ALLEGHENY COUNTY HEALTH DEPARTMENT
AIR QUALITY PROGRAM

June 30, 2023

SUBJECT: **Reasonable Available Control Technology (RACT III) Determination**
U.S. Steel Edgar Thomson Plant – Facility #0051
13th Street and Braddock Avenue
Braddock, PA 15104
Allegheny County

Title V Operating Permit No. 0051

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

FROM: Gregson Vaux
Air Quality Engineer

I. Executive Summary

U.S. Steel Edgar Thomson Plant is defined as a major source of NO_X and VOC emissions and was subjected to a Reasonable Achievable Control Technology (RACT III) review by the Allegheny County Health Department (ACHD) required for the 1997 and 2008 Ozone National Ambient Air Quality Standard (NAAQS). The findings of the review established that the U.S. Steel Edgar Thomson facility is subject to both presumptive RACT III and case-by case RACT III requirements and the requirements are summarized below.

Table 1 **Technically and Financially Feasible Control Options Summary for NO_X/VOC**

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

These findings are based on the following documents:

- RACT evaluation performed by Trinity Consultants (U S Steel Edgar Thomson RACT III Report 12-21-2022.pdf) – Submitted on December 22, 2022
- RACT II permit No.0051-I008, issued [April 21, 2020] (EPA approval 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 grater) to reevaluate NO_X and/or VOC 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 source 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 follow.

- 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

The U.S. Steel Edgar Thomson Plant (ET) is an iron and steel making facility that produces mainly steel slabs. Raw materials such as coke, iron-bearing materials, and fluxes are charged to blast furnaces in the iron making process. Molten metal (iron) is tapped from the blast furnace at the Casthouse into transfer ladles.

There are three Riley Boilers at ET, which are used to generate steam, heat, and electricity for the plant. The three primary fuels for the boilers are Blast Furnace Gas (BFG), Coke Oven Gas, (COG), and Natural Gas (NG). On December 30th, 1996 the facility entered into a consent decree with the Department to meet RACT I obligations under RACT Order No. 235. RACT Order 235 was approved as RACT by EPA in 2001 (66 FR 52511).

The last full compliance evaluation (FCE) at U.S. Steel Edgar Thomson was conducted on March 23, 2023 and the facility was found to be in compliance. The facility currently has no violations.

There were no major modifications or changes made to the facility after October 24, 2016. The following changes have been made to the facility since the RACT II permit, #0051-I008, was issued on April 21, 2020. These two units meet presumptive RACT III requirements by maintaining and operating according to the manufacturer's specifications and good operating practices [§129.112(c)(10)].

- Diesel emergency generator GEN-1 (limited to less than 500 hours/year)
- Diesel emergency generator GEN-2 (limited to less than 500 hours/year)

Table 2 Facility Sources Subject to NO_X Case-by-Case RACT III Regulations per PA Code 129.114

Source ID	Description	Rating	NO_X PTE (TPY)	NO_X CBC Limit (RACT II)	NO_X CBC Limit (RACT III)	RACT II as RACT III
P001a	Blast Furnace No. 1 Casthouse	1,752,000 TPY Hot Metal Coke Oven Gas Natural Gas	309.6	Install, maintain and operate the source in accordance with the manufacturer's specifications and with good operating practices.	No change from RACT II requirements (129.114(i)(1)(i))	Y
P001b	Blast Furnace No. 1 Stoves	495 MMBtu/hr	65.04	0.03 lb/MMBtu	No change from RACT II requirements (129.114(i)(1)(i))	Y
P002a	Blast Furnace No. 3 Casthouse	1,752,000 TPY Hot Metal Coke Oven Gas Natural Gas	263.4	Install, maintain and operate the source in accordance with the manufacturer's specifications and with good operating practices.	No change from RACT II requirements (129.114(i)(1)(i))	Y
P002b	Blast Furnace No. 3 Stoves	495 MMBtu/hr	65.0	0.03 lb/MMBtu	No change from RACT II requirements (129.114(i)(1)(i))	Y
P003	BOP Shop	3,467,500 TPY Steel Coke Oven Gas Natural Gas	112.2	Install, maintain and operate the source in accordance with the manufacturer's specifications and with good operating practices.	No change from RACT II requirements (129.114(i)(1)(i))	Y
B001	Riley Boiler No. 1	525 MMBtu/hr Blast Furnace Gas Coke Oven Gas Natural Gas	115.0	0.05 lb/MMBtu (long term limit) 0.07 lb/MMBtu (short term limit)	No change from RACT II requirements (129.114(i)(1)(i))	Y
B002	Riley Boiler No. 2	525 MMBtu/hr Blast Furnace Gas Coke Oven Gas Natural Gas	115.0	0.05 lb/MMBtu (long term limit) 0.07 lb/MMBtu (short term limit)	No change from RACT II requirements (129.114(i)(1)(i))	Y
B003	Riley Boiler No. 3	525 MMBtu/hr Blast Furnace Gas Coke Oven Gas Natural Gas	115.0	0.05 lb/MMBtu (long term limit) 0.07 lb/MMBtu (short term limit)	No change from RACT II requirements (129.114(i)(1)(i))	Y

Table 3 Facility Sources Subject to VOC Case-by-Case RACT III Regulations per PA Code 129.114

Source ID	Description	Rating	VOC PTE (TPY)	VOC CBC Limit (RACT II)	VOC CBC Limit (RACT III)	RACT II as RACT III
P001a	Blast Furnace No. 1 Casthouse	1,752,000 TPY Hot Metal Coke Oven Gas Natural Gas	11.4	Install, maintain and operate the source in accordance with the manufacturer's specifications and with good operating practices.	No change from RACT II requirements (129.114(i)(1)(i))	Y
P002a	Blast Furnace No. 3 Casthouse	1,752,000 TPY Hot Metal Coke Oven Gas Natural Gas	9.6	Install, maintain and operate the source in accordance with the manufacturer's specifications and with good operating practices.	No change from RACT II requirements (129.114(i)(1)(i))	Y

Source ID	Description	Rating	VOC PTE (TPY)	VOC CBC Limit (RACT II)	VOC CBC Limit (RACT III)	RACT II as RACT III
P003	BOP Shop	3,467,500 TPY Steel Coke Oven Gas Natural Gas	25.2	Install, maintain and operate the source in accordance with the manufacturer's specifications and with good operating practices.	No change from RACT II requirements (129.114(i)(1)(i))	Y
F005	BOP Miscellaneous Fugitives (Pot Coat)	N/A	31.9	Install, maintain and operate the source in accordance with the manufacturer's specifications and with good operating practices.	No change from RACT II requirements (129.114(i)(1)(i))	Y

Table 4 Facility Sources Subject to Presumptive from RACT III per PA Code 129.112

Source ID	Description	Combustion Fuel	Rating	NO$_X$ PTE (TPY)	VOC PTE (TPY)	Presumptive RACT Requirement
P001b	Blast Furnace No. 1 Stoves	Blast Furnace Gas Coke Oven Gas Natural Gas	495 MMBtu/hr	NA	2.1	§129.112(k) Maintain and operate in accordance with the manufacturer's specifications and with good operating practices. 0.10 lb/MMBtu NOx
P001c	Blast Furnace Gas Flare	Blast Furnace Gas	3 MMcf/hr	8.9	0.0	§129.112(c)(8) Maintain and operate in accordance with the manufacturer's specifications and with good operating practices.
P002b	Blast Furnace No. 3 Stoves	Blast Furnace Gas Coke Oven Gas Natural Gas	495 MMBtu/hr	NA	2.1	§129.112(k) Maintain and operate in accordance with the manufacturer's specifications and with good operating practices. 0.10 lb/MMBtu NOx
P004	Ladle Metallurgical Facility					§129.112(c) Maintain and operate in accordance with the manufacturer's specifications and with good operating practices.
P005	Dual Strand Caster	Coke Oven Gas Natural Gas	5 MMBtu/hr, combined for LMF and Caster	12.0	1.0	<20 MMBtu/hr §129.112(c) Maintain and operate in accordance with the manufacturer's specifications and with good operating practices.
P006	Vacuum Degasser					§129.112(c) Maintain and operate in accordance with the manufacturer's specifications and with good operating practices.
B001	Riley Boilers No. 1 (Model PAB 013472 NB 918; 525 MMBtu/hr firing BFG, COG and NG)	Blast Furnace Gas Coke Oven Gas Natural Gas	525 MMBtu/hr	CBC See above	9.7	§129.112(c)(2) Maintain and operate in accordance with the manufacturer's specifications and with good operating practices.
B002	Riley Boilers No. 2 (Model PAB 013472 NB 918; 525 MMBtu/hr firing BFG, COG and NG)	Blast Furnace Gas Coke Oven Gas Natural Gas	525 MMBtu/hr	CBC See above	9.7	§129.112(c)(2) Maintain and operate in accordance with the manufacturer's specifications and with good operating practices.
B003	Riley Boilers No. 3 (Model PAB 013472 NB 918; 525 MMBtu/hr firing BFG, COG and NG)	Blast Furnace Gas Coke Oven Gas Natural Gas	525 MMBtu/hr	CBC See above	9.7	§129.112(c)(2) Maintain and operate in accordance with the manufacturer's specifications and with good operating practices.
N/A	Misc. Natural Gas Combustion (space heaters)		<20 MMBtu/hr			§129.112(c) Maintain and operate in accordance with the manufacturer's specifications and with good operating practices.

Source ID	Description	Combustion Fuel	Rating	NO_X PTE (TPY)	VOC PTE (TPY)	Presumptive RACT Requirement
Gen-1 Gen-2	Diesel Emergency Generators and Fire Pump [Cummins QSK60-G6 NR1]; One fire pump at 220 bhp [Cummins, CFP7EVS-F40])	Diesel	Two generators at 2,179 kW each	11.3 each	0.8 each	§129.112(c)(10) §129.112(c) Maintain and operate in accordance with the manufacturer's specifications and with good operating practices.

Table 5 Facility Sources Exempt from RACT III Requirements

Source ID	Description	Combustion Fuel	Rating	NO_X PTE (TPY)	VOC PTE (TPY)	Article XXI RACT Requirement
-	Misc. Storage Tanks	-	-	0.0	-	§2105.82 Not subject to RACT III
F004	Paint and Solvent Use	-	2,949 gal/yr	0.0	2.4	§2105.15.a Not subject to RACT III

IV. RACT III Determination

A RACT Review was conducted by U.S. Steel to evaluate its Edgar Thomson facility and incorporated into the ACHD RACT Determination.

The Case-by-case RACT Control Options for U.S. Steel Edgar Thomson are detailed in Table 6 (NO_X) and Table 7 (VOC)

Table 6 RACT III NO_X Control Comparisons*

Control Option		Blast Furnace No. 1 Casthouse P001a	Blast Furnace No. 3 Casthouse P002a	BOP Shop P003	Riley Boilers B001 – B003
	Cumbustion Fuel	Coke Oven Gas Natural Gas	Coke Oven Gas Natural Gas	Coke Oven Gas Natural Gas	Coke Oven Gas Natural Gas Blast Furnace Gas
Low Nox Burners	tpy NO_X Removed	No Burners	No Burners	No Burners	Technically Infeasible
	Cost	No Burners	No Burners	No Burners	Technically Infeasible
	$/ton	No Burners	No Burners	No Burners	Technically Infeasible
Selective Catalytic Reduction	tpy NO_X Removed	Technically Infeasible	Technically Infeasible	Technically Infeasible	155.25
	Cost	Technically Infeasible	Technically Infeasible	Technically Infeasible	$106,108,444
	$/ton	Technically Infeasible	Technically Infeasible	Technically Infeasible	$683,468
Selective Non-Catalytic Reduction	tpy NO_X Removed	Technically Infeasible	Technically Infeasible	Technically Infeasible	276.0
	Cost	Technically Infeasible	Technically Infeasible	Technically Infeasible	34,348,259
	$/ton	Technically Infeasible	Technically Infeasible	Technically Infeasible	$124,450
	tpy NO_X Removed	Previously Implemented	Previously Implemented	Previously Implemented	Previously Implemented

Control Option		**Blast Furnace No. 1 Casthouse P001a**	**Blast Furnace No. 3 Casthouse P002a**	**BOP Shop P003**	**Riley Boilers B001 – B003**
	Cumbustion Fuel	**Coke Oven Gas Natural Gas**	**Coke Oven Gas Natural Gas**	**Coke Oven Gas Natural Gas**	**Coke Oven Gas Natural Gas Blast Furnace Gas**
Good Engineering/Combustion Practices	**Cost**	N/A	N/A	N/A	N/A
	$/ton	N/A	N/A	N/A	N/A

* RACT II Technical Support Document; uss et – ract rv8 (April 21, 2020)

Table 7 RACT III VOC Control Comparisons*

Control Option		**Blast Furnace No. 1 Casthouse P001a**	**Blast Furnace No. 3 Casthouse P002a**	**BOP Shop P003**	**BOP Misc. Fugitives**
	Cumbustion Fuel	**Coke Oven Gas Natural Gas**	**Coke Oven Gas Natural Gas**	**Coke Oven Gas Natural Gas**	**Coke Oven Gas Natural Gas**
Catalytic Oxidation	**tpy NO_x Removed**	Technically Infeasible	Technically Infeasible	Technically Infeasible	
	Cost	Technically Infeasible	Technically Infeasible	Technically Infeasible	
	$/ton	Technically Infeasible	Technically Infeasible	Technically Infeasible	
Thermal Oxidation/Incineration	**tpy VOC Removed**	Technically Infeasible	Technically Infeasible	Technically Infeasible	
	Cost	Technically Infeasible	Technically Infeasible	Technically Infeasible	
	$/ton	Technically Infeasible	Technically Infeasible	Technically Infeasible	
Catalytic Activated Ceramic Dust Filters	**tpy VOC Removed**	Technically Infeasible	Technically Infeasible	Technically Infeasible	
	Cost	Technically Infeasible	Technically Infeasible	Technically Infeasible	
	$/ton	Technically Infeasible	Technically Infeasible	Technically Infeasible	
Good Engineering Practices	**tpy VOC Removed**	Previously Implemented	Previously Implemented	Previously Implemented	
	Cost	N/A	N/A	N/A	
	$/ton	N/A	N/A	N/A	
Capture and Control	**tpy VOC Removed**				Technically Infeasible
	Cost				Technically Infeasible
	$/ton				Technically Infeasible
Material Substitution	**tpy VOC Removed**				Technically Infeasible
	Cost				Technically Infeasible
	$/ton				Technically Infeasible

* RACT II Technical Support Document; uss et – ract rv8 (April 21, 2020)

Blast Furnace No. 1 Casthouse (P001a) & No. 3 Casthouse (P002a)

NO_X RACT Assessment

The Edgar Thomson blast furnaces combine coke, iron-bearing materials, and fluxes with high heat to produce molten iron and slag. To produce the heat required, hot air must be injected into the blast furnace to ignite the coke. This hot air is produced in the blast furnace stoves and injected into the blast furnace through tuyeres located at the lower portion of the furnace along the circumference. In addition to hot air, auxiliary fuels (natural gas and coke oven gas) are injected into the Edgar Thomson blast furnaces to control flame temperatures within the furnace. The ratios of each material (i.e., iron ore, flux, air, and fuel) will vary depending on the specific product being processed in the furnace. The blast furnace exhaust gas exits the top of the furnace and is collected, processed (cleaned), and reused as fuel in other plant processes. The fugitive NO_X emissions resulting from tapping of the blast furnace are ducted to the casthouse baghouse. In addition, there are ancillary fuel-burning activities (e.g., iron oxide suppression, railcar thaw lines, torpedo car lancing, ladle drying, etc.) that take place within the blast furnace area that contribute to fugitive NO_X emissions that are ducted to the casthouse baghouse.

In general, when considering NO_X emissions from combustion processes there are three types of chemical kinetic processes. The NO_X emissions from these chemical mechanisms are referred to as: (1) thermal NO_X; (2) fuel NO_X; and (3) prompt NO_X.

Thermal NO_X is generated by the oxidation of molecular nitrogen (N_2) in the combustion air as it passes through the flame in the blast furnaces. This reaction requires high temperatures, hence the name thermal NO_X. The formation of nitrogen oxide (NO) from oxygen (O_2) and N_2 in air at high temperatures is described by the well-known Zeldovich mechanism. Fuel NO_X is the result of the conversion of nitrogen compounds contained in fuels to NO_X during fuel combustion. Prompt NO_X, which forms from the rapid reaction of atmospheric nitrogen with hydrocarbon radicals is insignificant compared to the overall quantity of thermal and fuel NO_X generated in combustion units/sources.

Potentially Available NOx Control Technologies for Blast Furnaces
- Selective Non-Catalytic Reduction (SNCR)
- Selective Catalytic Reduction (SCR)
- Good Engineering Practices

Selective Non-Catalytic Reduction (SNCR)

SNCR uses ammonia (NH_3) or a urea solution [$CO(NH_2)_2$], injected into the gas stream, to chemically reduce NO_X to form N_2 and water. High temperatures, optimally between 1,600 to 2,400°F, promote the reaction via the following equation:

$CO(NH_2)_2 + 2\ NO + ½\ O_2 \rightarrow 2\ N_2 + CO_2 + 2\ H_2O$
$4\ NH_3 + 6NO \rightarrow 5\ N_2 + 6\ H_2O$

At temperatures below the optimal range, unreacted ammonia can pass through the SNCR and be emitted from the stack (known as “ammonia slip”). At temperatures above the range, ammonia may be combusted, generating additional NO_X. In addition, an effective mixing of gases and entrainment of the reductant into the exhaust gases at the injection point is a critical factor in ensuring an efficient reaction. SNCR is being employed on various types of combustion sources in a wide range of sizes, including industrial boilers, electric utility steam generators, thermal incinerators, cement kilns, and industrial process furnaces in various sectors. SNCR is not suitable for sources where the residence time is too short (reducing conversion of reactants), temperatures or NO_X

concentrations are too low (slowing reaction kinetics), the reagent would contaminate the product, or no suitable location exists for installing reagent injection ports. Expected removal efficiencies for SNCR range from 25 to 65 percent, and are dependent on many factors, including the reagent type, injection rate, pre-control NO_X concentration as well as CO and O_2 concentrations, temperature and residence time.

SNCR requires a relatively high and very specific/narrow temperature range (generally between 1,550 °F and 1,950 °F), uncontrolled NO_X emissions above 200 ppm, and residence times of at least 1 second to be effective. Exhaust temperatures from the Edgar Thomson blast furnace casthouse baghouses average below 200 °F, which is well below the effective SNCR threshold operating temperature range of 1,550 – 1,950 °F. In addition, the exhaust gas has a high moisture content (> 20%) since they are routed through a venturi scrubber. In order to apply SNCR, the exhaust gas streams would need to be preheated. Given the large volume of exhaust gas and the relatively low exhaust temperature, significant energy would be required to raise the temperature nearly tenfold to effectively operate SNCR. This would result in the generation of significant quantities of NOX that would be counter to the objective of reducing emissions for RACT.

The facility's review of EPA's RBLC database shows that SNCR has not been commercially demonstrated on any blast furnaces or associated casthouses in the U.S. The significant technical challenges posed by the installation of SNCR for treating the casthouse baghouse exhaust streams make the control technology **not technically feasible** for RACT for these sources.

Selective Catalytic Reduction (SCR)

Like SNCR, SCR is also a post-combustion NO_X control technology which removes NO_X from flue gas based on the chemical reaction of a NO_X reducing agent (typically ammonia), however, in the case of SCR this takes place using a metal-based catalyst. An ammonia or urea reagent is injected into the exhaust gas and the reaction of NO_X and oxygen occurs on the surface of a catalyst which lowers the activation energy required for NO_X decomposition into nitrogen gas and water vapor. Reactor design, operating temperature, sulfur content of the fuel, catalyst de-activation due to aging, ammonia slip emissions, and the ammonia injection system design are all important technical factors for effective SCR operation. Generally, SCR can achieve higher control efficiencies and be applied to a broader and lower range of exhaust temperatures relative to SNCR. However, this is accompanied by significantly higher capital and operating costs. Another primary disadvantage of an SCR system is that particles from the catalyst may become entrained in the exhaust stream and contribute to increased particulate matter emissions. In addition, ammonia slip reacts with the sulfur in the fuel creating ammonia bisulfates that become particulate matter.

The primary chemical reactions for an SCR unit can be expressed as follows:

$4\ NH_3 + 4\ NO + O_2 \rightarrow 4\ N_2 + 6\ H_2O$

$4\ NH_3 + 2\ NO_2 + 2\ O_2 \rightarrow 3\ N_2 + 6\ H_2O$

The facility's review of EPA's RBLC database showed no entries citing use of SCR for NO_X control on blast furnaces or associated casthouses (i.e., the technology has not been demonstrated in this application). The SCR process is temperature sensitive, such that any exhaust gas temperature fluctuations will result in reduced removal efficiency and will upset the NH_3/ NO_X molar ratio. SCR requires an optimum temperature range of 480 to 800°F and fairly constant temperatures, or NO_X removal efficiency will decrease and ammonia slip will increase.[1] Below this temperature range, the reaction rate drops sharply and effective reduction of NO_X is no longer feasible. Above this temperature, conventional reduction catalysts break down and are unable to perform their desired functions. As noted in the previous SNCR discussion, the exhaust gas temperatures from the blast furnace casthouse baghouses at Edgar Thomson

---

[1] U.S. EPA, Technology Transfer Network, Clean Air Technology Center. "Air Pollution Control Technology Fact Sheet – Selective Catalytic Reduction." File number EPA-452/F-03-032. July 2003. http://www.epa.gov/ttn/catc/dir1/fscr.pdf (26 Nov. 2014).

are below the optimum SCR operating range. In order to apply SCR, the exhaust gas streams would need to be preheated. Given the large volume of exhaust gas and the relatively low exhaust temperature, significant energy would be required to raise the temperature to effectively operate SCR, resulting in the generation of NO_X that would be counter to the objective of reducing emissions for RACT.

For the various reasons described above, SCR is considered to be **not technically feasible** for controlling NO_X emissions from the blast furnace casthouse baghouses. Further evaluation of the technology is not required.

Good Engineering Practices/Proper Furnace Operation

The formation of NO_X is minimized by proper combustion unit design and operation. Generally, emissions are minimized when the operating temperatures are kept at the lower end of the desired range. The controlled distribution of air at the air and fuel injection zones can also help minimize NO_X formation. Ideally, maintaining a low-oxygen condition near fuel injection points approaches an off-stoichiometric staged combustion process. A certain amount of air is required to provide sufficient oxygen to burn all of the fuel introduced to the furnaces. However, excess air contributes to increased NO_X emissions through increasing the amount of air that must be heated (i.e., decreasing fuel efficiency and resulting in higher NO_X emissions) and providing more oxygen in the combustion zone which can in turn lead to greater amounts of thermal NO_X formation. By minimizing the amount of air used in the combustion process while maintaining proper furnace operation, the formation of NO_X can be reduced.

As noted previously, the formation of NO_X from combustion processes can typically be minimized by proper furnace operation. Generally, emissions are minimized when the furnace temperature is kept at the lower end of the desired range and when the distribution of air at the air and fuel injection zones is controlled. A high thermal efficiency leads to less consumption of heat and fuel and produces less NO_X emissions. General improvement in thermal efficiency is one design method of reducing NO_X formation, since less fuel is used. These principles typically apply to combustion processes with enclosed chambers like those in traditional boilers and heaters. In the case of the blast furnaces, there are no practical ways to control NO_X emissions within the furnace. For blast furnaces, good operating practices to minimize emissions consist of managing the material compositions and the burdens within the furnace to achieve optimum energy efficiency and heating.

U. S. Steel currently maintains and operates the blast furnaces at Edgar Thomson in accordance with good engineering and air pollution control practices and proper furnace design. These are **technically feasible** methods for minimizing NO_X emissions from the furnaces.

<u>VOC RACT Assessment</u>

Potentially Applicable VOC Control Technologies
- Catalytic Oxidation
- Thermal Oxidation/Incineration
- Catalyst Activated Ceramic Dust Filters (CADF)
- Good Engineering Practices

Catalytic Oxidation

Catalytic oxidation is performed by passing exhaust gases over a catalyst where the VOC is converted to CO2. The optimal working temperature range for oxidation catalysts is approximately 850 - 1,100 °F with a minimum exhaust gas stream temperature of 500 °F for minimally acceptable control. High particulate loading or inorganic content of the exhaust stream can cause fouling of the catalyst.

Heavy particulate matter loading and trace inorganic metals in the exhaust gas stream from the blast furnace casthouse would present significant risk of poisoning the catalyst in a catalytic oxidation system. Exhaust gases from the blast furnace also undergo rapid cooling (to temperatures typically below 200 °F) as they are ducted away from the furnace and through the venturi scrubber. Thus, the temperature will be well below the minimum 500 °F threshold for effective operation of oxidation catalysts. In addition, the high moisture content of the exhaust stream (typically greater than 20%) can block oxidation sites on the catalyst.

No known installations of catalytic oxidation for VOC control on blast furnaces exist. For these reasons, this control technology is not technically feasible for the blast furnace casthouses. Further evaluation of this technology is not required.

Thermal Oxidation/Incineration

Thermal oxidation or incineration eliminates VOC emissions by supplying adequate heat and oxygen to convert un-combusted VOCs to CO_2. Thermal oxidation requires temperatures of approximately 1,500 °F to achieve 90 to 95 percent conversion of VOC to CO_2.

Thermal oxidation requires temperatures of approximately 1,500 °F. The most logical location for a thermal oxidizer would be just prior to the baghouse. Exhaust temperatures at this location are generally below 200 °F and excessive measures would be necessary to reheat gases to the required temperature necessary for 90% or better control of VOC. In addition, the operation of a thermal oxidizer would require significant amounts of natural gas fuel due to the low concentrations of VOC in the exhaust as well as the low temperature, and would coincidentally generate NO_X emissions (thereby contravening efforts to reduce ozone precursors which is the purpose of RACT). Finally, the use of thermal oxidizers has not been commercially demonstrated on blast furnaces.

For these reasons, this technology is not technically feasible for controlling VOC emissions for the blast furnace casthouses. Further evaluation of this technology is not required.

Catalyst Activated Ceramic Dust Filters (CADF)

This technology involves the control of multiple pollutants using a single system. These systems consist of a filtration element for the control of particulate matter which is embedded with a catalyst. As the exhaust gases pass through the filters, VOC in the stream is reduced in the same manner as a standard oxidation catalyst. This technology has not been commercially demonstrated on any iron-making process vessels.

The technical feasibility of CADF technology would be similar to that outlined for catalytic oxidation that was discussed in detail earlier in the previous section (e.g., significant catalyst poisoning risk, etc.). These types of systems are not listed in the RBLC for iron and steel industry process vessels. For all of the reasons noted, this technology is **technically infeasible** and not RACT for the Edgar Thomson blast furnaces. Further evaluation of the technology is not required.

Good Engineering Practices

The facility's search of EPA's RBLC database and CTG references shows no control technologies or strategies specific to reduction of VOC emissions from iron-making process vessels. In numerous cases of similar sources, VOC BACT or RACT has been determined to be "good engineering practices". This includes operation and maintenance of the source and associated air pollution control devices in accordance with manufacturer's recommendations and/or good engineering practices.

U. S. Steel currently maintains and operates the blast furnace casthouses and the associated venturi scrubber and baghouse in accordance with good engineering and air pollution control practices and by performing regular maintenance. U. S. Steel is subject to various operation and maintenance requirements for the blast furnace casthouse under the MACT regulations for Integrated Iron & Steel Manufacturing Facilities (40 CFR 63 Subpart FFFFF). The applicable requirements under this MACT rule are intended to reduce HAP emissions, which would be expected to have a co-benefit of minimizing VOC emissions as well. These are **technically feasible** methods for minimizing VOC emissions from the blast furnace casthouse operations.

Only one VOC control strategy is technically feasible. U. S. Steel will continue to employ good engineering and air pollution control management practices in accordance with 40 CFR 63 Subpart FFFFF as RACT III for VOC emissions from these sources.

BOP Shop (P003)

The basic oxygen process (BOP) is the primary steel-making process step. It involves charging molten iron from the blast furnace along with scrap metal and fluxes into the basic oxygen furnace (BOF). The charge is blown with high-purity oxygen at high velocity to penetrate slag and metal emulsions and to oxidize the carbon and impurities to make steel. Emissions from the process are collected in an overhead hood and directed to a wet venturi scrubber. The BOP is an exothermic process that does not require combustion of fuel, however, at Edgar Thomson there are additional combustion-related emissions of NO_X generated from miscellaneous fuel burning activities that occur within the BOP Shop area. These originate from many small sources (e.g., space heaters, etc.) and are not significant relative to the overall NO_X generated from the BOP itself or are from other processes evaluated in this document.

NO_X RACT Assessment

Potentially Applicable NO_X Control Technologies

- Selective Non-Catalytic Reduction (SNCR)
- Selective Catalytic Reduction (SCR)
- Good Engineering Practices

Selective Non-Catalytic Reduction (SNCR)

SNCR requires a relatively high and very specific/narrow temperature range (generally between 1,550 °F and 1,950 °F), uncontrolled NO_X emissions above 200 ppm, and residence times of at least 1 second to be effective. Exhaust temperatures from the Edgar Thomson BOP scrubber are generally below 120 °F, which is well below the effective SNCR threshold operating temperature range of 1,550 – 1,950 °F. In addition, the exhaust gas has a high moisture content (> 20%) since it is routed through a venturi scrubber. In order to apply SNCR, the exhaust gas stream would need to be preheated. Given the large volume of exhaust gas and the relatively low exhaust temperature, significant energy would be required to raise the temperature more than tenfold to effectively operate SNCR. This would result in the generation of significant quantities of NO_X that would be counter to the objective of reducing emissions for RACT.

The facility's review of EPA's RBLC database shows that SNCR has not been commercially demonstrated on any BOF/BOP sources in the U.S. The significant technical challenges posed by the installation of SNCR for treating the BOP exhaust streams make the control technology **not technically feasible** for RACT.

Selective Catalytic Reduction (SCR)

The facility's review of EPA's RBLC database showed no entries citing use of SCR for NO_X control on steel-making BOF/BOP processes. The SCR process is temperature sensitive, such that any exhaust gas temperature fluctuations will result in reduced removal efficiency and will upset the NH_3/ NO_X molar ratio. SCR requires an optimum temperature range of 480 to 800°F and fairly constant temperatures, or NO_X removal efficiency will decrease.7 Below this temperature range, the reaction rate drops sharply and effective reduction of NO_X is no longer feasible. Above this temperature, conventional reduction catalysts break down and are unable to perform their desired functions. As noted in the previous SNCR discussion, the exhaust gas temperatures from the BOP scrubber at Edgar Thomson is below the optimum SCR operating range. In order to apply SCR, the exhaust gas stream would need to be preheated. Given the large volume of exhaust gas and the relatively low exhaust temperature, significant energy would be required to raise the temperature to effectively operate SCR, resulting in the generation of NO_X that would be counter to the objective of reducing emissions for RACT.

For the various reasons described above, SCR is considered to be **not technically feasible** for controlling NO_X emissions from the BOP. Further evaluation of the technology is not required.

Good Engineering Practices/Proper Furnace Operation

As noted previously, the formation of NO_X from combustion processes can typically be minimized by proper furnace operation. Generally, emissions are minimized when the furnace temperature is kept at the lower end of the desired range and when the distribution of air at the air and fuel injection zones is controlled. A high thermal efficiency leads to less consumption of heat and fuel and produces less NO_X emissions. General improvement in thermal efficiency is one design method of reducing NO_X formation, since less fuel is used. These principles typically apply to combustion processes with enclosed chambers like those in traditional boilers and heaters. In the case of the BOP, there are no practical ways to control NO_X emissions within the furnace since there is no fuel or burners. For the BOP, good operating practices to minimize emissions consist of managing the material compositions and the oxygen lancing within the furnace to achieve optimum energy efficiency.

U. S. Steel currently maintains and operates the BOP at Edgar Thomson in accordance with good engineering and air pollution control practices and proper furnace design. These are **technically feasible** methods for minimizing NO_X emissions from the furnaces.

<u>VOC RACT Assessment</u>

Potentially Available VOC Control Technologies for BOP Shop

- Catalytic Oxidation
- Thermal Oxidation/Incineration
- Catalyst Activated Ceramic Dust Filters (CADF)
- Good Engineering Practices

Catalytic Oxidation

Catalytic oxidation is described above.

Heavy particulate matter loading and trace inorganic metals in the exhaust gas stream from the BOP Shop would present significant risk of poisoning the catalyst in a catalytic oxidation system. The exhaust gas temperature is also well below the minimum 500 °F threshold for effective operation of oxidation catalysts (around 120 °F). In addition, the high moisture content of the exhaust stream (typically greater than 20%) can block oxidation sites on the catalyst. Finally, the concentration of VOC from the BOP Shop is estimated to be very low (parts per billion).

No known installations of catalytic oxidation for VOC control on BOP furnaces/shops exist. For these reasons, this control technology is **not technically feasible** for Edgar Thomson. Further evaluation of this technology is not required.

Thermal Oxidation/Incineration

Thermal oxidation/incineration is described above.

Thermal oxidation requires temperatures of approximately 1,500 ºF. As discussed above, exhaust temperatures from the BOP Shop are generally below 120 °F and excessive measures would be necessary to reheat gases to the required temperature necessary for 90% or better control of VOC. In addition, the operation of a thermal oxidizer would require significant amounts of natural gas fuel due to the very low concentrations of VOC in the exhaust as well as the low temperature, and would coincidentally generate NO_X emissions (thereby contravening efforts to reduce ozone precursors which is the purpose of RACT). Finally, the use of thermal oxidizers has not been commercially demonstrated on steel-making vessels. For these reasons, this technology is **not technically feasible** for controlling VOC emissions for the BOP Shop. Further evaluation of this technology is not required.

Catalyst Activated Ceramic Dust Filters (CADF)

Catalyst Activated Ceramic Dust Filters (CADF) is described above.

The technical feasibility of CADF technology would be similar to that outlined for catalytic oxidation that was discussed in detail earlier in the previous section (e.g., significant catalyst poisoning risk, etc.). These types of systems are not listed in the RBLC for iron and steel industry process vessels. For all of the reasons noted, this technology is **not technically feasible** for the BOP Shop. Further evaluation of the technology is not required.

Good Engineering Practices

The facility's search of EPA's RBLC database and CTG references shows no control technologies or strategies specific to reduction of VOC emissions from steel-making process vessels. In numerous cases of similar sources, VOC BACT or RACT has been determined to be "good engineering practices". This includes operating and maintaining the source and associated air pollution control devices in accordance with manufacturer's recommendations and/or good engineering practices.

U. S. Steel currently maintains and operates the BOP Shop and the associated venturi scrubber and secondary baghouse in accordance with good engineering and air pollution control practices and by performing regular maintenance. U. S. Steel is subject to various operation and maintenance requirements for the BOP under the MACT regulations for Integrated Iron & Steel Manufacturing Facilities (40 CFR 63 Subpart FFFFF). The applicable requirements under this MACT rule are intended to reduce HAP emissions, which would be expected to have a co-benefit of minimizing VOC emissions as well. These are **technically feasible** methods for minimizing VOC emissions from the BOP operations.

BOP Misc. (Fugitives)

Potentially Available VOC Control Technologies for BOP Fugitives (Pot Coat)

- Capture & Control
- Material Substitution

Capture & Control

This control strategy would involve the installation of capture systems (e.g., enclosures or hoods) to collect the fugitive emissions from spray application of the Pot Coat and subsequently direct it to a single control device or multiple control devices. Capture systems might include permanent total enclosures or partial enclosures like local exhaust hoods that are routed to a duct system with an exhaust fan that moves the exhaust to a control device such as a catalytic oxidizer or thermal oxidizer/incinerator (principles of operation for these control devices were discussed in Section 3.6). Overall capture/control system performance can range in efficiency from 50 – 100% depending on a number of design, operational, and maintenance factors.

As discussed above, the source of emissions from applying the Pot Coat material is fugitive in nature. In addition, the material is applied at various locations throughout the BOP Shop. In order to capture and control these emissions, construction of extensive and numerous enclosures or exhaust hoods would be needed, with associated ductwork to route the exhaust to a control device. This would result in a high volume stream with very low VOC concentrations. In addition, the exhaust stream temperature would be near ambient, and would require additional heating for oxidation. The necessary energy requirements to operate a fan large enough to capture the various streams, along with burning auxiliary fuel to oxidize the VOC in the exhaust, would be technically challenging and counter to the objective of reducing ozone
precursors (e.g., NO_X).

For these reasons, this technology is **not technically feasible** for controlling VOC emissions for the Pot Coat activities in the BOP Shop. Further evaluation of this technology is not required.

Material Substitution

Material substitution is the replacement of an existing chemical or raw material with an alternative material that results in lower emissions. In the case of the Pot Coat material in question, one approach to potentially reducing emissions would be to use an alternative material with lower VOC content. When considering material substitutions, it is important to evaluate the effectiveness of the material to ensure that it can meet the technical requirements of the intended use and will perform as well or better than the current material. In addition, the availability and cost of the material should be considered to confirm there is adequate supply to meet the facility's demand and that use of the alternate material is not cost prohibitive. Finally, the facility should evaluate current storage and application methods and capacities to verify that the alternative material would not require changes such as installation of storage tanks or installation of different application tools.

The Pot Coat material that U. S. Steel uses in the BOP Shop is a proprietary formulation developed specifically for its specialized application. U. S. Steel has contacted vendors to determine if alternative materials with lower VOC content are commercially available. At this time, U. S. Steel has not identified any alternative materials that are commercially available and have been demonstrated in practice to meet the specialized technical needs of the application.

As such, this technology is **not technically feasible** for the Pot Coat activities at the BOP Shop. Further evaluation of the technology is not required.

Riley Boilers (B001 – B003)

Riley Boilers 1, 2, and 3 are water-tube boilers each rated at 525 MMBtu/hr. The boilers are capable of firing multiple fuels, including BFG, COG, and natural gas (as well as fuel oil as a backup, although not routinely fired). Like the blast furnace stoves, BFG is the primary fuel utilized in the boilers. NO_X emission formation from the boilers is driven by the same principles outlined in Section 3.2. The burners on the boilers are designed with larger windboxes to allow for staged air firing. In addition, they are equipped with automation to optimize efficiency of their operation. Each boiler routes to a common stack that is equipped with a NO_X continuous emissions monitoring system (CEMS).

<u>NO_X RACT Assessment</u>

Potentially Applicable NO_X Control Technologies

- Selective Non-Catalytic Reduction (SNCR)
- Selective Catalytic Reduction (SCR)
- Low NO_X or Ultra Low NO_X Burners (LNB or ULNB)
- Good Combustion Practices

Selective Non-Catalytic Reduction (SNCR)

SNCR is described above.

SNCR requires a relatively high and very specific/narrow temperature range (generally between 1,550 °F and 1,950 °F), uncontrolled NO_X emissions above 200 ppm, and residence times of at least one second to be effective. Exhaust temperatures from the Edgar Thomson boilers average around 400 °F, which is well below the effective SNCR threshold operating temperature range of 1,550 – 1,950 °F. This means that preheating of the exhaust gas would be necessary to effectively employ SNCR on the boilers.

Nevertheless, since SNCR has been commercially demonstrated on many boilers of various fuel types, U. S. Steel has considered this technology **technically feasible** for RACT for the boilers at Edgar Thomson.

Selective Catalytic Reduction (SCR)

SCR is described above.

Like SNCR, the SCR process is temperature sensitive, such that any exhaust gas temperature fluctuations will result in reduced removal efficiency and will upset the NH_3/NO_X molar ratio. The installation of necessary components of the ammonia injection system and catalyst also require extensive structural modifications to the source and nearby structures. SCR requires an optimum temperature range of 480 to 800°F and fairly constant temperatures, or NO_X removal efficiency will decrease.[2] Below this temperature range, the reaction rate drops sharply and effective reduction of NO_X is no longer feasible. Above this temperature, conventional reduction catalysts break down and are unable to perform their desired functions. As noted in the previous SNCR discussion, the exhaust gas temperatures from the boilers are around 400 °F which is just below the optimum SCR operating range. Preheating the exhaust gas would likely be necessary to ensure effective operation of SCR for these boilers.

---

[2] U.S. EPA, Technology Transfer Network, Clean Air Technology Center. "Air Pollution Control Technology Fact Sheet – Selective Catalytic Reduction." File number EPA-452/F-03-032. July 2003. http://www.epa.gov/ttn/catc/dir1/fscr.pdf (26 Nov. 2014).

Because SCR is routinely used on boilers, it is considered to be **technically feasible** for controlling NO_X emissions from the boilers at Edgar Thomson.

Low NO_X Burners (LNBs)

The principle of all LNBs is the same: step-wise or staged combustion and localized exhaust gas recirculation at the flame is employed. LNBs are designed to control fuel and air mixing to create larger and more branched flames. Peak flame temperatures are reduced and the flame structure reduces oxygen supply to the hottest part of the flame, resulting in less NO_X formation. LNBs eliminate the need for steam or water injection, which was formerly the traditional method of NO_X control.

LNB retrofits on existing units must carefully consider boiler geometry, as the LNB flame diameters and lengths are typically larger and can impinge on walls which may lead to reduced control efficiencies.

The use of multiple fuels can present additional technical challenges with retrofitting burners. Replacement burner packages guaranteed to achieve NO_X emission rates lower than those currently being observed have not been identified, and a search of the RBLC for NO_X emission rates from similar large industrial boilers shows that the boilers at Edgar Thomson are already emitting significantly lower rates of NO_X than others that have been determined to meet RACT.

For the reasons noted above, LNB technology is considered **technically infeasible** for the Riley boilers at Edgar Thomson, and therefore is not further considered in this proposal.

Good Combustion Practices/Proper Furnace Operation/Minimize Excess Air

The formation of NO_X is minimized by proper combustion unit design and operation. Generally, emissions are minimized when the operating temperatures are kept at the lower end of the desired range. The controlled distribution of air at the air and fuel injection zones can also help minimize NO_X formation. Ideally, maintaining a low-oxygen condition near fuel injection points approaches an off-stoichiometric staged combustion process. A certain amount of air is required to provide sufficient oxygen to burn all of the fuel introduced to the boilers. However, excess air contributes to increased NO_X emissions through increasing the amount of air that must be heated (i.e., decreasing fuel efficiency and resulting in higher NO_X emissions) and providing more oxygen in the combustion zone which can in turn lead to greater amounts of thermal NO_X formation. By minimizing the amount of air used in the combustion process while maintaining proper boiler operation, the formation of NO_X can be reduced.

As noted previously, the boilers primarily burn blast furnace gas which has a lower nitrogen fuel content and burns at lower temperatures. As a result, the emissions from the boilers are inherently lower in both fuel NO_X and thermal NO_X. In addition, the burners operate with staged air firing with automation to optimize efficiency.

U. S. Steel currently maintains and operates the boilers at Edgar Thomson in accordance with good combustion practices and proper design as demonstrated through regular maintenance activities. Furthermore, emissions of NOX are continuously monitored to ensure that these practices are resulting in efficient operation. These are **technically feasible** methods for controlling NO_X emissions from the boilers.

Table 8. SCR & SNCR Control RACT III Costs for Boilers

Emission Source ID	Source Description	SCR Costs ($/ton of NO_X removed)	SNCR Costs ($/ton of NO_X removed)
B001 – B003	Riley Boilers No. 1 - 3	$124,450	$683,468

The results of the cost analysis show that installation of SCR or SNCR is cost prohibitive on a dollar per ton of NO_X removed basis. As such, the only remaining technically and economically feasible control technology is good combustion practices. RACT will be to continue operating the boilers in accordance with good engineering and air pollution control practices with Previously established NO_X emissions limits of 0.05 lb/MMBtu on a 12-month rolling average and 0.07 lb/MMBtu on a 30-day rolling average basis reflect these practices.

V. RACT III New Technology

In response to Allegheny County Health Department (ACHD)'s May 3, 2023 request for additional RACT III information, U.S. Steel provided the following information in a letter signed by the responsible official:

U.S. Steel contracted a consultant, Trinity Consultants, to assist with the RACT III analyses for the Irvin, Edgar Thomson and Clairton Plants. Trinity Consultants was selected based on their knowledge of pollution controls, including those specific to the processes in the iron and steel industry and coke plants. Trinity is also engaged, on an as-needed consulting basis for a wide multitude of air emission and control evaluations with relevant trade organizations such as the American Coke and Coal Chemicals Institute and the American Iron and Steel Institute. Trinity has been employed in the past to provide training for state/consortiums as part of conferences and also specific training such as air dispersion modeling. The firm's experience extends beyond U. S. Steel and it is well known and recognized throughout the country by the regulated community as well as many Federal and State regulators.

Trinity's process for identifying technologies considered in the RACT III analysis started with an updated review of EPA's RBLC database for the sector and NO_X/VOC emissions. Trinity then performed internet searches for any other more recent related permitting actions or new, demonstrated technologies. No information on new technologies (i.e., those not included in the RACT III evaluation) was obtained from these internet-based searches. Trinity's analysis is consistent with recent EPA analyses and considerations. Subsequent to the submittal of the RACT III analyses, this conclusion was confirmed by EPA in April 2023 in finalizing the Good Neighbor Plan for the 2015 Ozone NAAQS. In the final version of the rule, after significant consideration and evaluation, EPA concluded that NO_X control technologies have not been demonstrated to be feasible because of the uniqueness of the processes and the fuels burned in the iron and steel emission units. EPA concluded that NO_X controls may be feasible for only reheat furnaces and boilers in the iron and steel/coke industry. The RACT III evaluations performed considered all technologies listed in the final rule. As such, to the best of U. S. Steel's knowledge a complete search was conducted to rule out new technologies.

VI. RACT II as RACT III

The conditions listed in Table 8 of this document below supersede the relevant conditions of Plan Approval Order and Agreement No. 235 (RACT I), issued December 30, 1996 and RACT II. The RACT III conditions are at least as stringent as those from RACT II. Other RACT I conditions, not affected by RACT III, remain in effect.

Application of RACT III requirements did not result in any emissions reduction. Application of RACT II conditions did not result in any emissions reduction.

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 8 RACT II and RACT III Summary

Source ID	Description	Permit Condition 0051-OP23	RACT II Regulations	RACT III Regulations
B001-B003	Riley Boilers 1-3	Condition V.A.1.b	25 PA Code §129.99	§129.114(i)(1)(i)
		Condition V.A.1.d	25 PA Code §129.99	§129.114(i)(1)(i) §129.112(d)
		Condition V.A.1.e	25 PA Code §129.99	§129.114(i)(1)(i)
		Condition V.A.2.a	25 PA Code §129.100	25 PA Code §129.115
		Condition V.A.2.b	25 PA Code §129.100	25 PA Code §129.115
		Condition V.A.3.a	25 PA Code §129.100	25 PA Code §129.115
		Condition V.A.4.a	25 PA Code §129.100	25 PA Code §129.115
		Condition V.A.4.c	25 PA Code §129.100	25 PA Code §129.115
		Condition V.A.6.a	25 PA Code §129.99	§129.114(i)(1)(i)
B001-B003	Riley Boilers 1-3	Condition V.A.1.b	25 PA Code §129.99	§129.114(i)(1)(i)
		Condition V.A.1.d	25 PA Code §129.99	§129.114(i)(1)(i) §129.112(d)
		Condition V.A.1.e	25 PA Code §129.99	§129.114(i)(1)(i)
		Condition V.A.2.a	25 PA Code §129.100	25 PA Code §129.115
		Condition V.A.2.b	25 PA Code §129.100	25 PA Code §129.115
		Condition V.A.3.a	25 PA Code §129.100	25 PA Code §129.115
		Condition V.A.4.a	25 PA Code §129.100	25 PA Code §129.115
		Condition V.A.4.c	25 PA Code §129.100	25 PA Code §129.115
		Condition V.A.6.a	25 PA Code §129.99	§129.114(i)(1)(i)
P001b & P002b	Blast Furnace No1 & No. 3 Stoves	Condition V.B.1.b	25 PA Code §129.99	25 PA Code §129.114 §129.112(d)
		Condition V.B.1.c	25 PA Code §129.99	25 PA Code §129.114
		Condition V.B.1.d	25 PA Code §129.99	25 PA Code §129.114
		Condition V.A.4.a	25 PA Code §129.100	25 PA Code §129.115
		Condition V.A.4.c	25 PA Code §129.100	25 PA Code §129.115
P001a & P002a	Blast Furnace No1 & No. 3 Casthouses	Condition V.C	25 PA Code §129.99	§129.114(i)(1)(i)
P003	Basic Oxygen Process (BOP) Shop	Condition V.C	25 PA Code §129.99	25 PA Code §129.114(i)(1)(i)
P004	Ladle Metallurgical Facility	Condition V.C	25 PA Code §129.99	25 PA Code §129.114
P005	Dual Strand Continuous Caster	Condition V.C	25 PA Code §129.99	25 PA Code §129.114 25 PA Code §129.112(c)