CITY OF PHILADELPHIA
Department of Public Health
Public Health Services
Air Management Services

InterOffice Memo

To: File

From: Edward Wiener, Chief of Source Registration

Date: August 11, 2015

Subject: 1997 8-Hour RACT Analysis for Philadelphia Energy Solutions Refining and Marketing LLC (PES)

I. Introduction:

The Clean Air Act (CAA) requires that moderate (or worse) ozone nonattainment areas implement reasonably available control technology (RACT) controls on all major sources of Volatile Organic Compounds (VOC) and Nitrogen Oxides (NOx). Philadelphia County is part of the Philadelphia-Wilmington-Atlantic City moderate ozone nonattainment area for the 1997 8-hour ozone NAAQS. This document presents the findings of a RACT evaluation for the 1997 8-hour ozone standard for this facility.

II. Company Information:

Philadelphia Energy Solutions Refining and Marketing LLC (PES) owns and operates a petroleum refinery at 3144 Passyunk Avenue, Philadelphia, PA 19145. The refinery was previously owned by Sunoco, Inc. (R&M). PES – Tank Farm is part of the main refinery, although it has a different AMS Plant ID and Title V operating permit, however it is included in this RACT determination.

III. Applicability for NOx and VOC RACT:

PES is a major source of NOx having potential NOx emissions greater than 100 tons per year, the major source threshold in Philadelphia County that is applicable to NOx RACT for the 1997 8-hour ozone NAAQS.

PES is a major source of VOC having potential VOC emissions greater than 50 tons per year, the major source threshold in Philadelphia County that is applicable to VOC RACT for the 1997 8-hour ozone NAAQS.

IV. 1-hour RACT:

PES is subject to the 1-hour RACT determination (PA Permit Numbers 51-1501 and 51-1517) dated August 1, 2000, and approved into the SIP by EPA on October 31, 2001, 66 FR 54942 under the facility's former name Sunoco Inc. (R&M) – Philadelphia. This RACT determination includes both PES Refinery (Plant ID 01501, PA Permit Number 51-1501) and PES – Tank Farm (Plant ID 01517, PA Permit Number 51-1517).

V. Process Descriptions:

PES' emission sources include 27 refinery fuel gas-fired process heaters, 3 refinery fuel gas-fired boilers, 2 Fluid Catalytic Cracking Units (FCCUs), 5 diesel-fired non-emergency reciprocating internal combustion engines (RICE), 11 emergency generators and fire pumps, storage tanks, cooling towers, 2 loading operations, oil-water separators, and degreasers. More details about these processes can be found below.

Table 1 - NOx Sources

Location	Source	Permitted Capacity (MMBTU/hr unless noted)	NOx Emission Rate (lbs/MMBTU)	Reference	Potential NOx Emissions (TPY)
Point Breeze	Unit 210-13H1	235.4	0.104	1-hour RACT	107.2
Point Breeze	Unit 860-2H2	69.8	0.350	1-hour RACT	107.0
Point Breeze	Unit 860-2H3	174.7	0.163	1-hour RACT	124.7
Point Breeze	Unit 860-2H4	99.4	0.270	1-hour RACT	117.6
Point Breeze	Unit 860-2H5	155	0.163	1-hour RACT	110.7
Point Breeze	Unit 860-2H7	59	0.157	1-hour RACT	40.6
Point Breeze	Unit 860-2H8	49.6	0.113	AP-42	24.5
Point Breeze	Unit 864-PH1	80	0.167	1-hour RACT	58.5
Point Breeze	Unit 864-PH7	45.5	0.113	AP-42	22.5
Point Breeze	Unit 864-PH11	74	0.145	1-hour RACT	47.0
Point Breeze	Unit 864-PH12	85.1	0.119	1-hour RACT	44.4
Point Breeze	Unit 870-H01	97	0.035	PA 02184	14.9
Point Breeze	Unit 870-H02	53	0.035	PA 02184	8.1
Point Breeze	Unit 859-1H1	98	0.02	PA 06144	8.6
Girard Point	Unit 137 F-1	415	0.23	1-hour RACT	418.1
Girard Point	Unit 137 F-2	155	0.257	1-hour RACT	174.5
Girard Point	Unit 137 F-3	60	0.06	PA 07163	15.8
Girard Point	Unit 1332 H-1	45	0.113	AP-42	22.3
Girard Point	Unit 1332 H-2	60	0.04	PA 05124	10.5
Girard Point	Unit 1332 H-3	43	0.113	AP-42	21.3
Girard Point	Unit 1332 H-400	186	0.06	PA 09040	48.9
Girard Point	Unit 1332 H-401	233	0.06	PA 09040	61.2
Girard Point	Unit 1332 H-601	48	0.113	AP-42	23.8
Girard Point	Unit 1332 H-602	49	0.113	AP-42	24.3

Girard Point	Unit 433 H-1	260	0.035	PA 06050	39.9
Girard Point	Unit 1232 B-104	70	0.177	1-hour RACT	54.3
Point Breeze	Unit 868 FCCU	50,000 BPD feed rate (day)[1] 47,500 BPD (365-day avg.)	50 ppmdv@ 0% oxygen.	Low NOx CO Promoter	130.2
Girard Point	Unit 1232 FCCU	100,000 BPD feed rate (day)[1] 90,000 BPD (rolling 365-day avg.)	10 ppmdv @ 0% oxygen	PA 11353	208.3
Girard Point	#3 Boilerhouse Boiler #37	495	0.04	PA 08080	86.7
Girard Point	#3 Boilerhouse Boiler #39	495	0.04	PA 08080	86.7
Girard Point	#3 Boilerhouse Boiler #40	660	0.04	PA 08080	115.6
Point Breeze/Girard Point	Engine IC-002	1.4	4.4	AP-42	1.4
Point Breeze/Girard Point	Engine IC-005	0.2	4.4	AP-42	1.0
Point Breeze/Girard Point	Engine IC-006	0.8	2.2	Tier 1	1.0
Point Breeze/Girard Point	Engine IC-007	0.7	0.7	Tier 3	0.7
Point Breeze/Girard Point	Engine IC-008	1.5	1.1	Tier 2	0.3

BPD = barrels per day

[1]Each FCCU has maximum permitted throughput limits for both a single day and . for a rolling 365-day average.

Table 2 – VOC Sources

Location	Source	Permitted Capacity	VOC Emission Rate (lbs/MMBTU)	Reference	Potential VOC Emissions (TPY)
Point Breeze/Girard Point	Combustion Units (All sources listed in Table 1 except the 2 FCCUs)	See Table 1	0.0054 lbs/MMBTU	AP-42	109.8 combined
Point	Cooling Towers:				

Breeze/Girard Point	210 Crude - 29,600 gpm 868 - 19,700 gpm Complex - 35,000 gpm 864 - 18,000 gpm 137 - 36,300 gpm 433 - 35,300 gpm 490 - 75,000 gpm 1232 - 57,000 gpm	See Source column	0.7 lbs/MMgal	AP-42	56.3 combined
Point Breeze	Unit 868 FCCU	50 MBPD	5 lbs/hr	PA 00184	23.0
Girard Point	Unit 1232 FCCU	100 MBPD	1.88 lbs/hr	PA 11353	8.24
Point Breeze	Loading Operations (Wharf) Non-gasoline	Varies based on material loaded	AP-42	1,482,000 bbl/yr	25.99
Girard Point	Loading Operations (Wharf) Gasoline and Non-gasoline	Varies based on material loaded	AP-42	17,902,000 bbl/yr	15.2[1]
Point Breeze/Girard Point	5 Engines	Each 1.4 MMBTU/hr or less	0.00251 lbs/hp-hr	AP-42	Each 0.39 or less

[1]PTE represents 1.4 TPY VOC from gasoline materials controlled by the thermal oxidizer and 13.9 TPY VOC form non-gasoline materials that are uncontrolled, for a total of 15.2 TPY VOC

Sources Evaluated for RACT Separately

On August 31, 2012 PES submitted Plan Approval Application No. 12195 to replace the existing RACT limits for the following seven (7) process heaters:

- Unit 231 B101 Heater (rated capacity 104.5 MMBTU/hr)
- Unit 865 11H1 Heater (rated capacity 87.3 MMBTU/hr)
- Unit 865 11H2 Heater (rated capacity 64.2 MMBTU/hr)
- Unit 210 H101 Heater (rated capacity 192.0 MMBTU/hr)
- Unit 210 H201A/B Heater (rated capacity 254.0 MMBTU/hr)
- Unit 866 12H1 Heater from (rated capacity 61.2 MMBTU/hr)
- Unit 868 8H101 Heater from (rated capacity 60.0 MMBTU/hr)

As part of the application, PES revised RACT requirements and re-evaluated RACT for each of these 7 heaters. AMS has submitted a RACT determination for these 7 heaters to EPA for approval separately. As a result, while these heaters are existing sources, they are not part of this RACT evaluation.

De Minimis Sources

Engines IC-002, IC-005, IC-006, IC-007, and IC-008 each have potential emissions below 2 tons per year for both NOx and VOC. These potential emissions were calculated based on the rated capacity and either AP-42 emission factors or Tier 1 or Tier 2 standards, if applicable. Based on AMS permitting and engineering knowledge, AMS determines that installing any control technology on such small sources is both technically and economically unreasonable.

VI. RACT Evaluation

On July 24, 2015, PES submitted to AMS the "PES RACT Update July 2015 – Revision E," which includes a full case-by-case RACT analysis for the remaining NOx emission sources listed as "Case-by-case" in Table 3 below. AMS has reviewed and concurs with PES's analysis, which is attached to this document and submitted to EPA as part of the SIP revision. All costs per ton of pollutant controlled listed in this memo come from this document. This analysis excludes the seven (7) process heaters addressed in previous RACT submission dated August 31, 2012, as listed above.

A. NOx RACT

Table 3 below lists the 1-hour RACT requirements for the existing NOx sources. The permitted capacity includes any 1-hour RACT limits. Since the 1-hr RACT plan approval was issued in August 2000, permitted capacities and fuel types have changed. Therefore current emission limits, fuel types, and capacities may not match the EPA-approved 1-hr RACT plan approval. Moving forward, these various changes are being incorporated (or modified where appropriate) for RACT for the 1997 8-hr ozone standard.

Table 3- List of NOx Sources and Applicable 1-hour RACT Requirements

Location	Source	Permitted Capacity (MMBTU/hr unless noted)	Fuel	1-hour RACT		
				NO_x RACT Category	RACT Requirement	Emission Limit
Point Breeze	Unit 210-13H1	235.4	Refinery oil and refinery gas	Case-by-case	Combustion tuning	0.104 lb NOx/ MMBTU for gas and 0.4 lb NOx/ MMBTU for oil
Point Breeze	Unit 860-2H2	69.8	Refinery oil and refinery gas	Case-by-case	Combustion Tuning	0.350 lb NOx/ MMBTU for gas and 0.4 lb NOx/ MMBTU for oil
Point Breeze	Unit 860-2H3	174.7	Refinery oil and refinery gas	Case-by-case	Combustion Tuning	0.163 lb NOx/ MMBTU for gas and 0.4 lb NOx/ MMBTU for oil

Location	Source	Permitted Capacity (MMBTU/hr unless noted)	Fuel	1-hour RACT		
				NO_x RACT Category	RACT Requirement	Emission Limit
Point Breeze	Unit 860-2H4	99.4	Refinery oil and refinery gas	Case-by-case	Combustion Tuning	0.270 lb NOx/ MMBTU for gas and 0.4 lb NOx/ MMBTU for oil
Point Breeze	Unit 860-2H5	155	Refinery oil and refinery gas	Case-by-case	Combustion Tuning	0.163 lb NOx/ MMBTU for gas and 0.4 lb NOx/ MMBTU for oil
Point Breeze	Unit 860-2H7	59	Refinery oil and refinery gas	Case-by-case	Combustion Tuning	0.157 lb NOx/ MMBTU for gas and 0.4 lb NOx/ MMBTU for oil
Point Breeze	Unit 860-2H8	49.6	Refinery oil and refinery gas	Presumptive	25 Pa Code §129.93(b)(2)-(5)	Annual Tune-up
Point Breeze	Unit 864-PH1	80	Refinery oil and refinery gas	Case-by-case	Combustion Tuning	0.167 lb NOx/ MMBTU for gas and 0.4 lb NOx/ MMBTU for oil
Point Breeze	Unit 864-PH11	74	Refinery oil and refinery gas	Case-by-case	Combustion Tuning	0.145 lb NOx/ MMBTU for gas and 0.4 lb NOx/ MMBTU for oil
Point Breeze	Unit 864-PH12	85.1	Refinery oil and refinery gas	Case-by-case	Combustion Tuning	0.119 lb NOx/ MMBTU for gas and 0.4 lb NOx/ MMBTU for oil
Point Breeze	Unit 870-H01	97	Refinery gas	N/A[2]	N/A[2]	N/A[2]
Point Breeze	Unit 870-H02	53	Refinery gas	N/A[2]	N/A[2]	N/A[2]
Point Breeze	Unit 859-1H1	98	Refinery gas	N/A[2]	N/A[2]	N/A[2]
Girard Point	Unit 137 F-1	415[1]	Refinery oil and refinery gas	Case-by-case	Combustion Tuning	0.230 lb NOx/ MMBTU on a rolling 30-day average for gas and oil.
Girard Point	Unit 137 F-2	155[1]	Refinery oil and refinery gas	Case-by-case	Combustion Tuning	0.257 lb NOx/ MMBTU for gas and 0.4 lb NOx/ MMBTU for oil
Girard Point	Unit 137 F-3	60	Refinery oil	Case-by-case	Combustion Tuning	0.4 lb NOx/ MMBTU
Girard Point	Unit 1332 H-1	45	Refinery gas	Presumptive	25 Pa Code §129.93(b)(2)-(5)	Annual Tune-up
Girard Point	Unit 1332 H-2	60	Refinery gas	Case-by-case	Combustion Tuning	0.300 lb NOx/ MMBTU
Girard Point	Unit 1332 H-3	43	Refinery gas	Presumptive	25 Pa Code §129.93(b)(2)-(5)	Annual Tune-up
Girard Point	Unit 1332 H-400	186[1]	Refinery gas	Case-by-case	Combustion Tuning	0.156 lb NOx/ MMBTU
Girard Point	Unit 1332 H-401	233	Refinery gas	Case-by-case	Combustion Tuning	0.156 lb NOx/ MMBTU

Location	Source	Permitted Capacity (MMBTU/hr unless noted)	Fuel	1-hour RACT		
				NO_x RACT Category	RACT Requirement	Emission Limit
Girard Point	Unit 1332 H-601	48	Refinery gas	Presumptive	25 Pa Code §129.93(b)(2)-(5)	Annual Tune-up
Girard Point	Unit 1332 H-602	49	Refinery gas	Presumptive	25 Pa Code §129.93(b)(2)-(5)	Annual Tune-up
Girard Point	Unit 433 H-1	243[1]	Refinery gas	Case-by-case	ULNB and Combustion Tuning	0.060 lb NOx/ MMBTU
Girard Point	Unit 1232 B-104	70[1]	Refinery gas	Case-by-case	ULNB and Combustion Tuning	0.177 lb NOx/ MMBTU
Point Breeze	Unit 868 FCCU	50,000 BPD feed rate	Refinery gas	Case-by-case	Good Combustion and CO Promoter	569 tons NOx per year on a 365-day rolling avg.
Girard Point	Unit 1232 FCCU	100,000 BPD feed rate	Refinery gas	Case-by-case	-	-
Girard Point	#3 Boilerhouse Boiler #37	495[1]	Refinery oil and refinery gas	Case-by-case	ULNB	0.330 lb NOx/ MMBTU for both fuels
Girard Point	#3 Boilerhouse Boiler #39	495[1]	Refinery oil and refinery gas	Case-by-case	ULNB	0.330 lb NOx/ MMBTU for both fuels
Girard Point	#3 Boilerhouse Boiler #40	660[1]	Refinery oil and refinery gas	Case-by-case	ULNB	0.330 lb NOx/ MMBTU for both fuels
Point Breeze/Girard Point	Engine IC-002	1.4	Diesel	N/A	N/A[2]	N/A[2]
Point Breeze/Girard Point	Engine IC-005	0.2	Diesel	N/A	N/A[2]	N/A[2]
Point Breeze/Girard Point	Engine IC-006	0.8	Diesel	N/A	N/A[2]	N/A[2]
Point Breeze/Girard Point	Engine IC-007	0.7	Diesel	N/A	N/A[2]	N/A[2]
Point Breeze/Girard Point	Engine IC-008	1.5	Diesel	N/A	N/A[2]	N/A[2]
Point Breeze/Girard Point	11 Emergency Generators and Fire Pumps	856 HP or less	3 Diesel 8 ULSD	N/A	N/A[2]	N/A[2]

[1] Indicates a "capped" heat input, rather than maximum capacity, which were approved as part of the 1-hour RACT.

[2] Units were not part of 1-hour RACT

The RACT plan approval approved in the SIP under the 1-hour ozone standard contains only case-by-case requirements for the emissions units identified as such in Table 3 above. Under 1-hour

RACT, some boilers and heaters are required to have ULNB as RACT. Combustion units without NOx controls and not subject to presumptive requirements were required to have annual combustion tuning (CT). Some boilers and heaters have heat input caps in MMBTU/hr (as identified with the footnote "1" in Table 3). To determine compliance with these caps, the facility is required to monitor fuel input for these boilers in a daily basis. In addition, all combustion units above 50 MMBTU/hr have lbs NOx/MMBTU limits, in some cases one numerical limit is applied to both gas burning and oil burning. While most units at the time of the 1-hour RACT evaluation could burn both refinery fuel gas and refinery fuel oil, regular oil use by boilers and heaters was phased out of the facility by the end of 2010 as a requirement in a May 24, 2005 Consent Decree between EPA, several states, the City of Philadelphia, and Sunoco, Inc. (Civil Action No.05-02866). While the Consent Decree allows PES to burn oil in certain circumstances, such as gas curtailments, PES has completely stopped burning oil in these heaters and boilers and is requesting removal of the ability to burn oil for its 8-hour RACT. AMS is removing any limitation for burning fuel oil in these boilers and heaters as part of the RACT SIP for PES.

Additionally, the following units were subject to case-by-case requirements under the 1-hour RACT determination, but have since been shut down:

- #3 Boiler House Boiler #38
- 22 Boiler House Boilers #1
- 22 Boiler House Boilers #2
- 22 Boiler House Boilers #3
- 859 Heater 1H1 (76 MMBTU/hr) – This is a different unit from the 98 MMBTU/hr 859 Heater 1H1 listed below as being installed after 1-hour RACT.
- 859 Heater 1H2
- 859 Heater 1H3
- 864 Heater PH3
- 864 Heater PH4
- 864 Heater PH5
- 861 Heater 3H1S
- 861 Heater 3H1N
- 860 Boiler 2H9

Thus, AMS is not evaluating RACT for these units and requesting that the applicable RACT requirements be removed from the SIP.

The following units were subject to presumptive RACT and have since been shut down:

- 860 Heater 2H1
- 860 Heater 2H6
- 864 Heater PH2
- 1332 Heater H-600

These are being listed for informational purposes. No changes to the SIP are required.

The following units were installed after the 1-hour RACT approval:

- PB Unit 870 Heater H01 (97 MMBTU/hr, refinery gas)
- PB Unit 870 Heater H02 (53 MMBTU/hr, refinery gas)
- PB Unit 859 Heater 1H1 (98 MMBTU/hr, refinery gas) – This unit was installed in 2009 as part of the Unit 859 reactivation project and is a different unit from the 76 MMBTU/hr 859 Heater 1H1 listed above.

Unit 433 H-1 Heater was subject to the following 1-hour case-by-case RACT requirements as approved into the SIP: a firing rate cap of 243 MMBTU/hr and an emissions limit of 0.060 lbs/MMBTU. In 2006, AMS approved the following revisions to the heater in AMS Plan Approval No. 06050 dated December 6, 2006: the heater's capacity limit was increased to 260 MMBTU/hr and its NOx emission limit was reduced to 0.035 lbs/MMBTU. These changes resulted in a reduction of potential NOx emissions of 24 tons per year (63.9 - 39.9 tons per year). This permit modification is now being submitted as a revision to the SIP to address RACT for Unit 433 H-1 Heater.

No internal combustion engines were evaluated in the 1-hour RACT determination as none were permitted at that time. The facility has the following internal combustion engines:

- Eleven (11) emergency generators or emergency fire pumps. The largest unit is 896 HP. Three (3) units burn diesel, eight (8) burn ultra low sulfur diesel (ULSD).
- Five (5) non-emergency units used with pumps or compressors. The largest unit is 214 HP. Each unit burns diesel and were permitted after the 1-hour RACT approval.

The following incinerators and flares are control devices that emit NOx when burning/controlling VOCs:

- Unit 867 Sulfur Recovery Unit (SRU) Flare
- North Flare
- South Flare
- Acid Gas Flare
- SWS Flare
- LPG Flare (Propane Loading Station)
- Marine Vapor Recovery Unit (40 MMBTU/hr)
- 1231/1232 Flare
- 433 Flare
- 1232 FCCU CO Boiler (580 MMBTU/hr)

i. Presumptive RACT for NOx:

Each heater listed as Presumptive in Table 3 is subject to the presumptive RACT requirements of 25 PA Code Sections 129.93(b)(2)-(5). An annual adjustment or tune-up shall be performed on each unit.

Each of the eleven emergency generators or fire pumps are subject to the presumptive RACT requirements of 25 PA Code Section 129.93(c)(5). Each unit is limited to operating less than 500 hours per rolling 12-month period in Title V/State Operating Permit No. V06-016 and must be installed, maintained, and operated in accordance with manufacturer's specifications.

The following control devices are subject to the presumptive RACT requirements of 25 PA Code Section 129.93(c)(4): Unit 867 SRU Incinerator, North Flare, South Flare, Acid Gas Flare, SWS Flare, LPG Flare, Marine Vapor Recovery Unit, 1231/1232 Flare, 433 Flare, and 1232 FCCU CO Boiler. Each unit must be installed, maintained, and operated in accordance with manufacturer's specifications.

ii. Case-by-case RACT Analysis for NOx:

Boilers and Heaters

PES has 27 heaters and three (3) boilers. As mentioned above, seven (7) of the heaters were evaluated for RACT separately and are not being addressed in this document. The potential NOx emissions listed in Table 1 for the heaters and boilers are based on the rated capacity and the permitted lbs/MMBTU NOx emission limit for each unit.

For these case-by-case heaters and boilers, the following control options are available, including estimated NOx reduction, and were evaluated:

- Ultra Low NOx Burners (ULNBs) and Selective Catalytic Reduction (SCR) – 96%
- SCR – 85%
- ULNBs – 50-86% (Assumes modern ULNBs control emissions to 0.03 lbs/MMBTU. The NOx emission reduction varies, depending on the unit's current NOx emission rate.)
- Low NOx Burners (LNBs) and Selective Non-Catalytic Reduction (SNCR) – 70%
- LNBs and Flue Gas Recirculation (FGR) – 55%
- SNCR – 40%

Control Device Descriptions:

- ULNBs and LNBs are burners designed to create a larger, lower temperature flame, which reduces thermal NOx.
- SCR injects a nitrogen based reagent such as ammonia into the exhaust upstream of a catalyst. NOx, ammonia (NH3), and oxygen (O2) react on the surface of the catalyst to form

nitrogen (N2) and water (H20).

- SNCR is similar to SCR, but does not use a catalyst.

A summary of the available controls evaluated as RACT for the heaters and boilers and their technical and economic feasibility are provided in Table 4 below. Baseline potential NOx emissions were used for all cost analyses provided. Some units had controls installed after 1-hour RACT, as identified in the Existing Control column in Table 4 below. Emissions from existing controls were considered as baseline for the RACT evaluation.

Table 4 - Summary of Feasibility of NOx Controls Evaluated as RACT – Boilers and Heaters

		Technical Feasibility and Cost Effectiveness ($/Ton)					
Source	**Existing Control**	**ULNB & SCR**	**SCR**	**ULNB**	**LNB & SCR**	**LNB & FGR**	**SNCR**
Unit 210-13H1	CT	Infeasible	Infeasible	3,151	9,998	Infeasible	13,921
Unit 860-2H2	CT	Infeasible	Infeasible	Infeasible	Infeasible	Infeasible	5,631
Unit 860-2H3	CT	Infeasible	Infeasible	Infeasible	Infeasible	Infeasible	9,552
Unit 860-2H4	CT	Infeasible	Infeasible	2,999	16,808	Infeasible	6,641
Unit 860-2H5	CT	Infeasible	Infeasible	Infeasible	Infeasible	Infeasible	9,786
Unit 860-2H7	CT	Infeasible	Infeasible	Infeasible	Infeasible	Infeasible	12,605
Unit 864-PH1	CT	Infeasible	Infeasible	9,528	7,796	Infeasible	11,045
Unit 864-PH11	CT	Infeasible	Infeasible	12,967	9,070	Infeasible	1,898
Unit 864-PH12	CT	Infeasible	Infeasible	17,680	11,561	Infeasible	15,135
Unit 870-H01	ULNB [1]	ULNB installed	73,298	ULNB installed	ULNB installed	ULNB installed	49,070
Unit 870-H02	ULNB [1]	ULNB installed	92,541	ULNB installed	ULNB installed	ULNB installed	56,784
Unit 859-1H1	ULNB [1]	ULNB installed	127,640	ULNB installed	ULNB installed	ULNB installed	85,399
Unit 137 F-1	CT	9,648	6,578	4,331	8,232	7,224	5,883
Unit 137 F-2	CT	14,897	8,492	8,203	13,023	13,228	6,340
Unit 137 F-3	ULNB [1]	ULNB installed	51,523	ULNB installed	ULNB installed	ULNB installed	32,261
Unit 1332 H-2	ULNB [1]	ULNB installed	77,200	ULNB installed	ULNB installed	ULNB installed	48,210
Unit 1332 H-400	SCR [1]	SCR installed	SCR installed	11,337	SCR installed	SCR installed	SCR installed
Unit 1332 H-401	SCR [1]	SCR installed	SCR installed	9,051	SCR installed	SCR installed	SCR installed
Unit 433 H-1	ULNB	ULNB installed	50,368	ULNB installed	ULNB installed	ULNB installed	39,879
Unit 1232 B-104	ULNB	ULNB installed	16,570	ULNB installed	ULNB installed	ULNB installed	10,772
#3 Boilerhouse Boiler #37	ULNB + FGR [1]	ULNB & FGR installed	32,829	ULNB & FGR installed	ULNB & FGR installed	ULNB & FGR installed	13,221
#3 Boilerhouse Boiler #39	ULNB + FGR [1]	ULNB & FGR	32,829	ULNB & FGR	ULNB & FGR	ULNB & FGR	13,221

		installed		installed	installed	installed	
#3 Boilerhouse Boiler #40	ULNB + FGR [1]	ULNB & FGR installed	30,139	ULNB & FGR installed	ULNB & FGR installed	ULNB & FGR installed	11,823

[1] Controls were installed after the 1-hour RACT determination, thus are not approved as RACT

For each boiler and heater, all additional NOx controls are either technically infeasible or economically unreasonable based on the current existing level of control. AMS is revising the SIP to update to the RACT applicable requirements for each emissions unit based on the current level of control and most recent permit modifications. These revisions are summarized in Table 5 below.

Table 5 – Comparison of Approved 1-hour and Proposed 8-hour Case-by-Case RACT Requirements for Boilers and Heaters

Source	Permitted Capacity (MMBtu/ hr unless noted)	Approved 1-hour RACT		Proposed 8-hour RACT	
		RACT Control	Emission Limit	RACT Control	Emission Limit
Unit 210C-Heater 13H1	235.4	Combustion tuning	0.104 lb NOx/ MMBTU for gas and 0.4 lb NOx/ MMBTU for oil	Combustion tuning	0.104 lb NOx/ MMBTU for gas
Reformer 860- Heater 2H2	69.8	Combustion Tuning	0.350 lb NOx/ MMBTU for gas and 0.4 lb NOx/ MMBTU for oil	Combustion Tuning	0.350 lb NOx/ MMBTU for gas
Reformer 860- Heater 2H3	174.7	Combustion Tuning	0.163 lb NOx/ MMBTU for gas and 0.4 lb NOx/ MMBTU for oil	Combustion Tuning	0.163 lb NOx/ MMBTU for gas
Reformer 860- Heater 2H4	99.4	Combustion Tuning	0.270 lb NOx/ MMBTU for gas and 0.4 lb NOx/ MMBTU for oil	Combustion Tuning	0.270 lb NOx/ MMBTU for gas
Reformer 860- Heater 2H5	155	Combustion Tuning	0.163 lb NOx/ MMBTU for gas and 0.4 lb NOx/ MMBTU for oil	Combustion Tuning	0.163 lb NOx/ MMBTU for gas
Reformer 860- Heater 2H7	59	Combustion Tuning	0.157 lb NOx/ MMBTU for gas and 0.4 lb NOx/ MMBTU for oil	Combustion Tuning	0.157 lb NOx/ MMBTU for gas
Reformer 864- Heater PH1	80	Combustion Tuning	0.167 lb NOx/ MMBTU for gas and 0.4 lb NOx/ MMBTU for oil	Combustion Tuning	0.167 lb NOx/ MMBTU for gas
Reformer 864- Heater PH11	74	Combustion Tuning	0.145 lb NOx/ MMBTU for gas and 0.4 lb NOx/ MMBTU for oil	Combustion Tuning	0.145 lb NOx/ MMBTU for gas
Reformer 864- Heater PH12	85.1	Combustion Tuning	0.119 lb NOx/ MMBTU for gas and 0.4 lb NOx/ MMBTU for oil	Combustion Tuning	0.119 lb NOx/ MMBTU for gas
Unit 870-Heater H01	97	N/A	N/A	ULNB[1]	0.035 lb NOx/MMBTU
Unit 870-Heater H02	53	N/A	N/A	ULNB[1]	0.035 lb NOx/MMBTU
Unit 859-	98	N/A	N/A	ULNB[1]	0.035 lb NOx/MMBTU

Source	Permitted Capacity (MMBtu/ hr unless noted)	Approved 1-hour RACT		Proposed 8-hour RACT	
		RACT Control	Emission Limit	RACT Control	Emission Limit
Heater 1H1					
Unit 137 Heater F-1	415	Combustion Tuning	0.230 lb/ MMBTU on a 30-day rolling average	Combustion Tuning	0.230 lb/ MMBTU on a 30-day rolling average
Unit 137 Heater F-2	155	Combustion Tuning	0.257 lb NOx/ MMBTU for gas and 0.4 lb NOx/ MMBTU for oil	Combustion Tuning	0.257 lb NOx/ MMBTU for gas
Unit 137 Heater F-3	60	Combustion Tuning	0.4 lb NOx/ MMBTU for oil	ULNB[1]	0.060 lb NOx/MMBTU for gas
Unit 1332 Heater H-2	60	Combustion Tuning	0.300 lb NOx/ MMBTU for gas	ULNB[1]	0.040 lbs/MMBTU
Unit 1332 Heater H-400	186	Combustion Tuning	0.156 lb NOx/ MMBTU for gas	SCR[1]	0.06 lb/MMBTU on a rolling 365-day basis
Unit 1332 Heater H-401	233	Combustion Tuning	0.156 lb NOx/ MMBTU for gas	SCR[1]	0.06 lb/MMBTU on a rolling 365-day basis
Unit 433 - Heater H-1	260[2]	ULNB and Combustion Tuning	0.060 lb NOx/ MMBTU for gas	ULNB and Combustion Tuning	0.035 lb NOx/ MMBTU for gas
Unit 1232 - Heater B-104	70	ULNB and Combustion Tuning	0.177 lb NOx/ MMBTU for gas	ULNB and Combustion Tuning	0.177 lb NOx/ MMBTU for gas
#3 Boiler House Boiler #37	495	ULNB and Combustion Tuning	0.330 lbs NOx/MMBTU on a 30-day rolling average	ULNB + FGR[1]	0.040 lb/MMBTU on a rolling 365-day basis
#3 Boiler House Boiler #39	495	ULNB and Combustion Tuning	0.330 lbs NOx/MMBTU on a 30-day rolling average	ULNB + FGR[1]	0.040 lb/MMBTU on a rolling 365-day basis
#3 Boiler House Boiler #40	660	ULNB and Combustion Tuning	0.330 lbs NOx/MMBTU on a 30-day rolling average	ULNB + FGR[1]	0.040 lb/MMBTU on a rolling 365-day basis

[1] Controls were installed after the 1-hour RACT determination, thus are not approved as RACT

[2]Capacity increased from 243 MMBTU/hr to 260 MMBTU/hr along with reduction in NOx emission limit in AMS Plan Approval 06050 dated December 4, 2006 and is being proposed as a SIP revision for 8-hour RACT

Conclusions and Recommendations

AMS determines that the following updates to the current 1-hr RACT determination shall be NOx RACT for the 1997 8-hr ozone standard:

- Removing the ability to burn oil for all boilers and heaters. Emissions limits for burning oil will be removed.
- ULNB shall be the RACT control for the following heaters: Unit 870-H01, Unit 870-H02, Unit 859-1H1, Unit 137 F-3, and Unit 1332 H-2.
    - Unit 870-H01 and Unit 870 H02 Heaters shall be given NOx emission limits of 0.035 lbs/MMBTU (consistent with limit in AMS Plan Approval 02184 dated May 12, 2004).

- Unit 859-1H1 Heaters shall be given a NOx emission limit of 0.02 lbs/MMBTU (consistent with limit in AMS Plan Approval 06144 dated January 29, 2008).
- Unit 137 F-3 Heater shall be listed as burning refinery fuel gas and shall be given a NOx emission limit of 0.060 lbs/MMBTU (consistent with limit in AMS Plan Approval 07163 dated February 5, 2008).
- Unit 1332 H-2 Heater shall be given a NOx emission limit of 0.040 lbs/MMBTU (consistent with limit in AMS Plan Approval 05124 dated October 4, 2005).
- Unit 433 H-1 Heater shall be given NOx emission limits of 0.035 lbs/MMBTU and a capacity limit of 260 MMBTU/hr. (matches limits in AMS Plan Approval 06050 dated December 4, 2006).

- SCR shall be the RACT control for Unit 1332 H-400 and Unit 1332 H-401 Heaters. The NOx limit for each heater shall be changed from 0.156 lbs/MMBTU to 0.06 lbs/MMBTU on a rolling 365-day basis (consistent with limit in AMS Plan Approval 09040 dated February 1, 2010) and 0.15 lbs/MMBTU on a daily basis. These units have a NOx Continuous Emission Monitoring System (CEMS) on their combined stack at the SCR outlet. The SCR may be bypassed during times required to replace SCR catalyst or to do maintenance to the SCR/air pre-heater system or to operate the heaters at low firing rate during reformer catalyst regenerations, as per Plan Approval 09040. PES must take a daily NOx sample when the SCR and CEMS are bypassed. The daily and rolling 365-day emission limits still apply during the bypasses.
- FGR in addition to existing ULNB shall be the RACT control for #3 Boilerhouse Boilers #37, 39 & 40. The NOx limit for each boiler shall be changed from 0.330 lbs/MMBTU on a rolling 30-day to 0.040 lbs/MMBTU on a rolling 365-day basis (consistent with limit in AMS Plan Approval 08080 dated 11/2/10). They have been given an additional daily NOx limit of 0.10 lbs/MMBTU. These boilers were required to have NOx CEMS as part of the 1-hour RACT.
- Removal of all conditions referring to the following shutdown units:
  - #3 Boiler House Boiler #38
  - 22 Boiler House Boilers #1
  - 22 Boiler House Boilers #2
  - 22 Boiler House Boilers #3
  - 859 Heater 1H1 (76 MMBTU/hr unit)
  - 859 Heater 1H2
  - 859 Heater 1H3
  - 864 Heater PH3
  - 864 Heater PH4
  - 864 Heater PH5
  - 861 Heater 3H1S
  - 861 Heater 3H1N
  - 860 Boiler 2H9

Fluid Catalytic Cracking Units (FCCU)

PES has two (2) FCCUs. The 868 FCCU is a full-burn unit that is permitted under AMS Plan Approval No. 00184 dated March 22, 2002 to operate up to 50,000 barrels in a single day and 47,500 barrels per day on a rolling 365-day average. Under 1-hour RACT the unit has a NOx emission limit of 569 tons per rolling 12-month period and must follow good combustion practices and use a CO promoter in the regenerator. It did not have any barrels per day limits at that time. Potential NOx emissions in Table 1 are based on the 47,500 barrels per day on a rolling 365-day average permit limit from AMS Plan Approval No. 00184 dated March 22, 2002 and a 50 ppmvd @ 0% oxygen limit proposed by PES in a February 2013 "868 Low NOx CO Combustion Promoter Study" to comply with the Second Amendment of Civil Action No.05-02866 Consent Decree. This study involved operating the unit over a period of time with an additive which provides more complete oxidation of CO to CO2 at and reduced NOx emissions. The unit has been complying with the proposed emission, although it has not been approved by EPA yet.

The 1232 FCCU is a partial–burn unit that is permitted under AMS Plan Approval No. 11353 dated July 30, 2012 to operate up to 100,000 barrels in a single day and 90,000 barrels per day on a rolling 365-day average. It is equipped with a waste heat CO Boiler. It did not have any specific requirements under 1-hour RACT. It had SCR installed after the 1-hour RACT determination. Potential NOx emissions in Table 1 come from a rolling 365-day NOx permit limit from Plan Approval No. 11353 dated July 30, 2012.

The following control devices are available for controlling NOx emissions from FCCUs:

- SCR – Estimated 90% NOx control efficiency for FCCUs.
- LoTOx™ – This technology works in conjunction with a wet scrubber. It is a selective, low temperature oxidation technology that uses ozone to oxidize NOx to water soluble nitric pentoxide (N2O5), which, inside the wet scrubber, forms nitric acid that is subsequently scrubbed by the scrubber nozzles and neutralized by the scrubber's alkali reagent. Estimated 90% NOx control efficiency for FCCUs.
- SNCR – Estimated 40% NOx control efficiency for FCCUs.

SCR, SNCR, and LoTOx™ were evaluated as evaluated as technically feasible control options for the 868 FCCU.

Table 6 - Summary of NOx Controls Evaluated as RACT – FCCUs

		Technical Feasibility and Cost Effectiveness ($/Ton)		
Source	**Existing Control**	**SCR**	**SNCR**	**LoTOx™**
868 FCCU	Good Combustion and CO Promoter	30,794	10,679	13,328
1232 FCCU	SCR	SCR	SCR	SCR

		Installed	Installed	Installed

SCR, SNCR, and LoTOx^{TM} are all economically unreasonable for the 868 FCCU based on cost per ton of NOx controlled.

Since no NOx control is more effective than SCR for an FCCU, no further control evaluation was performed on the 1232 FCCU. The SCR will be considered RACT for the unit under the 1997 8-hour ozone standard.

Table 7 – 1-hour and 8-hour Case-by-Case RACT Requirements for FCCUs

Source	Permitted Capacity (MBPD)	Approved 1-hour RACT		8-hour RACT	
		RACT Control	Emission Limit	RACT Control	Emission Limit
868 FCCU	50	Good Combustion and CO Promoter	569 tons per rolling 12-month period	Good Combustion and CO Promoter	100 ppmdv @ 0% O_2 on a 7-day rolling average, and 130.2 tons per rolling 365-day period
1232 FCCU	100	N/A	N/A	SCR	40 ppmdv @ 0% O_2 on a 7-day rolling average and 208.28 tons per rolling 365-day period

The 100 ppmdv @ 0% O_2 on a 7-day rolling average emission limit for the 868 FCCU is a proposed limit by PES in a February 2013 "868 Low NOx CO Combustion Promoter Study" to comply with the Second Amendment of Civil Action No.05-02866 Consent Decree. The 30 ppmdv @ 0% O_2 on a 7-day rolling average limit for the 1232 FCCU is from Plan Approval No. 11353 dated July 30, 2012. The tons per rolling 365-day period limit come from the potential emissions in Table 1 for each unit, calculated as described above.

Conclusions and Recommendations:

AMS determines that adding a 100 ppmdv @ 0% O_2 on a 7-day rolling average NOx limit and modifying the annual NOx limit to 130.2 tons per rolling 365-day period shall be NOx RACT for the 1997 8-hour for Unit 868 FCCU. AMS determines the existing SCR shall be NOx RACT for the 1997 8-hour ozone standard for Unit 1232 FCCU. In addition, a 30 ppmdv @ 0% O_2 on a 7-day rolling average NOx emission limit and a 208.28 tons per rolling 365-day period NOx emission limit (matches limits in AMS Plan Approval No. 11353 dated July 30, 2012). AMS is also adding a requirement to operate a NOx CEMS on the Unit 868 FCCU and the Unit 1232 FCCU.

B. VOC RACT

The facility's air emissions sources contributing to VOC emissions include the following:

Table 8 – Summary of 1-hour and 8-hour RACT for VOC Sources

Location	Source Name	RACT Category	VOC RACT Summary
Point Breeze/Girard Point	Combustion Units [1] <50 MMBtu/hr	Presumptive	meets PA Code §129.93
	Combustion Units [1] ≥50 MMBtu/hr	Case-by-case	No technically feasible control option for controlling VOC emissions, both 1-hour and 8-hour RACT
Point Breeze/Girard Point	Cooling Towers	Case-by-case	1-hour RACT: Inspection and maintenance/monitoring program for VOC fugitive emissions 8-hour RACT: 40 CFR 63 Subpart CC equipment monitoring program
Point Breeze	868 Fluid Catalytic Cracking Unit	Case-by-case	Full-burn unit, no VOC RACT control options for 1-hour or 8-hour RACT
Girard Point	1232 Fluid Catalytic Cracking Unit	Case-by-case	Partial-burn unit 1-hour RACT: No specific requirements 8-hour RACT: Vent to CO Boiler when operating as partial-burn unit and good combustion practices
Point Breeze/Girard Point/Schuylkill River Tank Farm	Equipment Leaks	Case-by-case 1-hour CTG 8-hour	1-hour RACT: quarterly LDAR program 8-hour RACT: meets PA Code §129.58
Point Breeze/Girard Point/ Schuylkill River Tank Farm	Wastewater Treatment Plant Oil/Water separators (Carbon canisters)	CTG	meets PA Code §129.55
Point Breeze/Girard Point/ Schuylkill River Tank Farm	Storage Tanks	CTG	meets PA Code §§129.56 and 129.57
Point Breeze	Stormwater Tank 7308, 7300	CTG	meets PA Code §§129.56 and 129.57
Girard Point	Degreasers	CTG	meets PA Code §129.63
Point Breeze/Girard Point	Loading Operations (Wharf)	Case-by-case (CTG for RVP > 4 for 1-hour RACT)	1-hour RACT: CTG/ meets PA Code §129.81 for RVP > 4, no requirements for RVP < 4 8-hour RACT: PB limited to

			RVP < 4 and 25.99 tpy VOC. GP thermal oxidizer and 98% control or 20 ppm outlet for RVP >= 4, de minimis/no control for RVP < 4.
Girard Point/ Schuylkill River Tank Farm	Loading Operations (Truck Rack)	CTG for RVP > 4 Case-by-case for RVP < 4	RVP > 4 meets meets AMR V, Section V RVP < 4 (cumene) de minimis, no controls in 1-hour and 8-hour RACT
Point Breeze/Girard Point	11 Diesel-Fired Emergency and Fire Pumps RICE	Presumptive	meets PA Code §129.93

[1] The combustion units are the same boilers and heaters listed in the NOx RACT section.
[2] The diesel-fired RICE are the same units listed in the NOx RACT section.

The RACT plan approvals (PA Permit Number 51-1501 and 51-1517 dated August 1, 2000) approved in the SIP for the 1-hour ozone standard contain only case-by-case requirements for a few VOC emissions units as identified in Table 8. AMS is re-evaluating RACT for sources identified as case-by-case and summarizing RACT applicable requirements for remaining sources.

i. CTG RACT [i.e. Applicable to EPA Control Technique Guideline (CTG)]:

The following sources are subject to RACT regulations that have been SIP-approved in accordance with EPA's Control Technique Guidelines (CTGs) for controlling VOC emissions. In addition, each regulation has been recertified by Pennsylvania as meeting the applicable CTG requirements for RACT for the 1997 8-hour ozone standard.

Equipment leaks are subject to 25 PA Code Section 129.58, which satisfies EPA's CTG RACT requirements for the control of VOC emissions in leaks from petroleum refinery equipment. In accordance with 25 PA Code Section 129.58, the facility must conduct a monitoring program for equipment leaks. Under 1-hour case-by-case RACT, the facility must have a quarterly leak detection and repair (LDAR) program for all valves, pumps, flanges, and compressors in VOC service. Since these requirements are less stringent than 25 PA Code Section 129.58, which has more frequent monitoring for some equipment and has additional leak standards, the quarterly LDAR program is being removed from the RACT plan approval.

Wastewater Treatment Plant Oil/Water Separators are subject to 25 PA Code Section 129.55, which satisfies EPA's CTG RACT requirements for the control of VOC emissions for VOC controls of refinery vacuum producing systems, wastewater separators, and process turnarounds. In accordance with 25 PA Code Section 129.55, containers, pumps, and compressors in the refinery handling VOCs with a vapor pressure greater than 1.5 psia shall have mechanical seals.

Storage Tanks and Stormwater Tank 7308 and7300 are subject to 25 PA Code Sections 129.56 and 129.57, which satisfy EPA's CTG RACT requirements for the control of VOC emissions from petroleum liquid storage. Tanks storing VOCs with a vapor pressure greater than 1.5 psia must have

a floating roof or vapor recovery system and control device if the tank is greater than 40,000 gallons and a pressure relief valve meeting certain requirements if they are between 2,000 gallons and 40,000 gallons.

Degreasers are subject to 25 PA Code Section 129.63, which satisfies EPA's CTG RACT requirements for the control of VOC emissions from solvent metal cleaning. Degreasers must meet certain equipment standards and operating requirements.

Truck Loading Operations for organic materials with a RVP of 4.0 or greater are subject to the CTG RACT requirements of Air Management Regulation V, Section V. Loading organic materials with a RVP of 4.0 or greater requires a vapor recovery system. Truck Loading of cumene, which has a RVP below 4.0, has potential VOC emissions of 2 tons per year. Based on AMS permitting and engineering knowledge, AMS determines that installing any control technology on such small sources is both technically and economically unreasonable.

ii. Presumptive RACT:

Combustion units (boilers and heaters) with a rated heat input greater than or equal to 20 MMBTU/hr but less than 50 MMBTU/hr are subject to 25 PA Code Sections 129.93(b)(2)-(5). An annual adjustment or tuneup shall be performed on each unit.

The eleven emergency generators and fire pumps are subject to 25 PA Code Section 129.93(c)(5). Each unit is limited to operating less than 500 hours per rolling 12-month period in Title V/State Operating Permit No. V06-016 and must be installed, maintained, and operated in accordance with manufacturer's specifications.

iii. Case-by-case RACT Analysis for VOC:

The PES RACT Update July 2015 – Revision E submittal includes a full case-by-case RACT analysis for the VOC emission sources listed above. AMS accepted this analysis, which is being incorporated by reference.

Combustion Units Rated 50 MMBTU/hr and Greater

There are no 1-hour VOC RACT requirements for the combustion units (boilers and heaters) with a rated heat input of 50 MMBTU/hr or greater because there were no technically feasible VOC control options for these combustions units. It is not technically feasible to vent combustion unit exhausts to control devices like flares. Oxidation catalysts have not been demonstrated at refineries and are considered technically infeasible because the sulfur compounds found in refinery fuel gas poisons the catalyst. Most combustion units at the facility have potential VOC emissions below 5 tons per year.

Conclusions and Recommendations:

AMS determines that there are no VOC RACT controls for the combustion units.

Cooling Towers

The cooling towers emit fugitive VOC emissions when leaks in refinery heat exchangers allow VOCs to enter the cooling water streams and become volatilized when the cooling water passes through the cooling towers. The potential emissions listed in Table 2 were calculated using AP-42 emissions factors (AP-42 Table 5.1-2 for controlled emissions) and the circulation rate of the units. The SIP-approved 1-hour RACT plan approval requires an inspection and maintenance/monitoring program for VOC fugitive emissions from cooling towers. There are no add-on control devices for VOC emissions from cooling towers as all emissions are fugitives. As is noted in AP-42, controlling emissions from cooling towers involves minimizing leaks and monitoring cooling water for hydrocarbons. PES currently does this through the inspection and maintenance/monitoring program for VOC fugitive emissions from cooling towers as required in 1-hour RACT plan approval and an equipment monitoring program for heat exchange systems as required by 40 CFR 63, subpart CC, (National Emission Standards for Hazardous Air Pollutants from Petroleum Refineries. This program sets specific monitoring locations, frequencies, methods, leak levels, and repair requirements. This specificity makes it more stringent than the program in 1-hour RACT.

Conclusions and Recommendations:
AMS determines that the equipment monitoring program for heat exchange systems required by 40 CFR 63, subpart CC shall be VOC RACT for the 1997 8-hour ozone standard, replacing the maintenance/monitoring program required in 1-hour RACT..

Fluid Catalytic Cracking Units (FCCUs)

The Unit 1232 FCCU at the Girard Point Refinery is a partial-burn unit that uses a carbon monoxide (CO) waste heat boiler to reduce VOC emissions to very low levels (potential VOC emissions are 8.2 tons per year). It is capable of operating in full-burn mode when there is a problem with the CO boiler. There are no 1-hour VOC RACT requirements for this unit.

The Unit 868 FCCU at the Point Breeze Refinery is in operation as a full-burn unit, where relatively low VOC and CO emissions are emitted in the exhaust gas after thermal regeneration of the catalyst. There are no specific 1-hour VOC RACT requirements for this unit. The 868 FCCU is required to have good combustion practices controlling the level of excess oxygen and CO promoter in the regenerator for NOx RACT, which also helps to reduce VOC emissions.

The only VOC control device available for FCCUs is a CO Boiler, which can only be used with partial burn units. CO boilers burn the CO in exhaust gases as fuel, converting it into CO2, and producing steam. Full-burn FCCUs do not emit CO in high enough concentrations to make CO boilers technologically feasible.

The Unit 1232 FCCU already has a CO boiler, the only VOC control option. This is determined VOC RACT when the FCCU is operating in partial-burn mode. A CO boiler is not technically

feasible for the Unit 868 FCCU because it is a full-burn unit or during full-burn mode for the 1232 FCCU.

Conclusions and Recommendations for VOC RACT:

AMS determines that good combustion practices and operation with the CO boiler when in partial-burn mode for Unit 1232 FCCU shall be VOC RACT for the 1997 8-hour ozone standard. AMS determines that good combustion practices controlling the level of excess oxygen and CO promoter in the regenerator for Unit 868 FCCU shall be VOC RACT for the 1997 8-hour ozone standard.

Marine Loading Operations (Wharf)

The Girard Point Barge Loading Process (P130) processes materials with a RVP of 4 psi or greater and is controlled by a thermal oxidizer (CD011, described as a flare in the Title V operating permit) consistent with the requirements of 25 PA Code Section 129.81. At the time of 1-hour RACT, the Point Breeze Marine Barge Loading (P636) processed organic materials with an RVP of 4 psi or greater and consequently had a Marine Vapor Collection and Control System (MVCACS) which collected and fed vapors to process heaters and boilers as fuel, in accordance with 25 PA Code Section 129.81. Point Breeze Marine Barge Loading no longer processes materials with a RVP of 4 psi or greater and the MVCACS has been shut down (it was only required for these materials).

At the time of the 1-hour RACT analysis, 25 PA Code 129.81 was the presumptive RACT regulation for marine vessel loading in Pennsylvania. As such, these two sources were required to have a thermal oxidation/combustion unit installed with at least 90% VOC capture and destruction efficiency. In 2001, EPA has issued new RACT requirements for marine vessel loading found in 40 CFR Part 60, Subpart Y that require a capture and destruction efficiency of at least 98% when using a destruction device and at least 95% when using a recovery device. Neither marine loading process at the facility is applicable to Subpart Y since their maximum throughputs have never exceeded the applicability thresholds of 10 million barrels of gasoline or 200 million barrels of crude on a 24-month annual average,

For the 1997 8-hour ozone NAAQS, AMS is not recertifying 25 PA Code 129.81 as meeting the RACT requirements for marine vessel loading since there is only one applicable source remaining in Philadelphia. As a result, these sources are subject to a case-by-case RACT analysis

The following are potential control options for barge loading:

- Thermal Incinerator (est. up tp 98% VOC control)
- Flare (up to 98%)
- Carbon Adsorption (up to 98%)
- Condenser (up to 90%)

Girard Point Barge Loading already has a Thermal Oxidizer with a 98% control efficiency for loading materials with a RVP of 4 psi or greater. Since the thermal oxidizer is the most stringent control option available, it is considered RACT for loading these materials at Girard Poinnt. Point

Breeze Barge Loading is being given a limit to restrict loading of organic liquid materials with a RVP of 4 psi or greater.

A case-by-case RACT analysis was done for both Girard Point Barge Loading and Point Breeze Barge Loading for materials with a RVP below 4 psi. A condenser was determined technically infeasible for Girard Point Barge Loading because VOC condensation would not occur for the composition of the VOC being captured for this unit. A condenser was determined technically feasible for Point Breeze Marine Loading, although the maximum VOC reduction achievable is only estimated to be 61% based on the composition of the VOC being captured for this unit.

Table 9 - Summary of VOC Controls Evaluated as RACT – Marine Loading RVP < 4 psi

		Technical Feasibility and Cost Effectiveness ($/Ton)			
Source	**PTE**	**Thermal Incinerator**	**Flare**	**Carbon Adsorption**	**Condenser**
GP Marine Loading	13.9	116,267	62,828	59,489	Infeasible
PB Marine Loading	25.99	23,365	19,254	14,798	41,525

All controls for both processes were determined technically infeasible or economically unreasonable.

AMS determines the following requirements to be RACT:

Girard Point Barge Loading of VOC materials with a Reid Vapor Pressure of 4 psi or greater shall vent to a Thermal Oxidizer with a VOC destruction efficiency of at least 98% or control to an outlet of 20 ppmv VOC or less. The Thermal Oxidizer shall have a continuous temperature monitor and recorder.

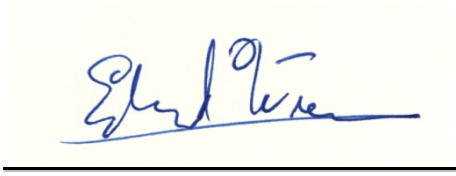
Point Breeze Marine Barge Loading shall not load any VOC materials with a Reid Vapor Pressure of 4 psi or greater. VOC emissions from Point Breeze Marine Barge Loading shall not exceed 25.99 tons per rolling 12-month period.

The 20 ppmv VOC outlet concentration option has been added for Girard Point Barge Loading of VOC materials with a RVP of 4 psi or greater in the event where the inlet concentration is very low, making it very difficult to achieve the alternative 98% destruction efficiency.

Conclusions and Recommendations for VOC RACT:

AMS determines that a Thermal Oxidizer with a 98% VOC control efficiency or controls outlet emissions to 20 ppmdv VOC shall be VOC RACT for the 1997 8-hour ozone standard for Girard Point Barge Loading of VOC materials with a RVP of 4 psi or greater. AMS determines that a limit

prohibiting loading materials with a RVP of 4 psi or greater and a 25.99 tons of VOC per rolling 12-month period limit to be VOC RACT for the 1997 8-hour standard for Point Breeze Marine Barge Loading.



8/11/15

Edward Wiener, Chief of Source Registration **Date**