

PERMIT BOOK

STATE OF MISSOURI

DEPARTMENT OF NATURAL RESOURCES

MISSOURI AIR CONSERVATION COMMISSION

PERMIT TO CONSTRUCT

Under the authority of RSMo 643 and the Federal Clean Air Act the applicant is authorized to construct the air contaminant source(s) described below, in accordance with the laws, rules and conditions as set forth herein.

Permit Number: **032008-010** Project Number: 2007-05-008

Parent Company: Ameresco Jefferson City, LLC

Parent Company Address: 111 Speen Street, Suite 410, Framingham, MA 01701

Installation Name: Ameresco Jefferson City, LLC

Installation Address: 8432 No More Victims Road, Jefferson City, MO 65101

Location Information: Cole County, S9, T35N, R33W

Application for Authority to Construct was made for:

The installation of a gas conditioning system which includes a flare for removing organic compounds and siloxanes from landfill gas and three (3) reciprocating internal combustion engines, Model JMS 320, each equipped with a 1060 Kilowatt generator. The engines will be fueled by landfill gas from the Jefferson City Landfill or natural gas. In addition, each engine will be equipped with a heat recovery steam generator that will provide steam. This review was conducted in accordance with Section (6), Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*.

- Standard Conditions (on reverse) are applicable to this permit
- Standard Conditions (on reverse) and Special Conditions are applicable to this permit.

MAR 21 2008

EFFECTIVE DATE



DIRECTOR OR DESIGNEE
DEPARTMENT OF NATURAL RESOURCES

STANDARD CONDITIONS:

Permission to construct may be revoked if you fail to begin construction or modification within two years from the effective date of this permit. Permittee should notify the Air Pollution Control Program if construction or modification is not started within two years after the effective date of this permit, or if construction or modification is suspended for one year or more.

You will be in violation of 10 CSR 10-6.060 if you fail to adhere to the specifications and conditions listed in your application, this permit and the project review. In the event that there is a discrepancy between the permit application and this permit, the conditions of this permit shall take precedence. Specifically, all air contaminant control devices shall be operated and maintained as specified in the application, associated plans and specifications.

You must notify the department's Air Pollution Control Program of the anticipated date of start up of this (these) air contaminant source(s). The information must be made available not more than 60 days but at least 30 days in advance of this date. Also, you must notify the Department of Natural Resources Regional office responsible for the area which you are located within 15 days after the actual start up of this (these) air contaminant source(s).

A copy of this permit and permit review shall be kept at the installation address and shall be made available to Department of Natural Resources' personnel upon request.

You may appeal this permit or any of the listed special conditions to the Administrative Hearing Commission (AHC), P.O. Box 1557, Jefferson City, MO 65102, as provided in RSMo 643.075.6 and 621.250.3. If you choose to appeal, you must file a petition with the AHC within 30 days after the date this decision was mailed or the date it was delivered, whichever date was earlier. If any such petition is sent by registered mail or certified mail, it will be deemed filed on the date it is mailed. If it is sent by any method other than registered mail or certified mail, it will be deemed filed on the date it is received by the AHC.

If you choose not to appeal, this certificate, the project review and your application and associated correspondence constitutes your permit to construct. The permit allows you to construct and operate your air contaminant source(s), but in no way relieves you of your obligation to comply with all applicable provisions of the Missouri Air Conservation Law, regulations of the Missouri Department of Natural Resources and other applicable federal, state and local laws and ordinances.

The Air Pollution Control Program invites your questions regarding this air pollution permit. Please contact the Construction Permit Unit at (573) 751-4817. If you prefer to write, please address your correspondence to the Missouri Department of Natural Resources, Air Pollution Control Program, P.O. Box 176, Jefferson City, MO 65102-0176, attention: Construction Permit Unit.

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Project No.	2007-05-008

SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

The special conditions listed in this permit were included based on the authority granted the Missouri Air Pollution Control Program by the Missouri Air Conservation Law (specifically 643.075) and by the Missouri Rules listed in Title 10, Division 10 of the Code of State Regulations (specifically 10 CSR 10-6.060). For specific details regarding conditions, see 10 CSR 10-6.060 paragraph (12)(A)10. "Conditions required by permitting authority."

Ameresco Jefferson City, LLC
Cole County, S9, T35N, R33W

1. **Superseding Condition**
The conditions of this permit supersede all special conditions found in the previously issued construction permit (permit number 022007-008 with project number 2006-09-024) from the Air Pollution Control Program.
2. **Emission Limitation**
 - A. Ameresco Jefferson City, LLC shall emit less than 40 tons of Nitrogen Oxides (NO_x) from the entire installation in any consecutive 12-month period.
 - B. Attachment A or equivalent forms approved by the Air Pollution Control Program shall be used to demonstrate compliance with Special Conditions 2A. Each of the electric generator sets shall be equipped with a non-resettable hour meter to record the hours of operation for that unit. Ameresco Jefferson City LLC shall maintain all records required by this permit for not less than five (5) years and shall make them available immediately to any Missouri Department of Natural Resources' personnel upon request.
 - C. Ameresco Jefferson City, LLC shall report to the Air Pollution Control Program's Enforcement Section, P.O. Box 176, Jefferson City, Missouri 65102, no later than ten (10) days after the end of the month during which the records from Special Condition Number 2.B. indicate that the source exceeds the limitation of Special Conditions Number 2.A.
3. **Stack Testing Requirements – Landfill Gas to Energy (LGE) Electrical Generators**
 - A. Ameresco Jefferson City, LLC shall conduct performance testing on one of the LGE electrical generators (EP-1, EP-2, or EP-3) sufficient to quantify the emission rates (pounds of pollutant per million cubic feet of methane) of carbon monoxide (CO), and nitrogen oxides (NO_x) claimed in the permit application (1.0 g NO_x/bhp-hr and 3.0 g CO/bhp-hr) from these sources. The emission tests should provide emission factors

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SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

for a full range of loads on the generators (i.e. at loads from 50% to 100%) so that an accurate estimate of CO, and NO_x emissions from the installation during all modes of operation can be determined. The installation shall conduct tests that represent, at a minimum, three (3) different operational loads for each pollutant. The test(s) shall be done in accordance with the procedures outlined below and subject to the Compliance Section's discretion. An emission factor shall be developed from the NO_x performance test to be used to determine compliance with the 40 ton per year limitation.

- B. A completed Proposed Test Plan (form enclosed) must be submitted to the Air Pollution Control Program (APCP) at least 30 days prior to the proposed test date any such performance tests are conducted so that a pretest meeting may be arranged, if necessary, and to assure that the test date is acceptable for an observer from the APCP to be present. The Proposed Test Plan must be approved by the Director prior to conducting the above required emissions testing.
- C. The stack tests required by this permit shall be performed within 60 days after achieving the maximum generation production rate at which the units will be operated, but not later than 180 days after initial start-up of the LGE electrical generators.
- D. Two (2) copies of a written report of the performance test results must be submitted to the Director within 90 days of completion of the performance testing. The report must include legible copies of the raw data sheets, analytical instrument laboratory data, and complete sample calculations from the required method for at least one sample run for each air pollutant tested.
- E. If the stack tests required by Special Condition 2.A of this permit indicate that the potential emissions (emissions when operating 8,760 hours per year) of CO will exceed the major source threshold (250 tons per year), Ameresco Jefferson City, LLC shall limit the hours of operation such that the major source threshold will not be exceeded. An emission rate of 3.0 grams CO per brake horse power was used to calculate the potential emissions, if the testing shows that the emission rate is higher than 3.0 grams CO per brake horsepower this permit will have to be amended. The GE model LMS 320 engines used to calculate the potential emission were rated at 1470 bhp each.

REVIEW OF APPLICATION FOR AUTHORITY TO CONSTRUCT AND OPERATE
SECTION (6) REVIEW

Project Number: 2007-05-008
Installation ID Number: 051-0075
Permit Number:

Ameresco Jefferson City, LLC
8432 No More Victims Road
Jefferson City, MO 65101

Complete: April 26, 2007
Reviewed: February 29, 2008

Parent Company:
Ameresco Jefferson City, LLC
111 Speen Street, Suite 410
Framinham, MA 01701

Cole County, S9, T35N, R33W

REVIEW SUMMARY

- Ameresco Jefferson City, LLC has applied for authority to construct three (3) General Electric Reciprocating Engines, Model JMS-320 each rated at 1470 brake Horsepower (bhp) (4410 bhp total) and a gas conditioning system for siloxane removal. The gas conditioning system includes a thermal swing adsorption (TSA) unit consisting of two twin adsorber units, a condensation tank, a control panel, and an open flare. The engines can burn either landfill gas or natural gas.
- Hazardous Air Pollutant (HAP) emissions are expected from the combustion of landfill and natural gas.
- Subpart WWW, Standards of Performance for Municipal Solid Waste Landfills, of the new Source Performance Standards (NSPS) will apply to the fuel preparation system at the Jefferson City Landfill. None of the New Source Performance Standards (NSPS) applies to the proposed reciprocating engines, generating sets or steam generators.
- Subpart ZZZZ, the National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines does not apply because the installation is not a major source of HAPs. None of the National Emission Standards for Hazardous Air Pollutants (NESHAPs) or currently promulgated Maximum Achievable Control Technology (MACT) regulations applies to the proposed equipment.
- Landfill gas emissions are being controlled by the reciprocating internal combustion engines and a flare. Additional control of siloxanes entering the three (3) engines are being controlled by the installation of the gas conditioning system. However, siloxanes are not a regulated air pollutant.

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- This review was conducted in accordance with Section (6) of Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*. Potential emissions of CO is above de minimis levels, but below major source levels. NO_x emissions are limited to below de minimis levels.
- This installation is located in Cole County, an attainment area for all criteria air pollutants.
- This installation is not on the List of Named Installations [10 CSR 10-6.020(3)(B), Table 2].
- Ambient air quality modeling was performed to determine the ambient impact of CO and NO_x.
- Emissions testing is required for the engines in this permit.
- Ameresco Jefferson City, LLC is required to submit a Part 70 Operating Permit application for the installation within one (1) year of startup.
- Approval of this permit is recommended with special conditions.

INSTALLATION/PROJECT DESCRIPTION

Ameresco, Inc. (Ameresco) is partnering with Jefferson City Landfill, LLC (JCLF) and the Missouri Department of Corrections (MDOC) to install a renewable generation source at the Jefferson City Correctional Center, 8416 Fenceline Road, Jefferson City, Missouri 65101. Ameresco plans to install three reciprocating internal combustion engines at the prison that can generate approximately 3.2 megawatts (MW) of electricity. The engines will be fueled by landfill gas generated at JCLF, which will be transferred via a pipeline from the landfill to Jefferson City Correctional Center or can be fueled with natural gas. In addition, each engine will be equipped with a heat recovery steam generator (HRSG), which will provide steam to the prison.

The generation units will be located at the Jefferson City Correctional Center. Ameresco will lease approximately 0.8 acres of existing property from the prison to install the generation sets. In addition, Ameresco will install a gas conditioning system at JCLF and approximately 3.5 miles of pipeline to transport gas from JCLF to the generation sets at the prison.

The generation units will consist of three General Electric model JMS 320 reciprocating engines each equipped with a 1060 kilowatt (kW) generator. The engines are each rated at 1470 brake horsepower (bhp) of mechanical output at full load with a maximum hourly heat input of approximately 10 million British thermal units (mmBtu). The waste heat from each engine will be utilized in three HRSGs that will generate steam for use by the prison. Each unit will be equipped with a bypass duct, allowing the operator to

control the flow of exhaust into the HRSG. One emission release point is associated with each unit. Exhaust from the bypass valve will pass through a silencer before releasing to the atmosphere. A summary of emission release points is provided in Table 1.

Table 1: Emission Release Points.

Emission Point	Location	Description
EP-1	Jefferson City Correctional Center	Engine 1 – HRSG
EP-2	Jefferson City Correctional Center	Engine 2 – HRSG
EP-3	Jefferson City Correctional Center	Engine 3 – HRSG
EP-4	Jefferson City Landfill	Flare

Ameresco will install a gas conditioning system at JCLF to prepare the gas for combustion and remove siloxanes, a class of organosilicon compounds that can lead to abrasive deposits on pistons and cylinder heads and damage the engines. The conditioning system will consist of a chiller, carbon filtration, and condensate removal.

As part of the conditioning system, Ameresco will install a regenerative system for siloxane removal in the form of a thermal swing adsorption (TSA) unit. The TSA unit will consist of two twin adsorber units, a condensate collection tank, a control panel, and an open flare. The activated carbon is regenerated by taking the adsorber unit offline, heating it to drive off captured VOCs and flushing it with landfill gas. The flushed landfill gas will then be sent to the flare for destruction. The frequency of the regenerative process occurs based on how quickly the activated carbon is exhausted, which is estimated to be every 7 to 10 days. The total gas sent to the flare will range from 120 to 240 scfm under normal operation and could possibly reach 300 scfm under certain conditions. The regeneration is expected to last 30 hours.

Landfill gas (LFG) results from the decomposition of waste, and is composed primarily of methane (CH₄) and carbon dioxide (CO₂). Methane (CH₄) and carbon dioxide (CO₂) are not considered regulated air pollutants. LFG contains trace amounts of other non – methane organic compounds (NMOC). Regulated air pollution emissions from the generation sets will include particulate matter (PM₁₀), sulfur dioxide (SO₂), nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compounds (VOC) and hazardous air pollutants (HAPs).

Permit 022007-008 was issued to Ameresco Jefferson City, LLC from the Air Pollution Control Program. This permit was issued prior to the modification of the gas conditioning system adding of a flare and is superseded with this permit. The equipment included with the project was permitted as a separate installation with identification number (051-0075) from JCCC (051-0066). This determination was based on electricity being the primary product of the generators and the ability of JCCC to be able to supply its own needs for steam and hot water. With the addition of the candlestick flare, the relationship between Ameresco and JCLF was additionally examined. JCLF (051-0058) is considered to be a separate installation from Ameresco (051-0075) as is the existing JCCC (051-0066).

Ameresco and JCLF are located on adjacent property, and they are also classified

under the same two digit SIC code of 49 (electric , gas and sanitary services) . However, Ameresco and JCLF are not under common control. This determination is based on the following:

- JCLF and Ameresco are under different ownership.
- JCLF will not have access to controls of the gas conditioning system or the engines and Ameresco will not have access to any JCLF emission units.
- The relationship between JCLF and Ameresco is solely for the purchase of landfill gas.
- JCLF can operate independently of Ameresco, as there are flares on site capable of controlling LFG emission under maximum conditions.
- JCLF will not obtain or purchase any electricity directly from Ameresco.

However, Ameresco is the sole purchaser of landfill gas from JCLF, but could operate independently from JCLF by switching to natural gas. The gas conditioning system is part of the JCLF. The JCLF and Ameresco are not considered the same installation. The two sites Ameresco (051-0075) and JCLF (051-0058) have different installation numbers. These are considered to be different sites.

EMISSIONS/CONTROLS EVALUATION

The emission factors for PM₁₀ used in this analysis were obtained from the Environmental Protection Agency (EPA) document AP-42, *Compilation of Air Pollutant Emission Factors*, Fifth Edition, Section 2.4, *Municipal Solid Waste Landfills* (11/1998). Emission factors for CO, NO_x and VOC were based on information from a performance test, supplied by the applicant. A special condition is included in this permit for stack testing to verify the emission rates claimed by the applicant. Sulfur oxide (SO_x) and HAP emissions were calculated based on the equations found in Section 2.4 of AP-42 and an analysis of the LFG, provided by Ameresco. Potential emissions of the application represent the potential of the new equipment, assuming continuous operation (8760 hours per year). The following table provides an emissions summary for this project.

Table 2: Emissions Summary (tons per year)

Pollutant	Regulatory De Minimis Levels	Existing Potential Emissions	Potential Emissions of the Application	Potential Emissions of the Installation (051-0075)	New Installation Conditioned Potential
PM ₁₀	15.0	N/A	6.94	6.94	N/A
SO _x	40.0	N/A	2.93	2.93	N/A
NO _x	40.0	N/A	43.42	43.42	<40.0
VOC	40.0	N/A	0.85	0.85	N/A
CO	100.0	N/A	152.6	152.6	N/A
HAPs	10.0/25.0	N/A	0.46	0.46	N/A

N/A = Not Applicable

The engines act as a control device burning the HAPs from the landfill gas as fuel. The destruction efficiencies is 93% for halogenated and 68.1% for non-halogenated HAPs are obtained from AP-42 Table 2.4-3 Control Efficiencies for LFG Constituents. The gas conditioning system is removing siloxanes from the land fill gas, but it is not a regulated pollutant. Estimated emissions for NO_x and CO from the candlestick flare are based on emission factors from AP-42. VOC emissions estimates are based on a recent LFG analysis. Estimates are conservatively based on continual operation of the candlestick flare.

PERMIT RULE APPLICABILITY

This review was conducted in accordance with Section (6) of Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*. Potential emissions of NO_x and CO are above de minimis levels. However, NO_x is conditioned to de minimis levels.

APPLICABLE REQUIREMENTS

Ameresco Jefferson City, LLC shall comply with the following applicable requirements. The Missouri Air Conservation Laws and Regulations should be consulted for specific record keeping, monitoring, and reporting requirements. Compliance with these emission standards, based on information submitted in the application, has been verified at the time this application was approved. For a complete list of applicable requirements for your installation, please consult your operating permit.

GENERAL REQUIREMENTS

- *Submission of Emission Data, Emission Fees and Process Information*, 10 CSR 10-6.110
The emission fee is the amount established by the Missouri Air Conservation Commission annually under Missouri Air Law 643.079(1). Submission of an Emissions Inventory Questionnaire (EIQ) is required June 1 for the previous year's emissions.
- *Operating Permits*, 10 CSR 10-6.065
- *Restriction of Particulate Matter to the Ambient Air Beyond the Premises of Origin*, 10 CSR 10-6.170
- *Restriction of Emission of Visible Air Contaminants*, 10 CSR 10-6.220
- *Restriction of Emission of Odors*, 10 CSR 10-3.090

SPECIFIC REQUIREMENTS

- *Restriction of Emission of Sulfur Compounds*, 10 CSR 10-6.260
- *Restriction of Emission of Particulate Matter From Industrial Processes*, 10 CSR 10-6.400
- *New Source Performance Regulations*, 10 CSR 10-6.070 – *New Source Performance Standards (NSPS) for Municipal Solid Waste Landfills*, 40 CFR Part 60, Subpart WWW

AMBIENT AIR QUALITY IMPACT ANALYSIS

Ambient air quality modeling was performed to determine the ambient impact of CO and NO_x since potential emissions are above the de minimis threshold. The following table lists the hourly emission rate, the predicted ambient impact from the subject sources and comparison with the applicable National Ambient Air Quality Standards (NAAQS). The results from the Screen3 analysis demonstrate compliance with the NAAQS for each modeled pollutant.

Table 2: Modeled Impact of NO_x and CO (µg/m³)

Pollutant	Modeled Impact	NAAQS	Time Period
CO	335	40,000	1-hour
	234	10,000	8-hour
NO _x	8.92	100	Annual Arithmetic

STAFF RECOMMENDATION

On the basis of this review conducted in accordance with Section (6), Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*, I recommend this permit be granted with special conditions.

Timothy Paul Hines
Environmental Engineer II

Date

PERMIT DOCUMENTS

The following documents are incorporated by reference into this permit:

- The Application for Authority to Construct form, dated 4/25/2007, received 4/26/2007, designating Ameresco Jefferson City LLC as the owner and operator of the installation.
- U.S. EPA document AP-42, *Compilation of Air Pollutant Emission Factors*, Fifth Edition.

- Northeast Regional Office Site Survey, dated 10/02/2006.

Attachment A: Monthly NOx Tracking Record
 AMERESCO Jefferson City, LLC
 Cole County, S9, T35N, R33W
 Project Number: 2007-05-008
 Installation ID Number: 051-0075
 Permit Number:

This sheet covers the month of _____ in the year _____.

Copy this sheet as needed.

Column 1	Column 2 (a)	Column 3	Column 4	Column 5	Column 6
Generator	Hours operated from meter beginning of month (hours/month)	Hours operated from meter at end of month (hours/month)	Hours end of month minus hours beginning of month	Emission Factor (tons/month)	NOx Emitted (Tons)
Generator 1				*	
Generator 2				*	
Generator 3				*	
(b) Monthly Total of NOx emissions from Generator 1, 2, and 3 in Tons:					
(c) 12-Month NOx Emissions Total from Previous Month's Attachment A, in Tons:					
(d) Monthly NOx emissions total (b) from previous year's Attachment A, in Tons					
(e) Current 12-month Total of NOx Emissions in Tons: [(b) + (c) - (d)]					

NOTE: The emission factor developed from the NOx performance test will be used to determine compliance with the 40 ton per year limitation.

Instructions:

- (a) [Column 3] - [Column 2] = [Column 4] then take [Column 4] x [Column 5] = [Column 6];
- (b) Summation of [Column 6] in Tons;
- (c) 12-Month NOx emissions total (e) from last month's Attachment A, in Tons;
- (d) Monthly NOx emissions total (b) from previous year's Attachment A, in Tons; and
- (e) Calculate the new 12-month NOx emissions total. **A 12-Month NOx emissions total (e) of less than 40.0 tons for the installation indicates compliance.**

Mr. Joseph DeManche
Executive Vice President
Ameresco Jefferson City, LLC
111 Speen Street, Suite 410
Framinham, MA 01710

RE: New Source Review Permit - Project Number: 2007-05-008

Dear Mr. DeManche:

Enclosed with this letter is your permit to construct. Please study it carefully. Also, note the special conditions, if any, on the accompanying pages. The document entitled, "Review of Application for Authority to Construct," is part of the permit and should be kept with this permit in your files.

Operation in accordance with these conditions, your new source review permit application and with your operating permit is necessary for continued compliance.

The reverse side of your permit certificate has important information concerning standard permit conditions and your rights and obligations under the laws and regulations of the State of Missouri.

If you have any questions regarding this permit, please do not hesitate to contact, Tim Hines at the departments' Air Pollution Control Program, P.O. Box 176, Jefferson City, MO 65102 or by phone at (573) 751-4817. Thank you for your attention to this matter.

Sincerely,

AIR POLLUTION CONTROL PROGRAM

Kendall B. Hale
New Source Review Unit Chief

KBH:thl

Enclosures

c: Northeast Regional Office
PAMS File 2007-05-008
Permit Number: