

Technical Analysis Report
For the terms and conditions of
Minor Permit AQ0196MSS09

Issued to:
Kotzebue Electric Association

For the:
Kotzebue Power Plant

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Preliminary - August 05, 2021

1. INTRODUCTION

This Technical Analysis Report (TAR) provides the Alaska Department of Environmental Conservation's (Department's) basis for issuing Minor Permit AQ0196MSS09 to Kotzebue Electric Association (KEA) for the Kotzebue Power Plant (KPP). KEA submitted an application under 18 AAC 50.508(6) to revise terms and conditions previously established in a Title I permit. Minor Permit AQ0196MSS09 incorporates changes requested by KEA and revises Minor Permit AQ0196MSS04.

2. STATIONARY SOURCE DESCRIPTION

The Kotzebue Power Plant is an existing stationary source that provides electric power to the city of Kotzebue, Alaska. The KPP is classified as a prevention of significant deterioration (PSD) major source because it has the potential to emit (PTE) at least 250 tons per year (tpy) of NO_x. The current emissions unit inventory consists of six diesel-fired reciprocating engines, two diesel fuel storage tanks, one used oil-fired boiler, and six small heaters/furnaces. KEA currently operates the KPP under Operating Permit AQ0196TVP03, Revision 3.

3. APPLICATION DESCRIPTION

On April 22, 2021, KEA submitted a minor permit application under 18 AAC 50.508(6) to revise Title I permit conditions. The requested revisions include changes to monitoring requirements and a new PSD avoidance limit for EU ID 16. The NO_x PSD avoidance limit for EU ID 16 was established in Minor Permit AQ0196MSS03 (July 5, 2012). The application for that permit requested authorization to replace two existing generators, EU IDs 11 and 12, with a new generator, EU ID 16. According to the TAR for Minor Permit AQ0196MSS03, "KEA did not propose a limit for EU ID 16 to avoid PSD review." The TAR also indicated that "actual combined NO_x emissions for EU IDs 11 and 12 are 5.83 tons" but did not describe how the Department arrived at that value. Based on the PSD analysis conducted, the Department imposed an annual NO_x limit of 45 tons for EU ID 16, after concurrence with the applicant.

In January of 2015, KEA notified the Department that it was unable to maintain compliance with the 45 tpy NO_x limit on EU ID 16 and requested that the limit be increased to 75 tpy. The notification was followed by an application to revise Minor Permit AQ0196MSS03. The Department pointed out inaccuracies in KEA's assumptions and calculations and based on KEA's response, the Department revised the monitoring rather than the limit. The changes were included in Minor Permit AQ0196MSS04 (March 1, 2016).

In the application for Minor Permit AQ0196MSS09, KEA provided an updated PSD applicability analysis for the installation of EU ID 16 and the removal of EU IDs 11 and 12. The baseline actual emissions² (BAE) for EU IDs 11 and 12 were calculated using operating data between March 2002 and February 2004 and emission factors (EFs) from a 2003 source test. KEA included an owner requested limit (ORL) to restrict NO_x emissions from EU ID 16 to no more than 79.3 tpy.

KEA also requested that Conditions 13.2 and 13.3 of Minor Permit AQ0196MSS04 be revised to include the use of actual output (kWe-hrs) to calculate NO_x emissions for EU IDs 7B, 10, 14, 15

² Baseline actual emissions means the rate of emissions of a regulated pollutant as determined in accordance with 40 CFR 51.166(b)(47).

and 17. This methodology is consistent with Condition 12 of Minor Permit AQ0196MSS04 for calculating NOx emissions from EU ID 16.

4. CLASSIFICATION FINDINGS

Based on the review of the application, the Department finds that this project is classified under 18 AAC 50.508(6) to revise or rescind the terms and conditions of a Title I permit.

5. APPLICATION REVIEW FINDINGS

Based on the review of the application, the Department finds that:

1. KEA's minor permit application for the Kotzebue Power Plant contains the elements listed in 18 AAC 50.540.
2. KEA requested that the NOx emission limit, established in Minor Permit AQ0196MSS03 and carried forward into Minor Permit AQ0196MSS04, be revised.
3. KEA also requested that Conditions 13.2 and 13.3 of Minor Permit AQ0196MSS04 be revised to include the use of actual output (kWe-hrs) to calculate NOx emissions for EU IDs 7B, 10, 14, 15 and 17. KEA wants to retain the option to calculate NOx emissions using hours of operation and pound per hour EFs in the event that kWe-hrs were not available.
4. In order to avoid PSD review for the installation of EU ID 16, Minor Permit AQ0196MSS03 established a NOx emission limit for EU ID 16 and required the decommissioning of EU IDs 11 and 12.
5. With the recession of Condition 12 of Minor Permit AQ0196MSS04, EU ID 16 becomes a new EU for permit applicability under Minor Permit AQ0196MSS09.
6. The ORL restricting the NOx emissions from EU ID 16 to no more than 79.3 tpy allows KEA to continue to avoid PSD review for EU ID 16 and is consistent with 18 AAC 50.544(i)(1)(B) and 40 CFR 52.21(r)(4), which require that the PSD analysis be conducted as if Minor Permit AQ0196MSS04 was never issued.
7. Potential NOx emissions from EU ID 16 are included in an existing NOx limit (initially established for EU IDs 7B, 10, 11, 12, 14, and 15) of 314 tpy, therefore, there is no change in stationary source NOx potential emissions.

6. EMISSIONS SUMMARY AND PERMIT APPLICABILITY

PSD Applicability Analysis

PSD applicability analysis is a two-step process. The first step determines if the emissions increases for the project reach or exceed the significant emissions thresholds listed in 40 CFR 52.21(b)(23)(i). The second step evaluates the net emissions increases during the five-year contemporaneous period. The project must undergo PSD review if the project results in both a significant emissions increase and a significant net emissions increase. Under 40 CFR 52.21(b)(3)(i)(b), BAE are calculated in accordance with 40 CFR 52.21(b)(48). Under 40 CFR 52.21(b)(48)(ii), the consecutive 24-month period for calculating BAE must be "within the 10-year period immediately preceding either the date the owner or operator begins actual

construction of the project or the date a complete permit application is received by the Administrator for a permit required under this section or by the reviewing authority for a permit required by a plan, whichever is earlier". Therefore, the allowed 10-year period is immediately preceding December 29, 2011, which is the date the Department received a complete application for Minor Permit AQ0196MSS03.

The BAE submitted with the application for Minor Permit AQ0196MSS09 are correctly based on operational data for EU IDs 11 and 12 between March 2002 and February 2004. The BAE were calculated using NO_x EFs from a 2003 source test. Creditable NO_x emissions reductions for the decommissioning of EU IDs 11 and 12 total 40.3 tpy. Therefore, the new ORL of 79.3 tpy allows KEA to continue to avoid PSD review for EU ID 16. Table 2 and Table 3 show the PSD permit applicability for the installation of EU ID 16. The PSD applicability analysis was conducted in two steps.

Step 1: The BAE for EU ID 16 (assumed to be a new EU for this analysis) would be zero so the change in emissions is therefore equal to the PTE. In this case, the NO_x PTE for EU ID 16 is the ORL of 79.3 tpy and the other pollutant emissions are the PTE while operating up to the NO_x ORL. As indicated in Table 2, the Step 1 emissions increases were significant for NO_x and indirect PM_{2.5} and ozone because of NO_x.

Table 2 – PSD Permit Applicability Step 1, Tons per Year (tpy)

Pollutant	BAE	PTE of EU 16	Change in Emissions	PSD Significance Level	Significant Emissions Increase?
NO _x	0	79.3	79.3	40	Yes
CO	0	63.9	63.9	100	No
PM	0	3.5	3.5	25	No
PM ₁₀	0	3.5	3.5	15	No
PM _{2.5}	0	3.5	3.5	10 (or 40 tpy SO ₂ or NO _x)	Yes (indirect)
Ozone	0	NA	NA	(40 tpy VOC or NO _x)	Yes
VOC	0	4.6	4.6	40	No
SO ₂	0	0.1	0.1	40	No
Pb	0	0	0	0.6	No
CO ₂ e	0		5,665.6	75,000	No

Notes:

Step 1 PSD permit applicability conducted in accordance with 40 CFR 52.21(a)(2)(iv)(d).

BAE – baseline actual emissions

PTE – potential to emit

PSD significant emission levels are from 40 CFR 52.21(b)(23)(i)

PM_{2.5} emissions are conservatively assumed equal to PM₁₀ emissions.

For fuel burning equipment, PM emissions are assumed equal to PM₁₀ emissions.

Step 2: This step involves calculating the net emissions increases, as described in 40 CFR 52.21(b)(3), and includes contemporaneous emissions increases and decreases. Because EU IDs 11 and 12 were decommissioned prior to the initial startup of EU ID 16, the combined BAE for those units is considered a creditable decrease. Without an ORL, the net emissions increase would be above the PSD significance level. KEA is requesting a NO_x ORL of 79.3 tpy for EU ID 16, which allows for a net emissions increase of 39 tpy and avoids PSD review.

Table 3 – PSD Permit Applicability Step 2, (tpy)

Pollutant	Step 1 Emissions	Step 2a	Step 2b	Net Emissions Increase	PSD Significance Level	Significant Net Emissions Increase?
NO _x	79.3	-40.3	NA	39.0	40	No

Notes:

Step 2 PSD permit applicability conducted in accordance with 40 CFR 52.21(b)(3).

Step 2a includes creditable emissions decreases.

Step 2b includes creditable emissions increases.

PSD significant emission levels are from 40 CFR 52.21(b)(23)(i).

KEA provided emissions calculations for EU ID 16 with the application for Minor Permit AQ0196MSS09. KEA utilized Tier 2 marine engine emission standards times a not-to-exceed (NTE) factor of 1.25 for the NO_x, CO, and PM emission factors (EFs). KEA used AP-42 for the VOC EF. The Department revised the VOC EF and instead used the manufacturer's certification level times a NTE factor of 1.5. This is a more accurate EF than AP-42. SO₂ emissions for EU ID 16 were calculated using mass balance and the existing fuel sulfur limit of 0.0015 wt% (ULSD).

KEA did not include a minor permit applicability analysis in the application for Minor Permit AQ0196MSS09 based on their assumption that there is no change to the stationary source PTE. While that is true for NO_x, because EU ID 16 is included in the existing NO_x limit of 314 tpy of NO_x, it is not necessarily true for the other criteria pollutants. For simplicity, the Department conservatively conducted the analysis by comparing PTE to PTE without the NO_x limits. Table 4 shows that the change in PTE for criteria pollutants is below the minor permit thresholds in 18 AAC 50.502(c)(3). 18 AAC 50.502(c)(3) emissions thresholds are used to determine permit applicability when the existing stationary source has a PTE greater than the thresholds listed in 18 AAC 50.502(c)(1), for a particular pollutant.

Table 4 – Emissions Summary and Minor Permit Applicability

	Emissions (tpy)				
	NO _x	CO	SO ₂	PM ₁₀ / PM _{2.5}	VOC
PTE for EU IDs 11 & 12	316	52	44	3	10
PTE for EU ID 16	135.7	87.0	0.1	4.7	6.3
Change in PTE	-180.3	35.0	-43.9	1.7	-3.7
18 AAC 50.502(c)(3) thresholds	10	NA	10	10/10	NA
50.502(c)(3) applicable?	No	No	No	No	No

Notes:

PTE for EU IDs 11 & 12 is from a PTE worksheet provided with the application for Minor Permit AQ0196MSS01.

PTE for EU ID 16 using 8760 hrs/yr and the emission standard times 1.25 for NO_x, CO, and PM. VOC EF is manufacturer's certification level times 1.5. SO₂ is a mass balance calculation.

PM_{2.5} emissions are conservatively assumed equal to PM₁₀ emissions.

NA is not applicable

Assessable emissions for the stationary source total 600 tpy, as shown in Table 5 and include any pollutant greater than or equal to 10 tpy. Appendix A presents the emissions summary.

Table 5 – Assessable Emissions (tpy)

	NO _x	CO	SO ₂	PM	VOC
Stationary Source PTE	315.2	191.9	5.4	46.6	46.2
Assessable Emissions	315	192	0	47	46
Total Assessable	600				

Notes:

PM emissions are assumed equal to PM-10 emissions.

Assessable emissions include any pollutant greater than or equal to 10 tpy.

Changes in PTE from the TAR for Minor Permit AQ0196MSS08 are due to corrections to EFs for EU ID 16.

7. REVISIONS TO PERMIT CONDITIONS

Table 6 lists the requirements carried over from Minor Permit AQ0196MSS04 into Minor Permit AQ0196MSS09 and conditions that have been added.

Table 6 – Comparison of AQ0196MSS04 to AQ0196MSS09 Conditions³

Permit AQ0196MSS04 Condition	Description of Requirement	Permit AQ0196MSS09 Condition	How Condition was Revised
1	Emission Unit Inventory	Section 1	The EU Inventory Table is no longer part of Condition 1.
2.1	Assessable PTE	3.1	The assessable PTE of the stationary source was changed from 557 tpy to 600 tpy as a result of updates to emission factors.
12	ORL to avoid PSD Modification	7	The ORL to avoid PSD for EU 16 was revised from 45 tpy NO _x to 79.3 tpy NO _x .
None	PSD avoidance monitoring	6.1	The Permittee requested this monitoring option to track kWe-hr for each of EU IDs 7B, 10, and 14 through 17. The data will be used for calculating actual NO _x emissions.
13.2	PSD avoidance monitoring	6.2	The condition was not revised. The Permittee asked to retain this monitoring option to track operating hours as a backup if kWe-hr data is not available for one or more of EU IDs 7B, 10, and 14 through 17. It is included in this permit because it is cross referenced in Condition 6.3.
13.3	PSD avoidance monitoring and recordkeeping	6.3	The Permittee requested that the emission factors be revised based on the most recent source test data.

8. PERMIT CONDITIONS

The bases for the conditions imposed in Minor Permit AQ0196MSS09 are described below.

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18 AAC 50.544(a)(1) requires the Department to identify the stationary source, Permittee, and contact information.

Emissions Unit Inventory

The EUs authorized and/or restricted by this permit are listed in Section 1. Unless noted elsewhere in this permit, the information in Section 1 is for identification purposes only.

³ This table does not include all standard and general conditions.

Condition 1 is a general requirement to comply with AS 46.14 and 18 AAC 50 when installing a replacement EU.

Section 2: Emission Fees

18 AAC 50.544(a)(2) requires the Department to include a requirement to pay fees in accordance with 18 AAC 50.400 – 18 AAC 50.499 in each minor permit issued under 18 AAC 50.542. The Department used the Standard Permit Condition I language for Minor Permit AQ0196MSS09.

Section 3: Revisions to Minor Permit AQ0196MSS04

The application for Minor Permit AQ0196MSS09 requested to revise the PSD avoidance limit in Condition 12 of Minor Permit AQ0196MSS04. Therefore, Condition 5 rescinds Condition 12 of Minor Permit AQ0196MSS04. The new ORL is established in Section 4 of this permit.

KEA also requested that Conditions 13.2 and 13.3 of Minor Permit AQ0196MSS04 be revised to include the use of actual output (kWe-hrs) to calculate NO_x emissions for EU IDs 7B, 10, 14, 15 and 17. Additionally, KEA wants to retain the option to calculate NO_x emissions using hours of operation and pound per hour EFs in the event that kWe-hrs are not available. Conditions 6.1 through 6.3 replace the monitoring in Conditions 13.2 and 13.3 of Minor Permit AQ0196MSS04.

Section 4: Owner Requested Limit to Avoid PSD Modification under 18 AAC 50.306

The primary reason KEA applied for Minor Permit AQ0196MSS09 was to establish a new PSD avoidance limit for EU ID 16. The previous NO_x PSD avoidance limit for EU ID 16 was 45 tpy and was established in Minor Permit AQ0196MSS03 (July 5, 2012). KEA requested to establish a new ORL to restrict NO_x emissions from EU ID 16 to no more than 79.3 tpy. KEA provided a PSD applicability analysis for the installation of EU ID 16 and the removal of EU IDs 11 and 12. The new ORL restricting the NO_x emissions from EU ID 16 to no more than 79.3 tpy allows KEA to continue to avoid PSD review for EU ID 16.

Section 5: Standard Permit Conditions

18 AAC 50.544(a)(5) requires each minor permit issued under 18 AAC 50.542 to contain the standard permit conditions in 18 AAC 50.345, as applicable. 18 AAC 50.345(a) clarifies that subparts (c)(1) and (2), and (d) through (o), may be applicable for a minor permit.

The Department included the necessary minor permit-related standard conditions of 18 AAC 50.345 in Minor Permit AQ0196MSS09. The Department incorporated these standard conditions as follows:

- 18 AAC 50.345(c)(1) and (2) are incorporated as Condition 8 of Section 5 (Standard Permit Conditions);
- 18 AAC 50.345(d) through (g) are incorporated as Conditions 9 through 12, respectively, of Section 5 (Standard Permit Conditions);

9. PERMIT ADMINISTRATION

KEA currently operates the KPP under Operating Permit AQ0196TVP03, Revision 3. The Department intends to incorporate the provisions of Minor Permit AQ0196MSS09 into the operating permit as an administrative amendment following EPA's 45-day review. The KPP can operate under this minor permit after the minor permit goes through EPA review and is issued by the Department.

Appendix A: Emissions Summary (tpy)

EU ID	Description	NO _x		CO		SO ₂		PM ₁₀		VOC	
		EF	PTE	EF	PTE	EF	PTE	EF	PTE	EF	PTE
7B	Diesel engine	Combined Emission Limit	314	1.2 lb/hr (source test)	5.3	0.0015 wt% S	0.07	0.0007 lb/hp-hr	4.7	0.00064 lb/hp-hr	4.3
10	Diesel engine			16 lb/hr (BACT)	70.1	0.0015 wt% S	0.19	0.0007 lb/hp-hr	12.6	0.00064 lb/hp-hr	11.6
14	Diesel engine			1.8 lb/hr (source test)	7.9	0.0015 wt% S	0.18	0.0007 lb/hp-hr	11.8	0.00064 lb/hp-hr	10.8
15	Diesel engine			2.3 lb/hr (source test)	10.1	0.0015 wt% S	0.18	0.0007 lb/hp-hr	11.8	0.00064 lb/hp-hr	10.8
16	Diesel engine ²			6.2565 g/kW-hr (standard x 1.25)	63.9	0.0015 wt% S	0.07	0.338 g/kW-hr (standard x 1.25)	3.5	0.45 g/kW-hr (Tier 2 cert x 1.5)	4.6
17	Diesel engine			4.375 g/kW-hr (NSPS Subpart IIII)	34.4	0.0015 wt% S	0.05	0.125 g/kW-hr (NSPS Subpart IIII)	1.0	0.5 g/kW-hr (NSPS Subpart IIII)	3.9
18	Used oil boiler	19 lb/kgal	0.7	5 lb/kgal	0.18	0.5 wt% S	2.7	32 lb/kgal	1.2	1.0 lb/kgal	0.04
T2	Fuel Tank	--	0	--	0	--	0	--	0	Tanks 4.09d	0.07
T3	Fuel Tank	--	0	--	0	--	0	--	0	Tanks 4.09d	0.07
19	Indirect Heater	18 lb/kgal	0.23	5 lb/kgal	0.06	0.5 wt% S	0.89	1.7 lb/kgal	0.02	0.34 lb/kgal	0.004
20	Indirect Heater	18 lb/kgal	0.23	5 lb/kgal	0.06	0.5 wt% S	0.89	1.7 lb/kgal	0.02	0.34 lb/kgal	0.004
21	Space Heater	18 lb/kgal	0.01	5 lb/kgal	0.003	0.5 wt% S	0.04	1.7 lb/kgal	0.001	0.34 lb/kgal	0.0002
22	Space Heater	18 lb/kgal	0.01	5 lb/kgal	0.003	0.5 wt% S	0.04	1.7 lb/kgal	0.001	0.34 lb/kgal	0.0002
23	Furnace	18 lb/kgal	0.02	5 lb/kgal	0.01	0.5 wt% S	0.09	1.7 lb/kgal	0.002	0.34 lb/kgal	0.0004
24	Furnace	18 lb/kgal	0.01	5 lb/kgal	0.004	0.5 wt% S	0.05	1.7 lb/kgal	0.001	0.34 lb/kgal	0.0003
	Total		315.2		191.9		5.4		46.6		46.2

Notes:

- 1 Emission factors are from AP-42 unless noted otherwise.
- 2 Using the 2016 source test NO_x emission rate of 24.64 lb/hr, EU 16 can operate approx. 6,436 hrs to reach NO_x limit of 79.3 tpy.
- 3 Emission factors from NSPS Subpart IIII are NTE values (standard × 1.25).
- 4 CO and PM₁₀ values for EU ID 16 (Tier 2 marine engine) are 1.25 times the emission standard. VOC EF is 1.5 times the certification level.
- 5 PM₁₀ EF for EU ID 18 assumes a used oil ash content of 0.5 percent.