

217/782-2113

CONSTRUCTION PERMIT -- NSPS SOURCE -- REVISED

PERMITTEE

University of Illinois
Attn: Sylvia Delgado
354 HAB 506 South Wright Street
Urbana, Illinois 61801

Application No.: 01010053

I.D. No.: 019010ADA

Applicant's Designation:

Date Received: August 5, 2003

Subject: Combined Cycle Turbines

Date Issued:

Location: 1117 South Oak Street, Champaign

Permit is hereby granted to the above-designated Permittee to CONSTRUCT emission source(s) and/or air pollution control equipment consisting of two turbines with associated heat recovery steam generators with duct burners, controlled with CO catalyst systems, and installation of low NO_x burners in two existing boilers (2 and 3), as described in the above-referenced application. This Permit is subject to standard conditions attached hereto and the following special condition(s):

- 1a. Each turbine is subject to a New Source Performance Standard (NSPS) for stationary gas turbines, 40 CFR 60, Subparts A and GG. The duct burners in each HRSG are subject to NSPS Subparts A and Dc. The Illinois EPA is administering these NSPS in Illinois on behalf of the United States EPA under a delegation agreement.
- b.
 - i. Emissions of nitrogen oxide (NO_x) from each turbine shall not exceed the allowable limit pursuant to the NSPS, 40 CFR 60.332(a)(1).
 - ii. Each turbine shall comply with the applicable standard for sulfur dioxide pursuant to the NSPS, 40 CFR 60.333, e.g., the sulfur content of the fuel burned in the turbine shall not exceed 0.8 percent by weight.
- c. At all times, the Permittee shall maintain and operate the turbines and the duct burners in a manner consistent with good air pollution control practice for minimizing emissions, pursuant to the NSPS, 40 CFR 60.11(d).
2. Emissions of carbon monoxide attributable to combustion of fuel by the duct burners in each HRSG shall not exceed 200 ppm corrected to 50% excess air pursuant to 35 Ill. Adm. Code 216.121.
- 3a.
 - i. Only natural gas and distillate fuel oil may be fired in the turbines.

- ii. Fuel oil usage in each turbine shall not exceed 500,000 gallons/month and 1,535,000 gallons/year.
- iii. Natural gas usage in each turbine shall not exceed 150 million scf/month and 1,310 million scf/year.
- b. i. Natural gas shall be the only fuel fired in the duct burners.
- ii. Natural gas usage in the duct burners associated with the turbines shall not exceed 51.9 million scf/month and 623 million scf/year.
- 4a. At all times the Permittee shall, to the extent practicable, maintain and operate the CO catalyst system in each turbine in a manner consistent with good air pollution control practice for minimizing emissions.
- b. Emissions from each turbine, including the duct burners, shall not exceed the following limits:

	Natural Gas Mode <u>(Lbs/Hour)</u>	Fuel Oil Mode <u>(Lbs/Hour)</u>
NO _x	22.24	61.48
CO	4.08	4.13
SO ₂	0.51	135.77
VOM	5.38	0.78
PM	1.50	2.22

These limits are based on emission data in the application, including the maximum firing rate of turbine and duct burners, and CO control efficiency (80%).

- c. Annual emissions from the turbines including the duct burners, in total shall not exceed the following limits:

	<u>Tons/Year</u>
NO _x	241.3
CO	34.5
SO ₂	14.4
VOM	8.5
PM	13.2

- 5a. This permit is issued based on the construction and operation of the new emission units not constituting a major modification subject to the federal rules for Prevention of Significant Deterioration of Air Quality, (PSD) 40 CFR 52.21. For emissions of NO_x this determination relies upon contemporaneous decreases in NO_x emissions from existing units such that the net changes in NO_x emissions from this project is not significant as shown in Tables I, II, III, and IV when taken with creditable decreases from the installation of low NO_x burners to two

existing boilers (Boilers 2 and 3) and reduce operation of one existing boiler (Boiler 4) along with associated creditable decreases.

- b. i. Annual fuel consumption of existing boilers 2 and 3 combined shall not exceed 2,561 million standard cubic feet of natural gas and 244,900 gallons of oil.
- ii. Natural gas shall be the only fuel fired in boiler 4 and annual natural gas consumption of boiler 4 shall not exceed 98 million standard cubic feet of natural gas.
- c. i. Emissions of existing boilers 2, 3 and 4 are based on the following emission factors:

	<u>Boiler 4</u> Gas Firing (Lbs/mmscf)	<u>Boilers 2 and 3</u> Gas Firing (Lbs/mmscf)	<u>Oil Firing</u> (Lbs/1,000 Gal)
NO _x	280	100	28.94
CO	84	125	20.70

- ii. Annual emissions of existing boilers 2, 3, and 4 combined shall not exceed the following limits:

	<u>Tons/Month</u>	<u>Tons/Year</u>
NO _x	18.0	145.31
CO	21.6	164.18

These limits are based on information included in the application and established as limits by this permit including the maximum usage, fuel usage and the applicable emission factors for boilers.

- d. These limits and requirements and associated recordkeeping and reporting requirements become effective upon initial startup of the turbines. If the startup of the second turbine is delayed, the Illinois EPA may establish alternative limits and requirements to assure sufficient contemporaneous decreases in NO_x emissions for operation of a single turbine.
- 6. Compliance with annual limits set by this permit shall be determined from a running total of 12 months of data.
- 7a. The Permittee shall fulfill applicable notification and recordkeeping requirements of the NSPS, 40 CFR 60.7 for the construction and operation of the turbines. Notification shall be made in writing to the Illinois EPA and shall include the following:
 - i. Written notification of commencement of construction, no later than 30 days after such date (40 CFR 60.7(a)(1));

- ii. Written notification of anticipated date of initial startup, at least 30 days but not more than 60 days prior to such date (40 CFR 60.7(a)(2); and
- iii. Written notification of the actual date of initial startup, within 15 days after such date (40 CFR 60.7(a)(3)).
- b. The Permittee shall fulfill notification of the date of construction, anticipated startup, and actual startup of the duct burner, pursuant to 40 CFR 60.48c(a), which shall include:
 - i. The design heat input capacity and identification of fuels to be combusted, pursuant to 40 CFR 60.48c(a)(1); and
 - ii. The annual capacity factor at which the Permittee anticipates operating the affected facility based on the fuel fired, pursuant to 40 CFR 60.48c(a)(3).
- 8a. Under this permit, the turbines and duct burners may be operated for a period of up to 180 days from initial startup to allow for equipment shakedown and emissions testing as required.
- b. Upon successful completion of the emission testing required by Condition 9(a) demonstrating compliance with applicable short-term limitations, the Permittee may continue to operate the facility as allowed by Section 39.5(5) of the Environmental Protection Act.
- c. This condition supersedes Standard Condition 6.
- 9a. Within 60 days after achieving the maximum production rate at which the emission units will be operated but not later than 180 days after initial startup, the Permittee shall have emissions testing performance for each turbine/duct burners and for selected boilers for NO_x and CO at its expense by a testing service approved by the Illinois EPA.
- b. The following methods and procedures shall be used for testing of emissions:
 - i. USEPA Reference Test Methods shall be used for emission testing, including the following methods:

Carbon Monoxide	USEPA Method 10
Nitrogen Oxides	USEPA Method 7
 - ii. Measurements for NO_x from the turbines/duct burners shall be conducted in accordance with 40 CFR 60.335, as specified below, unless alternative testing procedures are approved by USEPA pursuant to 40 CFR 60.8(b):
 - A. The NO_x emissions shall be computed for each run using the equation in 40 CFR 60.335(c)(1).

- B. The span values for Method 20 shall be 300 ppm of NO_x and 21 percent O₂, pursuant to 40 CFR 60.335(c)(3).
 - C. The NO_x emissions shall be determined separately for both gas and oil firing, at four points in the normal operating range of the turbine, including the minimum point in the range and peak load, pursuant to 40 CFR 60.335(c)(2), and for the combined operations of the turbine and duct burners.
 - D. All loads shall be corrected to ISO conditions using the appropriate equations supplied by the manufacturer, pursuant to 40 CFR 60.335(c)(2).
- c. At least 60 days prior to the actual date of testing, a written test plan shall be submitted to the Illinois EPA for review. This plan shall describe the specific procedures for testing and shall include as a minimum:
- i. The person(s) who will be performing sampling and analysis and their experience with similar tests.
 - ii. The specific conditions under which testing shall be performed including a discussion of why these conditions will be representative of maximum emissions and the means by which the operating parameters for the source will be tracked and recorded.
 - iii. The specific determinations of emissions and operation which are intended to be made, including sampling and monitoring locations.
 - iv. The test method(s) which will be used, with the specific analysis method, if the method can be used with different analysis methods.
- d. The Illinois EPA shall be notified prior to these tests to enable the Illinois EPA to observe these tests. Notification for the expected date of testing shall be submitted a minimum of thirty (30) days prior to the expected date. Notification of the actual date and expected time of testing shall be submitted a minimum of five (5) working days prior to the actual date of the test. The Illinois EPA may at its discretion accept notifications with shorter advance notice provided that the Illinois EPA will not accept such notifications if it interferes with the Illinois EPA's ability to observe testing.
- e. Three copies of the Final Reports for these tests shall be forwarded to the Illinois EPA within 30 days after the test results are compiled and finalized. The Final Report from testing shall contain a minimum:
- i. A summary of results;
 - ii. General information;

- iii. Description of test method(s), including a description of sampling points, sampling train, analysis equipment, and test schedule;
 - iv. Detailed description of test conditions, including:
 - A. Fuel consumption;
 - B. Turbine firing rate;
 - C. Duct burner firing rate; and
 - D. Turbine/steam turbine output rate.
 - v. Data and calculations, including copies of all raw data sheets and records of laboratory analysis, sample calculations, and data on equipment calibration.
- 10a. The Permittee shall monitor the sulfur and nitrogen content of the fuel being fired in the turbines in accordance with 40 CFR 60.334(b) unless a custom schedule or other alternative provisions for monitoring are approved by the USEPA.
- b. The Permittee shall install monitors on each turbine and the duct burners associated with each turbine to measure and record fuel consumption (scf and gallons).
- 11a. The Permittee shall maintain a file of the following items:
- i. Manufacturers specification of rated turbine and duct burner load;
 - ii. Manufacturers specifications for the low-NO_x burners installed in existing boilers 2 and 3;
 - iii. Heat and sulfur content of the fuels being fired in the turbines and existing boilers 2, 3 and 4, with supporting documentation, on a quarterly basis; and
 - iv. A copy of the Final Report(s) for emission testing conducted pursuant to Condition 9.
- b. The Permittee shall maintain the following daily and monthly operating records:
 - i. The quantity of fuel consumed for the turbine (standard cubic feet and gallons);
 - ii. The quantity of fuel consumed for the duct burner (standard cubic feet);

- iii. The quantity of fuel consumed for the existing boilers (standard cubic feet and gallons;
 - c. The Permittee shall keep inspection, maintenance and repair logs with dates and the nature of such activities for the turbines, (turbine burner, duct burner, and CO catalyst system) and existing boilers 2 and 3 (low-NO_x burners).
 - d. The Permittee shall maintain the following records related to emissions from the turbines:
 - i. Other data, not addressed above, used or relied upon by the Permittee to determine emissions;
 - ii. Monthly emissions of NO_x, CO, SO₂, VOM, and PM from each turbine, including the duct burners unit. Emissions shall be calculated based on fuel consumption and operating data and site-specific emission factors developed from emission test data (NO_x and CO) and standard emission factors (PM, VOM, and SO₂) or by other procedures approved by the Illinois EPA in the source's CAAPP permit;
 - iii. The annual emissions of NO_x, SO₂, PM, VOM and CO for each month using current months data and previous 11 months data with supporting calculations.
 - e. The Permittee shall maintain the following records related to emissions of NO_x and CO from existing boilers 2, 3 and 4:
 - i. Other data, not addressed above, used or relied upon by the Permittee to determine emissions;
 - ii. Monthly emissions of NO_x, CO, SO₂, VOM, and PM from each of the existing boilers 2, 3, and 4. Emissions shall be calculated based on fuel consumption and operating data and site-specific emission factors developed from emission test data (NO_x and CO) and standard emission factors (PM, VOM, and SO₂) or by other procedures approved by the Illinois EPA in the source's CAAPP permit;
 - iii. The annual emissions of NO_x, SO₂, PM, VOM and CO for each month using current months data and previous 11 months data with supporting calculations.
 - f. The Permittee shall maintain records that identify any day in which emissions or operation exceed an applicable standard or limitation.
12. All records and logs required by this permit shall be retained at a readily accessible location at the source for at least three years from the date of entry and shall be made available for inspection and copying by the Illinois EPA upon request. Any records retained in an electronic format (e.g., computer) shall be capable of being retrieved

and printed on paper during normal source office hours so as to be able to respond to an Illinois EPA request for records during the course of a source inspection.

13. If there is an exceedance of the requirements of this permit as determined by the records required by this permit, the Permittee shall submit a written report to the Illinois EPA's Compliance Section in Springfield, Illinois within 30 days after the exceedance. This report shall include the type and quantity of emissions released in accordance with the recordkeeping requirements, a copy of the relevant records, and a description of the exceedance or violation and efforts to reduce emissions and future occurrences.
14. Two (2) copies of required reports and notifications concerning equipment operation or repairs, performance testing or a continuous monitoring system shall be sent to:

Illinois Environmental Protection Agency
Division of Air Pollution Control
Compliance Section (#40)
P.O. Box 19276
Springfield, Illinois 62794-9276

and one (1) copy shall be sent to the Illinois EPA's regional office at the following address unless otherwise indicated:

Illinois Environmental Protection Agency
Division of Air Pollution Control
2009 Mall Street
Collinsville, Illinois 62234

- 15a. Compliance with the emission limit for NO_x and CO in Conditions 4 and 5 shall be demonstrated by proper operation of emission units in a manner that is consistent with that during emission testing in accordance by Condition 9 that shows compliance with applicable short-term limits, based on the records required by Condition 11 and other relevant data.
- b. Compliance with the emission limits for PM, VOM and SO₂ in Condition 4 shall be determined using the recordkeeping requirement of this permit and standard emission factors from USEPA's Compliance of Air Pollutant Emission Factors, and AP-42 as follows:

	Natural Gas Mode Turbines <u>(Lb/mmBtu)</u>	Oil Mode Turbines <u>(Lb/mmBtu)</u>	Duct Burner <u>(Lb/mmBtu)</u>
PM	0.007	0.012	0.008
VOM	0.003	0.001	0.009
SO ₂	0.003	0.051	0.001

16. This permit is issued based on this source, as described in the application, not being subject to the requirements of the federal Acid

Rain Program in accordance with 40 CFR Part 72.6(b)(4)(i), because the cogeneration plant will not be selling one-third or more of its potential electrical output generated at the plant, pursuant to 40 CFR 72.6(b)(4)(i).

17. This approval to construct does not relieve the Permittee of the responsibility to comply with all local, state, and federal regulations which are part of the applicable Illinois State Implementation Plan, as well as all other applicable federal, state, and local requirements.

It should be noted that this permit has been revised to show that low-NO_x burners will be installed on two existing boilers (Boilers 2 and 3) and reduced operation of existing boiler 4.

If you have any questions concerning this permit, please call Minesh Patel at 217/782-2113.

Donald E. Sutton, P.E.
Manager, Permit Section
Division of Air Pollution Control

DES:MVP:jar

cc: Region 3

Company: University of Illinois
 I.D.: 019010ADA
 P.N.: 01010053

TABLE I

Potential Emissions for the New Units

<u>Contaminant</u>	<u>Quantity (Tons/Year)</u>
NO _x	241.3
CO	34.5

Note: These limits are applicable to the combined operation of the turbines and duct burners.

TABLE II

Emission increases and decreases associated with Installation of low NO_x burner for Boilers 2 and 3 and reduced operation of Boiler 4

<u>Contaminant</u>	<u>Historical</u>	<u>New Limit</u>	<u>New Change (Tons/Year)</u>
NO _x	347.4	145.31	- 202.1
CO	103.9	164.18	+ 60.3

Note: These creditable decreases in emissions are based on averaged data from the years 1998 and 2000 and are most representative of typical actual operation of existing utility boilers as stated in the application.

TABLE III

Contemporaneous Changes in Emissions from Other Projects

<u>Contaminant</u>	<u>Change in Emission (Tons/Year)</u>
NO _x	0.0
CO	0.0

Note: This table accounts for all other increases and decreases in emissions of criteria pollutants which occurred at the above referenced source during the five year contemporaneous period (April 1996 through April 2001) prior to the project.

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TABLE IV

Net Change in Emissions (Tons/Year)

<u>Contaminant</u>	<u>Allowable Project Emissions</u>	<u>Future Net Change for Boiler</u>	<u>Other Past Contemporaneous Changes</u>	<u>Net Contemporaneous Change</u>
NO _x	241.3	- 202.1	+ 0	+ 39.2
CO	34.5	+ 60.3	+ 0	+ 94.8

Note: This table represents the net change in emissions associated with the new turbines and existing boilers 2, 3 and 4.

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