

**ALLEGHENY COUNTY HEALTH DEPARTMENT
AIR QUALITY PROGRAM**

December 18, 2013

SUBJECT: Review of Application
Renewal Title V Operating Permit
Bellefield Boiler Plant
S. Neville Street
Pittsburgh, PA 15213

RE: Operating Permit File No. 0047
Commercial steam generation plant

TO: Sandra L. Etzel
Chief Engineer

FROM: Hafeez Ajenifuja
Permit Engineer

FACILITY DESCRIPTION:

The Bellefield Boiler Plant, is a commercial steam generation facility located on Boundary Street in the Oakland section of Pittsburgh, PA, which supplies steam for heating and refrigeration to institutional sites in that area. The plant is composed of six (6) boilers exhausting to one stack, which fire natural gas as their primary fuel and has the capacity to fire no. 2 fuel oil with sulfur content of 0.05% (500 ppm) at times of emergency or natural gas curtailment with the exception of boilers 1, 5 and 8a, which do not have the capability to fire fuel oil. Boilers 3, 6 and 7 emergency fuel oil usage will be based on 500 hours/year. The facility also has two (2) oil fired emergency generators rated at 771 hp (5.4 MMBtu/hr) each.

The facility is a major source of nitrogen oxides (NO_x) and carbon monoxide emissions (CO), a minor source of particulate matter (PM), particulate matter < 10 microns in diameter. (PM-10), sulfur dioxide (SO₂), volatile organic compounds (VOCs) and hazardous air pollutants (HAPs) as defined in section 2101.20 of Article XXI.

The facility consists of the following emission units:

1. Boilers no.1 and no.5 at 124 & 134 MMtus/hr respectively - Natural gas only
2. Boiler no.3 at 119MMBtu (fuel oil) and 128 MMBtu (natural gas) – Natural Gas as Primary Fuel & No. 2 fuel oil as an emergency
3. Boilers no. 6 & 7 at 179 & 188 MMBtus/hr - Natural Gas as Primary Fuel & No. 2 fuel oil as an emergency
4. Boiler no. 8a at 87 MMbtus/hr each- Natural gas, rental unit
5. Two (2) 771 HP/500 kW (5.4 MMBtus/hr) each emergency generator – no. 2 fuel oil
6. No.2 fuel oil underground storage tanks no 1 through 4 – 30,000 gallons each

Coal fired boilers no.2 & no.4 were shut down in December 2003 and November 2002 respectively.

PROCESS DESCRIPTION:

This is a Title V renewal application for Bellefield Boiler Plant located in the City of Pittsburgh, Allegheny County. The original operating permit was issued on August 31, 2004 and the following changes were made during the renewal:

1. Boilers 1, 3 and 5: Coal has been deleted as an authorized fuel from and after July 1, 2009;
2. Boiler 3 Conditions V.B.1.c, V.B.1.d, V.B.1.g, V.B.1.h, V.B.1.m, V.B.1.n, V.B.2.c, V.B.3.a through c, V.D.4.b.3, V.B.5.a.1.c and V.B.7.a.2 have been deleted because the facility is no longer firing coal. The emission limit table was revised by deleting the coal emission limit. All other conditions referencing coal were revised. Condition V.B.1.f fuel sulfur content was reduced from 0.5% to 0.05%. Conditions V.B.1.g and h; Condition V.B.3.a were added;
3. Boiler 5 Conditions V.C.1.b, V.C.1.c, V.C.1.e, V.C.1.f, V.C.1.j, V.C.1.k, V.C.2.c, V.C.3.a through c, V.C.4.b.2 and V.C.7.a.2 have been deleted because the facility is no longer firing coal. The emission limit table was revised by deleting the coal emission limit. All other conditions referencing coal were revised;
4. Boiler 6 Condition V.D.1.f was revised by adding fuel sulfur content 0.05% (500 ppm). Conditions V.D.1.g and h were added. Condition V.D.1.k, the emission limit table was revised as necessary. Conditions V.D.3.a, V.D.4.b.3 and V.B.5.a.1.c;
5. Boiler 7 Condition V.D.1.i was revised by reducing fuel sulfur content from 0.5% to 0.05% (500 ppm). Conditions V.D.1.j and k were added. Condition V.D.1.q was revised as necessary;
6. Boiler 8 (rated at 160 MMBtu/hr) was deleted from the operating permit because it was no longer in use and it was replaced by boiler 8a;
7. Boilers 8a (87 MMBtu/hr) installation permit number 0047-I001f conditions were added to the permit.
8. Condition IV.20, Fuel Oil Cap: This condition was incorporated into the permit at the request of the facility. It limits the facility fuel burning among boilers 3, 6 & 7 to no greater than 1,275,000 gallons. The fuel cap was determined based on the fuel consumption rate for the most restricted boiler. The amount of fuel oil that each boiler is allowed to burn on an hourly basis is shown in the Table below, and it shows that boiler 3 has the lowest fuel oil consumption rate.

Boiler No.	Design Heat Input Rate for Oil (MMBtu/hr)	Permitted Maximum Oil Combustion Rate (gallons/hr)
3	119	850
6	179	1,280
7	188	1,340

The boilers are limited to 500 hours per year each while combusting fuel oil. Therefore, 1,500 hours of allowable fuel oil use in boiler 3 would produce the most restrictive equivalent

gallons per year limit. A factor of 5% was applied to the fuel oil cap calculation to account for fuel oil variability.

$$(850 \text{ gallons per hour}) * (1,500 \text{ hour/year}) = 1,275,000 \text{ gallons per year.}$$

EMISSION SOURCES OF MINOR SIGNIFICANCE:

1. Paved areas are a source of minor significance with negligible emissions of PM and PM-10 as per US EPA, AP-42, Section 13.2.1, "Paved Roads", 10-97.
2. The four No. 2 fuel oil underground storage tanks have negligible emissions of VOCs and HAPs as per US EPA, AP-42, Section 7.1, "Organic Liquid Storage Tanks", 9-97.

Fugitive emission sources:

Paved areas: Total paved areas are <2,000 ft² including parking spaces.

Unpaved roads: None

Parking areas: Included in paved areas above

Other sources: None

EMISSION CALCULATION:

The following table lists the emission decrease from deleting coal as the authorized/primary fuel in boilers 1, 3 and 6 and using NG as the primary fuel and No. 2 fuel as back up during emergencies in boiler 3

Pollutant	Total Combined Annual Emission Limit (tons/year)*	
	Before Deleting Coal as Fuel	After Deleting Coal as Fuel
Particulate Matter	383.78	7.29
PM-10	180.08	7.29
SO _x	1,413.50	21.10
NO _x	879.00	657.22
CO	371.50	74.59
VOC	7.43	4.88

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

EMISSION FACTOR SUMMARY:

Pollutant	Boiler Emissions Factor- NG Only ^a		Boiler Emissions Factor-Fuel Oil Only ^b	
PM	0.008 lb/MMBtu	Article XXI, §2104.02.a.1.A	0.0015 lb/MMBtu	Article XXI, §2104.02.a.1.B
PM ₁₀	0.008 lb/MMBtu	Article XXI, §2104.02.a.1.A	0.0015 lb/MMBtu	Article XXI, §2104.02.a.1.B
PM _{2.5}	0.008 lb/MMBtu	Article XXI, §2104.02.a.1.A	0.0015 lb/MMBtu	Article XXI, §2104.02.a.1.B
NO _x	RACT No. 248		RACT No. 248	
CO	0.817 lb/MMBtu	AP-42	0.0357 lb/MMBtu	AP-42, Table 1.3-1 (7/98)
SO _x	0.0006 lb/MMBtu	AP-42, Table 1.4-2 (7/98)	Article XXI, §2104.03.a.2.B	
VOC	0.0054 lb/MMscf	AP-42, Table 1.4-2 (7/98)	0.0024 lb/MMBtu	AP-42, Table 1.3-3 (7/98)

^aNote AP-42 emission factor was converted from lbs/MMSCF to lbs/MMBtu using the natural gas heating value of 1028 Btu/scf

^bNote AP-42 emission factor was converted from lbs/Mgal to lbs/MMbtu using the fuel oil heating value of 140,000 Btu/gal

POTENTIAL EMISSION SUMMARY:

Boilers No.1, No.5 and No.8a Firing NG Only-All exhausting through Stack No.2

Pollutants	Emissions ^a					
	Boiler 1 74 MMBtu/hr		Boiler 5 74 MMBtu/hr		Boiler 8a 87 MMBtu/hr	
	Lbs/hr	Tons/yr ^b	Lbs/hr	Tons/yr ^b	Lbs/hr	Tons/yr ^b
PM/PM ₁₀	0.59	2.59	0.59	2.59	0.70	3.05
NO _x	68.08	298.19	43.66	191.23	4.80	20.90
SO _x	0.04	0.19	0.04	0.19	0.05	0.23
CO	6.05	26.48	6.09	26.48	7.10	24.50
VOC	0.40	1.73	0.40	1.73	0.47	2.10

^aThe boiler NOx emission is based on RACT Order 248

^bA year is defined as any consecutive 12-month period

Boilers No. 3, No.6, No. 7 Firing NG & Fuel Oil as Emergency Only-All exhausting through Stack No. 2

Pollutants	Emissions ^a								
	Boiler ^b 3 128 MMBtu/hr			Boiler 6 179 MMBtu/hr			Boiler 7 188 MMBtu/hr		
	NG Lbs/hr	Fuel Oil Lbs/hr	Tons/yr ^b	NG Lbs/hr	Fuel Oil Lbs/hr	Tons/yr ^b	NG Lbs/hr	Fuel Oil Lbs/hr	Tons/yr ^b
PM/PM ₁₀	1.02	1.78	2.11	1.43	2.69	5.91	1.00	2.82	1.00
NO _x	80.64	74.97	167.80	50.12	50.12	207.0	38.0	37.60	38.00
SO _x	0.07	103.61	20.72	0.11	147.20	36.80	0.10	153.54	38.39
CO	10.64	4.25	21.60	14.63	6.39	60.42	27.0	3.21	27.0
VOC	0.68	0.29	1.40	1.02	14.68	4.21	3.6	0.46	3.6

^aThe boiler NOx emission is based on RACT Order 248

^aThe fuel oil usage for boilers 3, 6 & 7 are based on 500 hours per year each.

^aThe NG is based on 8,260 hours per year

^aNG heating value is 1028 btu/scf

^bBoiler 3 is limited to 50% capacity or operate at 64 MMBtu/hr or 560,640 MMBtu/yr based on RACT Order

^bBoiler 3 burner is 119 MMBtu/hr when firing fuel oil

Sample Calculation (PM for boiler firing natural gas)

PM: (0.008 lb/MMBtu)*(128 MMBtu/hr) = 1.02 lb/hr

(1.02 lb/hr)*(8760 hr/yr)/(2000 lb/ton)*(0.5) = 2.11 tpy

OR

For No. 2 Fuel Oil (PM for boiler firing No. 2 fuel oil)

PM: (0.015 lb/MMBtu)*(119 MMBtu/hr) = **1.79 lb/hr**

(1.79 lb/hr)*(500 hr/yr)/(2000 lb/ton) = **0.45 tpy**

RENEWAL OPERATING APPLICATION COMPONENTS:

1. Renewal Permit Application No. 0044 was received on February 27, 2009.
2. Update application information was received July 13, 2010
3. Installation Permit 91-I0056-C, For No. 7 gas fired boiler, Issued on December 3, 1991
4. Installation Permit Amendment 0047-I001f, For No. 8a gas fired boiler, Issued on November 2, 2007
5. Installation Permit 0047-I002, Issued November 2, 2007

METHOD OF DEMONSTRATING COMPLIANCE:

The facility will demonstrate compliance by complying with the daily recording of fuel type and consumption; maintain fuel certifications from #2 fuel oil suppliers per shipment. The facility will continuously monitor NO_x in boilers 7 and 8a. The facility will also continuously monitor and record flue gas oxygen content for all the boilers and tune ups for boilers 3, 6 and 7 to ensure the boilers are being operated and maintained properly and record keeping and recording requirements that include inspection, maintenance and repair data and monthly usage of natural gas and fuel oil. In addition, NO_x compliance may be demonstrated by the specified periodic NO_x emission tests. See the Operating Permit No. 0047 for the specific compliance methods, record keeping and reporting requirements for the facility.

REGULATORY APPLICABILITY:

1. Article XXI Requirements for Issuance:

The requirements of Article XXI, Parts B and C for the issuance of major source 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:

Pursuant to the RACT Order 248 requirement and §2105.06.b.4.B of Article XXI, Major Sources of NO_x and or VOCs Reasonably Available Control Technology, the facility will test boilers no.1, 3 and 5 through 8a for compliance with NO_x emissions every two years (24 consecutive months), while combusting natural gas and also, in addition, perform testing and maintenance on boilers 3, 6 and 7 while combusting fuel oil every 5 years for a combined total of 48 hours each during any calendar year according to approved U.S. EPA test methods and Section 2108.02 of Article XXI.

3. New Source Performance Standards (NSPS):

- a. *40 CFR PART 60, Subpart Db, Standards of Performance for Industrial Commercial-Institutional Steam Generating Units:*

This subpart is not applicable to boilers 1, 3, 5 & 6 because they were all installed before the applicability date of June 19, 1984 and also boilers 1 & 5 are below 100 MMBtu/hr. But the subpart is applicable to boiler 7 because the capacity is greater than 100 MMBtu/hr and it was installed in 1994.

- b. *40 CFR PART 60, Subpart Dc, Standards of Performance for Small Industrial Commercial-Institutional Steam Generating Units:*

Boiler 8a is the only boilers subject to this NSPS, Subpart Dc because boiler 8a was installed in 2004.

4. **NESHAP and MACT Standards:**

- a. *40 CFR PART 63 Subpart DDDDD--National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters:*

The facility was once subject to Subpart DDDDD due to firing coal as the primary fuel and was therefore, considered a major source of HCL. But after July 1, 2009, the facility ceased combusting coal and changed to natural gas as the primary fuel and fuel oil as back up in boilers 3,6 & 7. The changing from coal fuel to natural gas makes the facility a minor source of HAPs and no longer subject to subpart DDDDD.

- b. *40 CFR PART 63 Subpart JJJJJ--National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Source:*

The facility is not subject to this subpart. Pursuant to §63.11195(e), a gas fired boiler is not subject to this subpart. However, boilers 3, 6 and 7 are capable of firing fuel oil for emergency gas curtailment or gas interruption and therefore subject to Subpart JJJJJJ, Table 2, every 5 years tune-ups based on limited fuel oil use.

5. **Compliance Assurance Monitoring:**

The Compliance Assurance Monitoring (CAM) rule found in 40 CFR 64 is not applicable to the facility pursuant to §64.2(a)(2), which states “the CAM requirements apply to unit that uses a control device to achieve compliance with any such emission limitation or standard”. Therefore, since the facility does not have any control device, it is exempt from the CAM requirement.

6. **Reasonable Available Control Technology (RACT)**

Section 2105.06 of Article XXI requires that RACT be applied to all major sources of NO_x. The facility is subject to NO_x Reasonable Available Control Technology (NO_x RACT) because it is a major source of NO_x.

A NO_x RACT analysis found that no combustion or stack gas NO_x control equipment was technically or economically feasible for use on boilers no. 1 through no.7. Plan Approval Order and Agreement Upon Consent Number 248, dated December 19, 1996, submitted to the U.S EPA as a site specific SIP revision to Allegheny County’s portion of the PA SIP, has established the following conditions for NO_x RACT:

Maximum Allowable NO_x RACT emissions for both natural gas and fuel oil are shown in the Table below:

Unit	Lbs/MMBtu
Boiler no.1	0.92
Boiler no.3	0.63
Boiler no.5	0.59
Boiler no.6	0.28
Boiler no.7	0.20

NO_x emission testing of boilers no.1 through no.6 every two (2) years is required along with a NO_x CEM on boiler no.7 in accordance with 40 CFR 60, subpart Db. In addition, natural gas input to the burner in boiler no.3 is limited to a maximum of 64 mmbtu/hr or 560,640 mmbtu/yr along with record keeping and recording requirements for each boiler.

Boiler no.8a was constructed after the Plan Approval Order took effect therefore there are no conditions from the order applicable to that unit.

7. Regulate Pollutants With No Established Regulatory Emission Limitation:

Section 2103.12.a.2.B of Article XXI requires that RACT be applied to pollutants regulated by Article XXI without established regulatory emission limitations. RACT for carbon monoxide and volatile organic compound emissions from boilers no. 1 through no. 6 have been determined to be proper operation and maintenance of the boilers according to accepted combustion practices, therefore, the emission limitations for these pollutants will be the maximum potential emissions under proper operation of the boilers as shown in the above emission summary.

8. Streamlining Installation Permit 91-I-0056-C, Boiler No.7:

Installation Permit #91-I-0056-C specifies NO_x emission limits for Boiler no.7 at, 38 lbs/hr and 38 tons/yr for natural gas and oil combustion. These permit limits are more restrictive than NO_x RACT and being the controlling regulation for NO_x has been used as the controlling set of limitations for NO_x in the Operating Permit. The RACT 0.20 lbs/mmbtu emission limitation remains in the Operating Permit and is equivalent to the IP limit of 38 lbs/hr.

The above referenced installation permit was issued on December 3, 1991 and contains emission limitations for boiler no.7 firing natural gas only. Fuel oil was a permitted fuel for emergency only in the permit with no oil only emission limitations or restrictions on maximum annual oil usage. Fuel oil emission limitations based on AP-42, 1.3, 9/98 as well as a maximum of 500 hours/yr of fuel oil combustion at maximum capacity were added to the Title V Operating Permit.

9. EMISSIONS SUMMARY:

The allowable emission summary of Bellefield Plant is given in Table below:

Facility Potential Emissions

Emission Limitations

POLLUTANT	ANNUAL EMISSION LIMIT (tons/year)*
Particulate Matter	20.66
PM-10	20.66
SO_x	97.07
NO_x	946.75
CO	217.81
VOC	18.89

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

RECOMMENDATIONS:

All applicable Federal, State, and County regulations have been addressed in the permit application. The renewal Title V permit for the Bellefield Plant should be approved with the emission limitations, terms and conditions in Permit No 0044.

APPENDIX A

Emission Unit Data

Emission Unit Data

Units	Make	Model	Type ^a	Input Rating	Date Installed	Primary Fuel	Secondary Fuel	Exhaust No.	Emission Control
Boiler 1	Babcock & Wilcox	2 Drum	Overfeed Stoker	74 MMBtu/hr	1956	NG	NA	Stack No. 2	None
Boiler ^b 3	Erie City	VC	Chain Grate Stoker	128 & 119 MMBtu/hr	1977	NF	Fuel Oil	Stack No. 2	None
Boiler 5	Erie City	VC	Chain Grate Stoker	74 MMBtu/hr	1965	NG	NA	Stack No. 2	None
Boiler 6	Erie City	Keystone M21	FGR	179 MMBtu/hr	1973	NG	Fuel Oil	Stack No. 2	None
Boiler 7	IBW	WM 1500	FGR	188 MMBtu/hr	1994	NG	Fuel Oil	Stack No. 2	None
Boiler 8a	Rental	ND	Low NOx with optional FGR	87 MMBtu/hr	2004	GN	NA	Stack No. 2	None
Two Emergency generators	Caterpillar	3412	IC engine	711 hp Each		Diesel	NA	Stack No. 3	None
Tanks 1-4	None	None	Underground Horizontal Each	30,000 gallons each		No.2 fuel oil each	NA	None	None

^aChain-grate (overfeed) stoker with sidewall gas burner

Gas: 128 MMBtu/hr maximum heat input

Oil: 119 MMBtu/hr maximum heat input