Illinois Environmental Protection Agency
Bureau of Air, Permit Section
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PROJECT SUMMARY FOR AN CONSTRUCTION PERMIT APPLICATION FROM COUNTRYSIDE GENCO, LLC FOR INSTALLATIONS OF FOUR COMBUSTION TURBINES AT ITS GAS-TO-ENERGY FACILITY AT THE COUNTRYSIDE LANDFILL IN GRAYSLAKE, ILLINOIS

Facility Identification and Application Numbers:

Countryside Genco, LLC; ID 097025AAR
Permit/Application No. 11080061

Schedule

Public Comment Period Begins: October 11, 2011
Public Availability Session: October 25, 2011
Public Comment Period Closes: November 8, 2011

Illinois EPA Contacts

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I. INTRODUCTION

Countryside Genco, LLC has submitted a construction permit application to the Illinois Environmental Protection Agency, Bureau of Air (Illinois EPA) to install four combustion turbines at its existing landfill gas-to-energy facility adjacent to the Countryside Landfill. This gas-to-energy facility (the facility) uses landfill gas (LFG) collected at the Countryside Landfill as fuel to generate electricity. The proposed turbines would replace the six reciprocating engines at this facility.

The Illinois EPA has reviewed the application and made a preliminary determination that the application for this project meets applicable requirements. However, before issuing this permit, the Illinois EPA is providing a public comment period to receive comments on this action. The Illinois EPA has prepared a draft of the construction permit that it would propose to issue for public review and comment.

II. BACKGROUND

The Countryside landfill, which supplies LFG to the Countryside Genco gas-to-energy facility, is a municipal solid waste (MSW) landfill developed for the final disposal of household and commercial waste along with other types of wastes that do not have to be handled as hazardous waste. It is owned and operated by Waste Management of Illinois, Inc.

As a general matter, MSW landfills are stationary sources of emissions from fugitive particulate matter resulting from earth moving and vehicle traffic on roadways at the landfill. MSW landfills are also potential sources of emissions resulting from biological degradation of waste materials deposited in the landfill. The resulting LFG is composed primarily of methane (CH_4) and carbon dioxide ($C0_2$).[1] Trace amounts of other constituents are also present in LFG, including nonmethane organic compounds (NMOC)[2] and hydrogen sulfide (H_2S). During the operating life of the landfill vertical and horizontal collectors are placed within the landfill to collect the LFG that is generated. The collected LFG is typically combusted in a flare or utilized as fuel for a beneficial purpose, to control the emissions of LFG. The emissions from the control devices include carbon monoxide (CO), nitrogen oxides (NOx), and sulfur dioxide ($S0_2$). The emission rates depend on the composition of the LFG from the landfill, the LFG generation rate, and the type(s) of equipment that are used as the control device for the LFG.

The Countryside Genco facility currently has six reciprocating engines that use landfill gas collected at the Countryside Landfill to generate electricity. The Countryside Landfill currently has two flares to combust collected LFG. The flares combust LFG that Countryside Genco facility does not have the capacity to use. The flares also serve as a backup to this facility, when a turbine(s) at the facility is inoperable and the facility is unable to use all the LFG that is available from the landfill.

Separate from the application for installation of combustion turbines, separate permit application are currently pending from both Countryside Genco and the Countryside Landfill to increase permit limits for SO_2 emissions to address new data for the composition of the LFG generated by the Countryside Landfill. This data shows more

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[1] The generation of methane and carbon dioxide by a landfill is mediated by microorganisms that are adapted for anaerobic conditions. Gas generation proceeds through four phases. The first phase is aerobic (i.e., with oxygen (0_2) available from air trapped in the waste) and the primary gas produced is carbon dioxide ($C0_2$). The second phase is characterized by oxygen depletion, resulting in an anaerobic environment, with large amounts of CO_2 and some hydrogen (H_2) produced. In the third phase, methane (CH_4) production begins, with an accompanying reduction in the amount of CO_2 produced. Nitrogen (N_2) content is initially high in LFG in the first phase, and declines sharply as the landfill proceeds through the second and third phases. In the fourth phase, gas production of methane, carbon dioxide, and nitrogen becomes fairly steady. The duration of each phase and the total time of gas generation vary with landfill conditions (i.e., waste composition, design management, and anaerobic state).

[2] As applied to emissions of LFG, NMOC is generally synonymous with volatile organic material (VOM). A portion the NMOC is composed of various organic hazardous air pollutants (HAP). NMOC also commonly contains ozone depleting substances, i.e., organic compounds associated with stratospheric ozone depletion.

hydrogen sulfide in the gas,[3] compared to the data provided in the original application. This has resulted in emissions of sulfur dioxide from combustion of LFG that is higher than the limits in the current permit for the facility.[4] The Illinois EPA has not yet taken action on these applications. It is awaiting the results of air quality dispersion modeling from Waste Management to confirm that the requested increases in SO_2 emissions will not threaten ambient air quality for SO_2, as compared to the National Ambient Air Quality Standards for SO_2 adopted by the USEPA.

III. CURRENT APPLICATION

This current application submitted by Countryside Genco addresses installation of four combustion turbines, each with a nominal electrical rating of 2.5 MW. These turbines would replace the six engines currently at this facility, which each have a nominal capacity of 1.33 MW each. The replacement of the engines with turbines would allow the facility to use more of the LFG generated by the Countryside Landfill.

The use of turbines, as compared to the existing engines, should reduce the emissions of nitrogen oxides (NOx) from the facility. This is because the turbines, which will have low-NOx combustors and will emit less NOx than the existing engines. The switch to turbines will not directly affect the rate of SO_2 emissions from the facility, per cubic foot of LFG gas that is used. This is because the SO_2 emission rate is determined by the sulfur content of the LFG. However, because the capacity of the gas-to-energy facility will increase, more of the SO_2 emissions from the source will occur at this facility, rather than the flares located at the landfill.

IV. APPLICABLE EMISSION STANDARDS

The proposed combustion turbines would be subject to the applicable NSPS standards for the Combustion Turbines, 40 CFR 60 Subpart KKKK (the Turbine NSPS). Pursuant to this NSPS, for the affected turbines, which will each have a heat input less than 50 mmBtu/hr and fire biogas to generate electricity, the emissions of nitrogen oxides (NOx) from each turbine shall not exceed 96 ppm at 15 percent oxygen or 5.5.lb/MW-hr useful output. Emissions of sulfur dioxide (SO_2) shall not exceed 0.15 lb SO_2/mmBtu heat input.

The application indicates that the facility, with combustion turbines, would be equipped and operated so as to comply with the applicable emission standards.

V. EMISSIONS

The potential or permitted emissions from the turbines and the facility are summarized below. The potential emissions represent the maximum emissions of the facility as would be allowed by this construction permit. The determination of the facility's potential emissions considers the capacity of the turbines and continuous operation. The actual emissions of the facility would commonly be less than its potential emissions. This is because the landfill would not be generating LFG at peak rates. In addition, the levels of NMOC, hydrogen sulfide and other

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[3] One component of LFG that can vary greatly between landfills is hydrogen sulfide (H_2S). According to USEPA, *Compilation of Air Pollutant Emissions Factors*, AP-42, H_2S is normally present in LFG at levels that do not exceed 90 ppm, with an average concentration of 33 ppm. However, a recent trend at some landfills has been the use of shredded construction and demolition waste as daily cover. Under certain conditions that are not yet well understood, some microorganisms will rapidly convert the sulfur in the shredded wall-board present in this waste to H_2S. At these landfills, H_2S concentrations can be significantly higher than at MSW landfills that do not use this waste as daily cover. This effect from use of construction and demolition was generally not anticipated. Because of this phenomenon, USEPA recommends that actual measurements be used to determine the H_2S content of LFG and calculate emissions of sulfur dioxide at MSW landfills where construction and demolition waste has been used as daily cover at a landfill or was otherwise present in significant quantities in the waste deposited in the landfill.

[4] Countryside Genco's requested a revision to limits set in Construction Permit 98050077. Waste Management has applied for revision to the limits for the emissions of the two flares set by Construction Permit 98100039.

constituents in LFG contributing to emissions would be less than the maximum concentrations used for the determination of potential emissions.

Pollutant	Emissions (tons/year)
Nitrogen Oxides (NO_x)	76.0
Carbon Monoxide (CO)	239.0
Sulfur Dioxide (SO_2)	78.9
Particulate Matter (PM/PM_{10})	12.5
Volatile Organic Material(VOM)/ Nonmethane Organic Compounds (NMOC)	7.1
Individual Hazardous Air Pollutant (HAP)	1.7

VI. APPLICABILITY OF NEW SOURCE REVIEW

This project, i.e., the installation of combustion turbines replacing engines at the facility, does not constitute applicability of federal rules for Prevention of Significant Deterioration of Air Quality (PSD), 40 CFR 52.21 and state rules for Major Stationary Sources Construction and Modification (MSSCAM), 35 IAC Part 203. For emissions of NOx, as related to MSSCAM, this is because the project will be accompanied by a net decrease in the NOx emissions of the source, i.e., the combination of the gas-to-energy facility and the Countryside Landfill, as described in Attachment 2 of the draft permit. Otherwise, this is because, the source was not a major source of emissions for NSR pollutants prior to this project.[5] As reflected in the emission limits that would be established in the draft permit, the source must continue to be a non-major source following this project for purposes of PSD and, as applicable, MSSCAM.

VII. PERMIT CONDITIONS

The conditions of the construction permit for the combustion turbines would set forth the applicable additional air pollution control requirements that the Countryside Genco must meet for the gas-to-energy facility with the turbines. These limits would be accompanied by provisions to provide practical enforceability of the limits. For example, the permit would require additional sampling and analysis of collected LFG for its sulfur content. The construction permit would also clarify applicable regulatory requirements that apply to the facility.

VIII. REQUEST FOR COMMENTS

It is the Illinois EPA's preliminary determination that Countryside Genco's application meets applicable state and federal air pollution control requirements. Illinois EPA is therefore proposing to issue a constructions permit for installation of four combustion turbines. Comments are requested on this proposed action by Illinois EPA and the conditions of the draft permit.

[5] Based on the information provided in the application for the actual SO_2 emissions of the source for the past three years (Nov 2008 through Jul-2011), the source has never exceeded the major source threshold limits of 100 tons/year.