

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
BUREAU OF AIR, PERMIT SECTION
1021 N. GRAND AVENUE EAST
P.O. BOX 19276
SPRINGFIELD, ILLINOIS 62794-9276
217/782-2113

PROJECT SUMMARY
FOR A CONSTRUCTION PERMIT APPLICATION
FROM
POWER ENERGY PARTNERS, LLC
FOR A
PEAKING POWER PLANT, CRETE ENERGY PARK
CRETE, ILLINOIS

Site Identification No.: 197030AAO

Application No.: 99120056

Date Received: December 20, 1999

Schedule

Public Comment Period Begins: December 10, 2000

Public Hearing: January 23, 2001

Public Comment Period Closes: February 22, 2001

Illinois EPA Contacts

Permit Analyst: Manish Patel

Community Relations Coordinator: Brad Frost

I. INTRODUCTION

Power Energy Partners, LLC (Crete Energy) has proposed to construct an electrical generation facility in Crete, Will County. The facility would use four gas turbines to generate up to 356 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 four turbines fired with natural gas. The turbines would be used in a simple cycle configuration, with all power produced by a generator connected to the shaft of the turbine. This facility is designed to function as a peaking station, to generate electricity in the peak demand periods, and at other times when other power plants are not available due to scheduled or unexpected outages. Operation of the facility may occur throughout the year, although the facility is expected to run primarily in the summer months.

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

The principal air contaminants emitted from the proposed turbines would be NO_x and CO. NO_x can be formed thermally by combination of oxygen and nitrogen in the air at the temperatures at which fuel is burned. Thermal NO_x is formed during the operation of all common high temperature combustion processes including turbines. NO_x can also be formed from the combination of any nitrogen in the fuel with oxygen. This is not relevant for burning of natural gas, which contains minimal amounts of nitrogen. Factors affecting NO_x formation from a turbine include design, ambient conditions, turbine load, and fuel types. The NO_x emissions from the proposed turbines will be controlled with dry low NO_x combustors. Low NO_x combustors lower NO_x formation by controlling flame turbulence and staging the mixing of fuel and combustion air.

CO is formed by the incomplete combustion of fuel. CO is associated with most combustion processes and is found in measurable amounts in turbine exhaust. VOM and PM/PM₁₀ are also emitted as a result of incomplete combustion of fuel. SO₂ is found only in trace amounts from combustion of natural gas.

CO and VOM are controlled by providing adequate fuel residence time and high temperature in combustion zone to ensure complete combustion. PM/PM₁₀ are controlled by proper combustion control and firing natural gas fuel, which has negligible ash content.

III. PROJECT EMISSIONS

The annual emissions from the facility would be limited to 220 tons of NO_x, 239 tons of CO, 10.5 tons of VOM, 45 tons of PM/PM₁₀, and 2.6 tons of SO₂. These limits are based on the maximum emissions requested by Crete Energy. These limits are consistent with the maximum hourly emission rates achieved by the turbines as specified by the manufacturer of the turbines and the potential utilization of

the facility as specified by Crete Energy. Actual annual emissions of the facility would be less than these limits to the extent that the actual performance of the turbines is better than projected and the turbines are not utilized as much.

The turbines at the facility would be restricted to operate in peak mode by fuel usage limit equivalent to a total of 800 hours of operation in the peak mode. For purpose of this, peak mode means gas turbine operation above the normal rated capacity of the turbine, as specified by the equipment manufacturer, to supply additional output on a short-term basis with the potential for greater than normal wear on the turbine and increased frequency for periodic inspection and maintenance of the turbine.

Emissions from startup of the turbines would be considered when determining compliance with annual emission limits. During startup of the turbines, it is expected that emissions of NO_x, CO and VOM will be higher than during normal operation. This is because the turbine combustors are not as efficient when fuel is first ignited and cannot immediately operate in low-NO_x mode. This is a short-term phenomenon as the proposed turbines are typically able to be turned on and begin to produce power at normal rated capacity in 25 minutes. In this regard, the higher levels of emissions during startup are as much a reflection of the low levels of emissions achieved during normal operation of the turbines, as they are an indication of high emissions during startup.

IV. APPLICABLE EMISSION STANDARDS

All emission sources in Illinois must comply with the Illinois Pollution Control Board's emission standards. The Board's emission standards represent the basic requirements for sources in Illinois. The proposed project will readily comply with applicable state emission standards (35 Ill. Adm. Code: Subtitle B).

The turbines are also 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. These standard addresses NO_x emission from gas turbines limiting NO_x emissions to 75 ppm, adjusted for actual turbine efficiency¹. The project should readily comply with the applicable requirements of these standards. The application indicates NO_x emissions of 9 ppm on an hourly average when operated at normal rated capacity and 21 ppm on an hourly average when operated in peak mode.

¹ The NO_x emission standard of the NSPS includes an adjustment for the efficiency of the particular model of gas turbine, expressed in terms of the fuel energy input per unit of power output. This treats different models of turbines equitably, given the range of efficiency that is achieved by different models of turbines. In other words, turbines are generally allowed the same amount of NO_x emissions if they have the same power output, even if they differ in the amount of fuel that they use because one is more or less efficient than the other.

The base level of efficiency associated with the NO_x standard is 14.4 kilojoules heat input per watt-hour output (kj/w-h). To the extent that a particular turbine is more efficient than 14.4 kj/w-h, i.e., has a lower heat input for per unit energy output, the NSPS limit for the turbine is greater than 75 ppm NO_x. With this adjustment for energy efficiency, the NO_x emission limit for the proposed high efficiency turbines would be 99 ppm NO_x.

V. APPLICABLE REGULATORY PROGRAMS

This facility is not considered a major project under the federal rules for Prevention of Significant Deterioration of Air Quality (PSD), 40 CFR 52.21, or the state rules for Major Stationary Source Construction And Modification (MSSCAM) 35 IAC Part 203. This is because the potential emissions from the proposed facility, as limited by the permit, would be less than the major source thresholds for PSD, i.e., nitrogen oxides, sulfur dioxide, carbon monoxide, and particulate matter are limited to less than 250 tons/year. With respect to MSSCAM, volatile organic material (VOM) emissions are limited to less than 25 tons/year.

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 up to 10.5 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, Crete 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, Crete Energy would have to obtain a CAAPP operating permit for the facility after shakedown and testing of the turbines is complete. Crete 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.

VI. AIR QUALITY IMPACTS

With its application, Crete Energy submitted an air quality impact analysis for NO_x, CO, SO₂, and PM. The analysis shows that the proposed facility would not significantly affect ambient air quality in the vicinity of the facility. This is consistent with the Illinois EPA's experience with other new natural gas fired simple cycle power plants.

With respect to ozone, the ambient ozone levels in Will 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.

VII. PROPOSED PERMIT

The conditions of the draft permit for the facility contain limitations and requirements for the turbines to help assure that the facility complies with applicable regulatory requirements. The draft permit also identifies measures that must be used as good air pollution control practices to minimize emissions from the turbines.

The draft permit includes enforceable limits on emissions and operation for the turbines to assure that facility remains below the levels at which it would be considered major for PSD or MSSCAM (i.e. 250 tons/year for NO_x, CO, PM and SO₂ and 25 tons/year for VOM). In addition to limiting annual emissions, the permit also includes limits on hourly emissions and limitations on the amount of fuel that can be used in the turbines.

The permit also establishes appropriate compliance procedures for the facility, including requirements for emission testing, monitoring, recordkeeping, and reporting. Continuous monitoring of fuel use is required for the turbines to confirm actual levels of operation. Emission testing is required as part of the initial shakedown and operation of the turbines after completion of construction. Testing must be conducted at the peak, intermediate, and low points in the normal operating range of the turbines to account for the expected variation in emissions based on turbine load. Continuous emission monitoring for NO_x would be required for a turbine if its annual utilization exceeds 20 percent of its theoretical capacity in a year or 10 percent of its theoretical capacity on a three-year average (876 and 1752 hours per year, respectively at full load).

These measures are being imposed to assure that the emissions of the turbines are accurately tracked to confirm compliance with both the short-term and annual emission limits established for them, considering the variation in emissions based on turbine load and ambient temperature.

VIII. 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 this permit.

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