CHAPTER 2 TECHNICAL MEMORANDUM

TO: File

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Chief, Permitting Branch

FROM: John C. Nwoke For JCN
Environmental Engineer

SUBJECT: American University (AU)
Asbury Hall Central Plant
Permit No. 7207 to Construct and Operate One 11.5 MMBtu/hr Microturbine, Located at 4400 Massachusetts Avenue NW, Washington, DC

DATE: July 27, 2018

BACKGROUND INFORMATION

On March 6, 2018 the Air Quality Division (AQD) received a set of Chapter 2 permit applications to construct and operate one (1) natural gas-fired modular Capstone Signature Series microturbine, to be designated CHP-1, at the American University (AU) Asbury Hall Central Plant. The unit has a heat input rating of 11.5 MMBtu/hr. The purpose of the project is to upgrade the heating infrastructure within the central steam plant, located in Asbury Hall. This project emanates from a need to reconfigure the energy footprint of the Asbury Central Steam Plant with the purpose improving energy conservation and operational efficiency.

The proposed microturbine installation is part of a larger plant-wide project that involves also the installation of nine (9) 6.0 MMBtu/hr. natural-gas-fired boilers. Six of these new boilers will replace the existing boilers ASB-1 and ASB-2 by October of 2018, while the remaining three boilers are expected to be completed by October of 2019. Boiler ASB-3 will be retired. A separate permitting action is taking place to address these other nine boilers.

The publication of this permit action is scheduled for August 10, 2018 in the D. C. Register and on the Department of Energy and Environment (DOEE) website. Public comment for the permit action will be solicited through September 10, 2018.

AU has not requested that any aspects of the application be held confidential.

TECHNICAL INFORMATION

AU applied for a permit to construct and operate one new natural gas-fired microturbine generator having the capacity to produce 1,000 kW of electrical power. The power produced is to be utilized

within the facility and is not for sale. Per documentation from the manufacturer, the Capstone Microturbine is considered inherently clean and able to meet strict emissions standards. The exhaust emissions are established under full power and standard operating conditions. The emissions for the C1000S Standard units are the basis of the emissions calculations in the application, including the computations for sulfur dioxide and particulate matter. Capstone guaranteed emission rate for the microturbine is 0.40 lb/hr. This figure is available in the literature supplied by American University. Following some research and further study, the emissions for those pollutants were computed and appropriate limits were included in the permits.

Emission Evaluation

American University analyzed the project as a minor source because the potential nitrogen oxides emissions from the source are 1.75 tons per year. This is less than the major source threshold of 25 tons per year as shown on the tables below. Note that the tables below reflect the emission rates based on the manufacturer's data with the exception of sulfur dioxide and particulate matter which are fuel dependent, but were calculated based on AP-42 emission factors and natural gas properties.

Table 1: Total 12-Month Rolling Emissions from the MicroTurbine

Pollutant	12-Month Rolling Emissions Limit (tons/yr)
PM (Total)[1,2]	0.350
SO_2	0.175
NOx	1.75
VOC	0.438
CO	4.82

1. Total PM is the sum of the filterable PM and condensable PM.
2. All PM is expected to be smaller than 2.5 microns, so PM (Total) equals PM2.5

Table 2- Maximum Hourly Emissions (lbs/hr)

Pollutants	Hourly Emissions
PM (Total)	0.08
SO_2	0.04
NOx	0.40
VOC	0.10
CO	1.10

REGULATORY REVIEW

Both federal and District of Columbia regulations and applicable requirements apply to this project. Applicability or non-applicability of key regulations is discussed below.

DISTRICT REGULATIONS

20 DCMR 200 – General Permit Requirements:
The provisions of this section are applicable to the microturbine as a stationary source of air pollution. A permit is therefore required to operate the microturbine pursuant to 20 DCMR 200.1 and 200.2. The operating permit will be valid for five years. It should be noted that this unit is not eligible for the "fuel burning equipment" exemption from permitting pursuant to 20 DCMR 200.12 because the equipment does not meet the definition of "fuel burning equipment". The definition of "fuel burning equipment" in 20 DCMR 199 is as follows:

> **Fuel burning equipment** - any furnace, boiler, apparatus, stack, and all appurtenances in connection with, used in the process of burning fuel for the primary purpose of producing heat or power by indirect heat transfer.

The Capstone MicroTurbine technology uses direct heat transfer, rather than indirect heat transfer, thus it does not qualify for the permit exemption.

20 DCMR 204 – Permit Requirements for Major Stationary Sources Located in Non-attainment Areas (Non-attainment New Source Review (NNSR)):
The review of the Chapter 2 permit application indicated that the proposed equipment would emit maximum potential emissions of 1.75 tons per year of NOx. Because it is part of the same "project", for purposes of this evaluation, the potential to emit of the nine 6.0 MMBtu/hr boilers, 11.59 tons per year, was added to this value, for a total of 13.35 tons per year NOx. The significance threshold to trigger NSR requirements for NOx is 25 tons per year per the definition of "significant" in 20 DCMR 299. Similarly, the total potential to emit VOC for all ten units equals 1.71 tons per year, as compared to the identical significance threshold of 25 tons per year VOC. The requirements of 20 DCMR 204 is that projects with emissions increases and net emissions increases that exceed NNSR thresholds do the following: (1) analyze alternatives, (2) incorporate emission controls meeting the lowest achievable emission (LAER), (3) obtain emission offsets, and (4) certify compliance of all sources located within the District that are owned or operated by applicant.

The proposed project will not generate emission in excess of the significance threshold for either NOx or VOC, and therefore the project is not considered a new major stationary source or a "major modification" as defined in 20 DCMR 299. Therefore, pursuant to 20 DCMR 204.1, a major non-attainment new source review analysis is not required.

20 DCMR 205 – Permit Requirements for New Source Performance Standards (NSPS)
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 applicable NSPS standards into all Chapter 2 permits issued.

The microturbine is subject to NSPS Subpart KKKK, Standards of Performance for Stationary Combustion Turbines, because it is rated at 11.5 MMBtu/hr. and therefore over the 10 MMBTU/hr heat input size threshold for applicability. See below for a further discussion of the applicability of Subpart KKKK.

Because the unit is subject to Subpart KKKK, it is exempt from 40 CFR 60, Subpart GG, Standards of Performance for Stationary Gas Turbines.

No other NSPS standards apply to the unit.

20 DCMR 209 – Permit Requirements for Non-Major Stationary Sources (Minor New Source Review)
Minor New Source Review, which became effective January 1, 2014, is applicable to any source subject to 20 DCMR 200, if such sources use a stationary unit or air pollution control device that is involved in a project that results in an increase of the potential to emit equal to or greater than 5 tons per year (tpy) per unit of any criteria pollutant (excluding CO, Ozone and Lead) or aggregate of hazardous air pollutants (HAPs). The microturbine does not have the potential to emit 5 tons per year of NO_x or any other pollutant listed in Section 209.1(b). Therefore the equipment does not trigger a minor source review evaluation pursuant to this regulation.

20 DCMR Chapter 3 – Operating Permits and Acid Rain Programs
This units will be located at the American University, which is already subject to Chapter 3 (Title V), Permit No. 013-R2. The facility plans to amend its Title V permit renewal application to include the microturbine. This is required pursuant to Condition I(g) of the permit. The inclusion of the microturbine will increase the plant-wide emissions of the facility modestly, but it does not appear that this will have any significant impact on the major source threshold for SO_2 emission. Therefore this project will not make the facility subject to the acid rain program.

20 DCMR Chapter 5 – Testing, Monitoring and Record keeping Requirements
Appropriate monitoring and testing requirements have been included in Condition IV of the permits with associated record keeping and reporting requirements in Condition V of the permits to ensure that compliance with the conditions of the permit can be evaluated.

20 DCMR Chapter 6, Section 600 – Fuel Burning Particulate Emission
This regulation applies to emissions from "fuel burning equipment". As previously discussed, this equipment is not considered "fuel burning equipment", and is therefore not subject to this regulation.

20 DCMR Chapter 6, Section 606 – Visible Emissions
The visible emissions limitations of 20 DCMR 606.1 are applicable to all units. Visible emissions shall not be emitted into the outdoor atmosphere from the operation of the these units; provided, that discharges not exceeding forty percent (40%) opacity (unaveraged) shall be permitted for

two minutes in any sixty (60) minute period and for an aggregate of twelve (12) minutes in any twenty-four hour (24 hr.) period during start-up, or malfunction of equipment. This requirement is contained in Condition II(b) of the permits. Specific testing requirements related to this regulation are also included in the boiler permit.

Note that language has been included in the permit notifying the facility that there is an outstanding call for a State Implementation Plan (SIP) revision from EPA that may result in revisions to the applicable regulation. As such, if the regulation is changed, the new regulatory requirements will superseded those expressed in the permit specifically.

20 DCMR Chapter 8, Section 805 – Reasonably Available Control Technology for Major Stationary Sources of the Oxides of Nitrogen (NOx RACT)
NOx RACT is applicable to this facility pursuant to 20 DCMR 805.1(a) because it is a major source of NOx. On July 23, 2018, an emergency regulation went into effect revising 20 DCMR 805.4 to cover combustion turbines. AQD expects that a similar or identical permanent regulation will go into effect in the coming months. The applicable emission standard of this regulation is found in Condition II(d) of the permit (25 ppmvd NOx, corrected to 15% oxygen). Testing requirements pursuant to 20 DCMR 805.4(b)(2) are included in Condition IV(a) of the permit.

20 DCMR Chapter 9, Section 903 – Odorous or Other Nuisance Air Pollutants
The microturbine could emit odorous emissions during any period of equipment startup, operation or shutdown and as such 20 DCMR 903.1 is applicable. This requirement is contained in the proposed permit as Condition II(e). Minimal monitoring is required as the design of the equipment is unlikely to emit appreciable odors.

FEDERAL REGULATIONS

40 CFR 60, Subpart KKKK – Standards of Performance for Stationary Combustion Turbines
This regulation applies to the microturbine as it applies to all stationary combustion turbines with heat input ratings equal to or greater than 10 MMBtu/hr. This unit has a heat input rating of 11.5 MMBtu/hr. This regulation establishes an applicable NOx limit of 42 ppm at 15% oxygen, which is less stringent than the requirements at 20 DCMR 805.4. As such this requirement is streamlined with the 20 DCMR 805.4 limit discussed above in Condition II(d) of the permit. Subpart KKKK (in conjunction with 40 CFR 60.8) also establishes requirements to perform NOx testing thin 60 days of achieving the maximum production rate of the equipment, but not later than 180 days after initial startup of the equipment, and annually thereafter, which is reflected in Condition IV(a) of the permit.
Subpart KKKK also establishes an SO_2 emission requirement. This is reflected in Condition II(c) of the permit. Related monitoring or record keeping requirements used to ensure that the limit is enforceable as a practical matter are found in Condition IV(f) of the permit.

Additionally, as a result of the applicability of Subpart KKKK, aspects of 40 CFR 60, Subpart A are also applicable. Specifically, 40 CFR 60.7 notification requirements and 40 CFR 60.8 testing requirements were identified and included in 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 proposed project will produce emissions of HAP that are well under the major source thresholds. The facility as a whole is also a minor source of HAPs. Therefore the microturbine is not subject to this MACT standard.

Compliance Assurance Monitoring (CAM) (40 CFR 64)
The project is not subject to 40 CFR 64 because the pre-control emissions of pollutants for all sources are less than the applicability thresholds of the rule.

RECOMMENDATIONS

The application to construct and operate the microturbine and the proposed permit comply with all applicable federal and District air pollution control laws and regulations.

Public comments on the permit action will be solicited from August 10, 2018 through September 10, 2018. AQD will resolve any comments received before taking any final action on the permit. If no adverse comments are received, I recommend that permit No. 7207 be issued in accordance with 20 DCMR 200.2 promptly upon the completion of the public review period.

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