Illinois Environmental Protection Agency
Bureau of Air, Permit Section
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Project Summary
For a Construction Permit Application
From Natural Gas Pipeline Company of America
For Installation Of Low Emission Combustion Technology
On Five Natural Gas Fired Engines
At Its Compressor Station
South of Geneseo, Illinois

Site Identification No.: 073816AAAD
Application No.: 05110051
Date Received: November 21, 2005

Schedule
Public Comment Period Begins: March 7, 2006
Public Comment Period Closes: April 6, 2006

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I. INTRODUCTION

Natural Gas Pipeline Company of America (NGP) has applied for a construction permit from the Illinois Environmental Protection Agency (Illinois EPA) for changes at its natural gas pipeline station located south of Geneseo. NGP is proposing to add Low Emission Combustion (LEC) technology to five natural gas fired engines to meet future control requirements for emissions of nitrogen oxides (NOx). NGP must obtain a construction permit from the Illinois EPA for this project because it entails construction of air pollution control equipment and will increase the emissions of pollutants other than NOx from the engines.

The Illinois EPA has prepared a draft of the construction permit that it would propose to issue for this project. The permit is intended to identify the applicable rules governing emissions from the proposed project and to set limitations on those emissions. The permit is also intended to establish appropriate compliance procedures for the proposed project, including requirements for emissions testing, continuous monitoring, recordkeeping, and reporting.

II. PROJECT DESCRIPTION

The Geneseo Compressor Station is part of the interstate pipeline system that transports natural gas from production areas to utilities and other customers. Natural gas fired engines are used at the Station to power compressors, which raise the pressure of the natural gas in the pipeline and move the natural gas through the pipeline.

The Permittee is altering five existing engines at its Geneseo Station to reduce NOx emissions by installing Low Emission Combustion (LEC) Technology, also referred to as Low Emission Control Technology, on the engines. The five engines are low RPM, turbocharged "LeanBurn Engines," which operate with a very high fuel to air ratio. The LEC technology reduces the formation of NOx by altering the way in which fuel is introduced into the cylinders of the engines and burned. This entails increasing the operating pressure in the fuel injection systems, changing the configuration of the combustion chambers, and improving the electronic operating system for the engines. The objective of the project is to reduce the NOx emissions from the engines by about 40 percent, by achieving NOx emission rates of no more than 3.0 grams per brake horsepower for one engine and no more than 5.0 grams per brake horsepower for the other four engines.

A side effect of LEC technology is to increase the emissions of other pollutants from the engines, especially carbon monoxide (CO) and volatile organic material (VOM). CO and VOM are normally emitted from the engines, as trace products of incomplete combustion that are present in much lower concentrations than NOx. The Permittee will address the increases in CO and VOM emissions that accompany the use of LEC technology by using good engine practice for effective combustion and adding oxidation catalyst systems to the exhaust systems from the altered engines to control CO emissions.

III. PROJECT EMISSIONS

As summarized in Attachment 1, NGP estimates that this project will provide a decrease in annual NOx emissions of about 380 tons. The oxidation catalyst systems also being added to the five engines being equipped with LEC technology will serve to prevent a significant increase in CO emissions, with the annual increase for CO projected at only about 20 tons. However, even with the catalyst systems, NGP projects that the potential increase in annual VOM emissions will be about 110 tons, which is more than the 40 ton significant emission rate set for VOM by the federal rules for Prevention of Significant Deterioration (PSD), 40 CFR 52.21. Accordingly, the proposed project qualifies as a major modification for emissions of VOM under the PSD rules. The project is not subject to PSD for other pollutants since emissions of other PSD pollutants will either decrease or not increase by the amount that is considered significant under the PSD rules.

The actual changes in emissions with this project may be greater or smaller than projected by NGP. To the extent that the engines would be operated less than relied upon NGP in its analysis of the changes ine emissions accompanying this project, the increases in emissions will be smaller. To the extent that the LEC technology and the oxidation catalysts systems are more effective than predicted, the decrease in NOx emissions will be greater and the increases in CO and VOM emissions will be smaller.

IV. APPLICABLE EMISSION STANDARDS

At this time, for natural gas-fired stationary engines in Illinois, like those involved in this project, the only State emission standard of interest is a standard that addresses the opacity of the exhaust from the engines. The engines can readily comply with the applicable standard, which generally limits the opacity of emissions of smoke or particulate matter from any emissions unit located in Illinois to no more than 30 percent, on a 6-minute average.

NGP has designed this project to comply with the emission standards that the State of Illinois is still developing to address NOx emissions from stationary engines located in Illinois. These regulations must be adopted pursuant to a federal mandate from the United States EPA, which requires that standards for NOx emissions from stationary engines in Illinois be in place by no later than May 1, 2007.

V. PREVENTION OF SIGNIFICANT DETERIORATION (PSD)

The PSD rules are relevant for this project because the NGP's Geneseo Compressor Station is located in an area whose air quality is classified as attainment for all criteria air pollutants. The substantive requirement of the PSD rules for a major project, for each PSD pollutant subject to PSD, are: 1) A case-by-case determination of Best Available Control Technology (BACT), 2) An ambient air quality impact analysis to confirm that the project would not cause or contribute to a violation of the National Ambient Air Quality Standard(s) (NAAQS) or applicable PSD increment(s); and 3) An

assessment of the impacts of the project on soils, vegetation and visibility. The Illinois EPA has been delegated authority by the USEPA to administer permitting under the federal PSD program in Illinois.

The proposed project is considered a major modification under the PSD rules for emissions of VOM, as discussed above.

This project is not subject to PSD for other PSD pollutants. In particular, the increase in annual emission of CO, and other PSD pollutants for which an increase in emissions is projected, will not equal or exceed the significant emission rate set by the PSD rules for those pollutants.

A. BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

The Illinois EPA's initial review of the proposed project indicates that good combustion practices, along with catalyst systems for CO emissions, will constitute BACT for the increase in VOM emissions accompanying the use of LEC technology.

NGP submitted a BACT demonstration in its application. The demonstration included information from the USEPA's *RACT/BACT/LAER Clearinghouse*, which shows that VOM emissions from large stationary engines are commonly controlled by use of good combustion practices. This data did not reveal any add-on control systems being used for VOM emissions from the type of engine that are the focus of the project. Instead, VOM emissions are minimized by combustion control or good combustion practices.

The Illinois EPA has made an independent determination of BACT. As explained in further detail in Attachment 2, the Illinois EPA concurs with NGP's selection of good combustion practices as BACT for VOM emissions as it reflects technology that is being effectively used on engines at compressor stations for control of VOM emissions. In addition, the engines will be equipped with oxidation catalyst systems for CO emissions, which may serve to further reduce VOM emissions. Finally, as this project is being pursued to reduce emissions of NOx emissions from existing engines, the Illinois EPA has sought to establish a BACT limit for VOM emissions that allows NGP to reasonably pursue the required reductions in NOx emissions from the engines. It is important that the BACT limit for emissions of VOM does not impede or interfere with the objectives of this project with respect to reductions in NOx emissions. The Illinois EPA has concluded that an appropriate BACT limit for VOM emissions, reflective of good combustion practice, from the engines covered by this project is 0.8 grams of VOM per brake horsepower-hour of work produced by an engine.

B. AIR QUALITY ANALYSIS

The air quality analysis prepared by NGP pursuant to the PSD rules for this project indicates that it will not cause a violation of the ambient air quality standard for ozone in the area surrounding the source. This analysis used a conservative

procedure recommended by USEPA for evaluation of impacts of changes in VOM and NOx emissions on ozone air quality in attainment areas for PSD projects of the scale of the proposed project. The analysis also considered the changes in emissions that occurred from an earlier project at the Geneseo Station that also involved installation of LEC technology on another engine, with both a decrease in NOx emissions and an increase in VOM emissions.

The analysis indicates that the difference of the maximum impact of the station on local ozone air quality, before and after use of LEC technology, is an increase of 0.00184 ppm, on a one-hour average. Based upon ambient data for ozone collected at the monitoring station operated by the Illinois EPA in Rock Island, this increase would not be sufficient to threaten attainment of the ozone air quality standard in Henry County, where the station is located. For this purpose, one would generally add the calculated increase in ozone from a project to the fourth highest measured value in three years, to be consistent with the form of the ozone air quality standard. However, even when the calculated increase in ozone with the proposed project is added to the highest measured ozone concentration on a 1-hour average basis, the result is still well below the 0.120 ppm, the relevant criterion for ozone on a 1-hour average basis (0.00184 + 0.095 = 0.0968, ≤ 0.120).

While the USEPA's recommended analysis procedure for ozone air quality does not directly address ozone air quality on an 8-hour average basis, the results of the analysis can also be applied to consider the possible impacts of the proposed project relative to the current 8-hour ozone standard. For this purpose, the calculated increase in ozone air quality impact from the project, 0.00184 ppm, can be conservatively taken as an 8-hour impact and added to the fourth highest ambient measurement, i.e., 0.076 ppm. The result is still below the 0.080 ppm, the current ambient air quality standard for ozone, applicable on an 8-hour average basis (0.00184 + 0.076 = 0.07784, ≤ 0.080).

Monitored Ozone Air Quality Data for Rock Island (ppm)

Year	Highest Ambient Measurements (ppm)							
	1-Hour Averages				8-Hour Averages			
	1st	2nd	3rd	4th	1st	2nd	3rd	4th
2005	0.095	0.085	0.078	0.072	0.081	0.078	0.071	0.065
2004	0.082	0.070	0.066	0.064	**0.076**	0.060	0.059	0.059
2003	0.092	0.080	0.079	0.079	0.084	0.074	0.071	0.068

C. IMPACTS ON GROWTH, SOILS AND VEGETATION, AND VISIBILITY

Under the PSD rules, NGP must also submit analyses to address changes in air quality from growth in the area that result from the project, and construction of the source itself. It must also

evaluate the potential for visibility impairment and address the potential impacts on soil and vegetation.

NGP provided the required additional impact analyses for this project. NGP does not anticipate any growth impacts from the project, as it involves existing units at an existing source. The project should not adversely impact soil, vegetation or visibility. This is because the overall effect of the project is to reduce emissions of NOx, with an overall benefit to air quality. In addition, existing ozone air quality in the general area of the station should not be affected measurably by this project. Finally, the overall reduction in emissions from the project will reduce the Station's contribution to regional haze.

VII. PERMIT CONDITIONS

The conditions of the permit set forth the air pollution control requirements that the project must meet. These requirements include the applicable emission standards that apply to the project. The permit also establishes enforceable limitations on the amount of VOM emissions for which the project is permitted. As previously noted, actual emissions associated with the project would be less than the permitted emissions to the extent that the engines that are the subject of the project operate at less than capacity and control measures normally operate to achieve emission rates that are lower than have been relied upon in analyzing the changes in emissions accompanying this project.

The permit also establishes appropriate compliance procedures for the ongoing operation of the five affected engines, including requirements for emission testing, required work practices, operational monitoring, recordkeeping, and reporting. These measures are imposed to assure that the operation and emissions of the affected engines appropriately tracked to confirm compliance with the various requirements imposed on NGP to address the potential increase in emissions from this project.

VIII. REQUEST FOR COMMENTS

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

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

ATTACHMENT 1: EVALUATION OF THE CHANGE IN EMISSIONS WITH THIS PROJECT

Table 1: Past Actual Emissions of the Affected Engines
Based on average of data from 1999 and 2000

Engine	Past Actual Annual Emissions (Tons)				
	NOx	CO	PM	VOM	SO_2
9	400.37	74.16	1.23	14.69	0.07
12	198.74	46.88	1.04	7.19	0.06
13	195.84	46.20	1.03	7.09	0.06
14	262.56	61.94	1.38	9.50	0.08
15	220.59	52.04	1.16	7.98	0.07
Total	1278.1	281.2	5.84	46.45	0.34

Table 2: Future Projected and Permitted Emissions of the Affected Engines

Engine	Future Annual Emissions (Tons)				
	NOx	CO	PM	VOM	SO_2
9	123.12	30.78	1.88	32.83	0.13
12	193.12	67.98	2.15	30.90	0.22
13	193.12	67.98	2.15	30.90	0.22
14	193.12	67.98	2.15	30.90	0.22
15	193.12	67.98	2.15	30.90	0.22
Total	895.6	302.7	10.48	156.4	1.00

Table 3: Change in Emissions

Time Period	Annual Emissions (Tons)				
	NOx	CO	PM	VOM	SO_2
Future	895.6	281.2	10.48	156.4	0.34
Past	1278.1	302.7	5.84	46.4	1.01
Change	-382.5	21.5	4.64	110.0	0.67
PSD Sign.	40	100	15	40	40

ATTACHMENT 2: BACT CONTROL OPTIONS FOR VOM EMISSIONS FROM THE PROPOSED PROJECT

Control Option	Feasibility	VOM Control	Other Considerations
Combustion Control and Low Temperature "CO" Oxidation Catalyst	**Yes Well-demonstrated**	**Excellent**	**Enhanced control of CO emissions**
Combustion Control and Low Temperature "VOM" Oxidation Catalyst	Yes	Excellent (but no change)	CO emissions not directly addressed
Higher Temperature "CO/VOM" Oxidation Catalyst System	Unsound	-	-
Very High Temperature Oxidation Catalyst System	No	-	-
Combustion Control	Yes Well-demonstrated	Excellent	Good control of CO emissions
Selection of Natural Gas Fuel	Yes	Minimal	Very low emissions of PM and SO_2

Discussion

Fuel Selection: The Illinois EPA did not consider the selection of natural gas as the fuel for the engines to be a significant control option for the BACT determination. While natural gas is commonly referred to as a clean fuel, this is typically in relation to emissions of PM and SO_2, pollutants other than VOM that occur during combustion of the fuel due to the presence of ash and sulfur in a fuel. In contrast, VOM is a combustion pollutant. In addition to fuel selection, the nature of VOM emissions from a combustion process is dependent upon the quality of the combustion process. From this perspective, a fuel should not be characterized as clean relative to VOM emissions.

Perhaps of greater importance, the use of natural gas fuel is an inherent aspect of the engines at this compressor stations. This is because it diverts some of the natural gas that is being transported through the pipeline for use as fuel to power the engines at the station.

Combustion Control: As VOM is a product of incomplete combustion from the engines, combustion control is an obvious control "option" for BACT. Combustion practices must be used that minimize the formation of VOM while other requirements for the engine are met. These other requirements include operational requirements, as the engines are located at an existing natural gas pipeline compressor station. These other requirements also include the emission control requirements imposed on the engines for emissions of NOx.

Oxidation Catalyst System for VOM: The engines that are being addressed by this project are equipped with turbochargers. Accordingly, there are two possible locations for the installation of an oxidation catalyst system, either before the turbocharger or after the turbocharger. The temperature of the exhaust gas in the earlier location is hotter, so the oxidation catalyst

would theoretically be more effective. However, the installation of a catalyst system prior to the turbocharger poses concerns for reliable operation of an engine that makes placement of a catalyst system at that location unsound. These considerations include the effect of engine misfires on the catalyst system and the effects of catalyst wear, deterioration or failure on the reliable operation of the turbocharger.

In addition, the temperature before the turbocharger is not significantly higher than the temperature after the turbocharger, i.e., 650 °F, compared to about 540 °F. The working temperature range for an oxidation catalyst for control of VOM is ideally 850 to 1100 °F. Accordingly, an oxidation catalyst system targeted for VOM reduction would be unlikely to provide any significant reduction in VOM emissions irrespective of its location either before of after the turbocharger. This is a direct consequence of the nature of the existing engines that are being controlled. The engines operate with an exhaust gas temperature that is much lower than the 800 to 1100 °F range typically experienced for vehicle engines for which VOM oxidation catalyst systems are routinely applied.

Oxidation Catalyst System for CO: While this project is not subject to PSD for emissions of CO, the planned use of an oxidation catalyst system for CO emissions is a relevant factor in the BACT determination. At one level, this represents use of an additional control feature to minimize CO emissions. It is possible that this measure would have been required as BACT if it had not been proposed by NGP. This is because the increase in CO emissions from the project could have been 10 times greater than is occurring. The increase in CO emissions would almost certainly have been considered significant under the PSD rules if use of CO catalyst systems had not been proposed. As a consequence, if CO catalysts systems had not been proposed by NGP, the BACT determination for this project would have had to evaluate whether use of such systems in conjunction with the proposed project, which is being undertaken to meet new regulatory requirements for NOx. NOx is a pollutant that poses far greater concern for the environment than CO, as NOx is a pollutant in its own right, is a precursor to formation of ozone and fine particulate matter in the atmosphere, and contributes to acid rain. NGP has eliminated the need for this evaluation by deciding to use catalyst systems CO emissions as part of this project for installation of LEC technology.

The other aspect of the oxidation catalyst systems that are proposed as part of this project is that they will also act to reduce VOM emissions. This is because an oxidation catalyst functions to allow combustion to occur at a temperature that is lower than the temperature at which temperature would normally occur. As the oxidation catalyst system functions to convert CO to carbon dioxide (CO_2), it will also generally act to reduce VOM to carbon dioxide (CO_2) and water (H_2O). For CO, the oxidation catalyst system is expected to achieve at least a 50 percent reduction in the level of CO emissions in the engine exhaust. However, because of the temperature of the exhaust gas from the engines, the oxidation catalyst will be of uncertain effectiveness for emissions of VOM. In such circumstances, it is appropriate to allow a conventional oxidation catalyst system to be installed, which is targeted for effective control of CO emissions. This objective should not be complicated by additional provisions for the oxidation catalyst system to address the VOM that is also present, particularly as VOM will be present at about a quarter of the concentration of the CO. It also is not appropriate to require a particular level of additional control of VOM emissions to be provided by the oxidation catalyst system.

Conclusion: For VOM emissions from the engines that are the subject of this project, the use of good combustion practice, accompanied by an oxidation catalyst system developed for control of CO emissions, represent BACT.