**TECHNICAL REVIEW AND EVALUATION
OF APPLICATION FOR
AIR QUALITY PERMIT No. 103667**

I. INTRODUCTION

This Class I Significant Permit Revision is for the construction and operation of four (4) 47 megawatt (MW) Pro Energy PE6000 natural gas combustion turbines at the UNS Electric, Inc.'s (UNSE or "the Permittee") Black Mountain Generating Station. The Black Mountain Generating Station is an existing synthetic minor source of nitrogen oxides and carbon monoxides for the purposes of Major New Source Review (NSR).

A significant permit revision is required because UNSE voluntarily accepted emissions limitations in accordance with Arizona Administrative Code (A.A.C.) R18-2-306.01.A in order to limit the potential to emit of the new natural gas combustion turbines for nitrogen oxides (NO_X) and carbon monoxide (CO) to below the major source threshold identified in A.A.C. R18-2-401.13(b), thereby avoiding triggering the requirements of Major NSR.

A significant permit revision is also required because the increase in potential to emit of the combustion turbines for coarse particulate matter with aerodynamic diameter less than 10 microns (PM_{10}), fine particulate matter with aerodynamic diameter less than 2.5 microns ($PM_{2.5}$), volatile organic compounds (VOCs), CO, and NO_X is greater than the permitting exemption threshold in A.A.C. R18-2-101(102), which triggers the requirements of Minor NSR in accordance with A.A.C. R18-2-334.A.3. In order to satisfy the requirements of Minor NSR, the Permittee elected to conduct an ambient air impact analysis in accordance with A.A.C. R18-2-334.C.2.

Company Information

Company Name:	UNS Electric, Inc.
Mailing Address:	P.O. Box 711, Mail Stop HQW705 Tucson, AZ 85702
Facility Name:	Black Mountain Generating Station
Facility Location:	Approximately 11 Miles Southwest of Kingman Kingman, AZ 86401

A. Attainment Classification

The Black Mountain Generating Station is located in Mohave County, which is currently designated attainment or unclassified for all criteria pollutants.

II. PROCESS DESCRIPTION

A. Process Equipment

The Black Mountain Generating Station is an existing peaking/back-up electric generating facility consisting of two (2) 45-MW GE LM 6000PC SPRINT simple cycle natural gas combustion turbines, a cooling tower, a diesel emergency generator, and a diesel emergency fire water pump.

The Permittee proposes to install and operate four (4) 47 MW Pro Energy PE6000 simple cycle natural gas combustion turbines to supplement generating capacity at the Black Mountain Generating Station. The combustion turbines will be coupled with electrical generators to produce electric power to supply the grid. The combustion turbines are made up of an inlet air system, high- and low-pressure compressor sections, a combustor, and high- and low-pressure turbine sections. Inlet air, used as the working fluid for the turbines, is conditioned in the inlet air system, compressed in the low- and high-pressure compressor, and combusted with natural gas in the combustor section. The resulting exhaust gases turn the high- and low-pressure turbines, which produces electrical power when coupled with an electrical generator.

B. Air Pollution Controls

The Black Mountain Generating Station will implement the following air pollution controls to reduce emissions of the following pollutants:

Table 1: Air Pollution Controls for Combustion Turbine Units 3 – 6

Air Pollution Control	Pollutant(s) Controlled
Water-Injection Systems	Nitrogen Oxides
Selective Catalytic Reduction (SCR)	Nitrogen Oxides
Oxidation Catalyst	Carbon Monoxide, Volatile Organic Compounds (including Organic Hazardous Air Pollutants (HAPs))
Natural Gas with total sulfur content of 0.75 grains per 100 standard cubic feet (scf) or less.	Sulfur Dioxide

III. COMPLIANCE HISTORY

UNS Electric, Inc. is required to submit quarterly excess emissions and monitoring system performance reports detailing periods of excess emissions and continuous emissions monitoring system (CEMS) downtime for NO_X and CO. Cylinder Gas Audits and Relative Accuracy Test Audits for the CEMS were conducted as required by Appendix F to 40 CFR Part 60. All reporting and performance audits have been completed as required by the permit. The Black Mountain Generating Station has received two full inspection during the permit term. No non-compliance was noted during these on-site inspections.

On January 9, 2024, UNS Electric, Inc. submitted a permit deviation report detailing the failure to operate the facility’s water injection systems for combustion turbine Unit 2 during three brief periods of malfunction, troubleshooting, and repair testing for an approximate cumulative timeframe of 77 minutes. The malfunctions resulting in the failure to operate the water injection system for combustion turbine Unit 2 was promptly resolved and no excess emissions resulted.

IV. POTENTIAL TO EMIT

The new combustion turbines' potential to emit (PTE) for PM_{10}, $PM_{2.5}$, and VOCs were evaluated based on emission rates provided by the turbine vendor. PTE for CO and NO_X are based on the permitted voluntarily accepted emissions limitations adopted to avoid triggering the requirements of Major NSR. PTE for sulfur dioxide (SO_2) was evaluated based on a material balance utilizing heat input rate for the combustion turbines and the maximum permitted sulfur content of natural gas of 0.75 grains per 100 standard cubic feet. Emissions resulting from start-up and shut down for the combustion turbines were evaluated based on equivalent of four start-up and shut down events per day, per unit (1,460 events per year, per unit).

In most cases, PTE for hazardous air pollutants (HAPs) were evaluated based on emission factors from AP-42 Chapter 3.1-3 for Stationary Gas Turbines. For hexane, UNSE utilized emission factors from the Bay Area Air Quality Management District Toxic Air Contaminant Emission Factor Guidelines. For formaldehyde, the Permittee utilized worst-case emissions rates provided by the turbine vendor for emissions of formaldehyde.

The increases in the Black Mountain Generating Station's PTE resulting from the new combustion turbines are shown in Table 2. In calculating these increases, ADEQ conservatively assumed continuous operations.

As noted below, the generation station will be subject to the limits on CO_2 in 40 CFR Subpart TTTTa. Under Condition IV.F.1.b of Attachment "B" of the permit, the Permittee will be required to operate the units in such a manner that they are not subject to the limits for base load combustion turbines, which will require the units to supply no more than 40 percent of their output as net electric sales. This arguably qualifies as an "operational limitation on the capacity of the source to emit" regulated pollutants that should be considered in calculating PTE under A.A.C. R18-2-101(110). However, EPA published a proposal to repeal Subpart TTTTa on June 17, 2025, see 90 Fed. Reg. 25752, and is reportedly planning on finalizing the repeal in the near future. There is thus a substantial probability that the operational limits in Subpart TTTTa will no longer apply to the new units after the permit is issued. To ensure that NSR requirements accurately reflect the generating station's future PTE, ADEQ therefore has assumed that the new units may be operated continuously.

Table 2: Potential to Emit (tpy)

Pollutant	Pre-Project PTE	Change in PTE	Post-Project PTE	Minor New Source Review Threshold	Major New Source Review Threshold	New Source Review Triggered?
NO_X	244	+202	446	20	250	Minor NSR
PM_{10}	26.4	+81.4	107.8	7.5	250	Minor NSR
$PM_{2.5}$	26.4	+81.4	107.8	5	250	Minor NSR
CO	244	+245	489	50	250	Minor NSR
SO_2	7.28	+16.2	23.5	20	250	No
VOC	7.59	+44.2	51.8	20	250	Minor NSR
Pb	0	+0	0	0.3	250	No

Total HAPs	4.34	+4.87	9.21	Not Applicable	Not Applicable	Not Applicable
Maximum Single HAP (Formaldehyde)	2.5	+0.6	3.1	Not Applicable	Not Applicable	Not Applicable

V. MINOR NEW SOURCE REVIEW

Existing stationary sources are required to satisfy the requirements of Minor NSR prior to beginning construction of any physical change or change in the method of operation at the source that results in an increase in PTE for any regulated Minor NSR pollutant that is greater than the Minor NSR thresholds identified in Table 2 above. The installation of the combustion turbines results in an increase in PTE for PM_{10}, $PM_{2.5}$, CO, VOC, and NO_X that is greater than these thresholds, therefore this change is subject to the requirements of Minor NSR for each of those pollutants. Minor NSR is also trigged for ozone (O_3) due to precursor emissions of VOC and NO_X exceeding the permitting exemption thresholds.

In order to satisfy the requirements of Minor NSR, applicants may elect to evaluate and implement Reasonably Available Control Technology (RACT) for each emissions unit with PTE regulated NSR pollutants greater than 20% of the permitting exemption threshold, or conduct an ambient air impact analysis demonstrating that the operation of the proposed emissions units will not result in interference with attainment of the National Ambient Air Quality Standards (NAAQS). In this case, UNSE elected to conduct an ambient air impact analysis to demonstrate that worst-case emissions resulting from the operation of the combustion turbines will not interfere with attainment of the NAAQS in accordance with A.A.C. R18-2-334.C.2. In order to comply with the 1-hour NO_X NAAQS, UNSE has elected to take a 61 lb/hr emission limit on NO_X from any individual stack on the new combustion turbines. The ambient air impact analysis is discussed in Section XII below.

VI. MAJOR NEW SOURCE REVIEW

The Black Mountain Generating Station is considered a synthetic minor source for the purposes of Major NSR due to the existing voluntarily accepted emissions limitations adopted in accordance with A.A.C. R18-2-306.01.A to limit cumulative emissions for Gas Turbine Units 1 and 2, the emergency generator, and the fire pump engine below the major source thresholds of 250 tpy for CO and NO_X. This permit revision does not seek to relax these existing emissions limitations. As the Black Mountain Generating Station is not an existing major source subject to the requirements of Article 4 of Title 18, Chapter 2 of the A.A.C., the installation of new combustion turbines is not evaluated as a major modification, consistent with the definition of major modification in A.A.C. R18-2-101.74.

In order to avoid the triggering requirements of Major NSR for the installation of the new combustion turbines, UNSE has voluntarily accepted cumulative emissions limitations of 245 tons of CO and 202 tons of NO_X on a rolling 365-day basis for Combustion Turbine Units 3-6, below the major source threshold identified in A.A.C. R18-2-401.13(b). UNS Electric, Inc. is required to install, operate, maintain, and calibrate CEMS in order to demonstrate continuous compliance with the voluntarily accepted emissions limitations for CO and NO_X for Combustion Turbine Units 3 through 6.

Following this project, the Black Mountain Generating Station will be considered a major source for the purposes of Major NSR. As such, any future changes will require evaluation for applicability as a major modification for Major NSR.

VII. VOLUNTARILY ACCEPTED EMISSION LIMITATIONS AND STANDARDS

This permit revision enacts the following voluntary emission limitations and standards for Combustion Turbine Units 3 through 6:

A. Natural Gas Total Sulfur Content

In order to reduce PTE for SO_2 below the permitting exemption threshold and avoid the requirements of Minor NSR, by limiting total sulfur content, the Permittee shall combust natural gas with a maximum sulfur total sulfur content of 0.75 grains per 100 dry standard cubic foot or less in the Combustion Turbine Units 3 – 6.

B. Carbon Monoxide Emissions for Combustion Turbine Units 3 – 6

In order to avoid the requirements of Major NSR, the Permittee shall not emit greater than 245 tons of CO on a rolling 365-day basis, as measured by a certified continuous emissions monitoring system.

C. Nitrogen Oxides Emissions for Combustion Turbine Units 3 – 6

In order to stay below the Significant Impact Level (SIL) for ground-level ozone and to avoid the triggering the requirements of Major NSR, the Permittee shall not emit greater than 202 tons of NO_X on a rolling 365-day basis, as measured by a certified continuous emissions monitoring system. In order to comply with the 1-hour NO_X NAAQS, the Permittee has accepted a 61 lb/hr limit from any individual stack on the new combustion turbines.

VIII. APPLICABLE REGULATIONS

Table 3 identifies applicable regulations and verification as to why that standard applies for this Significant Permit Revision.

Table 3: Applicable Regulations

Unit	Control Device	Rule	Discussion
Gas Turbine Units 3 through 6	Water Injection System	NSPS Subpart KKKKa NSPS Subpart TTTTa	NSPS Subpart KKKKa “Standards of Performance for Stationary Combustion Turbines”, apply to stationary combustion turbines constructed after December 13, 2024. The requirements of NSPS Subpart TTTTa “Standards of Performance for Greenhouse Gas Emissions for Modified Coal-fired Steam Electric Generating Units and New Construction and Reconstruction Stationary Combustion Turbine Electric Generating Units” apply to stationary combustion turbines with base load rating greater than 260 gigajoules per hour (250 MMBtu/hr) of fossil fuel and that serve a generator (or generators) capable of selling greater than 25 MW of electricity to a utility power distribution system that commenced construction after May 23, 2023.
Cooling Tower	Not Applicable	A.A.C. R18-2-730	The requirements of Standards of Performance for Unclassified Sources applies to sources that are not otherwise subject to a requirement under Article 7, 9, or 11 of Title 18, Chapter 2 of the A.A.C.
Fugitive Dust Sources	Water Trucks, Dust Suppressants	A.A.C. R18-2 Article 6 A.A.C. R18-2-702	These standards are applicable to all fugitive dust sources at the facility.
Abrasive Blasting	Wet blasting; Dust collecting equipment; Other approved methods	A.A.C. R-18-2-702 A.A.C. R-18-2-726	These standards are applicable to any abrasive blasting operation.

Unit	Control Device	Rule	Discussion
Spray Painting	Enclosures	A.A.C. R18-2-702 A.A.C. R-18-2-727	These standards are applicable to any spray painting operation.
Demolition/Renovation Operations	Not Applicable	A.A.C. R18-2-1101.A.12	This standard is applicable to any asbestos related demolition or renovation operations.

IX. PREVIOUS PERMIT CONDITIONS

Table 4 addresses the changes made to the sections and conditions from Permit No. 96932:

Table 4: Previous Permit Conditions

Section No.	Determination			Comments
	Added	Revised	Deleted	
Att. "B" Section I	X			Relationship to State Implementation Plan: Authorization for construction of gas combustion turbines.
Att. "B" Section II		X		Facility Wide Requirements: Revised to include combined annual emissions limitations for the new combustion turbine units and the hourly limit on NO_X emissions.
Att. "B" Section VI	X			Gas Turbine Units 3 Through 6 Requirements: New Section added to identify all applicable requirements for new combustion turbines units.
Att. "C"		X		Equipment List: Revised to reflect the most recent equipment permitted at the facility and to include additional equipment information provided.

X. MONITORING, RECORDKEEPING, AND REPORTING REQUIREMENTS

Table 5 contains a list of the monitoring, recordkeeping and reporting requirements adopted in this Significant Permit Revision. The table below is intended to provide insight to the public for how the Permittee is required to demonstrate compliance with the emission limits in the permit for Combustion Turbine Units 3 through 6. Records are required be kept for a minimum of 5 years, as outlined in Section XII of Attachment "A" of the permit.

Table 5: Permit No. 103667

Emission Unit	Pollutant	Emission Limit	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
Combustion Turbine Units 3 through 6	NO_X	202 tons per year on rolling 365-day basis, cumulative. 61 pounds per hour from any individual stack of Gas Turbine 3-6. 25 ppmv at 15 percent O_2 when operated at greater than or equal to 70 percent of base load and less than or equal to 45 percent utilization rate.	Install, operate, maintain, and calibrate continuous emissions monitoring system for NO_X from Combustion Turbine Units 3-6. Install, operate, maintain, and calibrate fuel flow monitors.	Calculate and maintain records of rolling 365-day emissions of NO_X from Combustion Turbine Units 3-6.	Report periods of excess emissions of NO_X. Submit semiannual excess emissions and monitoring system performance reports.

Emission Unit	Pollutant	Emission Limit	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
		15 ppmv at 15 percent O_2 when operated at greater than or equal to 70 percent of base load and greater than 45 percent utilization rate. 96 ppmv at 15 percent O_2 when operated at less than 70 percent of base load.			
	CO	245 tons per year on rolling 365-day basis, cumulative	Install, operate, maintain, and calibrate continuous emissions monitoring system for CO from Combustion Turbine Units 3-6.	Calculate and maintain records of rolling 365-day emissions of CO from Combustion Turbine Units 3-6.	Not Applicable
	SO_2	26 ng SO_2/J (0.060 lb SO_2/MMBtu)	Conduct fuel sulfur analysis. Maintain records demonstrating that the total sulfur content for natural gas is at or below 0.75 grains per 100 standard cubic feet	Maintain records demonstrating that the total sulfur content for natural gas is at or below 0.75 grains per 100 standard cubic feet	Maintain records demonstrating that the total sulfur content for pipeline natural gas demonstrating total sulfur content is at or below 0.75 grains per 100 standard cubic feet of natural gas.

Emission Unit	Pollutant	Emission Limit	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
	CO_2	Low Load (Supply 20 Percent or Less Potential Electrical Output on 12-operating month and 3-year rolling average basis): 120 lb CO_2/MMBtu	Maintain purchase records of natural gas burned.	Maintain purchase records of natural gas burned.	
		Intermediate Load (Supply Greater than 20 Percent but Less Than 40 Percent Potential Electrical Output on 12-operating month and 3-year rolling average basis): 1,170 lb CO_2/MWh of gross energy output.	Install, certify, operate, maintain, and calibrate a CO_2 CEMS *or* calculate hourly CO_2 mass emissions using hourly EGU heat input rate and the F-Factor methodology in Appendix G to 40 CFR 75. Install, calibrate, maintain, and operate a sufficient number of watt meters to continuously measure and record the hourly gross electric output or net electric output	Maintain records of information used to demonstrate compliance, including emissions rates, calculations, and applicable monitoring data.	Quarterly compliance report demonstrating compliance with emissions limitations and gross energy output or net energy output sold to the grid, as applicable.

XI. COMPLIANCE ASSURANCE MONITORING (CAM)

The CAM rule applies to pollutant-specific emission units (PSEU) at a major Title V source if the unit meets all of the following criteria:

A. The unit is subject to an emission limit or standard for the applicable regulated air pollutant;

B. The unit uses a control device to achieve compliance with the emission limit or standard; and,

C. The unit has "potential pre-control device emissions" of the applicable regulated air pollutant equal to or greater than 100% of the amount (tons/year) required for a source to be classified as a major source. "Potential pre-control device emissions" means potential to emit (PTE, as defined in Title V) except emissions reductions achieved by the applicable control device are not taken into account.

The general purpose of monitoring required by the CAM rule is to assure compliance with emission standards by ensuring that control devices meet and maintain the assumed control efficiencies. Compliance is ensured through requiring monitoring of the operation and maintenance of the control equipment and, if applicable, operating conditions of the pollutant-specific emissions unit. For the PSEUs that have post control potential to emit 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, for each parameter monitored, the owner shall collect four or more data values equally spaced over each hour. Such units are defined as "large" PSEUs. For all other PSEUs ("small" PSEUs), the monitoring shall include some data collection at least once per 24-hour period.

The Black Mountain Generating Station proposes to operate CEMS to monitor emissions of NO_X and CO in order to demonstrate compliance with the applicable emissions limitations. These CEMS will be required in a Class I permit as the 'continuous compliance demonstration'. Therefore, in accordance with 40 CFR 64.2(b)(1)(vi), the proposed combustion turbines at the Black Mountain Generating Station are not subject to the CAM rule.

XII. AMBIENT AIR QUALITY IMPACTS ANALYSIS

A. General Overview

ADEQ reviewed the ambient air quality assessment submitted by UNSE in support of its application for a Class I significant permit revision to the Black Mountain Generating Station. The assessment evaluated emissions of the criteria pollutants regulated under the applicable provisions of the Minor NSR of the A.A.C. R18-2-334. Under the Minor NSR program, an ambient air quality assessment must demonstrate either of the following:

- The emissions from the source or minor modification will have an ambient impact below the significant impact levels (SILs);
- The ambient concentrations resulting from the source or minor modification combined with representative background concentrations of criteria pollutants will not interfere with attainment or maintenance of the NAAQS.

To satisfy the requirements of Minor NSR, USNE conducted an ambient air quality assessment in two steps: a preliminary analysis (often referred to as a significant impact analysis), and if required, a cumulative impact analysis:

- The significant impact analysis estimates ambient concentrations resulting from the proposed project for pollutants that trigger minor NSR review. If the ambient impacts from the project are greater than SILs, then a cumulative impact analysis is conducted.
- The cumulative impact analysis considers the emissions from the proposed project, the existing emissions from the Black Mountain Generating Station, and the emissions from other nearby sources. The modeling results from these emission sources are added to representative regional ambient background concentrations and the total concentrations are compared to the NAAQS.

For the proposed project, the pollutants subject to the Minor NSR program are PM_{10}, $PM_{2.5}$, NO_X, VOCs, CO, and ozone (O_3, due to precursor emissions of NO_X and VOCs). Guidance for performing air quality dispersion modeling analyses is set forth in the EPA's Guideline on Air Quality Models (40 CFR Part 51 Appendix W)[1] and the Air Dispersion Modeling Guidelines for Arizona Air Quality Permits, November 1, 2019 (ADEQ's Modeling Guidelines).[2]

B. Model Selection

The American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) model is the EPA-preferred model for estimating impacts at receptors located in simple terrain and complex terrain (within 50-km of a source) due to emissions from industrial sources. UNSE used AERMOD for the ambient impact analysis.

The AERMOD modeling system consists of three major components: AERMAP, used to process terrain data and develop elevations for receptors; AERMET, used to process the meteorological data; and the AERMOD dispersion model, used to estimate the ambient pollutant concentrations. UNSE used AERMAP version 18081; AERMET version 23132; and AERMOD version 24142. These were the latest versions of the AERMOD modeling system at the time of UNSE's application submission. The Department has reviewed the recent updates to AERMOD, dated December 4, 2024, and has determined that these updates will not impact the modeling analysis for the proposed project.

C. Source Inputs

1. Project Overview

Currently the Black Mountain Generating Station consists of two simple cycle combustion turbines, Unit 1 and Unit 2, that combined produce approximately 90 MW of electricity and other ancillary equipment. UNSE is proposing to install four

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1 US. EPA. 2017. Guidelines on Air Quality Models. https://www.epa.gov/sites/default/files/2020-09/documents/appw_17.pdf
2 Arizona Department of Environmental Quality. 2019. Air Quality Modeling Guidelines for Arizona Air Quality Permits. http://static.azdeq.gov/aqd/modeling_guidance.pdf

natural gas-fired simple cycle combustion turbines (Unit 3 through Unit 6) at the Black Mountain Generating Station. The new units will be ProEnergy PE6000 combustion turbines, each with approximately 47 MW gross generation capacity (188 MW combined).

2. Emissions Sources

a. Emission Sources for Significant Impact Analysis

Emission sources considered for the significant impact analysis are four new natural gas-fired simple cycle combustion turbines (Unit 3 through Unit 6).

b. Emission Sources for Cumulative Impact Analysis

Emission sources for cumulative impact analysis include all post-project emission units within the facility, including four new natural gas-fired simple cycle combustion turbines (Unit 3 through Unit 6), two existing natural gas-fired simple cycle combustion turbines (Unit 1 and Unit 2), a cooling tower, a diesel emergency generator, and a diesel emergency fire water pump.

Emissions from off-site sources accounted for in the cumulative impact analysis are discussed in Section 0 below.

3. Load Analysis

A load analysis is required for equipment that may operate under a variety of conditions that could affect emission rates and dispersion characteristics. Based on the performance testing data provided by the turbine vendor, UNSE conducted a load analysis for five operating scenarios for four new combustion turbines: 100%, 75%, 60%, 50% capacity, and startup/shutdown (SU/SD). Typically, the SU/SD scenario represents the worst case due to relatively higher emission rates combined with moderate gas temperatures and exit velocities. However, in some cases, the 50% load scenario represents the worst case because its lower gas temperature and exit velocity are unfavorable for dispersion. The emission rates and stack parameters associated with these worst-case scenarios were used for the significant impact analysis and cumulative impact analysis.

4. Model Scenarios for NO_2

a. Model Scenarios for 1-hour NO_2

As shown in Table 6, multiple emission limits apply to the four new turbines (Gas Turbine 3-6) under NSPS KKKKa - specifically 15 ppmv, 25 ppmv, and 96 ppmv (at 15% O_2). The applicable limit depends on whether the units operate at normal or part load, and whether their annual utilization is high or low. Preliminary modeling by the Department indicated that the part-load limit of 96 ppmv (158 lb/hr) is insufficient to protect the 1-hour NAAQS. Consequently, a mass-based 1-hour emission limit (lb/hr) must be established to ensure NAAQS compliance. Based on these considerations, UNSE and ADEQ conducted 1-hour NAAQS modeling analyses evaluating the following three scenarios.

Scenario 1: Operation of four new combustion turbines with the application of SCR for NO_X control consistent with manufacturer's specifications. This scenario assumes that all four combustion turbines initiate a 30-minute startup simultaneously, and then run concurrently for 30 minutes with emissions controlled by SCR at full load. The modeled emission rate was derived from the performance testing data provided by the turbine vendor.

Scenario 2: Operation of four new combustion turbines without the application of SCR for NOx control. This scenario assumes that all four combustion turbines run concurrently for 51 minutes with water injection at full load, and then all four combustion turbines initiate a 9-minute shutdown simultaneously. The full load emission rate was estimated based on 25 ppmv at 15% O_2.

Scenario 3: UNSE is proposing an hourly emission limit of 61 lb/hr for each individual stack of Gas Turbines 3 through 6. To evaluate this limit, the Department modeled the 61 lb/hr emission rate using the lowest gas temperature and the lowest exit velocity derived from the vendor's performance data. This approach is conservative, as it pairs the maximum emission rate with the worst-case dispersion parameters - a combination that is physically unlikely to occur simultaneously under actual operating conditions.

Table 6 summarizes the modeled NO_X emission rates for the two scenarios.

Table 6: Modeled NOx Emission Rates for Each Individual Gas Turbine (Units 3–6)

Scenario 1 - SCR	Startup - 30 Minutes	15.55 lb/event
	100% Load - 30 Minutes	4.2 lb/hr[1]
	Modeled Emission Rate	17.6 lb/hr
Scenario 2 – Water Injection Only	100% load - 51 Minutes	41.9 lb/hr[2]
	Shutdown - 9 Minutes	5.7 lb/event
	Modeled Emission Rate	41.3 lb/hr
Scenario 3- Hourly Emission Limit	Modeled Emission Rate	61 lb/hr

[1]The obtained emission rate was based on 0.0092 lb/MMBtu (2.5 PPMVD@15% O_2)
[2]The obtained emission rate was based on 0.092 lb/MMBtu (25 PPMVD@15% O_2)

b. Model Scenarios for Annual NO_2

To be consistent with the combined annual emission limit of 202 tpy for Gas Turbines 3–6, an annualized emission rate of 11.53 lb/hr was modeled for each turbine.

5. Model Scenarios for 1-hour and 8-hour CO

Similar to the 1-hour NO_2 modeling, UNSE conducted 1-hour and 8-hour CO NAAQS modeling analyses under scenarios with and without oxidation catalyst controls.

Scenario 1: Operation of four new combustion turbines with oxidation catalyst controls for CO, consistent with manufacturer's specifications. This scenario assumes that all four combustion turbines run concurrently for 51 minutes at full load, followed by a simultaneous 9-minute shutdown. This represents the worst-case scenario when oxidation catalyst controls are applied.

Scenario 2: Operation of four new combustion turbines at 50% load capacity without the application of oxidation catalyst controls for CO. This represents the worst-case scenario when oxidation catalyst controls are not applied.

Table 7 summarizes the modeled CO emission rates for the two scenarios.

Table 7: Modeled CO Emission Rates for Each Individual Gas Turbine (Units 3–6)

Scenario 1 – Oxidation Catalyst	100% Load – 51 Minutes	4.1 lb/hr
	Shutdown - 9 Minutes	16.6 lb/event
	Modeled Emission Rate	20.1 lb/hr
Scenario 2 - Without Oxidation Catalyst	50% load - 60 Minutes	100.7 lb/hr
	Modeled Emission Rate	100.7 lb/hr

6. Model Scenarios for PM_{10} and $PM_{2.5}$

UNSE submitted a manufacturer performance and emissions specification sheet showing that the highest particulate emission rate across all tested load conditions (50% to 100%) and ambient temperatures (47°F to 120°F) is 4.624 lb/hr for both PM_{10} and $PM_{2.5}$ for each individual gas turbine. To account for Startup/Shutdown (SU/SD) events, the Department estimated a maximum 24-hr average emission rate of 4.645 lb/hr. Assuming continuous operation, the Department applied this 4.645 lb/hr rate to model 24-hr PM_{10}, 24-hr $PM_{2.5}$, and annual $PM_{2.5}$.

7. Off-Site Sources

The Department provided UNSE with an off-site emission inventory of Mohave County for the cumulative impact analysis. Nearby permitted emissions sources within the maximum significant impact area (SIA) for each pollutant were included in the cumulative impact analysis. Additionally, UNSE used the "20D" screening approach to eliminate a majority of regional facilities from the cumulative impact analysis that would be expected to have a negligible impact on the analysis results. Under this approach, the Permittee may exclude sources that have potential allowable emissions (Q) in tons/yr that are less than 20 times the distance ("20D") between the two sources in kilometers. Those sources that were not eliminated using the "20D" approach were modeled in the cumulative impact analysis. The notable off-site sources included in the cumulative impact analysis were Griffith Power Plant and Nucor Steel Kingman.

D. Meteorological Data

1. Meteorological Data Selection

For regulatory dispersion modeling analyses, 5 years of National Weather Station (NWS) meteorological data, or at least 1 year of site-specific meteorological data, or at least 3 years of prognostic meteorological data should be used. However, from a technical standpoint, the EPA still considers site-specific datasets as the "gold standard". Per Appendix W Section 8.4.2.d, "*If 1 year or more, up to 5 years, of site specific data are available, these data are preferred for use in air quality analyses*".

The nearest NWS station to the Black Mountain Generating Station is located at the Kingman Airport, located approximately 20 miles northeast of the project site. However, the Kingman Airport is located in the Hualapai Valley, and its wind patterns are significantly impacted by the Hualapai Peak to the south – a topographic feature that is not present near the Black Mountain Generating Station.

The Black Mountain Generating Station is located in the Sacramento Valley, where the predominant wind direction aligns with the valley's northwest - southeast orientation. The Department has one-year site-specific meteorological data collected in 1997 at the Arizona Proving Grounds located in Yucca, Arizona (Yucca Station). The Yucca Station is located in the Sacramento Valley, approximately 10 miles south of the Black Mountain Generating Station, and captures the prevailing northwest-southeast wind patterns in the valley.

The 1997 site-specific meteorological dataset met all QA/QC requirements in Meteorological Monitoring Guidance for Regulatory Modeling Applications (EPA-454/R-99-005), and was previously used in the PSD modeling analysis for the Griffith Power Plant.

The Department has determined that the 1997 site-specific meteorological data remains representative of the current meteorological conditions at the Black Mountain Generating Station based on the flowing considerations: (i) prevailing northwest-southeast wind patterns in the Sacramento Valley are unlikely to have changed over this time period; (ii) land use and surface characteristics in the Sacramento Valley have remained consistent over the past 30 years; and (iii) long-term climate observations from the nearby Kingman Airport have remained consistent over the same period.

2. Meteorological Data Processing

UNSE utilized AERMET meteorological preprocessor (v23132) to process one year of site-specific data along with cloud cover data from the U.S. National Climatic Data Center (NCDC) for the Kingman Airport, and upper air radiosonde data from the Desert Rock station within the NWS Rawinsonde Network. UNSE also used the EPA's AERSURFACE tool (v20060) to calculate surface characteristic parameters (albedo, Bowen ratio, and surface roughness) required by AERMET.

E. Ambient Air Boundary and Receptor Network

Applicants are required to demonstrate compliance with NAAQS at receptors spaced along and outside the ambient air boundary (AAB). According to the EPA's revised policy on exclusion from "Ambient Air", "*the atmosphere over land owned or controlled by the stationary source may be excluded from ambient air where the source employs measures, which may include physical barriers, that are effective in precluding access to the land by the general public*" .[3] UNSE established the AAB, aligning it with the facility's fence line.

UNSE set up a receptor network to determine areas of maximum predicted concentrations. The grid spacing utilized for the receptors are as follows:

- AAB set at 25 m intervals;
- A receptor grid of 100 m, extending from AAB to 1 km;
- A receptor grid of 250 m, extending from 1 km to 2.5 km;
- A receptor grid of 500 m, extending from 2.5 km to 7.5 km;
- A receptor grid of 1,000 m, extending from 7.5 km to 20 km; and
- A receptor grid of 2,500 m, extending from 20 km to 50 km.

UNSE used the AERMAP terrain processor (v18081) to process the USGD National Elevation Data (NED) 1 arc second data to generate the receptor elevations and hill heights.

F. Downwash and Good Engineering Practice (GEP)

All the facility stacks are subject to downwash. All stacks are also below the minimum 65-meter allowable GEP height, therefore all stack heights are fully creditable for air quality modeling. UNSE evaluated building downwash effects based on building and stack location and dimensions, and the EPA's Building Profile Input Program Plume Rise Model Enhancements (BPIP-PRME).

G. Land Use Classification

The rural/urban classification of an area is determined by either the dominance of a specific land use or by population data in the study area. The land-use procedure specifies that the land-use within a three-kilometer radius of the source should be determined using the

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3 U.S. EPA. 2019. Revised Policy on Exclusion from "Ambient Air"
https://www.epa.gov/sites/default/files/2019-12/documents/ambient_air2019.pdf

typing scheme developed by Auer.[4] UNSE determined the project site area as "Rural" based on the land use method.

H. Background Concentrations

Background concentrations should be representative of regional air quality in the vicinity of a facility. Typically, background concentrations should be determined based on the air quality data collected in the vicinity of the proposed project site. However, if there are no monitors located in the vicinity of the project, a "regional site" may be used to determine background concentrations. Per Appendix W Section 8.3.2 b, a regional site is "*one that is located away from the area of interest but is impacted by similar or adequately representative sources*."

1. Background Concentration for $PM_{2.5}$

The closest $PM_{2.5}$ monitoring station to the Black Mountain Generating Station is the Alamo Lake monitor. As detailed in the ADEQ 5-year Network Assessment report, the monitoring coverage of the Alamo Lake station encompasses the entire Mohave County and La Paz County.[5]

Compared to the relatively remote surroundings of the Alamo Lake area, the project site is potentially impacted by a number of point sources that emit both primary $PM_{2.5}$ as well as $PM_{2.5}$ precursors (NO_X and SO_2). Because the primary $PM_{2.5}$ emissions from the large near-by source (the Griffith Power Plant) have been included in the NAAQS modeling, the Department examined the impacts from the precursor emissions from off-site sources on the background concentrations. To do this, the Department reviewed three years of reported annual emissions (2019-2021) obtained from the State and Local Emissions Inventory System (SLEIS) for off-site Title V sources. The reported total emissions of SO_2 and NOx from these sources amount to approximately 500 tons per year. Considering this relatively lower magnitude, the Department determined that the emissions of precursors are unlikely to significantly impact the $PM_{2.5}$ background concentrations at the project site area.

The Department further reviewed the historical monitoring data collected from the Peach Springs $PM_{2.5}$ monitor in Mohave County and the Prescott Valley $PM_{2.5}$ monitor in Yavapai County, the two closest inactive monitors to the Alamo Lake monitor. The monitoring data from the three monitors were generally comparable, with annual average concentrations around 4 $\mu g/m^3$ and 24-hour average concentrations (based on the 98th percentile) around 10 $\mu g/m^3$. This supports the conclusion that $PM_{2.5}$ is a regional air quality pollutant and indicates that the Alamo monitoring data should be representative of the project site area.

4 Auer, A.H. 1978. Correlation of Land Use and Cover with Meteorological Anomalies, Journal of Applied Meteorology, 17:636-643.
5 Arizona Department of Environmental Quality. 2020. ADEQ 2020 5-Year Network Assessment. https://static.azdeq.gov/aqd/5yrna.pdf

2. Background Concentration for NO_2

The background concentration for NO_2 at the project site area may be impacted by emissions from large near-by industrial emission sources and vehicular traffic emissions from Interstate-40. The large industrial emission sources such the Griffith Power Plant and the Nucor Steel Kingman have been included in the NAAQS modeling analysis.

UNSE selected the Buckeye monitor for background determination for NO_2. Located on the western edge of the Phoenix metropolitan area, the Buckeye monitor is an urban monitor with a measurement scale of 4 to 50 kilometers (km). The monitor is near Interstate-10 and State Route 85. Due to the impacts of urban sources, the Department has determined that the NO_2 monitoring data from the Buckeye monitor is adequately representative - and likely a conservative evaluation - of the current background concentrations for NO_2 near the Black Mountain Generating Station.

I. 1-hour NO_2 Modeling

Based on Appendix W Section 4.2.3.4-d, the following multi-tiered approach is recommended for 1-hour NO_2 modeling:

- Tier 1 Total Conversion: Assume full conversion of NO to NO_2 without any additional justification.
- Tier 2 Ambient Ratio Method (ARM2): Multiply Tier 1 result by representative equilibrium ratios of NO_2/ NO_X value that are based on ambient levels of NO_2 and NO_X derived from national data obtained from the EPA's Air Quality System (AQS).
- Tier 3: Plume Volume Molar Ratio Method (PVMRM) or Ozone Limiting Method (OLM).

UNSE used the Tier 2 approach, applying the ARM2 default option in all NO_X models.

J. Methodology for Ozone and Secondary $PM_{2.5}$ Impacts Analysis

Per Appendix W Section 5.3.2 and Section 5.4.2, the EPA recommends a two-tiered demonstration approach for addressing single-source impacts on ozone and secondary $PM_{2.5}$. The first tier involves use of technically credible relationships between precursor emissions and a source's impacts that may be published in the peer-reviewed literature; developed from modeling that was previously conducted for an area by a source, a governmental agency, or some other entity and that is deemed sufficient; or generated by a peer-reviewed reduced form model. The second tier involves application of more sophisticated case-specific chemical transport models (e.g., photochemical grid models) to be determined in consultation with the EPA Regional Office and conducted consistent with new EPA single-source modeling guidance. It is anticipated that the case for using a full quantitative chemical transport model is rare.

One of the first-tier demonstration tools is Model Emissions Rates for Precursors (MERPs). The MERPs can be described as an emission rate of a precursor that is expected to result in a change in ambient O_3 or $PM_{2.5}$ that is less than a specific air quality concentration threshold, such as a SIL. In summary, if the emission rates of precursors for a proposed source are less than MERPs, it is concluded that the proposed source will not cause or contribute to a violation of the NAAQS for ozone or the secondary formation of $PM_{2.5}$ from the proposed source.

The EPA has established empirical relationships between individual sources and their impacts on O_3 and $PM_{2.5}$ for hundreds of hypothetical sources, including three sources in Arizona[6]. During their assessment, UNSE examined the three hypothetical sources in Arizona and selected the most conservative values in their analysis, which are summarized in Table 8.

Table 8: Highest Modeled Concentrations for Three Hypothetical Sources in Arizona

Pollutants	Precursors	Stack Height (m)	Emissions (tpy)	Highest Modeled Concentrations in Arizona
Annual $PM_{2.5}$	SO_2	10	500	0.0032[a]
Annual $PM_{2.5}$	NOx	10	500	0.0004[a]
Daily $PM_{2.5}$	SO_2	10	500	0.3128[a]
Daily $PM_{2.5}$	NOx	10	500	0.0393[a]
O_3	VOCs	10	500	0.0263[b]
O_3	NOx	10	500	2.446[b]

[a] The unit for concentrations is $\mu g/m^3$;
[b] The unit for concentrations is ppb.

1. Ozone Impact Analysis

The contribution of each ozone precursor (VOCs and NO_X) is calculated by dividing the maximum impact of the hypothetical source by the hypothetical source's emissions, then multiplying that by the project emissions. As shown in Table 2, the project emissions for VOCs and NO_X are 44.2 tpy and 202 tpy, respectively. It should be noted that the PTE of 202 tpy for NO_X represents a voluntarily accepted emission limit, and does not necessarily reflect the intended design and operational conditions. Based on Black Mountain Generating Station's estimate, the PTE for NO_X would be 86.2 tpy when accounting for SCR control and an annual capacity factor of 40%. However, to ensure consistency with the proposed emission limit, the ozone impact analysis used 202 tpy rather than the lower 86.2 tpy. The 8-hour O_3 impacts from the proposed Project are:

$= 0.0263/500\times44.2+2.446/500\times202$
$= 0.99$ ppb

Because the O_3 impacts are below the O_3 SIL of 1 ppb, it is concluded that the proposed project will not cause or contribute to a violation of the NAAQS for ozone.

6 U.S. EPA. MERPs View Qlik. https://www.epa.gov/scram/merps-view-qlik

2. Secondary $PM_{2.5}$ Impact Analysis

The project emission for SO_2 and NO_X are 16.2 tpy and 202 tpy, respectively. The secondary impact for 24-hour $PM_{2.5}$ and annual $PM_{2.5}$ are calculated as follows.

Secondary Impact for 24-hour $PM_{2.5}$:
$= 0.313/500 \times 16.2 + 0.039/500 \times 202$
$= 0.026\ \mu g/m^3$

Secondary Impact for Annual $PM_{2.5}$:
$= 0.0032/500 \times 16.2 + 0.0004/500 \times 202$
$= 0.00027\ \mu g/m^3$

The secondary impacts above were incorporated with the primary impacts from the AERMOD NAAQS modeling and the background concentrations. The resulting total concentrations were subsequently assessed against the NAAQS.

K. Modeling Results

1. Significant Impact Analysis Model Results

As shown in Table 9, 24-hour concentration of PM_{10}, 1-hour and 8-hour CO concentrations, and annual NO_2 concentration are below Class II SILs, exempting them from a cumulative impact compliance analysis under minor NSR. However, the proposed project results in significant impacts for 1-hour NO_2, 24-hour $PM_{2.5}$, and annual $PM_{2.5}$. Therefore, a cumulative impact analysis was conducted for the 1-hour NO_2, 24-hour $PM_{2.5}$, and annual $PM_{2.5}$ NAAQS.

Table 9: Significant Impact Analysis Results

Pollutant	Averaging Period	Design Value	Concentration ($\mu g/m^3$)		Exceeds SIL?
			Modeled	Class II SIL	
PM_{10}	24-hour	H1H[a]	1.37	5.0	No
$PM_{2.5}$	24-hour	H1H[a]	1.40[b]	1.2	Yes
	Annual	H1H[a]	0.24[b]	0.2	Yes
CO (Scenario1)	1-hour	H1H[a]	68.42	2,000	No
	8-hour	H1H[a]	12.07	500	No
CO (Scenario2)	1-hour	H1H[a]	375	2,000	No
	8-hour	H1H[a]	65	5,00	No
NO_2 (Scenario1)	1-hour	H1H[a]	53.92	7.5	Yes
NO_2 (Scenario2)	1-hour	H1H[a]	115.8	7.5	Yes

NO_2 (Scenario3)	1-hour	H1H[a]	137.5	7.5	Yes
NO_2	Annual	H1H[a]	0.643	1.0	No

[a]*The highest modeled concentrations across all receptors.*
[b]*The modeled impacts for $PM_{2.5}$ included the primary modeled concentrations from AERMOD, and the secondary impacts as calculated in Section I.J.2.*

2. Cumulative Impact Analysis Model Results

Table 10 summaries the NAAQS modeled results for 1-hour NO_2, 24-hour $PM_{2.5}$, and annual $PM_{2.5}$. Representative background concentrations were added to modeled concentration, and the total concentrations were then compared to the NAAQS. As shown in the table, emissions from the proposed project will not cause or contribute to a violation of the NAAQS operating consistent with the operating limitations and conditions in the permit.

Table 10: NAAQS Model Results

Pollutant	Averaging Period	Design Value	Modeled Concentration (μg/m^3)	Background Concentration (μg/m^3)	Total Concentration (μg/m^3)	NAAQS (μg/m^3)	Exceeds NAAQS?
$PM_{2.5}$	Annual	H1H[d]	0.32[f]	3.4	3.72	9	No
	24-hour	H8H[e]	1.06[f]	11	12.06	35	No
NO_2 (Scenario1)[a]	1-hour	H8H[e]	75.7	62	137.7	188	No
NO_2 (Scenario2)[b]	1-hour	H8H[e]	103.93	62	165.97	188	No
NO_2 (Scenario3)[c]	1-hour	H8H[e]	118.1	62	180.1	188	No

[a] *Scenario 1: Operating four new combustion turbines with the application of SCR for NOx control.*
[b] *Scenario 2: Operating four new combustion turbines without the application of SCR for NOx control.*
[c] *Scenario 3: Hourly emission limit of 61 lb/hr.*
[d] *The highest modeled concentration across all receptors.*
[e] *The highest of the 8th -highest (98th percentile) modeled concentrations across all receptors.*
[f] *The modeled impacts for $PM_{2.5}$ included the primary modeled concentrations from AERMOD, and the secondary impacts as calculated in Section I.J.2.*

XIII. LIST OF ABBREVIATIONS

A.A.C.	Arizona Administrative Code
ADEQ	Arizona Department of Environmental Quality
AERMET	AERMOD Meteorological Preprocessor
AERMOD	AMS/EPA Regulatory Model
AERSURFACE	Surface characteristics preprocessor for AERMOD
AMS	American Meteorological Society
ARM	Ambient Ratio Method
BPIP	Building Profile Input Program
CAM	Compliance Assurance Monitoring
CEMS	Continuous Emissions Monitoring System
CO	Carbon Monoxide
GEP	Good Engineering Practice
HAPs	Hazardous Air Pollutants
HMC	Highest Modeled Concentration
KIGM	Kingman Airport
lb/MMBtu	Pound per Million British Thermal Units
MERP	Model Emissions Rates for Precursors
MW	Megawatts
NAAQS	National Ambient Air Quality Standard
NCDC	National Climatic Data Center
NED	National Elevation Dataset
ng/J	Nanogram per Joule
NO_X	Nitrogen Oxides
NO_2	Nitrogen Dioxide
NSPS	New Source Performance Standards
NSR	New Source Review
NWS	National Weather Service
O_3	Ozone
PM_{10}	Particulate Matter less than 10 µm nominal aerodynamic diameter
$PM_{2.5}$	Particulate Matter less than 2.5 µm nominal aerodynamic diameter
PRIME	Plume Rise Model Enhancements
PSD	Prevention of Significant Deterioration
PSEU	Pollutant Specific Emissions Unit
PTE	Potential to Emit
PVMRM	Plume Volume Molar Ratio Method
SCR	Selective Catalytic Reduction
SIA	Significant Impact Area
SIL	Significant Impact Level
SLEIS	State and Local Emissions Inventory System
TPY	Tons per Year
UNSE	Unisource Energy
VOCs	Volatile Organic Compound
yr	Year