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
Reviewer: BL
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	PM (Filterable + Condensable)
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	88.30
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	0.40
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	0.07
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	0.06
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	0.01
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**	**88.83**
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
Reviewer: BL
Date: March 29, 2021

Maximum Hourly Heat Input and Emissions During Steady-State Operations for CT and DB
Case 15 - 1 GT @ 100% load, DB 100% (except Pb which is AP-42 and formaldehyde which is Case 14)

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 3,844 MMBtu/hr

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

Maximum/Worst: Case 15
1 GT @ 100% load, DB 100%

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	2.0	2.00
NO_X lb/hr as NO_2	27.9	30.90
CO ppmvd @ 15% O_2	2.0	2.00
CO lb/hr	17.0	18.80
VOC ppmvd @ 15% O_2	1.0	1.50
VOC lb/hr as methane	4.9	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	5.1	5.60
SO_2 lb/MMBtu	0.0014	0.0014
$PM_{10}/PM_{2.5}$ lb/hr	16.5	21.11
$PM_{10}/PM_{2.5}$ lb/MMBtu	0.0084	0.0058
PM filterable lb/hr	8.2	10.55
PM filterable lb/MMBtu	0.0042	0.0029
H_2SO_4 lb/hr	3.6	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.

compared to

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
Reviewer: BL
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.

Cell: C10
Comment: Lipari, Bernadette:
Case 15 w duct bank and Case 17? w/o

Cell: D37
Comment: Lipari, Bernadette:
Case 14

Cell: E37
Comment: Lipari, Bernadette:
Case 21

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
Reviewer: BL
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											
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
Cold Start	1,380	250	900	280
Warm Start	1,300	180	570	220
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		artup+Max Baselo	
Event	Duration Minutes [c]	Annual No. of Events [d]	Annual No. of Hours	NO_X	CO	VOC	NO_X	CO	NO_X	1HR-CO
				lb/event			lb/hr	lb/hr	lb/hr	lb/hr
Cold Start	55	365	334.58	250.0	900.0	280.0	30.9	18.8	252.6	901.6
Warm Start	40	365	243.33	180.0	570.0	220.0	30.9	18.8	190.3	576.3
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
Cold Start	**91250**	**102200**	**328500**
Warm Start	**65700**	**80300**	**208050**
Hot Start	32,850	74,825	142,350
Shutdown	5,110	45,625	31,025

	Potential to Emit (tons/yr)		
	NO_X	VOC	CO
Cold Start	**45.63**	**51.10**	**164.25**
Warm Start	**32.85**	**40.15**	**104.03**
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**

Cell: D54
Comment: Lipari, Bernadette:
Invenergy has as 0.

Cell: D55
Comment: Lipari, Bernadette:
Invenergy has as 0.

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
Reviewer: BL
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
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)								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

	lb/hr	TPY
PM (Filterable + Condensable) 0.17 g/bph-hr	1.17	0.058

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

bhp
1 hp = 0.745699 kW

2000 kW	2280.35 kW
2682.05 bhp	3058 bhp

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
Reviewer: BL
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

			lb/hr	TPY
PM (Filterable + Condensable)	0.17	g/bph-hr	0.11	0.005

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
Reviewer: BL
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/MM		(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

			lb/hr	TPY
PM (Filterable + Condensable)	2.25E-03	lb/MMBtu	0.20	0.399

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
Reviewer: BL
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/MI		(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

			lb/hr	TPY
PM (Filterable + Condensable)	5.24E-03	lb/MMBtu	0.02	0.069

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
Reviewer: BL
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 Conv	491.67
Multiplier for Rankine to Celsius Conv	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
Reviewer: BL
Date: March 29, 2021

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

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	**Total 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

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
Reviewer: BL
Date: March 29, 2021

Process	Initial Conditions			Final Conditions				nnual Emissions	
	Volume[a] (ft^3)	Press. (psig)	Temp. (F)	Press. (psig)	Temp. (F)	Volume[b] (ft^3)	No. of Purges per Year	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	0.0282444	1	0.028
CH_4	31.791775	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
Reviewer: BL
Date: March 29, 2021

									CT	DB	Auxilary Boiler	Dew Point Heater	Emergency Generator	Fire Water Pump
								Emissions Unit Description						
								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**	**(tpy)**					
HAPs Pollutant Emitted	**Note**	**CAS Number**	**(lb/MMBtu)**	**(lb/MMscf)**	**(lb/MMBtu)**	**(lb/MMBtu)**	**(lb/MMBtu)**	**(lb/MMBtu)**						
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)anthracene	(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

Cell: B40

Comment: Lipari, Bernadette:

Invenergy tested this in Table C-2 and used the highest number - 2.76 e-4 instead of the AP42 factor of 7.1 e-4.

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
Reviewer: BL
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
Reviewer: BL
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