

Illinois Environmental Protection Agency
Bureau of Air, Permit Section
Springfield, Illinois 62794-9276

JANUARY 2014

Project Summary for a
Revision of the Construction Permit for the
Renewable Energy Center at
Eastern Illinois University
Charleston, Illinois

Site Identification No.: 029010AAK
Construction Permit Application/Permit No.: 09070002

Schedule

Public Comment Period Begins: January 24, 2014
Public Comment Period Closes: February 23, 2014

Illinois EPA Contacts

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I. INTRODUCTION

Eastern Illinois University (EIU) has requested a revision to an air pollution control construction permit for its new Renewable Energy Center (Energy Center). The construction permit was originally issued in November 2009. The Energy Center supplies steam for heating and cooling university buildings. This facility replaced EIU's old steam plant that used coal as its principal fuel. The requested revision would adjust the permitted capacities of the gasifier-boiler units; adjust various permit limits for emissions of NO_x and other pollutants to address the results of initial operational and emission testing of the units; and make other related changes to the provisions of the permit.

The Illinois Environmental Protection Agency (Illinois EPA) has reviewed EIU's request for revision of this construction permit 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 the revised permit and on the proposed changes to the permit, as set forth in the draft revised permit.

II. BACKGROUND

The Energy Center supplies steam for heating and cooling university buildings. It replaced EIU's old steam plant located near the center of the campus. The former steam plant used coal as its principal fuel. The construction permit for the new Energy Center, Permit 09070002, was issued on November 6, 2009. The Energy Center began operation in the summer of 2011.

The Energy Center has two gasifier-boiler units that are fired with biomass. The principal fuel is chipped wood and bark, obtained from forestry, lumber production and tree trimming operations. The first part of each gasifier-boiler unit, the gasifier, processes the biomass fuel or feedstock to produce a hot fuel gas. This fuel gas is mixed with additional air and combustion is carried to completion in a separate combustion chamber. The hot combustion gases pass to a boiler in which the thermal energy of the hot gases is recovered as steam.

The gasifier boiler units emit particulate matter (PM), nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic material (VOM) and sulfur dioxide (SO₂).¹ PM emissions are controlled by multi-tube cyclones followed by a common electrostatic precipitator (ESP) device. ESPs apply an electrical charge to particles in the flue gas. The charged particles move toward the grounded collection plates, where they accumulate. ESPs can have high efficiencies due to the strong electrical forces applied to the small particles. Emissions of NO_x are minimized by the staged combustion that is present with the gasifier-boiler system. Emissions of CO and VOM are minimized by good combustion practices. Emissions of SO₂ are minimized by the low sulfur content of wood chips and other biomass fuels.

The Energy Center also has two natural gas/oil fired boilers. Natural gas is the primary fuel for these boilers. Distillate oil is a backup fuel, enabling these boilers to continue to operate in the event of interruptions in the supply of natural gas.

¹ The boilers also emit carbon dioxide and other greenhouse gases. Greenhouse gases were not a regulated air pollutant when the Energy Center was developed.

The Energy Center also has a small emergency electrical engine generator to provide back-up power to the Energy Center.

III. REQUESTED REVISIONS TO THE PERMIT

EIU has requested revisions to certain provisions of the air pollution control construction permit for the Energy Center that apply to the gasifier-boiler units. The requested revisions reflect the actual capabilities and performance of these units.

- With respect to the permitted capacity of the units, EIU has requested a small increase in the capacity of one unit (from 52.1 to 54.2 million Btu/hr). It has also requested a small decrease in the capacity of the other unit (from 62.2 to 57.3 million Btu/hr). These changes reflect the demonstrated capacities of the units. Overall, the combined permitted capacity of the two units would be lower.
- With respect to emissions of NO_x, EIU has requested higher permitted emissions of NO_x on a short-term basis. This is because the units cannot reliably meet the short-term NO_x emission rates that were originally projected, which were set as limits in the permit. EIU attributes this to higher quality fuel and better operational efficiency than expected, which results in higher combustion flame temperatures. EIU has not requested increases in the permitted annual NO_x emissions of the units. To accomplish this, EIU has proposed a lower limit for the fuel usage for these units than in the original permit, 58,000 tons/year instead of 72,000 tons/year. This reduction in permitted fuel usage is possible because the thermal efficiency of the units is better than projected. The lower fuel usage also reflects a re-evaluation of operating projections for the units based on historical data and projected steam needs.
- With respect to emissions of pollutants other than NO_x, EIU has requested lower permitted annual emissions. This is a result of the reduction in the permitted fuel usage of these units. EIU has also requested adjustments, both higher and lower, in permitted short-term emissions of other pollutants due to the changes in the permitted capacities of the units.

For the natural gas/oil fired boilers EIU has also requested small increases in the permitted annual emissions of NO_x and CO. This would address increases in the potential usage of these boilers compared to the original projections for their usage.

For the gasifier-boiler units and the natural gas/oil fired boilers, EIU has also requested authorization to use an additional, alternative approach to track the actual emissions of these units.² This approach would involve operating a data acquisition system that records hourly operating parameters for each unit. Computer software would then use reference values for emissions of each unit for different pollutants in various modes of operation to determine the actual emissions of the units on an ongoing basis.

² The original permit provides that EIU must either comply with limits for the annual operating hours of the gasifier boiler units and the natural gas/oil boilers or conduct continuous emissions monitoring for the gasifier-boiler units for NO_x.

IV. PROJECT EMISSIONS

The potential or permitted annual emissions of the Energy Center, as would be allowed by the draft permit, are summarized below. As discussed, permitted emissions of all pollutants other than NO_x would be lower than allowed by the original construction permit. Permitted annual emissions of NO_x would not change.

Permitted Annual Emissions of the Energy Center (Tons/Year)

Pollutant	NO _x	CO	VOM	PM/PM ₁₀ ³	PM _{2.5} ³	SO ₂
Revised	97.3	78.3	4.8	9.8	7.2	26.3
Original	97.3	98.0	7.4	13.1	9.9	33.3

The Energy Center was originally permitted as a non-major project not subject to the federal regulations for Prevention of Significant Deterioration (PSD), 40 CFR 52.21, for any pollutants. Because the requested revisions to the permit would not increase the permitted emissions of the Energy Center for any regulated pollutants, the requested revision of the permit does not require a re-evaluation of the Energy Center to confirm that it would continue to be a non-major project. In particular, for emissions of pollutants other than NO_x, the project would continue to not be significant. For emissions of NO_x, the project originally relied on decreases in emissions from the shutdown of the existing steam plant, which was replaced by the new facility. The net increase in NO_x emissions would continue to be 39.4 tons per year, which is not significant.⁴

V. APPLICABLE EMISSION STANDARDS

The issuance of a revised permit would not affect the emission standards that apply to gasifier-boiler units. Performance testing conducted for these units shows that they generally comply with applicable Illinois emission standards at 35 IAC Subtitle B, which limit emissions of particulate matter, sulfur dioxide and carbon monoxide and opacity from these units.⁵ For these units, compliance is also shown with the federal New Source Performance Standards (NSPS) for Small Industrial- Commercial-Institutional Steam Generating Units, 40 CFR 60 Subpart Dc, which limit emissions of particulate matter and opacity from these units.

Since the original permit was issued, USEPA has adopted standards that will apply to the emissions of hazardous air pollutants for the gasifier-boiler units, the National Emissions Standards for Hazardous Air Pollutants for Air Pollutants (NESHAP) for Area Source Steam Generating Units and Process Units, 40 CFR 63 Subpart JJJJJJ. These rules, commonly known as the Area Source Boiler NESHAP, would require EIU to

³ For PM/PM₁₀ and PM_{2.5}, this table only provides data for emissions of filterable particulate. This is because condensable particulate was not a regulated pollutant for purposes of permitting when the original construction permit for the Energy Center was issued.

⁴ The difference between the permitted NO_x emissions of the Energy Center, 97.3 tons/year, and the past actual NO_x emissions of the steam plant, 57.9 tons/year, continues to be 39.4 tons/year.

⁵ The applicable state standard for CO emissions from boilers, 35 IAC 216.121, limits emissions to 200 ppm, at 50 percent excess air. Because of the design of the gasifier/boiler units, with gasification preceding combustion, these units are unable to comply with 35 IAC 216.121 when they are being shutdown and biomass fuel is no longer being fed to the units. EIU currently plans to address this by pursuing an adjusted standard before the Illinois Pollution Control Board so that 35 IAC 216.121 would not be applicable during shutdown.

conduct combustion tune-ups for these units at least every two years to facilitate efficient combustion and reduce emissions, with an initial tune-up conducted by March 21, 2014.⁶

VI. CONTENTS OF DRAFT OF THE REVISED PERMIT

The Illinois EPA has prepared a draft of the revised construction permit that it would propose to issue for the Energy Center. Most of conditions in the original construction permit, which set forth the air pollution control requirements that EIU must meet for the Energy Center, would be unchanged. These requirements would include the applicable emission standards that apply to the emission units at the Energy Center. The revised permit would also address new requirements that apply pursuant to the Area Source Boiler NESHAP.

Changes to emission limits would be made consistent with EIU's request. As set out in the draft of the revised permit, new limits would be set for permitted emissions consistent with EIU's request. In addition, to changes to emission limits, the revised draft permit would also lower the permitted fuel usage of the gasifier-boiler units.

The revised draft permit also continues to specify compliance procedures for the ongoing operation of emission units, including required work practices, opacity monitoring, recordkeeping, and reporting. These measures are imposed to assure that the operation and emissions of the source are appropriately tracked to confirm compliance with the various limitations and requirements established for individual emission units. As requested by EIU, for the gasifier-boiler units and the natural gas/oil boilers, the draft permit would allow use of a data acquisition system to determine emissions for purposes of verifying ongoing compliance with the emission limits set by the permit. In conjunction with the initial emissions testing that has been conducted for these units, a data acquisition system can provide credible emission data for gasifier-boiler units to reliably address compliance with the emission limits that are set for these units. The draft permit would also continue to allow continuous emission monitoring for NOx for the gasifier-boiler units as provided for by the original permit. However, the draft permit would require that if EIU elects to conduct emissions monitoring for the gasifier-boiler units, emissions monitoring must be conducted for both NOx and CO.

VII. REQUEST FOR COMMENTS

It is the Illinois EPA's preliminary determination that the proposed revisions to the permit meet all applicable state and federal air pollution control requirements. The Illinois EPA is therefore proposing to issue a revised construction permit for the Energy Center.

Comments are requested on this proposed action by the Illinois EPA and the proposed revisions to the permit.

⁶ For the gas/oil fired boilers, the Area Source Boiler NESHAP now requires EIU to conduct combustion tune-ups at least every five years.