GOVERNMENT OF THE DISTRICT OF COLUMBIA
Department of Energy and Environment

CHAPTER 2 TECHNICAL SUPPORT MEMORANDUM

TO: Stephen S. Ours, P.E.
Chief, Permitting

Digitally signed by Stephen S. Ours
DN: cn=Stephen S. Ours, o=Department of Energy and Environment, ou=Air Quality Division, email=stephen.ours@dc.gov, c=US
Date: 2022.04.18 11:10:23 -04'00'

FROM: John Nwoke
Engineer

John Nwoke
Digitally signed by John Nwoke
Date: 2022.04.18 11:25:52 -04'00'

SUBJECT: U.S. Department of the Navy, Naval Research Laboratory
Building 149 Cogeneration Project
Permit No. 7323 to Construct a Cogeneration Facility

DATE: April 18, 2022

BACKGROUND INFORMATION

On February 24, 2022, the U.S. Department of the Navy, Naval Research Laboratory (NRL) which operates under the NAICS code of 928110, submitted an air permit application to the Air Quality Division (AQD) of the Department of Energy and Environment (DOEE) to construct and operate a gas turbine and heat recovery steam generator (HRSG) without supplemental firing at NRL's Building 149. The facility is located at 4555 Overlook Avenue, SW Washington DC. NRL indicated that the proposed equipment would only burn natural gas and the HRSG will be unfired. The power produced by the cogeneration plant would be for internal consumption and not for sale.

NRL has not requested that any portions of the application be held confidential.

TECHNICAL INFORMATION

NRL applied for a Chapter 2 permit to construct new equipment at its existing facility because of a planned project involving the construction of a natural gas fired gas turbine having the capacity to produce 4.4 megawatts (MW) of electrical power. The combustion turbine has a heat input rating of 40.06 MMBTU/hr LHV basis and 43.1 MMBTU/hr HHV basis. The Solar Mercury 50-6400R Combustion Gas Turbine (CT), is identified by serial number 0134R. NRL plans to install the gas turbine and heat recovery steam generator (HRSG) in the area adjacent to, and south of, existing Building 149 at the NRL facility on Overlook Avenue SW, Washington DC. The unfired HRSG will ultimately produce steam from the recuperated exhaust from the gas turbine, while the gas turbine concurrently generates electric power for internal use only. Construction of this project is pending until the required permit to construct is issued.

Emission Evaluation

NRL analyzed the project as a minor source because the nitrogen oxide emission from the source is 3.6 tons per year. This is less than the major source threshold of 25 tons per year as shown on the tables below.

Table 1: Total 12-Month Rolling Emissions Estimates from Permitted Equipment[1]

Pollutant	**Potential to Emit (tons/12 month rolling period)**
Total Particulate Matter (PM Total)[2,3]	2.9
Oxides of Sulfur (SOx)[4]	0.7
Oxides of Nitrogen (NOx)	3.6
Volatile Organic Compounds (VOC)	0.5
Carbon Monoxide (CO)	4.3

1. The equipment covered consists of one Solar Mercury 50 gas turbine, and one HRSG (the latter of which has no independent emissions).
2. PM (Total) is the sum of the filterable PM and condensable PM.
3. All PM is expected to be smaller than 2.5 microns, so PM (Total) equals PM2.5
4. The maximum SOx emissions estimate used by the applicant, and reflected in this table, is based on AP-42 emission factors, but is, in reality, dependent upon the sulfur content in the natural gas being burned. Because the permit limit for fuel sulfur is based on an NSPS standard, the effective legal limit is substantially greater at approximately 11.3 tons per 12 month rolling period. However, the value listed in the table is expected to be a more accurate reflection of the worst case actual emissions based on the expected sulfur content of the natural gas fuel supply available in the area.

Table 2: Maximum Hourly Emissions when Operating Between 50% and 100 % Load

Pollutants	**Solar Mercury 50 Gas Turbine (CT) and HRSG (lb/hr)**
PM Total	0.65
SOx[1]	0.15
NOx	0.81
VOC	0.114
CO	0.99

1. The maximum SOx emissions estimate used by the applicant, and reflected in this table, is based on AP-42 emission factors, but is, in reality, dependent upon the sulfur content in the natural gas being burned. Because the permit limit for fuel sulfur is based on an NSPS standard, the legal limit is substantially greater at approximately 2.6 lb/hr. However, the value listed in the table is expected to be a more accurate reflection of the worst case actual emissions based on the expected sulfur content of the fuel supply available in the area.

REGULATORY REVIEW

20 DCMR Chapter 2, Section 200: General Permit Requirements

The provisions of this section are applicable to the combustion turbine as a stationary source of air pollution. A permit is therefore required to construct and operate the combustion turbine pursuant to 20 DCMR 200.1 and 200.2, respectively. The permit will be valid for five years (presuming it is used within one year pursuant to 20 DCMR 202.6 as specified in Condition I(c) of the permit). This permit, when issued, would authorize both construction and operation of the source.

20 DCMR Chapter 2, Section 201: General Requirements for Permit Issuance

This regulation specifies under what circumstances the Mayor (Department) may issue a permit and provides authority to the Department to place limits on proposed equipment and operations to ensure protection of public health, welfare, and the environment. This regulation is used to establish emission limits based on the proper operation of the equipment, crucially including the 5 ppmvd at 15% O_2 NOx standard contained in Condition III(a)(1)(D), but also including other emission limits in Condition III(a)(1)(A).

20 DCMR Chapter 2, Section 204: Permit Requirements for Sources Affecting Non-Attainment Areas

The review of the Chapter 2 permit application indicated that the proposed equipment would emit maximum potential emissions of 3.6 tons of NOx per 12-month rolling period as measured at the exhaust stack of the HRSG. The significance threshold to trigger NSR requirements for NOx is 25 tons per year per the definition of "significant" in 20 DCMR 299. The proposed project will not generate emission in excess of the significance threshold, and therefore the project would not be considered a new major stationary source or a "major modification" as defined in 20 DCMR 299. Similarly, no other pollutants potential emissions meet their respective "significant" thresholds. Therefore, pursuant to 20 DCMR 204.1, a major non-attainment new source review analysis is not required.

Prevention of Significant Deterioration (PSD) (Federal program)

The project will have a potential to emit (PTE) of less than 250 tpy for all pollutants, except greenhouse gases, which is also below the applicable threshold, and so this project is not subject to the PSD program (implemented by EPA). The potential emissions of greenhouse gases are 22,294.9 tons per year on a CO_{2e} basis.

20 DCMR Chapter 2, Section 205: New Source Performance Standards

Subsection 205.1 of 20 DCMR adopts the federal New Source Performance Standards (NSPS) as in effect on September 30, 1997. Additionally, in order to be sufficiently protective of public health pursuant to 20 DCMR 201, the Department places all current NSPS standards into all Chapter 2 permits issued.

The combustion turbine covered by this permitting action will be subject to 40 CFR 60, Subpart KKKK, Standards of Performance for Stationary Combustion Turbines. Please see below for a discussion of the applicability of this regulation.

20 DCMR Chapter 3: Operating Permits and Acid Rain Programs
The project is not subject to the Acid Rain Program. However, the equipment will be part of a larger facility subject to the major source operating permit program of 20 DCMR Chapter 3. As such, pursuant to 20 DCMR 301.1(a)(2), the facility must apply for the requirements of this permit to be placed into its existing Title V operating permit. This requirement is contained in Condition I(i) of the proposed permit.

20 DCMR Chapter 5: Testing, Monitoring and Record keeping Requirements
Testing, monitoring and record keeping requirements pursuant to 20 DCMR 500.8 and 502 have been included in the permit documents under Condition III(a)(3) and (4) to ensure that the emission limitations and operational limitations in the permit are enforceable as a practical matter. Many of these requirements are also based on 20 DCMR 200.7 and 20 DCMR 805.10.

20 DCMR Chapter 6: Particulates
20 DCMR 600.1 is applicable to the equipment. Combustion turbines alone are not "fuel burning equipment" pursuant to the definition in 20 DCMR 199 (direct heat transfer is used, rather than indirect heat transfer), however, when used in combination with the HRSG, indirect heat transfer is also used. Because the system uses direct heat transfer to produce electricity and indirect heat transfer to produce steam, both of which are primary purposes of the equipment, it is reasonable to apply this regulation to the equipment. As such, the requirements of this regulation are included in Condition III(a)(1)(B) of the permit.

The fugitive dust requirements of 20 DCMR 605 are applicable to all sources, but may be particularly relevant during construction of the source as a new building is being constructed to house the equipment. The requirements of this section are reflected in Condition III(a)(1)(F).

Additionally, the gas turbine could emit visible emissions during any period of equipment startup, operation, or shutdown and as such 20 DCMR 606.1 is applicable. This requirement is also contained in the proposed permit as Condition III(a)(1)(E).

20 DCMR Chapter 8, Section 801: Sulfur Content of Fuel Oils
The fuel sulfur provisions of 20 DCMR 801 are not applicable because the unit will not use fuel oil.

20 DCMR Chapter 8, Section 805: Reasonably Available Control Technology for Major Sources of the Oxides of Nitrogen
The NOx RACT provisions of 20 DCMR 805 are applicable because the combustion turbine is located at a facility that is a major source of NOx. The heat input rating of the combustion turbine of 43.1 MMBtu/hr,HHV basis, is within the applicability threshold of 20 DCMR

805.4(a)(3). This section establishes a 25 ppmvd, corrected to 15% O_2 emission limit for the equipment. Similar to the previously discussed NSPS standard, this requirement has been streamlined with the more stringent 5 ppmvd, corrected to 15% O_2 standard established pursuant to 20 DCMR 201 authority contained in Condition III(a)(1)(D) of the permit. The requirements of 20 DCMR 805.4(a)(3), 805.4(a)(8), 805.4(b), 805.4(c), 805.10, and 805.11, respectively relating to: emission limitations, proper operation, monitoring and testing and record-keeping have been included in Condition III(a)(1)(D), Condition III(a)(2)(C), Condition III(a)(3)(A) and Condition III(a)(4), respectively.

20 DCMR Chapter 9, Section 903: Odorous or Other Nuisance Air Pollutants
The gas turbine could emit emissions during any period of equipment startup, operation or shutdown and as such 20 DCMR 903.1 is applicable. This requirement is contained in Condition III(a)(1)(G) of the proposed permit.

Other Regulations

40 CFR 60, Subpart KKKK – Standards of Performance for Stationary Combustion Turbines
The gas turbine and HRSG will be subject to the NSPS that applies to stationary gas turbines/ HRSGs (40 CFR Part 60, Subpart KKKK). The NSPS NOx limit for the proposed equipment, pursuant to 40 CFR 60.4325 and Subpart KKKK, Table 1 for electric generating turbines firing natural gas is 42 ppm, dry volume basis at 15% O_2. This is streamlined with the more stringent 5 ppmvd at 15% O_2 established pursuant to 20 DCMR 201 authority in Condition III(a)(1)(D) of the permit. The NSPS also limits sulfur dioxide (SO_2) emissions to 0.060 lbs/MMBtu of heat input. This limit is found in Condition III(a)(1)(C) of the permit.

40 CFR 63, Subpart YYYY – National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines
40 CFR 63 Subpart YYYY for gas turbines regulates/monitors Hazardous Air Pollutants (HAPs) such as acetaldehyde, acrolein, benzene, toluene, xylene, cadmium, chromium, lead, etc, through surrogate compounds such as formaldehyde, carbon monoxide (CO) and/or volatile organic compounds (VOCs).

A facility that emits or has the potential to emit 10 tons/year of any single HAP or 25 tons/year of any combination of HAPs, is considered a major source. The facility, even with the construction of this cogeneration system will be a minor source of HAPs, therefore, the gas turbine is not subject to this MACT standard.

Compliance Assurance Monitoring (CAM) (40 CFR 64)
The project is not subject to this Part because the pre-control emissions of pollutants from this equipment (the “pollutant-specific emissions unit”), without emission controls, are less than applicable major source thresholds.

RECOMMENDATIONS

The draft permit will be published in the D.C. Register and on the Department's website on for a thirty-day public comment period beginning April 22, 2022.

The proposed project and attached permit comply with all applicable federal and District air pollution control laws and regulations. I recommend that the attached permit document be issued if no comments are received following the completion of the public review period. If comments are received, they will be addressed before any final action is taken on the permit.

SSO/JCN