4. Existing Supply-side Resources

Highlights

- *Ameren Missouri currently owns and operates 10,208 MW of supply-side resources: 4,522 MW of coal, 1,194 MW of nuclear, 2,949 MW of natural gas/oil, and 1,543 MW of renewables and storage.*
- *Ameren Missouri retired the Meramec Energy Center at the end of 2022.*
- *Ameren Missouri is scheduled to bring approximately 350 MW of solar capacity online by the end of 2024.*
- *Ameren Missouri has assumed retirement of 217 MW (summer net capacity) of older, less efficient gas and oil-fired combustion turbine generators (CTGs) by the end of 2029, subject to unit-specific evaluations prior to a final decision to retire. Additionally, the Company will be retiring its IL CTGs by the end of 2039 due to legislation passed in Illinois in 2021, including retirement of the Venice Energy Center by the end of 2029.*
- *The baseline retirement dates for Ameren Missouri's coal-fired energy centers, consistent with the Company's 2022 Notice of Change in Preferred Plan, are as follows:*
  - *Rush Island Energy Center retired by the end of 2024.*[1]
  - *Sioux Energy Center retired by the end of 2030.*
  - *Two Labadie Energy Center Units retired by the end of 2036 and the remaining two units retired by the end of 2042.*
  - *Evaluation of alternate retirement dates is discussed in Chapter 9.*

Ameren Missouri owns and operates solar, wind, coal-fired, natural gas-fired, nuclear, hydroelectric and storage energy centers to serve the energy needs of its customers. Ameren Missouri regularly evaluates energy center performance and upgrades that are necessary to operate its plants in an efficient, safe, cost-effective and environmentally friendly manner.

Ameren Missouri has recently completed Keokuk Energy Center upgrades on Units 5 and 15 (the last of 15 main units) in 2021 and 2022 respectively. During the 20-year planning horizon, Ameren Missouri has planned upgrades on Osage Units 2 and 4 which will complete the upgrades for all 27 currently operating hydro units. This IRP's baseline assumptions include the retirement of all of its coal-fired energy centers by the end of

[1] In the modeling, retirement was assumed to be by the end of 2025. The change in retirement date has no appreciable impact on any of the analyses or conclusions in this filing, which were completed before the expected retirement date was known.

2042, four older and less efficient CTG units by the end of 2029 and all its CTGs in Illinois by the end of 2039.

4.1 Existing Generation Portfolio[2]

Ameren Missouri owns and operates solar, wind, coal-fired, natural gas-fired, nuclear, hydroelectric, and storage energy centers to serve the energy needs of its customers. Table 4.1 reflects the 2023 summer net capability of Ameren Missouri's existing supply-side resources along with accredited capacity for summer and winter. Appendices A and B include a unit rating summary table and existing unit summer and winter accredited capacity for 2023-2043. Note that the seasonal accredited capacity (SAC) values for Callaway reflect its extended outage in 2021. Forward looking SAC values for Callaway reflect normal operation.

Table 4.1 Existing Supply-side Resource Installed Capacity

Existing Resource (MW)	Summer Net Capability*	Summer SAC	Winter SAC
Callaway	1,194	983	1,200
Labadie	2,372	2,378	2,456
Rush Island	1,178	1,204	1,164
Sioux	972	788	749
CTGs	2,949	2,613	1,724
Maryland Heights	6	6	11
Osage	235	234	231
Keokuk	148	139	130
Taum Sauk	440	414	267
High Prairie	400	77	148
Atchison	299	0	0
Solar	15	8	1
Total	10,208	8,843	8,081

*Nameplate capacity shown for solar and wind resources

[2] 20 CSR 4240-22.040(1); 20 CSR 4240-22.040(2)

4.1.1 Existing Coal Resources

Ameren Missouri has three coal-fired energy centers in its generation fleet. The coal-fired units at our Labadie, Rush Island, and Sioux energy centers have a total summer net generating capability of 4,522 MW.

Numerous projects were completed at the Labadie, Rush Island, and Sioux Energy Centers to comply with the EPA's Effluent Limitation Guidelines (ELG) and Coal Combustion Residual (CCR) rules. A comprehensive discussion of environmental regulations and compliance can be found in Chapter 5 – Environmental Compliance.

Labadie Energy Center

Labadie Energy Center is located outside Labadie, MO, on more than 1,100 acres adjacent to the Missouri River, 35 miles west of downtown St. Louis. The plant consists of four generating units with a combined summer net capability of 2,372 MW. The first unit started operating in 1970, and the plant was fully operational in 1973.

In 2021, the Labadie Unit 4 high pressure (HP) and intermediate pressure (IP) turbines were chemical-foam cleaned, a process that removes deposits without requiring long outages for turbine disassembly, to improve turbine efficiency in a cost-effective manner.

Projects related to environmental compliance continue at Labadie, with ash pond closure projects completed in 2021, and multi-year, Clean Water Act projects starting in 2022.

Rush Island Energy Center

Rush Island Energy Center is located 40 miles south of downtown St. Louis, in Jefferson County, Missouri, on 500 acres on the western bank of the Mississippi River. The plant has two units with a combined net summer capability of 1,178 MW. The first unit started operation in 1976 and the second unit in 1977.

Recent environmental project completion milestones include the Rush Island ash pond closure project in 2021, and a groundwater improvement project that went into service in 2022.

In December 2021, Ameren Missouri announced it would retire Rush Island Energy Center and filed its change in preferred plan with the Missouri Public Service Commission (MoPSC) in June 2022. MISO subsequently designated the two Rush Island generating units as System Support Resource (SSR) units to maintain grid reliability until transmission and distribution investments can be completed. The Rush Island units are expected to remain in-service as SSR units until certain transmission upgrades are completed by mid-to-late 2024.

Sioux Energy Center

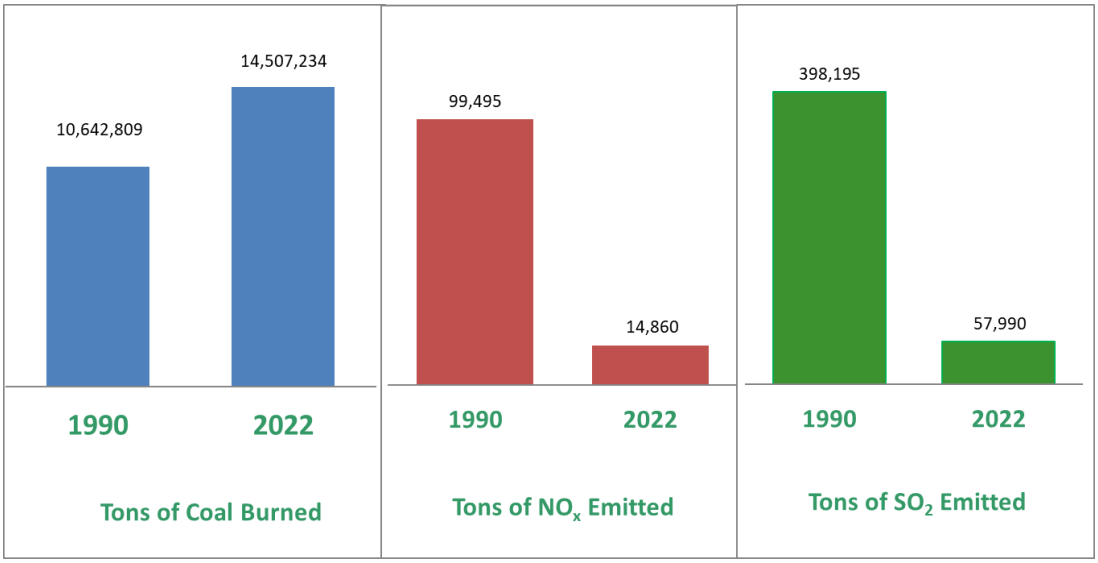
Sioux Energy Center is located in St. Charles County, Mo., 28 miles northwest of downtown St. Louis, on the Mississippi River. It consists of two cyclone boiler units which started operations in 1967 and 1968, respectively, and has a total net summer capability of 972 MW.

Both units at Sioux are equipped with wet flue gas desulfurization (FGD) equipment, commonly referred to as scrubbers, to comply with the Cross State Air Pollution Rule (CSAPR). The FGD systems at Sioux also provide significant co-benefits in complying with EPA's MATS rule for both mercury and particulate emissions. New dry ash handling systems and a new wastewater treatment system went in-service in late 2020. Ash pond closure projects were completed in 2021, and a groundwater improvement project will be completed in 2023.

Historical Emissions from Coal Resources

Ameren Missouri has achieved dramatic reductions in SO_2 and NO_x emissions during the past two decades, despite an increase in the amount of coal consumed to meet our customers' growing energy needs over that period. Over the years, Ameren Missouri has been able to reduce pollutant emissions by using lower-sulfur fuels, by installing cleaner-emitting burners with computer-controlled operation, by improving operation of existing precipitators -- collecting more than 99% of particulates -- and by installing scrubbers at Sioux Energy Center. In addition, Ameren Missouri developed an early, progressive approach to meeting NO_x control regulations. Figure 4.1 shows the decrease in Ameren Missouri's SO_2 and NO_x emissions as coal consumption has increased.

Figure 4.1 NO_x and SO_2 Emissions Reductions



4.1.2 Existing Gas & Oil Resources

Ameren Missouri owns and operates oil- or natural gas-fired combustion turbine generators (CTG) to provide electricity during times of high demand or when its higher utilization plants are not operating due to a forced outage or scheduled maintenance. Table 4.2 lists the Ameren Missouri combustion turbines and their 2023 summer net generating capabilities.

**

Table 4.2 CTG Capability

Plant	Fuel	Net MW
Audrain	Gas	608
Goose Creek	Gas	438
Pinckneyville	Gas	511
Raccoon Creek	Gas	304
Kinmundy	Gas	210
Peno Creek	Gas	172
Venice	Gas	489
Fairgrounds	Oil	55
Mexico	Oil	54
Moberly	Oil	54
Moreau	Oil	54
Total		2,949

**

[3] 20 CSR 4240-22.040(3)(B)

4.1.3 Existing Nuclear Resource

Callaway Energy Center is located about 100 miles west of St. Louis, Missouri, in Callaway County. The plant started operations in December 1984 and is the only power plant that uses nuclear fuel in Ameren Missouri's generation fleet. Ameren Missouri has continued to make cost-effective investments in Callaway to replace equipment that is at the end of its service life, including components such as turbine rotors, steam generators and main transformers.

Callaway Energy Center is the second largest power generation facility on the Ameren Missouri system with a net summer capability of 1,194 MW.

4.1.4 Existing Renewable and Storage Resources

Currently, Ameren Missouri owns 383 MW of hydroelectric resources, 440 MW of pumped storage, 699 MW of wind generation, a purchase power agreement for another 102 MW of wind generation, 15.4 MW (AC) of solar generation, and 8 MW of landfill gas-to-electric generation.

Existing Hydroelectric Resources

Keokuk

Ameren Missouri's Keokuk hydroelectric plant is located on the Mississippi River at Keokuk, Iowa, 180 miles north of St. Louis. The Keokuk Energy Center has a total net summer capability of 148 MW.

More than a million cubic yards of earth and rock were excavated to build the Keokuk dam and plant, which began operation in 1913. An engineering marvel of its time, Keokuk is the largest privately owned and operated dam and hydroelectric generating plant on the Mississippi River. Over the years, Ameren Missouri has continued to invest in the modernization and repair of the plant and dam.

As it passes through the power plant, falling water spins turbines, or water wheels, which drive generators that produce electricity. Keokuk Plant is a "run-of-river plant," meaning that all water flowing downstream passes the plant on a daily basis. An average day of operation at Keokuk Plant saves the equivalent of nearly 1,000 tons of coal. The individual

units at the Keokuk Energy Center, each having a nameplate rating of less than 10 MW, were certified as qualified renewable energy resources by the Missouri Department of Natural Resources (MoDNR) in September 2011.

As of 2022, 9 out of 15 unit controllers have been replaced. The remaining 6 will be replaced in 2023 while the balance of plant control system is expected to be complete in 2024.

Osage

Ameren Missouri's Osage hydroelectric plant is located in Lakeside Missouri on the Osage River at the Lake of the Ozarks. The Osage Energy Center has a total net summer capability of 235 MW.

Osage began operation in 1931. For early settlers, the rolling Osage River in the heart of Missouri's Ozark wilderness provided a way of life and a source of livelihood, whether that was fishing, farming, logging or other pursuits. Then in the 1930s, the river was harnessed when Union Electric Company (now known as Ameren Missouri) built Bagnell Dam to provide power for a growing state and a budding economy. The 1930s-era building of Bagnell Dam and Ameren Missouri's Osage hydroelectric plant created a range of recreational opportunities in the now-popular Lake of the Ozarks.

Every hour the Osage Plant operates, other energy resources are preserved. As water passes through the dam, the pressure of the falling water spins water wheels, which drive generators that produce electricity. In a typical year, Osage Plant uses the clean energy of falling water to produce as much power as 225,000 tons of coal or one million barrels of oil. Osage Energy Center produces completely renewable energy, although it does not qualify as a renewable energy resource per Missouri regulations due to the units being greater than 10 MW.

In 2021, Osage completed the last Unit Controller Replacement project, finishing a multi-year effort to update the controls on all eight generating units of the hydroelectric facility. Osage is currently working on the balance of plant control system, pulling all of the unit controllers together, which is expected to be complete in 2023.

Existing Pumped Storage

Taum Sauk

The Taum Sauk pumped storage plant is located approximately 120 miles southwest of St. Louis in the scenic Ozark highlands. The Taum Sauk Energy Center has a total net summer capability of 440 MW.

Taum Sauk Plant began operation in 1963, the turbines were completely rebuilt in 1999, and the upper reservoir rebuild project was completed in 2010. Taum Sauk is used primarily on a peaking basis and is put into operation when the demand for electricity is greatest. The pump storage system works much like a conventional hydroelectric plant, but is usually used only to meet daily peak power demands. Water stored in an upper reservoir is released to flow through turbines and into a lower reservoir during periods of high energy demand. Then, overnight, when the demand for electricity is low, the water is pumped back into the upper reservoir, where it is stored until needed.

Ameren Missouri has initiated projects to replace the Generator Step Up (GSU) Transformers at Taum Sauk. The GSUs link the Taum Sauk generators to the grid, increasing the voltage from the generator to a level suitable for transmission. The new, larger GSUs are sized to handle the full output of the Taum Sauk generators and will reduce environmental risk by replacing the current oil-cooled technology with gas-insulated GSUs.

Existing Renewables

High Prairie Renewable Energy Center

In May 2018, Ameren Missouri entered into an agreement to acquire, after construction, a 400 MW wind farm in Adair and Schuyler counties in northeast Missouri. The wind farm consists of 175 wind turbines that stand nearly 500 feet above the ground. Ameren Missouri began commercially operating the High Prairie Renewable Energy Center in December 2020 and it became certified as a renewable energy resource by the MoDNR in February 2021.

Atchison Renewable Energy Center

In May 2019, Ameren Missouri entered into an agreement to acquire, after construction, a 299 MW wind farm in Atchison County in northwest Missouri. The wind farm consists of 91 wind turbines that range in total height from 442 to 590 feet above ground. In March 2021, Atchison Renewable Energy Center became operational at a reduced capacity of 120 MW; by December 2021, it reached its full operational capacity of 298.6 MW, and received its renewable energy resource certification from the MoDNR in February 2021.

Pioneer Prairie Wind Farm

In June 2009, Ameren Missouri executed an agreement to purchase 102 MW of wind power from Phase II of Horizon Wind Energy's Pioneer Prairie Wind Farm in northeastern Iowa in Mitchell County. This power purchase agreement (PPA) runs from September 2009 through August 2024. The Pioneer Prairie Wind Farm was certified as a qualified renewable energy resource by the MoDNR in September 2011.

O'Fallon Renewable Energy Center

In December 2014 Ameren Missouri began operation of 4.5 MW (AC) of solar generation at the O'Fallon Renewable Energy Center. The O'Fallon facility includes more than 19,000 polysilicon solar panels and is located on 25 acres of land owned by Ameren Missouri.

Ameren Missouri BJC Solar Partnership

In October 2019, the Ameren Missouri BJC Solar Partnership project was completed. This facility generates 1.57 MW (AC) of solar power directly onto the 12.47-kV grid while being hosted by the BJC Parking Garage. This project was completed through the Solar Partnership Pilot Program.

Community Solar Resources

Ameren Missouri owns and operates two solar facilities that exclusively support the company's Community Solar Pilot Program for residential and small business customers. Both facilities are fully subscribed. Due to the success of the pilot program, Ameren Missouri received approval to implement a permanent Community Solar Program within the electric rate review filed in March 2021.

Lambert Community Solar Energy Center

In August 2019, the Ameren Missouri Lambert Community Solar Energy Center began operation of 942 kW (AC) of solar generation. The facility is located on land owned by St. Louis Lambert International Airport just west of the airfield near Lindbergh and Missouri Bottom Road. The facility supports approximately 350 customer enrollments in the Community Solar Pilot Program.

Montgomery Community Solar Center

In March 2022, the Ameren Missouri Montgomery Community Solar Energy Center began operation of 5.74 MW (AC) of solar generation. This facility is currently Ameren Missouri's largest operational solar energy center and supports more than 2,000 customer enrollments in the Community Solar Pilot Program. The tilt-panel design, a first for Ameren Missouri, allows the panels to follow the sun's trajectory through the day, maximizing the amount of energy captured from the sun.

Neighborhood Solar Resources

Ameren Missouri's Neighborhood Solar Program aims to add solar generation at customer partner sites that will inclusively benefit customers through renewables education, visibility, and workforce opportunities. Ameren Missouri will own and operate all Neighborhood Solar systems for the benefit of all customers; host participants provide site access to the partnership. Ameren Missouri has completed six Neighborhood Solar sites with a combined capacity of 2.6 MW (AC), fully utilizing the $14 million budget allocated through Senate Bill 564. Each site's development incorporated solar education tours and equitable workforce development union pre-apprentice job opportunities for diverse candidates. They are as follows:

South St. Louis Renewable Energy Center

The South St. Louis Renewable Energy Center is a 192 kW (AC) parking lot solar canopy in the diverse Dutchtown neighborhood of South St. Louis City. Habitat for Humanity Saint Louis is offering the use of the space so the energy produced there can benefit all Ameren Missouri customers. The site began generating energy in August 2021.

Cape Girardeau Renewable Energy Center

The largest Neighborhood Solar installation at 1.2 MW (AC), the Cape Girardeau Renewable Energy Center went into service in July 2022. This facility is located on the campus of Southeast Missouri State University, providing covered parking for the Show Me Center.

Fee Fee Renewable Energy Center

The Fee Fee Renewable Energy Center is a 504 kW (AC) parking lot solar canopy located between Aquaport and Maryland Heights Community Center. The City of Maryland Heights is offering the use of the space so the energy produced there can benefit all Ameren Missouri customers. The site began generating energy in April 2023.

North Metro Renewable Energy Center

The North Metro Renewable Energy Center is a 192 kW (AC) parking lot solar canopy located at the Ameren Missouri North Metro Operating Center. The site began generating energy in April 2023.

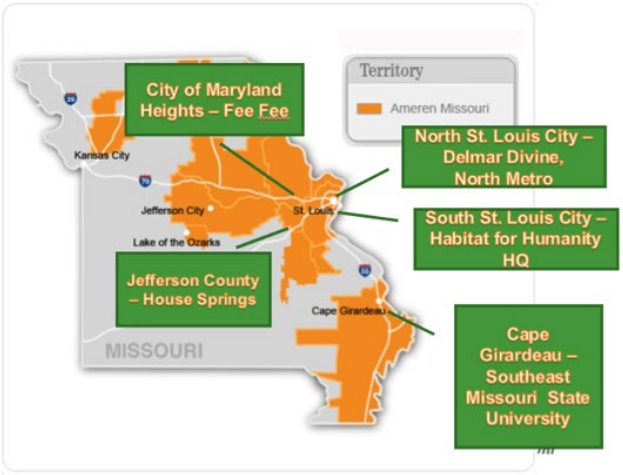
Delmar Renewable Energy Center

The Delmar Renewable Energy Center is a 288 kW (AC) parking lot solar canopy located at Delmar DivINe in the West End neighborhood. The site began generating energy in August 2023.

House Springs Renewable Energy Center

The House Springs Renewable Energy Center is a 228 kW (AC) parking lot solar canopy located at the Ameren Missouri House Springs Operating Center. The site began generating energy in August 2023.

Figure 4.2 Neighborhood Solar Site Map



Maryland Heights Renewable Energy Center

The Maryland Heights Renewable Energy Center (MHREC) is located in St. Louis County approximately 18 miles northwest of St. Louis. The MHREC is the largest landfill-gas-to-electric facility in Missouri and one of the largest in the country. The facility began operation in June 2012. It has a total net summer capacity of 6 MW. MHREC burns methane gas produced by the IESI Landfill in Maryland Heights, Missouri, in

three Solar Mercury 50 gas turbines to produce electricity. The current contract with the landfill guarantees enough gas supply for three generators until 2032. In August 2012, the MHREC was certified as a qualified renewable energy resource by the MoDNR.

4.1.5 Levelized Cost of Energy Evaluation for Existing Resources[4]

The levelized cost of energy (LCOE) was calculated for Ameren Missouri's existing resources. LCOE represents going-forward costs of ownership and operation and provides a basis for comparison to new resource alternatives. It is important to note that the LCOE figures do not fully capture all of the relative strengths of each resource type. Table 4.3 shows the component analysis for the LCOE for each energy center. The average LCOE for Ameren Missouri's entire generating fleet is approximately $42.30/MWh.

Table 4.3 Levelized Cost of Energy Component Analysis for Existing Resources

Existing Resources	Levelized Cost of Energy (¢/kWh)										
	Capital	O&M	Fuel	PTC	Decommission	Pump Cost	Env Capital	CO2	SO2	NOx	Total Cost
Labadie	0.40	0.46	2.20	--	--	--		1.30	0.00	0.19	**4.55**
Rush Island	0.53	2.65	2.64	--	--	--		0.18	0.00	0.40	**6.40**
Sioux	0.19	0.73	2.78	--	--	--		0.52	0.00	0.50	**4.72**
Callaway	1.33	1.41	0.85	--	0.07	--		0.00	0.00	0.00	**3.66**
Audrain CTG	0.19	0.45	5.22	--	--	--		1.24	0.00	0.04	**7.14**
Goose Creek CTG	0.58	0.41	4.76	--	--	--		0.92	0.00	0.04	**6.71**
Pinckneyville CTG	3.29	1.25	3.84	--	--	--		0.74	0.00	0.03	**9.14**
Raccoon Creek CTG	1.01	0.48	4.76	--	--	--		0.92	0.00	0.04	**7.21**
Kinmundy CTG	0.78	0.65	4.41	--	--	--		0.85	0.00	0.03	**6.73**
Peno Creek CTG	12.32	2.08	4.61	--	--	--		1.10	0.00	0.03	**20.14**
Venice CTG	0.34	0.68	4.05	--	--	--		0.26	0.00	0.03	**5.36**
Fairgrounds CTG	0.05	0.09	21.54	--	--	--		0.29	0.00	0.04	**22.00**
Mexico CTG	0.05	0.08	21.75	--	--	--		0.29	0.00	0.04	**22.21**
Moberly CTG	0.05	0.08	21.75	--	--	--		0.29	0.00	0.04	**22.21**
Moreau CTG	0.05	0.08	21.75	--	--	--		0.29	0.00	0.04	**22.21**
Keokuk	1.91	0.56	--	--	--	--		0.00	0.00	0.00	**2.47**
Osage	2.52	1.10	--	--	--	--		0.00	0.00	0.00	**3.62**
Taum Sauk	1.29	1.05	--	--	--	7.42		0.00	0.00	0.00	**9.76**
MHREC CTG	4.53	4.79	3.63	--	--	--		0.00	0.00	0.00	**12.94**
High Prairie	0.24	1.07	--	-1.24	--	--		0.00	0.00	0.00	**0.08**
Atchison	0.00	0.83	--	-1.24	--	--		0.00	0.00	0.00	**-0.41**
Ofallon Solar	0.00	0.29	--	--	--	--		0.00	0.00	0.00	**0.29**
Lambert	0.00	1.70	--	--	--	--		0.00	0.00	0.00	**1.70**
BJC	0.00	2.48	--	--	--	--		0.00	0.00	0.00	**2.48**
Montgomery	0.00	0.25	--	--	--	--		0.00	0.00	0.00	**0.25**
Neighborhood Solar	0.00	1.92	--	--	--	--		0.00	0.00	0.00	**1.92**

[4] 20 CSR 4240-22.040(2)(A); 20 CSR 4240-22.040(2)(B); 20 CSR 4240-22.040(2)(C)1

4.1.6 Planned Changes to Existing Non-Coal Resources

During the 20-year planning horizon, Ameren Missouri is considering two Osage Energy Center Units for upgrades and the retirement of several CTG units.

The original 89-year-old turbines at Osage units 2 and 4 are scheduled to be replaced by 2024 at a cost of about $35M. These upgrades are expected to result in 2% efficiency improvement; however, Ameren Missouri is currently conducting an ongoing engineering study to better estimate the benefits.

CTG Retirements

Ameren Missouri previously conducted a high-level retirement evaluation of the existing CTG fleet. The potential retirement recommendation is based on operating experience, condition of the assets, and qualitative analysis. The qualitative analysis considered factors such as condition of subsystems, obsolesce of control systems, availability of spare parts, and building condition. Based on the evaluation and in light of current market assumptions, Ameren Missouri plans to retire four of its older gas- and oil-fired CTG units (i.e., Fairgrounds, Mexico, Moberly, and Moreau), with a total net capacity of 217 MW, over the next 20 years. A combination of factors led to the potential CTG retirement recommendations, including the fact that the average age of those units is 43 years; and for some of the units, the long-term availability of spare parts is questionable. The lead time for obtaining spare parts is unknown. Table 4.4 provides a summary of the planned CTG retirements. The planned CTG retirements are included in the base capacity position (see Appendix B).

The results of a detailed condition assessment for each unit will be used as the basis for economic analysis to be considered along with other factors such as overall age, condition, reliability, safety and cost, significant capital needs, near-term capacity value, and availability of spare parts. Such economic analyses are generally initiated when a need for significant capital investment is identified and/or when expected market conditions change substantially.

In September 2021, the Illinois General Assembly passed the Climate and Equitable Jobs Act (CEJA), and Governor Pritzker signed it into law in the same month. Among other things, CEJA provides for the elimination of fossil-fueled generation in Illinois by 2045. The law requires fossil-fueled generators owned by investor-owned utilities to be retired by January 1, 2040; however, the timeline for retirement is accelerated for generators in close proximity to statutorily designated Environmental Justice Communities. Of Ameren Missouri's CTG facilities in Illinois, Venice Energy Center (489 MW) is the only facility that is subject to this requirement. As a result, the Company expects Venice to be retired by January 1, 2030, and the remaining CTGs in Illinois with summer net capability of 1,463 MW to be retired by January 1, 2040.

Table 4.4 Ameren Missouri Potential CTG Retirements during the Planning Period

Unit	Capacity (MW)	Fuel Type	Retirement Time Frame
Fairgrounds	55	Oil	12/31/2029
Mexico	54	Oil	12/31/2029
Moberly	54	Oil	12/31/2029
Moreau	54	Oil	12/31/2029
Venice	489	Natural Gas	12/31/2029
Goose Creek	438	Natural Gas	12/31/2039
Pinckneyville	511	Natural Gas	12/31/2039
Raccoon Creek	304	Natural Gas	12/31/2039
Kinmundy	210	Natural Gas/Oil	12/31/2039

Oil Back-up Capability

Ameren Missouri is planning to restore the oil backup capability at its Peno Creek and Kinmundy Energy Centers to increase the winter capability by approximately 47 MW and 40 MW, respectively. The Company is also evaluating the addition of oil backup for its Audrain Energy Center. The current estimate for restoration of oil backup at Peno Creek and Kinmundy is less than $10 million. The estimate as of September 12, 2023 for the addition of oil backup at Audrain is approximately **_____** and would add over 300 MW of winter capacity.

4.2 Existing Steam Generation Evaluation

Ameren Missouri has evaluated its coal energy centers in terms of condition, base retirement assumptions, reliability trends, operation and maintenance costs, and capital expenditures. Table 4.5 lists the commercial operation date for each generating unit, the average age at each energy center as of 12/31/2023, and the base retirement assumptions consistent with the Company's 2022 Notice of Change in Preferred Plan filing. Additional retirement dates will be analyzed and reported in Chapter 9.

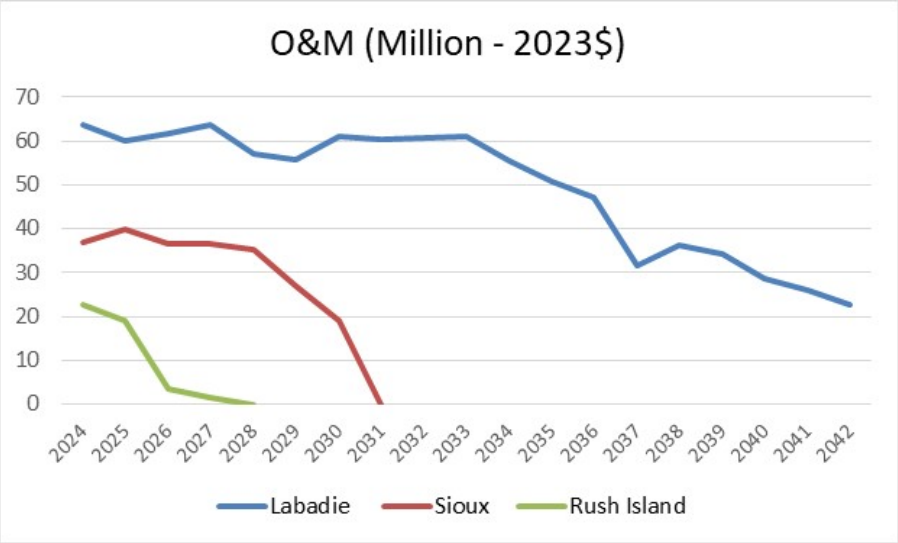
Table 4.5 Ameren Missouri Coal Energy Center Commercial Operation Dates, Average Age, and Base Retirement Assumptions[5]

Energy Center	Commercial Operation Date				Average Age as of 12/31/2023	Base Retirement Assumptions (Retirement Date)
	Unit 1	Unit 2	Unit 3	Unit 4		
Labadie	1970	1971	1972	1973	53	2042
Rush Island	1976	1977			48	2024
Sioux	1967	1968			57	2030

4.2.1 Operations and Maintenance Costs

The plant O&M costs are anticipated to remain flat to declining in real terms in the future. Figure 4.3 shows the future O&M costs from 2024 to 2042 in 2023 dollars using the base retirement date for each energy center. The labor portion of the O&M assumes a 50% pension and benefit loading factor. The O&M forecasts in the figure do not include annual revenues from ash sales. A six-year outage cycle for Labadie and a 3-year outage cycle for Sioux are assumed in the O&M forecast.

Figure 4.3 Future Non-Environmental Annual O&M for Ameren Missouri Coal Energy Centers (2023$)



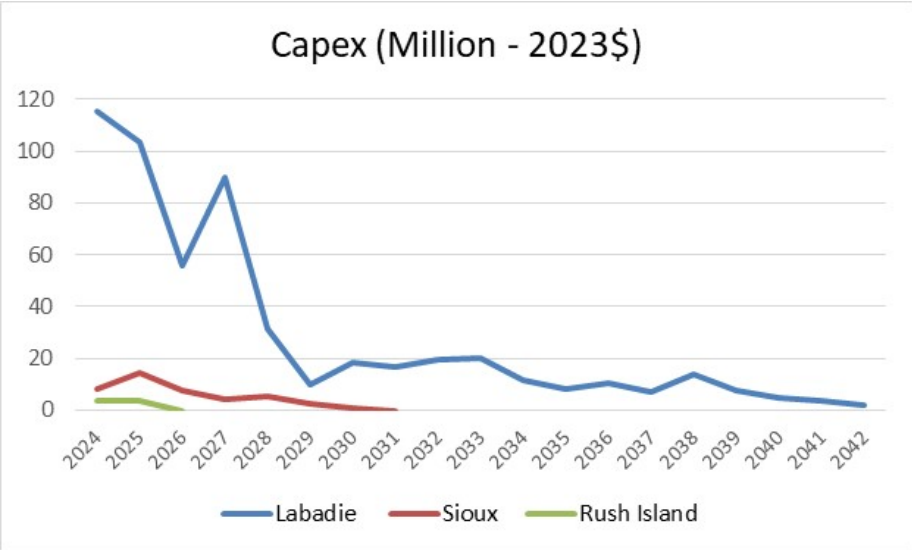
4.2.2 Capital Expenditures

Figure 4.4 shows the future non-environmental capital expenditures for 2024 to 2042 using the base retirement date for each energy center. Future environmental capital expenditures are discussed in Chapter 5. The future non-environmental plant capital

[5] The Labadie generating units are currently assumed to be retired in 2036 (two units) and 2042 (two units).

expenditures were provided by Ameren Missouri Power Operations Services and normalized to 2023 dollars using a 2% escalation rate. Note that assumptions for capital expenditures may vary significantly for alternate retirement dates and that such differences are included in the assumptions used for the analysis of alternative resource plans described in Chapter 9.

Figure 4.4 Future Non-Environmental Capital Expenditures Ameren Missouri Coal Energy Centers (2023$)



4.3 Efficiency Improvement[6]

4.3.1 Existing Facility Efficiency Options

Ameren Missouri has implemented various initiatives to improve efficiency and reduce GHG emissions at its existing facilities. These initiatives include replacement of incandescent light bulbs with compact fluorescent light bulbs and LEDs, and standardization of low-energy usage light fixtures during system replacements. Another initiative to improve efficiency and reduce GHG emissions in the operation of heating, ventilation, and air conditioning (HVAC) equipment through the installation of programmable thermostats for control of HVAC systems is expected to reduce energy consumption during off-hours. The projects completed in 2011 through 2021 have reduced energy consumption by more than 3,700 MWh annually and reduced CO_2 emissions by more than 2,600 metric tons annually (assuming 0.7 metric tons of CO_2 per MWh). Ameren Missouri will continue assessing and implementing the projects that prove to be feasible on an ongoing basis.

[6] 20 CSR 4240-22.040(1)

4.3.2 Existing Energy Center Efficiency Options[7]

Ameren Missouri continues to be focused on maintaining the efficiency of its coal-fired generating units. Projects that improve efficiency that are a benefit to the company and to customers continue to be evaluated and executed when appropriate. Projects and work activities that restore efficiency lost due to equipment degradation or operating issues continue to be evaluated and executed on a regular basis.

Ameren Missouri performs long-term scheduled major maintenance outages. Much of the work performed during these major outages (such as replacement or repair of leaking valves, restoration of duct work, insulation of equipment, and cleaning of equipment) typically results in improved efficiency when the unit returns to service.

Ameren Missouri's generating resources utilize the Plant Reliability Optimization (PRO) process to maintain assets in a cost efficient and effective manner to support conservative operations. The PRO process integrates personnel from all levels of the organization and uses data to assess equipment condition to prioritize and plan resources and work. The process develops, implements, and standardizes best practices system-wide to reduce failure rates on critical equipment, balancing additional maintenance costs against potential production losses to optimize investments, while ensuring equipment performance and condition support of safe and reliable asset operation.

Ameren Missouri continues to utilize performance monitoring on its major Energy Centers and has recently expanded focus to incorporate monitoring of wind and solar assets. Performance monitoring includes analysis of rotating equipment, vibration monitoring, Real Time Alarm Monitoring and expansion of monitoring services to the CTG fleet, along with exploring additional technologies and software to accomplish these goals. The Performance Monitoring function works closely with the Real Time Operations group, and complements Ameren Missouri's existing generation operations and dispatch functions.

Operational monitoring at Ameren Missouri’s coal plants is also an important tool in maintaining the heat rate (efficiency) at the coal plants. EtaPRO is a continuous monitoring software tool used at all the plants to monitor thermal performance of critical equipment. The EtaPRO system is maintained by Performance Engineering and is also used by performance engineers to generate plant heat rate (efficiency) reports. Operations personnel routinely check system components during operation and start-up modes to ensure that valve line-ups are correct and equipment performance is maintained.

[7] 20 CSR 4240-22.040(1)

4.4 Compliance References