



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: 032009-007 Project Number: 2008-12-002

Parent Company: Associated Electric Cooperative, Inc.

Parent Company Address: 2814 S. Golden, Springfield, MO 65801-0754

Installation Name: Essex Power Plant

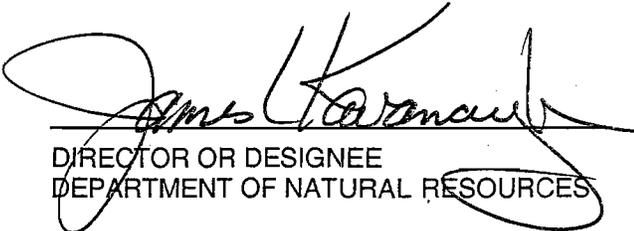
Installation Address: 24687 State Highway E, Essex, MO 63846

Location Information: Stoddard County, S26, T26N, R11E

Application for Authority to Construct was made for:
Installation of a new Westinghouse 510D5A EconoPac simple-cycle/dry low-NOx combustor electricity generating turbine. 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 12 2009
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 departments' 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 within 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.

Page No.	3
Permit No.	
Project No.	2008-12-002

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."

Essex Power Plant
Stoddard County, S26, T26N, R11E

1. NO_x and CO Emission Limitations
 - A. Associated Electric Cooperative, Inc. (AECI) - Essex Power Plant shall emit less than 250 tons of Nitrogen Oxides (NO_x) from Unit 2 in any consecutive 12-month period.
 - B. AECI - Essex Power Plant shall emit less than 250 tons of Carbon Monoxide (CO) from Unit 2 in any consecutive 12-month period.
 - C. AECI - Essex Power Plant shall maintain an accurate record of emissions of NO_x and CO emitted into the atmosphere from Unit 2. AECI shall record the monthly and running 12-month totals of NO_x and CO emissions from Unit 2. The emission factors used in these records to demonstrate compliance with Special Condition No. 1 shall be determined by the required stack test(s).
 - D. AECI - Essex Power Plant 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.
 - E. Essex Power Plant shall report to the Air Pollution Control Program's Enforcement Section, P.O. Box 176, Jefferson City, MO 65102, no later than ten (10) days after the end of the month during which the records indicate the source exceeds the limitation of Special Condition 1.A or 1.B.
2. Operational Limitation
 - A. Essex Power Plant shall burn only natural gas in the Siemens-Westinghouse Model 510D5A turbine Unit 2 (EP-02).
 - B. Except during periods of startup and shutdown, Essex Power Plant shall run the Siemens-Westinghouse Model 510D5A turbine (EP-02) at a load level no less than 50 percent.

Page No.	4
Permit No.	
Project No.	2008-12-002

SPECIAL CONDITIONS:

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

3. Compliance Testing

- A. Stack tests shall be performed on the Siemens-Westinghouse Model 510D5A turbine (EP-02) at Essex Power Plant to develop emission factors for purpose of recording to demonstrate compliance with Special Conditions 1.A and 1.B and to demonstrate compliance with Subpart KKKK, *Standards of Performance for Gas Turbines*, of the New Source Performance Standards (NSPS).
- B. AECE – Essex Power Plant shall conduct all tests in accordance with the test methods and procedures outlined here and Subpart KKKK of the NSPS.
- C. Emission factors for purpose of demonstrating compliance with Special Conditions 1.A and 1.B shall be determined according to approved methods for calculating mass emissions of NO_x and CO. Winter emissions, defined as the period beginning November 1 and ending the last day of February of the following year, shall be derived from an approved test (or tests) from the same period. Emission factors derived from low load test conditions (i.e. between fifty (50) and seventy-five (75) percent of nameplate generator capacity) shall be utilized when calculating hourly emissions during low load operations. Emission factors derived from high load test conditions (i.e. between seventy-five (75) percent of nameplate generator capacity and peak operating load) may be applied when calculating hourly emissions during high load operations. Non-winter mass emissions for NO_x and CO may be calculated from testing performed during either then winter or non-winter periods.
- D. The initial stack test(s) listed in Special Conditions 3.A through 3.C shall be performed within the earlier of 60 days after achieving the maximum production rate at which the combustion turbine will operate, but not later than 180 calendar days after the date of initial operation (i.e. “first fire”) [ref: 40 CFR Part 60.8(a)]. Testing for NO_x and CO shall be conducted at least every fifth year from the date of initial test. The timeframes for initial testing may be extended upon a written request being submitted to and approved by the Director of the Air Pollution Control Program.
- E. The date on which performance tests are conducted must be pre-arranged with the Air Pollution Control Program a minimum of 30 days prior to the proposed test so that a pretest meeting may be arranged if necessary, and to assure that the test date is acceptable for an observer to be present. A completed Proposed Test Plan form (copy enclosed) may

Page No.	5
Permit No.	
Project No.	2008-12-002

SPECIAL CONDITIONS:

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

serve the purpose of notification and must be approved by the Air Pollution Control Program prior to conducting the required emission testing.

- F. Two copies of a written report of the performance test results shall be submitted to the Director of the Air Pollution Control Program within 30 days of completion of any required testing. The report must include legible copies of the raw data sheets, analytical instrument laboratory data, and complete sample calculations from the required EPA method for at least one sample run.
- G. The test report is to fully account for all operational and emission parameters addressed by these permit conditions as well as in Subpart KKKK of the NSPS and any other applicable state or federal rules or regulations.

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

Project Number: 2008-12-002
Installation ID Number: 207-0064
Permit Number:

Essex Power Plant
24687 State Highway E
Essex, MO 63846

Complete: December 1, 2008

Parent Company:
Associated Electric Cooperative, Inc.
2814 S. Golden
Springfield, MO 65801-0754

Stoddard County, S26, T26N, R11E

REVIEW SUMMARY

- Essex Power Plant has applied for authority to install a new Westinghouse 510D5A EconoPac simple-cycle/dry low-NO_x combustor electricity generating turbine.
- Hazardous Air Pollutant (HAP) emissions are expected from the turbine due to the combustion of natural gas. The primary HAPs of concern from the proposed equipment are acrolein, formaldehyde and polycyclic aromatic hydrocarbons (PAH). These HAPs may be emitted from this installation in quantities greater than their respective Screening Model Action Levels (SMALs), but less than major source levels. Because they have exceeded their SMALs, acrolein, formaldehyde and PAH have undergone modeling analysis. Modeling for these HAPs have demonstrated ambient impacts less than their respective Risk Assessment Levels. Other HAPS are expected due to the combustion of natural gas, but in quantities below their respective SMALs.
- Subpart KKKK of the New Source Performance Standards (NSPS) applies to this turbine. This unit is a stationary gas turbine constructed after 2/18/2005 with a heat input of greater than 10 MMBTUH per hour.
- None of the National Emission Standards for Hazardous Air Pollutants (NESHAPs) or currently promulgated Maximum Achievable Control Technology (MACT) regulations apply to the proposed equipment. If the installation were to become a major source of HAPs, 40 CFR Part 63 Subpart YYYY, *Combustion Turbines* would apply.
- Low NO_x burners and water injection are being used to control NO_x emissions from the equipment in this permit.

- 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 conditioned to below major source levels.
- This installation is located in Stoddard County, an attainment area for all criteria air pollutants.
- This installation is on the List of Named Installations [10 CSR 10-6.020(3)(B), Table 2], Number 27. A stationary source category which, as of August 7, 1980 is being regulated under section 111 or 112 of the Act.
- Air quality modeling for this project was performed to determine the ambient impact of those pollutants that will be emitted in significant amounts (NO_x, CO, SO₂ and PM₁₀). Air quality modeling was also performed to determine the ambient impact of formaldehyde, acrolein and PAH. The modeling demonstrates there will not be an exceedance of the National Ambient Air Quality Standards (NAAQS), Risk Assessment Levels (RALs), or available increment.
- Emissions testing is required for the new turbine.
- A Part 70 Operating Permit application is required for this installation within 1 year of equipment startup.
- Approval of this permit is recommended with special conditions.

INSTALLATION DESCRIPTION

The existing Essex Power Plant consists of a 100-megawatt (MW) nominal, simple-cycle combustion turbine generator firing only natural gas. This unit commenced operation in June of 1999 and is located 1.5 miles east of Idalia, Missouri. A part 70 renewal (OP2008-012) was issued March 10, 2008.

The following permits have been issued to Essex Power Plant from the Air Pollution Control Program.

Table 1: Previously Issued Construction Permits

Permit Number	Description
0998-022	Installation of a new Westinghouse 501D5A EconoPac simple-cycle/dry low-NO _x electricity generating turbine.
0998-022A	Amendment to Permit No. 0992-022

PROJECT DESCRIPTION

AECI has applied for authority to construct a Westinghouse 501D5A EconoPac simple-cycle electricity generating turbine. This unit is a four-stage dry low-NO_x design firing natural gas only. The maximum rated heat input of this Westinghouse turbine is 1,437 MMBTU per hour. If necessary, the unit will also have the option to further reduce NO_x emissions by water injection (at the pilot nozzle) at loads greater than 70% to meet new source performance standards.

Essex will have a water storage tank for use as NO_x control on Unit 2.

This turbine will be limited to 250 tons of NO_x or CO for any twelve-month rolling period.

EMISSIONS/CONTROLS EVALUATION

Potential emissions of the application are based on the guaranteed emission rate of this specific model turbine by the manufacturer and AP-42. The actual NO_x and CO emission rates will be determined by a stack test. AECI has requested that this installation be limited to less than 250 tons per twelve-month period for NO_x and CO. AECI expects to operate the unit at or near base load most of the time, therefore NO_x is expected to have the highest emission rate of any criteria pollutant. Consequently, it is expected that operating hours will be limited by unit emissions of NO_x.

Modeling for NO_x and CO across a broad range of ambient temperatures and load conditions demonstrated that ambient impacts would not be significant in any case. As a result, the unit is permitted to operate at loads at or greater than 50% of peak load except for periods of startup, shutdown, or malfunction as afforded under 40 CFR Part 60, Section 8(c).

Manufacturer emission estimates were used to determine emissions for NO_x, SO₂, CO, VOC and PM₁₀. Emission factors for HAPs were taken from U.S. Environmental Protection Agency (EPA) Document AP-42, *Compilation of Air Pollutant Emission Factors*, Section 3.1, *Stationary Gas Turbines for Electricity Generation* (April 2000).

The staged burner is designed to reduce pollutant emissions and should provide a NO_x control efficiency of around 40 percent compared to an uncontrolled unit. Actual NO_x emission rates will be determined by a stack test. Pilot water injection or an ultra-low NO_x (ULN) system will provide additional NO_x reductions to meet and exceed the NSPS limit of 15 ppmv NO_x (corrected to 15% O₂).

Table 2: Emissions Summary (tons per year)

Pollutant	Regulatory De Minimis Levels ¹	Existing Potential Emissions ²	Existing Actual Emissions (2007 EIQ) ³	Potential Emissions of the Application ⁴	New Installation Conditioned Potential
PM ₁₀	15.0	20.0	0.75	35.04	N/A
SO _x	40.0	1.1	0.05	4.38	N/A
NO _x	40.0	100	3.08	315.4	<250
VOC	40.0	38.7	0.12	4.4	N/A
CO	100.0	100	0.08	127.0	<250
HAPs	10.0/25.0	0.03	0.04	6.47	N/A
Formaldehyde	2.0	N/D	N/D	4.47	N/A
Acrolein	0.04	N/D	N/D	0.04	N/A
PAH	0.01	N/D	N/D	0.014	N/A

N/A = Not Applicable; N/D = Not Determined

¹ The regulatory levels listed for individual HAPs are Screening Model Action Level (SMAL).

² Existing potential emissions are taken from Permit No. 0998-022A. Emissions of NO_x and CO are conditioned to 100 tons per year. All other pollutants are indirectly limited to emissions stated above.

³ Existing actual emissions are taken from the 2007 Emission Inventory Questionnaire (EIQ).

⁴ The potential emissions of the application represent emissions at base load operating at an ambient temperature of 59 °F. Due to the wide variability in emissions that result from changes in ambient temperature and turbine load, these emissions were chosen as representative of what emissions would be if the turbine were operated on a continuous basis. Potential emissions of CO, NO_x and VOC can exceed 250 tons per year depending on how and when the turbine is operated.

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 conditioned to below major levels.

APPLICABLE REQUIREMENTS

Essex Power Plant 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 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 Stationary Combustion Turbines*, 40 CFR Part 60, Subpart KKKK

AMBIENT AIR QUALITY IMPACT ANALYSIS

Ambient air quality modeling was performed to determine the ambient impact of PM₁₀, SO_x, NO_x, and CO as well as the following HAPs: acrolein, formaldehyde and polycyclic aromatic hydrocarbons (PAH). For further details on the modeling, please refer to the memo titled “Ambient Air Quality Impact Analysis (AAQIA) for Associated Electric Cooperative, Inc. (AECI)”. The ambient air quality impact analysis indicates that this project will not cause ambient air concentrations above acceptable levels.

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.

Susan Heckenkamp
Environmental Engineer

Date

PERMIT DOCUMENTS

The following documents are incorporated by reference into this permit:

- The Application for Authority to Construct form, dated November 21, 2008, received December 1, 2008, designating Associated Electric Cooperative, INC. as the owner and operator of the installation.
- U.S. EPA document AP-42, *Compilation of Air Pollutant Emission Factors*, Fifth Edition.
- Southeast Regional Office Site Survey, dated December 29, 2008.
- Siemens-Westinghouse Model 501D5A emissions table.