



## 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: **092015-001** Project Number: 2015-05-079  
Installation Number: 019-0004

Parent Company: Curators of the University of Missouri

Parent Company Address: EHS, 8 Research Park Development Building,  
University of Missouri, Columbia, MO 65211-3050

Installation Name: University of Missouri (MU) Power Plant

Installation Address: Fifth & Stewart, Columbia, MO 65211-2030

Location Information: Boone County, S13, T48N, R13W

Application for Authority to Construct was made for:  
Increased hydrated lime dry sorbent injection. This review was conducted in accordance with Section (5) of 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.

Alana L. Hess

Prepared by  
Alana Hess  
New Source Review Unit

Kyra L. Moore

Director or Designee  
Department of Natural Resources

SEP 01 2015

Effective Date

## 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. The 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 these air contaminant sources. The information must be made available within 30 days of actual startup. Also, you must notify the Department of Natural Resources' Northeast Regional Office within 15 days after the actual start-up of these air contaminant sources.

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 sources(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.

**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(12)(A)10. "Conditions required by permitting authority."*

**MU Power Plant**

Boone County, S13, T48N, R13W

1. Control Device Requirements – Baghouses, Fabric Filters, Cyclones, and Dust Recovery Systems
  - A. MU Power Plant shall control emissions from the EP07, EP-08, EP-09, and EP-10 Boilers using baghouses (CD01 and CD02) as specified in the permit application.
  - B. MU Power Plant shall control emissions from EP32 Lime Silo using a fabric filter (CD17) as specified in the permit application.
  - C. MU Power Plant shall control emissions from EP05 and EP12 Fly Ash Conveying using a cyclone and fabric filter (CD03 and CD05) as specified in the permit application.
  - D. MU Power Plant shall control emissions from EP06 and EP13 Ash Silo Unloading using a wet ash conditioner or dust recovery system (CD04 and CD06) as specified in the permit application.
  - E. The baghouses and fabric filters shall be operated and maintained in accordance with the manufacturer's specifications. The baghouses and fabric filters shall be equipped with a gauge or meter, which indicates the pressure drop across the control device. These gauges or meters shall be located such that Department of Natural Resources' employees may easily observe them.
  - F. Replacement filters for the baghouses and fabric filters sufficient to replace 15% of the total filters shall be kept on hand at all times. The filters shall be made of fibers appropriate for operating conditions expected to occur (i.e. temperature limits, acidic and alkali resistance, and abrasion resistance).
  - G. MU Power Plant shall monitor and record the operating pressure drop across the baghouses and fabric filters at least once every 24 hours. The operating pressure drop shall be maintained within the design conditions specified by the manufacturer's performance warranty.

**SPECIAL CONDITIONS:**

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

- H. MU Power Plant shall have a certified Method 9 observer conduct weekly visible emissions observations of the wet ash conditioner and dust recovery system using Method 22 procedures. If the observed emissions are perceived or believed to exceed 20% opacity, the source representative shall then conduct a Method 9 opacity observation to quantify the percent opacity. If the observed opacity is greater than 20%, the permittee shall take corrective maintenance actions to restore the wet ash conditioner and/or dust recovery system to proper working order.
  - I. MU Power Plant shall maintain a copy of the baghouse manufacturer's performance specifications on site.
  - J. MU Power Plant shall maintain a copy of the fabric filter manufacturer's performance specifications on site.
  - K. MU Power Plant shall maintain an operating and maintenance log for the dust recovery system which shall include the following:
    - 1) Date, time, and results of each weekly visible emissions observation; and
    - 2) Incidents of malfunction, with impact on emissions, duration of event, probable cause, and corrective actions; and
    - 3) Maintenance activities, with inspection schedule, repair actions, and replacements, etc.
  - L. MU Power Plant shall maintain an operating and maintenance log for the baghouses, fabric filters, and cyclone which shall include the following:
    - 1) Incidents of malfunction, with impact on emissions, duration of event, probable cause, and corrective actions; and
    - 2) Maintenance activities, with inspection schedule, repair actions, and replacements, etc.
2. **Record Keeping and Reporting Requirements**  
MU Power Plant shall maintain all records required by this permit for not less than five years and shall make them available immediately to any Missouri Department of Natural Resources' personnel upon request.

REVIEW OF APPLICATION FOR AUTHORITY TO CONSTRUCT AND OPERATE  
SECTION (5) REVIEW

Project Number: 2015-05-079  
Installation ID Number: 019-0004  
Permit Number:

Installation Address:  
MU Power Plant  
Fifth & Stewart  
Columbia, MO 65211-2030

Parent Company:  
Curators of the University of Missouri  
EHS, 8 Research Park Development  
Building, University of Missouri  
Columbia, MO 65211-3050

Boone County, S13, T48N, R13W

REVIEW SUMMARY

- MU Power Plant has applied for authority to increase hydrated lime dry sorbent injection.
- The application was deemed complete on August 4, 2015.
- HAP emissions are not expected from the proposed equipment.
- 40 CFR Part 63, Subpart DDDDD – *National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters* applies to EP-07, EP-08, EP-09, and EP-10 Boilers. The installation has requested increased hydrated lime dry sorbent injection in order to help them demonstrate compliance with the HCl emission limitation in this regulation.
- Baghouses are being used to control 99.9% of particulate emissions from EP-07, EP-08, EP-09, and EP-10. A fabric filter is being used to control 99% of emissions from EP32 Lime Silo. A cyclone and a fabric filter are being used to control 99% of emissions from EP05 and EP12 Fly Ash Conveying. A wet ash conditioner is being used to control 91.5% of emissions from EP06 East Ash Silo Unloading. A dust recovery system is being used to control 91.5% of emissions from EP13 West Ash Silo Unloading.
- This review was conducted in accordance with Section (5) of Missouri State Rule 10 CSR 10-6.060 *Construction Permits Required*. Potential emissions of all pollutants are below de minimis levels; however, a permit is required as potential PM<sub>10</sub> emissions exceed the insignificant emission exemption level at 10 CSR 10-6.061(3)(A)3.A without the federally enforceable control device provisions included in this permit.
- This installation is located in Boone County, an attainment area for all criteria pollutants.

- This installation is on the List of Named Installations found in 10 CSR 10-6.020(3)(B), Table 2, Item #21 “Fossil-fuel boilers (or combination thereof) totaling more than 250 MMBtu/hr heat input”. The installation's major source level is 100 tons per year and fugitive emissions are counted towards major source applicability.
- Ambient air quality modeling was not performed since potential emissions of the application are below de minimis levels.
- Emissions testing is not required for the equipment.
- The provisions of this permit shall be included in the Part 70 operating permit renewal review, Project 2013-08-023.
- Approval of this permit is recommended with special conditions.

### INSTALLATION DESCRIPTION

MU Power Plant operates a combined heat and power facility to generate steam and electricity to serve the MU campus.

The following New Source Review permits have been issued to MU Power Plant by the Air Pollution Control Program.

**Table 1: Permit History**

Permit Number	Description
0886-004	Installation of Boiler 11.
0294-018	Installation of emergency generator for North Well.
0494-020	Installation of Boiler 12.
0296-007	Installation of emergency generator for Southwest Well and twin fuel oil storage tanks.
1096-021	Replacement IC engine for East Well.
0697-002	Installation of solvent-based parts washer.
072000-005	Installation of turbine and back-up diesel generator.
042007-019	Temporary permit to burn biomass fuel in boiler.
032008-002	The replacement of four (4) existing cooling towers with a new relocated cooling tower and a closed loop cooling system cooling tower.
042007-019A	Addition of a feedwagon for temporary burning of biomass.
032008-002A	Amendment to remove the closed loop heat-exchanger cooling tower permitted in Permit No. 032008-002 and to lower the drift loss limit to less than 0.0010% of the water circulation for the remaining cooling tower.
042010-002	Replacement of Boiler 11 with a biomass-fired bubbling fluidized bed boiler
042010-002A	Correction of the NOx limit in Table 5.
042010-002B	Amendment to clarify that silt loading testing is not required until startup of the biomass boiler.
042010-002C	Amendment to temporarily allow operation of the boiler fuel handling/storage system without the baghouse.
032008-002B	Amendment to remove monthly TDS sampling requirement.

## PROJECT DESCRIPTION

MU Power Plant has determined that they need to inject more hydrated lime dry sorbent in order to meet the HCl limitation in 40 CFR Part 63, Subpart DDDDD; therefore, the installation has requested to increase hydrated lime dry sorbent injection from a baseline usage rate of 293 tons per year (289 tons in 2014 and 297 tons in 2013) to 1,883 tons per year (430 pounds per hour).

Increased hydrated lime dry sorbent injection results in increased lime handling, pass through emissions from the boilers<sup>1</sup>, and increased fly ash handling; therefore, this project modifies the following existing emission sources:

Emission Source	Description
EP36	1,188 foot Paved Haul Road
EP32	Lime Silo
EP07	Boiler
EP08	Boiler
EP09	Boiler
EP10	Boiler
EP05	Fly Ash Conveying
EP12	Fly Ash Conveying
EP06	East Ash Silo Unloading
EP13	West Ash Silo Unloading

## EMISSIONS/CONTROLS EVALUATION

The potential emissions increase from EP36 Paved Haul Road were calculated using equation 2 from the EPA document AP-42, *Compilation of Air Pollutant Emission Factors*, Fifth Edition, Section 13.2.1 “Paved Haul Roads” (January 2011), a silt loading of 9.7 g/m<sup>2</sup>, a mean vehicle weight of 27.5 tons, and 105 days per year with at least 0.01” of precipitation.

As no emission factors are available for the storage of lime, the potential emissions increase from EP32 Lime Silo was conservatively calculated using emission factors for concrete obtained from AP-42, Section 11.12 “Concrete Batching” (June 2006) and given 99% control of PM, PM<sub>10</sub>, and PM<sub>2.5</sub> due to the operation of a fabric filter (CD17) required by Special Condition 1.B.

Pass through emissions were calculated using a mass balance approach. A particle size distribution for hydrated lime dry sorbent indicates 100% of the particles have a diameter of 100 µm or less (i.e. PM), 60% of the particles have a diameter of 10.89 µm or less (i.e. PM<sub>10</sub>), and 30% of the particles have a diameter of 2.673 µm or less (i.e. PM<sub>2.5</sub>). Of the hydrated lime dry sorbent injected, 99.9% was determined to be captured along with the existing fly ash by the baghouses (CD01 and CD02) required by Special

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<sup>1</sup> The hydrated lime dry sorbent is injected into the boiler ductwork after the combustion chamber; therefore, the boilers themselves are not being modified by this project – only the boiler ductwork. The hydrated lime dry sorbent is expected to mix with the fly ash in the ductwork and baghouse, resulting in increased fly ash fugitives (emitted out of the boiler stack) and non-fugitives (captured by the baghouses and conveyed to a silo for subsequent shipment off-site).

Condition 1.A and 0.1% was determined to be emitted directly into the atmosphere. Note: The control efficiency used by the project is a minimum control efficiency and may be less than the control efficiency required to meet the PM restrictions of 10 CSR 10-6.405 and/or 40 CFR Part 63, Subpart DDDDD. Nothing in this permit prohibits the permittee from using more efficient filters in the baghouses to comply with 10 CSR 10-6.405 and/or 40 CFR Part 63, Subpart DDDDD.

As no emission factors are available for the conveying of fly ash, the potential emissions increase from EP05 and EP12 Fly Ash Conveying was conservatively calculated using emission factors for concrete obtained from AP-42, Section 11.12 “Concrete Batching” (June 2006) and given 99% control of PM, PM<sub>10</sub>, and PM<sub>2.5</sub> due to the operation of a cyclone and fabric filter (CD03 and CD05) required by Special Condition 1.C.

As no emission factors are available for the unloading of fly ash, the potential emissions increase from EP06 and EP13 Ash Silo Unloading was conservatively calculated using emission factors for concrete obtained from AP-42, Section 11.12 “Concrete Batching” (June 2006). As Special Condition 1.D requires the use of a dust recovery system or wet ash conditioner, the controlled emission factor for truck loading (Process SCC 30501110) in Table 11.12-2 was used.

The following table provides an emissions summary for this project. Existing potential emissions are unavailable for the installation; however, the installation is known to be an existing major source based on actual emissions. Existing actual emissions were taken from the installation’s 2014 EIQ. Potential emissions of the application represent the potential emissions increase of the identified emission sources, assuming continuous operation (8760 hours per year).

**Table 2: Emissions Summary (tons per year)**

Pollutant	Regulatory <i>De Minimis</i> Levels	Existing Potential Emissions	Existing Actual Emissions (2014 EIQ)	Potential Emissions of the Application
PM	25.0	Major	N/A	1.75
PM <sub>10</sub>	15.0	Major	110.29	1.00
PM <sub>2.5</sub>	10.0	Major	96.50	0.51
SO <sub>x</sub>	40.0	Major	5,171.09	N/A
NO <sub>x</sub>	40.0	Major	475.86	N/A
VOC	40.0	N/D	3.84	N/A
CO	100.0	Major	217.38	N/A
GHG (CO <sub>2</sub> e)	75,000	Major	N/A	N/A
HAPs	25.0	Major	49.89	N/A

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

### PERMIT RULE APPLICABILITY

This review was conducted in accordance with Section (5) of Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*. Potential emissions of all pollutants are below de minimis levels; however, a permit is required as potential PM<sub>10</sub> emissions



exceed the insignificant emission exemption level at 10 CSR 10-6.061(3)(A)3.A without the federally enforceable control device provisions included in this permit.

## APPLICABLE REQUIREMENTS

MU Power Plant shall comply with the following applicable requirements. The Missouri Air Conservation Laws and Regulations should be consulted for specific recordkeeping, 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

- 10 CSR 10-6.065 *Operating Permits*
- 10 CSR 10-6.110 *Submission of Emission Data, Emission Fees and Process Information*
- 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*

### SPECIFIC REQUIREMENTS

- 10 CSR 10-6.075 *Maximum Achievable Control Technology Regulations*
  - 40 CFR Part 63, Subpart DDDDD – *National Emission Standards for Hazardous Air Pollutant for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters* applies to EP-07, EP-08, EP-09, and EP-10 Boilers.
- 10 CSR 10-6.400 *Restriction of Emission of Particulate Matter From Industrial Processes* applies to EP06 and EP13 Ash Silo Unloading. EP32 Lime Silo and EP12 Fly Ash Conveying are exempt from this regulation per 10 CSR 10-6.400(1)(B)15.
- 10 CSR 10-6.405 *Restriction of Particulate Matter Emissions From Fuel Burning Equipment Used For Indirect Heating* applies to EP-07, EP-08, EP-09, and EP-10 Boilers.

## STAFF RECOMMENDATION

On the basis of this review conducted in accordance with Section (5) of Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*, it is recommended that this permit be granted with special conditions.

### PERMIT DOCUMENTS

The following documents are incorporated by reference into this permit:

- The Application for Authority to Construct form, dated August 3, 2015, received August 3, 2015, designating Curators of the University of Missouri as the owner and operator of the installation.

## APPENDIX A

### Abbreviations and Acronyms

<b>%</b> .....	percent	<b>m/s</b> .....	meters per second
<b>°F</b> .....	degrees Fahrenheit	<b>Mgal</b> .....	1,000 gallons
<b>acfm</b> .....	actual cubic feet per minute	<b>MW</b> .....	megawatt
<b>BACT</b> .....	Best Available Control Technology	<b>MHDR</b> .....	maximum hourly design rate
<b>BMPs</b> .....	Best Management Practices	<b>MMBtu</b> ....	Million British thermal units
<b>Btu</b> .....	British thermal unit	<b>MMCF</b> .....	million cubic feet
<b>CAM</b> .....	Compliance Assurance Monitoring	<b>MSDS</b> .....	Material Safety Data Sheet
<b>CAS</b> .....	Chemical Abstracts Service	<b>NAAQS</b> ...	National Ambient Air Quality Standards
<b>CEMS</b> .....	Continuous Emission Monitor System	<b>NESHAPs</b>	National Emissions Standards for Hazardous Air Pollutants
<b>CFR</b> .....	Code of Federal Regulations	<b>NO<sub>x</sub></b> .....	nitrogen oxides
<b>CO</b> .....	carbon monoxide	<b>NSPS</b> .....	New Source Performance Standards
<b>CO<sub>2</sub></b> .....	carbon dioxide	<b>NSR</b> .....	New Source Review
<b>CO<sub>2e</sub></b> .....	carbon dioxide equivalent	<b>PM</b> .....	particulate matter
<b>COMS</b> .....	Continuous Opacity Monitoring System	<b>PM<sub>2.5</sub></b> .....	particulate matter less than 2.5 microns in aerodynamic diameter
<b>CSR</b> .....	Code of State Regulations	<b>PM<sub>10</sub></b> .....	particulate matter less than 10 microns in aerodynamic diameter
<b>dscf</b> .....	dry standard cubic feet	<b>ppm</b> .....	parts per million
<b>EQ</b> .....	Emission Inventory Questionnaire	<b>PSD</b> .....	Prevention of Significant Deterioration
<b>EP</b> .....	Emission Point	<b>PTE</b> .....	potential to emit
<b>EPA</b> .....	Environmental Protection Agency	<b>RACT</b> .....	Reasonable Available Control Technology
<b>EU</b> .....	Emission Unit	<b>RAL</b> .....	Risk Assessment Level
<b>fps</b> .....	feet per second	<b>SCC</b> .....	Source Classification Code
<b>ft</b> .....	feet	<b>scfm</b> .....	standard cubic feet per minute
<b>GACT</b> .....	Generally Available Control Technology	<b>SDS</b> .....	Safety Data Sheet
<b>GHG</b> .....	Greenhouse Gas	<b>SIC</b> .....	Standard Industrial Classification
<b>gpm</b> .....	gallons per minute	<b>SIP</b> .....	State Implementation Plan
<b>gr</b> .....	grains	<b>SMAL</b> .....	Screening Model Action Levels
<b>GWP</b> .....	Global Warming Potential	<b>SO<sub>x</sub></b> .....	sulfur oxides
<b>HAP</b> .....	Hazardous Air Pollutant	<b>SO<sub>2</sub></b> .....	sulfur dioxide
<b>hr</b> .....	hour	<b>tph</b> .....	tons per hour
<b>hp</b> .....	horsepower	<b>tpy</b> .....	tons per year
<b>lb</b> .....	pound	<b>VMT</b> .....	vehicle miles traveled
<b>lbs/hr</b> .....	pounds per hour	<b>VOC</b> .....	Volatile Organic Compound
<b>MACT</b> .....	Maximum Achievable Control Technology		
<b>µg/m<sup>3</sup></b> .....	micrograms per cubic meter		

Mr. Gregg P. Coffin  
CF Energy Management Director  
MU Power Plant  
Energy Management, 417 South Fifth Street  
Columbia, MO 65211-2030

RE: New Source Review Permit - Project Number: 2015-05-079

Dear Mr. Coffin:

Enclosed with this letter is your permit to construct. Please study it carefully and refer to Appendix A for a list of common abbreviations and acronyms used in the permit. Also, note the special conditions 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 were adversely affected by this permit decision, you may be entitled to pursue an appeal before the administrative hearing commission pursuant to §§621.250 and 643.075.6 RSMo. To appeal, you must file a petition with the administrative hearing commission 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 administrative hearing commission, whose contact information is: Administrative Hearing Commission, Truman State Office Building, 573-751-2422, 573-751-5018, website: [www.ao.mo.gov/ahc](http://www.ao.mo.gov/ahc). If you have any questions regarding this permit, contact Alana Hess, Department of Natural Resources' Air Pollution Control Program, at (573) 751-4817.

Sincerely,

AIR POLLUTION CONTROL PROGRAM

Susan Heckenkamp  
New Source Review Unit Chief

SH:ahl

Enclosures

c: Northeast Regional Office  
PAMS File: 2015-05-079  
Permit Number: