

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

February 2014

Project Summary for
Revisions to Construction Permit 97050128 for
Boilers and Engine-Generators at the
University of Illinois at Chicago - East Campus
Chicago, Illinois

Source Identification No.: 031600CEV
Construction Permit Application/Permit No.: 97050128

Schedule

Public Comment Period Begins: February 7, 2014
Public Comment Period Closes: March 9, 2014

Illinois EPA Contacts

Permit Analyst: Manish Patel/Christopher Romaine
Community Relations Coordinator: Brad Frost

I. Introduction

The University of Illinois at Chicago (UIC) has requested revisions to an air pollution control construction permit issued in 1997 for new boilers and electrical generators at its East Campus. The requested revisions involve certain limits set by the permit and do not involve the emission standards that apply to these units. UIC has determined that revisions to those permit limits would enable it to more effectively meet the heating needs of its East Campus.

The Illinois Environmental Protection Agency (Illinois EPA) has reviewed UIC's request 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 97050128 was originally issued in December 1997. It addresses the construction of three boilers and two engine-generator systems to support the operation of UIC's East Campus. The project replaced four old natural gas-fired boilers in the steam plant at the East Campus. Because the new engine-generator systems would supply both heat and electricity, the project was pursued as a means to improve the energy efficiency of the East Campus.¹

The three boilers supply heat, as hot water, for the East Campus. The primary fuel for the boilers is natural gas. Fuel oil is a backup fuel. The rated capacity of each of the two larger boilers is 75 million Btu (mmBtu) per hour. The rated capacity of the smaller boiler is 50 mmBtu/hour.

The two engine-generator systems are only fired with natural gas. The nominal rated electrical output of each of the engine-generator systems is 4 megawatts. These systems have burners in the ductwork downstream of the engines and waste heat recovery units so they provide heat (hot water), as well as electricity, for the East Campus. The burners also function as afterburners to control emissions of volatile organic material (VOM) and carbon monoxide (CO) in the exhaust from the engines.

For these boilers and engine-generator systems, Construction Permit 97050128 addresses emissions of nitrogen oxide (NO_x), particulate matter (PM), sulfur dioxide (SO₂), CO and VOM. For emissions of NO_x, CO and VOM, UIC relied on "netting" to show that the project would not be a major project for purposes of the federal rules for Prevention of Significant Deterioration (PSD), 40 CFR 52.21, and Illinois' rules for Major Stationary Sources Construction and Modification (MSSCAM), 35 IAC Part 203.^{2, 3} With netting, a source relies on certain

¹ When Construction Permit 97050128 was originally issued in December 1997, the boilers and engine-generator systems were new. The requested revisions to this permit would not involve installation of any additional or "new" emission units by UIC pursuant to the revised permit.

² If the project had been a major modification for particular pollutant(s), additional regulatory requirements would have

contemporaneous decreases in emissions to show that the net increase in annual emissions from a project will not be significant. That is, the net changes in emissions are less than the applicable “significant emission rates” established by PSD and MSSCAM for different pollutants. For this project, UIC in 1997 relied on the decreases in emissions from retiring four existing boilers at the East Campus. The overall result was that the net increases in emissions of NO_x, CO and VOM from the project were not significant and the project was not a major project. In addition to addressing the new emission units that were part of this project, Construction Permit 97050128 also required UIC to retire the four old boilers to provide the emissions decreases relied upon in permitting the new units.

III. Current Request

UIC has requested revisions to certain limits set by Construction Permit 97050128 on the usages of fuel and the permitted emissions of the boilers and engine-generator systems. The requested revisions do not involve the emission standards that apply to these units. UIC has determined that revisions to the permit limits would enable it to more effectively meet the heating demand of the East Campus. In particular, UIC has determined that to reliably meet the heating demands of the East Campus, it needs to be able to operate the boilers to meet this demand without having to depend upon the engine systems to meet some of the load.⁴ In its original application, UIC assumed that the engine systems would always be available and able help meet the heating load of the East Campus.

UIC has also requested other changes to certain provisions of Construction Permit so that it more accurately and appropriately addresses the boilers and engine-generator systems that UIC constructed pursuant to this permit.

For the three boilers, UIC has requested:

- Higher permitted usage of natural gas by the boilers. The requested future permitted annual fuel usage is 800 million cubic feet, compared to the original limit of 263 million cubic feet.⁵
- Accompanying increases in permitted emissions of the boilers consistent with the increase in permitted usage of natural gas. For this purpose, UIC also addressed emissions of VOM and SO₂, for which limits were not set in the original permit. It also requested that the limits for PM also apply to emissions of particulate matter₁₀ (PM₁₀) and particulate matter_{2.5} (PM_{2.5}).

applied to the project related to its emissions of those pollutant(s) as specified by under either the federal rules for Prevention of Significant Deterioration, 40 CFR 52.21, or Illinois’ rules for Major Stationary Sources Construction and Modification (MSSCAM), depending on the pollutant(s) for which the project would have been a major modification.

³ UIC also addressed the net changes in emissions of PM and SO₂ in its application for this project. The construction permit for the project also addresses the changes in emissions of these pollutants.

⁴ UIC also indicated that the boilers need to be permitted to be able to operate more to address steam loads during periods of severe cold weather. The boilers must also supply steam to additional buildings at the East Campus that have been built since 1997.

⁵ The air pollution control operating permit for UIC’s East Campus, Clean Air Act Permit Program 96080123, sets a higher limit for the annual usage of natural gas by these boilers, 400 million cubic feet/year.

- Removal of provisions for the boilers addressing use of residual fuel oil as the backup fuel. Distillate fuel oil would instead be the designated backup fuel for the boilers. Distillate fuel oil is a cleaner fuel than residual fuel oil, containing less ash and sulfur.
- Lower permitted usage of fuel oil by the boilers. The requested future permitted annual fuel usage is 600,000 gallons, compared to the current limit of 1,200,000 gallons.
- Accompanying changes in permitted emissions due to the lower permitted usage of fuel oil, using updated emission factors for combustion of distillate fuel oil. For this purpose, in addition to emissions of PM, UIC also addressed emissions of PM₁₀ and PM_{2.5}.

For the two engine-generator systems, UIC has requested:

- Lower emission limits for VOM and CO that reflect the control of emissions provided by the afterburners on these units. The reductions in emissions of these pollutants provided by these control systems were not actually considered when the current limits for VOM and CO were developed.
- Limits for emissions of PM and SO₂, for which limits were not set in the original permit. UIC also requested that the new limits for PM also apply to emissions of PM₁₀ and PM_{2.5}.

For both the boilers and the engines, UIC requested changes to the provisions in the permit that specified the emission factors that were to be used to determine compliance with the emission limits set by the permit. The requested changes involved corrections and updates to the factors for certain pollutants.

IV. Discussion on Net Change in Emissions

For the pollutants addressed by the original permit, the potential or permitted annual emissions of the boilers and engines and the net changes in emissions that would be allowed by the draft revised permit are summarized below. The construction of these units would still not be a major project with the proposed revisions to the permit.

Changes in the Potential/Permitted Emissions the Project

Scenario	Potential Emissions (tons/year)				
	CO	NO _x	PM	SO ₂	VOM
Revised	161.72	111.56	7.34	2.56	5.55
Original	166.8	101.9	7.08	0.32	24.53

The net changes in emissions from the project would continue to be not significant. Compared to the original permit, the net increases in emissions of CO and VOM would be lower than originally calculated. The net changes in emissions of NO_x and PM and SO₂ would be higher. However, the

changes for NO_x and PM would still be net decreases. The change for SO₂ would become a slight net increase, rather than a net decrease. Accordingly, the requested revision of the permit does not require a re-evaluation of the project to confirm that it would continue to be a non-major project. Copies of the revised netting analysis and the original netting analysis for the project are provided in Attachments 1 and 2 of this Project Summary.

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

Scenario	Net Change in Emissions (tons/year)				
	CO	NO _x	PM	SO ₂	VOM
Revised Permit	90.22	- 48.94	- 2.61	0.36	1.10
Original Permit	95.32	- 58.63	- 2.87	- 1.88	20.08
Significant Emission Rate	100	40	25	40	25
Change	- 5.1	9.69	0.26	2.24	- 18.98

Emissions of particulate as PM₁₀ and PM_{2.5} and emissions of greenhouse gases (GHG) were not addressed by the original permit.⁶ Changes in emissions of these pollutants from the proposed increase in permitted natural gas usage by the boilers are summarized below. The future emissions, as would be allowed by the draft of the revised permit, are based on the new proposed limits on natural gas usage. The baseline emissions are based on the permitted usage of natural gas for the boilers in the original construction permit. The permitted usage of these boilers is lower than the actual usage of natural gas in recent years. Decreases in emissions due to the change in the backup fuel oil for the boilers are not considered in this assessment.

Changes in PM₁₀, PM_{2.5} and GHG Emissions from Revision of the Permit

Time Period	Change in Emissions (tons/year)	
	PM ₁₀ /PM _{2.5}	GHG (as CO ₂ e)
Future	3.04	48,112
Baseline	1.00	15,816
Change:	2.04	32,296

V. Draft of Revised Construction Permit

The Illinois EPA has prepared a draft of the revised version of the construction permit that it would propose to issue. Most of the conditions in the original construction permit, which set forth the air

⁶ The original permit discusses emissions of PM₁₀ in the text of Condition 1(b). This condition generally addresses the changes in emission from the proposed project, explaining that the project would not be a major project under either the PSD or MSSCAM rules because the net increases in emissions of various pollutants would not be significant. However, the original permit only set limits for PM and did not specify that those limits were also applicable to emissions of PM₁₀.

pollution control requirements that UIC must meet for the units, would be unchanged.

The draft of the revised permit would make the revisions requested by UIC to the limits for fuel usage and emissions. For the boilers, the draft of the revised permit would increase the permitted natural gas usage and emissions of the boilers. It would also provide for use of distillate fuel oil as the backup fuel for the boilers, rather than residual fuel oil. It would also make the requested changes to the permitted emissions of the engine systems. Because the permitted emissions of emission units would change, the revised permit would also include a new summary of the netting analysis for the project in Attachment A of the permit. It would also include a new Attachment B addressing the increases in emissions of PM₁₀, PM_{2.5} and GHG that result from the increase in the permitted fuel usage of the boilers.

In response to UIC's request, the draft of the revised permit would also clarify or correct certain 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 afterburners are present are to be determined considering the reductions in emissions provided by these devices. It would also include new factors for emissions of certain pollutants from these units to reflect current information.

However, the draft of the revised permit would also remove provisions from the permit that would be contrary to the principle of "credible evidence." The provisions that would be removed could potentially be interpreted to suggest that the emission factors that are identified in the permit must be used to determine compliance with the various emission limits set by the permit. In this regard, the draft of the revised permit would specifically indicate that the specific emission rates and emission factors identified in the permit should not be used to determine compliance with emission limits set by the permit if site-specific emission testing or other credible information shows higher emissions.

The draft of the revised permit would also address the National Emission Standards for Hazardous Air Pollutants (NESHAP) that USEPA has adopted since 1997 that are now relevant for boilers and reciprocating engines. The permit would provide that the boilers must be operated as to qualify as "gas fired boilers," pursuant to 40 CFR 63.11195, so they are not subject to standards or requirements pursuant to 40 CFR 63 Subpart JJJJJ, commonly known as the Area Source Boiler NESHAP. For the engines, the permit would indicate that they must comply with applicable requirements of 40 CFR 63 Subpart ZZZZ, commonly known as the Engine NESHAP.

VI. Request for Comments

It is the Illinois EPA's preliminary determination that UIC's application for revision of Construction Permit 97050128 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 – Revised Netting Analysis

Table I – Revised Permitted Emissions of New Equipment

Emission Units	Emissions (Tons/Year)				
	CO	NO _x	PM/PM ₁₀	SO ₂	VOM
Boilers	35.10	18.80	4.03	2.37	2.30
Engines*	126.62	92.76	3.31	0.19	3.25
Total	161.72	111.56	7.34	2.56	5.55

* Emissions after considering afterburner control.

Table II - Historic Actual Emissions of Existing Equipment to be Removed

Emission Unit	Emissions (Tons/Year)				
	CO	NO _x	PM/PM ₁₀	SO ₂	VOM
4 Boilers*	71.5	160.5	9.95	2.2	4.45

* These emissions are an average of 1994 and 1995 reported emissions.

Table III – Revised Changes in Emissions (Tons/Year)

Time Period	Pollutant				
	CO	NO _x	PM/PM ₁₀	SO ₂	VOM
Future Potential	161.72	111.56	7.34	2.56	5.55
Emissions Decrease	71.5	160.5	9.95	2.2	4.45
Net Change	90.22	- 48.94	- 2.61	0.36	1.10

General Note:

This revised permit has implications for the evaluation of the net change in emissions for another, subsequent project by UIC that involved turbines and engines at the West Campus. That project is addressed by Construction Permit 98100093, which was originally issued in April 1999 and then revised in May 2013. With this revised netting, the net changes in emissions of CO, NO_x, SO₂ and VOM of the project will be lower than indicated in Permit 98100093. The net change in emissions of PM₁₀ is higher (i.e., a net increase of 10.25 tons/year in Permit 98100093, rather than 6.75 tons/year) but continues to be less than the significant emissions threshold for PM₁₀ of 15 tons/year.

Attachment 2 – Original Netting Analysis

Table I – Original Permitted Emissions of New Equipment

Emission Units	Emissions (Tons/Year)				
	CO	NO _x	PM	SO ₂	VOM
Boilers	14.57	4.97	7.08	0.32	0.72
Engines*	152.3	96.9	0	0	23.81
Total Emissions	166.8	101.9	7.08	0.32	24.53

* Emissions after afterburner control.

Table II - Historic Actual Emissions of Existing Equipment to be Removed

Item of Equipment	Emissions (Tons/Year)				
	CO	NO _x	PM	SO ₂	VOM
4 Boilers*	71.5	160.5	9.95	2.2	4.45

* These emissions are an average of 1994 and 1995 reported emissions.

Table III - Original Changes in Emissions (Tons/Year)

Time Period	Pollutant				
	CO	NO _x	PM/PM ₁₀	SO ₂	VOM
Future Potential	166.8	101.9	7.08	0.32	24.53
Emissions Decrease	71.5	160.5	9.95	2.2	4.45
Net Change	95.32	- 58.63	- 2.87	- 1.88	20.08