

Illinois Environmental Protection Agency
Bureau of Air, Permit Section
1021 N. Grand Avenue East
Springfield, Illinois 62794-9276

PROJECT SUMMARY FOR AN
APPLICATION FROM
WINNEBAGO ENERGY CENTER LLC FOR A
REVISED CONSTRUCTION PERMIT FOR
THE GAS-TO-ENERGY FACILITY
ASSOCIATED WITH THE
WINNEBAGO LANDFILL NEAR
ROCKFORD, ILLINOIS

Facility Identification and Permit/Application Numbers:

Winnebago Energy Center; ID 201801AAN
Permit/Application 07030094

Schedule

Public Comment Period Begins: May 23, 2011
Public Availability Session: May 31, 2011
Public Comment Period Closes: June 22, 2011

Illinois EPA Contacts

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I. INTRODUCTION

Winnebago Energy Center, LLC, has requested revisions to the air pollution control construction permit for its existing gas-to-energy facility associated with the Winnebago Landfill south of Rockford. This facility uses landfill gas (LFG) collected from this landfill as fuel in four engine-generators. The requested revisions would increase the permitted emissions of the facility to reflect site specific information for the sulfur content of the LFG being generated by this landfill.

The Illinois Environmental Protection Agency, Bureau of Air (Illinois EPA) has reviewed the application and made a preliminary determination that the requested changes meet the applicable requirements. However, before issuing a revised 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 revised construction permit that it would propose to issue for public review and comment.

II. BACKGROUND

The Winnebago Landfill 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. 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 (CH₄) and carbon dioxide (CO₂).¹ Trace amounts of other constituents are also present in LFG, including nonmethane organic compounds (NMOC)² and hydrogen sulfide (H₂S). 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 (NO_x), and sulfur dioxide (SO₂). 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 Winnebago Energy Center operates the existing gas-to-energy facility that uses LFG collected from the Winnebago Landfill as fuel to generate electricity. The Winnebago Energy Center is a separate company from Winnebago Reclamation Service, the operator of the landfill.³ The Winnebago Energy Center uses LFG collected from the North and South Units at the Winnebago landfill as fuel in four engines-generators. The flares at the landfill serve as a backup to the landfill gas treatment system and engines at this gas-to-energy facility, when an engine is not operable or the flow of LFG is more than the engines can handle.

III. CURRENT APPLICATIONS

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 (O₂) available from air trapped in the waste) and the primary gas produced is carbon dioxide (CO₂). The second phase is characterized by oxygen depletion, resulting in an anaerobic environment, with large amounts of CO₂ and some hydrogen (H₂) produced. In the third phase, methane (CH₄) production begins, with an accompanying reduction in the amount of CO₂ produced. Nitrogen (N₂) 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.

³ The Winnebago Landfill and the Winnebago Energy Center, are considered to be a single source pursuant to 40 CFR 52.21(b) (6), 35 211.6130, and Section 39.5(1) of Illinois' Environmental Protection Act.

Winnebago Reclamation Service has requested revisions to the air pollution control construction permits for its gas-to-energy facility at the Winnebago Landfill.⁴ The requested revisions would address new, site specific data on the composition of the LFG generated within the landfills to reflect higher levels of compounds in the LFG collected from the South Unit that was not anticipated in the original applications.⁵ This has resulted in emissions of sulfur dioxide (SO₂) from combustion of LFG that are higher than projected in the initial application and addressed in the current permit.

IV. APPLICABLE EMISSION STANDARDS

Because it is associated with the Winnebago Landfill, Winnebago Energy Center's gas-to-energy facility is subject to the federal New Source Performance Standards (NSPS) for MSW landfill at 40 CFR 60 Subparts WWW. This NSPS requires control of emissions of nonmethane organic compounds (NMOC) in LFG at large MSW landfills that are constructed or expanded after May 30, 1991, such as the North and South Units landfills, if the calculated emissions of NMOC from these units in the absence of any control would be 55 tons per year (50 Megagrams per year) or more. The LFG at a landfill that is subject to this NSPS must be collected by a well-designed and well-operated gas collection system.⁶ One option under the NSPS for control of collected LFG is to appropriately process the gas to remove NMOC before combusting it. This option is commonly used when the collected LFG will be used as fuel in an engines or boilers to beneficially use the LFG and recover its energy value as either electricity or steam.⁷

The Winnebago Energy Center is also subject the applicable requirements of the NESHAP for Stationary Reciprocating Internal Combustion Engines, 40 CFR 63 Subpart ZZZZ, for each affected engine that meets the applicability provisions of this NESHAP, (e.g., the engine is manufactured after June 11, 2006). In particular, pursuant to this NESHAP, 40 CFR 623.6590(c), each such subject engine shall comply with the applicable requirements of the NSPS for Stationary Spark Ignition Internal Combustion Engines, 40 CFR 60 Subpart JJJJ (the Engine NSPS).

The Winnebago Energy Center is also subject to the federal National Emission Standards for Hazardous Air Pollutants (NESHAP) for MSW landfills, 40 CFR 63 Subpart AAAA. This NESHAP requires control of the same landfills and has the same requirements for control of emissions as the landfill NSPS. The NESHAP also requires the operator of a subject landfill and the associated gas-to-energy facility to maintain and implement a

⁴ Winnebago Reclamation Service has also applied for revision to its construction permits for two flares to reflect the site specific information for the sulfur content of the LFG collected at the Winnebago Landfill. (Construction Permits 02040025 and 04120073).

⁵ One component of LFG that can vary greatly between landfills is hydrogen sulfide (H₂S). According to USEPA, *Compilation of Air Pollutant Emissions Factors*, AP-42, H₂S 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 H₂S. At these landfills, H₂S 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 H₂S 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.

⁶ The effectiveness of the LFG collection system is addressed by an operation standard that requires the methane concentrations at the surface of the landfill to be measured on a regular basis. If excessive levels of methane are detected, (i.e., more than 500 ppm after three consecutive measurements), the LFG collection system must be expanded or enhanced to accommodate the excess LPG.

⁷ Under the NSPS, collected LFG may also be controlled by combustion in an appropriate control device, such as an open flare that meets certain specific design and operating requirements or an enclosed flare that reduces the NMOC in the collected LFG by at least 98 weight-percent or to no more than 20 ppmv in the exhaust.

Startup, Shutdown, and Malfunction Plan to facilitate proper operation of the LFG control systems at all times to the extent practical.

The Winnebago Energy Center is equipped and operated so as to comply with the applicable requirements of the NSPS and NESHAP standards, as well as with applicable state emission standards.

IV. EMISSIONS

The potential or permitted emissions of the existing source (i.e., the combination of the Winnebago Energy Center and the North and South Units at the Winnebago Landfill, as requested in their respective application for the revised construction permits for the engines and flares engines, are summarized below. The potential emissions represent the maximum emissions of the existing source as would be allowed by the revised construction permits. The determination of the source's potential emissions considers the calculated maximum amount of LFG that would be generated from the North and South Unit landfills, the maximum LFG burning capacity of the flares and the engines, emissions factors from on-site emission testing, manufacturer's emission data, and emission factors from USEPA's *Compilation of Air Pollutant Emission Factors* (AP-42). The actual emissions of the existing source 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 constituents in LFG contributing to emissions would be less than the maximum concentrations used for the determination of potential emissions.

Pollutant	Potential Emissions (tons/year)
Nitrogen Oxides (NO _x)	225
Carbon Monoxide (CO)	235
Sulfur Dioxide (SO ₂)	245

V. APPLICABILITY OF THE FEDERAL PSD PROGRAM

The existing source is not considered a major project under the federal rules for Prevention of Significant Deterioration of Air Quality (PSD), 40 CFR 52.21. This is because the source was not a major source, prior to these modifications, and continues to be a non-major source, as the emissions in these revised permits for the open flares and the engines are less than the applicability thresholds of the PSD.

VI. PERMIT CONDITIONS

The conditions of the draft revised permit would set forth additional air pollution control requirements that the Winnebago Energy must meet for the operations of its gas-to-energy facility. The revised construction permits would also allow higher SO₂ emissions from the existing source, reflecting the new data for composition of LFG. 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, which could be conducted either by the Winnebago Energy Center or Winnebago reclamation. The revised permit would also clarify applicable regulatory requirements that apply to the gas-to-energy facility.

VII. REQUEST FOR COMMENTS

It is the Illinois EPA's preliminary determination that the application for revised permit from the Winnebago

Energy Center meets applicable state and federal air pollution control requirements. Illinois EPA is therefore proposing to issue a revised construction permit. Comments are requested on this proposed action by Illinois EPA and the conditions of the draft of the revised permit.