Missouri Department of dnr.mo.gov
NATURAL RESOURCES
Eric R. Greitens, Governor Carol S. Comer, Director

JAN 10 2018

Mr. Steven C. Whitworth
Senior Director Environmental Policy & Analysis
Ameren Corporation
1901 Chouteau Ave.
St. Louis, MO 63166

RE: New Source Review Temporary Permit Request - Project Number: 2017-12-036
Installation ID Number: 071-0003
Temporary Permit Number: 012018-002
Expiration Date: July 9, 2018

Dear Mr. Whitworth:

The Missouri Department of Natural Resources' Air Pollution Control Program has completed a review of your request to test two different technologies on Boiler Unit 3: a liquid coal additive, M-Prove, and an alternative liquid flue gas-conditioning agent, RESPond, at the Ameren Missouri Labadie Energy Center (Ameren – Labadie), located in Labadie, Missouri. The Air Pollution Control Program is hereby granting your requests to conduct these temporary testing operations at this location in accordance with Missouri State Rule 10 CSR 10-6.060(3).

According to the application, Ameren – Labadie is considering options to replace SO_3 as the conditioning agent on Boiler Unit 3. Ameren – Labadie is considering SO_3 replacement because SO_3 impedes capture of mercury by activated carbon sorbents which increases the costs associated with complying with 40 CFR Part 63, Subpart UUUUU – *National Emission Standards for Hazardous Air Pollutants From Coal and Oil-Fired Electric Utility Steam Generating Units*. Ameren – Labadie employs flue gas conditioning on Boiler Unit 3 to ensure proper control of particulate matter (PM) by the electrostatic precipitator (ESP) on Boiler Unit 3. ESP control efficiency is partially dependent on fly ash resistivity. Western Powder River Basin (PRB) coals tend to result in high resistivity ash, impeding capture by the ESP.

ADA flue gas conditioning technology is based on the injection of a proprietary liquid flue gas-conditioning additive into the flue gas upstream of a unit's ESP. The purpose of the technology is to optimize flue gas resistivity and enhance the collection efficiency of an ESP, thereby reducing PM emissions from the boiler. The primary mechanism for ESP performance improvement is through the reduction of fly ash resistivity. Optimizing the resistivity of the fly ash enables the ESP to operate at a greater collection efficiency.

Additionally, this flue gas conditioning technology has been shown to not inhibit the adsorptive capacity of the carbon sorbents used for mercury control. Ameren hopes this testing will show

improved PM control as well as improved mercury control when compared to SO_3 as a flue gas-conditioning agent and as compared to no flue gas conditioning.

The ADA liquid flue gas conditioning technology, RESPond (formerly ADA-ES, inc. product ATI-2001), was tested previously at Boiler Unit 3; however, flue gas duct stratification issues during the testing were believed to have limited the observed fly ash resistivity benefits. Ameren – Labadie is proposing additional testing of RESPond to see if optimal PM control can be achieved after modifications to the injection lance array.

The liquid coal additive, M-Prove, is expected to increase mercury oxidation rates allowing for greater mercury adsorption and capture in the ESP.

Ameren – Labadie will apply the coal additive, M-Prove, to the coal using a portable skid containing a pump, flexible tubing, and rotameters dedicated to one of the coal feeders for Boiler Unit 3. The flow to the selected feeder will be controlled by manually adjusting needle valves on the rotameters. Totes containing M-Prove will be placed in a secondary containment area near the skid. M-Prove will not be tested individually. M-Prove will be tested in conjunction with RESPond.

RESPond will be delivered to the installation by tanker trucks. The RESPond equipment will include a chemical injection skid provided by ADA, a receiving tank, a set of injection lances, liquid and air distribution equipment, piping, and low-pressure blowers. The concentrated RESPond chemical will be blended with water to create a low concentration aqueous solution at the chemical injection skid. The solution will be delivered to a grid of fluid spray high performance atomizers by a high-pressure pump. The atomizers are located on a set of removable chemical injection lances that will be arranged in the ESP inlet ductwork to give equal distribution of the solution throughout the flue gas stream. The high performance atomizers will produce an ultrafine spray of droplets to provide quick evaporation, good distribution, and optimum chemical utilization. RESPond will be testing individually and in conjunction with M-Prove.

Ameren – Labadie is testing RESPond to potentially replace the use of the installation's current SO_3 flue gas conditioning system; therefore, the current SO_3 injection system required by Construction Permit 0992-016B will not be operated during RESPond testing. This permit temporarily relieves the installation of the requirement to operate the SO_3 flue gas conditioning system on Boiler Unit 3 only for testing purposes.

Ameren – Labadie expects mercury and particulate matter (PM) emissions from Boiler Unit 3 to be reduced by the testing operations; however, the receiving of M-Prove and RESPond will result in increased haul road particulate emissions. Particulate emissions associated with the receiving of 100 tons combined of M-Prove and RESPond were determined to be 0.02 tons of PM, 0.004 tons of PM_{10}, and 0.001 tons of $PM_{2.5}$. Boiler Unit 3 ESP will be in operation during all testing. SDS provided by the installation for M-Prove and RESPond indicate the materials do not contain any hazardous air pollutants (HAPs). As emissions of all pollutants are expected to be below 100 tons per year, permission to temporarily use up to 100 tons combined of M-Prove

and RESPond is granted up to the expiration date stated above. In order to continue using M-Prove and RESPond past the expiration date, Ameren - Labadie will need to seek permission from the Air Pollution Control Program.

Ameren – Labadie shall submit an Excess Emissions Report for any emissions exceeding the emission limits within the installation's Title V Operating Permit, OP2017-048. Ameren – Labadie should indicate the testing as the source of the excess emissions on the report.

No later than 90 days following the expiration of this permit, Ameren - Labadie shall submit a testing project report to the Air Pollution Control Program. At a minimum, the report shall include:

1. Identification of the emission unit (Boiler Unit 3) and control device (ESP) evaluated for this project
2. Location(s) of M-Prove application
3. Locations of the RESPond injection and sampling sites
4. M-Prove application rates and concentrations, RESPond injection rates and concentrations, and unit load for each trial
5. The date, time, and duration of each trial
6. Emission rates of particulates, mercury, NO_x, and SO_2 during the M-Prove and RESPond trial runs as observed by the CEMS already installed on Unit 3
7. Baseline emission rates of particulates, mercury, NO_x, and SO_2 while using SO_3 as the flue gas conditioning agent as observed by the CEMS already installed on Unit 3
8. Higher heating value, sulfur, mercury, and ash content of the coal used during the M-Prove and RESPond trial runs and during the baseline SO_3 flue gas conditioning agent runs
9. Conclusions reached concerning the emissions reduction effectiveness of the testing project
10. Comparison of the RESPond testing results from Temporary Permits 112012-011 and 122009-009 to the testing results of this project.

You are still obligated to meet all applicable air pollution control rules, Department of Natural Resources' rules, or any other applicable federal, state, or local agency regulations. Specifically, you should avoid violating:

- 10 CSR 10-6.045 *Open Burning Requirements*
- 10 CSR 10-6.165 *Restriction of Emission of Odors*
- 10 CSR 10-6.170 *Restriction of Particulate Matter to the Ambient Air Beyond the Premises of Origin*
- 10 CSR 10-6.220 *Restriction of Emission of Visible Air Contaminants*
- 10 CSR 10-6.260 *Restriction of Emission of Sulfur Compounds*
- 10 CSR 10-6.261 *Control of Sulfur Dioxide Emissions*
- 40 CFR Parts 72, 73, and 75 through 78 - *Acid Rain Program*
- 40 CFR Part 96 – *Clean Air Interstate Rule*
- 40 CFR Part 97, Subparts AAAAA, CCCCC, and EEEEE – *Cross-State Air Pollution Rules*

- 40 CFR Part 63, Subpart UUUUU – *National Emission Standards for Hazardous Air Pollutants From Coal and Oil-Fired Electric Utility Steam Generating Units*

Ameren – Labadie shall retain a copy of this letter with the unit and make this letter available to Department of Natural Resources' personnel upon verbal request. If you have any questions regarding this determination, please do not hesitate to contact Alana Hess at the Air Pollution Control Program, P.O. Box 176, Jefferson City, MO 65102 or by telephone at (573) 751-4817. Thank you for your time and attention to this matter.

Sincerely,
AIR POLLUTION CONTROL PROGRAM

Kyra L. Moore
Director

KLM:ahj

c: St. Louis Regional Office
PAMS File: 2017-12-036

PERFORMANCE TEST PLAN

Submitted to: MO Dept. of Natural Resources,
Air Pollution Control Program, Enforcement Section
P.O. Box 176, Jefferson City, MO 65102

Date Submitted:_____

Attention:_____

Proposed Test Date:_____

Test date must be agreed to by Air Pollution Control Program

1.) FACILITY INFORMATION:		
Name:		
Address:		
City	State:	Zip:
Name & title of Contact Person:		
Phone # of Contact Person:	Mobile #:	

2.) AIR POLLUTION SOURCE TO BE TESTED:				
Type of Facility/Source:				
Permit #	FIPS/Plant ID:	PORT #		
Address/Location:				
Directions to Source (or map attached):				
Initial Start-up Date:				
Reason for Test:		Condition of Permit		Consent Agreement
		Administrative Order		
		Other (specify)		

3.) TESTING FIRM INFORMATION:		
Name of Firm:		
Address:		
City	State:	Zip:
Name & title of Contact Person:		
Phone # of Contact Person:	Mobile #:	
Number of employees of firm:		
No. of employees actually engaged in air pollution source testing:		
Organizational chart with names & title of personnel: (please attach)		

3.) TESTING FIRM INFORMATION: (cont.)	
Location & description of laboratory facilities:	
Subcontractor(s) utilized by firm for source testing activities:	
Number of air pollution sources previously tested by firm:	
Sources tested by firm in Missouri in past 3 years (source, test, date):	

4.) PERFORMANCE TEST INFORMATION:

	Pollutant	No. of Sampling Points	Total Time per Test Run	No. of Test Runs	Test Method to be Used
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

5.) AUDIT INFORMATION:

Method	Specific analyte	Expected sample concentration	Sample matrix & audit matrix (if different)	Audit sample concentration requested	Audit provider

6.) AUDIT PROVIDER INFORMATION:

Provider #1:		
Address:		
City	State:	Zip:
Name & title of Contact Person:		
Phone # of Contact Person:	Fax #:	
Provider #2:		
Address:		
City	State:	Zip:
Name & title of Contact Person:		
Phone # of Contact Person:	Fax #:	

7.) SAMPLE LOCATION & TRAVERSE POINT INFORMATION

Duct to be Sampled:

Duct Dimensions:

From inside far wall to outside of port	
Nipple length	
Depth (or diameter) of duct	
Width (rectangular duct)	

Rectangular stack Equivalent Diameter :

$D_e = \frac{2 \times \text{Depth} \times \text{Width}}{\text{Depth} + \text{Width}} = \frac{2 (\quad)(\quad)}{(\quad + \quad)} = \_\_\_\_\_$

Distance **from** nearest flow disturbance **to** Ports

	Upstream (A)	Downstream (B)
Distance		
Diameters		

Stack Area =

Calculated by:

Sketch of Stack or Duct with Port Locations & Distances Shown **[NOTE: Cyclonic flow must be measured by instrument and shown to be within allowable limits prior to initiation of sampling.]** If sampling location is downstream from an axial flow fan, installation of a flow straightening device will probably be necessary to meet cyclonic flow criterion.:

LOCATION OF TRAVERSE POINTS IN CIRCULAR STACKS

	4	6	8	10	12	14	16	18	20	22	24
1	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	25	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3	75	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6	5.5
4	93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5		85.4	67.7	34.2	25	20.1	16.9	14.6	12.9	11.6	10.5
6		95.6	80.6	65.8	35.6	26.9	22	18.8	16.5	14.6	13.2
7			89.5	77.4	64.4	36.8	28.3	23.6	20.4	18	16.1
8			96.8	85.4	75	63.4	37.5	29.6	25	21.8	19.4
9				91.8	82.3	73.1	62.5	38.2	30.6	26.2	23
10				97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2
11					93.3	85.4	75	70.4	61.2	39.3	32.3
12					97.9	90.1	83.1	76.4	69.4	60.7	39.8

LOCATION OF TRAVERSE POINTS IN RECTANGULAR STACKS

	2	3	4	5	6	7	8	9	10	11	12
1	25	16.7	12.5	10	8.3	7.1	6.3	5.6	5	4.5	4.2
2	75	50	37.5	30	25	21.4	18.8	16.7	15	13.6	12.5
3		83.3	62.5	50	41.7	35.7	31.3	27.8	25	22.7	20.8
4			87.5	70	58.3	50	43.8	38.9	35	31.8	29.2
5				90	75	64.3	56.3	50	45	40.9	37.5
6					91.7	78.6	68.8	61.1	55	50	45.8
7						92.9	81.3	72.2	65	59.1	54.2
8							93.8	83.3	75	68.2	62.5
9								94.4	85	77.3	70.8
10									95	86.4	79.2
11										95.5	87.5
12											95.8

POINT	% of Stack I.D.	Stack I.D.	Distance from Outside Wall	Nipple Length	Distance from Outside of Port

8.) TEST PROCEDURES & EQUIPMENT

A. Sampling Equipment Information:
Manufacturer and model of the sampling equipment to be used by the tester for the performance tests, along with a description of any equipment which may differ from that required by the specified method(s).

B. Test Procedures:
Description of any test procedures to be used in the conduct of the performance tests which may differ from the specified method(s).

NOTE:Deviations from EPA test methods observed during test procedures will not necessarily be corrected by agency observer and could result in agency rejection of test results.

C. Analytical Procedures:
Description of any analytical procedures which differ from the specified method(s).

D. Data Sheets:
Sample of all field data sheets which do not provide the data shown on the example sheets in 40 CFR 60 for the specified method(s).

E. Air Pollution Control Equipment:
Types and manufacturers of all control equipment:

Design or guarantee efficiency

Design gas volume at full load (acfm)

Design pressure drop

Maintenance schedule and method of record keeping:

9.) SPECIFIC: for Fossil Fuel-Fired Steam Generators						
A description of the source operation including as a minimum the following:						
A. Fuel type(s): Coal, Oil, or Gas Type of fuel(s) used and ultimate analysis of the fuel burned (%H, %C, %S, %N, %O, $\%H_2O$ & GCV) or F factors to be used in test:.						
If fired in combination, list percentages of each fuel. For coal and oil, indicate classification, and for gas, indicate type:						
B. Manufacturer(s) of boiler and other major components:						
C. FIRING TYPE: For coal:		underfeed,				
		overfeed (moving grate, spreader or vibrating grate),				
		or suspension (pulverized or cyclone)				
For oil, gas, or pulverized coal suspension firing:		vertical				
		tangential				
		horizontal				
Number and Location(s) of burners:						
D. Type of boiler:		shell		firetube		watertube
E. Description of ash handling and disposal system:						
F. Fuel composition (by analysis):						
G. Design fuel firing rate and heat input:						
H. Design steam production rate, pressure, and temperature:						
I. Use of steam produced:						
J. Design electricity generation rate, if applicable:						
K. Fly ash re-circulation system description, if applicable:						
L. Frequency and duration of soot blowing:						
M. Normal maintenance schedule for facility, along with a description of the operating difficulties encountered thus far:						
N. Normal operating schedule:						

9.) SPECIFIC: for Fossil Fuel-Fired Steam Generators

O. Diagram of facility: (please attach)

SOURCE TESTING REPORT FORMAT

COVER
- Plant name and location
- Source sampled
- Testing company or agency, name, and address

CERTIFICATION
- Certification by team leader
- Certification by reviewer (e.g.: Professional Engineer)

INTRODUCTION
- Test purpose
- Test location, type of process
- Test dates
- Pollutants tested
- Observers' names (industry and agency)
- Any other important background information

SUMMARY OF RESULTS
- Emission results
- Process data, as related to determination of compliance
- Allowable emissions
- Description of collected samples
- Visible emissions summary
- Discussion of errors, both real and apparent

SOURCE OPERATION
- Description of process and control device
- Process and control equipment flow diagram
- Process data and results, with example calculations
- Representatives of raw materials and products
- Any specially required operation demonstrated

SAMPLING and ANALYSIS PROCEDURES
- Sampling port location and dimensioned cross section
- Sampling port description, including labeling system
- Sampling train description
- Brief description of sampling procedures, with discussion of deviations from standard methods
- Brief description of analytical procedures, with discussion of deviations from standard methods

APPENDIX
- Complete results with example calculations
- Raw field data (original, not computer printouts)
- Laboratory report, with chain of custody
- Test log
- Calibration procedures and results
- Project participants and titles
- Related correspondence