

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
BUREAU OF AIR, PERMIT SECTION
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PROJECT SUMMARY
FOR A CONSTRUCTION PERMIT APPLICATION
FROM
ZION ENERGY L.L.C.
FOR A
PEAKING POWER PLANT, ZION, ILLINOIS

Site Identification No.: 097200ABB
Application No.: 99110042
Date Received: November 12, 1999

Schedule

Public Comment Period Begins: June 30, 2000
Public Hearing: August 14, 2000
Public Comment Period Closes: August 30, 2000

Illinois EPA Contacts

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I. INTRODUCTION

Zion Energy L.L.C. (Zion Energy) has proposed to construct an electrical generation facility in Zion. The facility would use five simple cycle turbines and five auxiliary boilers to generate up to 800 MW of electricity. The construction of the proposed facility requires a permit from the Illinois EPA because of its associated air emissions.

II. PROJECT DESCRIPTION

The proposed project will include five combustion turbines fired with natural gas and distillate oil as back-up fuel. The proposal also includes installing five auxiliary natural gas fired boilers to generate steam, to be injected into the turbines for power augmentation when needed. The turbines would be installed as simple cycle units, with all power produced by generators on the shaft of the turbines. Operation of the facility may occur throughout the year, although the facility is expected to run primarily in the summer months during peak loading periods. Currently peak loading typically occurs during daylight and evening hours on hot summer weekdays. As such, Zion Energy is requesting a permit that would only allow these “peaking units”, to operate at most 2,300 hours per year, average, and an individual turbine for at most 3,300 hours per year in a single year. In a given year, actual utilization will be far less depending on the demand for electric power.

Two natural gas-fired heaters will also be used to warm the natural gas prior to use by the combustion turbines and auxiliary boilers. The gas must be heated because it is received at pipeline pressure and cools when the pressure is lowered to operating levels. The amount of heating required will depend on natural gas delivery pressure. The facility will also have a 1.5 million-gallon capacity distillate fuel oil storage tank.

III. PROJECT EMISSIONS

Emissions of combustion products (carbon monoxide (CO), nitrogen oxide (NO_x), particulate matter/particulate matter <10 microns (PM/PM₁₀), sulfur dioxide (SO₂), and volatile organic material (VOM) result from the combustion of fuel in the turbines, auxiliary boilers and the fuel heaters.

The potential emissions from the proposed project are summarized below. The potential emissions are based on all turbines operating for a total 2,300 hours/year each including 500 hours/year operation on natural gas with steam injection and 500 hours/year operation on backup fuel (fuel oil).

Potential Project Emissions (ton/yr)	
Pollutant	Project Potential
NO _x	716.74
CO	258.03
PM/PM ₁₀	146.23
SO ₂	135.41
VOM	24.65

These annual emission limits include emissions from startup of the turbines, during which time NO_x, CO and VOM emissions of the turbine would be higher than during normal operation. This is

because the turbine burners cannot operate in low-NO_x mode until the turbines reach approximately 50 percent load.

IV. APPLICABLE REGULATIONS

A. EMISSION STANDARDS

The proposed project will comply with applicable state and federal emission standards including the Illinois Air Pollution Control Board emission standards and regulations (35 Ill. Adm. Code: Subtitle B) and applicable federal emission standards.

The turbines are subject to the federal New Source Performance Standards (NSPS), 40 CFR 60 Subpart GG, for Stationary Gas Turbines. The Illinois EPA is administering NSPS in Illinois on behalf of the United States EPA under a delegation agreement. This standard addresses NO_x emission from gas turbines limiting NO_x emissions to approximately 75 ppm, adjusted for actual turbine efficiency. The project should also readily comply with the applicable requirements of these standards. The application indicates NO_x emissions of 15 ppm on an hourly average.

B. APPLICABLE REGULATORY PROGRAMS

The project is in an area classified as attainment except for ozone. This source has potential emissions greater than 250 tons per year for NO_x and CO and thus this facility is considered now a major source subject to Prevention of Significant Deterioration regulations (PSD), 40 CFR 52.21. The SO₂ and PM/PM₁₀ emissions noted above exceed the PSD significant emissions threshold and are subject to the additional requirements imposed by the federal rules for PSD.

With regard to ozone VOM emissions are regulated as precursors to ozone formation in the atmosphere. Potential VOM emissions are not significant. Because the VOM emissions will be less than 25 tons per year, requirements of the nonattainment New Source Review (NSR) program are not applicable.

This facility is not being considered to be a new participating source under Illinois' Emission Reduction Market System (ERMS), 35 IAC Part 205. This is because emissions of VOM are expected to be below 10 tons per season (May through September.) Although the permit would allow VOM emissions of 24.65 tons/year, which is greater than 10 tons per season, the Illinois EPA's experience indicates that actual VOM emissions would be much less than the conservative VOM emission rates provided by the manufacturer. If actual seasonal VOM emissions are 10 tons or greater, considering the results of VOM emissions testing for the turbines, Zion Energy would be required to obtain allotment trading units (ATU) for the facility's VOM emissions as a new participating source under the ERMS.

This facility would be considered a major source under Illinois Clean Air Act Permit Program (CAAPP) pursuant to Title V of the Clean Air Act. This is because the facility's potential emissions would be greater than 100 tons/year, which is the relevant applicability threshold under the CAAPP. Accordingly, Zion Energy would have to obtain a CAAPP operating permit for the facility after shakedown and testing of the turbines is complete. Zion Energy

would also have to permit the facility as an affected source under the federal acid rain program because each turbine generates more than 25 MWe of electricity.

V. PREVENTION OF SIGNIFICANT DETERIORATION (PSD)

The PSD rules were established to ensure that new major sources will not adversely impact “clean air” areas and will comply with applicable air quality standards.

A PSD review requires: 1) a case-by-case Best Available Control Technology (BACT) determination, taking into account energy, environmental and economic impacts, as well as technical feasibility; 2) an ambient air quality impact analysis, including a baseline determination and dispersion modeling, to determine whether the allowable emissions from the source, would cause or contribute to a violation of the applicable PSD increment or National Ambient Air Quality Standard (NAAQS); 3) an assessment of the impact on soils, vegetation and visibility; and, 4) public notice and comment, including an opportunity for public hearing. The Illinois EPA has been delegated authority by the USEPA to administer the federal PSD program.

A. BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

BACT is defined as an emission limitation based on the maximum degree of pollution reduction determined on a case-by-case basis considering technical, economic, energy and environmental considerations.

A BACT analysis was conducted for NO_x, CO, SO₂, and PM/PM₁₀ in order to determine the most appropriate level of control required at the facility for these pollutants. In considering the technical, economic, energy and environmental considerations, the Illinois EPA determined that the project will utilize BACT.

As determined by Illinois EPA, BACT will include use of dry low-NO_x combustors or water injection and good combustion practices on the turbines and auxiliary Boilers. The proposed BACT limits would require compliance with a maximum NO_x emission rate of 9 ppm_{dv} on an annual average, 12 ppm_{dv} on a monthly average and 15 ppm_{dv} on an hourly average. Water injection control will be used when the turbines are fired on fuel oil. BACT also will include utilization of good combustion practices with the fuel heaters to minimize emissions of NO_x. These practices represent the stringent level of control for NO_x required on similar simple cycle turbines in other similar projects across the country.

Good combustion practices including use of gaseous fuels will be used on the turbines and fuel heaters to minimize emissions of CO and PM/PM₁₀.

Use of natural gas fuel effectively minimizes SO₂ emissions. Use of fuel oil is allowed as backup fuel to natural gas with restriction of 500 hour/year for each turbine. The fuel oil used will be low sulfur distillate oil to minimize SO₂ emissions.

B. AIR QUALITY ANALYSIS

An ambient air quality analysis was conducted by the consulting firm, Goodwin, on behalf of Zion Energy to assess the impacts of the increased emissions due to the proposed project. Under the PSD rules, this analysis must determine whether the proposed project will cause or contribute to a violation of any applicable air quality standard.

Modeling was done for NO_x, CO, SO₂ and PM/PM₁₀ incorporating the proposed emissions increase at the power generation facility and major stationary sources in surrounding areas. The analysis performed conforms to the guidance and requirements of the USEPA and the Illinois EPA.

Pollutant	Averaging Period	Maximum Predicted Impact ¹ ($\mu\text{g}/\text{m}^3$)	Significant Impact Level ($\mu\text{g}/\text{m}^3$)	NAAQS ($\mu\text{g}/\text{m}^3$)
NO _x	Annual	0.39	1	100
PM ₁₀	24-Hour	6.31	5	150
	Annual	0.17	1	50
SO ₂	3-Hour	23.92	25	1,300
	24-Hour	9.08	5	365
	Annual	0.01	1	80
CO	1-Hour	135.06	2,000	40,000
	8-Hour	63.93	500	10,000

1. Maximum predicted impacts are worst case

The numerical significant impact level was exceeded for PM₁₀, and SO₂ for 24-hour averaging period, which required additional modeling to be performed. The additional modeling includes existing emission sources in the area and background concentrations.

Pollutant	Averaging Period	NAAQS ($\mu\text{g}/\text{m}^3$)	Background Concentration ($\mu\text{g}/\text{m}^3$)	Maximum Modeled Concentration ($\mu\text{g}/\text{m}^3$)	Total Concentration ($\mu\text{g}/\text{m}^3$)
PM ₁₀	24-hour	150	107	22.70	129.70
SO ₂	24-hour	365	67	13.83	80.83

Zion Energy has provided adequate information to determine that proposed emission increases will not cause a violation of the National Ambient Air Quality Standards (NAAQS) or the allowable increment levels established under the PSD regulations.

With respect to ozone, the ambient ozone levels in Lake County are the result of its location in the Greater Metropolitan Chicago area and are caused by emissions from many varied sources. In order to improve ozone air quality in the greater Chicago area, reductions are needed in precursor emissions in both the Chicago area itself and from sources outside the area whose emissions contribute to high-levels of ozone entering the Chicago area. The emissions from the proposed facility would be small compared to the emissions of all these existing

sources and the proposed facility is not anticipated to have any measurable affect on local ozone air quality. In any event, the emissions of the facility would be included in future planning to assure that sufficient reductions in emissions from existing sources are being obtained to make the needed improvements in ozone air quality. The facility would also be subject to any applicable requirements of future regulatory program to reduce emissions of ozone precursors.

C. ASSESSMENT OF ENVIRONMENTAL IMPACTS

The ambient air quality assessment performed also assessed the potential impact of the power generation facility on soils, vegetation, and visibility. The Illinois EPA concluded that the project would not cause any adverse effect to these environmental media.

VI. PROPOSED PERMIT

The conditions of the proposed permit for the facility contain limitations and requirements for the turbines to help assure that the facility complies with applicable regulatory requirements. The proposed permit includes enforceable limits on emissions and operation for the facility. The permit identifies the measures that must be used to control NO_x, CO, PM/PM₁₀, and SO₂ emissions from the proposed combustion turbines.

The permit also establishes appropriate compliance procedures for the facility, including requirements for emission testing, monitoring, recordkeeping, and reporting. Continuous monitoring is required for the turbines to confirm actual levels of operation and emissions. Emission testing is required as part of the shakedown of the turbines.

VII. REQUEST FOR COMMENTS

It is the Illinois EPA's preliminary determination that the proposed permit meets all applicable state and federal air pollution control requirements. The Illinois EPA is therefore proposing to issue a permit for construction of the proposed facility.

Comments are requested on this proposed action by the Illinois EPA and the proposed conditions on the draft permit.