5. Environmental Compliance

Highlights

- *Since the 2014 Integrated Resource Plan (IRP) filing, the U.S. Environmental Protection Agency (EPA) has issued a number of new or updated regulations for power plant air, water, and solid waste emissions.*
- *Such environmental regulations affect the operations of Ameren Missouri's Energy Centers; in particular, its coal-fired units.*
- *Ameren Missouri has identified mitigation steps and costs for complying with current and probable future environmental regulations to be used in its evaluation of alternative resource plans.*

Ameren Missouri has made significant investments to comply with existing environmental regulations and maintain a sufficient compliance margin. Rules proposed or promulgated since the beginning of 2014 include the regulation of greenhouse gas emissions for new, modified and existing coal-fired and natural gas-fired combined cycle units; revised national ambient air quality standards for ozone; the Cross-State Air Pollution Rule (CSAPR), which requires reductions of SO_2 emissions and NO_x emissions from energy centers; a regulation governing management of coal combustion residuals (CCR) and coal ash impoundments; the Mercury and Air Toxics Standards (MATS) rule, which requires reduction of emissions of mercury, trace metals, and acid gases from energy centers; the Steam Electric Effluent Limitations Guidelines (ELG) rule, which requires dry ash handling systems and the construction of waste water treatment facilities; and revised regulations under the Clean Water Act that require capital expenditures for water intake structures.

Environmental regulations are an important factor to consider in resource planning. Due to the recent change in administration, the future regulatory horizon is uncertain with respect to certain regulatory programs such as greenhouse gas emissions from coal-fired and natural gas generating units. Nevertheless, in this IRP, we have assumed that construction of a new coal-fired power plant would require carbon capture and sequestration (CCS) in addition to measures required to comply with other existing, proposed and potential environmental regulations. Ameren Missouri has incorporated assumptions regarding proposed and potential environmental regulations in its "most likely" case and a corresponding compliance path characterized by environmental retrofits to its existing fleet. The cost and timing of those retrofits are reflected in the risk

analysis presented in Chapter 9. Furthermore, the planning scenarios (described in Chapter 2) act as signposts for decision making and therefore are an important aspect of the strategy selection in Chapter 10.

5.1 Overview

Ameren Missouri is subject to various environmental laws and regulations enforced by federal, state (Missouri and Illinois) and local authorities. The following sections describe the status of the major current and future regulations that may govern the operations of Ameren Missouri facilities. Given the recent change in administration and the lack of certainty regarding future regulatory programs, Ameren Missouri has necessarily made good faith assumptions based upon available information regarding potential future compliance measures. Such assumptions are subject to revision.

Table 5.1 summarizes the current environmental regulations for which Ameren Missouri must implement mitigation measures, along with expectations for compliance requirements for certain potential regulations.

Table 5.1 Current & Pending Environmental Regulations

Regulatory Driver	Summary Requirements	Regulation Status	Compliance Timing
Cross-State Air Pollution Rule (CSAPR)	Reduction in NOx and SO2 allowances vs. CAIR; New allowances for trading program (state level caps)	EPA implemented Phase 1 starting on 1/1/2015. On September 7, 2016 EPA finalized an update effective December 27, 2016 to lower the seasonal NOx (May-Sept) allocations beginning with the 2017 ozone season.	Phase 1: 1/1/2015 Phase 2: 1/1/2017
Revisions to National Ambient Air Quality Standards (NAAQS)	Lower PM, NOx and SO2 limits; Expansion of non-attainment areas	SO2 final rule June, 2010; EPA issued a final designation of "unclassifiable" for area around Labadie; final designations for all areas 2016-2020.	SO2: 2017 - 2020
		Fine particulate (PM2.5) lowered 1/15/2013; Attainment designations 03/2015; State Implementation Plans 2018.	PM 2.5: 2020 - 2025
		Ozone standard lowered, final rule 12/2015; Attainment designations 2017; State Implementation Plans 2020	Ozone: 2020+
Mercury and Air Toxics Standards (MATS)	Reduction in emissions of Mercury, HCl (proxy for acid gases) and particulate emissions (proxy for non-mercury metals)	Final rule effective April 16, 2012. Compliance required by April 16, 2015.	Rush Island and Sioux Energy Centers compliant on April 16, 2015; Labadie and Meramec (units 3 & 4) Energy Centers received MDNR approved 1-yr extensions and compliant on April16, 2016.
Clean Air Visibility Rule (CAVR)/Regional Haze Rule	Application of Best Available Retrofit Technology (BART); Targets reduction in transported SO2 and NOx; status of CSAPR may require state to change approach.	Final rule issued by EPA in 1999; States submitted progress reports in 2013; CSAPR resolution may require changes to state rule.	EPA finalized a rule that will move the next deadline from July 31, 2018 to July 31, 2021.
Clean Water Act Section 316(a) Thermal Standards	Implementation through NPDES permit conditions	Evaluation covered by NPDES permits	2015 - 2020
Clean Water Act Section 316(b) Protection of Aquatic Life	Case-by-case determination of controls required to meet entrainment standards; national standard for impingement	Final rule from EPA effective October 2014	Study plans 2014; Studies 2015 - 2017; Compliance 2022 - 2024
Waters of The United States (WOTUS)	Protection of additional streams and tributaries	Final rule issued June 2015; Rule was stayed nation-wide on 10/09/15 by the U.S. Court of Appeals for the 6th Circuit. The EPA and Corps of Engineers has proposed revisions to the definition.	Unknown
Revisions to Steam Electric Effluent Limitations Guidelines (ELG)	Lower effluent emissions for existing parameters; Installation of wastewater treatment facilities; Implemented through NPDES permit conditions	EPA proposal April 19, 2013; final rule Sept 30, 2015; linked to CCR rule; revised rulemaking for steam electric power plant discharges effective January 4, 2016. The EPA has stayed compliance deadlines pending review of the final rule.	2018 - 2023
Coal Combustion Residuals (CCR)	Conversion to dry bottom ash and fly ash; Closure of existing ash ponds; Dry disposal in landfill	Final determination from EPA on haz/non-haz Dec 2014; final rule April 2015, effective October 19, 2015. Fedral legislation (WINN Act) to revise rule signed December 16, 2016.	2018 - 2023
Clean Air Act Regulation of Greenhouse Gases (GHG)/Clean Power Plan (CPP)	Output-based emission limit for new, modified, reconstructed units	New unit NSPS re-proposed Jan 2014; final rule effective 12/22/2015. Challenge filed in DC Circuit Court; oral argument is April 17, 2017.	New unit NSPS applies 1/8/2014
		Proposed rule for modified and reconstructed NSPS June 2014; final effective 12/22/2015. Challenge filed in DC Circuit Court.	Modified/reconstructed applies 6/18/2014
	State emission limits for existing sources	Proposed NSPS for existing units June 2014; final effective 12/22/2015; Rule stayed by Supreme Court 2/9/2016; oral arguments September 2016; DC Circuit Court holding case in abeyance pending EPA review of final rule.	Existing source interim rates 2022 - 2029; final rates 2030+ Compliance dates are suspended due to Supreme Court stay

5.2 Air Regulation and Compliance Assumptions

CSAPR and the CSAPR Update Rule

The CSAPR was finalized on July 6, 2011 replacing the Clean Air Interstate Rule (CAIR)[1]. CSAPR established new allowances for the annual NO_x (nitrogen oxides) and SO_2 (sulfur dioxide) trading programs and the seasonal NO_x trading program. CSAPR uses newly created allowances and thus there is no initial bank to rely on from the Acid Rain or CAIR programs to use for any potential shortfall. CSAPR was slated to become effective January 1, 2012, but the rule was stayed by a federal court decision on December 30, 2011, in response to several legal challenges. On June 26, 2014, the EPA filed a motion with the United States (U.S.) Court of Appeals for the District of Columbia (D.C.) Circuit to: (1) remove the stay of CSAPR and (2) delay for three years all of the compliance deadlines that had not already passed when the stay was enacted. On October 23, 2014, the D.C. Circuit court lifted the stay. On December 3, 2014, the EPA implemented a 3 year toll that moved the starting date for Phase 1 of CSAPR to January 1, 2015 and January 1, 2017 for Phase 2. Ameren Missouri units are in compliance with the CSAPR limits for both SO_2 and NO_x. The planned retirement of the Meramec Energy Center at the end of 2022 will provide Ameren Missouri with additional margin through 2028 to help comply with any future updates to the CSAPR. In the future, the EPA could revise the rule with lower caps on SO_2 and NO_x emissions. If future revisions require additional reductions in the CSAPR SO_2 and/or NO_x allocations, Ameren Missouri would evaluate compliance strategies that could include modified operation of existing generation resources as well as the installation of additional pollution control equipment at one or more of its facilities depending on the level of required reduction. Ameren Missouri expects future regulations would continue to allow for fleet averaging for demonstration of compliance. The following figures show Ameren Missouri's coal fleet emissions relative to the various regulations promulgated by the EPA. As seen from these graphs, Ameren Missouri's fleet has margin to comply with both the CSAPR SO_2 and annual NO_x programs. The new CSAPR update rule revises ozone season limits and will require Ameren Missouri to take additional compliance action beginning in May, 2017.

[1] No further compliance with CAIR is required.

Figure 5.1 Ameren Missouri Coal Fleet SO_2 Emissions vs Regulations

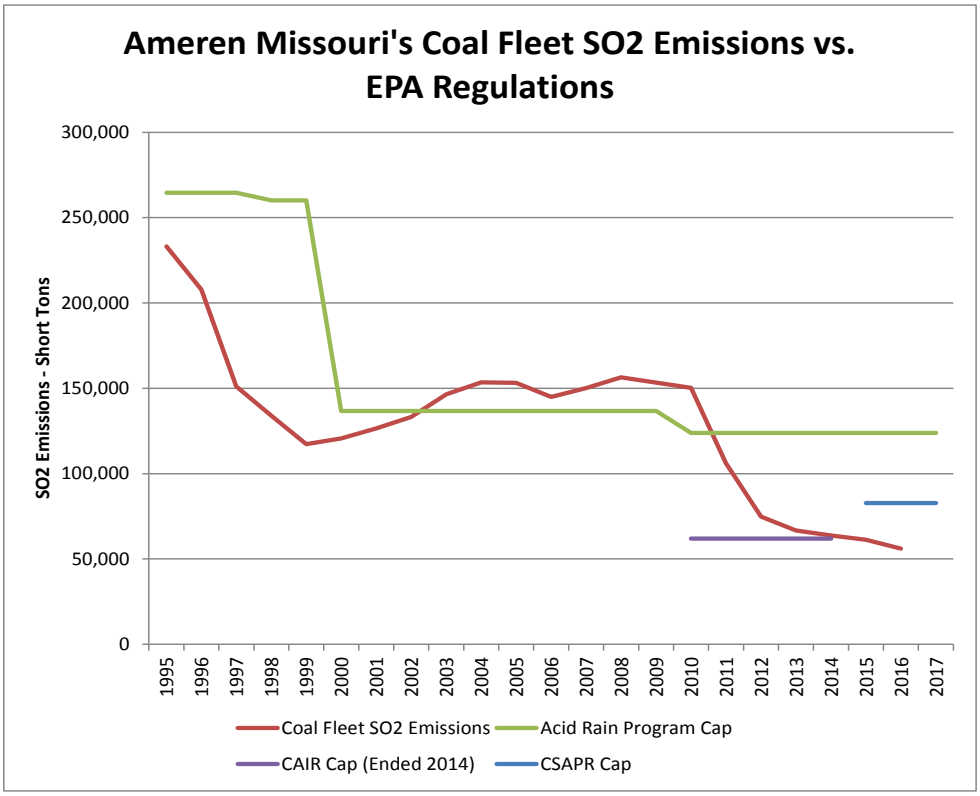


Figure 5.2 Ameren Missouri Coal Fleet Annual NO_x Emissions vs Regulations

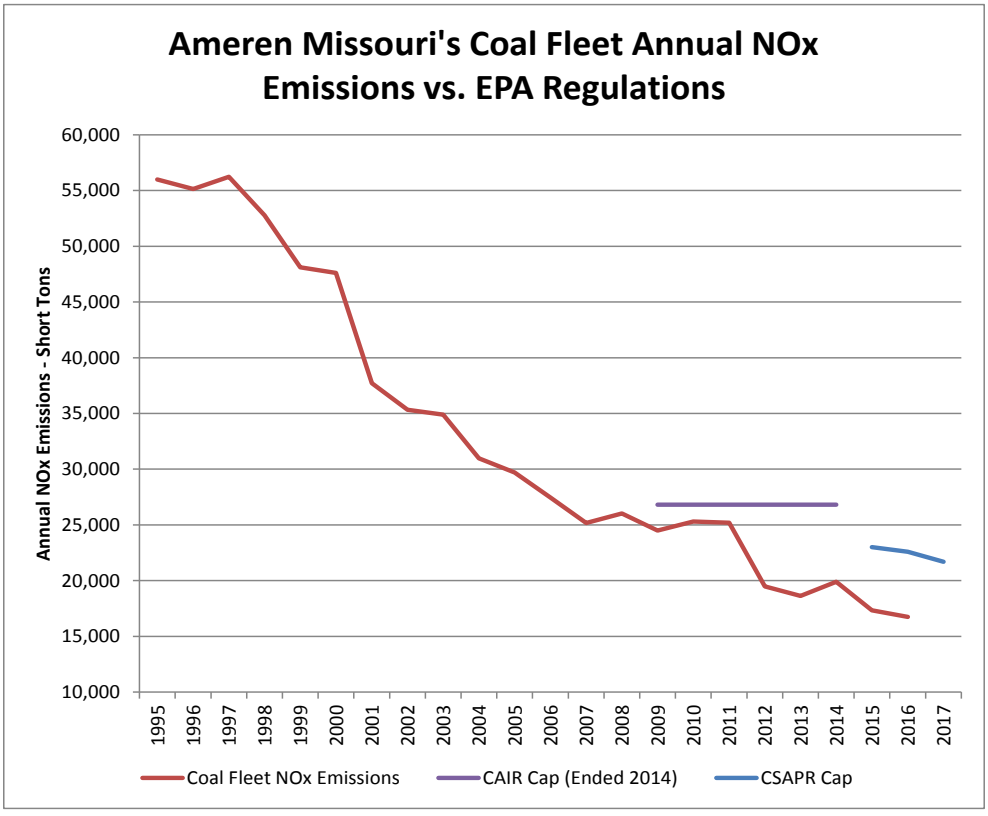
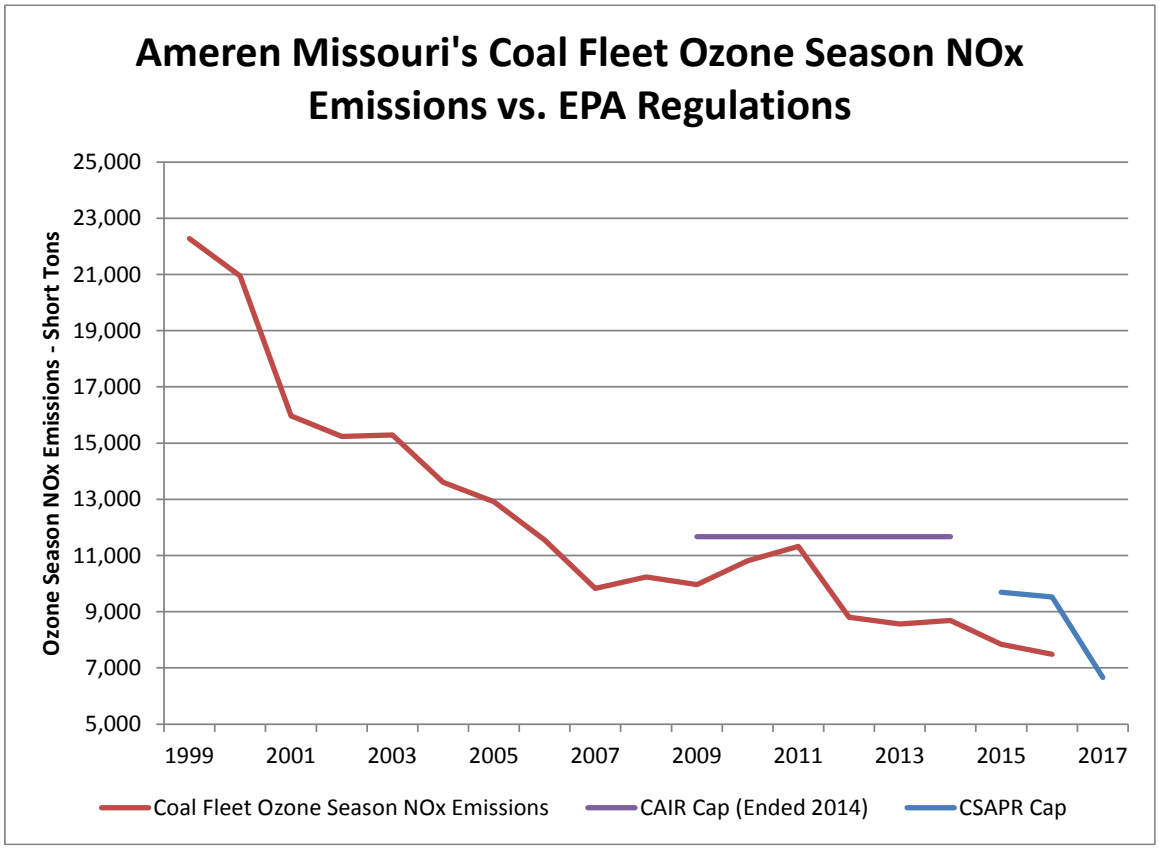


Figure 5.3 Ameren Missouri Coal Fleet Ozone Season NO_x Emissions vs Regulations



On December 3, 2015, the EPA published a proposed update to the CSAPR rule in the Federal Register. The proposed update included a reduction in the Ozone Season NO_x allocations for Phase 2 of the original CSAPR rule, which would become effective May 1, 2017. The public comment period for the proposed update rule closed on February 1, 2016. On September 7, 2016, the EPA Administrator signed the final update rule requiring lower NO_x limits during the ozone season beginning with the 2017 ozone season. That final rule was published in the Federal Register on October 26, 2016, with an effective date of December 27, 2016. The stated purpose of the update rule is to help downwind areas achieve compliance with the 2008 Ozone standard (75 ppb standard). The final update rule implements reductions in the Ozone Season NO_x allowance allocations for several states including Missouri and Illinois. The state of Missouri allocation was reduced to 15,780 allowances that are approximately 25% below previous CSAPR 2017 ozone season allocations. In addition, the Illinois CT (combustion turbine) fleet received an allocation of approximately 30% fewer allowances in 2017 than they received in 2016 (85 allowances versus 122 allowances). However, there should still be sufficient allowances available to achieve compliance in Illinois based on projected levels of operation. In addition to fewer allowances, the EPA

also made changes to the use of the allowance bank accumulated from compliance periods 2015 and 2016. Beginning with the compliance for the 2017 ozone season, approximately 99,700 banked allowances will be allowed to be used from the banked allowance pools from 2015 and 2016. The EPA estimates that, for every 3.5 allowances held in the bank, 1 allowance will be allocated for use in 2017 and beyond compliance periods. This will have the effect of reducing Ameren Missouri's allowance bank to only about 1/3 of its current level of nearly 5,000 allowances. As a result of these two changes, Ameren Missouri may need to operate its selective non-catalytic reduction (SNCR) systems at Sioux in order to achieve compliance with the update rule in Missouri.

National Ambient Air Quality Standard (NAAQS) for SO_2

The EPA lowered the SO_2 ambient standard to 75 parts per billion (ppb) on June 2, 2010. Initial attainment designations were finalized on August 5, 2013, and included the designation of two areas in Missouri as nonattainment. The two nonattainment areas included an area in the vicinity of Kansas City (portions of Jackson County) and an area around Herculaneum (portions of Jefferson County). In 2015, the Missouri Department of Natural Resources (MDNR) finalized attainment plans for both areas. The areas are required to demonstrate compliance with the new SO_2 standard no later than October 4, 2018. For the Herculaneum area, the MDNR has three years of air quality monitoring data that indicates the area is in attainment with the standard. At MDNR's request, on June 23, 2017 the EPA proposed a determination that the area has attained the SO_2 ambient standard. On September 13, 2017, EPA published a final determination that the Jefferson County area is in attainment with the SO_2 ambient standard. The MDNR is in the process of finalizing a maintenance plan and formal request that the area be redesignated to attainment. As a part of MDNR's state implementation plan for the Herculaneum area, Ameren Missouri entered into an agreement in 2015 to install an ambient SO_2 monitoring network in the vicinity of the Rush Island Energy Center. The agreement also includes lower SO_2 emissions limits for the Rush Island, Labadie and Meramec Energy Centers that took effect on January 1, 2017. The ambient SO_2 monitors near the Rush Island Energy Center began gathering data in December 2015 and, to date, measured values are significantly (<60%) below the ambient air quality standard for SO_2.

In addition to the initial attainment designations, the EPA is taking additional steps to complete the designation process for the SO_2 ambient standard. The EPA entered into a consent order with the Sierra Club and the Natural Resources Defense Council on March 2, 2015, and also finalized the "Data Requirements Rule" on August 21, 2015. These steps are intended to address other areas in the country, for which the attainment status has not been determined.

The "Data Requirements Rule" requires states to evaluate emissions from "large sources" of SO_2 (generally greater than 2000 tons SO_2/year) by either the use of air dispersion modeling or ambient air quality monitoring. For areas where states choose to use modeling to determine attainment status, states must submit their designations (and supporting information) to the EPA by January 13, 2017. The EPA will designate these areas either attainment or nonattainment by December 31, 2017. Non-attaining areas must be in compliance by December 2022. For sources in Missouri for which the modeling option of the Data Requirements Rule was utilized, the MDNR completed the modeling analysis in the fall of 2016. In December 2016, the Missouri Air Conservation Commission approved the MDNR recommendation of attainment for eight sources in Missouri that included the Meramec Energy Center. The attainment recommendations were submitted to the EPA. On September 5, 2017, the EPA issued the preliminary designations for the modeling option and will issue the final designations by December 31, 2017.

For areas where states choose monitoring, states had to submit monitoring plans to the EPA by July 2016, and sources are required to have monitors installed by January 1, 2017. After 3 years of monitoring data is collected (2017-19), the states must certify the data collected by May 2020. The EPA will designate these areas either attainment or nonattainment by December 2020. Non-attaining areas must be in compliance by December 2025.

The Consent Order addresses areas that contain any stationary source not announced for retirement that according to the EPA's Air Markets Database emitted in 2012 either (a) more than 16,000 tons of SO_2, or (b) more than 2,600 tons of SO_2 and had an average emission rate of at least 0.45 lbs. SO_2/MMBtu. The EPA must complete designations for these areas by July 2, 2016. These areas have up to 5 years to achieve attainment. In September 2015, the MDNR recommended that the area around the Labadie Energy Center be designated as unclassifiable. In April 2015, Ameren Missouri began operating SO_2 ambient monitors to demonstrate that the area is in compliance with the SO_2 air quality standard. On June 30, 2016, the EPA issued a final determination of "unclassifiable" for the area around the Labadie Energy Center. Data collected from the ambient SO_2 monitors indicates that air quality in the vicinity of the Labadie Energy Center complies with the EPA standards, however, a full three years of data has not yet been collected. In accordance with the EPA's Data Requirement Rule, the ambient SO_2 monitoring network for the Labadie Energy Center has been enhanced and two additional monitors are in service as of January 2017. After three years of monitoring data is collected (2017 – 2019), the MDNR will recommend the attainment status and the EPA will make a final determination by December 2020. Ameren Missouri will continue to work with the MDNR and the EPA to ensure that they receive

the best and most up-to-date scientific data to determine the appropriate designation for the area. Ameren Missouri continues to operate the monitoring systems and submit the data to both MDNR and the EPA. Based on monitoring data gathered to date, we have assumed the area around Labadie to ultimately be designated as "attainment". Ameren Missouri's assumptions for compliance regarding SO_2 emissions reflect this expectation as well as expected steps necessary to comply with CSAPR.

Revisions to the National Ambient Air Quality Standard (NAAQS) for Ozone

The air quality in the St. Louis area continues to improve. At the same time, the ambient standard has been lowered. Most recently, in February of 2015, the EPA re-designated the St. Louis area to attainment with the 1997 eight-hour ozone standard. Additionally, the EPA also approved the state's plan for maintaining the 1997 ozone standard in the St. Louis area for ten years beyond re-designation to 2025. Current ozone air quality data for years 2013 through 2015 indicate that the St. Louis area is meeting the 2008 ozone standard. Based on this data, the MDNR has submitted a request to the EPA to re-designate the St. Louis area to attainment in 2016. In 2015, the EPA lowered the ambient standard for ozone to 70 ppb. The MDNR submitted their proposed designations to the EPA in October 2016. The EPA will finalize the designations by October 2017. Attainment plans are expected to be due in the late 2020 timeframe. Based on current air quality data, the St. Louis area is very close to meeting the 70 ppb ozone standard. Based on this current data, the St. Louis area is expected to be classified as marginal nonattainment and compliance would be required within 3 years of the effective date of the designation.

While several outcomes are possible, Ameren Missouri believes the most likely outcome would be a reduction in the CSAPR ozone season NO_x allowance allocations in the future, but no earlier than 2022. Compliance strategies to reduce NO_x emissions might include the need for selective catalytic reduction (SCR) systems at the Sioux Energy Center. However, for this IRP it was assumed the SCR systems would not be required for compliance. Table 5.2 shows the NO_x emission rates achieved by Ameren Missouri's coal-fired units in the 2016 ozone season.

Table 5.2 Major Fossil Unit NO_x Emission Rates

Energy Center/Unit	NO_x Rate (lb/MMBtu)
Labadie Energy Center	0.090
Meramec Unit 1	0.053
Meramec Unit 2	0.073
Meramec Unit 3	0.181
Meramec Unit 4	0.179
Rush Island Energy Center	0.083
Sioux Energy Center	0.239
Coal Fleet	0.122

Revisions to the National Ambient Air Quality Standard (NAAQS) for Fine Particulate Matter (PM2.5)

On June 15, 2012, the EPA proposed to lower the ambient standard to a range of 12 to 13 micrograms per cubic meter ($\mu g/m^3$). The final rule was signed on December 14, 2012, and set the standard at 12 $\mu g/m^3$. In December 2013, the MDNR recommended that the entire state of Missouri, including the St. Louis area that includes Franklin, Jefferson, St. Charles, and St. Louis Counties and St. Louis City, be designated as "attainment/unclassifiable". Based on 2010 through 2012 ambient air monitoring data, all monitors in Missouri were in compliance with the standard. The EPA designated the St. Louis area and the metro-East area in Illinois as unclassifiable due to insufficient quality assured monitoring data for the state of Illinois to assess compliance with the 2012 annual fine particle standard. Illinois will have sufficient ambient air monitoring data at the end of 2017 and a final determination of the St. Louis area's attainment status is expected in 2018. Based on the current data, the area is expected to be classified as in attainment. As stated, Ameren Missouri expects the area to be classified as in attainment and thus no further mitigation would be required at Ameren Missouri's facilities.

The Clean Air Act requires the EPA to review all of the ambient standards on a periodic basis. In the future, it is possible that the EPA will reevaluate the PM standards and determine whether a further reduction is required. The potential impact of a lower standard is lower allowance allocations for the CSAPR SO_2 and annual NO_x trading programs. A scenario that assumes a reduction in allocations by 20%, resulting in a new SO_2 cap of 66,150 tons and a new annual NO_x cap of 17,428 tons was evaluated. Based on Ameren Missouri's current emission levels and the future retirement of the Meramec Energy Center at the end of 2022, no additional control technology should be required to be installed to meet these lower fleet wide caps.

Maximum Achievable Control Technology (MACT) Standards to Control Mercury and Other Hazardous Air Pollutants for Electric Generating Units (EGU)

The MACT rule for EGU's was effective on April 16, 2012. This final rule is known as the Mercury and Air Toxics Standards (MATS). The MATS includes standards for mercury, particulate matter as a surrogate for non-mercury metals, hydrogen chloride (HCl) as a surrogate for acid gases, work practices for organic emissions and monitoring requirements. The MATS standard also includes more stringent emission limits for new sources.

Ameren Missouri's Rush Island and Sioux Energy Centers were compliant with the MATS on April 16, 2015. The Labadie and Meramec (units 3 & 4) Energy Centers received a one-year extension and achieved compliance with the MATS on April 16,

2016. Units 1 & 2 at the Meramec Energy Center began burning natural gas only on April 16, 2016, and thus were not subject to MATS. Ameren Missouri installed Activated Carbon Injection technologies at all four of its coal-fueled energy centers and made modifications to the existing PM controls at its Labadie Energy Center. In addition, Ameren Missouri will utilize work practices and fuel choices to meet the other MATS regulated hazardous air pollutants. The figures below show Ameren Missouri's coal fleet compliance with the MATS requirements. Ameren Missouri is achieving compliance with some margin. In the unlikely event some of these limits would be lowered, Ameren Missouri believes its facilities would be able to comply without the installation of additional control technology.

Figure 5.4 Labadie MATS Compliance – Mercury

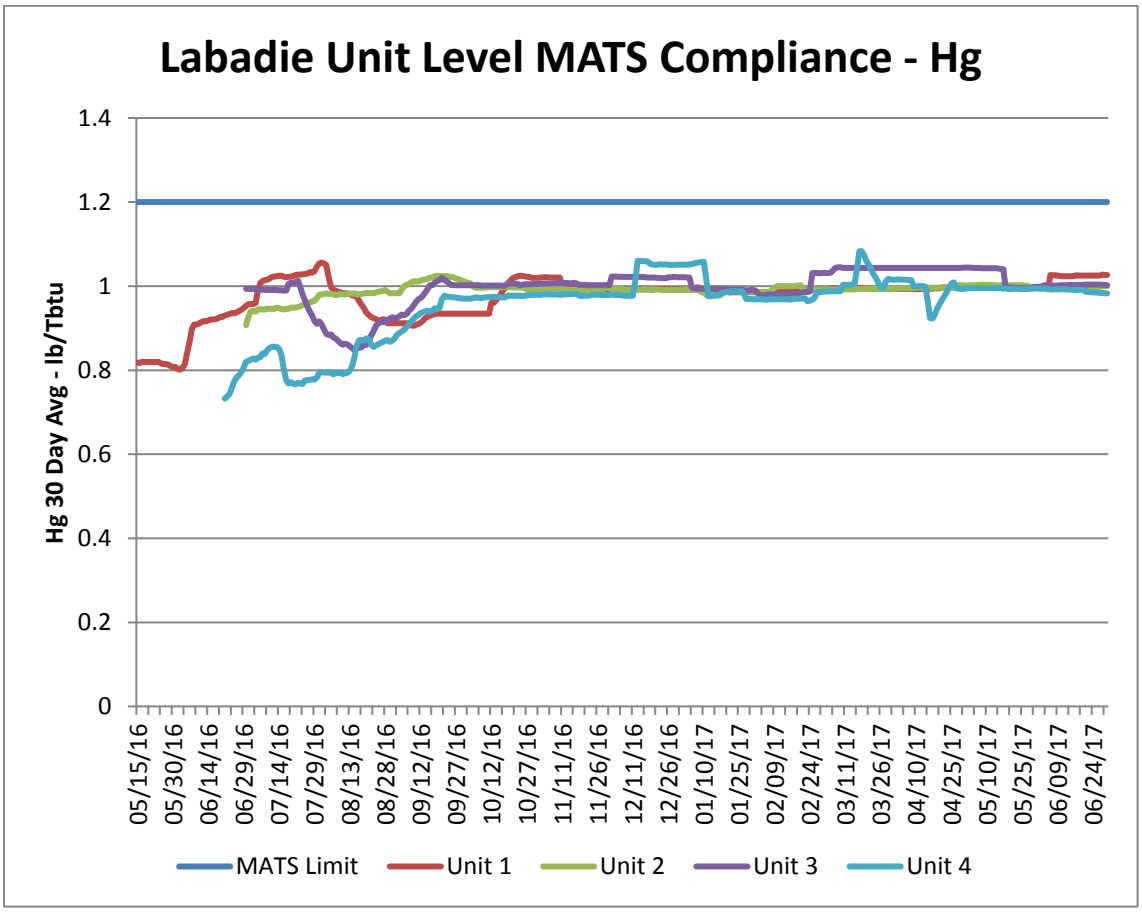


Figure 5.5 Meramec MATS Compliance – Mercury

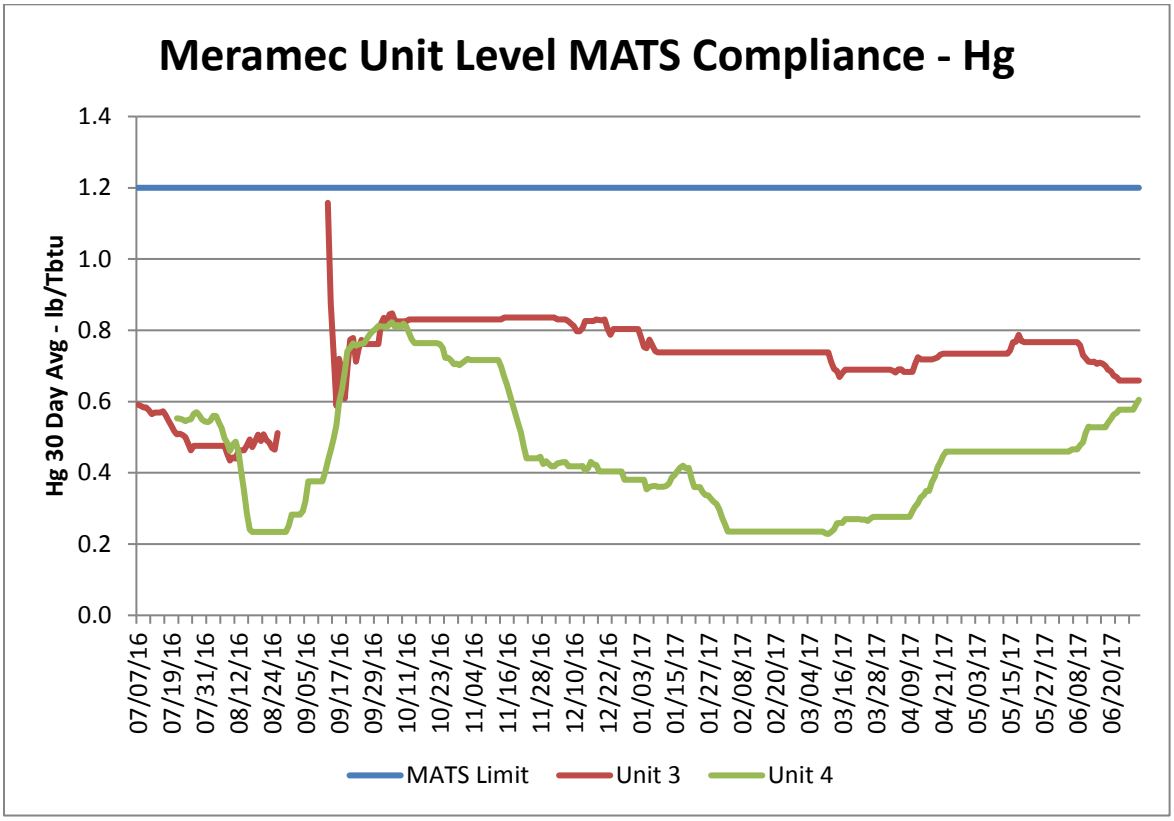


Figure 5.6 Rush Island MATS Compliance – Mercury

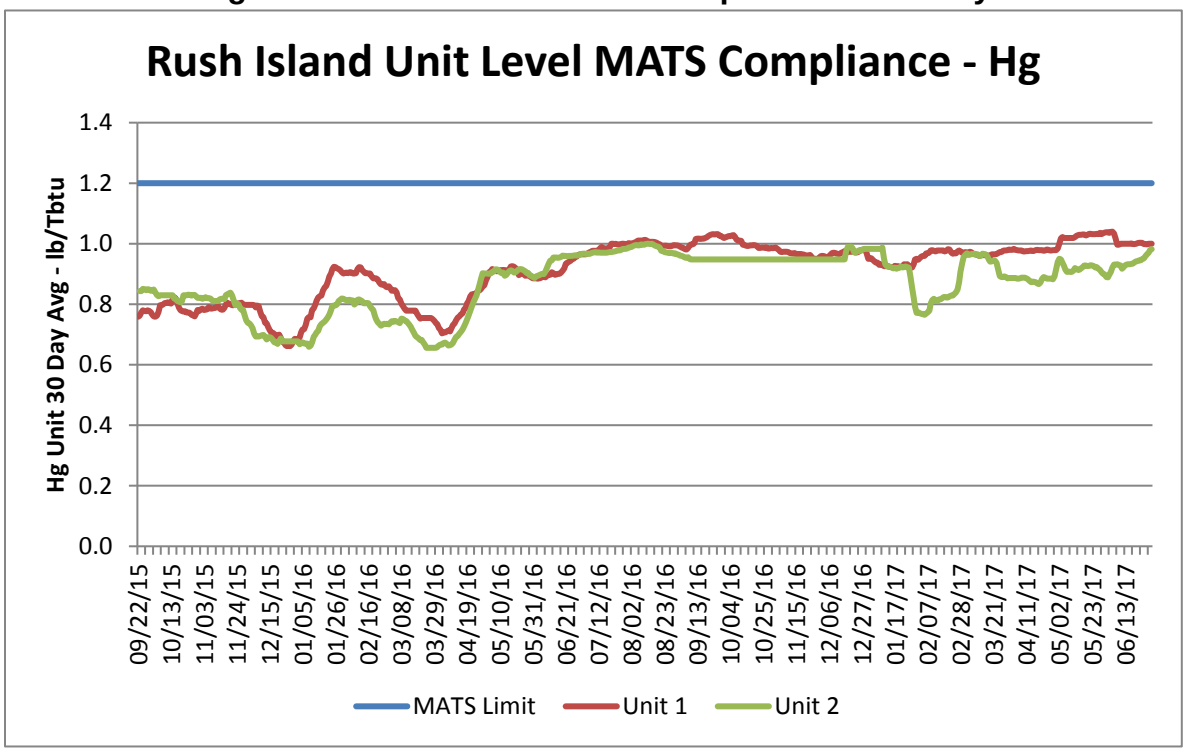


Figure 5.7 Sioux MATS Compliance – Mercury

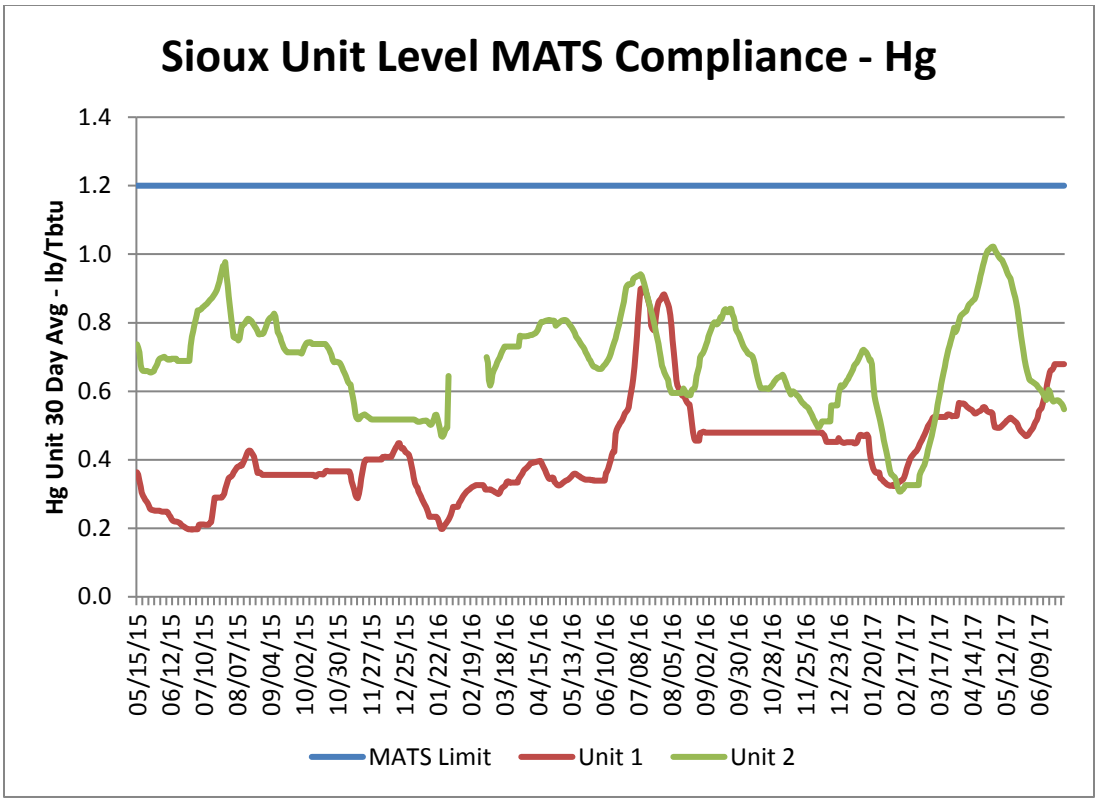


Figure 5.8 Labadie MATS Compliance – PM

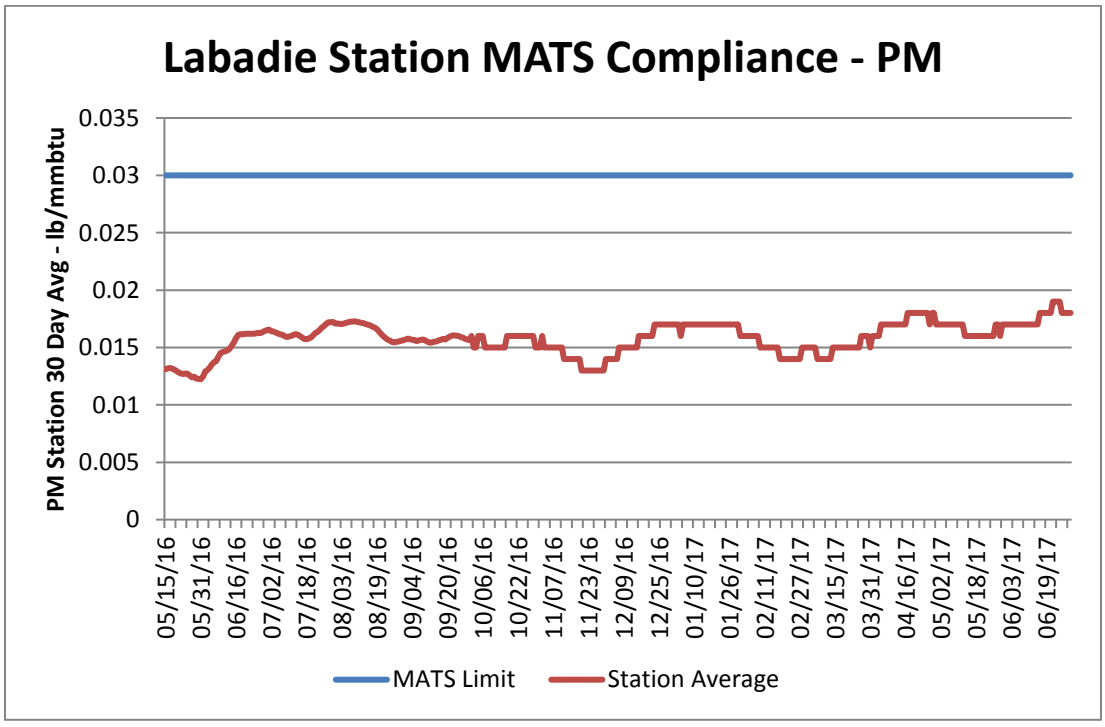


Figure 5.9 Meramec MATS Compliance – PM

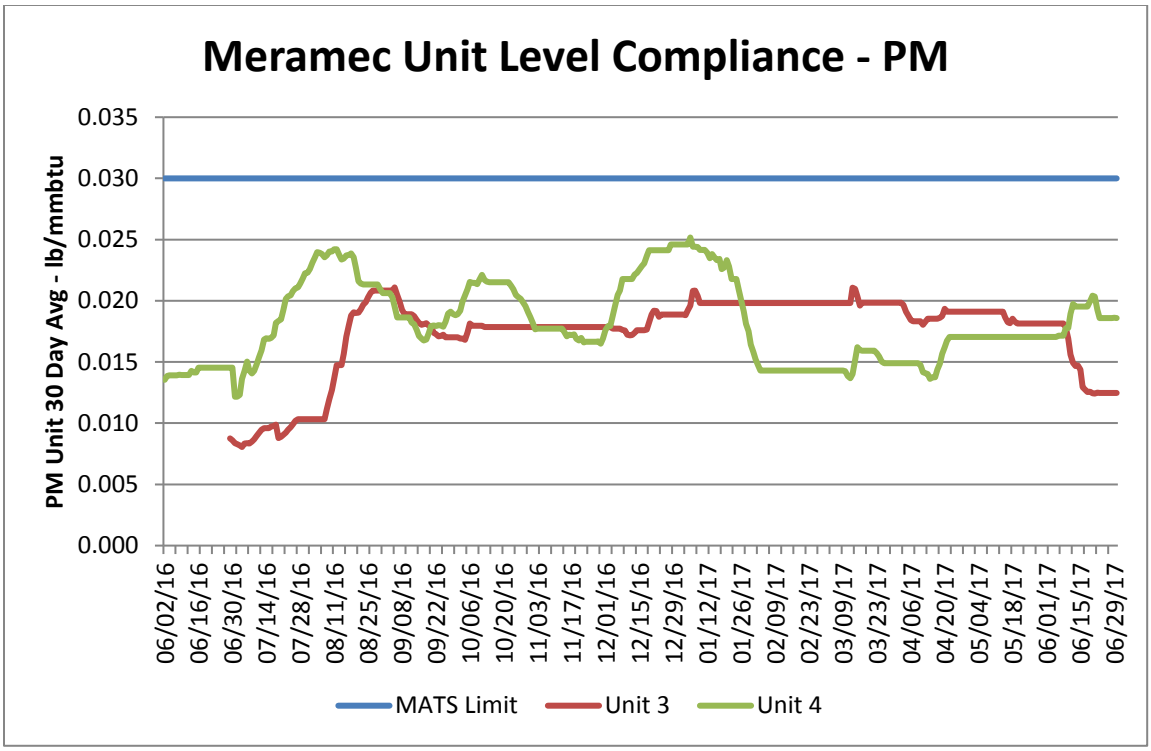


Figure 5.10 Rush Island MATS Compliance – PM

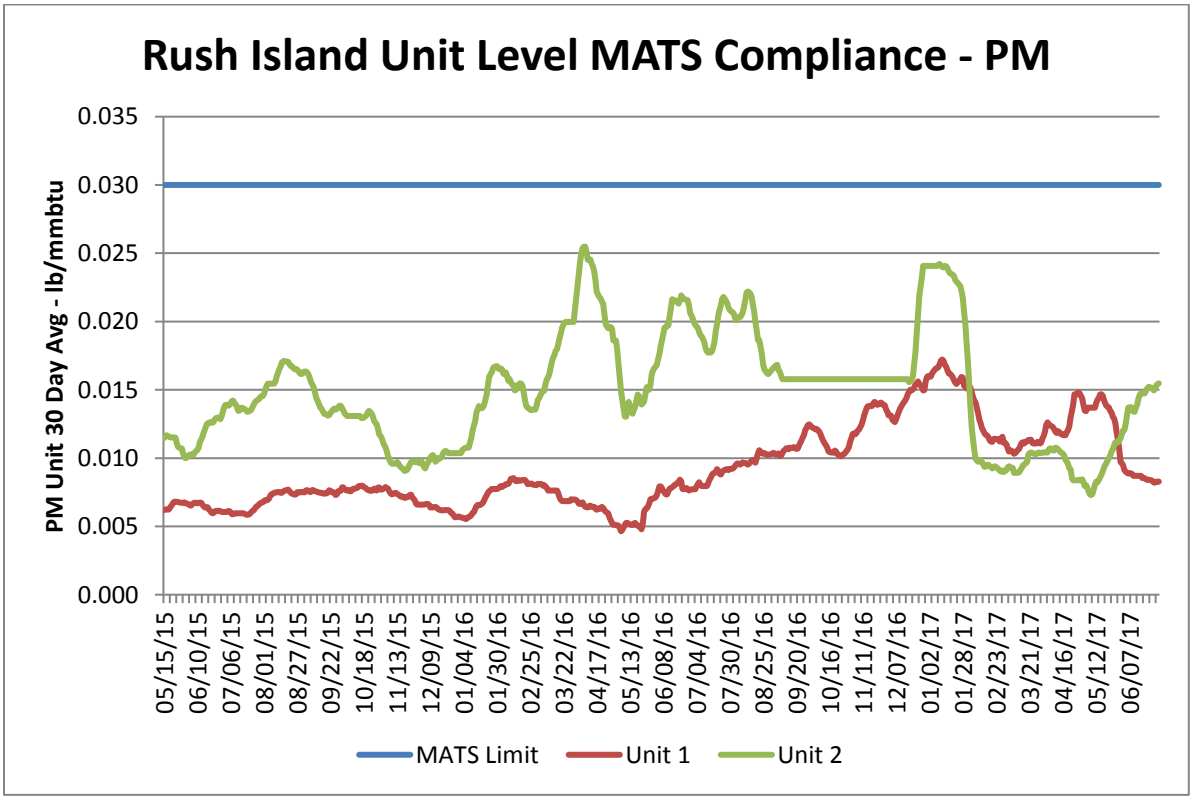


Figure 5.11 Sioux MATS Compliance – PM

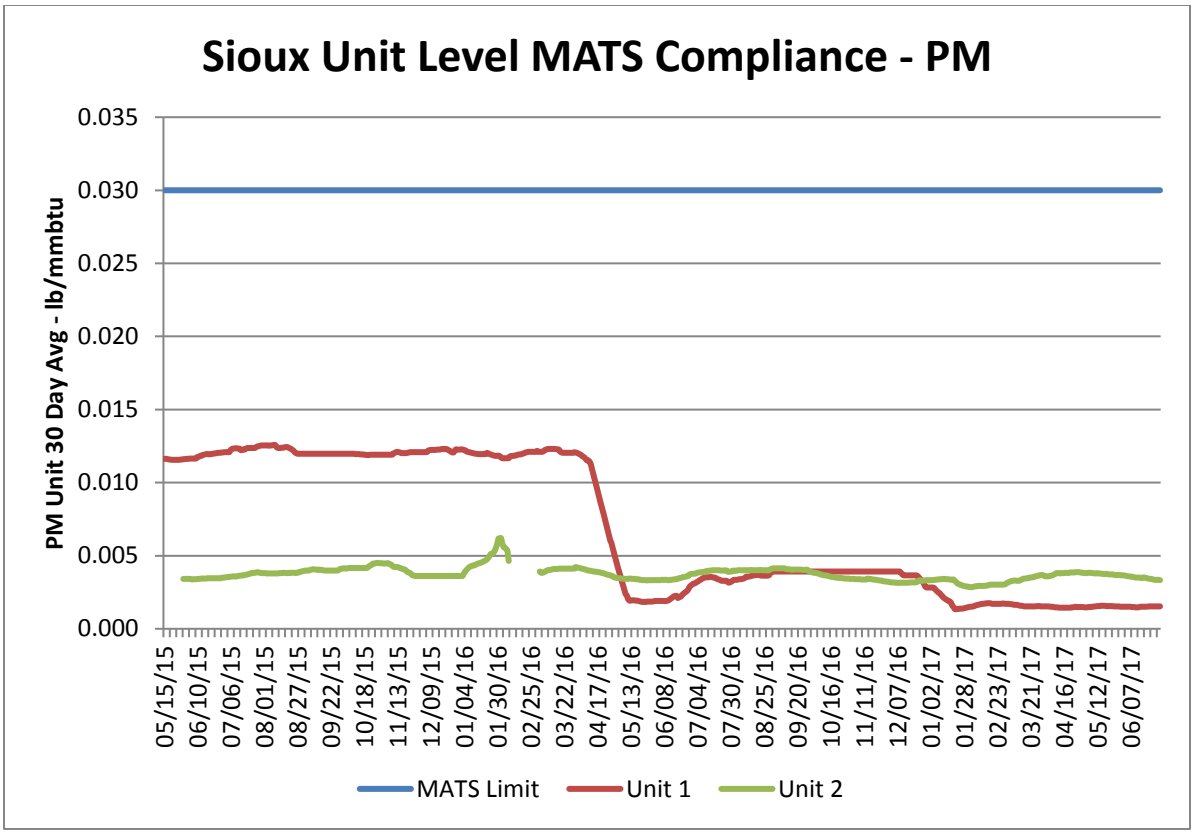
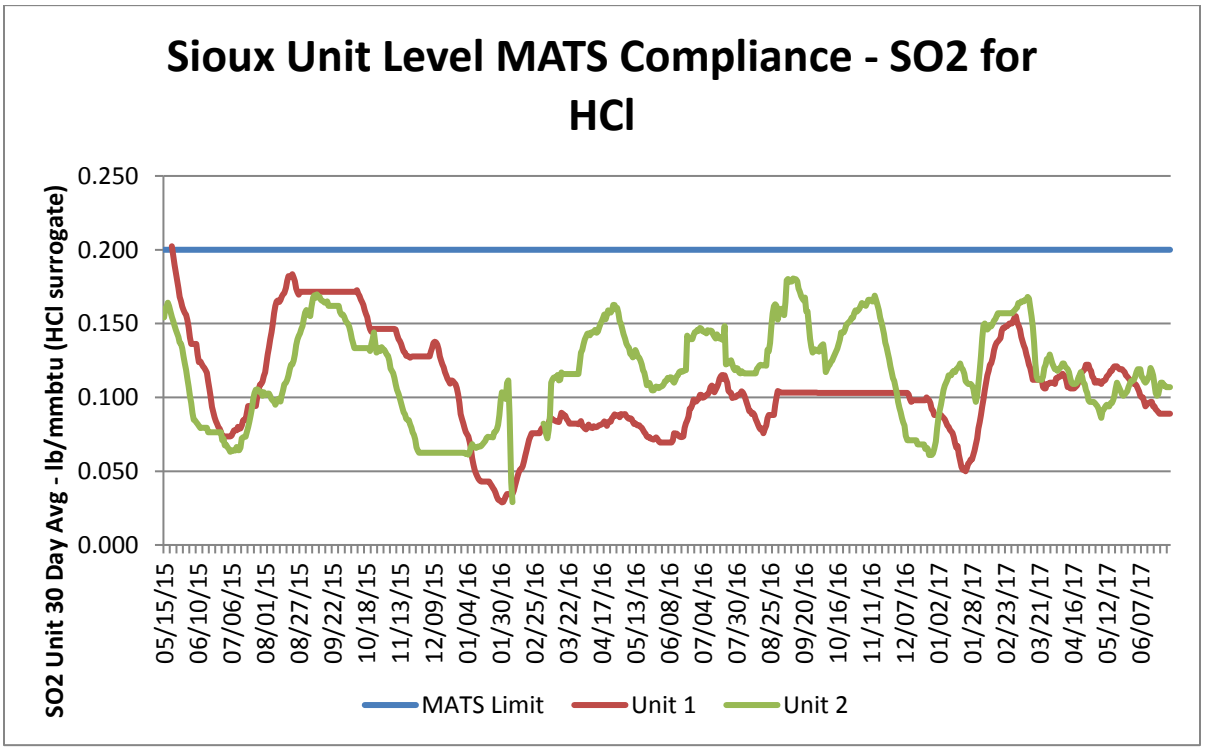


Figure 5.12 Sioux MATS Compliance – HCl (Sioux uses SO_2 as a surrogate)



The data is based on a 30-day rolling average comprised of hourly data when the emission unit is operating. If the unit is not operating there will be gaps in the 30-day rolling average.

Clean Air Act Regional Haze Requirements

The goal of the Regional Haze Rule is to set visibility equivalent to natural background levels by 2064 in Class I areas. Class I areas are defined as national parks exceeding 6,000 acres, wilderness and national memorial parks exceeding 5,000 acres and all international parks in existence on August 7, 1977. There are currently 156 Class I areas, two of which are in the State of Missouri (Hercules Glade and Mingo). As part of the first planning period (2008-2018), states must develop controls necessary to meet the glide path for the first 10 year planning period. In addition, the Regional Haze Rule requires compliance with Best Available Retrofit Technology (BART) for SO_2 & NO_x for the first planning period. The EPA has determined that compliance with CSAPR meets the BART requirements. Ameren Missouri is fully compliant with CSAPR, and thus, is compliant with the BART requirements. However, Environmental Groups are challenging the EPA's CSAPR=BART determination. Currently, both of the Missouri Class I areas are meeting the first planning period glide path. Ameren Missouri has assumed in this IRP that compliance with CSAPR will allow it to be in compliance with the BART requirements of the Regional Haze Rule.

Clean Air Act – New Source Review (NSR)

Ameren Missouri is required to review projects that it intends to perform under 40 CFR 52.21(r)(6) to determine if NSR permitting is applicable for existing major sources. For new facilities not located at Ameren Missouri's existing facilities, evaluations are performed based on the level of expected emissions and whether these projects fall under regulations defined under the New Source Performance Standards (NSPS) (Clean Air Act Section 111), National Emission Standards for Hazardous Air Pollutants (NESHAP) (Clean Air Act Section 112) or other state construction permitting requirements.

- Ameren Missouri continues to review major projects at its existing facilities related to maintenance activities and compliance initiatives (e.g. ESP upgrades, ACI systems for MATS compliance…) for the EPA's and the state's regulations.
- Ameren Missouri currently is not involved in construction of new major air pollutant emitting facilities requiring compliance with NSPS, NESHAP or other state air regulations.

5.3 Water Regulation and Compliance Assumptions

Clean Water Act (Amended 1972)

The Clean Water Act (CWA), in conjunction with State regulations, establishes pollutant-specific water quality standards for discharges to surface waterbodies and groundwater. Protection of water resources for industrial facilities is provided through the National Pollutant Discharge Elimination System (NPDES) permit process. Technology and water quality based effluent limitations are applied to ensure water quality standards are attained. In order to comply with effluent standards, it may be necessary to modify operations and/or install additional water pollution control equipment to meet a pollutant specific water standard.

CWA, Section 316(a) Thermal Discharges

Section 316(a) of the CWA requires limitations on thermal discharges from industrial sources, including power plants.

- Energy Center cooling water discharges are regulated by the EPA and MDNR through the NPDES permit program. Currently the State of Missouri and the EPA continue to review NPDES permits for Ameren Missouri Energy Centers.

As required by the Labadie Energy Center NPDES permit, Ameren Missouri has conducted a thermal study to determine if its discharges are compliant with Section 316(a) of the CWA. Based on the results from the modeling effort, Ameren Missouri believes it is in compliance with the thermal limitations of Section 316(a) of the CWA. While Ameren Missouri assumes that current Energy Center operations will meet our compliance needs in the near term, Ameren Missouri has identified the risk that this solution may not fully meet our compliance needs when the planning window is extended out to the 20-year IRP planning window. As a result, Ameren Missouri has identified operating procedures it would implement to address any thermal issues. This will allow it to avoid requirements to install cooling towers at the Labadie Energy Center. In addition, Ameren Missouri does not believe there are any thermal issues at its other fossil energy centers that would require cooling towers.

CWA, Section 316(b) Entrainment and Impingement of Aquatic Organisms

Section 316(b) of the CWA was established to protect fish and other aquatic habitat from detrimental impacts associated with water intake structures. At energy centers, aquatic organisms can be impinged (e.g. trapped or pinned against the intake screens) and entrained (e.g. pass through the screens, enter the heat exchanger and then discharged) within cooling water intake structures/piping and condenser systems. The EPA and MDNR establish regulations to limit adverse impacts associated with cooling

water intake structure operation through the NPDES permit process. Compliance with CWA §316(b) standards may incorporate performance and/or design criteria, or the utilization of specific control technologies. The presence of threatened or endangered species at a cooling water intake structure could potentially result in the need for additional operational and physical changes.

The EPA issued revised CWA §316(b) regulations on August 15, 2014. While the rules do not expressly require the installation of cooling towers at all facilities, they are expected to result in capital expenditures for modifications to existing cooling water intake structures to achieve compliance. All facilities with a cooling water intake structure are required to perform studies for review by the MDNR and other agencies. Facilities withdrawing in excess of 125 million gallons of water per day are required to perform additional studies to determine what control technologies are required. Intake structure owners are provided the option of selecting one of seven different impingement compliance options. These options include: (1) closed cycle cooling; (2) 0.5 foot per second (ft./sec) through-screen velocity (by design); (3) 0.5 ft./sec through-screen velocity (as measured); (4) existing off-shore velocity cap; (5) modified traveling water screens; (6) a "suite of technologies" determined by the permit writer to represent the best available technology; or (7) any technology that results in an annual impingement mortality rate of less than 24%. For those facilities that withdraw over 125 million gallons of water per day, or at the discretion of the permitting authority, the regulation also requires the reduction of entrainment similar to closed cycle cooling or a site-specific standard. New generating units are required to install closed cycle cooling.

The compliance options that have been considered to meet the CWA §316(b) include the following.

To meet the impingement and entrainment standards:

- Installation of Fine Mesh Screens
- Installation of closed cycle cooling using Cooling Towers

In 2015, Ameren Missouri began two-year entrainment characterization studies as the next step in complying with Section 316(b). Ameren Missouri is conducting biological studies and anticipates the installation of fine mesh screens at the Labadie, Rush Island and Sioux coal-fired energy centers. It is expected that with the retirement of the Meramec Energy Center at the end of 2022, it would be exempted from installation of fine mesh screens. Fish studies performed at the Callaway Energy Center have resulted in the initial determination that no additional modifications of its intake structure are required to achieve compliance with CWA §316(b) requirements. For the IRP, the installation of fine mesh screens has been assumed at the Labadie, Rush Island and Sioux Energy Centers.

CWA-Wetlands and Waters of the United States

Construction projects involving "dredge and fill" (land disturbance) within identified wetlands/streams can require mitigation, based on the total number of acres impacted. Mitigation involves establishment of replacement wetlands at a ratio of anywhere from 1:1 up to 4:1. On June 29, 2015, a revised Waters of the United States (WOTUS) rule was issued that may result in protection of additional streams and tributaries. At this time it is believed that the WOTUS rulemaking will have very limited impacts on Ameren Missouri generating facilities. A federal district court in North Dakota granted a preliminary injunction blocking implementation of the WOTUS rule for 13 states including Missouri. Following that action, the U.S. Court of Appeals for the Sixth Circuit has stayed the WOTUS rule pending a full hearing on the merits of the final rule. Ameren Missouri will be following these cases as they proceed through the courts. In June 2017, the EPA announced they would withdraw the WOTUS rule and propose a replacement rule by the 4th quarter of 2017 or the 1st quarter of 2018.

CWA, Steam Electric Effluent Limitation Guidelines Revisions

Sector specific effluent limitation guidelines are periodically updated by the EPA to ensure best available technology is utilized in the treatment of wastewater discharges, including those from steam electric power plants. The existing steam electric effluent limitations guidelines were last revised in 1982. On November 3, 2015, the EPA issued a revised rulemaking for steam electric power plant discharges. Although most of the impact of this rule is associated with discharges from flue gas desulphurization scrubber wastewater, the rule prohibits discharges of ash transport water. As such, Ameren Missouri will have to construct new or augmented fly ash handling systems and new bottom ash handling systems. Ameren Missouri will also need to construct new wastewater treatment systems to manage discharges from various power plant systems such as demineralizer regenerations, storm water, and other process wastewater.

The revised rule establishes federal limits on the levels of toxic metals in wastewater that can be discharged from power plants including mercury, arsenic, and selenium. These guidelines will require the use of new physical, chemical and/or biological treatment systems. Ameren Missouri has assumed that existing and any new installations would require dry systems with the use of landfills for disposal. Compliance is achieved through the NPDES permit process with compliance required no later than November 2023. However, the EPA has taken action to stay certain compliance dates in the rule as litigation of the rule proceeds.

The compliance options that have been considered to meet the Steam Electric Effluent Limitation Guidelines include the following:

- Installation of Wastewater Treatment Systems

- Installation of Dry Fly Ash Systems
- Installation of Dry or Zero Discharge Bottom Ash Systems

The development of the Steam Electric Effluent Limitation Guidelines has resulted in an IRP assumption that Wastewater Treatment Systems will be required at each of our coal-fired energy centers except for Meramec. With its retirement at the end of 2022, it is assumed that Meramec would be exempted for the requirement of the installation of a waste water treatment system. In 2015, Ameren Missouri began to design waste water treatment systems for the Labadie, Rush Island, and Sioux Energy Centers and has included costs for these systems and conversion to dry ash handling in its IRP planning assumptions.

5.4 Solid Waste Regulation and Compliance Assumptions

Coal Combustion Residuals (CCR)

The CCR rule was published April 17, 2015, and became effective October 19, 2015. It establishes national standards for the management of CCR. The regulatory status of CCR has been debated since they were first excluded from regulation as a hazardous waste under Resource Conservation Recovery Act (RCRA). In December 2016, Congress amended federal solid waste statutes to classify coal combustion residual units as “sanitary landfills” and authorized the states under the WIIN Act to develop programs that, following the EPA approval, would act in lieu of the federal rule. Under the WIIN Act, each state may submit to the EPA a permitting program or other system of approval to achieve compliance with the CCR rule or "other State criteria that [EPA] determines to be at least as protective as" that rule.[2] The amendments afford states flexibility in establishing a CCR management program and state agencies are not required to adopt verbatim the federal CCR Rule. Missouri has not yet indicated whether it intends to adopt such a CCR management program.

Ash Pond Closure Initiatives

Historically, coal ash has typically been wet sluiced into ash ponds. Ash ponds are permitted as wastewater treatment devices under the Missouri water permit program and are subject to closure requirements when they are excluded from the water permit process. Ash pond closures may require an evaluation of groundwater conditions and the development of a closure plan that includes an impervious cap and vegetative cover. Long-term monitoring of groundwater conditions and the integrity of the cap and vegetation may be required.

[2] Solid Waste Disposal Act ("SWDA") §4005 (d)(1)(B), 42 U.S.C. §6945(d)1)(B)

In response to the CCR rules and the Effluent Limitation Guidelines, Ameren Missouri is planning the following projects for its energy centers:

Labadie Energy Center

- Operate the on-site landfill
- Dry ash conversion projects will be implemented
- Close the bottom and fly ash ponds
- New wastewater treatment facilities will be installed
- Off-site reuse or disposal options will be established as needed

Meramec Energy Center

- Begin the closure of some of the ponds except for those necessary for operation until retirement when the remaining ponds will be closed
- Off-site reuse or disposal options will be established as needed

Rush Island Energy Center

- Dry ash conversion projects will be implemented
- Close the bottom and fly ash ponds
- New wastewater treatment facilities will be installed
- Off-site reuse or disposal options will be established

Sioux Energy Center

- Continue the operation of the on-site landfill
- Dry ash conversion projects will be implemented
- Close the bottom and fly ash ponds
- New wastewater treatment facilities will be installed

Ameren Missouri has also included costs for the installation of groundwater monitoring systems in the IRP.

While mitigation has been included in our analysis for current and certain potential future regulations, further changes in regulations are possible. The Company continues to monitor the potential for further changes in regulation that may impact resource planning decisions.

Total Environmental Mitigation Costs[3]

Table 5.3 below shows the capital expenditures (capex) and operations and maintenance (O&M) cost assumptions for all environmental mitigation described in the

[3] 4 CSR 240-22.040(1); EO-2017-0073 1.C

above sections. The cost information shown in the table does not include AFUDC (allowance for funds used during construction).

Table 5.3 Environmental Mitigation Costs (2016$)

Facility	Environmental Mitigation	Regulation	In-Service Year	Cost $Million	Fixed O&M $Million	Var O&M $Million
Meramec	Ash Pond Closure	CCR	2023	41	-	-
	Activated Carbon	MATS	2016	-	-	0.4
	NPDES Permit & Groundwater Monitoring	CWA	2022	1	-	-
Meramec	Total Environmental			42	0	0.4
Labadie	Ash Pond Closure	CCR	2021	45	-	-
	Landfill Cells	CCR	2023	79	-	-
	Dry Ash Conversion	CCR	2019	89	-	-
	Waste Water Treatment Plant	ELG	2019	42	0.6	-
	ESP Upgrade	MATS	2019	1	-	-
	Activated Carbon	MATS	2016	-	-	4.7
	Fine Mesh Screens	CWA 316 (b)	2023	19	-	-
	NPDES Permit & Groundwater Monitoring	CWA	2022	1	-	-
Labadie	Total Environmental			275	1	4.7
Rush Island	Ash Pond Closure	CCR	2020	23	-	-
	Dry Ash Conversion	CCR	2019	57	-	0.6
	Pad & Canopy for Ash Staging	CCR	2019	4	-	-
	Waste Water Treatment Plant	ELG	2019	30	0.4	-
	Activated Carbon	MATS	2021	1	-	1.4
	ESP Upgrade	MATS	2019	5		
	Fine Mesh Screens	CWA 316 (b)	2025	20	-	-
	NPDES Permit & Groundwater Monitoring	CWA	2022	1	-	-
Rush Island	Total Environmental			140	0	2.0
Sioux	Ash Pond Closure	CCR	2022	24	-	-
	Landfill Cells	CCR	2022	36	-	-
	Dry Ash Conversion	CCR	2022	87	-	1.7
	Waste Water Treatment Plant	ELG	2021	35	0.4	-
	Fine Mesh Screens	CWA 316 (b)	2024	10	-	-
	Activated Carbon	MATS	2018	2	-	0.3
	ESP Upgrade	MATS	2020	3	-	-
	NPDES Permit & Groundwater Monitoring	CWA	2022	1	-	-
Sioux	Total Environmental			197	0	2.0
Total	Total Environmental			**654**	**1**	**9**

5.5 Clean Power Plan (CPP)

Considerable uncertainty remains with respect to the outcome of the legal proceedings on the CPP rule and how that might impact the form and timing of final regulations for Green House Gas (GHG) emissions from existing power plants. The EPA signed the final CPP rule for existing sources in August 2015 and it was published in the Federal Register on October 23, 2015. On February 9, 2016, the U.S. Supreme Court issued a stay of the rule pending review by the lower court of various legal challenges to the rule. As a result of the stay, many state governments (including Missouri) have suspended significant further actions to implement the rule unless and until the stay is lifted. On April 28, 2017, the U.S. Court of Appeals for the D.C. Circuit issued an order to hold the case in abeyance as the EPA considers action on the final rule. The EPA has indicated to the Court that EPA expects to file a proposed rule with respect to the CPP in the fall of 2017.

Background

The CPP was published in the Federal Register on October 23, 2015, and became effective December 22, 2015. The CPP establishes for the first time GHG emission limits for new power plants and emission guidelines for existing power plants. The rules are designed to achieve significant carbon dioxide emission reductions from the utility power sector. The EPA projects the existing source rule will result in a 32% reduction in CO_2 levels from the utility sector by 2030 from a reference year of 2005. The rule will require CO_2 reductions that will be phased in over the period 2022-2029 with the final target to be achieved by 2030.

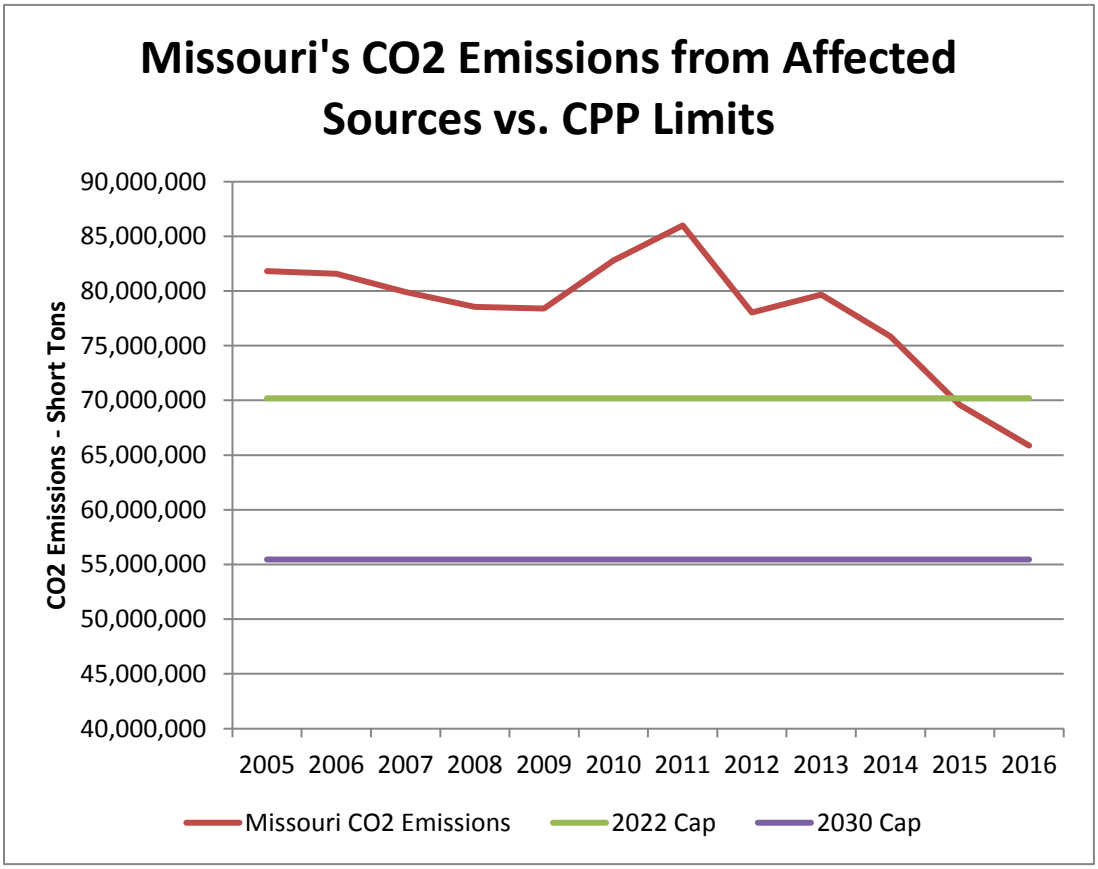
Each state with affected sources is required to develop a state compliance plan, which will describe how the state will achieve the targets required by the rule.

A number of states (including Missouri) and other organizations filed challenges to the rule and requested a stay of the final rule with the U.S. Supreme Court. The U.S. Supreme Court granted the stay request on February 9, 2016. The legal process is ongoing in the D.C. Circuit Court of Appeals. In March of 2017, the EPA requested the Court to hold the litigation in abeyance pending review by the EPA. The Court has ruled to hold the case in abeyance and the EPA has indicated that they intend to take action on the rule in the fall of 2017. Considerable uncertainty exists as to the manner in which the EPA will take action with respect to the pending litigation and the now-stayed CPP. It is highly unlikely, however, that the CPP will be implemented in its current form.

With the stay in effect, the MDNR has stopped discussions on the development of a state implementation plan for compliance with the CPP. They have indicated they plan to delay any further formal action on the rule until the stay is lifted.

For illustration purposes, the figure below shows Missouri's affected units' historical CO_2 emissions for the period 2005-2016 relative to the CO_2 allocations specified in the CPP for the years, 2022 and 2030.

Figure 5.13 CO_2 Emissions from Affected Sources in Missouri and CPP Limits



The rules for new, modified and reconstructed units have also been challenged in the D.C. Circuit Court of Appeals. Briefing began in October 2016 and final briefs were filed by February 6, 2017. Oral argument was scheduled for April 17, 2017. However, on March 30, 2017, the Court issued an order to remove the new, modified and reconstructed rule litigation from the oral argument calendar.

5.6 Compliance References