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**Technical Support Document
Arizona Public Service Company
Sundance Power Plant
Permit # V20690.R02**

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This technical support document (TSD) covers the potential emissions and ambient impact analysis from the proposed expansion of the Sundance Power Plant, for which the permit application was received by PCAQCD on August 24, 2023.

The permit limits emissions from this expansion to be below Prevention of Significant Deterioration (PSD) levels, therefore this facility is not subject to Best Available Control Technology (BACT) requirements.

1. Applicant

Arizona Public Service Company
Sundance Power Plant
2060 West Sundance Road
Casa Grande, AZ 85194

2. Project Location

The applicant, Arizona Public Service Company is currently operating a 450 MW, simple cycle natural gas-fired power generation station located in the City of Casa Grande in Pinal County.

The facility location lies in the central desert basin of Arizona, about 30 miles from Superstition Wilderness, and 75 miles from Saguaro National Monument. These areas are designated as Federal PSD Class I areas which are afforded special protection from environmental impacts under the CAA. Although it does not qualify for the Class I area protections under the CAA, the BLM's Table Top Wilderness lies about 35 miles from the facility. The Gila Indian Reservation lies about 4 miles north of the facility, and the Ak Chin Indian Reservation lies about 33 miles to the northwest.

The area is designated as serious non-attainment for PM₁₀ and attainment for all other criteria pollutants. The underlying attainment criteria are defined by the National Ambient Air Quality Standards (NAAQS), as required under CAA §109 and promulgated at 40 CFR Part 50. The attainment designation includes carbon monoxide (CO), oxides of nitrogen (NO_x), oxides of sulfur (SO_x), and ozone (O₃). However, ozone and CO areas all commence at the Pinal County/Maricopa County line, lying about 21 miles due north of the project. The location is within the West Pinal serious PM₁₀ nonattainment area.

3. Expansion Project Description

The Sundance Expansion Project will involve the installation of two (2) General Electric Model LM6000PC aeroderivative simple cycle combustion turbines (CTs) with the spray intercooling (SPRINT) performance augmentation. These CT units will be identified as Units 11 and 12. Each CT will have a maximum nominal electric output of 49.6 MW and a maximum nominal natural gas fuel flow of 424.3 mmBtu/hr (LHV), equal to 467 mmBtu/hr (HHV) at 45 °F and 100% relative humidity. These CTs will be very similar to the existing CTs and, like the existing CTs, will also be equipped with water injection and selective catalytic reduction (SCR) for NO_x control and oxidation catalysts for CO and VOC control.

The facility proposed emission and operating limits which limited the potential emissions for both of the new CTs combined below the thresholds that triggered major New Source Review (NSR), including the Prevention of Significant Deterioration (PSD) and Non-Attainment Area New Source Review (NANSR) significant increase levels. Based on the proposed limits, the only pollutants with potential emissions which exceeded the minor NSR permitting exemption thresholds in Arizona Administrative Code (AAC)

R18-2-101(101) were nitrogen oxides (NO_x), particulate matter (PM) less than 10 microns (PM₁₀), and PM_{2.5}. An air quality modeling analysis was performed for these pollutants, the results of which are described in Section 5 of this TSD.

Under the Arizona Revised Statutes (“ARS”) 49-402, Arizona Department of Environmental Quality (“ADEQ”) has original jurisdiction over “major sources in any county that has not received approval from the Administrator for New Source Review (NSR) and Prevention of Significant Deterioration (PSD) under the Clean Air Act.” Since Pinal County’s new source rules are not approved in the State Implementation Plan for the area, ADEQ’s permitting regulations apply for major sources that are in Pinal County. Pinal County issues permits for major sources under a delegation agreement.

4. Emissions Rates Calculation for the Expansion Project

A. Emission Rates Calculation

1. Carbon Monoxide (CO) and Nitrogen Oxides (NO_x) Emission Rates

CO and NO_x emissions during normal operation are calculated based on concentrations of 15 and 5 parts per million, dry volume basis (ppmdv) corrected to 15% excess oxygen according to the following equations from 40 CFR Part 60, Appendix A, Reference Method 19, Eq. 19-1 and 40 CFR Part 75, Appendix F, Eq. F-5:

$$E_{NO_x} = K_{NO_x} * C_d * F_d * (20.9 / (20.9 - \%O_{2d}))$$

$$E_{CO} = K_{CO} * C_d * F_d * (20.9 / (20.9 - \%O_{2d}))$$

Where, E = Pollutant emission rate, lb/mmBtu

C_d = Pollutant concentration during unit operation, parts per million, dry volume basis

F_d = 8,710 dscf/mmBtu for natural gas

%O₂ = Oxygen concentration, percent by volume, dry basis, = 15%

K_{CO} = 7.237 x 10⁻⁸ lb/dscf-ppm CO

K_{NO_x} = 1.194 x 10⁻⁷ lb/dscf-ppm NO_x

2. Particulate Matter (PM) Emission Rate

a. PM emissions are based on a proposed emission rate of 7.0 pounds per hour, equal to 0.015 lb/mmBtu at 100% load. An emission rate of 0.015 lb/mmBtu is 120% of the highest 3-run average test results for four compliance emission tests conducted on the existing Sundance LM6000 CTs.

b. All filterable plus condensable PM₁₀ emissions are also assumed to be PM_{2.5} emissions.

3. Sulfur Dioxide (SO₂) Emission Rate

Sulfur dioxide (SO₂) emissions are based on the emission factor for the combustion of pipeline natural gas from the Acid Rain Program in 40 CFR Part 75 of 0.0006 lb SO₂/mmBtu.

4. Volatile Organic Compounds (VOCs) Emission Rate

VOC emissions are based on an emission limit of 4.5 lb/hr, equal to 0.0096 lb/mmBtu. This rate is more than 4 times higher than the emission factor for uncontrolled natural gas-fired turbines from the U.S. EPA's AP-42, Compilation of Air Pollutant Emission Factors, Table 3.1-2a.

5. Hazardous Air Pollutants (HAPs)

The emission factors for all HAPs except formaldehyde emissions are uncontrolled emission factors from the U.S. EPA's Compilation of Air Pollutant Emission Factors, AP-42, Volume 1: Stationary Point and Area Sources, Section 3.1, Stationary Gas Turbines for Electricity Generation.

6. Lead (Pb) Emission Rate

Lead emissions are based on the emission factor from U.S. EPA's AP-42, Table 1.4-2.

7. Greenhouse Gases (GHGs) Emission Rates

The emission factors for greenhouse gases including CO₂, N₂O and CH₄ are from 40 CFR 98, Tables C-1 and C-2. The CO_{2e} factors are from 40 CFR 98, Subpart A, Table A-1.

B. Maximum Controlled Emission Rates during Normal Operations and Startup/Shutdown

Table 1 lists the maximum controlled emission rates for CO, NOX, PM/PM10/PM2.5, SO₂, VOC, Pb, and GHGs during normal and startup/shutdown operations based on the emission rates calculation in Section §3.A of this TSD.

Table 1 – Maximum Controlled Potential Emission Rate per CT

Pollutant	Normal Operation Emissions per CT (lbs./hour)	Startup (SU)/Shutdown (SD) Emissions Per CT (lbs./SU-SD Event)¹
CO	15.64	32.3
NOX	8.60	18.2
PM	7.0	3.5
PM10	7.0	3.5
PM2.5	7.0	3.5
SO ₂	0.28	0.1
VOC	4.5	2.7
HAPS	0.25	0.0
H ₂ SO ₄	0.021	0.0
Pb	0.0002	0.0
CO ₂	54,628	27,290

¹ The normal duration for a startup and shutdown cycle is 39 minutes combined. There will be approximately 730 startup events per year per CT.

CO _{2e}	54,684	27,318
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C. Total Emissions Based on the Proposed Voluntary Emission Limits

In order to avoid NNSR or PSD review, the permittee volunteered to take federally enforceable limits for the proposed project. Table 2 lists the total emissions for the expansion project which includes total emissions from the two (2) CTs, including emissions from start-up/shutdown events based on the proposed limits, with a proposed heat input value of 1,236,000 mmBtu/yr. As seen, the project emissions increases (based on the proposed limits) are below the applicable ‘major source’ thresholds for all regulated NSR pollutants.

Table 2 – Total Emissions for the Expansion Project Based on the Proposed Voluntary Emission Limits

Pollutants	Normal Operation Emissions per CT (lb./hr.)	Normal Operations Emissions for Two CTs (tpy)	Total Emissions for Two CTs Based on Proposed Voluntary Emission Limits (tpy)
CO	15.64	20.70	44.3
NO _x	8.6	11.38	24.7
PM	7.0	9.26	9.3
PM ₁₀	7.0	9.26	9.3
PM _{2.5}	7.0	9.26	9.3
SO ₂	0.28	0.37	0.4
VOC	4.5	5.96	7.9
HAPs	0.25	0.34	0.34
H ₂ SO ₄	0.02	0.03	0.03
Pb	0.0002	0.0003	0.0003
CO ₂	54,628	72,291	72,291
CO _{2e}	54,684	72,365	72,365

5. Air Quality Impact Analysis

A. Modeling Approach

The proposed Sundance Expansion Project involves the construction and operation of two (2) new simple cycle aeroderivative combustion turbines. APS is proposing emission and operating limits which will limit the potential emissions from both new CTs combined to less than the thresholds that trigger major New Source Review (NSR), including the Prevention of Significant Deterioration (PSD) and Non-attainment Area (NAA) significant increase levels. The proposed potential emissions will also be below the minor-NSR permitting exemption thresholds in Arizona Administrative Code (AAC) R18-2-101(101), except for the pollutants NO₂, PM₁₀, and PM_{2.5}; therefore, minor-NSR review is triggered for these three pollutants.

The modeling for air quality impact analysis was conducted using current version of the US EPA’s AERMOD model (Version 21112). Model was run using the appropriate regulatory default options for AERMOD as stipulated by Appendix W. ADEQ’s Modeling Guideline was used for the impact analysis. Meteorological inputs for AERMOD were generated using meteorological

data from Phoenix Sky Harbor Airport as it was determined to be most representative of the Sundance facility.

The turbine emission rates and stack parameters vary with the numerous combinations of operating load and ambient temperature. A load screening analysis was therefore performed to determine the operating conditions that result in the highest modeled impacts. Rather than model each of the potential combinations of operating load and ambient temperature, a simplified and conservative analysis was performed by modeling the “worst-case” minimum stack temperature and flow rate for 100%, 75%, 50%, and startup/shutdown operating loads across all the ambient temperature conditions. Because emissions are generally directly related to heat input rates, the emissions used for the reduced load scenarios were normalized relative to the 100% load emissions based on the relative heat input rate. The startup/shutdown load simulation used the peak hourly emissions which occur during startup (emissions included startup rates for the first 30 minutes and 100% load rates for the remaining 30 minutes of the hour).

B. Significant Impact Analysis

For the significant impact analysis only the new combustion turbines were modeled and the maximum modeled predicted impacts were compared against the pollutant specific “significant impact limits” (SILs). Pollutants with impacts that exceed the significant impact levels would then be evaluated for NAAQS compliance in a refined analysis. The project resulted in significant impacts for 1-hour NO2.

Table 3 – Significant Impact Analysis Results

Pollutant	Averaging Period	Maximum Modeled Impact ($\mu\text{g}/\text{m}^3$)	PSD Significant Impact Level ($\mu\text{g}/\text{m}^3$)
NO2	1-hr	17.2	7.5
	Annual	0.31	1.0
PM2.5	24-hr	0.56	1.2
	Annual	0.11	0.2
PM10	24-hr	0.7	5

C. National Ambient Air Quality Standards (NAAQS) Analysis

For pollutants averaging intervals with project impacts above the SIL, ADEQ’s Minor NSR Guidance document requires that the applicant demonstrate that the ambient concentrations resulting from the source or modification combined with representative background concentrations of regulated minor NSR pollutants will not cause the violation of NAAQS. Based upon the results of the significant impact analysis, NAAQS analysis was conducted to assess compliance with the NAAQS for NO2. The additional emissions sources added to the cumulative modeling analysis were the 10 existing combustion turbines at the site.

The cumulative modeling results were added to the “background” concentration representing the air quality impacts from local/regional/global emissions. The background air quality levels were based on air quality measurements from monitoring sites in Pinal County and elsewhere in Arizona, as applicable. As seen in Table 4 below, the cumulative modeling analysis for 1-hr NO2 showed compliance with the NAAQS.

Table 4 – NAAQS Impact Analysis Results

Pollutant	Averaging Period	Modeled Concentration	Background Concentration	Total Concentration	Standard ($\mu\text{g}/\text{m}^3$)	% of 1-hr NO2
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		($\mu\text{g}/\text{m}^3$)	($\mu\text{g}/\text{m}^3$)	($\mu\text{g}/\text{m}^3$)		NAAQS
NO2	1-hr	78.8	26.3	105	188	56%
	1-hr	78.8	99.6	178	188	95%

D. Conclusion

PCAQCD, along with expertise of Air Resource Specialists, has reviewed the modeling data and inputs provided in the APS Sundance Expansion permit application. The modeling results demonstrate that the expansion proposed by the source will not violate the NAAQS standards for any NSR pollutants.

6. **Applicable Requirements**

A. NSPS KKKK – Standards of Performance for Stationary Combustion Turbines

The proposed installation and operation of two (2) new simple cycle aeroderivative combustion turbine generators (CT11-CT12) under Permit #V20690.R02, meet the affected facility definition under this standard. Therefore, they are subject to the requirements of 40 CFR 60 Subpart KKKK.

B. NSPS TTTT - Standards of Performance for Greenhouse Gas Emissions for Electric Generating Units

This NSPS Subpart applies to greenhouse gas emissions from stationary combustion turbines that commence construction after January 8, 2014, or that commence reconstruction after June 18, 2014, as provided by 40 CFR §60.5509 (a). The two (2) proposed new simple cycle combustion turbines (CT11-CT12), each have a base load rating greater than 250 MMBtu per hour of fossil fuel and serve generators capable of selling greater than 25 MW electricity, meeting the applicability criteria of this subpart. Therefore, these units are subject to the requirements of this standard.

C. Testing Requirements

Performance Testing

Performance testing is required to demonstrate compliance with the emission rates specified in the permit. Specifications regarding the approved test methods, protocol, reporting requirements and testing frequency are specified in Sections §§6.A and 6.B of the permit. These tests shall be performed at the maximum practical production rate.

7. **Conclusion and Proposed Action**

Based on the information and the analysis supplied by the applicant, and the review conducted by Pinal County Air Quality Department (PCAQCD), PCAQCD has concluded that the requested significant permit revision is consistent with Federal, State, and County regulations, and will not cause or contribute to a violation of any federal ambient air quality standards, will not cause any Arizona Ambient Air Quality Guidelines to be exceeded, and will not cause additional adverse air quality impacts. Therefore, PCAQCD proposes to issue the permit revision subject to the proposed permit conditions outlined in the permit.