

Engineering Analysis
PowerSouth Energy Cooperative – Lowman
Facility No. 108-0001
Combustion Turbine
Air Permit 108-0001-X005 (Reissuance)

Introduction

On November 14, 2024, the Department received an application from PowerSouth Energy Cooperative in Leroy, Alabama. They requested that the duct burner operation limit be increased to 4,792,000 MMBtu/year. PowerSouth is currently classified as a major source with respect to Title V. The facility holds a major source operating permit (MSOP).

Project Description

On March 7, 2019, PowerSouth submitted an air permit application for a project to take place at the Lowman Plant to convert from coal-fired generation to natural-gas generation by installing a new natural gas-fired combined cycle (NGCC) unit and retiring the existing coal-fired units at the facility. The NGCC consists of a combustion turbine generator, a duct-fired heat recovery steam generator (HRSG), and a steam turbine generator. The combustion turbine (CC1) would be capable of producing a gross output of approximately 720 megawatts (MW). The Department issued Air Permit No. 108-0001-X005 on August 21, 2019. CC1 is subject to 40 CFR Part 60, Subpart KKKK, Standards of Performance for Stationary Combustion Turbines, and 40 CFR Part 60, Subpart TTTT, Standards of Performance for Greenhouse Gas Emissions for Electric Generating Units. In the initial application, the facility assumed a maximum heat input of 2,644,000 MMBtu/yr for the duct burner. The facility has requested to increase the heat input to 4,792,000 MMBtu/yr. In their 2019 permit application, the facility used more conservative emission rates and an operations limit of 3,500 hours in their calculations to establish operating limits. The facility has provided updated emission rates based on post-commissioning emission testing as opposed to the emission factors originally provided from vendor manufacturer guarantees, EPA AP-42, Section 1.4, and AP-42, Section 3.1 to demonstrate that an increased heat input will not cause emissions to increase above the significance thresholds.

	Baseline	DB Operation 3,500 hours	2019 Application Project Summary	DB Operation 7,250 hours	Proposed Request Project Summary	PSD Threshold
NOx	3,368.41	271.99	-3,096.42	306.61	-3,061.80	40
PM	314.40	220.74	-93.66	247.33	-67.07	25

PowerSouth has also requested to propose a CO limit of 6.5 ppmvd at 15% oxygen and 65.5 lb/hour. As evidenced by their September 2023 certification testing, PowerSouth is expected to be well below this emission limit. The facility has additionally proposed to conduct 5 year stack testing based on the historic rate of degradation of the oxidation catalyst and the manufacturer guarantee.

	Baseline	DB Operation 3,500 hours	2019 Application Project Summary	DB Operation 7,250 hours	Proposed Request Project Summary	PSD Threshold
CO	234.01	319.66	85.65	301.90	67.89	100

40 CFR Part 60 (NSPS)

40 CFR Part 60, Subpart A – General Provisions

The NGCC would be subject to various 40 CFR Part 60 subparts. As a result, this source would be required to comply with the applicable requirements of this subpart.

40 CFR Part 60, Subpart KKKK – Standards of Performance for Stationary Combustion Turbines

The NGCC is subject to 40 CFR Part 60, Subpart KKKK. The HRSG including the duct burner associated with the turbine is also subject to 40 CFR Part 60, Subpart KKKK. The unit would remain subject to the applicable emission limits, monitoring, recordkeeping, and reporting requirements of this subpart.

40 CFR Part 60, Subpart TTTT – Standards of Performance for Greenhouse Gas Emissions for Electric Utility Generating Units

CC1 is subject to this subpart to include the CO₂ emissions limitation. Stationary turbines that burn natural gas are not subject to any monitoring or reporting requirements under this subpart [40 CFR 60.5520(d)(1)].

40 CFR Part 63 (NESHAP/MACT)

40 CFR Part 63, Subpart UUUUU – National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units

This subpart applies to coal-fired and oil-fired EGUs as defined in 40 CFR 63.10042. This unit is a natural gas fired unit. Therefore, this rule does not apply.

ADEM Admin. Code R. 335-3

Opacity

ADEM Admin. Code r. 335-3-4-.01 states that no person shall discharge from any source of emission, particulate of an opacity greater than twenty percent (20%), as determined by a six (6) minute average. ADEM 335-4-.01(b) states that during one six (6) minute period in any sixty (60) minute period a person may discharge into the atmosphere from any source of emissions, particulate of an opacity not greater than that designated as forty percent (40%) opacity. Each unit will remain subject to this rule.

Particulate Matter (PM)

The unit would remain subject to a PM emission limit according to Table 4-1 of ADEM Admin. Code r. 335-3-4-.03.

Sulfur Dioxide (SO₂)

The unit would remain subject to the applicable SO₂ requirements of ADEM Admin. Code r. 335-3-5-.01.

Nitrogen Oxides (NO_x)

The unit would remain subject to the applicable NO_x requirements of ADEM Admin. Code r. 335-3-8-.06.

Other Notable Changes

- Removed “ The nitrogen oxide (NO_x) emissions from this unit shall not exceed 4.0 ppmvd at 15% O₂” from the Emission Standard section of the permit. The unit is also subject to 40 CFR Part 60, Subpart KKKK with a NO_x emissions limit of 15 ppm at 15% O₂. Per ADEM Admin. Code r. 335-3-10-.01(2), the emissions standard in ADEM Admin. Code r. 335-3-10 supersedes the emissions standards in ADEM Admin. Code r. 335-3-3 through 8 if the unit is subject to the regulations in ADEM Admin. Code r. 335-3-10 and if the emission standard under ADEM Admin. Code r. 335-3-3 through 8 is more stringent than the emission standard in ADEM Admin. Code r. 335-3-10.
- Removed Startup, Shutdown, and Malfunction proviso from the Emission Standard section of the permit and the excess emissions report under the Recordkeeping and Reporting Requirements. 40 CFR 60.4375(a) requires that an excess emissions report must be submitted for all units of operation, including startup, shutdown, and malfunction, and 40 CFR 60.4395 requires that the report be postmarked by the 30th day following the end of each 6-month period.

Recommendation

Based on the above analysis, I recommend that PowerSouth be reissued Air Permit No. 108-0001-X005 for CC1 to update the duct burner operation limit and incorporate CO limit and CO stack testing.

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Date

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