ALLEGHENY COUNTY HEALTH DEPARTMENT
AIR QUALITY PROGRAM

October 5, 2021

SUBJECT: **Allegheny Energy Center (AEC)**
2130 Margaret St. Ext.
West Newton, PA, 15089
Allegheny County

Installation Permit No. 0959-I001

TO: JoAnn Truchan, P.E.
Chief Engineer

FROM: Bernadette Lipari
Air Quality Engineer

FACILITY DESCRIPTION:

Invenergy plans to construct, own, and operate the Allegheny Energy Center (AEC), a 639 megawatt (MW), natural gas-fired combined-cycle power plant Elizabeth Township, Allegheny County. AEC will consist of a one-on-one (1×1), nominal 639 MW power plant that will include one combustion turbine (CT), one heat recovery steam generator (HRSG) with supplemental duct firing, and one steam turbine (ST). The proposed General Electric (GE) model (7HA.03) CT will fire clean low sulfur pipeline-quality natural gas. In addition to the CT and associated pieces of equipment, one auxiliary boiler, one dew point heater, one emergency generator, one fire water pump, and three above-ground storage tanks (AST) including a 20,000-gallon aqueous ammonia storage tank will be included as part of the facility.

The facility is a major source of nitrogen oxides (NO_X), carbon monoxide (CO), and volatile organic compounds (VOCs) emissions and a minor source of particulate matter, particulate matter < 10 microns in diameter (PM_{10}), particulate matter < 2.5 microns in diameter ($PM_{2.5}$), sulfur dioxide (SO_2), and hazardous air pollutants (HAPs) as defined in section 2101.20 of Article XXI and in 40 CFR Part 51 Subpart 165(a)(1)(iv)(A)(1).

INSTALLATION PERMIT DESCRIPTION

This permit is for the installation of a natural gas-fired combined-cycle power block in a 1×1 configuration with a combustion turbine (CT), a heat recovery steam generator (HRSG) with a supplementary duct burner (DB), and a steam turbine (ST). The CT and the ST will have separate electric generators. Other components include an emergency generator, a fire water pump, an auxiliary boiler, a dew point heater, and four above-ground storage tanks. The principal product of this facility will be electricity.

PERMIT APPLICATION COMPONENTS:

1. Installation Permit application #0959-I001, dated March 20, 2019
2. "Modeling Review of Invenergy LLC (Invenergy) Proposed Natural Gas Combined-Cycle Power Plant Installation Permit" (S. Vozar, ACHD Planning & Analysis Section)
3. Correspondence, dated January 9, 2019 (Questions from 1/4/19 Meeting)
4. Correspondence, dated February 12, 2019 (Invenergy Allegheny Energy Center Air Quality Modeling Protocol-Environmental Justice Areas)
5. Correspondence, dated April 11, 2019 (Emission Reduction Credits)
6. Correspondence, dated April 12, 2019 (NNSR Threshold for Modeling-NNSR for $PM_{2.5}$)
7. Correspondence, dated May 21, 2019 (Request for Applicability of Class I Area AQRV Modeling Analysis)
8. Correspondence, dated May 22, 2019 (Invenergy Modeling Final Review)
9. Correspondence, dated July 26, 2019 (CT and HRSG Specifications)
10. Correspondence, dated July 29, 2019 (Sulfuric Acid Emissions)
11. Correspondence, dated August 6, 2019 (Storage Tank Specifications and Project PM Emissions)

12. Correspondence, dated August 20, 2019 (Combined Cycle Power Block Emissions)
13. Correspondence, dated September 9, 2019 (Emergency Generator)
14. Correspondence, dated October 2, 2020 (Engine and Boiler Specifications)

EMISSION SOURCES:

Table 1: Emissions Sources

I.D.	SOURCE DESCRIPTION	CONTROL DEVICE(S)	MAXIMUM CAPACITY	FUEL/RAW MATERIAL	STACK I.D.
Combined Cycle Power Block					
CT01	General Electric 7HA.03 Combustion Turbine	Dry Low NO_X burner, SCR, Oxidation Catalyst	3,844 MMBtu/hr (626 MW)	Natural Gas	S001
	Heat Recovery Steam Generator with Duct Burner		394 MMBtu/hr		
	Steam Turbine		--		
Ancillary Equipment					
EG01	MTU 16V4000 DS 2000 (or similar) Emergency Generator	None	2,000 kWe	Ultra-Low Sulfur Diesel	S002
WP01	JU6H-UFAD98 282 HP (or similar) Fire Water Pump	None	1.9 MMBtu/hr	Ultra-Low Sulfur Diesel	S003
B001	Custom Built Auxiliary Boiler	Ultra-Low NO_X burner, Flue Gas Recirculation	88.7 MMBtu/hr	Natural Gas	S004
H001	Dew Point Heater	None	3.0 MMBtu/hr	Natural Gas	S005
T001	Aqueous Ammonia Storage Tank	None	20,000 gallons	Aqueous Ammonia	--
T002	Lubricating Oil Storage Tank	None	11,250 gallons	Lubricating Oil	--
T003	Emergency Generator Diesel Storage Tank	None	3,500 gallons	Ultra-Low Sulfur Diesel	--
T004	Fire Water Pump Diesel Storage Tank	None	500 gallons	Ultra-Low Sulfur Diesel	--
--	Circuit Breakers	None	1,473 pounds	Sulfur Hexafluoride	--

STACKS:

Table 2: Stacks

Stack ID	Stack Height (ft)	Stack Diameter (ft)	Exhaust Rate (acfm)	Exhaust Temp. (°F)	Lining/Outer Material
S001	180	22	1,710,000	155	pre-manufactured stainless steel
S002	15	1.5	16,100	896	pre-manufactured stainless steel
S003	12.5	0.5	1,400	961	pre-manufactured stainless steel
S004	35	4	22,964	270	pre-manufactured stainless steel
S005	25	1.5	2,208	660	pre-manufactured stainless steel

METHOD OF DEMONSTRATING COMPLIANCE:

Methods of demonstrating compliance with the emission standards set in this permit are summarized in Table 3 below. See operating permit No. 0959-I001 for the specific conditions for determining compliance with the applicable requirements. Compliance with the short-term (lb/hr) limits must be maintained at all times, including startup and shutdown unless explicitly stated otherwise in the permit. Any emissions due to startup and/or shutdown are included in facility's total annual emissions.

Table 3: Method(s) of Demonstrating Compliance

TVOP Section	Process	Method(s) of Demonstrating Compliance
V.A.	639 MW Combined Cycle Power Block	• annual performance tests for NO_X emissions • install and certify a NO_X-diluent CEMS • NO_X and O_2 shall be determined by the certified CEMs at the outlet stack • perform PM, PM_{10}, $PM_{2.5}$, NO_X, SO_2, CO, NH_3, and VOC emissions testing on the combustion turbine and HRSG stack • monitor the selective catalytic reduction (SCR) system and oxidation catalyst • operate and maintain continuous nitrogen oxides monitoring systems and other monitoring systems to convert data to required reporting units in compliance with 25 PA Code §§139.101 - 139.111 relating to requirements for continuous in-stack monitoring • operate and maintain continuous carbon monoxide monitoring systems and other monitoring systems to convert data to required reporting units in compliance with 25 PA Code §§139.101 - 139.111 and the PADEP's "Continuous Source Monitoring Manual." • continuously monitor the oxygen content of the flue gas of the combustion turbine and HRSG • monitor the total sulfur content of the fuel being fired in the turbines • keep and maintain records of operation, maintenance, inspections, fuel usage, steam load, and SU/SD events for the combustion turbine and HRSG • maintain records of all air pollution control system performance evaluations and all records of calibration checks, adjustments, and maintenance performed on all equipment • keep a record of the date, time, and cause of the malfunction of all air pollution control systems, and the action taken to correct the malfunction • record start-up and shutdown of each combustion turbine including date, time and duration of each event
V.B.	Emergency Generator (EG01)	• keep and maintain records of operation, maintenance, inspections, and the manufacturer's certification of the emission standards for the generator • Records of diesel fuel certifications from fuel suppliers shall be maintained per shipment • keep and maintain records of hours of operation and fuel shipments
V.C.	Auxiliary Boiler (B001)	• perform nitrogen oxides emissions testing on the Auxiliary Boiler at least once every five years in order to demonstrate compliance with the emission limitations • keep and maintain records of the amount of natural gas combusted, cold starts, total operating hours, and records of operation, maintenance, inspection, calibration, and/or replacement of equipment

TVOP Section	Process	Method(s) of Demonstrating Compliance
V.D.	Dew Point Heater (H001)	• keep and maintain record of fuel consumption and records of operation, maintenance, inspection, calibration and/or replacement of combustion equipment
V.E.	Aqueous Ammonium Storage Tank (T001)	• Monthly inspection • keep and maintain monthly throughput, and concentration of the aqueous ammonia stored, and records of each inspection performed
V.F.	Lubricating Oil Storage Tank (T002)	• Perform routine inspections on the tank annually • keep readily accessible records showing the dimension of the diesel fuel storage tanks and an analysis showing its capacity • records of throughput
VI.A.	Fire Water Pump (WP01)	• Use only ULSD fuel • install a non-resettable hour meter • keep and maintain records of operation
VI.B.	Diesel Storage Tanks (T003 &T004)	• perform routine inspections on the diesel fuel storage tanks annually • keep readily accessible records showing the dimension of the diesel fuel storage tanks and an analysis showing its capacity

EMISSION CALCULATIONS:

639 Megawatt Combined Cycle Power Block

Unit:	Combined cycle power block (CT, HRSG with DB, and ST)
I.D.(s):	CT01
Make:	General Electric
Model	7HA.03
Fuel:	Pipeline quality natural gas only
Rating:	639 MW - 3,884 x 10^6 Btu/hr HHV nominal CT; 394 x 10^6 Btu/hr HHV DB
Exhaust:	Heat recovery steam generator with duct burner
Controls:	Dry Low-NO_X burners with SCR and oxidation catalyst
Instrumentation:	CEMs for fuel flow, exhaust gas flow, nitrogen oxides, oxygen and carbon monoxide

The short-term (hourly) emission rates for the combustion turbine were measured at 15% O_2 dry basis, at standard conditions, and are the manufacturer's short-term emission rates for the worst operation case scenario tested, Case 15 (in the permit application). Based on manufacturer's data, only emissions of NO_X, CO, and VOC are higher during startup and shutdown (SU/SD) events. Emissions of other regulated NSR pollutants are equivalent to steady-state emissions during SU/SD. Annual emissions from the combustion turbine for NO_X, CO, and VOC were calculated using the manufacturer's short-term emission rates for the average operation case scenario tested, Case 1, and 8,200 hours of steady-state operation. The SU/SD emissions were then added to the calculated annual emission rates for NO_X, CO, and VOC. The number of SU/SD events is assumed to be 365 events/year. Hot starts last 20 minutes and shutdowns last 12 minutes with a total SU/SD time lasting one hour. SU/SD time was subtracted from the total number of annual hours to arrive at the number of annual steady-state hours. Emission calculations for the remaining NSR pollutants are based on 8,760 hours of steady-state operation and on emission factors for the average operation case scenario tested, Case 1. Emission calculations for HAPs are based on 8,760 hours of steady-state operation and on emission factors found in U.S. EPA AP-42 Section 3.1: *Stationary Gas Turbines*. The following table summarizes the permitted limits:

Table 4: Combined Cycle Power Block Emission Limits

Pollutant	ppm vd [1,3]	SU/SD Emission Rates (lbs/event)	Maximum Hourly Emission Limit (lb/hr)	Average Hourly Emission Limit (lb/hr)	Annual Emission Limit (tons/year) [2]
Particulate Matter (Filterable)	--	--	10.55	10.08	44.15
PM_{10}	--	--	21.11	20.16	88.30
$PM_{2.5}$	--	--	21.11	20.16	88.30
Nitrogen Oxides	2.0	90/14	30.90	30.00	141.99
Sulfur Oxides	--	--	5.60	5.40	23.65
Carbon Monoxide	2.0	390/85	18.80	18.30	161.72
Volatile Organic Compounds	1.5	205/125	8.10	7.88	92.51
Sulfuric Acid Mist	--	--	4.00	3.90	17.08
Ammonia	4.0	--	22.90	22.24	97.41
Total HAP	--	--	2.39	--	10.45
Benzene	--	--	0.047	--	0.21
Ethylbenzene	--	--	0.123	--	0.54
Formaldehyde	0.091	--	1.17	--	5.12
Toluene	--	--	0.50	--	2.19
Xylenes	--	--	0.246	--	1.08
Lead	--	--	1.88×10^{-4}	--	8.22×10^{-4}

[1] @15% O_2 during any three-hour time period at or above 70% of full load for NO_X and any one-hour time at or above 70% of full load for CO.
[2] A year is defined as any consecutive 12-month period. Annual emissions include emissions during startup and shutdown. Maximum operating hours for the turbine are 8,200 hours per year.
[3] Based on a rolling 3-hour average

<u>Example Calculation:</u>
Steady-State (Average Scenario, Case 1):
NO_X = 30.00 lb/hr × 8,200.3 hr/yr ÷ 2,000 lb/ton = **123.01 tons NO_X/yr**
SU/SD:
[90 lbs/event NO_X × 365 events/yr ÷ 2,000 lb/ton] + [14 lbs/event NO_X × 365 events/yr ÷ 2,000 lb/ton] =
18.98 tons NO_X /yr

NO_X = 123.01 tons $_{NOx}$ /yr + 18.98 tons $_{NOx}$ /yr = 141.99 tons/yr

<u>GHG Mass and CO_2e Emissions:</u>
Calculations of greenhouse gases (GHG) and CO_2-equivalent (CO_2e) emissions are based on performance emissions/specifications from different operation case scenarios for the combustion turbine. The CO_2 emission factor, 439,000 lb/hr, was the average of all the tested operation scenarios (Case 1). The emissions factors for N_2O and CH_4 are found in 40 CFR Part 98, Subpart C, §98.33(a)(1), Table C-2 and have been converted to lb/MMBtu. The maximum annual fuel consumption of the combustion turbine with the duct burner derived from the tested operation scenarios (Case 1 at 8,760 hours) is 36,079,812 MMBtu/yr.

CO_2: 439,000 lb/hr × 8,760 hr/yr ÷ 2,000 lb/ton = 1,922,820 tons/year
N_2O: 36,079,812 MMBtu/yr × 2.2×10^{-4} lb/MMBtu ÷ 2,000 lb/ton = 4 tons/year
CH_4: 36,079,812 MMBtu/yr × 2.2×10^{-3} lb/MMBtu ÷ 2,000 lb/ton = 40 tons/year

Global Warming Potential (GWP) Factors (from Part 98, Subpart A, Table A-1):

CO_2 = 1
N_2O = 298
CH_4 = 25

CO_2e = (1,922,820 × 1) + (4 × 298) + (40 × 25) = **1,924,999 tons/year of CO_2e**

Note: Number is not exact due to rounding.

Emergency Generator

Generator Rating:	2,000 kW
Fuel Use (100%):	147.3 gal/hr
Brake Horsepower:	3,058 bhp
Fuel Oil Density:	7.39 lb/gal
Fuel Oil Sulfur Limit:	0.0015%
Operation:	100 hrs/yr

Calculations of emissions of PM, NO_X, SO_2, CO, VOC, and Pb from the generator are based on emission factors found in 40 CFR Part 89 Subpart B, Table 1 and U.S. EPA AP-42 Section 3.4: *Large Stationary Diesel and All Stationary Dual-fuel Engines* and Section 1.3: *Fuel Oil Combustion*.

Table 5: Emergency Generator Emission Limits

Pollutant	Emission Factor	Reference	Emission Limit (lb/hr)	Annual Emission Limit (tons/year) [1]
Particulate Matter (Filterable)	0.149 g/bhp-hr [2]	40 CFR §89.112, Table 1	1.01	0.050
PM_{10}	0.173 g/bhp-hr [2]	AP-42 Table 3.4-2	1.17	0.058
$PM_{2.5}$	0.173 g/bhp-hr [2]	AP-42 Table 3.4-2	1.17	0.058
Nitrogen Oxides	4.53 g/bhp-hr [3]	40 CFR §89.112, Table 1	30.56	1.528
Sulfur Oxides	5.50×10^{-3} g/bhp-hr [4]	AP-42, Table 3.4-1	0.04	0.002
Carbon Monoxide	2.61 g/bhp-hr [3]	40 CFR §89.112, Table 1	17.59	0.880
Volatile Organic Compounds	0.239 g/bhp-hr [3]	40 CFR §89.112, Table 1	1.61	0.080
Sulfuric Acid Mist	6.74×10^{-4} g/bhp-hr	(5)	4.55×10^{-3}	2.27×10^{-4}
Ammonia	6.62 lb/1,000 gal	(6)	0.99	0.049
Lead	9.0×10^{-6} lb/MMBtu	AP-42 Table 1.3-10	1.88×10^{-4}	9.39×10^{-6}

[1] A year is defined as any consecutive 12-month period.

[2] It is assumed that $PM_{10} = PM_{2.5}$. PM_{10} and $PM_{2.5}$ emissions factors account for both the filterable and condensable portions of PM. The filterable portion of PM_{10} and $PM_{2.5}$ was obtained through vendor supplied information. The condensable portion of PM_{10} and $PM_{2.5}$ was obtained from AP-42 Chapter 3.4 Table 3.4-2 (10/96).

[3] 40 CFR §89.112, Table 1. E.F. in g/kW-hr x 0.7457 to g/bhp/hr. Published emissions factor is for NO_X+NMHC. NO_X emissions are assumed to be 95% of this factor and VOC emissions are 5% based "CARB Emission Factor for CI Diesel Engines - Percent HC in Relation to NMHC + NO_X" policy.

[4] Diesel fuel content = 0.0015% (15 ppm).

[5] H_2SO_4 emissions factor conservatively calculated based on 10% conversion of SO_2 to SO_3 and 100% conversion of SO_3 to H_2SO_4.

[6] EPA Emission Inventory Improvement Program, "Estimating Ammonia Emissions from Anthropogenic Nonagricultural Sources - Draft Final Report", April 2004.

Example Calculation:
VOC = 3,058 bhp × 0.239 g/bhp-hr ÷ 453.6 g/lb = 1.61 lb $_{VOC}$/hr
1.61 lb $_{VOC}$/hr × 100 hrs/yr ÷ 2,000 lb/ton = **0.080 tons VOC/yr**

GHG Mass and CO_2e Emissions:
Calculations of greenhouse gases (GHG) and CO_2-equivalent (CO_2e) emissions are based on the methodology found in 40 CFR Part 98, Subpart C, §98.33(a)(1), and factors found in Table C-1 and Table C-2 of that subpart. Per §98.30(b)(2), stationary fuel combustion sources do not include emergency generators and emergency equipment and was thus not included in the overall GHG calculation.

Total rated heat input capacity of the emergency generator = 20.87 MMBtu/hr × 100 hr/yr = 2,087 MMBtu/yr
Emission Factors: CO_2 = 73.96 kg/MMBtu × 2.2046 lb/kg = 163.05 lb/MMBtu
N_2O = 6×10^{-4} kg/MMBtu × 2.2046 lb/kg = 1.32×10^{-3} lb/MMBtu
CH_4 = 3×10^{-3} kg/MMBtu × 2.2046 lb/kg = 6.61×10^{-3} lb/MMBtu

CO_2: 2,087 MMBtu/yr × 163.05 lb/MMBtu ÷ 2,000 lb/ton = 170 tons/year
N_2O: 2,087 MMBtu/yr × 1.32×10^{-3} lb/MMBtu ÷ 2,000 lb/ton = 1.38×10^{-3} tons/year
CH_4: 2,087 MMBtu/yr × 6.61×10^{-3} lb/MMBtu ÷ 2,000 lb/ton = 6.90×10^{-3} tons/year

Global Warming Potential (GWP) Factors (from Part 98, Subpart A, Table A-1):
CO_2 = 1
N_2O = 298
CH_4 = 25

CO_2e = (170 × 1) + (1.38×10^{-3} × 298) + (6.90×10^{-3} × 25) = **171 tons/year of CO_2e**
Note: Number is not exact due to rounding.

Fire Water Pump

Brake Horsepower:	282 bhp
Fuel Use (100%):	13.7 gal/hr
Fuel Oil Density:	7.39 lb/gal
Fuel Oil Sulfur Limit:	0.0015%
Operation:	100 hrs/yr

Calculations of emissions of PM, NO_X, SO_2, CO, VOC, and Pb from the fire water pump are based on emission factors found in 40 CFR Part 60 Subpart IIII, Table 4 and U.S. EPA AP-42 Sections 3.3: *Gasoline And Diesel Industrial Engines* and Section 1.3: *Fuel Oil Combustion*.

Table 6: Fire Water Pump Emission Limits

Pollutant	Emission Factor	Reference	Emission Limit (lb/hr)	Annual Emission Limit (tons/year) [1]
Particulate Matter (Filterable)	0.150 g/bhp-hr [2]	40 CFR §60.4205(c), Table 4	0.093	0.0047
PM_{10}	0.174 g/bhp-hr	(2)	0.108	0.0054
$PM_{2.5}$	0.174 g/bhp-hr	(2)	0.108	0.0054
Nitrogen Oxides	2.85 g/bhp-hr [3]	40 CFR §60.4205(c), Table 4	1.772	0.0886
Sulfur Oxides	0.93 g/bhp-hr [4]	AP-42, Table 3.3-1	0.578	0.0289
Carbon Monoxide	2.60 g/bhp-hr [3]	40 CFR §60.4205(c), Table 4	1.616	0.0808

Pollutant	Emission Factor	Reference	Emission Limit (lb/hr)	Annual Emission Limit (tons/year) [1]
Volatile Organic Compounds	0.150 g/bhp-hr [3]	40 CFR §60.4205(c), Table 4	0.093	0.0047
Sulfuric Acid Mist	0.114 g/bhp-hr	(5)	7.08×10^{-2}	0.0035
Ammonia	6.62 lb/1,000 gal	(6)	0.0925	0.0046
Lead	9.0×10^{-6} lb/MMBtu	AP-42 Table 1.3-10	1.75×10^{-5}	8.73×10^{-7}

[1] A year is defined as any consecutive 12-month period.
[2] It is assumed that $PM_{10} = PM_{2.5}$. PM_{10} and $PM_{2.5}$ emissions factors account for both the filterable and condensable portions of PM. The filterable portion of PM_{10} and $PM_{2.5}$ was obtained through vendor supplied information. The condensable portion of PM_{10} and $PM_{2.5}$ was obtained from AP-42 Chapter 3.4 Table 3.4-2 (10/96).
[3] 40 CFR §60.4205(c), Table 4. Published emissions factor is for NO_X+NMHC. NO_X emissions are assumed to be 95% of this factor and VOC emissions are 5% based "CARB Emission Factor for CI Diesel Engines - Percent HC in Relation to NMHC + NO_X" policy.
[4] Diesel fuel content = 0.0015% (15 ppm).
[5] H_2SO_4 emissions factor conservatively calculated based on 10% conversion of SO_2 to SO_3 and 100% conversion of SO_3 to H_2SO_4.
[6] EPA Emission Inventory Improvement Program, "Estimating Ammonia Emissions from Anthropogenic Nonagricultural Sources - Draft Final Report", April 2004.

<u>Example Calculation:</u>
SO_2 = 282 bhp × 0.93 g/bhp-hr ÷ 453.6 g/lb = 0.578 lb SO_2/hr
0.578 lb SO_2/hr × 100 hrs/yr ÷ 2,000 lb/ton = **0.0289 tons SO_2/yr**

<u>GHG Mass and CO_2e Emissions:</u>
Calculations of greenhouse gases (GHG) and CO_2-equivalent (CO_2e) emissions are based on the methodology found in 40 CFR Part 98, Subpart C, §98.33(a)(1), and factors found in Table C-1 and Table C-2 of that subpart.

Total rated heat input capacity of the fire water pump = 1.94 MMBtu/hr × 100 hr/yr = 194 MMBtu/yr
Emission Factors: CO_2 = 73.96 kg/MMBtu × 2.2046 lb/kg = 163.05 lb/MMBtu
N_2O = 6×10^{-4} kg/MMBtu × 2.2046 lb/kg = 1.32×10^{-3} lb/MMBtu
CH_4 = 3×10^{-3} kg/MMBtu × 2.2046 lb/kg = 6.61×10^{-3} lb/MMBtu

CO_2: 194 MMBtu/yr × 163.05 lb/MMBtu ÷ 2,000 lb/ton = 16 tons/year
N_2O: 194 MMBtu/yr × 1.32×10^{-3} lb/MMBtu ÷ 2,000 lb/ton = 1.28×10^{-4} tons/year
CH_4: 194 MMBtu/yr × 6.61×10^{-3} lb/MMBtu ÷ 2,000 lb/ton = 6.42×10^{-4} tons/year

Global Warming Potential (GWP) Factors (from Part 98, Subpart A, Table A-1):
CO_2 = 1
N_2O = 298
CH_4 = 25

CO_2e = (16 × 1) + (1.28×10^{-4} × 298) + (6.42×10^{-4} × 25) = **16 tons/year of CO_2e**
Note: Number is not exact due to rounding.

<u>Fuel Oil No. 2 Storage Tanks</u>
Emissions from the emergency generator and the fire pump engine ultra-low sulfur diesel storage tanks were estimated using U.S. EPA AP-42 Sections 7.1: *Organic Liquid Storage Tanks* for each tank. See the calculations spreadsheet Appendix A for a complete breakdown for each tank.

Table 7: Fuel Oil No. 2 Storage Tanks Emissions Limits

Pollutant	Annual Emission Limit (tons/year)
Volatile Organic Compounds	0.0056

Aqueous Ammonia Storage Tank

Emissions from the aqueous ammonia storage tank are considered insignificant.

Lubricating Oil Storage Tank

Emissions from the lubricating oil storage tank was estimated using U.S. EPA AP-42 Sections 7.1: *Organic Liquid Storage Tanks* for each tank. See the calculations spreadsheet Appendix A for a complete breakdown for the tank.

Table 8: Lubricating Oil Storage Tank Emission Limits

Pollutant	Annual Emission Limit (tons/year)
Volatile Organic Compounds	0.02

Fugitive Emissions

Fugitive greenhouse gas emissions were based on 40 CFR Part 98, Subpart W emission factors for fugitive piping and 40 CFR Part 98, Subpart A emission factors for natural gas pipe maintenance and for the circuit breakers, pumping rates (where applicable), and throughput factors to account for actual usage times. See the calculations spreadsheet Appendix A for a complete table of components, pumping rates, throughput factors, and individual emission rates.

Auxiliary Boiler

Heating rate:	88.7 MMBtu/hr
Natural gas heating value:	1,050 Btu/scf
Operation:	4,000 hrs/yr

Emission calculations for PM and Pb were based on emission factors found in U.S. EPA AP-42 Section 1.4: *Natural Gas Combustion (7/98)*; NO_X, CO, and VOC emissions were based on manufacturer's data. SO_2 emissions were calculated using a 0.4 gr/100 scf BACT equivalent.

Table 9: Boiler Emission Limits

Pollutant	Emission Factor	Reference	Emission Limit (lb/hr)	Annual Emission Limit (tons/year) [1]
Particulate Matter (filterable)	1.81×10^{-3} lb/MMBtu	AP-42, Table 1.4-2 (7/98)	0.161	0.321
PM_{10}	1.49×10^{-3} lb/MMBtu	U.S. EPA's Emission Inventory and Analysis Group guidance 3/30/2012 with 3x safety factor	0.132	0.264
$PM_{2.5}$	1.23×10^{-3} lb/MMBtu		0.109	0.218
Nitrogen Oxides	0.011 lb/MMBtu	Mfg. data	0.976	1.951
Sulfur Oxides	1.09×10^{-3} lb/MMBtu	(2)	0.097	0.193

Pollutant	Emission Factor	Reference	Emission Limit (lb/hr)	Annual Emission Limit (tons/year) [1]
Carbon Monoxide	0.041 lb/MMBtu	Mfg. data	3.637	7.273
Volatile Organic Compounds	0.004 lb/MMBtu	Mfg. data	0.355	0.710
Sulfuric Acid Mist	1.33×10^{-4} lb/MMBtu	(3)	0.012	0.024
Ammonia	3.20 lb/MMscf	(4)	0.270	0.541
Lead	5.0×10^{-4} lb/MMscf	AP-42, Table 1.4-2 (7/98)	4.22×10^{-5}	8.44×10^{-5}

[1] A year is defined as any consecutive 12-month period.
[2] SO_2 emissions factor is calculated based on a 0.4 gr/100 scf sulfur content of natural gas (BACT equivalent from the RACT/BACT/LAER Clearinghouse) and converted to lb/MMBtu.
[3] H_2SO_4 emissions factor conservatively calculated based on 10% conversion of SO_2 to SO_3 and 100% conversion of SO_3 to H_2SO_4.
[4] EPA Emission Inventory Improvement Program, "Estimating Ammonia Emissions from Anthropogenic Nonagricultural Sources - Draft Final Report", April 2004.

<u>Example Calculation:</u>
CO = 88.7 MMBtu/hr × 0.041 lb/MMBtu = 3.64 lb CO/hr
3.64 lb CO/hr × 4,000 hrs/yr ÷ 2,000 lb/ton = **7.27 tons CO/yr**

<u>GHG Mass and CO2e Emissions:</u>
Calculations of greenhouse gases (GHG) and CO_2-equivalent (CO_2e) emissions are based on the methodology found in 40 CFR Part 98, Subpart C, §98.33(a)(1), and factors found in Table C-1 and Table C-2 of that subpart.

Total rated heat input capacity of the auxiliary boiler = 88.7 MMBtu/hr × 4,000 hr/yr = 354,800 MMBtu/yr
Emission Factors: CO_2 = 53.06 kg/MMBtu × 2.2046 lb/kg = 116.98 lb/MMBtu
$N_2O = 1\times10^{-4}$ kg/MMBtu × 2.2046 lb/kg = 2.2×10^{-4} lb/MMBtu
$CH_4 = 1\times10^{-3}$ kg/MMBtu × 2.2046 lb/kg = 2.2×10^{-3} lb/MMBtu

CO_2: 354,800 MMBtu/yr × 116.98 lb/MMBtu ÷ 2,000 lb/ton = 20,752 tons/year
N_2O: 354,800 MMBtu/yr × 2.2×10^{-4} lb/MMBtu ÷ 2,000 lb/ton = 0.04 tons/year
CH_4: 354,800 MMBtu/yr × 2.2×10^{-3} lb/MMBtu ÷ 2,000 lb/ton = 0.39 tons/year

Global Warming Potential (GWP) Factors (from Part 98, Subpart A, Table A-1):
CO_2 = 1
N_2O = 298
CH_4 = 25

CO_2e = (20,752 × 1) + (0.04 × 298) + (0.39 × 25) = **20,773 tons/year of CO_2e**
Note: Number is not exact due to rounding.

<u>Dew Point Heater</u>
Heating rate: 3.0 MMBtu/hr
Natural gas heating value: 1,050 Btu/scf
Operation: 8,760 hrs/yr

Emission calculations for Pb were based on emission factors found in U.S. EPA AP-42 Section 1.4: *Natural Gas Combustion (7/98)*; PM, NO_X, CO, and VOC emissions were based on manufacturer's data. SO_2 emissions were calculated using a 0.4 gr/100 scf BACT equivalent.

Table 10: Dew Point Heater Emission Limits

Pollutant	Emission Factor	Reference	Emission Limit (lb/hr)	Annual Emission Limit (tons/year) [1]
Particulate Matter	4.80×10^{-3} lb/MMBtu	Mfg. data	0.014	0.063
PM_{10}	1.49×10^{-3} lb/MMBtu	U.S. EPA's Emission Inventory and Analysis Group guidance 3/30/2012 with 3x safety factor	4.46×10^{-3}	0.020
$PM_{2.5}$	1.23×10^{-3} lb/MMBtu		3.69×10^{-3}	0.016
Nitrogen Oxides	0.011 lb/MMBtu	Mfg. data	0.033	0.145
Sulfur Oxides	1.09×10^{-3} lb/MMBtu	(2)	0.003	0.014
Carbon Monoxide	0.037 lb/MMBtu	Mfg. data	0.111	0.486
Volatile Organic Compounds	0.005 lb/MMBtu	Mfg. data	0.015	0.066
Sulfuric Acid Mist	1.33×10^{-4} lb/MMBtu	(3)	4.0×10^{-4}	0.002
Ammonia	3.20 lb/MMscf	(4)	0.009	0.040
Lead	5.0×10^{-4} lb/MMscf	AP-42, Table 1.4-2 (7/98)	1.43×10^{-6}	6.26×10^{-6}

[1] A year is defined as any consecutive 12-month period.
[2] SO_2 emissions factor is calculated based on a 0.4 gr/100 scf sulfur content of natural gas (BACT equivalent from the RACT/BACT/ LAER Clearinghouse) and converted to lb/MMBtu.
[3] H_2SO_4 emissions factor conservatively calculated based on 10% conversion of SO_2 to SO_3 and 100% conversion of SO_3 to H_2SO_4.
[4] EPA Emission Inventory Improvement Program, "Estimating Ammonia Emissions from Anthropogenic Nonagricultural Sources - Draft Final Report", April 2004.

Example Calculation:
VOC = 3.0 MMBtu/hr × 0.005 lb/MMBtu = 0.015 lb VOC/hr
0.015 lb VOC/hr × 8,760 hrs/yr ÷ 2,000 lb/ton = **0.066 tons VOC/yr**

GHG Mass and CO_2e Emissions:
Calculations of greenhouse gases (GHG) and CO_2-equivalent (CO_2e) emissions are based on the methodology found in 40 CFR Part 98, Subpart C, §98.33(a)(1), and factors found in Table C-1 and Table C-2 of that subpart.

Total rated heat input capacity of the dew point heater = 3.0 MMBtu/hr × 8,760 hr/yr = 26,280 MMBtu/yr
Emission Factors: CO_2 = 53.06 kg/MMBtu × 2.2046 lb/kg = 116.98 lb/MMBtu
N_2O = 1×10^{-4} kg/MMBtu × 2.2046 lb/kg = 2.2×10^{-4} lb/MMBtu
CH_4 = 1×10^{-3} kg/MMBtu × 2.2046 lb/kg = 2.2×10^{-3} lb/MMBtu

CO_2: 26,280 MMBtu/yr × 116.98 lb/MMBtu ÷ 2,000 lb/ton = 1,537 tons/year
N_2O: 26,280 MMBtu/yr × 2.2×10^{-4} lb/MMBtu ÷ 2,000 lb/ton = 2.9×10^{-3} tons/year
CH_4: 26,280 MMBtu/yr × 2.2×10^{-3} lb/MMBtu ÷ 2,000 lb/ton = 0.03 tons/year

Global Warming Potential (GWP) Factors (from Part 98, Subpart A, Table A-1):
CO_2 = 1
N_2O = 298
CH_4 = 25

CO_2e = (1,537 × 1) + (2.9×10^{-3} × 298) + (0.03 × 25) = **1,539 tons/year of CO_2e**
Note: Number is not exact due to rounding.

Sources of Minor Significance/Miscellaneous Sources

Table 11 lists sources determined to be of minor significance.

Table 11: Sources of Minor Significance/Miscellaneous Sources

ID	SOURCE DESCRIPTION	CONTROL DEVICE(S)	MAXIMUM CAPACITY	FUEL/RAW MATERIAL	STACK ID
WP01	JU6H-UFAD98 282 HP Water Pump	Tier 3	282 bhp/1.9 MMBtu/hr	Ultra-Low Sulfur Diesel	S04
T003	Emergency Generator Diesel Storage Tank	Uncontrolled	3,500 gallons	Diesel	--
T004	Fire Water Pump Diesel Storage Tank	Uncontrolled	500 gallons	Diesel	--
--	Natural Gas Piping Fugitives	Uncontrolled	--	Natural Gas	--
--	Natural Gas Maintenance + SU/SD Venting	Uncontrolled	--	Natural Gas	--
--	SF6 Circuit Breakers	Uncontrolled	1,474 lb/yr	Sulfur Hexafluoride	--

APPLICABILITYANALYSIS FOR NONATTAINMENT NEW SOURCE REVIEW (NSR)

Because the AEC is a new source and a major source under Title V, Nonattainment New Source Review (NSR) applies. The regulations for NSR can be found under 25 Pa. Code §127.203a (as referenced under Article XXI, §2102.06.a), and apply to pollutants for which Allegheny County is designated as being in nonattainment. These include ozone (NO_X and VOC) and $PM_{2.5}$. With respect to ozone precursors, the Project is a major source for NO_X and VOC. Therefore, the facility's potential project-related emissions of NO_X and VOC will trigger major source NSR requirements as precursor emissions to O_3, and NO_X emissions will trigger NSR requirements as precursor emissions to $PM_{2.5}$. Project SO_2 and direct $PM_{2.5}$ emissions do not exceed the major NSR thresholds, therefore NSR is not triggered for SO_2 or $PM_{2.5}$.

The applicability analysis for NSR is a two-step process. Step 1 is to calculate the emissions increases only and determine if they exceed the significant increase threshold. Step 2 is to calculate the net emissions increase (project increases + contemporaneous increases – contemporaneous decreases) and determine if they exceed the significant increase threshold. No netting analysis is necessary, in this case, because the facility is a new major source.

NSR Step 1 – Increases Due to Project

Step 1 is to calculate the emissions increase due to the project and compare to the NSR significant increase threshold values. Different calculation methodologies are used for existing and new units. Since the facility is a new source, all units are new emission units under 40 CFR §52.21(b)(7)(i) and 25 PA Code §121.1.

Under §127.203a(a)(1)(i)(B), the emissions increase for new emission units (i.e., the combustion turbine, HRSG, and all ancillary equipment) is the potential to emit.

Table 12: Nonattainment New Source Review Applicability

Pollutant	NO_X	VOC	SO_2	$PM_{2.5}$
Total Project Emissions (tpy)	145.70	93.40	23.89	88.60
NSR Major Source Threshold	100	50	100	100
Subject to NSR Review?	Yes	Yes	No	No

NSR Step 2 – Netting Analysis
No netting analysis is required since this is a new major source.

LAER Analysis
As shown in Table 12 above, the AEC proposed project potential emissions of NO_X and VOC exceed the NSR major source thresholds. Therefore, NSR requirements for NO_X and VOC are to install Lowest Achievable Emission Rate (LAER) and to purchase Emission Reduction Credits (ERCs). A complete LAER analysis can be found in Section 5 of the application. A summary of the LAER analysis can be found in Appendix B of this document.

LAER for this facility includes an SCR, dry low-NO_X combustors, and catalytic oxidation on the CT and HRSG, ultra-low NO_X burners and FGR on the Auxiliary Boiler, ultra-low sulfur diesel on the Emergency Generator and Fire Water Pump, and good engineering practice.

The following table provides a comparison of LAER limits with other facilities and was obtained from the PA Department of the Environmental Protection:

POLLUTANT	RENOVO ENERGY HOURLY EMISSION LIMIT With Duct Firing (lb/hr)	RENOVO ENERGY HOURLY EMISSION LIMIT Without Duct Firing (lb/hr)	LAKAWANNA ENERGY HOURLY EMISSION LIMIT With Duct Firing (lb/hr)	LAKAWANNA ENERGY HOURLY EMISSION LIMIT Without Duct Firing (lb/hr)	CPV FAIRVIEW HOURLY EMISSION LIMIT With Duct Firing (lb/hr)	CPV FAIRVIEW HOURLY EMISSION LIMIT Without Duct Firing (lb/hr)
PM	N/A	11.30	18.0	18.0	N/A	N/A
PM_{10}	N/A	11.30	18.0	18.0	N/A	N/A
$PM_{2.5}$	N/A	11.30	18.0	18.0	N/A	N/A
NO_X	N/A	26.30	29.0	24.1	26.63	26.63
SO_X	N/A	4.85	4.3	4.3	N/A	N/A
CO	N/A	16.00	15.6	14.6	N/A	N/A
VOC	N/A	4.58	8.0	4.2	N/A	N/A
H_2SO_4	N/A	3.42	3.4	3.4	N/A	N/A
Ammonia	N/A	25.52	26.7	26.7	N/A	N/A
Formaldehyde	N/A	0.47	N/A	N/A	N/A	N/A
CO_2e	N/A	N/A	N/A	N/A	N/A	N/A

The following table provides a comparison of startup and shutdown (SU/SD) limits with other facilities and was obtained from the PA Department of the Environmental Protection:

POLLUTANT	AEC-INVENERGY HOURLY EMISSION LIMIT (Hot SU/SD) (lb/hr per turbine) (639 MW)	LAKAWANNA ENERGY HOURLY EMISSION LIMIT (Hot SU/SD) (lb/hr per turbine) (500 MW)	CPV FAIRVIEW HOURLY EMISSION LIMIT (Hot SU/SD) (lb/hr per turbine) (510 MW)	TENASKA PA HOURLY EMISSION LIMIT (Hot SU/SD) (lb/hr per turbine) (450 MW)
NO_X	270/70	279.2/34.3	140.73/140.73	340/340
CO	1,170/425	770.8/732.9	N/A	N/A
VOC	615/625	94.6/360	N/A	N/A

The table above shows that the startup and shutdown (SU/SD) limits for the AEC-Invenergy facility are similar to other facilities although the other units are smaller.

Emission Reduction Credits
Per §127.205(4), the facility is required to purchase Emission Reduction Credits (ERCs) prior to commencement of operation of any sources at the facility to offset the total of the net increase in potential to emit.

Table 13: Emissions Reduction Credits

Pollutant	Total Project-Wide Emissions (tpy)	Offset Ratio	ERC Offsets (tons)
NO_X	146	1.15	168
VOC (stack emissions)	93		107
VOC (fugitive emissions)	2.95E-02	1.3	3.83E-02
		Total	**275**

Environmental Justice
According to Appendix A of the Pennsylvania Environmental Justice Public Participation Policy (Document ID #012-0501-002, April 24, 2004), Trigger Air Permits include new major sources of hazardous air pollutants or criteria pollutants. The location of the project is in Elizabeth Borough, Allegheny County, which is not considered an Environmental Justice area. However, the project impacts Smithdale, in Allegheny County, and West Newton and Sutersville, both in Westmoreland County. Therefore, this application is subject to the Enhanced Public Participation Policy. A public information session was held on July 11, 2019.

Analysis of Alternatives
In accordance with 25 Pa. Code § 127.205(5), an analysis shall be conducted of alternative sites, sizes, production processes, and environmental control techniques for the proposed facility, which demonstrates that the benefits of the proposed facility significantly outweigh the environmental and social costs imposed within this Commonwealth as a result of its location, construction or modification. A complete Alternatives Analysis can be found in Section 7 of the application. The analysis evaluated alternatives to the current project scope for the following five items:

- Physical location of the proposed project
- Size of the project
- Approach selected to generate electricity
- Type of emissions controls evaluated
- Economic, social, and environmental impacts

Since the emissions profile from the facility has been designed to be as minimally impacting as possible, locating the facility in Allegheny County will have minimal impact on the local air quality related to ozone, $PM_{2.5}$, and

SO_2. Air quality modeling and other analyses that have been conducted for the project also support a demonstration of minimal concentrations of ozone, $PM_{2.5}$, and SO_2 resulting from AEC emissions. Considering alternate project sites in place of the proposed site would not significantly improve the surrounding air quality since regional sources located outside of Allegheny County are likely contributors to existing ozone and $PM_{2.5}$ concentration levels.

APPLICABILITY ANALYSIS FOR PREVENTION OF SIGNIFICANT DETERIORATION (PSD)

Because the AEC is a new source and a major source under Title V, New Source Review Prevention of Significant Deterioration (PSD) applies. The regulations for PSD can be found under 40 CFR, §52.21 (as referenced under Article XXI, §2102.07.a), and apply to pollutants for which Allegheny County is designated as being in attainment or unclassified. These include NO_2, SO_X (as SO_2), CO, and CO_2e. Additionally, PSD applies only to those sources considered a major source under PSD. For this facility, the major source threshold is 100 tpy of any regulated NSR pollutant.

PSD permitting requirements for major sources as defined in 40 CFR 52.21(b)(1)(i)(a) are triggered because the facility's potential project-related emissions of NO_X and CO exceed the major source applicability threshold of 100 tons per year (tpy). Therefore, PSD significant emissions rates (SER) as defined in 40 CFR 52.21(b)(23) apply to emissions of sulfuric acid mist (H_2SO_4), CO, PM, PM_{10}, and NO_X (which is assessed as nitrogen dioxide (NO_2) for air quality modeling purposes). Additionally, potential emissions of greenhouse gases (CO_2e) are greater than 100,000 tpy, and therefore the project is also subject to PSD for CO_2e. Lead (Pb) emissions do not exceed the PSD SER, therefore, PSD is not triggered for Pb. Total HAPs emissions from the Project will not exceed 25 tpy and individual HAP emissions will not exceed 10 tpy. Therefore, the AEC Facility will not be a major stationary source of HAPs.

The applicability analysis for PSD is a two-step process. Step 1 is to calculate the emissions increases only and determine if they exceed the significant increase threshold. If the emissions in Step 1 exceed the significant increase threshold, Step 2 is to calculate the net emissions increase (project increases + contemporaneous increases – contemporaneous decreases) and determine if they exceed the significant increase threshold. No netting analysis is necessary because the facility is a new major source.

PSD Step 1 – Increases Due to Project

As in NSR Step 1, PSD Step 1 is to calculate the emissions increase due to the project and compare to the PSD significant increase threshold values. Since the facility is a new source, all units are new emission units and future allowable emissions for the new units are calculated using the PTE are compared to the SERs.

Under §52.21(b)(41)(ii)(*d*), the emissions increase for new emission units (i.e., the combustion turbine, HRSG, and all ancillary equipment) is the potential to emit.

Table 14: Prevention of Significant Deterioration Applicability

Pollutant	NO_X	CO	PM/PM_{10}	H_2SO_4	Pb	CO_2e
Total Project Emissions (tpy)	145.70	170.44	44.59/88.65	17.11	9.23×10^{-4}	1,948,493
PSD Significant Emissions Threshold	40	100	25/15	7	0.6	75,000
Subject to PSD Review?	Yes	Yes	Yes	Yes	No	Yes

PSD Step 2 – Netting Analysis

No netting analysis is required since this is a new major source.

BACT Analysis

As shown in the table above, AEC proposed project potential emissions of NO_X, CO, PM, PM_{10}, and H_2SO_4 exceed the PSD thresholds. PSD requirements include Best Available Control Technology (BACT). A complete BACT analysis can be found in Section 5 of the application. A summary of the BACT analysis can be found in Appendix

B of this document.

BACT for this facility includes catalytic oxidation on the CT and HRSG, low sulfur fuels in the combustion equipment, ultra-low sulfur diesel in the Emergency Generator and Fire Water Pump, a fugitive dust prevention and control plan, and good engineering practice.

Air Quality Modeling Analysis
In accordance with the Prevention of Significant Deterioration (PSD) rules in 40 CFR § 52.21 and ACHD Article XXI §2102.07(a), a full air quality analysis was performed by AEC and reviewed by ACHD. A summary of the analysis may be found in Appendix C of this document. Detailed analyses may be found in Section 6 of the application and in the document "Modeling Review of Invenergy LLC (Invenergy) Proposed Natural Gas Combined-Cycle Power Plant Installation Permit".

Federal Land Managers
In accordance with 40 CFR §52.21(p), written notice of Allegheny Energy Center's proposed facility has been provided to the Federal Land Managers (FLMs) from the U.S Forest Service (USFS) and the National Park Service (NPS) of nearby Class I areas as well as initial screening calculations. Both indicated that no negative impacts to visibility and air quality related values in nearby Class I areas as a result of the Project were anticipated; and therefore, no Air Quality Related Values (AQRV) analysis was requested.

REGULATORY APPLICABILITY:

1. **Article XXI Requirements for Issuance:**
   See Permit Application No. 0959, Section 5. The requirements of Article XXI, Parts B and C for the issuance of operating permits have been met for this facility. Article XXI, Part D, Part E & Part H will have the necessary sections addressed individually.

2. **Testing Requirements:**
   Testing for criteria pollutants, as well as sulfuric acid and formaldehyde is required on the combustion turbine (CT) once every two years in order to demonstrate compliance with the emission limitations of this permit. Testing is also required for NO_X on the Auxiliary Boiler at least once every five (5) years. The Department reserves the right to require additional testing if necessary in the future to assure compliance with the terms and conditions of this Title V Operating Permit.

   A correlation factor for VOC emissions with CO emissions from the CEMS will be established during the regular testing of the CT in order to establish continuous compliance with the VOC limits.

3. **Applicable New Source Performance Standards (NSPS):**
   The facility is subject to the following NSPS:
   - 40 CFR Part 60 Subpart KKKK – *Standards of Performance for Stationary Combustion Turbines,*
   - 40 CFR Part 60, Subpart TTTT – *Standards of Performance for Greenhouse Gas Emissions for Electric Generating Units*, and
   - 40 CFR Part 60, Subpart IIII – *Standards of Performance for Stationary Compression Ignition Internal Combustion Engines*.

   Because the facility will be subject to NSPS, it will be required to comply with the applicable requirements of 40 CFR Part 60, Subpart A – *Standards of Performance for New Stationary Sources, General Provisions*.

   CT01 is subject to SO_2 limits of 0.90 lb/MWh gross output and 0.060 lb/MMbtu heat input under 40 CFR Part 60, Subpart KKKK. However, Subpart KKKK is streamlined by the more stringent limit of 0.0014 lb/MMBtu in the permit, but still is an applicable requirement.

4. **<u>Non-Applicable New Source Performance Standards (NSPS):</u>**
   Because the proposed petroleum liquid storage vessels associated with the Project have individual capacities less than 75 m^3 (i.e., 19,813 gallons) the storage vessels are not subject to the requirements of 40 CFR Part 60, Subpart Kb - *Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984*.

   Because the proposed auxiliary boiler will meet the 40 CFR §60.41c definition of a steam generating unit and will have a maximum design heat input of 88.7 MMBtu/hr, which is less than 100 MMBtu/hr, but greater than 10 MMBtu/hr, the requirements of 40 CFR Part 60, Subpart Dc - *Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units* apply. Since the auxiliary boiler will fire natural gas only, the facility will comply with the notification and recordkeeping requirements in accordance with 40 CFR §60.48c(g)(2), by recording the amount of fuel combusted during each month.

   The proposed dew point heater, which will have a maximum design heat input of 3.0 MMBtu/hr is not subject to Subpart Dc per 40 CFR §60.40c(e). The proposed CT and HRSG with DB are not subject to Subpart Dc per 40 CFR §60.40c(e) as the requirements of 40 CFR Part 60, Subpart KKKK apply to the proposed CT and HRSG with DB.

5. **<u>Applicable NESHAP and MACT Standards:</u>**
   The facility will be subject to 40 CFR Part 63, Subpart YYYY - *National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines* when the regulation is finalized by the EPA. This facility proposes to implement a limit on formaldehyde to remain a minor source of hazardous air pollutants.

   The facility is subject to 40 CFR Part 63, Subpart ZZZZ – *National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines* for the emergency generator and the fire water pump.

   Because the engines driving the emergency generator and the fire water pump are CI RICE, demonstrating compliance with the requirements of 40 CFR Part 60, Subpart IIII ensures that the requirements of 40 CFR Part 63, Subpart ZZZZ are met.

   Because the facility is subject to 40 CFR Part 63 Subparts, the requirements of Subpart A will apply. The facility will comply with each of the applicable sections of the General Provisions as specified in 40 CFR Part 63, Subpart A – *National Emission Standards for Hazardous Air Pollutants for Source Categories, General Provisions.*

6. **<u>Non-Applicable NESHAP and MACT Standards:</u>**
   Because the facility is considered an area source of HAPs, the emissions standards of 40 CFR Part 63, Subpart YYYY – *National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines* and 40 CFR Part 63, Subpart DDDDD – *National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters* will not apply because these rules regulate major sources of HAPs.

   The auxiliary boiler is not subject to 40 CFR Part 63, Subpart JJJJJ – *National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources* per §63.11195(e) because combusts only natural gas and is defined as "gas-fired boiler" under §63.11237. In addition, the proposed HRSG with DB meets the definition of a "waste heat boiler" and the proposed dew point heater meets the definition of a "process heater" and are excluded from the definition of a "boiler" per 40 CFR §63.11237.

7. **<u>Risk Management Plan; CAA Section 112(r):</u>**
   Aqueous ammonia, used by the SCR system for NO_X emissions control, is a Regulated Substance under

Section 112(r). The threshold quantity in the RMP Rule List of Regulated Substances pursuant to 40 CFR §68.130 for aqueous ammonia is 20,000 pounds with a concentration 20% or greater. Because aqueous ammonia will be stored on-site in one storage tank with a capacity of 20,000 gallons with a concentration of less than 20% by weight, the concentration applicability criteria will not be met and 40 CFR Part 68 – *Chemical Accident Prevention Provisions* does not apply.

8. **Greenhouse Gas Reporting (40 CFR Part 98):**
Because the facility will emit more than 25,000 metric tons of CO_2e, the facility is subject to 40 CFR Part 98, Subpart D – *Electricity Generation*. The Mandatory GHG Reporting requirements, promulgated at 40 CFR Part 98, were published by U.S. EPA on October 30, 2009 and require facilities that emit greater than 25,000 metric tons per year of carbon dioxide equivalent (CO_2e) to provide an annual reporting of GHG emissions.

9. **Compliance Assurance Monitoring (40 CFR Part 64):**
The facility will be a major stationary source (i.e., it will be required to obtain a 40 CFR Part 70 permit under ACHD air quality regulations); therefore, CAM applicability must be addressed. The facility will include the following control devices: SCR for control of NO_X emissions and oxidation catalysts for the control of CO emissions. The facility proposes to use continuous emissions monitoring systems (CEMs) to demonstrate compliance with the NO_X and CO emissions limits. As a result, the CAM regulations will not apply for demonstrating compliance with the facility emissions limits.

10. **Continuous Emission Monitoring (40 CFR Part 75):**
To demonstrate compliance with Cross State Air Pollution Rule (CSAPR), the permittee will implement NO_X CEMS requirements in accordance with 40 CFR Part 75, Subpart B – *Monitoring Provisions* section §75.12 and Subpart H – *NO_X Mass Emissions Provisions*. In addition, the permittee will implement fuel flow based SO_2 monitoring system requirements for gas-fired units pursuant to 40 CFR Part 75, Subpart B §75.11(d)(2) and Appendix D. The facility will comply with the fuel flow and heat input monitoring system requirements for gas-fired units pursuant to 40 CFR Part 75, Appendix D. By complying with the applicable monitoring requirements identified in 40 CFR Part 75, the facility will meet the requirements of 40 CFR §§97.430 – 97.434 and 40 CFR §§97.530 through 97.534. The CSAPR application for the Project is provided in Appendix G of the permit application.

11. **Continuous Emission Monitoring (40 CFR Part 60, Appendix B):**
CO CEMS will be regularly tested for accuracy in accordance with 40 CFR Part 60, Appendix B -*Performance Specifications*.

12. **Acid Rain Program (Title IV Acid Rain Permit, §2103.22.j, and 40 CFR 72 through 40 CFR 78):**
NO_X emissions from the combined cycle combustion turbine and steam generator shall be limited to 30.9 lb/hr and SO_2 emissions shall be limited to 23.65 tons/year (plus or minus based on emissions trading). A Designated Representative for the facility, for the purposes of the Acid Rain Program, must be identified on a certificate of representation form; and this Designated Representative shall certify all Acid Rain Submissions (40 CFR §72.20-72.24).

13. **CAIR NO_X and SO_2 Trading Programs (40 CFR Part 97 and 25 Pa Code § 145):**
The permittee shall comply with all requirements of 40 CFR PART 97 (relating to Federal NO_X Budget Trading Program and CAIR NO_X and SO_2 Trading Programs) and 25 Pa Code § 145 (relating to Interstate Pollution Transport Reduction). The permittee is subject to Subpart B - *NO_X Authorized Account Representative for NO_X Budget Sources*, Subpart H – *Monitoring and Reporting*, Subpart AAAA – *CAIR NO_X Oxone Season Trading Program General Provisions*, Subpart BBBB – CAIR *Designated Representative for CAIR NO_X Ozone Season Sources*, and Subpart CCCC – *Permits*. The permittee is subject to the standard requirements of 40 CFR § 97.106, 40 CFR § 97.206 and 40 CFR § 97.306. The requirements are hereby incorporated by reference in the permit. This program has replaced Pa Code §123.102-123.120(§2105.100).

14. **Prevention of Significant Deterioration (PSD):**

Potential facility-related emissions of sulfuric acid mist (H_2SO_4), CO, PM, PM_{10}, greenhouse gases (GHG), and NO_X, assessed as nitrogen dioxide NO_2 for air quality modeling purposes, associated with the facility are major for PSD purposes and trigger PSD permitting requirements. Therefore, in addition to meeting BACT, air dispersion modeling that incorporated ACHD approved air quality modeling procedures was used to demonstrate that the Project will not cause or contribute to any violation of the National Ambient Air Quality Standards (NAAQS) and will not cause any PSD increments to be exceeded.

15. **Air Toxics**
The facility's emissions of air toxics exceed the de minimis levels established pursuant to ACHD's "Policy for Air Toxics Review of Installation Permit Applications." An air toxics modeling analysis was performed to evaluate carcinogenic and non-carcinogenic health risks of the Project. The results of this analysis show that the cumulative Maximum Individual Carcinogenic Risk (MICR) is less than 1 x 10-5 and the Hazard Quotient (HQ) and Cumulative Hazard Index (HI) were less than 1.0 and 2.0, respectively, and therefore no cumulative air toxics analysis is required. See the document "Modeling Review of Invenergy LLC (Invenergy) Proposed Natural Gas Combined-Cycle Power Plant Installation Permit" for the full modeling analysis.

EMISSIONS SUMMARY:

Table 15: Emissions Summary for Allegheny Energy Center

Pollutant	Total (tpy*)
Particulate Matter (filterable)	**44.59**
Particulate Matter <10 µm (PM_{10})	**88.65**
Particulate Matter <2.5 µm ($PM_{2.5}$)	**88.60**
Nitrogen Oxides (NO_X)	**145.70**
Sulfur Oxides (SO_X)	**23.89**
Carbon Monoxide (CO)	**170.44**
Volatile Organic Compounds (VOC)	**93.40**
Sulfuric Acid Mist	**17.11**
Ammonia	**98.05**
Hazardous Air Pollutants (HAP)	**10.50**
Benzene	**0.21**
Ethylbenzene	**0.54**
Formaldehyde	**5.18**
Toluene	**2.20**
Xylenes	**1.08**
Lead	**9.23×10^{-4}**
Greenhouse Gases (CO_2e)	**1,948,493**

* A year is defined as any consecutive 12-month period.

RECOMMENDATION:

All applicable Federal, State, and County regulations have been addressed in the permit application, and the facility is not in violation of the provisions of Article XXI, §2102.04.k. The Installation Permit for Allegheny Energy Center LLC should be approved with the emission limitations, terms and conditions in Permit No. 0959-I001.

APPENDIX A – EMISSIONS CALCULATIONS

Appendix A: Emission Calculations
Project Summary

Company Name: Allegheny Energy Center
Address: 2130 Margaret St. Ext., West Newton, PA 15089
Title V Operating Permit: 0959-I001
Date: March 29, 2021

Pollutants (tpy)	NO_X	CO	VOC	SO_2	PM	PM_{10}	$PM_{2.5}$	H_2SO_4	Pb	Formaldehyde	NH_3	GHGs (CO_2e)	Total HAPs
Combustion Turbine w/ Duct Burner	141.99	161.72	92.51	23.65	44.15	88.30	88.30	17.08	8.22E-04	5.12	97.41	1,924,999.44	10.45
Auxiliary Boiler	1.95	7.27	0.71	0.19	0.32	0.26	0.22	0.02	8.45E-05	4.90E-02	0.54	20,772.99	0.05
Dew Point Heater	0.14	0.49	0.07	0.01	0.06	0.02	0.02	1.75E-03	6.26E-06	3.63E-03	0.04	1,538.65	3.81E-03
Emergency Generator	1.53	0.88	0.08	1.86E-03	0.05	0.06	0.06	2.27E-04	9.39E-06	8.23E-05	0.05	170.73	1.69E-03
Fire Pump	0.09	0.08	4.66E-03	2.89E-02	4.66E-03	5.41E-03	5.41E-03	3.54E-03	8.73E-07	1.15E-04	4.63E-03	15.87	3.81E-04
Diesel and Lubricating Oil Tanks	-	-	0.03	-	-	-	-	-	-	-	-	-	-
Natural Gas Piping Fugitives	-	-	-	-	-	-	-	-	-	-	-	274.73	-
Natural Gas Maintenance + SU/SD Venting	-	-	-	-	-	-	-	-	-	-	-	794.82	-
SF_6 Circuit Breakers	-	-	-	-	-	-	-	-	-	-	-	96.58	-
Total Project Emissions	**145.70**	**170.44**	**93.40**	**23.89**	**44.59**	**88.65**	**88.60**	**17.11**	**9.23E-04**	**5.18**	**98.05**	**1,948,493.09**	**10.50**
NSR Major Source Threshold	100	100	100	100	100	100	100	100	100		100	100,000	10/25
Major Source	Y	Y	Y	N	N	N	N	N	N		N	Y	N [(a)]
PSD Significant Net Emission Rate	40	100	N/A [(c)]	N/A [(d)]	25	15	N/A [(d)]	7	0.6		N/A [(f)]	75,000	
Subject to PSD Review	Y [(b)]	Y			Y	Y		Y [(e)]	N			Y	
Nonattainment Major Source Threshold	100		50	100			100				100		
NNSR	Y [(g)]		Y	N			N				N		

[(a)] The AEC Facility and Project would be considered an area source for HAPs with respect to NESHAP because the PTE HAP emissions are less than 10 tons per year (tpy) for a single HAP and less than 25 tpy for total (combined) HAPs.

[(b)] PSD applies for NO_X because NO_2 has a NAAQS and the Project is proposed in a NO_2 attainment area.

[(c)] PSD does not apply for VOC because the Project is proposed in the Northeast OTR which is managed as nonattainment area and VOC is a precursor pollutant of ozone.

[(d)] PSD does not apply for SO_2 or $PM_{2.5}$ because the Project is proposed in a $PM_{2.5}$ and SO_2 nonattainment area.

[(e)] Major source thresholds for NO_X and CO triggered therefore PSD significant net emissions rates applicable to NSR regulated pollutants subject to PSD.

[(f)] The Project is proposed in a $PM_{2.5}$ nonattainment area which was determined NH_3 is a precursur pollutant to $PM_{2.5}$. Therefore NH_3 is a regulated NSR pollutant which is subject to NNSR.

[(g] The Project is proposed in the Northeast OTR which is managed as a nonattainment area and NO_X is a precursor pollutant of ozone.

Appendix A: Emission Calculations
Combustion Emissions for Combustion Turbine 3,844 MMBtu/hr

Company Name: Allegheny Energy Center
Address: 2130 Margaret St. Ext., West Newton, PA 15089
Title V Operating Permit: 0959-I001
Date: March 29, 2021

Maximum Hourly Heat Input and Emissions During Steady-State Operations for CT and DB

Gross Maximum Electrical Capacity[(a)]	639	MW total
Net Maximum Power	626	MW total
Maximum CT Heat Input (HHV)	3,844	MMBtu/hr HHV
Maximum DB Heat Input (HHV)	394	MMBtu/hr HHV
Parameter	**Maximum Short Term Emissions Rates[(b)]**	
	CT w/o DB	**CT w/ DB**
NO_X ppmvd @ 15% O_2	2.00	2.00
NO_X lb/hr as NO_2	27.90	30.90
CO ppmvd @ 15% O_2	2.00	2.00
CO lb/hr	17.00	18.80
VOC ppmvd @ 15% O_2	1.00	1.50
VOC lb/hr as methane	4.90	8.10
CO_2 lb/hr	395,000.0	467,000.0
NH_3 Slip ppmvd @15% O_2	4.00	4.00
NH_3 Slip lb/hr	20.64	22.90
SO_X lb/hr as SO_2	5.10	5.60
SO_2 lb/MMBtu	0.0014	0.0014
$PM_{10}/PM_{2.5}$ lb/hr	16.49	21.11
$PM_{10}/PM_{2.5}$ lb/MMBtu	0.0084	0.0058
PM filterable lb/hr	8.24	10.55
PM filterable lb/MMBtu	0.0042	0.0029
H_2SO_4 lb/hr	3.60	4.00
H_2SO_4 lb/MMBtu	0.00101	0.00100
Pb lb/MMBtu	negligible	4.76E-07
Formaldehyde lb/MMBtu	2.76E-04	2.66E-04

[(a)] Nominal value.

[(b)] No emissions of fluoride (F), hydrogen sulfide (H_2S), or total reduced sulfur (TRS) are expected to occur.

Appendix A: Emission Calculations

Combustion Emissions for Combustion Turbine 3,799 MMBtu/hr

Company Name: Allegheny Energy Center
Address: 2130 Margaret St. Ext., West Newton, PA 15089
Title V Operating Permit: 0959-I001
Date: March 29, 2021

Average Hourly Heat Input and Emissions During
1 GT @ 100% load, DB 80.9%

Gross Maximum Electrical Capacity[(a)]	639	MW total
Net Maximum Power	626	MW total
Maximum CT Heat Input (HHV)	3,799	MMBtu/hr HHV
Maximum DB Heat Input (HHV)	319	MMBtu/hr HHV
Parameter	**Average Short Term Emissions Rates**[(b)]	
	CT w/o DB	**CT w/ DB**
NO_X ppmvd @ 15% O_2	2.00	2.00
NO_X lb/hr as NO_2	27.60	30.00
CO ppmvd @ 15% O_2	2.00	2.00
CO lb/hr	16.80	18.30
VOC ppmvd @ 15% O_2	1.00	1.50
VOC lb/hr as methane	4.80	7.88
CO_2 lb/hr	373,000.00	439,000.00
NH_3 Slip ppmvd @15% O_2	4.00	4.00
NH_3 Slip lb/hr	20.40	22.24
SO_X lb/hr as SO_2	5.00	5.40
SO_2 lb/MMBtu	0.0014	0.0014
$PM_{10}/PM_{2.5}$ lb/hr	16.40	20.16
$PM_{10}/PM_{2.5}$ lb/MMBtu	0.0045	0.0051
PM filterable lb/hr	8.19	10.08
PM filterable lb/MMBtu	0.0023	0.0026
H_2SO_4 lb/hr	3.60	3.90
H_2SO_4 lb/MMBtu	0.0010	0.0010
Pb lb/MMBtu	negligible	4.76E-07
Formaldehyde lb/MMBtu	2.65E-04	2.64E-04

(a) Nominal value.

(b) No emissions of fluoride (F), hydrogen sulfide (H_2S), or total reduced sulfur (TRS) are expected to occur.

Appendix A: Emission Calculations
Combustion Emissions for Combustion Turbine 3,844 MMBtu/hr

Company Name: Allegheny Energy Center
Address: 2130 Margaret St. Ext., West Newton, PA 15089
Title V Operating Permit: 0959-I001
Date: March 29, 2021

1. Process Description

	Unit Description	Gross Max.Electric Power (MW)	Total Heat Input Capacity (MMBtu/hr)	Maximum Potential Throughput (MMCF/yr)	Btu/CF	Max. hrs/yr	Steady-State hrs/yr [c]
CT-001	Combined Cycle Power Block [a]	639	3844	32069.94	1,050	8,760	8200.3
DB-001	Duct Burner [b]	NA	394	3287.09	1,050	8,760	8200.3
Total		639	4238	35357.03	1,050	8,760	8200.3

[a] The Combined Cycle Power Block Consistes of the Combustion Turbine, a Duct Burner, a Heat Recovery Steam Generator, and a Steam Turbine.
[b] The Duct burner must be used during all opperations.
[c] Steady state = 8,760 hrs - [365 hr + (32 min × 1hr/60 min × 365 hr)]; See Section 3. below.

2. Steady-State Combustion Emissions - Criteria Pollutants

Potential to Emit (lbs/hr) [a]											
PM	PM_{10}	$PM_{2.5}$	NO_X	VOC	CO	SO_2	CO_2	NH_3	H_2SO_4	Pb [b]	Formaldehyde
10.08	20.16	20.16	30.00	7.88	18.30	5.40	439,000	22.24	3.90	1.88E-04	1.17

Potential to Emit (lbs/yr)											
PM	PM_{10}	$PM_{2.5}$	NO_X	VOC	CO	SO_2	CO_2	NH_3	H_2SO_4	Pb	Formaldehyde
88,301	176,602	176,602	246,010	64,578	150,066	47,304	3,845,640,000	194,822	34,164	1.64	10,246.47

Potential to Emit (tons/yr)											
PM	PM_{10}	$PM_{2.5}$	NO_X	VOC	CO	SO_2	CO_2	NH_3	H_2SO_4	Pb	Formaldehyde
44.15	88.30	88.30	123.01	32.29	75.03	23.65	1,922,820	97.41	17.08	8.22E-04	5.12

[a] Manufacturer's Data; average short term steady-state emission rates with duct burner
[b] AP-42, Table 1.4-2

3. SU/SD - Criteria Pollutants
Annual No. of SU/SD Events = 365

Emissions Per Event [a]:

CT Startup to Minimum Emissions Compliance Load [b]				
Event	Fuel	NOx	CO	VOC
	MMBtu/event	lb/event	lb/event	lb/event
Hot Start	495	90	390	205
Shutdown	170	14	85	125

[a] Events per year is assumed to be 365.
[b] Manufacturer guarantees.

CT Startup/Shutdown Emissions Rates [a/b]							Max Baseload		Startup+Max Baseload	
Event	Duration	Annual No. of	Annual No. of	NO_X	CO	VOC	NO_X	CO	NO_X	1HR-CO
	Minutes [c]	Events [d]	Hours	lb/event			lb/hr	lb/hr	lb/hr	lb/hr
Hot Start	20	365	121.67	90.0	390.0	205.0	30.9	18.8	110.6	402.5
Shutdown	12	365	73.00	14.0	85.0	125.0	30.9	18.8	38.7	100.0

[a] SU/SD emissions of NO_X, CO, and VOC are emision guranatees from the vendor.
[b] Based on vendor data, only emissions of NO_X, CO, and VOC are higher during SU/SD events. Emissions of other regulated NNSR pollutants assumed to be equivalent to the average case steady-state emissions rate guarantees from the manufacturer.
[c] 32 min per hot SU/SD provided by manufacturer.
[d] Worst case of one hour between SD and SU; 365 SU/SD events = 365 hours per year where the CT is not in operation. See footnote (c) in Process Description above.

	Potential to Emit (lbs/yr)		
	NO_X	VOC	CO
Hot Start	32,850	74,825	142,350
Shutdown	5,110	45,625	31,025

	Potential to Emit (tons/yr)		
	NO_X	VOC	CO
Hot Start	16.43	37.41	71.18
Shutdown	2.56	22.81	15.51
Total	18.98	60.23	86.69

4. - Total Combustion Emissions + SU/SD

	Potential to Emit (tons/yr)											
	PM	PM_{10}	$PM_{2.5}$	NO_X	VOC	CO	SO_2	CO_2	NH_3	H_2SO_4	Pb	Formaldehyde
TOTAL	**44.15**	**88.30**	**88.30**	**141.99**	**92.51**	**161.72**	**23.65**	**1,922,820**	**97.41**	**17.08**	**8.22E-04**	**5.12**

Appendix A: Emission Calculations
Combustion Emissions for Diesel Fired Emergency Generator 2,000 kW

Company Name: Allegheny Energy Center
Address: 2130 Margaret St. Ext., West Newton, PA 15089
Title V Operating Permit: 0959-I001
Date: March 29, 2021

1. Process Description

Emission Unit ID	Unit Description	Power Output (kW)	Max. hrs/yr	BHP	Fuel Consumption (gal/hr)	MMBtu/hr [(a)]	Max. Fuel Consumption (MMBtu/yr)
EG-01	Emergency Generator	2,000	100	3,058	147.3	20.87	2,087

[(a)] Calculated from fuel consumption (gph x fuel density [lb/gal] x fuel heat content [MMBtu/lb]). Ultra Low Sulfur Diesel Fuel = 19,170 Btu/lb and Fuel density = 7.39 lb/gal

2. Combustion Emissions - Criteria Pollutants

Emission Factor (g/bhp/hr)								Emission Factor (lb/MMbtu)	Emission Factor (lb/1,000 gal)	Emission Factor (lbs/MMBtu)
PM [(a)]	PM_{10} [(b)]	$PM_{2.5}$ [(b)]	NO_X [(c)]	VOC [(c)]	CO [(d)]	SO_2 [(e)]	H_2SO_4 [(f)]	Pb [(g)]	NH_3 [(h)]	Formaldehyde [(i)]
0.149	0.173	0.173	4.534	0.239	2.610	5.50E-03	6.74E-04	9.00E-06	6.62	7.89E-05

Potential to Emit (lbs/hr)										
PM	PM_{10}	$PM_{2.5}$	NO_X	VOC	CO	SO_2	H_2SO_4	Pb	NH_3	Formaldehyde
1.01	1.17	1.17	30.56	1.61	17.59	0.04	4.55E-03	1.88E-04	0.99	1.65E-03

Potential to Emit (tons/yr)										
PM	PM_{10}	$PM_{2.5}$	NO_X	VOC	CO	SO_2	H_2SO_4	Pb	NH_3	Formaldehyde
0.050	0.058	0.058	1.528	0.080	0.880	1.86E-03	2.273E-04	9.390E-06	0.0497	8.23E-05

[(a)] 40 CFR §89.112, Table 1. It is assumed that the PM emissions factor reflects the filterable portion of PM only.
[(b)] It is assumed that $PM_{10} = PM_{2.5}$. $PM_{10} = PM_{2.5}$ emissions factors account for both the filterable and condensable portions of PM. The filterable portion of $PM_{10} = PM_{2.5}$ was obtained through vendor supplied information. The condensable portion of PM_{10} and $PM_{2.5}$ was obtained from AP-42 Chapter 3.4 Table 3.4-2 (10/96).
[(c)] 40 CFR §89.112, Table 1. E.F. in g/kW-hr x 0.7457 to g/bhp/hr. Published emissions factor is for NO_X+NMHC. Invenergy assumed that NO_X emissions are 95% of this factor and VOC emissions are 5% based "CARB Emission Factor for CI Diesel Engines - Percent HC in Relation to NMHC + NO_X" policy.
[(d)] 40 CFR §89.112, Table 1. E.F. in g/kW-hr x 0.7457 to g/bhp/hr.
[(e)] AP-42, Table 3.4-1. Diesel fuel sulfur content = 0.0015% (15 ppm).
[(f)] H_2SO_4 emissions factor conservatively calculated based on 10% molar conversion of SO_2 to SO_3 and 100% conversion of SO_3 to H_2SO_4.
[(g)] AP-42, Table 1.3-10
[(h)] U.S. EPA Emission Inventory Improvement Program, "Estimating Ammonia Emissions from Anthropogenic Nonagricultural Sources - Draft Final Report", April 2004.
[(i)] AP-42, Table 3.4-3

Appendix A: Emission Calculations
Combustion Emissions for Diesel Fired Fire Water Pump 1.9 MMBtu/hr

Company Name: Allegheny Energy Center
Address: 2130 Margaret St. Ext., West Newton, PA 15089
Title V Operating Permit: 0959-I001
Date: March 29, 2021

1. Process Description

Emission Unit ID	Unit Description	Max. hrs/yr	BHP	Fuel Consumption (gal/hr)	MMBtu/hr [a]	Max. Fuel Consumption (MMBtu/yr)
WP-01	Fire Water Pump	100	282	13.7	1.94	194

[a] Calculated from fuel consumption (gph x fuel density [lb/gal] x fuel heat content [MMBtu/lb]). Ultra Low Sulfur Diesel Fuel = 19,170 Btu/lb and Fuel density = 7.39 lb/gal.

2. Combustion Emissions - Criteria Pollutants

Emission Factor (g/bhp/hr)								Emission Factor (lb/MMbtu)	Emission Factor (lb/1,000 gal)	Emission Factor (lbs/MMBtu)
PM [a]	PM_{10} [b]	$PM_{2.5}$ [b]	NO_X [c]	VOC [c]	CO [d]	SO_2 [e]	H_2SO_4 [f]	Pb [g]	NH_3 [h]	Formaldehyde [i]
0.150	0.174	0.174	2.850	0.150	2.600	0.930	0.114	9.00E-06	6.620	1.18E-03

Potential to Emit (lbs/hr)										
PM	PM_{10}	$PM_{2.5}$	NO_X	VOC	CO	SO_2	H_2SO_4	Pb	NH_3	Formaldehyde
0.093	0.108	0.108	1.772	0.093	1.616	0.578	7.082E-02	1.75E-05	0.0925	2.29E-03

Potential to Emit (tons/yr)										
PM	PM_{10}	$PM_{2.5}$	NO_X	VOC	CO	SO_2	H_2SO_4	Pb	NH_3	Formaldehyde
0.0047	0.0054	0.0054	0.0886	0.0047	0.0808	0.0289	0.0035	8.73E-07	0.0046	1.15E-04

[a] 40 CFR §60.4205(c), Table 4. It is assumed that the PM emissions factor reflects the filterable portion of PM only.
[b] It is assumed that $PM_{10} = PM_{2.5}$. $PM_{10} = PM_{2.5}$ emissions factors account for both the filterable and condensable portions of PM. The filterable portion of $PM_{10} = PM_{2.5}$ was obtained through vendor supplied information. The condensable portion of PM_{10} and $PM_{2.5}$ was obtained from AP-42 Chapter 3.4 Table 3.4-2 (10/96).
[c] 40 CFR §60.4205(c), Table 4. Published emissions factor is for NO_X+NMHC. Invenergy assumed that NO_X emissions are 95% of this factor and VOC emissions are 5% based "CARB Emission Factor for CI Diesel Engines - Percent HC in Relation to NMHC + NO_X" policy.
[d] 40 CFR §60.4205(c), Table 4.
[e] AP-42, Table 3.3-1. Diesel fuel sulfur content = 0.0015% (15 ppm). Calculated from power output (lb/hp-hr x g/lb [g/bhp/hr]).
[f] H_2SO_4 emissions factor conservatively calculated based on 10% molar conversion of SO_2 to SO_3 and 100% conversion of SO_3 to H_2SO_4.
[g] AP-42, Table 1.3-10
[h] U.S. EPA Emission Inventory Improvement Program, "Estimating Ammonia Emissions from Anthropogenic Nonagricultural Sources - Draft Final Report", April 2004.
[i] AP-42, Table 3.3-2

Appendix A: Emission Calculations
Combustion Emissions for Natural Gas Fired Auxiliary Boiler 88.7 MMBtu/hr

Company Name: Allegheny Energy Center
Address: 2130 Margaret St. Ext., West Newton, PA 15089
Title V Operating Permit: 0959-I001
Date: March 29, 2021

1. Process Description

Emission Unit ID	Unit Description	Total Heat Input Capacity (MMBtu/hr)	Maximum Potential Throughput (MMCF/yr)	Btu/CF	Max. hrs/yr	Max. Fuel Consumption (MMBtu/yr)
B-001	Auxiliary Boiler	88.7	337.90	1,050	4,000	354,800

2. Combustion Emissions - Criteria Pollutants

Emission Factor (lbs/MMBtu)								Emission Factor (lbs/MMSCF)		(lbs/MMBtu)
PM [a]	PM_{10} [b]	$PM_{2.5}$ [b]	NO_X [c]	VOC [c]	CO [c]	SO_2 [d]	H_2SO_4 [e]	Pb [a]	NH_3 [f]	Formaldehyde [a]
1.810E-03	1.486E-03	1.229E-03	0.011	0.004	0.041	1.09E-03	1.33E-04	5.00E-04	3.20	2.76E-04

Potential to Emit (lbs/hr)										
PM	PM_{10}	$PM_{2.5}$	NO_X	VOC	CO	SO_2	H_2SO_4	Pb	NH_3	Formaldehyde
0.161	0.132	0.109	0.976	0.355	3.637	0.097	0.012	4.224E-05	0.270	2.45E-02

Potential to Emit (tons/yr)										
PM	PM_{10}	$PM_{2.5}$	NO_X	VOC	CO	SO_2	H_2SO_4	Pb	NH_3	Formaldehyde
0.321	0.264	0.218	1.951	0.710	7.273	0.193	0.024	8.448E-05	0.541	4.90E-02

(a) AP-42, Table 1.4-2 (7/98). PM emissions factor represents the filterable portion only.
(b) U.S. EPA's Emission Inventory and Analysis Group guidance 3/30/2012 with 3x safety factor. PM_{10} and $PM_{2.5}$ are revised emissions factors for Gas Combustion based upon the NYSERDA dilution sampling test reports. PM_{10} and $PM_{2.5}$ emissions factors account for both the filterable and condensable portions of PM.
(c) Manufacturer's data.
(d) SO_2 emissions factor calculated based on a 0.4 gr/100 scf sulfur content of natural gas.
(e) H_2SO_4 emissions factor conservatively calculated based on 10% molar conversion of SO_2 to SO_3 and 100% conversion of SO_3 to H_2SO_4.
(f) U.S. EPA Emission Inventory Improvement Program, "Estimating Ammonia Emissions from Anthropogenic Nonagricultural Sources - Draft Final Report", Table III-1, April 2004.

Appendix A: Emission Calculations
Combustion Emissions for Natural Gas Fired Dew Point Heater 3 MMBtu/hr

Company Name: Allegheny Energy Center
Address: 2130 Margaret St. Ext., West Newton, PA 15089
Title V Operating Permit: 0959-I001
Date: March 29, 2021

1. Process Description

Emission Unit ID	Unit Description	Total Heat Input Capacity (MMBtu/hr)	Maximum Potential Throughput (MMCF/yr)	Btu/CF	Max. hrs/yr	Max. Fuel Consumption (MMBtu/yr)
H-001	Dew Point Heater	3.0	25.03	1,050	8,760	26,280

2. Combustion Emissions - Criteria Pollutants

Emission Factor (lbs/MMBtu)								Emission Factor (lbs/MMSCF)		(lbs/MMBtu)
PM [(a)]	PM_{10} [(b)]	$PM_{2.5}$ [(b)]	NO_X [(a)]	VOC [(a)]	CO [(a)]	SO_2 [(c)]	H_2SO_4 [(d)]	Pb [(e)]	NH_3 [(f)]	Formaldehyde [(a)]
4.800E-03	1.486E-03	1.229E-03	0.011	0.005	0.037	1.09E-03	1.33E-04	5.00E-04	3.20	2.76E-04

Potential to Emit (lbs/hr)										
PM	PM_{10}	$PM_{2.5}$	NO_X	VOC	CO	SO_2	H_2SO_4	Pb	NH_3	Formaldehyde
0.014	4.457E-03	3.686E-03	0.033	0.015	0.111	0.0033	0.0004	1.43E-06	0.0091	8.28E-04

Potential to Emit (tons/yr)										
PM	PM_{10}	$PM_{2.5}$	NO_X	VOC	CO	SO_2	H_2SO_4	Pb	NH_3	Formaldehyde
0.063	0.020	0.016	0.145	0.066	0.486	0.014	0.002	6.26E-06	0.040	3.63E-03

[(a)] Manufacturer's data. PM emissions factor represents the filterable portion only.
[(b)] U.S. EPA's Emission Inventory and Analysis Group guidance 3/30/2012 with 3x safety factor. PM_{10} and $PM_{2.5}$ are revised emissions factors for Gas Combustion based upon the NYSERDA dilution sampling test reports. PM_{10} and $PM_{2.5}$ emissions factors account for both the filterable and condensable portions of PM.
[(c)] SO_2 emissions factor calculated based on a 0.4 gr/100 scf sulfur content of natural gas.
[(d)] H_2SO_4 emissions factor conservatively calculated based on 10% molar conversion of SO_2 to SO_3 and 100% conversion of SO_3 to H_2SO_4.
[(e)] AP-42, Table 1.4-2 (7/98)
[(f)] U.S. EPA Emission Inventory Improvement Program, "Estimating Ammonia Emissions from Anthropogenic Nonagricultural Sources - Draft Final Report", Table III-1, April 2004.

Appendix A: Emission Calculations
Storage Tank VOC Emissions

Company Name: Allegheny Energy Center
Address: 2130 Margaret St. Ext., West Newton, PA 15089
Title V Operating Permit: 0959-I001
Date: March 29, 2021

Description	Notes	Abbreviation	Units	Tank 1	Tank 2	Tank 3
General Tank Information						
Tank ID		-	-	ULSD Storage Tank	Lubricating Oil Tank	Fire Pump Engine ULSD Day Tank
Material		-	-	Distillate Fuel Oil No. 2	Residual Oil No. 6	Distillate Fuel Oil No. 2
Orientation		-	-	Vertical	Horizontal	Vertical
Vessel Shape		-	-	Cylindrical	Cylindrical	Cylindrical
Roof Type		-	-	Fixed	Fixed	Fixed
Tank Color		-	-	White	White	White
Roof Construction		-	-	Welded	Welded	Welded
Shell Construction		-	-	Welded	Welded	Welded
Product Days			Days	365	365	365
Capacity			Bbl	83.33	267.86	11.90
Capacity		-	Gal	3500	11250	500
Diameter		De (p)	ft	7.5	16.43	5.29
Height		He (q)	ft	13	6.28	3.14
Length		-	ft		26.5	5.5
Width		-	ft		8	4
Emission Factors for Fixed Roof Tanks (AP-42 Table 7.1, Organic Liquid Storage Tanks)						
Tank Radius		Rs	ft	3.75	8.21	2.65
Tank Roof Slope	(a)	Sr	ft/ft	0.06	0.06	0.06
Tank Roof Height		Hr	ft	0.23	0.51	0.17
Roof Outage		Hro	ft	0.08	0.17	0.06
Liquid Height		HL	ft	12.48	6.03	3.02
Tank Shell Height		Hs	ft	13.00	6.28	3.14
Vapor Space Outage		Hvo	ft	0.60	2.01	0.18
Tank Diameter		D	ft	7.50	16.43	5.29
Vapor Space Volume		Vv	ft3	26.42	426.49	3.98
Paint Solar Absorptance For Fixed Roof Tanks	(b)	alpha	-	0.1	0.1	0.1
Daily Maximum Ambient Temperature	(c)	Tax	deg R	521.07	521.07	521.07
Daily Minimum Ambient Temperature	(c)	Tan	deg R	502.27	502.27	502.27
Daily Average Ambient Temperature	(c)	Taa	deg R	511.67	511.67	511.67
Liquid Bulk Temperature	(c)	Tb	deg R	511.27	511.27	511.27
Daily Total Solar Insolation Factor	(d)	I	BTU/ft2	1068.90	1068.90	1068.90
Daily Average Liquid Surface Temperature	(e)	TLa	deg R	512.29	512.29	512.29
Daily Maximum Liquid Surface Temperature	(f)	TLx	deg R	516.42	516.42	516.42
Constant in Vapor Pressure Equation	(g)	A	-	7.82	7.82	7.82
Constant in Vapor Pressure Equation	(g)	B	-	1800.03	1800.03	1800.03
Constant in Vapor Pressure Equation	(g)	C	-	246.89	246.89	246.89
Vapor Pressure at Daily Average Liquid Surface Temperature	(h)	Pva	psia	0.1362	0.1362	0.1362
Vapor Pressure at Daily Maximum Liquid Surface Temperature	(h)	Pva	psia	0.1569	0.1569	0.1569
Average Vapor Molecular Weight		Mv	lb/lb-mole	188	387	188
Ideal Gas Constant		R	psi*ft/mole*R	10.731	10.731	10.731
Vapor Density		Wv	lb/ft^3	0.004658982	0.009590565	0.004658982
Atmospheric Pressure		Pa	psia	14.7	14.7	14.7
Breather Vent Vacuum Setting	(i)	Pbv	psig	-0.03	-0.03	-0.03
Breather Vent Pressure Setting	(i)	Pbp	psig	0.03	0.03	0.03
Breather Vent Pressure Setting Range		Pb	psig	0.06	0.06	0.06
Daily Ambient Temperature Range		Ta	deg R	18.8	18.8	18.8
Daily Vapor Temperature Range		Tv	deg R	16.53	16.53	16.53
Daily Vapor Pressure Range		Pv	psi	4.29E-06	4.29E-06	4.29E-06
Vapor Space Expansion Factor		Ke	-	0.03	0.03	0.03
Vented Vapor Saturation Factor		Ks	-	1.00	0.99	1.00
Vapor Molecular Weight		Mv	lb/lb-mole	188	387	188
Total Vapor Pressure of the Stored Liquid		Pva	psia	0.136	0.136	0.136
Annual Throughput Rate	(j)		gallons/yr	14730	5000	1370
Annual Throughput Rate		Q	Bbl/Yr	350.71	119.05	32.62
Turnover Factor	(k)	Kn	-	1.00	1.00	1.00
Working Loss Product Factor	(l)	Kp	-	1.00	1.00	1.00
Standing Losses	(m)	Ls	lb/yr	1.26	41.42	0.19
Standing Losses		Ls	lb/hr	1.44E-04	4.73E-03	2.17E-05
Standing Losses		Ls	tpy	6.30E-04	0.02	9.51E-05
Working Losses	(n)	Lw	lb/yr	8.98	6.28	0.84
Working Losses		Lw	lb/hr	1.03E-03	7.17E-04	9.54E-05
Working Losses		Lw	tpy	4.49E-03	3.14E-03	4.18E-04
Total Tank Loss	(o)	Lt	**lb/hr**	**1.17E-03**	**5.44E-03**	**1.17E-04**
Total Tank Loss		Lt	**tpy**	**5.12E-03**	**0.02**	**5.13E-04**

Conversions	
Constant for Rankine to Celsius Co	491.67
Multiplier for Rankine to Celsius Cor	0.556
mmHg to Psia conversion	0.019

(a) If unknown, use the value of 0.0625 ft/ft.
(b) AP-42 Chapter 7.1 Table 7.1-6 for aluminum paint color in good condition.
(c) Annual average, minimum and maximum temperatures are for Pittsburgh, PA obtained from https://www.usclimatedata.com/climate/pittsburgh/pennsylvania/united-states/uspa3601.
(d) Total solar insolation factor was obtained for Pittsburgh, PA from the Insolation Data Manual and Direct Normal Solar Radiation Data Manual, as prepared by the Solar Radiation Resource Assessment, Solar Energy Research Institute (July 1990).
(e) Equation 1-26 ($0.44T_{AA}+ 0.56T_B+0.0079*\alpha*I$) on page 7.1-17 of AP-42 Chapter 7.1 was used.
(f) Figure 7.1-17 containing the equation ($T_{LX} = T_{LA} + 0.25*T_V$) on page 7.1-57 of AP-42 Chapter 7.1 was used.
(g) Each constant, A and B, was derived from the equation in Figure 7.1-15.
(h) Vapor pressures were calculated using antoine coefficients from *Elementary* Principles of Chemical Processes: Third Edition.
(i) If specific information on the settings for the breather vent pressure setting and vacuum setting was not readily available, therefore, 0.03 psig for PBP and -0.03 psig for PBV were assumed as values, pursuant to guidance provided in AP-42 Chapter 7.1.
(j) Throughput was estimated using plant provided information.
(k) When turnovers are less than or equal to 36, then K_N =1, pursuant to guidance provided in AP-42 Chapter 7.1.
(l) For all organic liquids except crude oils, K_P = 1, pursuant to guidance provided in AP-42 Chapter 7.1.
(m) Equation 1-2 ($365*V_V*W_V*K_E*K_S$) on page 7.1-10 of AP-42 Chapter 7.1 was used. Emissions are routed to a scrubber with 75% efficiency and have been adjusted accordingly.
(n) Equation 1-29 ($0.0010*M_V*P_{VA}*Q*K_N*K_P$) on page 7.1-18 of AP-42 Chapter 7.1 was used.

(p) Equation 1-14 on page 7.1-14 of AP-42 was used for horizontal tanks.

(q) Equation 1-13 on page 7.1-15 of AP-42 was used for horizontal tanks.

(q) Equation 1-13 on page 7.1-15 of AP-42 was used for horizontal tanks.

Appendix A: Emission Calculations
Fugitive GHG Emissions From Natural Gas Piping

Company Name: Allegheny Energy Center
Address: 2130 Margaret St. Ext., West Newton, PA 15089
Title V Operating Permit: 0959-I001
Date: March 29, 2021

	Connections		Valves			Other				
Area	**Flange**	**Thread**	**Block**	**Control**	**Safety Relief**	**Open Ended Line**	**Compressor**	**Ultrasonic Meter**	**Orifice Meter**	**Notes**
Primary Knock-out and Metering Yard	22	3	14	4	1	1	0	2	0	
Primary Filtration	44	10	40	4	2	2	0	0	0	Filtration prior to letdown station
Dew Point Heater	38	10	30	11	2	4	0	0	0	Natural Gas Fired
Fuel Gas Compressors/Bypass/Metering	42	16	18	8	4	4	3	0	3	3 x 50% Gas Compressors
Performance Heaters	10	0	2	0	1	1	0	0	0	Feedwater Based Heating
Fuel Gas Scrubbers	22	5	20	2	1	1	0	0	0	1 per CT
CT (inclusive of FG Module)	62	6	28	0	0	8	0	1	1	External to CT package
HRSG (Including BMS skid)	49	14	32	11	2	8	0	0	1	External to HRSG BMS
Auxiliary Boiler	38	10	30	11	2	4	0	0	0	
Subtotal	327	74	214	51	15	33	3	3	5	
Contingency	20%	20%	10%	10%	10%	10%	0%	0%	0%	
TOTAL	**392**	**89**	**235**	**56**	**17**	**36**	**3**	**3**	**5**	

Component	**Count**	**Emissions Factor (scf/hr /comp.)[a]**	**CO_2 (tpy)[d]**	**CH_4 (tpy)[d]**
Connectors	481	0.003	2.27E-04	0.26
Valves (block and control)	291	0.027	1.24E-03	1.39
Safety Relief Valves	17	0.040	1.07E-04	0.12
Open-ended Lines	36	0.061	3.46E-04	0.39
Compressors	3	13.300	6.29E-03	7.08
Meter[b]	3	2.930	1.39E-03	1.56
Orifice Meter[c]	5	0.212	-	0.19
Total			**9.60E-03**	**10.99**

Vol.% CO2 in natural gas[d]: 0.032%
Vol.% CH4 in natural gas[d]: 97.563%

GHG	**Mass Emissions (tpy)**	**GWP[e]**	**CO_2e (tpy)**
CO_2	9.60E-03	1	9.60E-03
CH_4	10.99	25	274.72
Total CO_2e			**274.73**

[a] Whole gas emissions factors from 40 CFR Part 98, Subpart W, Table W-1A for components in gas service for Eastern U.S, unless otherwise stated.
[b] Meter emissions factor from 40 CFR Part 98, Subpart W, Table W-2 for Leaker Emission Factors—Non-Compressor Components, Gas Service.
[c] Whole gas emissions factors from 40 CFR Part 98, Subpart W, Table W-7 for Leaker Emission Factors—Transmission-Distribution Transfer Station Components, Gas Service. Emissions factor is for methane emissions.
[d] CO_2 and CH_4 fractions based on volume % CO_2 and CH_4 in natural gas.
[e] Global warming potentials (GWP) from 40 CFR Part 98, Subpart A, Table A-1.

Fuel comp.	**mole% (mole/100 mole)**	**molec. Wt. (lb/lbmole)**	**lb/lbmole**
CH4	97.56	16.04	15.65
C2H6	2.06	30.07	0.62
C3H8	0.07	44.09	0.03
C4H10	0.00	58.12	0.00
C5H12	0.00	72.15	0.00
C6H14	0.00	86.17	0.00
CO2	0.03	44.01	0.01
N2	0.28	28.01	0.08

Appendix A: Emission Calculations TSD Appendix A: Page 11 of 14

Fugitive GHG Emissions From Natural Gas Pipe Maintenance and Startup/Shutdown Line Purging

Company Name: Allegheny Energy Center
Address: 2130 Margaret St. Ext., West Newton, PA 15089
Title V Operating Permit: 0959-I001
Date: March 29, 2021

Process	Initial Conditions			Final Conditions			No. of Purges per Year	Annual Emissions[c]	
	Volume[a] (ft^3)	Press. (psig)	Temp. (F)	Press. (psig)	Temp. (F)	Volume[b] (ft^3)		CO_2 (TPY)	CH_4 (TPY)
Full piping system purge (650 psig piping)[a]	690	650	60	0	68	35,216	2	1.27E-03	1.43
Full piping system purge (100 psig piping)[a]	240	100	60	0	68	1,918	2	6.90E-05	0.08
CT/DB Skids Purges @ Startups/Shutdowns	74	650	60	0	68	3,782	365	2.48E-02	27.96
Auxiliary Boiler Skid Purges # Startups/Shutdowns	39	100	60	0	68	314	365	2.06E-03	2.32
Total								0.03	31.79

Vol.% CO_2 in natural gas[c]: 0.032%

Vol.% CH_4 in natural gas[c]: 97.56%

GHG	Total Mass Emissions (TPY)	GWP[d]	CO_2e (TPY)
CO_2	0.028244	1	0.028
CH_4	31.79177	25	794.79
Total CO_2e			794.82

Natural Gas Piping Inventory					
Line Description	**Size**	**Quantity**	**Pressure**	**Temp**	**Volume**
	inches	**ft**	**psig**	**F**	**cu.ft**
Aux Boiler Area to Performance Heater Inlet Area	16	85	650	60	118.6
Fuel Gas Conditioning to Aux Boiler Area	16	210	650	60	293.1
Fuel Gas Conditioning to Regulating Skid	12	40	650	60	31.4
Metering Station to Fuel Gas Conditioning	12	40	650	60	31.4
Performance Heater Outlet Area to Filer Sep and CTG Inlet	4	220	650	60	19.2
Piping to Aux Boiler	10	50	650	60	27.3
Utility TP to Metering Station	16	120	650	60	167.5
CT Fuel Gas Skid	16	50	100	60	69.8
CT to Pilot	4	50	100	60	4.4
DB Runner	16	50	100	60	69.8
From Aux. Boiler Area to Aux. Burner Skid	12	50	100	60	39.3
From Aux. Boiler Area to Perf. Heater Area	6	250	100	60	49.1
From Perf. Htr. To DB Skid	4	85	100	60	7.4
Misc. 1"	1	350	650	60	1.9
					930.0
		Total piping @ 650 psig			690.3
		Total piping @ 100 psig			239.6

[a] Initial volume is calculated by multiplying the cross-sectional area by the length of pipe using the following formula: Vi = pi * [(diameter in inches/12)/2]2 * length in feet = ft^3 using the table below.

[b] Final volume calculated using the compressibility factor modification of the ideal gas law to account for real gas behavior: [(PV/ZT)i = (PV/ZT)f]. Vf = Vi (Pi/Pf) (Tf/Ti) (Zf/Zi), where the compressibility factor (Z) for natural gas is estimated based on Dranchuk and Abou-Kassem equation of state using http://checalc.com/solved/naturalgasZ.html:

For 500 psig natural gas at 60F, Z = 0.90
For 35 psig natural gas at 60F, Z = 0.99
For 0 psig natural gas at 68F, Z = 1

[c] CO_2 and CH_4 fractions based on volume % CO_2 and CH_4 in natural gas.

[d] Global warming potentials (GWP) from 40 CFR Part 98, Subpart A, Table A-1.

Appendix A: Emission Calculations
HAPs Emissions From Combustion Sources

Company Name: Allegheny Energy Center
Address: 2130 Margaret St. Ext., West Newton, PA 15089
Title V Operating Permit: 0959-I001
Date: March 29, 2021

								Emissions Unit Description	CT	DB	Auxilary Boiler	Dew Point Heater	Emergency Generator	Fire Water Pump
								Case Number	12	2	N/A	N/A	N/A	N/A
								Operating Time, hrs/yr	8,760	8,760	4,000	8,760	100	100
								Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas	ULSD	ULSD
								Heat Input (HHV), Max. MMBtu/hr each unit	3,844	394.4	88.7	3.0	20.87	1.94
								Number of Units	1	1	1	1	1	1
Emission Factor Reference (unless otherwise noted)			Emissions Factors for Natural Gas-Fired Turbines	Emissions Factors for Natural Gas Combustion	Emissions Factors for Natural Gas Combustion	Emissions Factors for Large Diesel Engines	Emissions Factors for Small Diesel Engines	Emissions Factors for Trace Metals from Distillate Oil Combustion	Annual Emissions					
			AP-42 Ch 3.1	AP-42 Ch 1.4	AP-42 Ch 1.4	AP-42 Ch 3.4	AP-42 Ch. 3.3	AP-42 Ch 1.3						
HAPs Pollutant Emitted	Note	CAS Number	(lb/MMBtu)	(lb/MMscf)	(lb/MMBtu)	(lb/MMBtu)	(lb/MMBtu)	(lb/MMBtu)	(tpy)					
1,3-Butadiene	(a)	106-99-0	4.30E-07	-	-	-	3.91E-05	-	7.24E-03	0.00	0.00	0.00	0.00	3.79E-06
2-Methylnaphthalene		91-57-6	-	2.40E-05	2.29E-08	-	-	-	0.00	3.95E-05	4.05E-06	3.00E-07	0.00	0.00
3-Methylchloranthrene	(a)	56-49-5	-	1.80E-06	1.71E-09	-	-	-	0.00	2.96E-06	3.04E-07	2.25E-08	0.00	0.00
7,12-Dimethylbenz(a)anthracen	(a)	57-97-6	-	1.60E-05	1.52E-08	-	-	-	0.00	2.63E-05	2.70E-06	2.00E-07	0.00	0.00
Acenaphthene	(a)	83-32-9	-	1.80E-06	1.71E-09	4.68E-06	1.42E-06	-	0.00	2.96E-06	3.04E-07	2.25E-08	4.88E-06	1.38E-07
Acenaphthylene	(a)	208-96-8	-	1.80E-06	1.71E-09	9.23E-06	5.06E-06	-	0.00	2.96E-06	3.04E-07	2.25E-08	9.63E-06	4.91E-07
Acetaldehyde		75-07-0	4.00E-05	-	-	2.52E-05	7.67E-04	-	0.67	0.00	0.00	0.00	2.63E-05	7.44E-05
Anthracene	(a)	120-12-7	-	2.40E-06	2.29E-09	1.23E-06	1.87E-06	-	0.00	3.95E-06	4.05E-07	3.00E-08	1.28E-06	1.81E-07
Acrolein	(a)	107-02-8	6.40E-06	-	-	7.88E-06	9.25E-05	-	0.11	0.00	0.00	0.00	8.22E-06	8.98E-06
Benz(a)anthracene	(a)	56-55-3	-	1.80E-06	1.71E-09	6.22E-07	1.68E-06	-	0.00	2.96E-06	3.04E-07	2.25E-08	6.49E-07	1.63E-07
Benzene		71-43-2	1.20E-05	2.10E-03	2.00E-06	7.76E-04	9.33E-04	-	0.20	3.45E-03	3.55E-04	2.63E-05	8.10E-04	9.05E-05
Benzo(a)pyrene (PAH)	(a)	50-32-8	-	1.20E-06	1.14E-09	2.57E-07	1.88E-07	-	0.00	1.97E-06	2.03E-07	1.50E-08	2.68E-07	1.82E-08
Benzo(b)fluoranthene	(a)	205-99-2	-	1.80E-06	1.71E-09	1.11E-06	9.91E-08	-	0.00	2.96E-06	3.04E-07	2.25E-08	1.16E-06	9.62E-09
Benzo(g,h,i)perylene	(a)	191-24-2	-	1.20E-06	1.14E-09	-	4.89E-07	-	0.00	1.97E-06	2.03E-07	1.50E-08	0.00	4.75E-08
Benzo(k)fluoranthene	(a)	207-08-9	-	1.80E-06	1.71E-09	2.18E-07	1.55E-07	-	0.00	2.96E-06	3.04E-07	2.25E-08	2.27E-07	1.50E-08
Chrysene	(a)	218-01-9	-	1.80E-06	1.71E-09	1.53E-06	3.53E-07	-	0.00	2.96E-06	3.04E-07	2.25E-08	1.60E-06	3.43E-08
Dibenz(a,h)anthracene	(a)	53-70-3	-	1.20E-06	1.14E-09	3.46E-07	5.83E-07	-	0.00	1.97E-06	2.03E-07	1.50E-08	3.61E-07	5.66E-08
Dichlorobenzene		25321-22-6	-	1.20E-03	1.14E-06	-	-	-	0.00	1.97E-03	2.03E-04	1.50E-05	0.00	0.00
Ethylbenzene		100-41-4	3.20E-05	-	-	-	-	-	0.54	0.00	0.00	0.00	0.00	0.00
Fluoranthene		206-44-0	-	3.00E-06	2.86E-09	4.03E-06	7.61E-06	-	0.00	4.94E-06	5.07E-07	3.75E-08	4.20E-06	7.38E-07
Fluorene		86-73-7	-	2.80E-06	2.67E-09	1.28E-05	2.92E-05	-	0.00	4.61E-06	4.73E-07	3.50E-08	1.34E-05	2.83E-06
Formaldehyde	(b)	50-00-0	2.76E-04	7.50E-02	2.76E-04	7.89E-05	1.18E-03	-	4.64	0.48	0.05	3.62E-03	8.23E-05	1.15E-04
Hexane (n)	(c)	110-54-3	-	1.30E-03	1.24E-06	-	-	-	0.00	2.14E-03	2.20E-04	1.63E-05	0.00	0.00
Indeno(1,2,3-cd)pyrene	(a)	193-39-5	-	1.80E-06	1.71E-09	4.14E-07	3.75E-07	-	0.00	2.96E-06	3.04E-07	2.25E-08	4.32E-07	3.64E-08
Naphthalene		91-20-3	1.30E-06	6.10E-04	5.81E-07	1.30E-04	8.48E-05	-	0.02	1.00E-03	1.03E-04	7.63E-06	1.36E-04	8.23E-06
Phenanthrene		85-01-8	-	1.70E-05	1.62E-08	4.08E-05	2.94E-05	-	0.00	2.80E-05	2.87E-06	2.13E-07	4.26E-05	2.85E-06
Propylene Oxide	(a)	75-56-9	2.90E-05	-	-	-	-	-	0.49	0.00	0.00	0.00	0.00	0.00
Pyrene		129-00-0	-	5.00E-06	4.76E-09	3.71E-06	4.78E-06	-	0.00	8.23E-06	8.45E-07	6.26E-08	3.87E-06	4.64E-07
Toluene		108-88-3	1.30E-04	3.40E-03	3.24E-06	2.81E-04	4.09E-04	-	2.19	5.59E-03	5.74E-04	4.25E-05	2.93E-04	3.97E-05
Xylenes		1330-20-7	6.40E-05	-	-	1.93E-04	2.85E-04	-	1.08	0.00	0.00	0.00	2.01E-04	2.77E-05
Arsenic		7440-38-2	-	2.00E-04	1.90E-07	-	-	4.00E-06	0.00	3.29E-04	3.38E-05	2.50E-06	4.17E-06	3.88E-07
Beryllium	(a)	7440-41-7	-	1.20E-05	1.14E-08	-	-	3.00E-06	0.00	1.97E-05	2.03E-06	1.50E-07	3.13E-06	2.91E-07
Cadmium		7440-43-9	-	1.10E-03	1.05E-06	-	-	3.00E-06	0.00	1.81E-03	1.86E-04	1.38E-05	3.13E-06	2.91E-07
Chromium		7440-47-3	-	1.40E-03	1.33E-06	-	-	3.00E-06	0.00	2.30E-03	2.37E-04	1.75E-05	3.13E-06	2.91E-07
Cobalt		7440-48-4	-	8.40E-05	8.00E-08	-	-	-	0.00	1.38E-04	1.42E-05	1.05E-06	0.00	0.00
Lead		7439-92-1	-	5.00E-04	4.76E-07	-	-	9.00E-06	0.00	8.23E-04	8.45E-05	6.26E-06	9.39E-06	8.73E-07
Manganese		7439-96-5	-	3.80E-04	3.62E-07	-	-	6.00E-06	0.00	6.25E-04	6.42E-05	4.76E-06	6.26E-06	5.82E-07
Mercury		7439-97-6	-	2.60E-04	2.48E-07	-	-	3.00E-06	0.00	4.28E-04	4.39E-05	3.25E-06	3.13E-06	2.91E-07
Nickel		7440-02-0	-	2.10E-03	2.00E-06	-	-	3.00E-06	0.00	3.45E-03	3.55E-04	2.63E-05	3.13E-06	2.91E-07
Selenium	(a)	7782-49-2	-	2.40E-05	2.29E-08	-	-	1.50E-05	0.00	3.95E-05	4.05E-06	3.00E-07	1.57E-05	1.46E-06
								Highest Individual HAP (tpy)	**4.64**	**0.48**	**0.05**	**3.62E-03**	**8.10E-04**	**1.15E-04**
								Total HAPs (tpy)	**9.95**	**0.50**	**0.05**	**3.81E-03**	**1.69E-03**	**3.81E-04**
									10.50					

[a] Emissions factors are based on method detection limits from AP-24 Chapter 1.4, Chapter 3.1, Chapter 3.3, or Chapter 3.4.

[b] Formaldehyde standard in 40 CFR Part 63, Subpart YYYY (0.091 parts per million, volumetric dry [ppmvd] @ 15% oxygen [O_2]).

[c] The AP-42 emissions factor for hexane from natural gas combustion (AP-42 Chapter 1.4 Table 1.4-3 (7/98)) has been designated as poor (i.e. "E" rating). This hexane emissions factor is considered unreasonably high. Therefore, a more realistic hexane emissions factor is being used. The hexane emissions factor is located in Ventura County Air Pollution Control District document AB2588 AB 2588 - Combustion Emission Factors.

Appendix A: Emission Calculations
Fugitive SF_6 Emissions From Circuit Breakers

Company Name: Allegheny Energy Center
Address: 2130 Margaret St. Ext., West Newton, PA 15089
Title V Operating Permit: 0959-I001
Date: March 29, 2021

Input Data/Assumptions	138 kV	25 kV
Number of SF_6 Circuit Breakers	3	1
Circuit Breaker SF_6 Capacity, per breaker (lbs)	483.0	24.4
Total SF_6 circuit breaker capacity by size (lbs)	1,449.0	24.4
Total SF_6 capacity	1,473.4	lbs
Fugitive Loss/Leak Rate	0.5	% per year[c]
SF_6 Global Warming Potential (40 CFR 98, Subpt. A, Table A-1)	22,800 CO_{2e}/SF_6	
Potential Emissions - Fugitive SF_6[a]	8.5	lbs/year
Potential GHG - Fugitive SF_6 in CO_2e[b]	96.6	tons/year

[a] 1,473.4 total circuit breaker SF6 capacity x 0.5 percent per year leak rate x 1.15 margin = 8.5 lbs/year SF6.

[b] 8.5 lbs/year SF_6 x 22,800 CO_2e/SF_6 GWP / 2,000 lbs/ton = 96.6 tons/year CO_2e.

[c] Leak rate is based on the alarm threshold of 0.5%.

Appendix A: Emission Calculations
GHG Emissions From Combustion Sources

Company Name: Allegheny Energy Center
Address: 2130 Margaret St. Ext., West Newton, PA 15089
Title V Operating Permit: 0959-I001
Date: March 29, 2021

Unit Description	Fuel	Potential Annual Consumption	Fuel Consumption Units	Notes
Combustion Turbine w/ Duct Burner	Natural Gas	36,079,812	MMBtu	Average of Operating Scenarios
Auxiliary Boiler	Natural Gas	354,800	MMBtu	
Dew Point Heater	Natural Gas	26,280	MMBtu	
Emergency Generator	ULSD	2,087	MMBtu	
Fire Water Pump	ULSD	194	MMBtu	

Unit Description	Fuel	CO_2 [a] Emissions Factor	CH_4 [b] Emissions Factor	N_2O [b] Emissions Factor	PTE CO_2	PTE CH_4	PTE N_2O	PTE CO_2e[c]
		lb/MMBtu			TPY			
Combustion Turbine w/ Duct Burner	Natural Gas	439,000	2.20E-03	2.20E-04	1,922,820	40	4	1,924,999.4
Auxiliary Boiler	Natural Gas	116.98	2.20E-03	2.20E-04	20,752	0.39	0.04	20,773.0
Dew Point Heater	Natural Gas	116.98	2.20E-03	2.20E-04	1,537	0.03	2.90E-03	1,538.7
Emergency Generator	ULSD	163.05	6.61E-03	1.32E-03	170	6.90E-03	1.38E-03	170.7
Fire Water Pump	ULSD	163.05	6.61E-03	1.32E-03	15.8	6.42E-04	1.28E-04	15.9
TOTAL								**1,947,327**

[a] The emissions factor for CO_2 for the combustion turbine is from manufacturer's data in lb/hr. The emissions factor for the ancillary equipment is from 40 CFR Part 98, Subpart C, Table C-1 in lb/MMBtu.
[b] Emissions Factor Reference: 40 CFR Part 98, Subpart C, Table C-2
[c] CO_2e is carbon dioxide equivalent, calculated according to 40 CFR Part 98 Equation A-1:

$$CO_2e = \sum_{i=1}^{n} GHG_i \times GWP_i$$

GWPi = global warming potential of greenhouse gas i from 40 CFR Part 98 Table A-1 (below):

Pollutant	GWP
CO_2	1
CH_4	25
N_2O	298

APPENDIX B – BACT/LAER SUMMARY

BACT/LAER Summary for the Combustion Turbine and HRSG, with and without Duct Burners

Pollutant	Control Evaluation Required	Available Control Technologies	Technically Feasible Options	Economically, Environmentally, and Energetically Feasible	Identify BACT/LAER	AEC Proposed BACT/LAER
NO_X	LAER	Good Combustion Practices	✓	Not applicable (N/A) for a LAER analysis.	✓	AEC proposes to use SCR, DLN combustors, and good combustion practices as NO_X LAER for the CT and HRSG with and without DBs.
		Water or Steam Injection	✗		✗	
		Dry Low-NO_X Combustors (DLN)	✓		✓	
		Selective Catalytic Reduction (SCR)	✓		✓	
		Selective Non-Catalytic Reduction (SNCR)	✗		✗	
		Low-NO_X Burners (LNB)	✓		✗	
		Ultra-Low-NO_X Burners (ULNB)	✓		✗	
		Oxidation Catalyst	✗		✗	
		XONON™ Catalytic Combustor	✗		✗	
		EMx™ Catalytic Absorption/Oxidation (Formerly SCONOX™)	✗		✗	
CO	BACT	Good Combustion Practices	✓	✓	✓	AEC proposes to use good combustion practices and catalytic oxidation as CO BACT for the CT and HRSG with and without DBs.
		Oxidation Catalyst	✓	✓	✓	
		XONON™ Catalytic Combustor	✗	✗	✗	
		EMx™ Catalytic Absorption/Oxidation (Formerly SCONOX™)	✗	✗	✗	
VOC	LAER	Good Combustion Practices	✓	Not applicable (N/A) for a LAER analysis.	✓	AEC proposes to use good combustion practices and catalytic oxidation as VOC LAER for the CT and HRSG with and without DBs.
		Oxidation Catalyst	✓		✓	
		XONON™ Catalytic Combustor	✗		✗	
		EMx™ Catalytic Absorption/Oxidation (Formerly SCONOX™)	✗		✗	

Pollutant	Control Evaluation Required	Available Control Technologies	Technically Feasible Options	Economically, Environmentally, and Energetically Feasible	Identify BACT/LAER	AEC Proposed BACT/LAER
PM/PM_{10} $PM_{2.5}$	BACT ACHD BACT	Good Combustion Practices	✓	✓	✓	AEC proposes to use good combustion practices and the use of low sulfur fuels, as PM, PM_{10}, and $PM_{2.5}$ BACT for the CT and HRSG with and without DBs.
		Low Sulfur Fuels	✓	✓	✓	
		Fabric Filter Baghouse	✗	✗	✗	
		Electrostatic Precipitator	✗	✗	✗	
		Wet Electrostatic Precipitator	✗	✗	✗	
		Scrubber	✗	✗	✗	
SO_2	ACHD BACT	Good Combustion Practices	✓	✓	✓	AEC proposes to use good combustion practices and the use of low sulfur fuels, as SO_2 BACT for the CT and HRSG with and without DBs.
		Low Sulfur Fuels	✓	✓	✓	
		Scrubber/Flue Gas Desulfurization	✗	✗	✗	
H_2SO_4	BACT	Good Combustion Practices	✓	✓	✓	AEC proposes to use good combustion practices and the use of low sulfur fuels, as H_2SO_4 BACT for the CT and HRSG with and without DBs.
		Low Sulfur Fuels	✓	✓	✓	
		Flue Gas Desulfurization	✗	✗	✗	
GHG	BACT	Energy efficient and inherently lower-emitting processes/work practices/design	✓	✓	✓	AEC proposes the use of oxidation catalyst in conjunction with energy efficient and inherently lower-emitting processes, work practices, and design for the CT and HRSG with and without DBs.
		Good Combustion Practices	✓	✓	✓	
		Carbon Capture and Sequestration	✓	✗	✗	
		Oxidation Catalyst	✓	✓	✓	
		Thermal Oxidation	✗	✗	✗	

BACT/LAER Summary for the Auxiliary Boiler

Pollutant	Control Evaluation Required	Available Control Technologies	Technically Feasible Options	Economically, Environmentally, and Energetically Feasible	Identify BACT	AEC Proposed BACT/LAER
NO_X	LAER	Good Combustion Practices	✓	Not applicable (N/A) for a LAER analysis.	✓	AEC proposes to use good combustion practices, ULNB, and FGR as LAER for the Auxiliary Boiler.
		Selective Catalytic Reduction (SCR)	✗		✗	
		Selective Non-Catalytic Reduction (SNCR)	✗		✗	
		Low-NO_X Burners (LNB)	✓		✗	
		Ultra-Low-NO_X Burners (ULNB)	✓		✓	
		Flue Gas Recirculation (FGR)	✓		✓	
CO	BACT	Good Combustion Practices	✓	✓	✓	AEC proposes to use good combustion practices as CO BACT for the Auxiliary Boiler.
		Oxidation Catalyst	✗	✗	✗	
		Thermal Oxidation	✗	✗	✗	
VOC	LAER	Good Combustion Practices	✓	Not applicable (N/A) for a LAER analysis.	✓	AEC proposes to use good combustion practices and FGR as VOC LAER for the Auxiliary Boiler.
		Oxidation Catalyst	✗		✗	
		Flue Gas Recirculation	✓		✓	
		Thermal Oxidation	✗		✗	
PM/PM_{10} $PM_{2.5}$	BACT ACHD BACT	Good Combustion Practices	✓	✓	✓	AEC proposes good combustion practices as BACT for the auxiliary boiler to minimize emissions of PM, PM_{10}, and $PM_{2.5}$.
		Low Sulfur Fuels	✓	✓	✓	
		Fabric Filter Baghouse	✗	✗	✗	
		Electrostatic Precipitator	✗	✗	✗	
		Wet Electrostatic Precipitator	✗	✗	✗	
		Scrubber	✗	✗	✗	

Pollutant	Control Evaluation Required	Available Control Technologies	Technically Feasible Options	Economically, Environmentally, and Energetically Feasible	Identify BACT	AEC Proposed BACT/LAER
SO_2	ACHD BACT	Good Combustion Practices	✓	✓	✓	AEC proposes to use good combustion practices, including the use of low sulfur fuels, to control SO_2 emissions from the Auxiliary Boiler.
		Low Sulfur Fuels	✓	✓	✓	
		Scrubber/Flue Gas Desulfurization	✗	✗	✗	
H_2SO_4	BACT	Good Combustion Practices	✓	✓	✓	AEC proposes to use good combustion practices, including the use of low sulfur fuels as H_2SO_4 BACT for the Auxiliary Boiler.
		Low Sulfur Fuels	✓	✓	✓	
GHG	BACT	Energy efficient and inherently lower-emitting processes/work practices/design	✓	✓	✓	AEC proposes energy efficient and inherently lower-emitting processes, work practices, and design as GHG BACT for the Auxiliary Boiler.

BACT/LAER Summary for the Dew Point Heater

Pollutant	Control Evaluation Required	Available Control Technologies	Technically Feasible Options	Economically, Environmentally, and Energetically Feasible	Identify BACT	AEC Proposed BACT/LAER
NO_X	LAER	Good Combustion Practices	✓	Not applicable (N/A) for a LAER analysis.	✓	AEC proposes good combustion practices as NO_X LAER for the Dew Point Heater.
		Selective Catalytic Reduction (SCR)	✗		✗	
		Low-NO_X Burners (LNB)	✗		✗	
		Ultra-Low-NO_X Burners (ULNB)	✗		✗	
		Flue Gas Recirculation (FGR)	✗		✗	
CO	BACT	Good Combustion Practices	✓	✓	✓	AEC proposes good combustion practices as CO BACT for the Dew Point Heater.
		Oxidation Catalyst	✗	✗	✗	
		Thermal Oxidation	✗	✗	✗	
VOC	LAER	Good Combustion Practices	✓	N/A for a LAER analysis.	✓	AEC proposes good combustion practices as VOC LAER for the Dew Point Heater.
		Oxidation Catalyst	✗		✗	
		Flue Gas Recirculation	✗		✗	
PM/PM_{10} $PM_{2.5}$	BACT ACHD BACT	Good Combustion Practices	✓	✓	✓	AEC proposes good combustion practices and the use of low sulfur fuels, as PM, PM_{10}, and $PM_{2.5}$ BACT for the Dew Point Heater.
		Low Sulfur Fuels	✓	✓	✓	
		Fabric Filter Baghouse	✗	✗	✗	
		Electrostatic Precipitator	✗	✗	✗	
		Wet Electrostatic Precipitator	✗	✗	✗	
		Scrubber	✗	✗	✗	
SO_2	ACHD BACT	Good Combustion Practices	✓	✓	✓	AEC proposes good combustion practices and the use of low sulfur fuels, as SO_2 and H_2SO_4 BACT for the Dew Point Heater.
		Low Sulfur Fuels	✓	✓	✓	
		Scrubber/Flue Gas Desulfurization	✗	✗	✗	
H_2SO_4	BACT	Good Combustion Practices	✓	✓	✓	
		Low Sulfur Fuels	✓	✓	✓	

Pollutant	Control Evaluation Required	Available Control Technologies	Technically Feasible Options	Economically, Environmentally, and Energetically Feasible	Identify BACT	AEC Proposed BACT/LAER
GHG	BACT	Energy efficient design and work practices	✓	✓	✓	AEC proposes energy efficient and inherently lower-emitting processes, work practices, and design as GHG BACT for the Dew Point Heater.

BACT/LAER Summary for the Emergency Generator

Pollutant	Control Evaluation Required	Available Control Technologies	Technically Feasible Options	Economically, Environmentally, and Energetically Feasible	Identify BACT	AEC Proposed BACT/LAER
NO_X	LAER	Good Combustion Practices	✓	Not applicable (N/A) for a LAER analysis.	✓	AEC proposes good combustion practices and the use of ULSD as NO_X LAER for the Emergency Generator.
		Selective Catalytic Reduction	✗		✗	
CO	BACT	Good Combustion Practices	✓	✓	✓	AEC proposes good combustion practices and the use of ULSD as CO BACT for the Emergency Generator.
		Diesel Oxidation Catalyst	✗	✗	✗	
VOC	LAER	Good Combustion Practices	✓	Not applicable (N/A) for a LAER analysis.	✓	AEC proposes good combustion practices and the use of ULSD as VOC LAER for the Emergency Generator.
		Oxidation Catalyst	✗		✗	
		Non-Selective Catalytic Reduction	✗		✗	
PM/PM_{10} $PM_{2.5}$	BACT ACHD BACT	Good Combustion Practices	✓	✓	✓	AEC proposes good combustion practices and the use of ULSD as PM, PM_{10}, and $PM_{2.5}$ BACT for the Emergency Generator.
		Low Sulfur Fuels	✓	✓	✓	
		Add-On Control Technologies	✗	✗	✗	
SO_2	ACHD BACT	Good Combustion Practices	✓	✓	✓	AEC proposes good combustion practices and the use of ULSD as SO_2 BACT for the Emergency Generator.
		Low Sulfur Fuels	✓	✓	✓	
		Scrubber/Flue Gas Desulfurization	✗	✗	✗	
H_2SO_4	BACT	Good Combustion Practices	✓	✓	✓	AEC proposes good combustion practices and the use of ULSD as H_2SO_4 BACT for the Emergency Generator.
		Low Sulfur Fuels	✓	✓	✓	
GHG	BACT	Good Combustion Practices	✓	✓	✓	AEC proposes good combustion practices and the use of ULSD as GHG BACT for the Emergency Generator.

BACT/LAER Summary for the Fire Water Pump Engine

Pollutant	Control Evaluation Required	Available Control Technologies	Technically Feasible Options	Economically, Environmentally, and Energetically Feasible	Identify BACT	Identify BACT
NO_X	LAER	Good Combustion Practices	✓	Not applicable (N/A) for a LAER analysis.	✓	AEC proposes good combustion practices and the use of ULSD as NO_X LAER for the Fire Water Pump.
		Selective Catalytic Reduction	✗		✗	
CO	BACT	Good Combustion Practices	✓	✓	✓	AEC proposes good combustion practices and the use of ULSD as CO BACT for the Fire Water Pump.
		Diesel Oxidation Catalyst	✗	✗	✗	
VOC	LAER	Good Combustion Practices	✓	Not applicable (N/A) for a LAER analysis.	✓	AEC proposes good combustion practices and the use of ULSD as VOC LAER for the Fire Water Pump.
		Oxidation Catalyst	✗		✗	
		Non-Selective Catalytic Reduction	✗		✗	
PM/PM_{10} $PM_{2.5}$	BACT ACHD BACT	Good Combustion Practices	✓	✓	✓	AEC proposes good combustion practices and the use of ULSD as PM, PM_{10}, and $PM_{2.5}$ BACT for the Fire Water Pump.
		Low Sulfur Fuels	✓	✓	✓	
		Add-On Control Technologies	✗	✗	✗	
SO_2	ACHD BACT	Good Combustion Practices	✓	✓	✓	AEC proposes good combustion practices and the use of ULSD as SO_2 BACT for the Fire Water Pump.
		Low Sulfur Fuels	✓	✓	✓	
		Scrubber/Flue Gas Desulfurization	✗	✗	✗	
H_2SO_4	BACT	Good Combustion Practices	✓	✓	✓	AEC proposes good combustion practices and the use of ULSD as H_2SO_4 BACT for the Fire Water Pump.
		Low Sulfur Fuels	✓	✓	✓	
GHG	BACT	Good Combustion Practices	✓	✓	✓	AEC proposes good combustion practices and the use of ULSD as GHG BACT for the Fire Water Pump.

BACT/LAER Summary for the Natural Gas Pipeline

Pollutant	Control Evaluation Required	Available Control Technologies	Technically Feasible Options	Economically, Environmentally, and Energetically Feasible	Identify BACT
GHG	BACT	Implementation of AVO programs for fugitive control	✓	✓	✓

BACT/LAER Summary for the Storage Tanks

Pollutant	Control Evaluation Required	Available Control Technologies	Technically Feasible Options	Economically, Environmentally, and Energetically Feasible	Identify BACT
VOC	LAER	Tank Design	✓	✓	✓

BACT/LAER Summary for the Roadways

Pollutant	Control Evaluation Required	Available Control Technologies	Technically Feasible Options	Economically, Environmentally, and Energetically Feasible	Identify BACT
PM/PM_{10} $PM_{2.5}$	BACT	Fugitive Dust Prevention and Control Plan	✓	✓	✓

APPENDIX C – AIR QUALITY MODELING ANALYSIS

In accordance with the Prevention of Significant Deterioration (PSD) rules in 40 CFR § 52.21 and ACHD Article XXI §2102.07(a), Allegheny Energy Center LLC has conducted an air quality analysis which utilizes dispersion modeling. Allegheny Energy Center's air quality analysis satisfies the requirements of the PSD rules and is consistent with the U.S. Environmental Protection Agency's (EPA) *Guideline on Air Quality Models* (40 CFR Part 51, Appendix W) and the EPA's air quality modeling policy and guidance.

In accordance with 40 CFR § 52.21(k), Allegheny Energy Center's air quality analysis demonstrates that the proposed emissions from Allegheny Energy Center's facility would not cause or contribute to air pollution in violation of the National Ambient Air Quality Standards (NAAQS) for carbon monoxide (CO), nitrogen dioxide (NO_2), particulate matter less than or equal to 2.5 micrometers in diameter ($PM_{2.5}$), or particulate matter less than or equal to 10 micrometers in diameter (PM_{10}).

Allegheny County is designated as nonattainment for the 2012 annual particulate matter less than or equal to 2.5 micrometers in diameter ($PM_{2.5}$) NAAQS. Sections of Allegheny County are also designated as nonattainment for the 1997 24-hour $PM_{2.5}$ NAAQS; however, the Elizabeth Township is not one of those sections. In addition, sections of Allegheny County including Elizabeth Township are designated nonattainment with the 2010 1-hour sulfur dioxide (SO_2) NAAQS. As a result, $PM_{2.5}$ and SO_2 are regulated by the Nonattainment New Source Review (NNSR) permitting program. Allegheny Energy Center's proposed $PM_{2.5}$ and SO_2 emissions are below the major source NNSR emissions threshold of 100 tons per year (tpy) and therefore is not subject to NNSR permitting requirements. The Department requested a $PM_{2.5}$ air quality modeling demonstration be completed to evaluate impacts to the $PM_{2.5}$ nonattainment areas. Allegheny County is also part of the Ozone Transport Region, and as such, ozone is regulated by the NNSR permitting program. NO_2 is a precursor for ozone, and proposed emissions are above the major source threshold of 100 tons per year. An SO_2 air quality modeling demonstration was not requested based on the relatively low amount of SO_2 emissions associated with the project.

A summary of the Class II significant impact level (SIL) air quality modeling analysis and subsequent NAAQS air quality modeling demonstration is provided in the following tables:

Table C-1 – Allegheny Energy Center SIL Analysis Air Quality Modeling Results

Pollutant	Averaging Period	AEC Class II SIL Impact	Class II SIL
		$\mu g/m^3$	$\mu g/m^3$
CO	1-Hour	639.55867	2,000
	8-Hour	363.09435	500
NO_2	1-Hour	28.94776[(a)]	7.5
	Annual	0.42440	1.0
$PM_{2.5}$	24-Hour	0.99406	1.2
	Annual	0.08367	0.2
PM_{10}	24-Hour	1.59703	5.0
	Annual	0.08856	1.0

(a) Allegheny Energy Center's impact is greater than Class II SIL therefore NAAQS and PSD increment air quality modeling demonstrations were also completed.

Table C-2 – Allegheny Energy Center NAAQS Air Quality Modeling Demonstration

Pollutant	Averaging Period	Combined Impact[(a)(b)]	NAAQS
		$\mu g/m^3$	$\mu g/m^3$
NO_2	1-Hour	62.2	188.0

(a) AEC contribution combined with background concentration from the Charleroi NO_2 ambient monitor (42-125-0005).

(b) Local sources were also evaluated, and a significant contribution analysis was completed that demonstrated that the contribution of NO_2 concentrations due to

AEC-only sources does not cause or contribute to violations of the 1-hour NO_2 NAAQS.

Allegheny Energy Center's air quality analysis demonstrates that the proposed emissions from Allegheny Energy Center's facility would not cause or contribute to air pollution in violation of the increments for NO_2, $PM_{2.5}$, or PM_{10}. The degree of Class II and Class I increment consumption expected to result from the operation of Allegheny Energy Center's facility is provided in the following tables:

Table C-3 – Degree of Class II Increment Consumption from Operation of Allegheny Energy Center's Facility

Pollutant	Averaging Period	Degree of Class II Increment Consumption		Class II Increment
		µg/m³	% of Class II Increment	µg/m³
NO_2	Annual	< 0.42736	< 1.71 %	25
$PM_{2.5}$	24-Hour	< 0.99411	< 11.05 %	9
	Annual	< 0.08367	< 2.09 %	4
PM_{10}	24-Hour	< 1.59703	< 5.32 %	30
	Annual	< 0.08856	< 0.52 %	17

Table C-4 – Degree of Class I Increment Consumption from Operation of Allegheny Energy Center's Facility

Pollutant	Averaging Period	Degree of Class I Increment Consumption		Class I Increment
		µg/m³	% of Class I Increment	µg/m³
NO_2	Annual	< 0.01061	< 0.42 %	2.5
$PM_{2.5}$	24-Hour	< 0.06632	< 3.32 %	2
	Annual	< 0.00712	< 0.71 %	1
PM_{10}	24-Hour	< 0.10347	< 1.29 %	8
	Annual	< 0.00713	< 0.18 %	4

In accordance with 40 CFR §52.21(o), Allegheny Energy Center provided a satisfactory analysis of the impairment to visibility, soils, and vegetation that would occur as a result of Allegheny Energy Center's facility and general commercial, residential, industrial, and other growth associated with Allegheny Energy Center's facility.

In accordance with 40 CFR §52.21(p), written notice of Allegheny Energy Center's proposed facility has been provided to the Federal Land Managers of nearby Class I areas as well as initial screening calculations to demonstrate that the proposed emissions from Allegheny Energy Center's facility would not adversely impact visibility and air quality related values in nearby Class I areas.

A more detailed summary of the air quality modeling analysis is summarized in Section 6 of the permit application and in ACHD's "Modeling Review of Invenergy LLC (Invenergy) Proposed Natural Gas Combined-Cycle Power Plant Installation Permit" modeling review document prepared by the Planning and Data Analysis Section.

ALLEGHENY COUNTY REGULATIONS:

Allegheny County Regulations (Article XXI - Air Pollution Control Regulations)

ACHD retains jurisdiction within Allegheny County with full delegation from the EPA to enforce the air quality programs under the CAA. The emission sources presented in this document will comply with applicable ACHD regulations promulgated under Article XXI - Air Pollution Control Regulations. This section highlights the applicable county regulations and citations with regulatory requirements pertinent to the proposed Project and Installation Permit Application.

Article XXI §2101.10 - Ambient Air Quality Standards

This Chapter sets for the basis for the ACHD incorporating, by reference, the National Ambient Air Quality Standards, as part of the standards in §2101.10(a). The Project's demonstration of compliance with the NAAQS is presented in Section 6 of the Installation Permit Application.

RECOMMENDATION:

Allegheny Energy Center has demonstrated that the proposed natural gas-fired combined cycle power plant located in Elizabeth Township, Allegheny County meets the requirements of 40 CFR Part 52.21 (related to Prevention of Significant Deterioration), ACHD Article XXI §2102.06 (related to New Source Review), and Best Available Control Technology. In addition to the above recordkeeping, testing, reporting, and federal and state regulations the installation permit incorporates additional requirements that may or may not be addressed in this review. Refer to the installation permit for all requirements pertaining to this project. AEC has also demonstrated that the proposed facility will not cause or contribute to air pollution in violation of the NAAQS, will not impair visibility, soils, and vegetation, and will not adversely affect air quality related values (AQRV), including visibility, in federal Class I areas. Based on this analysis the issuance of an installation permit is recommended.