



Pennsylvania
Department of Environmental Protection

SOUTHEAST REGIONAL OFFICE

MEMO

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RE TVOP RACT III - Case by Case
Constellation Energy Generation
TVOP No. 46-00038
APS ID: 346524, AUTH ID: 1528688, PF ID: 240931
Limerick Township, Montgomery County

On May 27, 2025, the Department of Environmental Protection (DEP) received a Significant Operating Permit Modification for a proposed Reasonably achievable Control Technology (RACT) III from Constellation Energy Generation (Constellation) for its facility located 3146 Sanatoga Road Pottstown in Limerick Township, Montgomery County.

Using the interactive map found on the *Pennsylvania Environmental Justice Mapping and Screening Tool (PennEnviroScreen)*, the facility is not located within ½ mile of an Environmental Justice (EJ) area.

1.0 Background

Constellation operates the following equipment that is covered under a Title V Operating Permit: three boilers, eight emergency generators, two natural draft cooling towers, an emergency spray pond, a remote reservoir solvent cleaning unit, and nuclear boiling water reactors with two steam turbines. The latter sources are used for the generation of electricity and the emissions of radionuclides associated with the nuclear boiling reactors are regulated by the Nuclear Regulatory Commission (NRC). Constellation submitted this proposal to comply with the regulations under 25 Pa. Code §129.114(b) and (d), which covers alternative Reasonably Available Technology (RACT) proposals and petition for alternative compliance schedules, for the RACT III NO_x.

The last five years of facility wide NOx emissions are provided in Table 1 below:

Table 1: Total NOx Actual Emissions– 2020 to 2024 AIMS Data

Year	NOx (tons/year)
2020	27.3
2021	26.7
2022	31.7
2023	39.7
2024	23.0

Constellation provided Table 2 to summarize RACT Compliance Strategy for the NOx sources at the facility.

Table 2: NOx Emitting Sources:

Emissions Source ID	Source Description	NOx RACT Compliance Strategy
001	Boiler A	Subject to RACT – <u>cannot</u> meet presumptive limits. Proposing Case-By-Case per 25 Pa. Code §129.114(b) and (d).
002A	Boilers B and C	Subject to RACT – <u>cannot</u> meet presumptive limits. Proposing Case-By-Case per 25 Pa. Code §129.114(b) and (d).
004A	Emergency Generators (8)	Subject to RACT – <u>cannot</u> meet presumptive limits. Proposing Case-By-Case per 25 Pa. Code §129.114(b) and (d).
105	Misc 2 Emergency Engines	Exempt from RACT III – 25 Pa. Code §129.111(c) (Initial Notification submitted to PADEP on April 4, 2025)
106	Emergency Engines NSPS – 6 Total	Exempt from RACT III – 25 Pa. Code §129.111(c) (Initial Notification submitted to PADEP on April 4, 2025)
Misc	Temp Boiler and Fire Pump	Exempt from RACT III – 25 Pa. Code §129.111(c) (Initial Notification submitted to PADEP on April 4, 2025)

2.0 Alternate RACT Analysis

This major modification encompasses the individual sources that address the requirements under 25 Pa. Code § 129.114(a) through the proposal of an alternate RACT requirement or limitation. Case-by-case RACT involves conducting a “top-down” analysis as outlined in the US EPA Draft “New Source Review Workshop Manual”, published in October 1990.

A basic summary of this top-down analysis after determining the sources and pollutant (NO_x) subject to the regulation [25 Pa. Code § 129.92(b)] is as follows:

1. Identify all available control technologies;
2. Eliminate the technically infeasible control technologies;
3. Rank the remaining control options by effectiveness;
4. Evaluate the remaining control options for economic, environmental and energy impacts in accordance with Section 4.2, Chapter 1, of the Office of Air Quality Planning and Standards (OAQPS) Air Pollution Control Cost Manual and document the results;
5. Finally, identify RACT based on the above steps.

2.1 NO_x RACT Assessment for Boilers A, B and C (Source IDs 001 and 002A)

The facility submitted case by case RACT analyses for the boilers listed above using the five step top-down analysis.

Step 1. Available control technologies

Selective Catalytic Reduction (SCR)
Selective Non-Catalytic Reduction (SNCR)
Low NO_x Burners (LNBs)
Catalyst Filters
Good Combustion Practices Good Air Pollution Control Practices

Step 2. Elimination of technically infeasible control technologies.

Control Technology	Reason the technology is infeasible
Selective Non-Catalytic Reduction (SNCR)	SNCR requires a high but very specific temperature range (generally between 1,550 °F and 1,950 °F) and sufficient residence time at this temperature to be effective. The average operating temperature for the three boiler units at the Limerick Facility is 609°F. This value is below the 1,550°F SNCR threshold operating temperature. Therefore, SNCR is deemed infeasible for these boiler units and will not be discussed further in this section.
Catalyst Filters	Catalyst Filter control technology has not been provided in the RBLC search or EPA guidance as a standard control device for boilers.

Step 3. Feasible control technology ranking:

Selective Catalytic Reduction (SCR): Reduction 70-90%

Low NOX Burners (LNBs): Reduction 40-85%

Good Combustion Practices Good Air Pollution Control Practices

Step 4. Control technology evaluation:

Constellation submitted a cost per ton of NO_x captured for the remaining control technologies listed above. SCR and LNB were eliminated as both controls exceed the cost effectiveness of \$7500 per ton of NO_x captured – please see table below.

Control technology	Cost per ton of NO _x captured	Comments
SCR	\$11,428	Exceeds cost effectiveness
LNB	\$13,052	Exceeds cost effectiveness
Good Combustion Practices	NA	In place

Step 5. Identify RACT

The remaining control is Good Combustion Practices which is currently in place. The existing requirements are in Section E, Group #2 conditions for the Boilers in the TVOP and are listed below. Condition #10 also demonstrates compliance with 40 C.F.R. Part 63 Subpart JJJJJJ.

Recordkeeping Requirement

#008 [25 Pa. Code §127.441]

Operating permit terms and conditions.

[Additional authority for this permit condition is also derived from 25 Pa. Code Section 129.91 - 129.95 and 129.115(i)]

(a). The permittee shall record each adjustment conducted during the annual adjustment or tune-up on the boiler in a permanently bound logbook or electronic format. The logbook shall contain, at a minimum, the following information:

- (1). The date of the tuning procedure.
- (2). The name of the service company and technicians.
- (3). The final operating rate or load.
- (4). The final CO and NOx emission rates.
- (5). The final excess oxygen rate.

(b). The permittee shall maintain the following records relating to the fuel oil fired in the boiler:

- (1). A certification for each shipment of No. 2 fuel oil stating that the fuel complies with ASTM D396-78 "Standard Specifications for Fuel Oils."
- (2). A certification from the fuel supplier for each shipment of fuel oil documenting the sulfur content (wt. percent).

Work Practice Requirement

#010 [25 Pa. Code §127.441]

Operating permit terms and conditions.

[Additional authority for this permit condition is also derived from 25 Pa. Code 129.91 - 129.95 and 129.111- 129.115]

(a). The permittee shall perform an annual tune-up on the combustion process for this source. The annual tune-up shall consist of, at a minimum, the following:

- (1) Inspection, adjustment, cleaning or replacement of fuel burning equipment, including the burners and moving parts necessary for proper operation as specified by the manufacturer.
- (2) Inspection of the flame pattern or characteristics and adjustments necessary to minimize total emissions of NOx, and to the extent practicable, minimize the emissions of CO.
- (3) Inspection of the air-to-fuel ratio control system and adjustments necessary to ensure proper calibration and operation as specified by the manufacturer.

(b). The annual combustion tune-up shall be made in accordance with EPA document "Combustion Efficiency Optimization Manual for Operators of Oil and Gas-fired Boilers," September 1983 (EPA-340/1-83-023) or equivalent procedures approved by the Department in writing.
Compliance with this condition will demonstrate compliance with 40 C.F.R. Part 63 § 63.11223(b)(1-3)].

2.2 NO_x RACT Assessment for Stationary Internal Combustion Engines (Source ID 004A)

The facility submitted case by case RACT analyses for the eight (8) Internal Combustion Engines using the five-step top-down analysis.

Step 1. Available control technologies:

Selective Catalytic Reduction (SCR)
Selective Non-Catalytic Reduction (SNCR)
Catalyst Filters
Good Combustion Practices

Step 2. Elimination of technically infeasible control technologies.

Control Technology	Reason the technology is infeasible
Selective Non-Catalytic Reduction (SNCR)	SNCR requires a high but very specific temperature range (generally between 1,550 °F and 1,950 °F) and sufficient residence time at this temperature to be effective. The average operating temperature for the engines in Source ID 004A at the Limerick Facility is 690°F. This value is below the 1,550°F SNCR threshold operating temperature. Therefore, SNCR is deemed infeasible for these engines.
Catalyst Filters	Catalyst Filter control technology has not been provided in the RBLC search or EPA guidance as a standard control device for generators.

Step 3. Feasible control technology ranking:

Selective Catalytic Reduction (SCR): Reduction 70-90%
Good Combustion Practices Good Air Pollution Control Practices

Step 4. Control technology evaluation:

Constellation submitted a cost per ton of NOx captured for the remaining control technologies listed above. SCR was eliminated as this control exceeded the cost effectiveness of \$7500 per ton of NOx captured – please see table below.

Control technology	Cost per ton of NOx captured	Comments
SCR	\$666,864	Exceeds cost effectiveness
Good Combustion Practices	NA	In place

Step 5. Identify RACT

The remaining control is Good Combustion Practices which is currently in place. Please see Section D, Source ID: 004A for the Emergency Generators (8) in the TVOP and are listed below.

Work Practice Requirement

**#008 [25 Pa. Code §127.441]
Operating permit terms and conditions.**

[Additional authority for this permit condition is also derived from 25 Pa. Code Section 129.91 - 129.95 and 129.111 -129.115]

The permittee shall maintain and operate the emergency generators in accordance with manufacturer's specifications and good air pollution control practices.

3.0 Conditions modified in the TVOP

Section D, Source ID 004A, condition #001

The facility proposed a NOx emission restriction (6.0 tons per year per generator on a 12- month rolling basis). DEP has added this condition as requested.

Section E, Group #2, condition #002

The facility proposed changing the NOx emission restriction from 37 tons to 30 tons per boiler on a 12-month rolling basis. DEP has revised this condition as requested.

Section D, Source ID 004A, condition #001

The facility proposed a NOx emission restriction (6.0 tons per year per generator on a 12-month rolling basis). DEP has added this restriction as requested.

4.0 Summary

The RACT determination for the sources is summarized in the Table 3 below.

Table 3: Overall RACT Summary

Source ID	Source Name	Pollutant evaluated	Proposed RACT	PADEP Determination
001 and 002A	Boilers A, B and C	NOx	Continue Good Combustion Practices	PADEP concurs
004A	Emergency Generators (8)	NOx	Continue Good Combustion Practices	PADEP concurs

5.0 Recommendation

I recommend that TVOP No. 46-00038 be significantly modified and issued to Constellation Energy Generation.