GOVERNMENT OF THE DISTRICT OF COLUMBIA
Department of Energy and Environment

CHAPTER 2 TECHNICAL SUPPORT MEMORANDUM

TO: File

THROUGH: Stephen S. Ours, P.E.
Chief, Permitting Branch

FROM: Thomas Olmstead For TO
Environmental Engineer

SUBJECT: Howard University (HU), 2240 6th Street NW Permit Nos. 7285 to 7287 to Construct and Operate a Combined Heat and Power and Supplemental Boiler Plant

DATE: November 10, 2020

BACKGROUND INFORMATION

On June 27, 2020, the Air Quality Division (AQD) of the Department of Energy and Environment (DOEE) received an application for the construction and operation of a combined heat and power (CHP) system and supplemental boiler plant with 69.51 MMBtu/hr natural gas-fired combustion turbine generator (6.5 MWe) with a heat recovery steam generator with 26.5 MMBtu/hr natural gas-fired duct burner and as back-up, two 62.77 MMBtu/hour dual fuel-fired (natural gas as primary and ultra-low sulfur diesel (ULSD) as back-up fuel) boilers to be located at 2240 6th Street NW. The applicant is Howard University (HU).

Emission Unit	Unit ID	Chapter 2 Permit	Heat Input Capacity (MMBtu/hr)	Primary Fuel	Secondary Fuel
Combustion Turbine-Generator	CTG-1	7287	69.51	Natural Gas	--
Heat Recovery Steam Generator	HRSG-1		26.5	Natural Gas	--
Boiler	CU-24	7285	62.77	Natural Gas	ULSD
Boiler	CU-25	7286	62.77	Natural Gas	ULSD
Emergency Generator	EG-48	7048-SC-0175-R1	2,206 BHP	ULSD	--

HU intends to use CTG-1 and HRSG-1 as the primary steam generation source, with either CU-24 or CU-25 supplementing with additional steam as needed to meet HU's steam demand or

when the CTG is not in operation. Whichever boiler is not supplementing the steam load will serve as a backup boiler and placed into full operation should one of the other units need to be taken off-line. In the event of a natural gas interruption, CU-24 and CU-25 will operate on ULSD potentially together until such time that the Power Plant can return to its regular operation on natural gas. HU proposes to install a selective catalytic reduction (SCR) system and a separate carbon monoxide (CO) catalyst to control emissions of NO_X, CO, and VOC from CTG-1 and HRSG-1. The SCR control system will be a Umicore (Topsøe) model DNX-929, which will control NO_X to 2 ppm at 15% O_2, as provided by the manufacturer in Revised Attachment 4c of the permit application. The CO catalyst control system will be an Advanced Catalyst Systems ADVOCAT CO catalyst, which will control CO to 2 ppm and VOC to 2.5 ppm at 15% O_2, as provided by the manufacturer in Revised Attachment 4c of the permit application. This level of control is achievable when the exhaust gas entering the emissions controls is between 650 °F and 775 °F[1]. A Closed Cooling Water (CWC) System will be used to provide cooling for the new CHP equipment. The System will consist of a propylene glycol and demineralized water mix. The CWC equipment will be located in the Plant and will utilize an air-cooled heat exchanger located on the roof for rejection of heat. For a construction timeline, see Attachment 1b of the permit application, for the process and instrumentation diagram, see Attachment 3 of the permit application, and for manufacturer emissions data and specifications, see Attachment 4 of the permit application.

In addition, the facility maintains the following miscellaneous/insignificant sources:

- Two (2) Underground Storage Tanks (USTs) for ULSD;
- One (1) Aboveground Storage Tanks (ASTs) for ULSD;
- One (1) oil water separator; and
- One (1) urea storage tank.

The one AST is included as part of EG-48, referred to as a belly tank for EG-48. The two 25,000 gallon each USTs, which will replace the existing ASTs that were used as day tanks at the power plant, will support CU-24 and CU-25, as well as providing fuel for the EG-48 belly tank. The urea storage tank is for the SCR to be installed for the CTG and HRSG exhaust stream.

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

TECHNICAL INFORMATION

Based on the emission calculations provided by the facility, the project has the potential to emit the following:

[1] The SCR operating range is between 350 °F and 775 °F. The CO catalyst operating range is between 650 °F and 1200 °F.

Pollutant	Maximum Annual Emissions (tons/yr)
Total Particulate Matter (PM Total)	10.69
Sulfur Dioxide (SO_2)	2.92
Nitrogen Oxides (NOx)	25.64
Volatile Organic Compounds (VOC)	5.35
Carbon Monoxide (CO)	29.70

HU anticipates actual commissioning hours to be approximately 250 hours, and annual startup time to be 50 hours for CTG-1 and HRSG-1. Emissions will be uncontrolled during these times. Emissions under commissioning and annual startup time were not calculated for CU-24 and CU-25 because the emissions provided by the manufacturer for operating during these circumstances were lower than those at full load.

At this time, the potential to emit NOx from this facility exceeds 25 tons per year (TPY), the threshold for a major source. The facility is currently covered by expired Title V Operating Permit No. 006 (enforceable through an enforcement settlement agreement) which is currently in the renewal process, as well as several Chapter 2 permits.

REGULATORY REVIEW

20 DCMR Chapter 2, Section 200: General Permit Requirements
The equipment comprising this project is stationary and has the potential to emit air pollutants. The two 62.77 MMBtu/hour dual fuel-fired boilers have heat input ratings greater than 5 MMBTU/hr. Therefore, the equipment is subject to the requirement to obtain Chapter 2 permits pursuant to this regulation.

20 DCMR 204 – Permit Requirements for Major Stationary Sources Located in Non-attainment Areas (Non-attainment New Source Review (NNSR)):
The permitted project is located in an area that has been designated non-attainment with respect to the 1979 1-hour ozone National Ambient Air Quality Standard (NAAQS). The area was subsequently designated moderate and marginal non-attainment for the 1997 and 2008 8-hour ozone standards, respectively, and is currently a maintenance area for $PM_{2.5}$ standard. The District of Columbia is also located within the Northeast corridor of the Ozone Transport Region (OTR). Nitrogen oxide (NO_x) and volatile organic compounds (VOCs) emissions are potentially subject to NNSR due to their role as precursors to the photochemical formation of ozone. Although the U.S. Environmental Protection Agency (U.S. EPA) revoked the 1-hr ozone standard, and despite the current designation of moderate non-attainment of the 8-hour ozone standard, the District has retained the 25-tpy NNSR applicability thresholds for NO_x and VOCs that were applicable for severe nonattainment classification under the 1-hour ozone standard as a measure taken against backsliding.

The requirements of 20 DCMR 204 are 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. Based on the natural gas 2 ppm NOx emission rate for the CTG-1 and HRSG-1, the natural gas 9 ppm NOx emission rate for CU-24 and CU-25, and the ULSD 70 ppm NOx emission rate, contained in Condition II(a) of the permits, these units' potential emissions were calculated in Attachment 14-1 (as revised by the email submittal from Rob Needham of All4 Inc., dated October 7, 2020) of the permit application, including a 1,200 Mgal ultra-low sulfur diesel limit in aggregate for CU-24 and CU-25. The project, by itself, does result in a "significant" emissions increase for NOx (greater than 25 tons per year). Emissions from CU-1, CU-3, and CU-4, the units being replaced by the project, as well as other facility wide emission units that have been removed from the facility, were analyzed for the years 2016 and 2017, with emissions calculated in Attachment 14-6 of the permit application. Potential emissions for units installed between 2015 and 2019 were included in the NSR analysis in Attachment 14-5 of the permit application, including the temporary boilers. Net emissions increases, considering both emissions increases and decreases, were calculated in Attachment 14-4 of the permit application. These calculations showNOx emissions increases of 8.3 tons per year, which will be below the "significant" emission rate, 25 tons per year for NOx. Based on this analysis, 20 DCMR 204 is not applicable.

20 DCMR 205 – Permit Requirements for New Source Performance Standards (NSPS):
The requirements of this section adopt the federal NSPS codified in 40 CFR 60 as in effect on September 30, 1997. See the below discussions of specific New Source Performance Standards.

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 source uses a stationary unit or air pollution control device that, individually, would have 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 CHP system (CTG-1 and HRSG-1, combined) would have a potential to emit greater than 5 tons per year of NO_x if operated without controls. However, with the proposed controls, it does not have the potential to emit greater than 5 tons per year of NO_x or any other pollutant listed in Section 209.1(b), see Attachment 15-1 of the permit application. Therefore the CTG-1 and HRSG-1 do not trigger a minor source review evaluation pursuant to this regulation.

As part of the application, HU has provided an analysis demonstrating that it is economically and technically feasible to operate an SCR and carbon monoxide (CO) catalyst in order to control emissions below 5 tons per year, see Attachment 12 of the permit application. These controls are

designed to limit emissions and maximize the reduction of pollutants and have been incorporated as requirements in the permit.

CU-24 and CU-25 do individually have a potential to emit 5 tons per year of NO_x, see Attachment 15-1 of the permit application. Therefore the boilers trigger a minor source review evaluation pursuant to this regulation. As a result, a NOx control technology evaluation was completed for CU-24 and CU-25. The conclusions of the evaluation indicate that the proposed use of ultra-low NOx burners and good operating practices constitutes NOx BACT for these boilers and satisfies the requirements of 20 DCMR 209. AQD searched the RACT/BACT/LAER Clearinghouse and found similar requirements for BACT, but also found less stringent emission limits than the more stringent emission limits proposed by HU. These controls are designed to limit emissions and maximize the reduction of pollutants and have been incorporated as requirements in the permit. Please see Attachment 12 of the permit application for the details of this evaluation.

20 DCMR Chapter 3: Operating Permits and Acid Rain Programs
These units will be located at Howard University, which is a major source of NOx. Howard University is already subject to Chapter 3 (Title V). They are operating under expired Permit No. 006 and a settlement agreement requiring compliance with the expired permit until a new Title V permit can be issued. Condition I(g) of the permits specify, pursuant to DCMR 301.1(a)(3), that the Permittee must submit a permit application (or application revision, as appropriate) to incorporate the requirements of these permits into the facility's Title V permit. Additionally, Condition VI(c) of Permit No. 7287 and Condition VI(e) of Permit Nos. 7285 and 7286 requires that the Permittee report on compliance with these permits as part of their semi-annual and annual compliance reports and certifications. Additionally, the record keeping requirements in the permit have been extended to five years from three years required elsewhere as Chapter 3 requires this longer retention schedule.

20 DCMR Chapter 5, Section 500: Source Monitoring and Testing Requirements
Appropriate monitoring and testing requirements have been included in Condition IV of the permits with associated record keeping and reporting requirements in Conditions V and VI 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
20 DCMR 600 applies to fuel burning equipment defined in 20 DCMR 199.1 as 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 combustion turbine does not meet this definition and is therefore not subject to 20 DCMR 600. Total suspended particulate emission from each of the boilers shall not exceed 0.07 pounds per MMBTU per 20 DCMR 600.1. Total suspended particulate emission from the HRSG shall not exceed 0.08 pounds per MMBTU per 20 DCMR 600.1. This requirement is contained in

Condition II(d) of Permit Nos. 7285 to 7286 and Condition II(a) of Permit No. 7287 (streamlined with a limit established pursuant to 20 DCMR 201).

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, cleaning, adjustment of combustion controls, 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 permits. Note that the regulation also allows for higher visible emissions during soot blowing, but this allowance was not included in the permits as none of the equipment being permitted performs soot blowing.

Also, 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 upersede those expressed in the permit specifically.

20 DCMR Chapter 8, Section 801: Sulfur Content of Fuel Oil

The back-up fuel for the two boilers shall be ULSD containing no more than 0.0015% sulfur by weight per 20 DCMR 801.3. It has been included in Condition III(b) of Permit Nos. 7285 to 7286.

20 DCMR Chapter 8, Section 804: Nitrogen Oxide Emissions

Each of the units is less than 100 million British thermal units per hour. Therefore, 20 DCMR 804, does not apply.

20 DCMR Chapter 8, Section 805: Reasonably Available Control Technology for Major Stationary Sources of the Oxides of Nitrogen (NOx RACT)

NO_x RACT is applicable to this facility pursuant to 20 DCMR 805.1(a) because it is a major source of NO_x. See the discussion above related to 20 DCMR Chapter 3 applicability. As such, requirements from 20 DCMR 805 were placed in the set of permits.

For CTG-1 and HRSG-1, the following shall be met:

1. Emissions, with any supplemental duct burner firing, shall not be greater than twenty-five (25) ppmvd, corrected to fifteen percent (15%) oxygen (O_2) when fired on any combination of gaseous fuels pursuant to 20 DCMR 805.4(a)(1)(A)(i), which is contained in Condition II(d) of Permit No. 7287; and

2. Maintain continuous compliance at all times and show compliance by testing performed once within one hundred and eighty (180) days of initial start-up of the unit, with subsequent tests performed once each calendar year and no more than fourteen (14) calendar months following the previous performance test, unless the performance test results show emissions are less than or equal to seventy-five percent (75%) of the applicable emission limit, in which case the subsequent test must be performed once during the next two calendar years and no more than twenty-six (26) calendar months following the previous performance test.

For the boilers, the requirement to perform combustion adjustments pursuant to 20 DCMR 805.8, is contained in Conditions II(e) and V(h) of Permit Nos. 7285 and 7286. AQD evaluated the applicability of 20 DCMR 805.5(b) because the units have heat input ratings between 50 and 100 MMBTU/hr, but determined that this regulatory section was not applicable because the units will not be "powered exclusively by oil" at all times, but rather will be primarily fired on natural gas.

20 DCMR Chapter 9, Section 903: Odorous or Other Nuisance Air Pollutants
"An emission into the atmosphere of odorous or other air pollutants from any source in any quantity and of any characteristic, and duration which is, or is likely to be injurious to the public health or welfare, or which interferes with the reasonable enjoyment of life or property is prohibited [20 DCMR 903.1]" is applicable to all sources. This requirement is contained in the proposed permits.

20 DCMR Chapter 14, Section 1410: Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers
20 DCMR 1401.1 adopts 40 CFR 63, Subpart JJJJJJ by reference. Please see the more detailed discussion of the federal regulation below.

40 CFR 60, Subpart D—Standards of Performance for Fossil-Fuel-Fired Steam Generators
The two boilers are less than 250 million British thermal units per hour. Therefore, 40 CFR 60, Subpart D, does not apply.

40 CFR 60, Subpart Da—Standards of Performance for Electric Utility Steam Generating Units
Each of the units is less than 250 million British thermal units per hour. Therefore, 40 CFR 60, Subpart Da does not apply.

40 CFR 60, Subpart Db—Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units
Each of the units is less than 100 million British thermal units per hour. Therefore, 40 CFR 60, Subpart Db, does not apply.

40 CFR 60, Subpart Dc—Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units

The HRSG is not subject to this rule because pursuant to 40 CFR 60.40c(e) affected facilities (i.e. heat recovery steam generators and fuel heaters) that are associated with stationary combustion turbines and meet the applicability requirements of subpart KKKK of this part are not subject to this subpart.

The two boilers are subject to this rule because they are steam generating units for which construction, modification, or reconstruction is commenced after June 9, 1989 and they have a maximum design heat input capacity of 29 megawatts (MW) (100 million British thermal units per hour (MMBtu/h)) or less, but greater than or equal to 2.9 MW (10 MMBtu/h). The permits contain the relevant requirements in Condition II(c) of Permit Nos. 7285 and 7286, for visible emissions, and a streamlined fuel sulfur requirement in Condition III(b) of Permit Nos. 7285 and 7286.

The District does not have delegation for this standard, but does enforce it through the permitting program. However, for the relevant testing and reporting requirements from the regulation, the permit has been written to require test protocols, test reports, and other relevant reports to be submitted to EPA as well as the Department.

Additionally, as a result of the applicability of Subpart Dc, 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 60, Subpart KKKK—Standards of Performance for Stationary Combustion Turbines

Pursuant to 40 CFR 60.4305(a) If you are the owner or operator of a stationary combustion turbine with a heat input at peak load equal to or greater than 10.7 gigajoules (10 MMBtu) per hour, based on the higher heating value of the fuel, which commenced construction, modification, or reconstruction after February 18, 2005, your turbine is subject to this subpart. Only heat input to the combustion turbine should be included when determining whether or not this subpart is applicable to your turbine. Any additional heat input to associated heat recovery steam generators (HRSG) or duct burners should not be included when determining your peak heat input. However, this subpart does apply to emissions from any associated HRSG and duct burners.

This regulation establishes an applicable NOx limit of 25 ppm at 15% oxygen, which is similar in stringency to 20 DCMR 805.4. As such this requirement is streamlined with the 20 DCMR 805.4 limit discussed above in Condition II(d) of Permit No. 7287 and a more stringent standard of 2 ppmvd corrected to 15% oxygen adopted pursuant to 20 DCMR 201. 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 Permit No. 7287.

Subpart KKKK also establishes an SO_2 emission requirement. This is reflected in Condition II(c) of Permit No. 7287. 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 Permit No. 7287.

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 60, Subpart GG—Standards of Performance for Stationary Gas Turbines
Pursuant to 40 CFR 60.4305(b) Stationary combustion turbines regulated under 40 CFR 60, Subpart KKKK are exempt from the requirements of 40 CFR 60, Subpart GG. Therefore, the requirements of 40 CFR 60, Subpart GG are not included in the permit for the combustion turbine because the unit is subject to 40 CFR 60, Subpart KKKK.

40 CFR 63, Subpart YYYY—National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines
40 CFR 63, Subpart YYYY establishes national emission limitations and operating limitations for hazardous air pollutants (HAP) emissions from stationary combustion turbines located at major sources of HAP emissions. Howard University is an area source of HAPs. Therefore, 40 CFR 63, Subpart YYYY does not apply to the combustion turbine.

40 CFR 63, Subpart DDDDD—National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters
40 CFR 63, Subpart DDDDD establishes national emission limitations and work practice standards for hazardous air pollutants (HAP) emitted from industrial, commercial, and institutional boilers and process heaters located at major sources of HAP. Howard University is an area source of HAPs. Therefore, 40 CFR 63, Subpart DDDDD does not apply to the combustion turbine.

40 CFR 63, Subpart JJJJJJ—National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources
The boilers are not subject to 40 CFR 63, Subpart JJJJJJ because pursuant to 40 CFR 63.11195 a gas-fired boiler is not subject to this subpart. Pursuant to 40 CFR 63.11237 Gas-fired boiler includes any boiler that burns gaseous fuels not combined with any solid fuels and burns liquid fuel only during periods of gas curtailment, gas supply interruption, startups, or for periodic testing, maintenance, or operator training on liquid fuel. Periodic testing, maintenance, or operator training on liquid fuel shall not exceed a combined total of 48 hours during any calendar year per boiler. This requirement is contained in Condition III(d) of Permit Nos. 7285 and 7286.

Therefore, the boilers meet the definition of gas-fired boiler and are not subject to the requirements of 40 CFR 63, Subpart JJJJJJ.

40 CFR 64 – Compliance Assurance Monitoring (CAM)
This regulation is not applicable to this equipment pursuant to 40 CFR 64.2. In order for 40 CFR 64 to be applicable, all of the following criteria must be met:

(1) The unit is subject to an emission limitation or standard for the applicable regulated air pollutant;

(2) The unit uses a control device to achieve compliance with any such emission limitation or standard; and

(3) The unit has potential pre-control device emissions of the applicable regulated air pollutant that are equal to or greater than 100 percent of the amount, in tons per year, required for a source to be classified as a major source.

In this case, none of the units exceeds the major source threshold for the pollutant. Therefore, 40 CFR 64 is not applicable.

RECOMMENDATIONS

The proposed project and attached permits comply with all applicable federal and District air pollution control laws and regulations.

The permit action for the equipment will be published in the DC Register and on DOEE's website on November 13, 2020. Public comments for the permit action will be solicited from November 13, 2020 through December 14, 2020. AQD will resolve any comments received before taking final action on the applications. If no comments are received, I recommend that permit Nos. 7285 through 7287 be issued in accordance with 20 DCMR 200 promptly following the end of the public comment period.

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