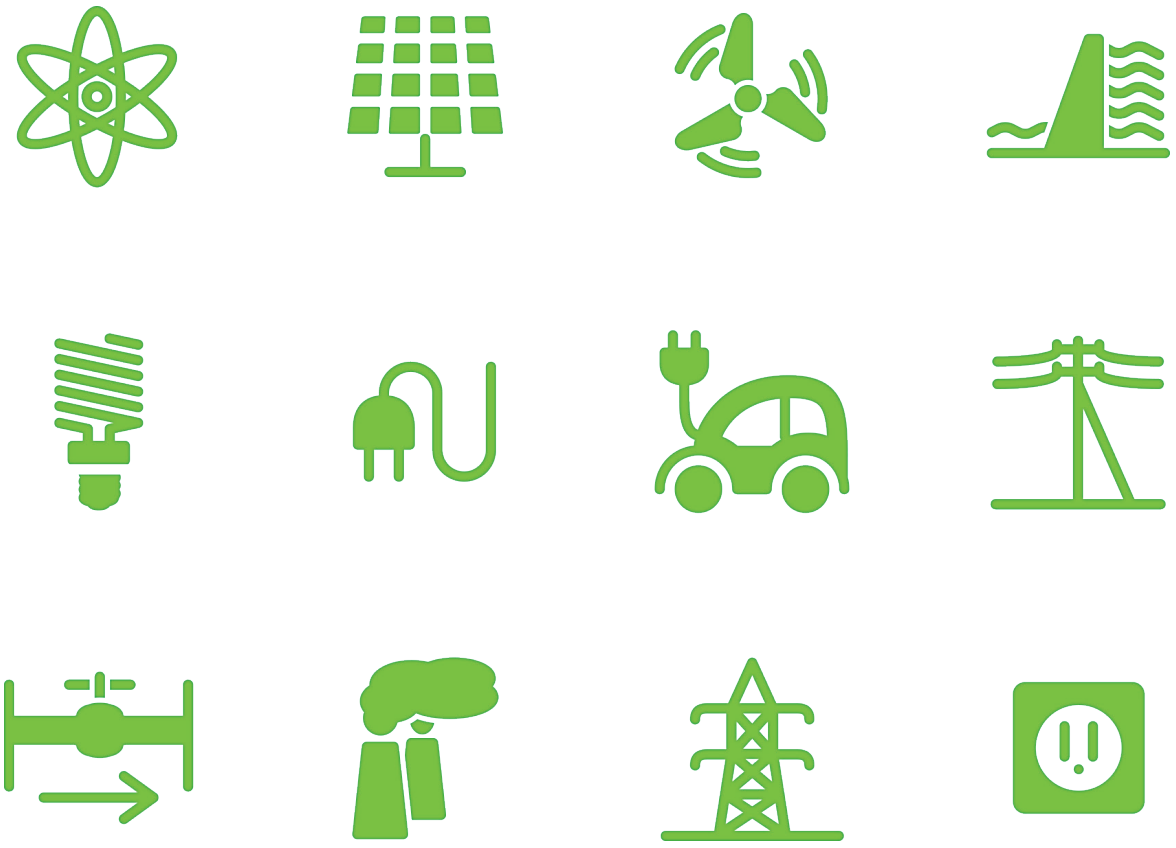
INTEGRATED RESOURCE PLAN UPDATE // SPRING 2016



Ameren MISSOURI

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1. Executive Summary

Ameren Missouri continues to execute on the preferred resource plan presented in its 2014 IRP filing. Our plan is focused on transitioning our generation fleet to a cleaner and more fuel diverse portfolio in a responsible fashion. The transition plan includes continued customer energy efficiency program offerings, retirement of approximately one-third of our coal-fired generating capacity, which will be reaching the end of its useful life, and expansion of renewable and cleaner-burning natural gas-fired generation. By executing our plan, we will ensure that our customers' long-term electric energy needs are met in a safe, reliable, cost-effective and environmentally responsible manner.

Key steps that Ameren Missouri has taken since the filing of our 2014 IRP include:

- Received approval from the PSC for our second three-year portfolio of customer energy efficiency programs under the Missouri Energy Efficiency Investment Act (MEEIA)
- Reaffirmed plans to burn natural gas at Meramec units 1&2 in April 2016
- Issued a Request for Proposal (RFP) for the development of wind energy resources
- Initiated identification and evaluation of potential sites for gas-fired combined cycle generation
- Completed the upgrade of the Electrostatic Precipitator (ESP) for Labadie Unit 1 and are currently implementing ESP upgrades on Unit 4 to reduce particulate emissions and comply with the Environmental Protection Agency's (EPA) Mercury and Air Toxics Standards (MATS)[1]
- Initiated projects to close coal ash ponds and switch to dry handling of coal ash ahead of EPA mandated deadlines
- Continued to evaluate the requirements and implications of the EPA's Clean Power Plan (CPP), including the value of new renewable energy resource additions under the EPA's proposed Clean Energy Incentive Program (CEIP) and in light of the extension of tax credits (ITC, PTC) for renewables
- Obtained approval from the Nuclear Regulatory Commission for extension of the operating license for our Callaway Energy Center

While the legal proceedings on the CPP and its scheduled implementation remain uncertain, our continued efforts to execute on our plan while maintaining flexibility

[1] ESP upgrade for Labadie Unit 2 was completed prior to 2014 IRP filing on October 1, 2014.

position us to be able to comply with the final regulation if it is upheld. Ameren Missouri continues to work with regulators, utilities and other stakeholders in Missouri to identify an approach to compliance that continues to ensure affordable and reliable service to our customers in an environmentally responsible manner.

2. Compliance Overview

2.1 Purpose of Annual Updates

Annual Updates are required by 4 CSR 22.080(3). The rules indicate that the purpose of annual updates is to ensure that members of the stakeholder group have the opportunity to provide input and to stay informed regarding the items listed below.

- The utility's current preferred resource plan (see Chapter 1)
- The status of the identified critical uncertain factors (see section 3.4)
- The utility's progress in implementing the resource acquisition strategy (see section 2.3)
- Analyses and conclusions regarding any special contemporary issues identified by the Commission (see Compliance References at the end of this report for the location of specific discussion on each issue)
- Resolution of any deficiencies or concerns in the utility's most recent triennial filing, either as agreed to among the utility and the other parties or as found by the Commission in its Order in the case (see section 3.1)

Ameren Missouri has created this annual update report to satisfy the intended purpose established in the IRP rules and has updated its assessment of general planning conditions. Each item explicitly cited in the rules is addressed in the referenced chapter or section of this report as noted above.

2.2 Ameren Missouri's Approach to its Annual Update

In its Order in File EO-2012-0039 establishing special contemporary issues to be evaluated by Ameren Missouri in its 2012 IRP Annual Update, the Commission noted that, "the requirement to examine special contemporary issues should not be allowed to expand the limited annual update report into something more closely resembling a triennial compliance report." Ameren Missouri agrees with the Commission that the scope and depth of an IRP Annual Update should not be comparable to that for a triennial IRP filing. Also in its Order in File EO-2016-0037 establishing special contemporary issues for Ameren Missouri's 2016 IRP Annual Update, the Commission stated if the Company believes it has already adequately addressed some of these

issues in its IRP filing, then it does not need to undertake any additional analysis because of the special contemporary issue designation. On that basis, Ameren Missouri has relied heavily on the groundwork developed in its 2014 IRP as a basis for reviewing its assumptions and analysis and reporting its findings.

The Company also views the IRP Annual Update in its proper role as just that, an update on the nature of key variables and the conclusions that follow. Based on the conclusions drawn from the review and analysis discussed here, the Company believes that its preferred resource plan, as presented in its 2014 IRP filing, is still appropriate at this time. Should the Company's continued planning and consideration of relevant issues lead to a conclusion that its Preferred Resource Plan is no longer appropriate, the Company will notify the Commission of its decision in accordance with 4 CSR 240-22.080(12).

2.3 Implementation of Current Preferred Resource Plan

Ameren Missouri adopted a new preferred resource plan with its 2014 IRP filing. In that filing, the Company indicated that its new Preferred Resource Plan includes retirement of its Meramec Energy Center and implementation of a 3-year energy efficiency plan as well as continued pursuit of DSM programs through the entire planning horizon at the Realistic Achievable Potential level. The Company also indicated that the implementation of future programs will depend on policies that reflect timely cost recovery, proper alignment of incentives, and appropriate earnings opportunities, as required by the Missouri Energy Efficiency Investment Act. Also included in the filing was an updated implementation plan. Following is an item-by-item status on the implementation steps listed in the Company's 2014 IRP filing.

Demand-Side Resources Implementation

The Missouri Energy Efficiency Act requires that utility incentives be aligned with helping customers use energy efficiently by providing timely recovery of program costs, elimination of the throughput disincentive and timely earnings opportunities.

Ameren Missouri's initial request for approval of its second three-year portfolio of demand-side programs was denied by the Commission in October 2015. Ameren Missouri worked with stakeholders on a portfolio of programs, cost recovery and a performance incentive mechanism that addresses the Commission's concerns and filed a non-unanimous stipulation and agreement on February 5, 2016. The Commission approved Ameren Missouri's amended MEEIA Cycle 2 programs and associated incentives on February 10, 2016.

Ameren Missouri successfully implemented its first three-year cycle approved MEEIA programs for 2013 through 2015. The Company's second three-year cycle programs

commenced on March 1, 2016. Table 2.1 below provides a summary of the annualized energy savings and peak reduction goals, as well as budgets, for residential and business programs in the Company's MEEIA Cycle 2 portfolio. It should be noted that the goals and budgets represent program years, not calendar years.

Table 2.1: MEEIA Cycle 2 Implementation Plan (Annualized Savings)

	2016	2017	2018	Total
Residential EE Programs net energy savings (MWh)*	108,513	84,410	83,386	208,809
Business EE Programs net energy savings (MWh)	105,643	124,294	132,234	362,171
Total estimated net energy savings (MWh) at meter*	**214,156**	**208,705**	**215,620**	**570,980**
Residential EE Programs net demand reduction (MW)*	45	37	37	88
Business EE Programs net demand reduction (MW)	23	27	29	79
Estimated net demand reduction (MW) at meter*	**68**	**64**	**65**	**167**
Residential EE Programs annual costs ($ millions)	$26.38	$21.03	$20.30	$67.71
Business EE Programs annual costs ($ millions)	$25.83	$30.70	$32.43	$88.97
Estimated costs (Program costs in $ millions)**	**$52.21**	**$51.73**	**$52.73**	**$156.68**

*** Due to a 1 year persistence for the Behavior Modification program, the Total Column is less than the sum of the annual values**

**** An additional cost of $1.5 M for R&D is not reflected in table, but will be included per Stipulation and Agreement**

Renewables

Project development work began in late 2014 for a 15 MW (DC) solar facility in Montgomery County. Ameren Missouri has determined it is appropriate to re-evaluate its previously determined timeline for this project and has decided to delay the start of construction of the Montgomery Renewable Energy Center. The work completed to date for the facility allows Ameren Missouri the flexibility to make adjustments in project plan timelines in line with the new requirements of the CPP.

In the fall of 2014, during discussions with the operators of the landfill at Maryland Heights, it was determined that the landfill would not be in a position to deliver enough gas volume to effectively operate 4 turbines until possibly the 2025-2026 time frame. The contract was therefore amended, and plans for installation of the 4th unit have been delayed. The landfill operator will continue to monitor gas production and will advise Ameren Missouri as to when volumes will be sufficient to reliably support a fourth unit.

In December 2015, Ameren Missouri issued a request for proposal (RFP) for wind generation with the intention of acquiring a minimum of 50 MWs of wind to be added to its generation portfolio no later than 2019. Responses were received on January 22, 2016 and are being reviewed and evaluated.

Meramec

The Company plans to begin using natural gas at Meramec units 1&2 in April 2016.

Combined Cycle

While Ameren Missouri's preferred resource plan includes the addition of a new combined cycle resource in 2034, we are preparing for the possibility of new generation sooner to support generation transition planning, including steps that may need to be taken to comply with greenhouse gas regulations. Ameren Missouri has begun evaluating potential sites for new combined cycle generation including greenfield and brownfield options. Initial evaluations focus on permitting and access to transmission, water and fuel.

Nuclear

Ameren Missouri continues to monitor energy development activities including nuclear technology and policy developments to ensure that an understanding of available options is maintained. The combined construction and operating license application for a large nuclear unit that had been submitted in 2008 to the Nuclear Regulatory Commission (NRC) was withdrawn in 2015. Ameren Missouri continues to believe that nuclear generation is an important clean energy source for our company and country as demonstrated by approval by NRC of a 20-year license extension to 2044 for our Callaway Energy Center in March 2015.

Environmental

The Company continues to refine its estimates for environmental controls as part of its ongoing environmental compliance analysis. Coal Combustion Residuals (CCR) and Effluent Limitation Guidelines (ELG) rules have been finalized and published in the Federal Register in April 2015 and November 2015, respectively. The Company has updated mitigation costs and timing accordingly; more detailed discussion is included in section 3.1.

Electrostatic precipitator upgrades on Labadie Units 1&2 to comply with the MATS compliance have been completed, and the Unit 4 ESP upgrade is currently on schedule for completion in spring 2016. Ameren Missouri determined through its testing of the upgraded precipitators on Units 1&2 that the previously planned upgrade of the Unit 3 ESP can be delayed.

Load Analysis and Forecasting Implementation

Ameren Missouri continually works to explore additional data sources and enhanced forecasting and analytical techniques to improve its load analysis processes and is in

the process of developing and implementing a new sample for its load research program. Ameren Missouri has worked with Enernoc Utility Solutions in 2009 and 2013 to perform extensive primary market research and anticipates continuing to engage in periodic collection of primary data to further enhance its understanding of the mix of end-use appliances and equipment in its service territory.

Voltage Control Pilot Project

SCADA capable, communicating capacitor controls were installed on selected circuits. The controls allowed for SCADA control via the VVO software and also included local high/low voltage overrides so that the local conditions take priority over centralized control. The hardware installed is being utilized in the distribution system and providing better voltage support to our customers. The benefits of voltage control on the broader system remain uncertain as end use efficiencies continue to advance and diminish the value of such measures. Ameren Missouri will continue to evaluate the benefits of voltage control in light of experience to date and the evolving nature of benefits.

3. Planning Environment

3.1 Environmental Regulation[2]

Ameren Missouri has reviewed its assumptions on the eventual requirements for pending environmental regulations. Table 3.1 summarizes the current and pending environmental regulations for which Ameren Missouri must implement mitigation measures, along with expectations for compliance requirements for certain potential regulations.

[2] EO-2015-0084 Commission Order 2

Table 3.1: Current & Pending Environmental Regulations

Regulatory Driver	Summary Requirements	Regulation Status	Compliance Timing
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 late 2016.	New unit NSPS applies 1/8/2014
		Proposed rule for modified/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	Existing source interim rates 2022 - 2029; final rates 2030+ Compliance dates are suspended due to Supreme Court stay
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. In Dec 2015, EPA proposed an update to lower the seasonal NOx (May-Sept) allocations effective 1/1/17. The final rule expected mid-2016.	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; Initial attainment designations final Oct 2013; Nonattainment plans due April 2015; final designations for other 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+
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 submit progress reports in 2013 CSAPR resolution may require changes to state rule.	2018
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 will be compliant on April16, 2016.
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
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	2020 - 2022
Revisions to Steam Electric Effluent Guideline Limitations (EGL)	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 11/3/2015	2018 - 2023
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	Unknown

3.1.1 Air, Water and Solid Waste Laws

Cross State Air Pollution Rule (CSAPR) and Update

The Cross State Air Pollution Rule (CSAPR) was finalized on July 6, 2011 replacing Clean Air Interstate Rule (CAIR)[3]. CSAPR established new allowances for the annual NO_x and SO_2 programs and the seasonal NO_x program. CSAPR uses newly created allowances and thus there is no bank to rely on 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 U.S. Court of Appeals for the D.C. Circuit to (1) remove the stay of CSPAR 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, 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 to comply with any future updates to the CSAPR. In the future, the EPA could revise the rule. If future revisions require significant reductions in the CSAPR SO_2 and/or NO_x allocations, Ameren Missouri would evaluate compliance strategies that could include the installation of additional pollution control equipment such as Flue-Gas Desulfurization (FGD) systems and Selective Catalytic Reduction systems (SCR) at one or more of its facilities depending on the severity of the reduction. Ameren Missouri expects future regulations would allow for fleet averaging to demonstrate compliance and has assumed FGDs at Labadie units 3&4 and SCRs at Sioux units 1&2 would bring the fleet into compliance with potential future SO_2 and NO_x regulations in the longer term.

On December 3, 2015, the EPA published in the Federal Register a proposed update to the CSAPR rule. 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 January 1, 2017. The public comment period for the proposed update rule closed on February 1, 2016. EPA is expected to issue the final rule the summer of 2016. The purpose of the proposed update rule is to aide in achieving compliance with the 2008 Ozone standard (75 ppb standard). If the rule is finalized as proposed, there will be a reduction in the Ozone Season NO_x allowance allocations for several states including Missouri. For Ameren Missouri facilities there would be approximately a 27% reduction in NO_x Ozone Season allowances. The state of Missouri allocation would be reduced by

[3] No further compliance with CAIR is required.

approximately 23%. Ameren Missouri will assess what is required to achieve compliance when the final rule is published.

National Ambient Air Quality Standard (NAAQS) for SO_2[4]

The EPA lowered the SO_2 ambient standard to 75 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. It is expected that the MDNR will request the area to be re-designated as attainment in 2016. As a part of MDNR's effort to demonstrate attainment for the Herculaneum area, Ameren Missouri entered into an agreement in 2015 to install ambient SO_2 monitors near the Rush Island Energy Center. The agreement also includes lower SO_2 emissions limits for the Rush Island, Labadie and Meramec Energy Centers beginning on January 1, 2017. The ambient SO_2 monitors near the Rush Island Energy Center began gathering data in December 2015.

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 finalized the "Date Requirements Rule" on August 21, 2015 and also entered into a consent order with the Sierra Club and the Natural Resources Defense Council on March 2, 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. U.S. EPA will designate these areas either attainment or nonattainment by December 2017. Non-attaining areas must be in compliance by December 2022. For areas where states choose monitoring, states must submit monitoring plans to EPA by July 2016, and sources are required to have monitors installed by January 1, 2017. After 3 years of monitoring data

[4] EO-2015-0084 Commission Order 2

is collected (2017-19) the states must certify the data collected by May 2020. U.S. EPA will designate these areas either attainment or nonattainment by August 2020. Non-attaining areas must be in compliance by August 2025.

The Consent Order addresses areas that contain any stationary source not announced for retirement that according to 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 February 17, 2016, the EPA issued a preliminary determination of "non-attainment" regarding air quality near the Labadie Energy Center even though data being reported from the SO_2 monitors indicates that air quality near Labadie complies with EPA standards. Ameren Missouri will continue to work with the MDNR and the EPA to see 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 U.S. 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.[5]

Revisions to the National Ambient Air Quality Standard (NAAQS) for Ozone[6]

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, it is expected that the MDNR will request that the EPA re-designate the St. Louis area to attainment in 2016. In 2015, the EPA lowered the ambient standard for ozone to 70 ppb. States must submit their

[5] Ameren Missouri made a supplemental filing on May 29, 2015, in File EO-2015-0084 elaborating on its assumptions for compliance with the NAAQS standards for both SO_2 and Ozone and noting any changes relative to prior IRP assumptions.
[6] EO-2015-0084 Commission Order 2

proposed designations by October 2016 and the EPA will finalize these designations by October 2017. Attainment plans are expected to be due in the 2020-2021 timeframe. Based on current air quality data the St. Louis area is very close to meeting the 70 ppb ozone standard. Depending on whether the area is classified as Marginal or Moderate nonattainment, compliance would be required within 3 or 6 years, respectively.

While several outcomes are possible, Ameren Missouri believes the most likely requirement from any future attainment plans will be the need to install SCRs at Sioux. This is primarily due to the very low NO_x emission rates at the Labadie and Rush Island Energy Centers and the planned retirement of Meramec by the end of 2022. Table 3.2 shows the NOx emission rates assumed for each of Ameren Missouri's coal-fired units.

Table 3.2: Coal Unit NO_x Emission Rates

Energy Center/Unit	NOx Rate (lb/MMBtu)
Labadie Energy Center	0.094
Meramec Unit 1	0.118
Meramec Unit 2	0.115
Meramec Unit 3	0.170
Meramec Unit 4	0.176
Rush Island Energy Center	0.081
Sioux Energy Center	0.245
Coal Fleet	0.126

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 – 13 µg/m^3. The final rule was signed on December 14, 2012 and set the standard at 12 µg/m^3. In the St. Louis area, Franklin, Jefferson, St. Charles, and St. Louis Counties and St. Louis City were designated as "Unclassifiable" even though Missouri PM2.5 monitoring sites demonstrated attainment. The Illinois side of the St. Louis Metropolitan area experienced some data quality issues and thus EPA was unable to make a determination as to the attainment status of this area. Final determination of the St. Louis area's attainment status is expected in the 2017-2018 timeframe. If the area is determined to be in nonattainment an attainment plan must be submitted no later than 3 years after designation. Attainment is required no later than 5 years after designation. The administrator may extend the attainment date to 10 years after designation if appropriate.

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. Compliance with the MATS standards was required by April 16, 2015, although the permitting authority may grant a one-year extension on a case-by-case basis. 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 emission limits for new sources which are significantly tighter than for existing 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 will be compliant with the MATS on April 16, 2016. Units 1 & 2 at the Meramec Energy Center will begin limited to burning natural gas and will not be subject to MATS. Ameren Missouri installed Activated Carbon Injection technologies and/or fuel additives and other sorbents to control mercury emissions 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.

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 and Ameren Missouri is fully compliant with CSAPR. However, Environmental Groups are challenging EPA's CSAPR=BART determination. Currently, both of the Missouri Class I areas are meeting the first planning period glide path.

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 EPA and state 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.

3.1.2 Water Environmental 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.

Clean Water Act, 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 Missouri Department of Natural Resources (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 will conduct a thermal study to determine if our discharges are compliant with Section 316(a) of the

Clean Water Act. 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 such, Ameren Missouri has assumed the installation of "helper" cooling towers at its Labadie Energy Center to meet possible future requirements in its 2014 IRP and the 2016 Annual IRP Update.

Clean Water Act, 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 will be 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 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

Ameren Missouri is conducting biological studies and anticipates the installation of fine mesh screens, at all coal fired energy centers and the Callaway Energy Center, to achieve compliance with CWA §316(b) requirements. In 2015, Ameren Missouri began two-year entrainment characterization studies as the next step in complying with Section 316(b). Ameren Missouri has included the addition of fine mesh screens at each of its coal-fired energy centers as well as our Callaway nuclear facility in our assumptions for compliance.

Clean Water Act-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.

Clean Water Act, 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 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. Ultimate enactment of these guidelines may require the use of new physical, chemical and/or biological treatment systems. Ameren Missouri has assumed that existing ash and new scrubber installations require dry systems with the use of landfills for disposal. Compliance is achieved through the NPDES permit process with compliance as soon as possible by November 2018.

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

To meet the proposed standards:

- 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 driven a long term IRP assumption that Wastewater Treatment Systems will be required at each of our coal-fired Energy Centers. 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. Ameren Missouri has assumed Meramec will not be required to install such a system as it will be retired by the end of 2022.

3.1.3 Solid Waste Environmnetal Regulation and Compliance Assumptions

Coal Combustion Residuals

The Coal Combustion Residuals (CCR) rule was published April 17, 2015 and became effective October 19, 2015. It establishes national standards for the management of CCRs. The regulatory status of CCRs has been debated since they were first excluded from regulation as a hazardous waste under Resource Conservation Recovery Act (RCRA). The CCR rule is self-implementing and separate from the State requirements.

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.

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

- Complete the construction and 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

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

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. Table 3.3 below shows the capex and O&M assumptions for environmental mitigation.

Table 3.3: Environmental Mitigation Costs (2016$)[7]

Facility	Environmental Mitigation	Regulation	Cost $Million	Fixed O&M $Million	Var O&M $/MWh
Meramec	Ash Pond Closure	CCR	49	-	-
	Activated Carbon	MATS	15	0.1	0.5
	NPDES Permit & Groundwater Monitoring	CWA	1	0.1	-
Meramec	**Total Environmental**		65	0.2	0.5
Labadie	Ash Pond Closure	CCR	46	-	-
	Landfill Cell	CCR	66	-	-
	Dry Ash Conversion	CCR	98	-2.7*	-
	Water Treatment Plant	ELG	26	0.4	-
	ESP Upgrade	MATS	24	-	-
	Activated Carbon	MATS	20	0.1	0.9
	FGD	CSAPR	519	6.5	0.6
	Cooling Tower	CWA 316 (a)	166	1.4	0.7
	Fine Mesh Screens	CWA 316 (b)	19	-	-
	NPDES Permit & Groundwater Monitoring	CWA	2	0.1	-
Labadie	**Total Environmental**		988	8.6	2.2
Rush Island	Ash Pond Closure	CCR	33	-	-
	Dry Ash Conversion	CCR	75	-0.6*	-
	Pad & Canopy for Ash Staging	CCR	5	-	-
	Water Treatment Plant	ELG	23	0.3	-
	Activated Carbon	MATS	7	0.1	0.3
	Fine Mesh Screens	CWA 316 (b)	18	0.2	-
	NPDES Permit & Groundwater Monitoring	CWA	2	0.1	-
Rush	**Total Environmental**		161	0.7	0.3
Sioux	Ash Pond Closure	CCR	25	-	-
	Landfill Cell	CCR	71	-	-
	Dry Ash Conversion	CCR	82	.2*	-
	Water Treatment Plant	ELG	22	0.3	-
	SCR	NAAQS - Ozone	232	0.8	0.6
	Fine Mesh Screens	CWA 316 (b)	11	0.1	-
	Mercury Addition	MATS	2	0.1	0.2
	NPDES Permit & Groundwater Monitoring	CWA	2	0.1	-
Sioux	**Total Environmental**		446	1.4	0.8
Total	**Total Environmental**		1,659	10.8	3.8

* Incremental cost(+)/savings(-)

[7] EO-2016-0037 c (1)-(12)

3.1.4 Clean Power Plan (CPP)[8]

Considerable uncertainty remains with respect to the outcome of the legal proceedings on the rule and how that might impact the form and timing of final regulations for GHG emissions from existing power plants known as the Clean Power Plan. The U.S. EPA released the final CPP rule for existing sources in August 2015. In February 2016, the U.S. Supreme Court issued a stay of the rule pending review by lower courts of various legal challenges to the rule. As a result of the stay, many state governments have suspended or have planned to suspend significant further actions to implement the rule unless and until the stay is lifted. Ameren Missouri has been working with the Missouri Department of Natural Resources, affected Missouri generators and other stakeholders to consider various approaches for how Missouri should craft its state compliance plan should the CPP be found to be legal.

Background

The Clean Power Plan was published in the Federal Register on October 23, 2015 and became effective December 22, 2015. The CPP establishes for the first time Green House Gas 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. The state's final plan is required to be submitted by September 6, 2016. If the state believes it will be unable to complete a final plan by that date, it can submit an initial plan and request a two year extension in filing its final plan. If granted by the EPA, the state would have until September 6, 2018 to file its final state plan.

A number of parties have requested that EPA reconsider the final rule. EPA has yet to rule on those requests. In addition, a number of states and other organizations filed challenges to the rule and requested a stay of the final rule with the D.C. Circuit Court. The D. C. Circuit denied the stay petition on January 21, 2016. On January 26, 2016, numerous parties including Missouri appealed the D. C. Circuit Court stay petition denial to the U. S. Supreme Court. The Supreme Court granted the stay petition on February

[8] EO-2016-0037 g

9, 2016. The formal hearing of the case in the D. C. Circuit Court will continue despite the granting of the stay by the Supreme Court. The D. C. Circuit Court has begun the process of reviewing the vacatur request from numerous parties to the case on an expedited schedule. Oral arguments are scheduled for June 2, 2016.

It is expected the legal process will continue through most of 2016 with a ruling not expected until late 2016. It is also expected that regardless of the ruling certain parties will appeal the Court's decision to the U.S. Supreme Court for their consideration. That process could take at least a year if the Court decides to hear the appeal.

The rules for new, modified and reconstructed units have also been challenged in the DC Circuit Court of Appeals. Petitioners must file their brief by July 15, 2016. Oral argument is expected approximately 45 days following the final brief filings due on November 14, 2016.

Current Activities

In February, Ameren Missouri, along with regulators, other utilities and other stakeholders, participated in a workshop to consider various questions and issues regarding Missouri's approach to the CPP and their implications. Ameren Missouri filed its responses to these questions on February 1, 2016. Likewise, Ameren Missouri has prepared responses on a number of questions raised in the Commission's order on special contemporary issues. Following are those questions and our responses.

Describe how the preferred plan of the Company's last and current annual or triennial Integrated Resource Plans (IRPs) positions the utility for full or partial compliance with the U.S. Environmental Protections Agency's (EPA) Clean Power Plan (CPP) under Section 111(d) of the Clean Air Act, as released in final form on August 3, 2015.

Considerable uncertainty remains with the CPP and its implementation. Specifically, legal challenges regarding the CPP have been filed which, if successful, could lead to material changes in the final rule. The stay issued by the U.S. Supreme Court is expected to result in further delay of the implementation of the rule. As a result, the extent to which Ameren Missouri's preferred resource plan positions the Company for partial or full compliance with the CPP is unclear. That said, the Company continues to work to ensure that it is prepared to meet the requirements of the final form of the regulations by identifying and implementing elements of the preferred resource plan and resource acquisition strategy, including contingency plans, which are likely to support partial or full compliance. Such actions include the continuation of successful energy efficiency programs, the addition of new renewable resources, and the identification of potential sites for gas-fired combined cycle generation. Ameren Missouri also continues

to review investments in and operation of our existing generation assets to support the transition of our fleet to one that is cleaner and more fuel diverse in a responsible fashion, consistent with our generation strategy.

Include an evaluation of how renewable energy, energy efficiency and other demand-side resources (including combined heat and power) deployed by the Company after January 1, 2013, could contribute to compliance.

Ameren Missouri's existing and planned renewable resources and energy efficiency programs will contribute to compliance with the CPP in Missouri by displacing or continuing to displace the need for generation from affected sources under the CPP.

Include an evaluation of how renewable energy and energy efficiency and other demand-side resources (including combined heat and power) deployed by the Company after the submission of a final State Implementation Plan could qualify under the EPA's proposed Clean Energy Investment Program (CEIP).

Under the proposed CEIP, qualifying renewable resources and low-income energy efficiency programs could be eligible for additional emission allowances under the CPP. Qualifying resources must be initiated after submittal of the state's final CPP implementation plan. Under the proposal, renewable generation (or energy efficiency savings) achieved in 2020 and 2021 would be eligible for credits; the credits would be available from a pool that includes credits from the state's allowance allocation and matching credits from the EPA.

Ameren Missouri has not yet determined a compliance plan for the CPP, largely because Missouri has not yet settled on an approach for a state implementation plan. However, any modifications to our current IRP preferred plan will consider all options available and will be designed to satisfy the compliance requirements of the state implementation plan in a manner that most effectively maintains affordable and reliable service to our customers. Such considerations will include the CEIP, recent changes to tax incentives for renewable generation (ITC/PTC), as well as other relevant factors.

Include a description of additional investments which will be required by the Company to meet the targets in the CPP under scenarios including: a statewide rate-based or mass-based emissions goal; a "trading-ready" approach; and participation in the CEIP.

Ameren Missouri does not currently have reliable estimates for the investments that may be required to comply with the final form of the CPP and Missouri's state implementation plan due to the great uncertainty as to the timing and final form of the

rule. However, Ameren Missouri believes that the state's goal should be to achieve compliance with the CPP's targets in an affordable manner while maintaining the reliable service Missouri customers expect. Ameren Missouri supports a mass-based compliance approach for Missouri that allocates allowances to all affected sources based on a historical multi-year baseline. In order to provide certainty that is critical in resource and compliance planning, Ameren Missouri supports allowance allocations that are permanent and irrevocable, regardless of whether a unit retires or is operational, and does not support the auctioning of allowances as it could result in higher costs to customers.

Ameren Missouri believes that the CEIP should be structured as a pure incentive program for early action and as such the EPA should not require the state to set aside allowances from its allocations for participating in the CEIP. Instead, the incentive should come from additional federal allowances that are provided by the EPA and not from state allowance budgets.

Describe the barriers to achieving these additional investments.

Because the nature, extent and timing of investments are highly uncertain, it is not clear what barriers may need to be overcome.

Note the price of carbon used by the Company in the analyses described above.

Because of the continued high level of uncertainty regarding the final form of the rule and the timing of implementation, no such analysis has been performed. The Company's 2014 IRP filing indicates a range of carbon prices used for its previous analysis, and a comparison of those assumptions to more recent external sources is included in Section 3.4.

Provide an indication of the Company's preferences regarding various compliance options under a state implementation plan.

In order to develop a cost effective and reliable compliance plan for our customers to meet the requirements of the final CPP, Ameren Missouri would consider additional cost-effective energy efficiency programs, new renewable resources, allowance purchases, new natural gas fired generation and any other compliance elements included in the state plan.

3.2 Supply-Side Resource Review[9]

Ameren Missouri has analyzed cost and performance characteristics of a wide range of supply side resources in its 2014 IRP and has documented its analysis in Chapter 6 of its 2014 IRP filing. New supply side resources that were selected as final candidate resource options in the 2014 IRP include the following;

- Gas Combined Cycle
- Gas Simple Cycle Combustion Turbine
- Ultra-super-critical Pulverized Coal with CCS
- Wind
- Solar
- Small Hydro
- Small Modular Nuclear Reactor (SMR)
- Pumped Hydroelectric Energy Storage

Additionally, analysis of utility-scale vs. customer-owned solar generation was included in Chapter 6, and in Chapter 10 an evaluation of a wider adoption of customer-owned solar in the Ameren Missouri service area, based on the Department of Energy's Sunshot Initiative, was evaluated. This evaluation provides an economic assessment of the impacts of significant proliferation of distributed solar generation.

Since the development of costs for supply side resources for the 2014 IRP, Ameren Missouri's expectations associated with owning any of these diverse resources have not materially changed. The current expectations for wind resources located in Missouri have dropped by approximately 10% from our original expectation, which is well within the project cost uncertainty range evaluated in the 2014 IRP. Additionally, since we developed our supply side resource costs, Ameren Missouri constructed its solar-powered O'Fallon Renewable Energy Center. In developing and constructing this utility-scale solar facility, Ameren Missouri has gained first-hand knowledge of actual construction costs. These costs are still within the ranges established for the 2014 IRP.

As of this filing there have been no assessments of the value of solar (VOS) made by Ameren Missouri.[10]

[9] EO-2016-0037 j
[10] EO-2016-0037 h

Potential Emerging Energy Storage Resources[11]

In the 2014 IRP, Ameren Missouri identified three viable options for energy storage: pumped hydroelectric energy storage, compressed air energy storage, and sodium-sulfur (NaS) battery energy storage. In December, 2015, Haresh Kamath, EPRI's Senior Program Manager for Energy Storage, reviewed the energy storage section of Ameren Missouri's 2014 IRP, and concluded that it is still appropriate;

Pumped Hydroelectric Energy Storage

As stated in the 2014 IRP, pumped hydroelectric energy storage is a large-scale, mature, commercial utility-scale technology. The DOE Global Energy Storage Database (http://www.energystorageexchange.org/) shows no pumped hydro projects under construction in North or South America; however, there are 32 projects under construction worldwide in 2015 with a total capacity of 26,231 MW.

Compressed Air Energy Storage

Compressed Air Energy Storage (CAES) is also a large-scale commercially available energy storage technology; however, there are only two operating CAES facilities in the world – one in the state of Alabama and one in Germany. The DOE Global Energy Storage Database shows 4 Projects under construction worldwide with a total capacity of 202MW, located in Germany, Switzerland, Canada, and the United States. Robert Schainker, EPRI's Senior Technical Executive, issued a CAES update on December 16, 2015, in which he reviewed the status of five active EPRI demonstration projects:

1. Endesa (Spain) using solution mined salt cavern
2. New York Power Authority using above-ground pipeline storage
3. Pathfinder using Utah solution mined salt cavern
4. Pacific Gas & Electric porous rock air storage
5. Southern Company using solution mined salt cavern

He also listed 14 other active projects that were not discussed in-depth. The five projects he discussed are generally in the design and/or permitting stages. The estimated LCOEs reported were in the same order of magnitude as the value used in the 2014 IRP.

[11] EO-2016-0037 b

Battery Storage Technologies

Battery storage technologies are commercially available, evolving but still costly relative to other storage options.

Sodium-Sulfur Battery Energy Storage

Sodium-sulfur (NaS) batteries are commercially available energy storage devices typically ranging in size from 2 to 10 MW. There are 26 operational sites worldwide totaling 98 MW, mostly located in the United States and Japan. However, the only projects under construction are 4 projects in Europe totaling 36 MW.

Lithium Ion Battery Energy Storage

Li-ion battery technology is the fastest growing platform for stationary storage applications. This has been facilitated by their ubiquitous presence in consumer electronics and plug-in vehicles. There are already 279 operational grid-scale projects totaling 400 MW and another 90 projects under construction totaling 278 MW.

Ameren is evaluating a project that would establish a microgrid at the Technology Application Center in Urbana-Champaign and one at the Ameren Headquarters in St. Louis or near a large customer and on the Ameren Missouri side of the meter. It is envisioned that energy storage (Lithium Ion) will be included in both of these projects. We are in the early stages of defining our teams and project scope.

Lead-Carbon Battery Energy Storage

Lead-acid batteries are the oldest form of rechargeable battery technology. They have historically been considered a technology applicable only to shallow discharge service. However, new lead-acid carbon technologies have been developed that incorporate capacitor technology as part of anode electrode design. This fundamentally different chemistry results in very different performance characteristics. Lead-acid carbon technology can tolerate high-rate charge and discharge rates previously only available with higher-cost nickel metal-hydride (NiMH) and Li-ion batteries. Laboratory prototypes have undergone deep-discharge testing and withstood more than 1600 cycles before failure. In comparison, most lead-acid batteries designed for deep discharges deliver 300 to 500 cycles. Although a promising technology, lead carbon acid batteries are not commercially available. There are only two operational projects and one under construction totaling a little over 1 MW.[12]

[12] http://www.energystorageexchange.org/

Pumped hydroelectric storage is still considered the most cost-effective utility-scale storage option based on commercial maturity of the technology, the quantity of energy that can be stored, and the cost of energy.

Transmission Costs

Ameren Missouri's expectations on transmission interconnection costs for new supply-side resources as well as the transmission system upgrade costs that might be incurred following retirement of its existing coal-fired energy centers have not materially changed since the 2014 IRP. These costs can be found in Chapter 7 of the 2014 IRP filing.[13]

3.3 Demand-Side Resource Review

Ameren Missouri has been committed to helping its customers use energy more efficiently since 2009 when it started offering energy efficiency programs to its customers, and has implemented the largest utility energy efficiency program in Missouri with its MEEIA Cycle 1 energy efficiency portfolio in 2013-2015. Ameren Missouri's second cycle of energy efficiency programs was approved by the Missouri Public Service Commission on February 10, 2016 and Ameren Missouri began implementation in March 2016.

Ameren Missouri has conducted a comprehensive DSM potential study with the assistance of a nationally recognized independent contractor to estimate demand-side resource potential that was used in its 2014 IRP and that informs the MEEIA Cycle 2 energy savings and cost estimates. The comprehensive DSM potential study reviewed and considered the impact of foreseeable emerging energy efficiency technologies throughout the planning period. Ameren Missouri continues to follow developments in emerging technologies and has obtained new information on learning thermostats that make them cost-effective. As a result, Ameren Missouri now has included Wi-Fi enabled learning thermostats in its MEEIA Cycle 2 residential portfolio.[14]

Customer Financing[15]

Ameren Missouri has evaluated potential customer financing options for energy efficiency measures. The high level categories of financing options available to customers that may provide additional customer uptake in energy efficiency programs are as follows:

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[13] EO-2016-0037 d; EO-2016-0037 i
[14] EO-2016-0037 a; EO-2016-0037 k
[15] EO-2016-0037 f

- On-Bill Financing (OBF)
- On-Bill Repayment (OBR)
- Property Assessed Clean Energy (PACE)

While there are other state initiated energy efficiency financing options such as Green Banks, Ameren Missouri is focusing on options that can be created or directly accessed by Ameren Missouri and/or its customers.

On-Bill Financing (OBF): In this option the utility uses its own capital as a source of customer lending. It carries loans on its books until they reach maturity, and it originates and services all loans.[16] This allows utility customers to invest in energy efficiency improvements and repay the funds through additional charges on their utility bills.[17] The benefit of this program is that it leverages existing billing relationships with customers and the utility, and the implied or actual threat of disconnection increases payment rates. The drawback to this option is that the utility is providing all services including the upfront capital. Additionally, operating any loan program presents significant risks such as operational risks related to taking applications, closing loans and funding them, and financial risks related to managing repayment and prepayment speeds, delinquencies and defaults, interest rate changes, and other considerations.[18]

On-Bill Repayment (OBR): This option is very similar to On-Bill Financing except the upfront capital is provided by a third-party and not the utility. The benefits are also the same as OBF. One drawback of OBR is the question of payment priority when a customer only partially pays their bill. (i.e., who gets paid first; the utility or the third-party lender?)[19]

Property Assessed Clean Energy (PACE): PACE allows local/state governments or other inter-jurisdictional authorities, when authorized by state law, to fund the up-front cost of energy improvements on commercial and residential properties, which are paid back over time by the property owners.[20] A benefit to both the customer and utility under this option is that it reduces the concern about investment recovery when the property is sold, because the financing is tied to the property itself rather than to the owner. The programs are usually sponsored by the municipality, which could engender

[16] http://www.swenergy.org/data/sites/1/media/documents/publications/documents/Energy_Efficiency_Finance_Options_for_Utilities_Oct_2011.pdf
[17] http://aceee.org/sector/state-policy/toolkit/on-bill-financing
[18] http://www.nrdc.org/energy/on-bill-financing-programs/files/on-bill-financing-IB.pdf
[19] http://energy.gov/eere/slsc/bill-financing-and-repayment-programs
[20] http://energy.gov/eere/slsc/property-assessed-clean-energy-programs

more trust in the accuracy of the information as opposed to contractor-led programs.[21] The U.S. Department of Energy is also a major supporter of PACE financing providing both technical support and grant funding for innovative financing options like PACE. The one drawback of a PACE program is that it requires action at the state and local levels. Laws must be established to enable local governments to create special assessment districts that recognize energy efficiency and renewable energy as public "goods." Next, each locality can pass ordinances creating assessment zones and authorizing lien creation and project financing. Finally, the locality establishes administrative and funding processes.[22]

Ameren Missouri's Current Focus: Of the three options presented, the option which may be the most viable in some but not all communities in the Ameren Missouri service area at the present time is PACE. It allows customers to decrease the upfront capital cost of energy efficiency measures, but it eliminates risks of other Ameren Missouri customers subsidizing potential loan defaults.

At this time, Ameren Missouri does not have plans to offer measure, project or program specific financing options to customers. Ameren Missouri will assist customers in whatever manner required who opt to pursue PACE financing. However, Ameren Missouri does not have plans to pursue long-term financing options that may add costs and additional operational and financial risks to the delivery of energy efficiency programs. Ameren Missouri and the Commission are cognizant of the financial impact of customer funded energy efficiency programs on non-participating customers. Any potential future energy efficiency financing options should not have a detrimental impact on non-participating customers.

Ameren Missouri will continue to monitor developments in the utility industry energy efficiency program financing business models. Should conditions for such programs in Ameren Missouri's service territory become favorable, Ameren Missouri is open to discussing financing options for customer funded energy efficiency programs in a statewide DSM Collaborative setting.

3.4 Uncertain Factors

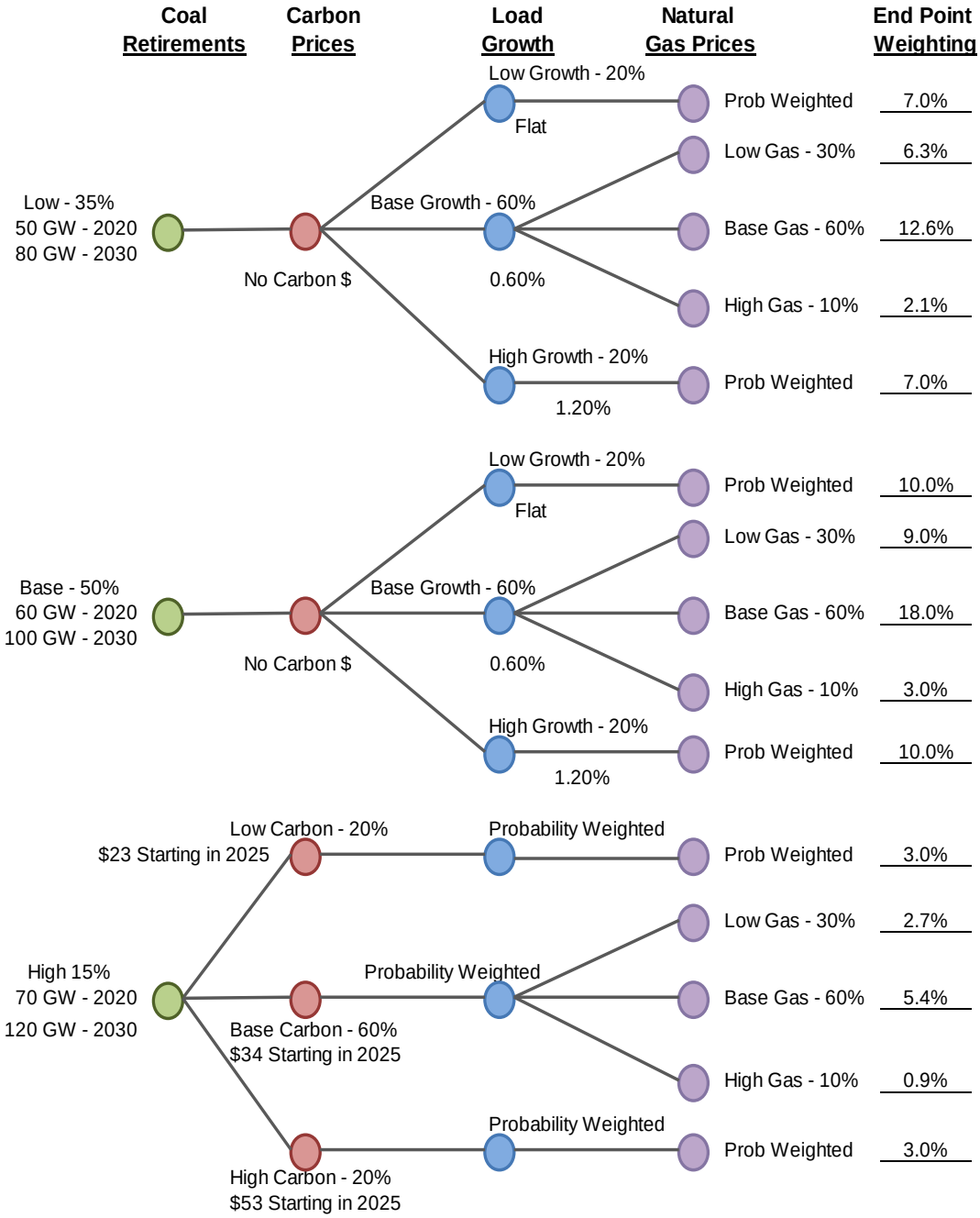
3.4.1 Price Scenarios

Ameren Missouri has reviewed its assumptions on load growth, coal retirements, carbon prices, and natural gas prices, which are the major drivers of power prices. As

[21] http://www.nrel.gov/docs/fy10osti/47097.pdf
[22] http://www.nrel.gov/docs/fy10osti/47097.pdf

discussed in more detail in this section, Ameren Missouri has determined that its current expectations for these driver variables are within the ranges established in the 2014 IRP. As a result, it is not necessary to update our power price scenarios. Each unique combination of uncertain factors is probability weighted and allows for analysis over a wide range of potential future conditions. Figure 3.1 shows the scenario tree from the 2014 IRP.

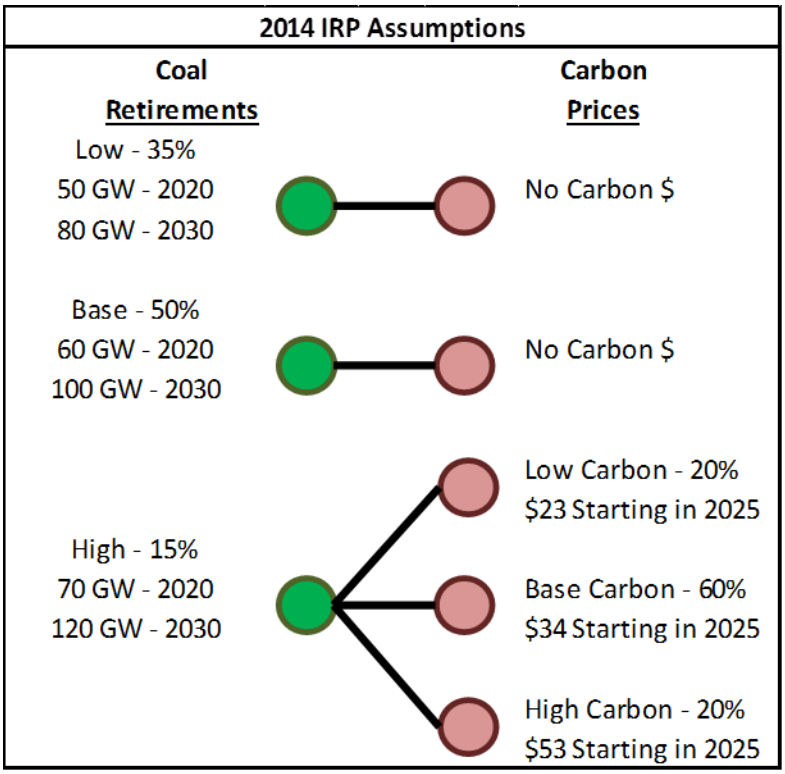
Figure 3.1: Scenario Tree



Coal Retirements

As specified in the 2014 IRP, a range of coal retirements was assumed to reflect a variety of factors that can significantly affect power prices over the 20-year planning period. The range of retirements is intended to capture the effects of market pressures like coal-to-gas switching, current and expected future environmental regulations, and U.S. coal plant lives. The current expectations for coal plant retirements have not materially changed from our assumptions in the 2014 IRP. A NERA study of the CPP projected about 45 GW of coal retirements due to the CPP rule. The base case assumed about 38 GW of coal retirements. That would result in a total of about 83 GW of coal from their modeling of the impact of all environmental regulations including the CPP. Figure 3.2 shows the assumptions used in the 2014 IRP and continues to reflect our planning assumptions.

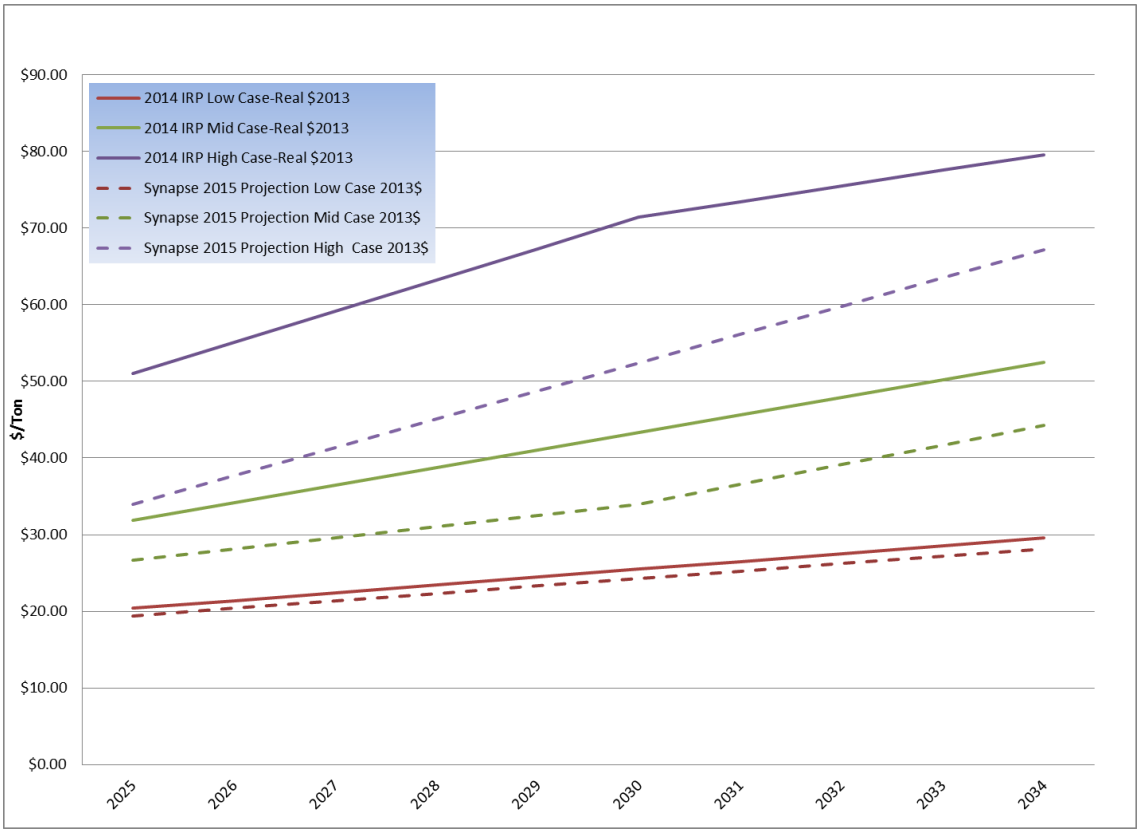
Figure 3.2: Coal Retirement Assumptions



Carbon Dioxide Emission Prices[23]

In addition to coal plant retirements, the above figure shows the carbon price expectations assumed in the 2014 IRP. We used a range of potential prices for carbon dioxide emissions from the 2013 Carbon Dioxide Price Forecast developed by Synapse Energy Economics, Inc.[24]. Figure 3.3 shows the range of prices used in the 2014 IRP and the 2015 Synapse Carbon Dioxide Price Forecast. As can be seen from the chart, current Synapse forecasts for CO_2 emission prices are now generally lower but are still within the range established for the 2014 IRP.

Figure 3.3: CO_2 Price Assumptions



It should be noted that the price assumptions shown represent an explicit price on CO_2 emissions, not necessarily an estimated cost to comply with CO_2 emission regulations such as the CPP. While these prices may factor into the cost of compliance, the cost to comply is necessarily a function of the form of the regulation and the compliance options available. For example, the CPP establishes emission limits for CO_2 which can

[23] EO-2015-0084 Commission Order 2
[24] Only values starting in 2025 and beyond have been used in the 2014 IRP.

be met by reducing the share of coal generation used to produce electricity and, if necessary, replacing the coal energy with energy efficiency, renewables, natural gas, or other forms of energy with lower or zero CO_2 emissions. The step of displacing the coal energy, including the cost of any new generation resources needed to accomplish it, results in a cost of compliance regardless of whether there is an explicit price on CO_2 emissions. It is therefore not necessary to assume in all cases that such an explicit price is imposed to maintain consistency with assumptions regarding compliance with CO_2 emission regulations.

Ameren Missouri's preferred resource plan reflects retirement of approximately one-third of its coal-fired generation. This is roughly the proportion of coal generation we have reflected in our base assumption for coal retirements in the Eastern Interconnect, described earlier in this section. To the extent that compliance with CO_2 regulations, even in the absence of an explicit price on CO_2, imposes a cost on the U.S. coal fleet in general, the cost imposed on Ameren Missouri is consistent.

Natural Gas Prices

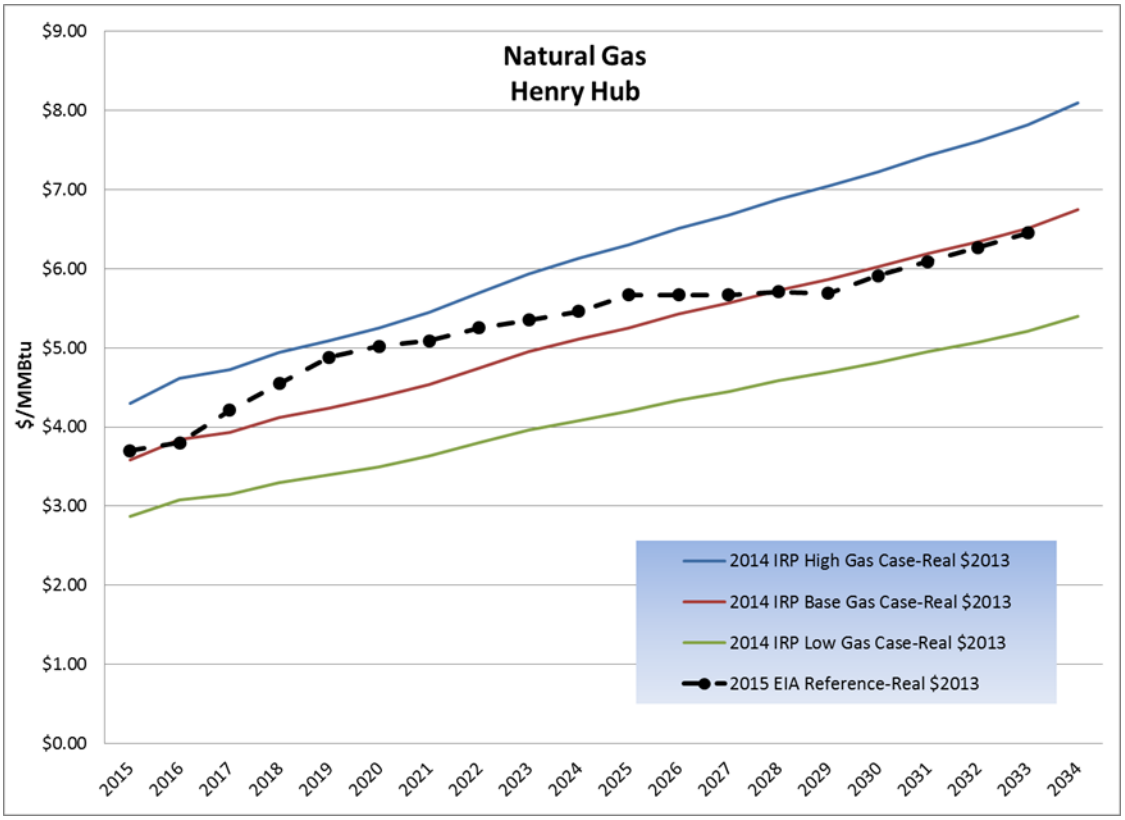
Supply – The supply of natural gas continues to be robust with shale gas reserves proving to far exceed original estimates. Dry natural gas production in the lower 48 states has increased from 66.8 billion cubic feet (Bcf) per day in 2013 to 74.5 Bcf per day in 2015, an increase of 11.5% in two years. Natural gas production is projected to exceed 95 Bcf per day by 2020, a nearly 30% increase over five years. Technology advancements continue to improve recovery rates and have lowered wellhead development and completion costs. Prior to the shale gas revolution, markets included significant risk for finding new supplies. Producers now have reserves that are known and abundant from which to extract supplies. Although producers have begun to reduce drilling and development activities in this low cost environment, they can ramp up production rapidly from known reserves in response to price increases. Nevertheless, there is a risk that the technology that makes these supplies so abundant, hydraulic fracking, may be banned as has occurred in the State of New York.

Demand – In reviewing the drivers of demand, we continue to see several major drivers shaping long term demand. They include energy efficiency programs, coal to gas switching, industrial growth and LNG exports. The long run changes in efficiency standards will continue to put downward pressure on retail demand. Upward pressure on demand will result from expanded coal to gas switching, industrial growth and global exports of LNG.

I**nfrastructure** – The shift in production areas and LNG export demand has resulted in significant build out of new capacity. The Marcellus and Utica shale reserves in the northeast will continue to drive production expansion and changes in gas flows from the

region. Changing demand will affect pipeline flows to the southeast with its petro-chemical industry, gas fired generation throughout the country, and LNG exports from the gulf coast. By 2020, 20.4 Bcf per day of new pipeline capacity is planned to be developed to move gas from the northeast to other markets.

Figure 3.4: Natural Gas Price Forecasts



Price –Current expectations are for prices to trend closer to the low end of our IRP range for the first few years. However, as we move forward in time demand from LNG exports, coal-to-gas switching and increased industrial demand could drive higher prices in later years. As demonstrated in Figure 3.4, EIA's most recent Annual Energy Outlook reflects future gas prices that are within the range used in the 2014 IRP.

Load Growth

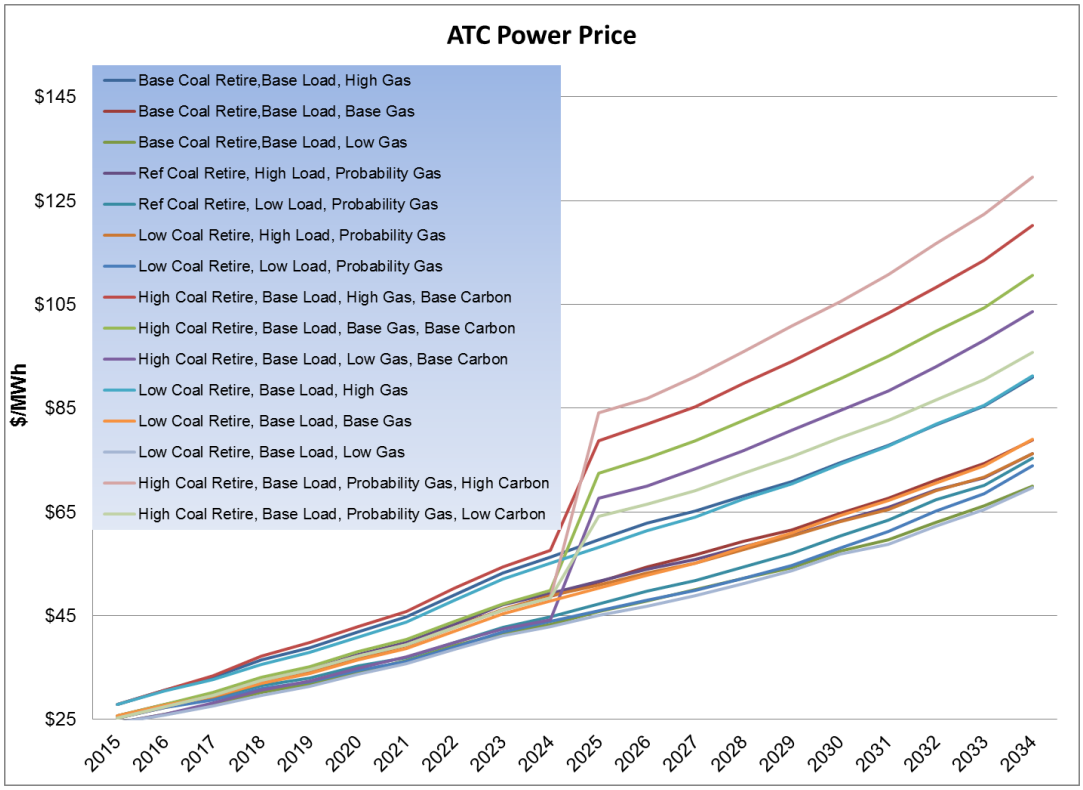
In the probability tree in Figure 3.1, load growth has 3 different value levels – one features a 1.2% compound annual growth rate (CAGR) over the IRP 20-year timeframe, with a 20% subjective probability; the other is 0.6% CAGR over the IRP 20-year timeframe, with a 60% subjective probability; and the last level features 0% CAGR with a 20% subjective probability. While it is certainly possible that load growth could fall short of 0 % or exceed 1.2% over the planning horizon, for the 2016 IRP Update we

continue to use these three levels to represent the distribution of potential load growth based on a review of assumptions with our internal subject matter experts. Our load growth assumptions for Ameren Missouri's service territory continue to fall within this range.

3.4.2 Scenario Modeling

Because current assumptions for each of the three scenario variables described in section 3.3.1 are within the ranges defined in our 2014 IRP, no updated scenario modeling is warranted at this time. The power price forecasts for the scenarios modeled for the 2014 IRP are presented in Figure 3.5 below.

Figure 3.5: Market Price Scenarios



3.4.3 Independent Uncertain Factors

Ameren Missouri identified four independent uncertain factors to be critical as a result of the sensitivity analysis conducted and presented in the 2014 IRP: project cost uncertainty, cost of capital (equity and debt), DSM impacts/costs, and coal prices. The Company reviewed its expectations and previous value ranges for these critical uncertain factors and determined the % deviations for the low-high-base values from the expected values of each uncertain factor are still valid.

Cost of Capital Uncertainty

Ameren Missouri reviewed the long-term interest rate assumptions from the December 1, 2015, Blue Chip Financial Forecast, a consensus survey of 49 economists from banks, investment firms, universities and economic consulting firms. Analyst expectations for both corporate bonds and treasury bills are lower in the 2015 forecast than in the December 2013 Blue Chip Financial Forecast, which was the basis for Ameren Missouri's 2014 IRP cost of capital expectations. Table 3.4 below shows a comparison between the 2014 IRP and 2016 IRP Annual Update cost of capital expectations. As can be seen from the table, the base expectations for cost of capital are within the ranges established for the 2014 IRP.

Table 3.4: ROE and Long-Term Interest Rates

		Low	Base	High
2016 Update	ROE		11.1%	
2016 Update	Interest Rate		6.3%	
2014 IRP	ROE	11.0%	11.4%	11.8%
2014 IRP	Interest Rate	5.8%	6.7%	7.6%

3.4.4 Coal Price Forecasts

The 2014 IRP long term coal price assumptions included a review of the drivers that most affect the coal industry and more specifically those affecting Powder River Basin coal. The overall assumptions about US coal supply have not materially changed.

Ameren Missouri continues to maintain an expectation that long-term demand for PRB coal will be negatively affected by declining natural gas prices. Additionally, how environmental regulations, transportation costs and even producer solvency will influence the coal markets are continually under review. Also, the ongoing review of export market demand is still largely driven by global market stability and completion of export terminals on the west coast.

The factors reviewed that affect PRB production costs remain the same and are;

- Strip ratios (overburden vs. coal seam) are expected to increase
- Government regulations continue to increase reclamation costs
- Severance taxes and coal lease fees
- Volatility in cost of materials, supplies and capital equipment such as diesel fuel, explosives & haul trucks
- Haul distances from coal pit to load-out are expected to increase
- Eventual interference with the railroad mainline

The cost of mining PRB coal has recently decreased/stabilized as less economical mines have reduced production. However, long-term production costs are projected to rise as strip ratios increase. Strip ratios will grow at a modest 0.5% per year over the next twenty years with most of that growth occurring in the near-term as mines begin to cross the joint line railroad. Mining companies have reduced cash costs over the past few years but long-run costs will increase in real terms due to the increasing strip ratios as production moves westward.

Our plan to meet emission compliance for SO_2 standards by burning ultra-low sulfur coal (considered 0.55 lb SO_2/MMBtu or less) remains consistent with assumptions made in the 2014 IRP. Ameren Missouri expects long-term production/supply of ultra-low sulfur PRB coal to be 200-350 million tons per year.

3.5 Energy and Peak Forecasting

Ameren Missouri has reviewed its key drivers for long-term load expectations and has concluded that current expectations are materially unchanged. One key uncertainty with respect to long-term demand pertains to the long-term viability of Noranda's aluminum smelter in New Madrid, MO. Noranda announced earlier this year its intention to idol the smelter should it be unable to secure a stable long-term power price and filed for Chapter 11 bankruptcy protection in February. In its 2014 IRP, Ameren Missouri evaluated the potential impact of a loss of Noranda's load on its resource planning. This analysis is presented in Chapter 10 of the 2014 IRP and indicates that no near-term changes in Ameren Missouri's resource plan would be necessary because no new non-renewable generation was included in the preferred plan to meet demand and reserve margin requirements until 2034. Ameren Missouri will continue to consider the resource planning implications of possible outcomes for Noranda.

In its 2014 IRP, Ameren Missouri has modeled distributed generation in the form of customer-owned solar systems. Ameren Missouri evaluated two levels of customer-owned solar generation: one that assumes installations would slow to 5MW per year (following the depletion of the available solar rebate funds established in File ET-2014-0085) and another scenario that assumes increased penetration based on projections from the U.S. Department of Energy’s Sunshot Initiative. The analysis can be found in the 2014 IRP Chapter 3. All generation from the customer-owned solar systems reduces the energy Ameren Missouri has to purchase at its AMMO.UE node for its customers in the MISO market. An after-the-fact estimation using solar installations

through 2015 and a capacity factor of 15.5%[25] (based on DC capacity) shows that customers use about 70% of the energy generated on-site, and the rest of the energy produced goes into the distribution system and is used by other customers, reducing the amount of energy Ameren Missouri needs to purchase in the MISO market to serve its load.[26]

[25] At the time 2014 IRP was being prepared, National Renewable Energy Laboratory (NREL)'s estimate for customer-owned capacity factor was 14.4%; current capacity factor from NREL is 15.5%.
[26] EO-2016-0037 e

4. Compliance References