

ALLEGHENY COUNTY HEALTH DEPARTMENT AIR QUALITY PROGRAM

June 26, 2023

SUBJECT: Reasonably Available Control Technology (RACT III) Determination
Bellefield Boiler Plant
4400 Forbes Avenue
Pittsburgh, PA 15213
Allegheny County

Permit No. 0047

TO: JoAnn Truchan, P.E.
Program Manager, Engineering

FROM: Reihaneh Etemadi
Air Quality Engineer

I. Executive Summary

The Bellefield Boiler Plant is defined as a major source of NO_x emissions and was subjected to a Reasonably Achievable Control Technology III (RACT III) review by the Allegheny County Health Department (ACHD) required for the 2015 Ozone National Ambient Air Quality Standard (NAAQS). The findings of the review established that the Bellefield Boiler Plant is subject to both presumptive RACT III and case-by-case RACT III requirements. These requirements are summarized below:

Table 1 Technically and Financially Feasible Control Options Summary for NO_x

Unit ID	Emissions Unit	Financially Feasible Control Option	Current NO _x PTE	RACT Reduction	Revised NO _x PTE	Annualized Control Cost (\$/yr)	Cost Effectiveness (\$/ton NO _x removed)
There are no additional technically and financially feasible control options available for NO _x reduction from RACT II to RACT III.							

These findings are based on the following documents:

- RACT III evaluation performed by CDM Smith on behalf of Bellefield Boiler Plant dated December 15, 2022.
- RACT II permit No. 0047-I003a, issued April 14, 2020 and amended November 30, 2020 (EPA approved on October 21, 2021, 86 FR 58223)

II. Regulatory Basis

On October 26, 2015, the US EPA revised the ozone NAAQS. To meet the new standards, ACHD requested all major sources of NO_x (potential emissions of 100 tons per year or greater) and all major sources of VOC (potential emissions of 50 tons per year or greater) to reevaluate NO_x and/or RACT for incorporation into Allegheny County's portion of the PA SIP. ACHD has also incorporated by reference 25 Pa. Code, §§129.111-115 under Article XXI, §2105.08 ("RACT III").

This document is the result of ACHD's determination of RACT submitted by the subject sources and supplemented with additional information as needed by ACHD. The provisions of RACT III will replace those of the previous RACT I and RACT II.

As part of the RACT regulations codified in 25 Pa. Code §§ 129.111—129.115 (relating to additional RACT requirements for major sources of NO_x and VOCs for the 2015 ozone NAAQS) (RACT III), ACHD has adopted the Pennsylvania Department of Environmental Protection's established method under § 129.114(i) (relating to alternative RACT proposal and petition for alternative compliance schedule) for an applicant to demonstrate that the alternative RACT compliance requirements incorporated under § 129.99 (relating to alternative RACT proposal and petition for alternative compliance schedule) (RACT II) for a source that commenced operation on or before October 24, 2016, and which remain in force in the applicable operating permit continue to be RACT under RACT III as long as no modifications or changes were made to the source after October 24, 2016. The date of October 24, 2016, is the date specified in § 129.99(i)(1) by which written RACT proposals to address the 1997 and 2008 8-hour ozone National Ambient Air Quality Standard (NAAQS) were due to the Department from the owner or operator of an air contamination source located at a major NO_x emitting facility or a major VOC emitting facility subject to § 129.96(a) or (b) (relating to applicability).

The procedures to demonstrate that RACT II is RACT III are specified in § 129.114(i)(1)(i), 129.114(i)(1)(ii) and 129.114(i)(2), that is, subsection (i), paragraphs (1) and (2). An applicant may submit an analysis, certified by the responsible official, that the RACT II permit requirements remain RACT for RACT III by following the procedures established under subsection (i), paragraphs (1) and (2).

Paragraph (1) establishes cost effectiveness thresholds of \$7,500 per ton of NO_x emissions reduced and \$12,000 per ton of VOC emissions reduced as "screening level values" to determine the amount of analysis and due diligence that the applicant shall perform if there is no new pollutant specific air cleaning device, air pollution control technology or technique available at the time of submittal of the analysis. Paragraph (1) has two subparagraphs.

Subparagraph (i) under paragraph (1) specifies that the applicant that evaluates and determines that there is no new pollutant specific air cleaning device, air pollution control technology or technique available at the time of submittal of the analysis and that each technically feasible air cleaning device, air pollution control technology or technique evaluated for the alternative RACT requirement or RACT emission limitation approved by the Department (or appropriate approved local air pollution control agency) under § 129.99(e) had a cost effectiveness equal to or greater than \$7,500 per ton of NO_x emissions reduced or \$12,000 per ton of VOC emissions reduced shall include the following information in the analysis:

- A statement that explains how the owner or operator determined that there is no new pollutant specific air cleaning device, air pollution control technology or technique available.
- A list of the technically feasible air cleaning devices, air pollution control technologies or techniques previously evaluated under RACT II.
- A summary of the economic feasibility analysis performed for each technically feasible air cleaning device, air pollution control technology or technique in the previous bullet and the cost effectiveness of each technically feasible air cleaning device, air pollution control technology or technique as submitted previously under RACT II.
- A statement that an evaluation of each economic feasibility analysis summarized in the previous bullet demonstrates that the cost effectiveness remains equal to or greater than \$7,500 per ton of NO_x emissions reduced or \$12,000 per ton of VOC emissions reduced.

Subparagraph (ii) under paragraph (1) specifies that the applicant that evaluates and determines that there is no new pollutant specific air cleaning device, air pollution control technology or technique available at the time of submittal of the analysis and that each technically feasible air cleaning device, air pollution control technology or technique evaluated for the alternative RACT requirement or RACT emission limitation approved by the Department (or appropriate approved local air pollution control agency) under § 129.99(e) had a cost effectiveness less than \$7,500 per ton of NO_x emissions reduced or \$12,000 per ton of VOC emissions reduced shall include the following information in the analysis:

- A statement that explains how the owner or operator determined that there is no new pollutant specific air cleaning device, air pollution control technology or technique available.
- A list of the technically feasible air cleaning devices, air pollution control technologies or techniques previously evaluated under RACT II.
- A summary of the economic feasibility analysis performed for each technically feasible air cleaning device, air pollution control technology or technique in the previous bullet and the cost effectiveness of each technically feasible air cleaning device, air pollution control technology or technique as submitted previously under RACT II.
- A statement that an evaluation of each economic feasibility analysis summarized in the previous bullet demonstrates that the cost effectiveness remains less than \$7,500 per ton of NO_x emissions reduced or \$12,000 per ton of VOC emissions reduced.
- A new economic feasibility analysis for each technically feasible air cleaning device, air pollution control technology or technique.

Paragraph (2) establishes the procedures that the applicant that evaluates and determines that there is a new or upgraded pollutant specific air cleaning device, air pollution control technology or technique available at the time of submittal of the analysis shall:

- Perform a technical feasibility analysis and an economic feasibility analysis in accordance with § 129.92(b) (relating to RACT proposal requirements).
- Submit that analysis to the Department (or appropriate approved local air pollution control agency) for review and approval.

The applicant shall also provide additional information requested by the Department (or appropriate approved local air pollution control agency) that may be necessary for the evaluation of the analysis submitted under § 129.114(i).

III. Facility Description

Bellefield Boiler Plant is a captive steam generation facility located on S. Neville Street in the Oakland section of Pittsburgh, PA and it supplies steam for heating to institutional sites in that area. The plant is composed of six (6) boilers emitting from one stack. All the boilers fire natural gas as their primary fuel.

The boilers have the capacity to fire no. 2 fuel oil at times of emergency, including natural gas curtailment and natural gas supply interruption, and during maintenance, periodic testing and startups except for 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 an annual capacity factor of 4.91%. The facility also has two (2) oil fired emergency generators rated at 771 hp (5.4 MMBtu/hr) each. On December 19th, 1996 the facility entered into a consent decree with the Department to meet RACT I obligations under RACT Order No. 248.

There were no modifications or changes made to the facility after October 24, 2016. There have been no changes to this facility since the RACT II permit No. 0047-I003a was issued on April 14, 2020 and amended on November 30, 2020.

The Bellefield Boiler Plant is a major source of NO_x emissions. Bellefield Boiler Plant does not emit 50 tons per year or greater of VOC and thus is not a major source of VOC.

Table 2 Facility Sources Subject to Case-by-Case RACT III

Source ID	Description	Rating	NO _x PTE (TPY)	Case-by-Case Limit (RACT II)	Case-by-Case Limit (RACT III)	RACT II as RACT III
B003	Boiler 3	128 MMBtu/hr (Natural Gas) 119 MMBtu/hr (Fuel Oil)	72.3	Annual boiler tune-up	No change from RACT II requirements (129.114(i)(1)(i))	Y
B007	Boiler 7	188 MMBtu/hr	52.8	Annual boiler tune-up	No change from RACT II requirements (129.114(i)(1)(i))	Y

Table 3 Facility Sources Presumptive from RACT III per PA Code 129.112

Source ID	Description	Control Device	Rating	NO _x PTE (TPY)	Presumptive Limit (RACT III)	RACT III Citation
B001	Boiler 1	None	74 MMBtu/hr	32.4	0.1 lb/MMBtu	129.112 (g)(1)(i)
B005	Boiler 5	None	74 MMBtu/hr	32.4	0.1 lb/MMBtu	129.112 (g)(1)(i)
B006	Boiler 6	FGR	179 MMBtu/hr	89.2	0.1 lb/MMBtu	129.112 (g)(1)(i)
B008a	Boiler 8a	LNB	87 MMBtu/hr	21	0.05 lb/MMBtu	129.112 (g)(1)(i)
EG 1 & 2	Two (2) Emergency generators	None	771 hp (5.4 MMBtu/hr), each	NA	NA	§129.112(c)(10)

IV. RACT III Determination

Emergency Generators EG 1 & 2

The two emergency generators shall be maintained and operated in accordance with the manufacturer's specifications and with good operating practices and operate less than 500 hours in any consecutive 12-month period, as required in the rule §129.112(c)(10).

Boilers B-001, B-005, B-006 and B-008a

The presumptive RACT III NO_x limit for natural gas boilers greater than 50 MMBtu/hr is 0.10 lb/MMBtu [129.112 (g)(1)(i)]. As shown in the Table 3, the permitted NO_x emission rates for Boilers B-001, B-005 and B-006, as

approved in RACT II IP 0047-I003a, is 0.1 lb/MMBtu and 0.055 lb/MMBtu for Boiler B-008a. Therefore, Boilers B-001, B-005, B-006 and B-008a will meet the RACT III presumptive RACT limit and no further analysis is required as indicated in Table 3 above.

Boilers B-003, B-006 and B-007 are permitted to use fuel oil as an emergency back-up fuel and with an annual capacity factor restriction of less than five percent. BBP will continue to meet RACT II requirements for RACT III. These requirements include maintaining the oil burners and operating the boilers in accordance with the manufacturer’s specifications and good operating practices.

Boilers B-003, B-007

As shown in the Table 4, the permitted NO_x emission rates for the Boilers B-003 and B-007 do not meet the RACT III presumptive RACT limit, and therefore further analysis is required. For Boilers B-003 and B-007, BBP had proposed an alternative NO_x RACT limit based on a previous RACT II case-by-case analysis (IP-003A). The previous RACT II case-by-case analysis for Boilers B-003 and B-007 found that the low NO_x burner (LNB) and selective catalytic reduction (SCR) options were economically infeasible based on cost estimates obtained from vendors in 2015 and 2017. Because the RACT II cost-effectiveness was deemed economically infeasible at that time, an updated RACT III analysis is provided with a current (2022) budgetary cost analysis.

Table 4 Facility Sources Subject to Case-by-Case RACT III per PA Code 129.114

Source ID	Control Device	Fuel	Heat Input Capacity	NO _x limit (lb/MMBtu) per RACT II IP-003A when firing natural gas	NO _x limit (lb/MMBtu) per RACT II IP-003A when firing fuel oil
Boiler B-003	None	Natural Gas; No. 2 fuel oil (backup)	128 MMBtu/hr (119 MMBtu/hr oil)	0.20	0.63
Boiler B-007	LNB	Natural Gas; No. 2 fuel oil (backup)	188 MMBtu/hr	0.14	0.20

NO_x RACT III Analysis for Boilers B-003 & B-007

Assessment of New NO_x Control Technologies

A case-by-case RACT III analysis was conducted for boilers B-003 and B-007 since they do not meet the RACT III presumptive limit in PA Code 129.112(g).

The facility conducted a review of EPA’s RBLC (RACT, BACT and LAER) clearinghouse determinations for natural gas boilers from the last 10 years (2012-2022) and ACHD did further searches of online control technology vendors and other available guidance to verify if any new NO_x emission control technology is available that was not evaluated previously.

The analysis shows there are no new NO_x emission control technologies available other than those originally evaluated for Boilers B-003 and B-007 during RACT II.

Table 5 below shows a summary of the technologies for NO_x reduction. As shown in this table, Selective Catalytic Reduction (SCR), Low-NO_x Burner (LNB), Flue-Gas Recirculation (FGR) and Combustion optimization or tune-up were determined technically feasible control options. All the others were determined to be technically infeasible.

Table 5 Summary of NO_x Reduction Technologies

Category	Control Option	Technically Feasible Yes/No?
Combustion Optimization	Reduced air preheat (RAP)	No
	Combustion Optimization or Tune-up	Yes
	Low Excess Air (LEA)	No
Staged Combustion	Air Staging	No
	Fuel Staging	No
	Fuel Reburning	No
Additions To Combustion, Air or Fuel	Flue Gas Recirculation (FGR)	Yes
	Water / Steam Injection (WSI)	No
	Fuel Induced Recirculation (FIR)	No
Low-NO _x Burning	Low-NO _x Burner (LNB)	Yes ⁽¹⁾
Post Combustion Control	Selective Catalytic Reduction (SCR)	Yes
	Selective Non-Catalytic Reduction (SNCR)	No

(1) Boiler B-007 is already equipped with Low NO_x Burner.

Boiler B-003 RACT III Cost Analysis

SCR Option

Installation of SCR in Boiler B-003 would cost \$73,700 per ton of NO_x removed. The cost makes this control option economically infeasible for Boiler B-003.

LNB Option

The next technically feasible control option evaluated for economic feasibility is LBN. Installation of LNB in Boiler B-003 would cost \$11,500 per ton of NO_x removed. This cost exceeds the economic infeasibility threshold of \$7,500 per ton of NO_x removed. On this basis, installation on LNB is also not economically feasible.

An annual tune-up was, therefore, determined to be NO_x RACT III for Boiler B-003 .

Boiler B-007 RACT III Cost Analysis

SCR Option

This boiler already possesses a low-NO_x burner with the capability of meeting a NO_x emission limit of 0.14 lb/MMBtu. Installation of SCR in Boiler B-007 would cost \$134,300 per ton of NO_x removed. Since the cost is higher than the economic infeasibility threshold of \$7,500, this control option is economically infeasible.

Therefore, additional control technology beyond the presently installed Low NO_x burner is not considered.

Since Boilers B-003 and B-007 commenced operation before October 24, 2016, have not been modified, and are subject to RACT II requirements under 25 Pa Code § 129.99 (b), which satisfy § 129.114 (b), these sources meet the requirements for § 129.114 (i). The analysis under the requirements of § 129.114 (i)(1)(i) showed that there were no new technically feasible control devices or methods for these boilers. Also, the new economic analysis conducted for the technically feasible control options proved that these methods are still economically infeasible for these boilers. Therefore, RACT III for Boiler B-003 and B-007 shall be continued compliance with the requirements contained in the RACT II permit.

The RACT II Technically Feasible Control Options for Boilers B-003 and B-007 are detailed in Table 6.

The RACT III Technically Feasible Control Options for Boilers B-003 and B-007 are detailed in Table 7 in Section V below.

Table 6 RACT II Technically Feasible NO_x Control Cost Comparisons

Control Option	Process	RACT II Cost Analysis *	
Low NO _x Burners with Flue Gas Recirculation	Boiler B-003	tpy NO _x Removed	27.9
		Cost	\$226,000
		\$/ton	\$8,100
Selective Catalytic Reduction with Flue Gas Recirculation	Boiler B-007	tpy NO _x Removed	26.8
		Cost	\$489,000
		\$/ton	\$18,300

* RACT II Technical Support Document; Bellefield – ract rv3 (April 14, 2020)

V. RACT III Control Technology updated cost analysis

Table 7 RACT III Technically Feasible NO_x Control Updated Cost Comparisons

Control Option	Process	RACT III Cost Analysis	
Selective Catalytic Reduction	Boiler B-003	tpy NO _x Removed	28
		Cost	\$2,065,000
		\$/ton	\$73,700
Low NO _x Burners	Boiler B-003	tpy NO _x Removed	28
		Cost	\$322,000
		\$/ton	\$11,500
Selective Catalytic Reduction	Boiler B-007	tpy NO _x Removed	32.9
		Cost	\$4,424,000
		\$/ton	\$134,300

VI. RACT II as RACT III

The conditions listed in the table in Section VI of this document below supersede the relevant conditions of Plan Approval Order and Agreement # 248 (RACT I), issued December 19, 1996 and RACT II. The RACT III conditions are at least as stringent as those from RACT II. Other RACT I conditions listed in Table 8 below not affected by RACT III remain in effect.

Table 8 RACT II as RACT III Summary

Unit ID	New source or change to existing source?	Pollutant	(RACT II) PTE (tpy)	RACT III PTE (tpy)	RACT II NO _x	RACT III NO _x	RACT III Same as RACT II?
B001	No	NO _x	32.4	32.4	P	P	Y
B003	No	NO _x	NG 56.1	72.3	cbc	cbc	Y
			Fuel oil 16.12				
B005	No	NO _x	32.4	32.4	P	P	Y
B006	No	NO _x	NG 78.40	89.18	P	P	Y
			Fuel oil 10.78				
B007	No	NO _x	NG 44.7	52.78	cbc	cbc	Y
			Fuel oil 8.08				
B008a	No	NO _x	20.98	20.98	cbc	P	Y
TOTAL			299.96	299.96			

VII. RACT III Summary and Revised RACT III Permit Conditions

The Department has analyzed the facility’s proposal for considering RACT II requirements as RACT III and also performed an independent analysis. Based on the information provided by the facility and independently verified by the Department, ACHD has determined that the RACT II requirements satisfy the RACT III requirements. The RACT III requirements are identical to the RACT II requirements and are as stringent as RACT II.

Table 9 RACT I, RACT II, and RACT III Summary

Unit ID	Permit Condition No.	RACT I Requirement	RACT II Requirement	RACT III Requirement
B001, B005 & B008a	(V.A.1.c)	RACT Order No. 248	25 Pa Code §129.97(g)(1)(i)	§129.112(g)(1)(i)
B001, B005 & B008a	(V.A.1.d)		25 Pa Code §129.99	§129.114(i)
B001, B005 & B008a	(V.A.1.e)		25 Pa Code §129.99	§129.114(i)
B001, B005 & B008a	(V.A.2.a)		25 Pa Code §129.99, §129.100	§129.114(i), §129.115
B001, B005 & B008a	(V.A.2.b)		25 Pa Code §129.99, §129.100	§129.114(i), §129.115
B001, B005 & B008a	(V.A.2.c)		25 Pa Code §129.99, §129.100	§129.114(i), §129.115
B001, B005 & B008a	(V.A.3.b)		25 Pa Code §129.100	§129.115
B001, B005 & B008a	(V.A.4.a)		25 Pa Code §129.100	§129.115

Unit ID	Permit Condition No.	RACT I Requirement	RACT II Requirement	RACT III Requirement
B001, B005 & B008a	(V.A.4.c)		25 Pa Code §129.100(i)	§129.115
B001, B005 & B008a	(V.A.5.a)		25 Pa Code §129.100	§129.115
B003, B006 & B007 (No. 2 fuel oil for emergencies)	(V.B.1.b)		25 Pa Code §129.99	§129.114(i)
B003, B006 & B007 (No. 2 fuel oil for emergencies)	(V.B.1.d)		25 Pa Code §129.99	§129.114(i)
B003, B006 & B007 (No. 2 fuel oil for emergencies)	(V.B.1.e)		25 Pa Code §129.99	§129.114(i)
B003, B006 & B007 (No. 2 fuel oil for emergencies)	(V.B.1.f)		25 Pa Code §129.99	§129.114(i)
B003, B006 & B007 (No. 2 fuel oil for emergencies)	(V.B.1.g)		25 Pa Code §129.99	§129.114(i)
B003, B006 & B007 (No. 2 fuel oil for emergencies)	(V.B.1.i)		25 Pa Code §129.97(g)(1)(i)	§129.112(g)(1)(i)
B003, B006 & B007 (No. 2 fuel oil for emergencies)	(V.B.1.j)		25 Pa Code §129.97(c)	§129.112
B003, B006 & B007 (No. 2 fuel oil for emergencies)	(V.B.1.l)		25 Pa Code §129.97(c)(7)	§129.112
B003, B006 & B007 (No. 2 fuel oil for emergencies)	(V.B.1.m)		25 Pa Code §129.97(c)	§129.112
B003, B006 & B007 (No. 2 fuel oil for emergencies)	(V.B.2.a)		25 Pa Code §129.99, §129.100	§129.114(i), §129.115
B003, B006 & B007 (No. 2 fuel oil for emergencies)	(V.B.2.b)		25 Pa Code §129.99, §129.100	§129.114(i), §129.115
B003, B006 & B007 (No. 2 fuel oil for emergencies)	(V.B.2.c)		25 Pa Code §129.99, §129.100	§129.114(i), §129.115
B003, B006 & B007 (No. 2 fuel oil for emergencies)	(V.B.3.b)		25 Pa Code §129.100	§129.115
B003, B006 & B007 (No. 2 fuel oil for emergencies)	(V.B.4.a)		25 Pa Code §129.100	§129.115
B003, B006 & B007 (No. 2 fuel oil for emergencies)	(V.B.4.c)		25 Pa Code §129.100(i)	§129.115

Unit ID	Permit Condition No.	RACT I Requirement	RACT II Requirement	RACT III Requirement
Emergency Generators	(V.C.1.b)		25 Pa Code §129.97(c)	§129.112
Emergency Generators	(V.C.2)		25 Pa Code §129.100	§129.115
Emergency Generators	(V.C.3.a)		25 Pa Code §129.100	§129.115
Emergency Generators	(V.C.3.b)		25 Pa Code §129.100(i)	§129.115
Emergency Generators	(V.C.4.a)		25 Pa Code §129.100	§129.115

Table 10 Revised Permit Conditions

The following conditions were cited for compliance with presumptive RACT (25 Pa. Code, §129.112):

IP #0047-I003	
V.A.1.c	V.B.1.i-m
V.C.1.b	

The following conditions were cited for case-by-case RACT (25 Pa. Code, §129.114):

IP #0047-I003	
V.A.1.d, e	V.B.1.b-g
V.A.2.a-c	V.B.2.a-c

The following conditions were cited for compliance with case-by-case RACT (25 Pa. Code, §129.115):

IP #0047-I003	
V.A.2.a-c	V.B.2.a-c
V.A.3.b	V.B.3.b
V.A.4.a, c	V.B.4.a, c
V.A.5.a	V.C.2
V.C.3.a, b	V.C.4