

Illinois Environmental Protection Agency
Bureau of Air, Permit Section
Springfield, Illinois

April 2013

Project Summary for the
Planned Revision of
Construction Permit 98100093 for
New Turbines and Engine Generators at the
University of Illinois at Chicago - West Campus
Chicago , Illinois

Source Identification No.: 031600CRS
Construction Permit Application/Permit No.: 98100093

Schedule

Public Comment Period Begins: April 19, 2013
Public Comment Period Closes: May 19, 2013

Illinois EPA Contacts

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I. Introduction

The University of Illinois at Chicago (UIC) has requested a revision to Construction Permit 98100093 to allow continued operation of an existing natural gas and oil-fired boiler at its West Campus, Boiler 4. This construction permit addressed the construction of certain new equipment to supply heat and electricity to facilities at UIC's West Campus. In conjunction with the project, UIC was required to cease operation of Boiler 4. UIC did cease operation of Boiler 4. However, UIC has now requested that it be able to resume use of Boiler 4 on a long-term basis. UIC has determined that this is needed to be able to reliably meet the steam demands of the West Campus, which includes the UIC Hospital and various other medical facilities.

The Illinois Environmental Protection Agency (Illinois EPA) has reviewed UIC's request for revision of Permit 98100093 and made a preliminary determination that it meets applicable requirements for revisions to the permit. The Illinois EPA has prepared a draft of the revised permit that it would propose to issue. Before issuing a revised permit, the Illinois EPA is holding a public comment period to receive comments on the proposed issuance of a revised permit and on the proposed changes to the permit, as set forth in the draft of a revised permit.

II. Background

Construction Permit 98100093, which was issued in 1999, addressed the construction of certain new equipment to support the facilities at UIC's West Campus. The project included three natural gas fired combined cycle turbines to supply steam and electricity. The project also included three engine generators, which would primarily be fired on natural gas, to supply heat and electricity. The project was intended to replace four natural gas-fired boilers at the West Campus (Boilers 1 through 4). Because the new equipment would produce both heat and electricity, the project improved the energy efficiency of the West Campus.

For the permitting of this project, UIC relied on "netting" to show that the project would not be a major modification for purposes of the federal rules for Prevention of Significant Deterioration (PSD), 40 CFR 52.21, and Illinois's rules for Major Stationary Sources Construction and Modification (MSSCAM), 35 IAC Part 203.¹ With netting, a source relies on certain contemporaneous decreases in emissions to show that the net increase in annual emissions from a project will not be significant, that is, equal to or greater than the applicable "significant emission rates" established by PSD and MSSCAM for different pollutants. For this project, UIC's original application relied on the decreases in emissions from the shut down of four existing boilers at the West Campus, Boilers 1 through 4. It also relied on decreases in emissions of carbon monoxide (CO) and volatile organic material (VOM) from installing catalytic converters on two existing engine-generators at its East Campus. The overall result was that the net increases in emissions of various pollutants from the project were not significant and the project was not a major modification. In addition to addressing the new emission units that were part of this project,

¹ If the project had been a major modification for particular pollutant(s), additional regulatory requirements would have applied to the project related to its emissions of those pollutant(s) as specified by PSD and/or MSSCAM, depending on the pollutant(s) for which the project would have been a major modification.

Construction Permit 98100093 also required UIC to implement the actions that it had identified to provide contemporaneous emissions decreases to accompany the project.

Further information concerning the original permitting of the project is provided in Attachment 1 of this Project Summary. Attachment 1 is a copy of the Project Summary that was prepared by the Illinois EPA in conjunction with the public comment period that was held on the draft of the original construction permit.

III. Current Request

UIC has requested a revision to Construction Permit 98100093 to allow continued operation of Boiler 4 at the West Campus on a long-term basis. It has determined that Boiler 4 is still capable of consistent and efficient operation.² It has also determined that the long-term ability to be able to use Boiler 4 would provide it with the operational flexibility that is needed to reliably meet the steam demands of the West Campus, which includes the UIC Hospital, the Rush University Hospital and a number of other medical facilities.

In its application for a revised permit, UIC observes that Construction Permit 98100093 did not need to rely on any emissions decreases from the shut down of Boiler 4. This is apparent from the actual terms of the permit, which show that the project would still not have been a major modification if UIC had not relied on emission decreases from the shut down of Boiler 4. In particular, the “limiting pollutant” was VOM for purposes of MSSCAM, for which the permit only relied upon a decrease in VOM emissions of 0.47 tons/year. Even without this decrease, the project would not have been a major modification for VOM emissions. The net increase in VOM emissions would still have been less than the applicable significant emission rate, 25 tons/year.³ Accordingly, UIC has requested that Construction Permit 98100093 be revised to no longer rely upon or require that Boiler 4 be shut down.

IV. Discussion

As observed by UIC, Construction Permit 98100093 did not need to rely on emission decreases from the shut down of Boiler 4. Even without these decreases, the net increases in emissions accompanying the project addressed by this permit would not have been significant, as described in the tables below. The project would still not be a major modification without decreases in emissions from Boiler 4. Accordingly, Construction Permit 98100093 may be revised as requested by UIC to no longer require the shut down of this boiler. In this regard, because this permit relied upon the shut down of Boiler 4, it is appropriate for the future operation of this boiler on a long-term basis to be addressed through the revision of this permit.

² The Illinois EPA previously issued a separate construction permit, Permit 12070001, that authorized operation of Boiler 4 to resume on a temporary basis. This permit provided for operation as needed to evaluate the operational condition and performance of Boiler 4 followed by operation as part of UIC’s plan to meet steam demands during the 2012-2013 winter season.

³ In 1999, when Construction Permit 98100093 was originally issued, the significant emission rate for VOM was 25 tons/year pursuant to MSSCAM. With the improvements in air quality for ozone that have occurred since 1999, the significant emission rate for VOM is now 40 tons/year.

Emissions Decreases That Were Relied Upon from Boiler 4⁴

Fuel	Emissions (tons/year)				
	CO	NO _x	PM ₁₀	SO ₂	VOM
Natural Gas	2.27	7.55	0.21	0.02	0.15
Oil	1.41	13.28	2.46	43.91	0.32
Totals	3.68	20.83	2.67	43.93	0.47

Changes in the “Net Changes in Emissions” from the Project

Scenario	Net Change in Emissions (tons/year)				
	CO	NO _x	PM ₁₀	SO ₂	VOM
Revised	51.18	30.59	6.75	-290.1	24.10
Current	47.50	9.76	4.08	-344.0	23.63
Significant Rate	100	40	15	40	25

V. Draft of Revised Construction Permit

The Illinois EPA has prepared a draft of the revised version of Construction Permit 98100093 that it would propose to issue in response to UIC’s request. This permit would no longer rely on emission decreases from the shut down of Boiler 4 and, accordingly, would no longer require that Boiler 4 be shut down. The revised permit would also include appropriate changes to the tables in the permit that set forth the netting analysis for the project. The draft of the revised construction permit would not add requirements to the permit to specifically address Boiler 4. This is because Construction Permit 98100093 included requirements for the new emission units and control devices that were being installed at the West Campus and did not address existing equipment. Requirements for existing emission units are appropriately addressed in the operating permit for the facility and/or in construction permits that address modifications to specific emission units at the facility.⁵

The draft of the revised permit would also clarify certain provisions of the issued permit that address emission units that the permit does address. In particular, the draft of the revised permit

⁴ Incidentally, for pollutants other than SO₂, the past actual emissions of Boiler 4, as provided in this table, are expected to reflect the magnitude of future emissions that should be expected from Boiler 4. The future emissions of SO₂ would be substantially lower. As addressed in a separate application for a construction permit that is pending with Illinois EPA, Air Permit Section, Application 12090023, UIC is planning to switch the boilers at the West Campus, including Boiler 4, to use low sulfur distillate fuel oil. Thus the future SO₂ emissions will be substantially less than past SO₂ emissions. Thus, even if the future operation of Boiler 4 were approached as a separate project, it would not be expected to be a major modification for purposes of either MSSCAM or PSD.

⁵ In particular, in any construction permit for the switch of the boilers at the West Campus to backup distillate oil, the Illinois EPA is also planning to address 35 IAC Part 217 Subparts D and E. These new standards for NO_x emission were recently adopted by Illinois and apply to boilers located in the Greater Chicago and Metro East Areas.

would update certain conditions in the permit that contain monitoring requirements from the federal New Source Performance Standards for Combustion Turbines, 40 CFR 60 Subpart GG, which apply to the combustion turbines addressed by this permit. The changes would be made so that the permit reflects or accommodates changes to the underlying provisions of the NSPS that USEPA has adopted since the permit was issued.

The draft of the revised permit would also clarify or correct certain terms and conditions of the permit. In particular, with respect to the compliance procedures for various emission units, it would make clear that emissions of CO and VOM from the two existing engine-generators on which catalytic converters were installed should be determined considering the reductions in emissions provided by these devices. It would also remove provisions that would potentially be interpreted to suggest that credible evidence could not be used to determine compliance with certain state emission standards and the various emission limits set by the permit. It would also specifically indicate that the specific emission rates and emission factors listed in the permit should not be used to determine compliance with emission limits set by the permit if emission testing or other credible information shows higher emissions.

VI. Request for Comments

It is the Illinois EPA's preliminary determination that UIC's application for revision of Construction Permit 98100093 meets applicable state and federal air pollution control requirements, subject to the conditions in the draft of the revised construction permit. The Illinois EPA is therefore proposing to issue a revised permit.

Comments are requested on this proposed action and the proposed revisions to this permit, as set forth in the draft of the revised permit and as further described in this Project Summary.

Attachment 1: Project Summary for Original Construction Permit

PROJECT SUMMARY
for
University of Illinois at Chicago

I. INTRODUCTION

The University of Illinois at Chicago has applied for a permit to construct three 5 MW natural gas-fired gas turbines (each with an 88 mmBtu/hr duct burner), three 7 MW natural gas-fired engine generators each controlled by catalytic converter, and catalytic converters controlling two existing 6.3 MW dual fuel-fired engine generators. A permit must be obtained from the Illinois EPA for the construction of this project.

II. BACKGROUND

The University of Illinois at Chicago operates a medical school campus located at 1717 West Taylor Street in Chicago. The University of Illinois at Chicago also operates a traditional university campus at 1140 S. Morgan Street in Chicago. Because each of the campuses is located within a short distance of the other, the Illinois EPA considers these to be a single source. The source's emission units include boilers, incinerators, and storage tanks.

Gas Turbines will be used at this source to produce power and steam. The turbines are natural gas fired, each with a maximum rating of 7 MW. The turbines will be each equipped with a duct burner rated at 88 mmBtu/hr to boost exhaust temperatures for steam production.

Natural gas-fired reciprocating engine generators will be used at the source to produce electricity and power. Each engine has a maximum power output of 5 MW. Engine Generators #1, #2, and #3 at the West Campus will be equipped with low temperature catalytic converters to control carbon monoxide (CO) and volatile organic material (VOM) emissions.

Existing Engine Generators #1 and #2 produce electricity and hot water for the University of Illinois at Chicago's East Campus (Circle Campus) by using low speed reciprocating engine generators. These engine generators are designed to operate normally on combination of natural gas and diesel fuel oil in a dual fuel mode. In an emergency situation, these engine generators make use of No. 2 fuel oil. These engine generators were originally constructed in 1990 and will now be equipped with catalytic converters to control CO and VOM emissions.

Air contaminants emitted from the University of Illinois at Chicago include CO, nitrogen oxides (NO_x), particulate matter less than 10 microns (PM₁₀), sulfur dioxide (SO₂), and VOM (VOM). Emissions from three new natural gas-fired gas turbines with duct burners, the three new natural gas-fired engine generators each controlled by catalytic converter, and the two existing dual fuel-fired engine generators must comply with the Illinois Pollution Control Board Rules and Regulation: 35 Ill. Adm. Code Subtitle B, Chapter 1, Subchapter C1, Emission Standards; Part 203, Major Stationary Source Construction and Modification (MSSCAM); the federal Prevention of Significant

Deterioration (PSD) rules, 40 CFR 52.21; and the federal New Source Performance Standards for Stationary Gas Turbines, 40 CFR 60 Subparts A and GG, as applicable.

III. APPLICABLE EMISSION STANDARDS

All emission sources are subject to Illinois Pollution Control Board emission standards. Board emission standards represent the minimum requirement for sources in Illinois.

The Board emission standards for natural gas-fired gas turbines with duct burners and natural gas-fired reciprocating engine generators are 35 Ill. Adm. Code 214.301 and 218.301. Board Rule 35 Ill. Adm. Code 214.301 is for SO₂ emissions from process emission units and Board Rule 35 Ill. Adm. Code 218.301 is for VOM emissions from process emission units. There are no standards for CO, PM₁₀, or NO_x from natural gas-fired gas turbines with duct burners and natural gas-fired reciprocating engine generators. The above rules governing SO₂ and VOM emissions are less stringent than the federal PSD rules or the MSSCAM rules.

The Illinois EPA's review of the engineering information in the application determined that this project should comply with the applicable Board Rules for SO₂ and VOM emissions.

Emission limits called New Source Performance Standards (NSPS) have been established by USEPA for a number of industries. These emission limits specify the maximum allowable quantity of concentration of a pollutant that may be emitted to the atmosphere or certain design or operating standards that must be achieved. USEPA determines the degree of air pollution emission control which can be achieved by a particular industry and sets the NSPS which can apply nationwide. The Illinois EPA administers NSPS in Illinois for the USEPA under a delegation agreement.

The gas turbines are subject to the NSPS for Stationary Gas Turbines, 40 CFR 60 Subparts A and GG. This specifies a maximum allowable concentration for NO_x emissions depending on the gas turbine load and the quantity of nitrogen in the fuel. The NSPS for Stationary Gas Turbines also specifies a maximum allowable concentration for SO₂ emissions and requires that the fuel contain no more than 0.8 percent sulfur by weight.

The Illinois EPA's review of the engineering information in the application determined that this project should comply with the applicable NSPS. This will be reviewed by appropriate tests when construction of equipment is complete, as required by conditions of the permit.

IV. APPLICABILITY OF REQUIREMENTS FOR MAJOR SOURCES

Construction of a new major source or a modification which results in a significant increase in emissions at an existing major source would be subject to one of two new source review requirements.

As this project is located in an area which is attainment for CO, NO_x, PM₁₀, and SO₂ emissions (i.e., meeting the air quality standards), PSD would apply.

The particular regulations that apply depend on the air quality classification of the area in which the project is located. If an area is classified as nonattainment for the pollutant (meaning air pollution levels exceed the established air quality standard), MSSCAM would apply. If an area is classified as attainment (i.e., meeting the standards), PSD would apply. Areas which are unclassified are also treated as attainment. The same area can be classified as attainment for one pollutant while being classified nonattainment for another.

This project is in an area classified as nonattainment for ozone. VOM emissions are regulated as precursors to ozone formation. Therefore, MSSCAM would apply to VOM emissions.

The significant emission levels for different pollutants are listed in the chart below. The plant's existing emissions, the project emissions, and the net increase or decrease in emissions from this project.

Summary of Emissions (Tons/Year)

<u>Pollutant</u>	<u>Significant Emissions Level</u>	<u>Existing Plant Emissions</u>	<u>Project Emissions</u>	<u>Net</u>
				<u>Emissions Increase/Decrease</u>
Carbon Monoxide	100	402.80	165.75	+ 12.49
Nitrogen Oxides	40	1,032.08	225.06	+ 13.04
Particulate Matter < 10 microns	15	96.15*	25.51	+ 0.10
Sulfur Dioxide	40	919.26	29.09	-356.40
Volatile Organic Material	25	130.36	28.13	+ 7.77

* Existing plant emissions expressed as total suspended particulate matter.

This facility is considered major for VOM emissions under MSSCAM because the potential emissions of the source are above 25 tons/year. Accordingly, this project would be subject to MSSCAM for VOM emissions increases of 25 tons/year or more and contemporaneous increases in VOM emissions of 25 tons/year or more.

The existing facility is major under PSD because the potential emissions of CO, NO_x and SO₂ are each greater than 100 tons/year and the combined heat input capacity of the existing boilers are greater than 250 million Btu/hour.

Voluntary Restrictions by the Applicant

The University of Illinois at Chicago will keep the net increase in CO, NO_x, PM₁₀, SO₂, and VOM emissions accompanying this project below the significance levels by voluntarily accepting limits on the types and quantities of the fuel used in the new equipment. To achieve the CO and VOM emission limits, the University of Illinois at Chicago will also install catalytic converters on the three new engine generators and on the two existing dual fuel-fired engine

generators. The University of Illinois at Chicago will also permanently shut down four existing natural gas and fuel oil fired boilers.

Project New Emissions

In determining the applicability of MSSCAM and PSD, emissions from the current project were reviewed with emissions increases and decreases from other contemporaneous projects constructed within the last five years. The University of Illinois at Chicago has undertaken only one such project.

Previous Contemporaneous Emissions Increases

<u>Emission Unit/Activity</u>	<u>Permit</u>		<u>Date Issued</u>		
Boilers and Engines	97050128		December 1, 1997		
	CO	NO _x	PM ₁₀	SO ₂	VOM
	<u>ton/yr</u>	<u>ton/yr</u>	<u>ton/yr</u>	<u>ton/yr</u>	<u>ton/yr</u>
Net Change in Emissions:	+95.32	-58.63	-2.87	-1.88	+20.08
Significance Levels:	100.00	40.00	15.00	40.00	25.00

Emissions Decreases from Shutdown of Existing West Campus Boilers

<u>Emission Unit</u>	E M I S S I O N S					VOM
	CO	NO _x	PM ₁₀	SO ₂		
	<u>ton/yr</u>	<u>ton/yr</u>	<u>ton/yr</u>	<u>ton/yr</u>		<u>ton/yr</u>
Boiler No. 1 (gas)	2.16	7.19	0.20	0.02		0.14
Boiler No. 1 (oil)	4.18	39.25	7.29	129.79		0.63
Boiler No. 2 (gas)	4.23	14.12	0.38	0.03		0.28
Boiler No. 2 (oil)	5.15	48.42	8.99	160.13		0.78
Boiler No. 3 (gas)	2.57	8.56	0.23	0.02		0.17
Boiler No. 3 (oil)	1.60	15.08	2.79	49.70		0.24
Boiler No. 4 (gas)	2.27	7.55	0.21	0.02		0.15
Boiler No. 4 (oil)	<u>1.41</u>	<u>13.28</u>	<u>2.46</u>	<u>43.91</u>		<u>0.21</u>
Totals	23.57	153.45	22.55	383.62		2.60

Emissions Decreases from Catalytic Converters on Existing East Campus Dual Fuel-Fired Generators*

<u>Emission Unit</u>	E M I S S I O N S					VOM
	CO	NO _x	PM ₁₀	SO ₂		
	<u>ton/yr</u>	<u>ton/yr</u>	<u>ton/yr</u>	<u>ton/yr</u>		<u>ton/yr</u>
East Generator #1	113.55	--	--	--		24.10
East Generator #2	<u>111.47</u>	<u>--</u>	<u>--</u>	<u>--</u>		<u>13.73</u>
Totals	225.02	--	--	--		37.83

* There will be no net change in emissions of NO_x, PM₁₀, or SO₂ as a result of the addition of catalytic converters to the existing East Campus dual fuel-fired engine generators.

Net Changes in Emissions

<u>Emission Unit</u>	E M I S S I O N S				
	CO	NO _x	PM ₁₀	SO ₂	VOM
	<u>ton/yr</u>	<u>ton/yr</u>	<u>ton/yr</u>	<u>ton/yr</u>	<u>ton/yr</u>
Gas Turbines #1 - 3 (combined)	+ 96.88	+ 96.87	+12.48	+ 9.11	+ 3.36
Duct Burners #1 - 3 (combined)	+ 42.14	+ 92.70	+11.80	+ 0.51	+ 7.58
West Generators #1 - 3 (combined)	+ 26.73	+ 35.49	+ 1.23	+ 19.47	+17.19
West Boilers #1 - 4 (combined)	- 23.56	-153.39	-22.54	-383.61	- 2.61
East Generators #1 & 2 (combined)	-225.02	--	--	--	-37.83
<u>Previous Contemporaneous Increase</u>	<u>+ 95.32</u>	<u>- 58.63</u>	<u>- 2.87</u>	<u>- 1.88</u>	<u>+20.08</u>
Net Change in Emissions:	+ 12.49	+ 13.04	+ 0.10	-356.40	+ 7.77
Significance Levels:	100.00	40.00	15.00	40.00	25.00

The net increases in emissions are less than the significance levels, therefore, this project is not subject to MSSCAM and PSD.

V. Request for Comments

It is the Illinois EPA's preliminary determination that the proposed project meets all applicable state and federal air pollution control regulations, and is not subject to MSSCAM and PSD because the net increases in emissions are less than the significance levels. The Illinois EPA is therefore proposing to issue a construction permit, subject to the conditions proposed in the draft permit.

Comments are requested on this proposed action by the Illinois EPA and the proposed conditions on the draft permit. If substantial public interest is shown in this matter, the Illinois EPA will consider holding a public hearing in accordance with 35 Ill. Adm. Code Part 164.