

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

MEMO

TO Kassahun Sellassie, Program Director

FROM Maryjoy Ulatowski, Chief of Source Registration *MU*

DATE November 3, 2023

RE Naval Surface Warfare Center, Philadelphia Division
Title V Operating Permit No. V13-009
Philadelphia, Philadelphia County

Procedural History

As part of the RACT regulations codified at 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), PA DEP has established a 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) that are currently in force in the applicable operating permit continue to be RACT under RACT III.

The procedures to demonstrate that RACT II equals 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).

Facility Information

Naval Surface Warfare Center, Philadelphia Division (NSWCPD) is a Navy research and development facility located at 5001 S. Broad Street in Philadelphia, Pennsylvania. Equipment used at the facility includes boilers, heaters, emergency generators, fire pumps, diesel engines, test cell engines, gas turbines, and paint spray booth with dry filters. The following six testing engines and gas turbines are being evaluated under 25 Pa Code § 129.114(i)(1)(i):

Source ID	Description	Heat Input	Fuel Burned
CU-M111	B77H; Engine Testing Gas Turbine DDG-51	206.9 MMBtu/hr (6,180.7 bhp)	Diesel
CU-M112	B77H; Engine Testing Gas Turbine DDG-51	206.9 MMBtu/hr (6,180.7 bhp)	Diesel
CU-M113	B77H; Engine Testing Gas Turbine CG-47	40.6 MMBtu/hr (1,212.8 bhp)	Diesel
CU-M114	B77H; Engine Testing Gas Turbine GTG #2	37.4 MMBtu/hr (1,117.2 bhp)	Diesel
CU-M139	B77H; Engine Testing Gas Turbine GTG#1	37.4 MMBtu/hr (1,117.2 bhp)	Diesel
CU-M151	B77H; DD(X) LM-500	51.4 MMBtu/hr (1,535.5 bhp)	Diesel

The turbine with source ID CU-M119 (B824; Engine Testing TF-40 Gas Turbine rated for 42.1 MMBtu/hr heat input) was also evaluated under case-by-case RACT II but is not included in the facility's RACT III evaluation because it has been removed from the facility. Except for one turbine being removed, there have not been any changes since October 2016 for the case-by-case sources listed above. There is one new case-by-case source at the facility which will be addressed in a separate review memo.

The turbine with source ID CU-M142 was listed in the facility's RACT notification as RACT II equals RACT III but is being processed by Air Management Services as Presumptive RACT III because it was Presumptive under RACT II under 25 Pa Code §129.97(c)(4) and qualifies for Presumptive RACT III under 25 Pa Code §129.112(c)(5).

NSWCPD submitted the RACT II equals RACT III proposal on December 21, 2022, as part of their RACT III notification.

The facility is a major source for NO_x only.

The most recent facility full compliance inspection was completed on December 9, 2021. There are currently no outstanding compliance issues or consent agreements.

RACT III Analysis for NO_x and VOC applicability

Source ID	Source Name	New source or change to existing source?	NO _x (tpy)	VOC (tpy)
Facility-wide	Plantwide Applicability Limit	no	240.4	n/a
Facility-wide	PTE Calculations Submitted by Facility		n/a	<25
TOTAL FACILITY PTE			240.4	<25

NSWCPD is a major source for NO_x. The facility's NO_x potential to emit (PTE) is 240.4 tons per year (TPY) based on the Plantwide Applicability Limit (PAL) permit dated 7/10/2019.

NSWCPD is not a major source for VOC. The facility's VOC PTE is less than 25 tons per year.

Summary of RACT requirements for each source

The facility's RACT II Plan Approval (IP16-000235 dated 3/20/2020) was approved by EPA on 11/1/2021 under Federal Register 52.6064 (f)(6) and included the following conditions:

- The testing engines and gas turbines will adhere to the standard Navy Planned Maintenance program as defined for shipboard use.
- The testing engines and gas turbines will adhere to the following short-term NO_x emission limits:

Unit	NO _x Emission Limitation
CU-M111	244 lbs/hr
CU-M112	263 lbs/hr
CU-M113	24.8 lbs/hr
CU-M114	30.3 lbs/hr
CU-M139	29.1 lbs/hr
CU-M151	514.60 lbs/hr (for entire DDX Test Cell*)

RACT II continues to be RACT for RACT III and therefore these requirements are not changing.

RACT II as RACT III

NSWCPD is a research and development facility and is required to equip and operate its sources like their shipboard or submarine counterparts to effective test platforms. Including control technology, particularly on its testing sources, would change their intended operation and therefore is considered technically infeasible.

For all testing engines (turbines) currently at the facility, possible NO_x controls identified for RACT II included switching to natural gas combustion; pre-combustion controls such as water injection, and Dry Low Emissions (DLE); add-on controls such as Selective Catalytic Reduction (SCR), and Selective Non-

Catalytic Reduction (SNCR). Searches of the RACT/BACT/LAER Clearinghouse by AMS did not locate any new control options.

Analysis of the available control options conducted by for RACT II showed that they would be technically infeasible for their testing applications for the reasons described below. AMS believes this analysis to be sufficient and unchanged by recent technological developments.

The purpose of the testing turbines and engines is to act as full-scale test sites which house a variety of marine engines used for the research, development, test and evaluation of ship propulsion and power generation systems. These test facilities are used to evaluate equipment under shipboard conditions in an at-sea environment and therefore must be configured exactly as they are on a ship. There is currently no emission control equipment approved for or installed on a Navy ship. Additionally, all existing shipboard equipment is operated on liquid fuel oil. The use of post combustion controls such as SCR and NSCR would also be technically infeasible for the following reasons:

- For SCR to operate properly, the exhaust gas must be within a temperature range of 450 F to 850 F. The NSWCPD gas turbines are simple cycle and have peak exhaust temperatures of 800 F to 1,000 F. At approximately 850 F the catalyst can be damaged irreversibly. For this reason, SCR works best in combined cycle gas turbines and would not be feasible for this application.
- SCR systems inject ammonia into the flue gas upstream of a catalyst to enable a reaction with NO_x to form nitrogen and water vapor. Test protocols employed with the NSWCPD gas turbines require frequent load changes and periods of low-capacity operations. Operating the gas turbines under these transient conditions would cause an uneven distribution of ammonia in the flue gas and reduce the effectiveness of the control system. Also, since the SCR system would be designed to operate at the maximum capacity, extended periods of low-capacity operations would negatively impact the NO_x removal rate.
- SNCR is similar to SCR in that both control systems inject ammonia into the post combustion flue gas to react with nitrogen. However, SNCR operates at much higher temperatures than SCR and does not use a catalyst. The effective temperature range for SNCR is 1,600 F to 2,000 F, which is well above the 800 F to 1,000 F exhaust temperature range for the gas turbines. Operation at lower temperatures results in excessive ammonia emissions and ineffective NO_x removal. For this reason, SNCR is considered technically infeasible for gas turbines.
- Because the gas turbines are configured as they would be on a ship, the equipment rooms where the gas turbines are installed do not have extra space to install the SCR or SNCR systems. To complete a rooftop installation would require major building modifications to accommodate post combustion controls and therefore is not feasible.

Therefore, the implementation of any of the above control devices would invalidate test results and is therefore not technically feasible. It should also be noted that operations are not typical of similar equipment used in industry. Being a research facility, operations are historically intermittent and are driven by test schedules dictated by Navy sponsors. It is therefore necessary to maintain a high PTE to accommodate the irregular spikes in operations due to unanticipated changes in testing protocols.

The Department has reviewed source information, control technologies or measures evaluated by NWSCPD. The Department also performed an independent analysis which included, the Department's continuous review of permit applications since the applicability date of RACT II, internet searches, BACT/RACT/LAER Clearinghouse search, knowledge gained from the Department permitting staff participating in technical presentations by several vendors and manufacturers of pollution control technology, and a review of EPA and MARAMA's documents. Based on our review of these documents, along with training and the expertise of the reviewing staff, the Department concludes that there are no new or updated air pollution control technologies available for the sources found at NWSCPD and determines that RACT II requirements for sources CU-M111, CU-M112, CU-112, CU-M1139, CU-M151 listed in the table assure compliance with requirement for RACT III for the § 129.111 - § 129.115.

Comparison between RACT II and RACT III requirements

Because RACT II requirements are being certified as continuing to be RACT, RACT III requirements are identical to RACT II and therefore are as stringent as RACT II.

Public discussion

No discussions with the EPA, the company, or the public beyond the initial applications have materially impacted the evaluation above.

Attachments (1):

RACT III Notification and Proposal