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BUREAU OF AIR, PERMIT SECTION  
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PROJECT SUMMARY  
FOR A CONSTRUCTION PERMIT APPLICATION  
FROM  
EMERALD RENEWABLE ENERGY - TUSCOLA, LLC  
FOR A  
ETHANOL PLANT  
IN TUSCOLA, ILLINOIS

Site Identification No.: 041808AAO  
Application No.: 06120054  
Date Received: December 26, 2006

Schedule

Public Comment Period Begins: August 21, 2007  
Public Comment Period Closes: September 20, 2007

Illinois EPA Contacts

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## **I. INTRODUCTION**

Emerald Renewable Energy - Tuscola, LLC (Emerald Renewable Energy) has submitted an application to construct a fuel ethanol plant in Tuscola. The construction of the proposed plant requires a permit from the Illinois EPA because the plant would be a source of emissions.

The Illinois EPA has reviewed the application and made a preliminary determination that the application for the proposed project meets applicable requirements. Accordingly, the Illinois EPA has prepared a draft of the construction permit that it would propose to issue for the proposed plant. However, before issuing this permit, the Illinois EPA is holding a public comment period to receive written comments on the proposed issuance of a permit and the terms and conditions of the draft permit.

## **II. PROJECT DESCRIPTION**

Emerald Renewable Energy has proposed to construct a plant to produce ethanol from corn. The Plant would be designed to have nominal capacity of 115.5 million gallons denatured ethanol per year. The denatured ethanol produced by the plant would be used as motor vehicle fuel. When added to gasoline, ethanol is an octane enhancer and oxygenated fuel additive, which reduces hydrocarbon and carbon monoxide emissions in vehicle exhaust. The plant would produce ethanol by fermentation of ground corn, followed by processing to separate out and purify the ethanol. The plant would also produce animal feed from the stillage material remaining after the fermentation process. The plant would have facilities to receive and ship out products (grain, fuel ethanol, and feed) by both truck and rail. Natural gas would be used as the fuel for the plant.

The proposed plant would have grain elevator, at which corn would be received and stored. The first step in the production of ethanol by fermentation is to prepare the corn. Corn would be transferred from the elevator to the ethanol plant. The corn is first milled or ground, mixed with water, and heated, producing fine slurry. Enzymes are then added to convert the starch in the corn into sugar. The resulting mash is then sterilized before sent for fermentation.

Fermentation would be performed on a batch basis in seven separate fermentation tanks. The seven tanks would continuously cycle through the fermentation process. At any time, one tank would normally be undergoing the steps between a batch, i.e., transfer of the tank's contents to the beer well (where it is temporarily held while awaiting distillation), thorough cleaning of the interior of the tank with automated equipment (to prevent buildup of undesired microorganisms), and charging of the tank with fresh mash. Fermentation would normally be taking place in the other six tanks, one tank just beginning fermentation, one finishing up, and the other tanks at intermediate points in the process.

A distillation system would be used to separate the ethanol from the beer from the fermentation tanks. The ethanol would be further refined to water-free, 200 proof, ethanol using a molecular sieve. The ethanol would be denatured with natural gasoline, stored in floating roof tanks, and shipped to customers by both truck and rail.

The non-ethanol “Stillage” recovered from the distillation system would be further processed to separate and recover water, which would be reused at the plant, and feed material. First the whole stillage would be processed by centrifuges to mechanically recover solids, with solid rich thick stillage then sent to thermal dryers. The water-laden thin stillage from centrifuges would be further processed with evaporators to separate and recover water, leaving behind nutrient-rich thick syrup. The thick syrup would also be dried with the thick stillage in the dryers to produce animal feed, i.e., dried distillers grain with solubles or DDGS.

The proposed plant would have two natural gas-fired dryer systems, with total capacity to be able to fully dry all feed material produced by the plant. Each dryer system would have be followed by a natural gas fired afterburner or oxidizer. In addition to controlling emissions of from feed drying (carbon monoxide, volatile organic material and particulate matter), each oxidizer would also control emissions from certain emission units in mash preparation and fermentation, which are vented through the fermentation scrubber, and certain units in distillation.

### **III. PROJECT EMISSIONS**

The proposed fuel ethanol plant would use appropriate equipment for effective control of emissions from the various operations at the plant. Fabric filters would be used to control particulate matter emissions from the principle grain handling operations at the elevator and from milling of grain. Fabric filter would also be used to control particulate matter emissions from the handling and load out of the dried feed.

A fermentation scrubber would recover ethanol and other organic compounds in the exhaust of certain emission units in mash preparation and fermentation prior to venting to the oxidizers for control. The organic material laden water from this scrubber would be reused at the plant, so that the scrubber would not be a source of wastewater.

Combustion control, with natural gas fired thermal oxidizers, would be used to control emissions of organic material, carbon monoxide and particulate matter from the natural gas-fired feed dryers, which complete the conversion of wet stillage into dry feed. These oxidizers, as well as the natural gas fired dryers, would be equipped with low-NO<sub>x</sub> burners to minimize nitrogen oxide emissions. The oxidizer systems would also control the organic material emissions from certain emission units in distillation and feed dewatering area

As a result of this emission control equipment and other equipment and control measures that would be used at the source, Emerald Renewable Energy has proposed to control emissions of the source so that it would not be a major source subject to the Clean Air Act Permit Program (CAAPP) after the start up of the fuel ethanol plant. Annual emissions from the source would be limited to no more than 98.5 tons of each criteria pollutant (particulate matter, nitrogen oxides (NO<sub>x</sub>), carbon monoxide, etc.), 9.8 tons of any single hazardous air pollutant<sup>1</sup> and 20 tons of

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<sup>1</sup> While most of the organic material emissions of the proposed plant would be ethanol, the plant would also have emissions of organic compounds, such as acetaldehyde, formaldehyde and methanol, which are listed as hazardous air pollutants by Section 112(b) of the federal Clean Air Act.

total hazardous air pollutants.<sup>2</sup> These limits are based on data for the maximum emissions of the proposed plant and represent its permitted emissions. Actual emissions of the plant would be less than these limits to the extent that the actual performance of the equipment is better than projected and the plant does not operate at its capacity.

In addition to stack emissions, the limits on the source's emission would address organic material emissions from leaking equipment components, such as valves, flanges, pressure relief devices, pump seals, etc., involved with fermentation and the subsequent handling of product ethanol. (These emissions would be minimized with a Leak Detection and Repair Program, with regular inspections of components for leaks and timely repairs of any leaking components.) The limits for particulate matter emissions also address fugitive dust generated by vehicle traffic and wind blown dust on roadways and parking lots at the source. (These emissions would be minimized by paving of plant roads and a Fugitive Dust Control Program.)

#### **IV. APPLICABLE EMISSION STANDARDS**

All emission units in Illinois must comply with State emission standards adopted by the Illinois Pollution Control Board (35 Illinois Administrative Code, Subtitle B, Chapter I, Subchapter c). These emission standards represent the basic requirements for units in Illinois. The emission units at the proposed ethanol plant should readily comply with applicable state emission standards.

Certain emissions units at the proposed plant would also be subject to the federal New Source Performance Standards (NSPS), at 40 CFR 60, which the Illinois EPA administers for source in Illinois on behalf of the United States EPA under a delegation agreement. These units include the boiler systems (40 CFR 60, Subpart Db), engine for fire pump backup (40 CFR 60, Subpart III), product ethanol storage tanks (40 CFR 60, Subpart Kb) and component leaks in the distillation area (40 CFR 60, Subpart VV). These units should also readily comply with applicable NSPS standards and requirements.

#### **V. APPLICABLE REGULATORY PROGRAMS**

This plant is not considered a new major stationary source under the federal rules for Prevention of Significant Deterioration of Air Quality (PSD), 40 CFR 52.21. This is because the potential emissions from the proposed facility, as limited by the permit, would be less than the major source thresholds for PSD.

#### **VI. PROPOSED PERMIT**

The permit that the Illinois EPA is proposing to issue for the proposed plant includes a variety of requirements to ensure that the plant is properly constructed and operated. The permit contains limitations and requirements for the various operations at the plant to help assure that the source

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<sup>2</sup> The draft permit would limit emissions from the source to less than the thresholds for a major source under the Clean Air Act Permit Program (CAAPP), e.g., annual emissions of 100 tons or more of an individual criteria pollutant, with a margin of compliance to assure that the actual emissions of this source are both enforceably and practically constrained to levels below those at which it would be a major source required to have a CAAPP permit.

complies with applicable regulatory requirements. The permit also identifies measures that must be used as good air pollution control practices to minimize emissions.

The permit includes enforceable limits on emissions and operation to assure that this project would not be a major project subject to the PSD rules. In addition to limiting annual emissions of different operations, the permit also includes short-term limits on hourly emissions and requirements for proper operation of control systems. The permit also includes annual and monthly operational limitations on production of ethanol and feed and usage of grain natural gas.

The permit also establishes appropriate compliance procedures for the source, including requirements for emission testing, monitoring, recordkeeping, and reporting. These measures, which would be established by the permit to specifically address the proposed plant, are being imposed to assure that the operation and emissions of the source are accurately tracked to confirm compliance with all applicable requirements.

The performance of the principal control systems would have to be tested after the plant is built. The Emerald Renewable Energy would have to conduct operational monitoring and recordkeeping to confirm that the plant is properly operated and maintained on a continuing basis. These activities would be overseen by the Illinois EPA, which will review the various reports that the plant must submit and periodically conduct on-site inspections of the plant.

## **VII. REQUEST FOR COMMENTS**

It is the Illinois EPA's preliminary determination that the proposed project meets all applicable state and federal air pollution control requirements. The Illinois EPA is therefore proposing to issue this permit.

Comments are requested on this proposed action by the Illinois EPA and the proposed conditions of the draft permit.