: TurboPhase Engine Emissions (all 8 engines combined, per R13-2373B)

Pollutant	PSD Sig. Threshold	Annual (ton/yr)	PSD (Y/N)
CO	100 tpy	8.66	N
NO_X	40 tpy	39.40	N
PM	25.00	2.60	N
PM_{10}	15.00	2.60	N
$PM_{2.5}$	10.00	2.60	N
VOCs	40.00	2.36	N
SO_2	40.00	0.12	N
GHG's (CO_{2e})	75,000.00	25,879.00	N

45CSR16: Standards of Performance for New Stationary Sources

45CSR16 incorporates by reference applicable requirements under 40 CFR 60. 40 CFR 60 Subpart GG applies to the facility (see below under Federal Regulations).

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 GG: Standards of Performance for Stationary Gas Turbines

Subpart GG of 40 CFR 60 establishes limits for NO_x and SO_2 emissions from stationary gas-fired turbines with a heat input at peak load equal to or greater than 10.7 gigajoules per hour (10MMBTU/hr), based on the lower heating value of the fuel fired. The Pleasants Energy Project turbines will each have a heat input (fuel flow) of approximately 1, 571 MMBTU per hour at 59° F at full load, making each turbine subject to the requirements of Subpart GG as per 40 CFR 60.330. Subpart GG contains emission standards (for NO_x and SO_2) in addition to notification, monitoring and testing requirements. The applicable standard limiting the discharge of NOx into the atmosphere from each turbine is expressed as:

STD = 0.0075* (14.4/Y) + F

where:

STD = allowable NOx emissions (percent volume at 15 percent oxygen and on a dry basis)

Y = manufacturer's rated heat rate at manufacturers rated load (kilojoules per watt hour) or, actual measured heat rate based on lower heating value of fuel as measured at actual peak load for the facility. The value of Y shall not to exceed 14.4 kilojoules per watt hour.

F = NO_x emission allowance for fuel-bound nitrogen as defined in paragraph (a)(3) of this section.

The heat input rate for each of the GE 7FA turbines on natural gas firing is 9.87 kJ/W-hr at 100% load and 59° F. Therefore, the NSPS limitation for NO_x is 109 ppmvd at 15% oxygen. The anticipated emission rate for the Pleasants Energy Project turbines is 9.0 ppmvd at 15% O_2 while combusting natural gas and 42 ppmvd at 15% O_2 when combusting fuel oil both of which are well below the NSPS emission limit for NO_x. The emissions limit set forth in the permit will be more stringent than the limit specified under the NSPS.

Under the Subpart GG NSPS, SO_2 is limited to 0.015% SO_2 by volume (150 ppmvd corrected to 15 percent O_2), and fuel oil sulfur content is limited to less than 0.8 percent by weight. The Pleasants Energy, LLC facility will meet these criteria by using natural gas as the primary fuel source. The facility has a current permit limit of 0.5 grains per 100 scf which is approximately 8 ppmvd. Further, the distillate fuel oil is limited to an annual average sulfur content of 0.05% by weight. Fuel sulfur content for the turbines is, therefore, below the NSPS requirements. The corresponding maximum flue gas SO_2 concentrations will also be well below the NSPS standards, with SO_2 emissions of about 1 ppmvd corrected to 15 percent O_2 during gas firing and 10 ppmvd corrected to 15 percent O_2 during fuel oil firing.

Pleasants Energy, LLC will continue to follow existing permit requirements for fuel monitoring to satisfy the monitoring requirements for sulfur content of the natural gas as required in 40 CFR 60.334.

40 CFR 60 Subpart KKKK: Standards of Performance for Stationary Combustion Turbines *(Not Applicable)*

Subpart KKKK is only applicable to stationary combustion turbines that commenced construction, modification or reconstruction after February 18, 2005. The Pleasants Energy, LLC turbines commenced construction in 2001. Additionally, simply increasing the hours of operation alone, does not meet the definition of “modified” per 40 CFR 60.14(e)(3).

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

Subpart TTTT is only applicable to stationary combustion turbines that commenced construction after January 8, 2014 or reconstruction after June 18, 2015. The Pleasants Energy, LLC turbines commenced construction in 2001. Additionally, simply increasing the hours of operation alone, does not meet the definition of “reconstruction” per the NSPS.

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 construction of a "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 15: 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	15.0 lb.hr w/o TP 17.2 lb/hr w/ TP 39 lb/hr	AF, NG, ULSD	1,297 lb/ MW-hr 1,570 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.03 turbines.
(4) Where 2 limits exist, 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 NOx 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 $2,912,855 while reducing NO_x emissions by 174 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 found in Table 6. 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 174 tons per year, this equates to an incremental cost of $16,740.55 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 entries with NO_x emissions stated as ppm were considered):

Natural Gas

RBLC ID	Date	Company	BACT Emission Rate
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
TX-0769	10/27/2015	Navasota North	9 ppm
TX-0764	10/14/2015	Nacogdoches Power	9 ppm
Avg. Emission Rate			9 ppm

Fuel Oil

RBLC ID	Date	Company	BACT Emission Rate
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
MD-0031	04/01/2005	Mirant Mid Atlantic	42 ppm
MS-0072	12/10/2004	TVA-Kemper	42 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 other recent RBLC entries. None of the other units employed any NO_x control technology other than DLNB. Pleasants proposed emission rate of 49 ppm when firing fuel oil is similar to the average of four 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. 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 Oxidation Catalyst system at the facility would be approximately $8,568,365 with an annualized cost of $1,219,367 while reducing CO emissions by 68.5 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 found in Table 6. 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 68.5 tons per year, this equates to an incremental cost of $17,800.98 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 entries with CO emissions stated as ppm were considered):

Natural Gas

RBLC ID	Date	Company	BACT Emission Rate
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
TX-0769	10/27/2015	Navasota North	9 ppm
TX-0764	10/14/2015	Nacogdoches Power	9 ppm
Avg. Emission Rate			9 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 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 49.58 tons per year. It should be noted that Pleasants calculated a reduction of only 19 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 6,195 hours each if only natural gas is used but can only operate 375 hours each if the maximum amount of fuel oil is used.

Using the above scenario, new turbines would emit:

(3250 hrs/yr * 9.2 lbs/hr) + ((6195 hrs/yr-3250 hrs/yr)*7.0 lbs/hr) = 25.26 tons per year per turbine or 50.52 tons per year total.

As can be seen from Table 6 above, PM emissions from the existing turbines will be 100.10 tons per year.

100.1 tpy - 50.52 tpy = 49.58 tpy

Using the annualized cost shown above, and a emissions reduction of 49.58 tons per year, this equates to an incremental cost of $119,645.01 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
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
TX-0769	10/27/2015	Navasota North	8.6 lb/hr
TX-0764	10/14/2015	Nacogdoches Power	12.09 lb/hr
Avg. Emission Rate			11.34 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 17.2 pounds per hour when firing natural gas and 39 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 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-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
TX-0775	11/13/2015	Navasota South	1,461 lb/MW-hr
FL-0355	09/10/2015	Florida Power & Light	1,374 lb/MW-hr
Avg. Emission Rate			1,414 lb/MW-hr

Fuel Oil[1]

RBLC ID	Date	Company	BACT Emission Rate
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			1,654 lb/MW-hr

[1]The writer could only find two 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 two most recent entries for fuel oil firing, it is very close to one of the entries. 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.

On September 29, 2015, WVDAQ provided details of Pleasants Energy, LLCs proposed project to both the US Forest Service and the National Park Service. On October 6, 2015, both agencies requested copies of the permit application which WVDAQ provided on October 7, 2015. During followup conversations both the USFS and NPS requested that Pleasants perform a Class I modeling analysis for all four previously mentioned Class I areas. On March 2, 2016, Pleasants submitted to WVDAQ, USFS and NPS the final report detailing the results from said analysis.

Pleasants used CALPUFF to model both visibility and deposition effects on the Class I areas. Additionally, Pleasants performed a Class I increment analysis. The results indicated that the project should not have any noticeable effect on visibility nor have any adverse impacts resulting from deposition. As shown below in Tables 15 and 16, when evaluating the impacts as they relate to the Class I Significant Impact Levels (SILs), the modeling showed that even at a distance of 50 km (31 miles) most impacts were below the SILs and all impacts were below the SILs at the actual Class I areas.

Table 16

Pollutant	Averaging Period	Maximum Modeled value at 50 kilometer receptor (µg/m^3)				Class I Significant Impact Level (µg/m^3)
		Otter Creek Wilderness	Dolly Sods Wilderness	Shenandoah National Park	James River Face Wilderness	
PM_{10}	24-hour	0.0972	0.0499	0.0526	0.0733	0.3
	Annual	0.0036	0.0018	0.0018	0.0020	0.2
$PM_{2.5}$	24-hour	**0.0972**[1]	0.0499	0.0526	**0.0733**[1]	0.07
	Annual	0.0036	0.0018	0.0018	0.0020	0.06
NO_2	Annual	0.0139	0.0071	0.0071	0.0078	0.1

[1]Value exceeded the SIL.

Table 17

Maximum Modeled value ($\mu g/m^3$)		Class I Significant Impact Level ($\mu g/m^3$)
Otter Creek Wilderness	James River Face Wilderness	
0.0401	0.0146	0.07

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 17) thereby requiring the applicant to proceed to the next stage of the modeling process for those pollutants.

Table 18

Pollutant	Averaging Period	Year	Maximum Modeled Concentration ($\mu g/m^3$)	Significant Impact Level (SIL) ($\mu g/m^3$)
NO_2	Annual	2012	0.1	1
	1-hour	5 years	**45.7**[1]	7.5
CO	1-hour	2012	174.3	2000
	8-hour	2013	80.0	500
PM_{10}	Annual	2012	0.03	1
	24-hour	2014	2.8	5
$PM_{2.5}$	Annual	5 years	0.02	0.3
	24-hour	5 years	**2.1**[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 18, 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 19

Pollutant and Averaging Period		Maximum Modeled Con-centration	Background Con-centration	Total Con-centration	NAAQS	Pleasants Energy Contribution	SIL
		($\mu g/m^3$)					
NO_2	1-hr	141.4	68.3	209.7	188	0.019	7.5
$PM_{2.5}$	24-hr	582.8	19.4	602.2	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 19, Pleasants Energy's contribution to the maximum increment exceedance, and all increment exceedances at all modeled receptors, was below the SIL.

Table 20

Pollutant and Averaging Period		Maximum Modeled Concentration	PSD Class II Increment	Pleasants Energy Contribution	SIL
		($\mu g/m^3$)			
$PM_{2.5}$	24-hr	882.8	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 September 19, 2016 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 also 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 supplemental material submitted on March 2, 2016 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, has triggered the minor source baseline date (MSBD) for the following areas:

Table 21: Minor Source Baseline Triggering

Pollutant	Pleasants County	Wood County
NO_2	Previously	Previously
PM_{10}	Previously	No
$PM_{2.5}$	Yes	Yes[1]

[1]Triggered because modeled impacts in Wood County exceed the SIL.

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). Potential applicability to these programs were discussed above under REGULATORY APPLICABILITY.

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 22: 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
Hexane	VOC	No	Inadequate Data
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
Biphenyl	VOC	No	D-Not Classifiable
1,3-Butadiene	VOC	Yes	Carcinogenic by Inhalation
Methanol	VOC	No	Not Classified
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. The regulatory applicability of any potential NESHAP or MACT to the Pleasants Energy, LLC Plant was discussed above. 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 23

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	Permit	Method 5 & Method 202 or other as approved
SO_2	Fuel usage + fuel sulfur content	Subpart GG	Fuel S content Pursuant §60.334(h)(1)
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 §60.334
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 GG. The existing natural gas fired and fuel oil fired engines shall continue to follow the record-keeping requirements of 40 CFR 60 Subparts IIII and JJJJ 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 GG for the turbine. The existing natural gas fired and fuel oil fired engines shall continue to follow the reporting requirements of 40 CFR 60 Subparts IIII and JJJJ 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 Generator/TurboPhase Engines

Performance testing for black start generators and TurboPhase engines are limited to those required under 40 CFR 60, Subparts IIII and JJJJ.

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 R14-0034.

Steven R. Pursley, PE
Engineer

September 26, 2016

R14-0034
Pleasants Energy, LLC
Waverly Power Plant

Attachment A: Modeling Analyses