MISSOURI PUBLIC SERVICE COMMISSION

STAFF REPORT

SEVENTH PRUDENCE REVIEW OF COSTS RELATED TO THE FUEL ADJUSTMENT CLAUSE FOR THE ELECTRIC OPERATIONS OF UNION ELECTRIC COMPANY, d/b/a AMEREN MISSOURI

FILE NO. EO-2019-0257

June 1, 2017 through September 30, 2018

Jefferson City, Missouri

August 29, 2019

** Denotes Confidential Information **

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I. Executive Summary

The Missouri Public Service Commission ("Commission") first authorized a Fuel Adjustment Clause ("FAC") for Union Electric Company, d/b/a Ameren Missouri in Case No. ER-2008-0318. Since then, the Commission has approved continuation of Ameren Missouri's FAC with modifications in its orders in Ameren Missouri's subsequent general rate cases, Case Nos. ER-2010-0036, ER-2011-0028, ER-2012-0166, ER-2014-0258, and ER-2016-0179.

Commission Rule 4 CSR 240-20.090(11) and Missouri Revised Statute Section 386.266.5(4) (2018) require that the Commission's Staff ("Staff") conduct prudence reviews of an electric utility's FAC no less frequently than every 18 months. In this seventh prudence review of Ameren Missouri's FAC for the period June 1, 2017 through September 30, 2018, Staff analyzed items affecting Ameren Missouri's total fuel costs, purchased power costs, net emission costs, transmission costs, off-system sales revenues, and interest for the twenty-sixth, twenty-seventh, twenty-eighth, and twenty-ninth, four-month accumulation periods[1] of Ameren Missouri's FAC. Staff's previous Ameren Missouri FAC prudence reviews are listed in Table 1:

continued on next page

[1] Rate adjustments based on the four (4) four-month accumulation periods during this seventh prudence audit period were the subject of File Nos. ER-2018-0142, ER-2018-0255, ER-2019-0024, and ER-2019-0152.

Table 1

Prudence Review	File Number	Review Period
First	EO-2010-0255	March 1, 2008 through September 30, 2009
Second	EO-2012-0074	October 1, 2009 through May 31, 2011
Third	EO-2013-0407	June 1, 2011 through September 30, 2012
Fourth	EO-2015-0060	October 1, 2012 through May 31, 2014
Fifth	EO-2016-0228	June 1, 2014 through September 30, 2015
Sixth	EO-2018-0067	October 1, 2015 through May 31, 2017

In evaluating prudence, Staff reviews whether a reasonable person making the same decision would find both the information the decision-maker relied on and the process the decision-maker employed were reasonable based on the circumstances at the time the decision was made, *i.e.*, without the benefit of hindsight. The decision actually made is disregarded and the review is instead an evaluation of the reasonableness of the information the decision-maker relied on and the decision-making process the decision-maker employed. If either the information relied upon or the decision-making process employed was imprudent, then Staff examines whether the imprudent decision caused any harm to customers. Only if an imprudent decision resulted in harm to Ameren Missouri's customers, will Staff recommend a disallowance.

Staff analyzed a variety of items in examining whether Ameren Missouri prudently incurred the fuel and purchased power costs associated with its FAC tariff sheets. Based on its review, Staff identified no evidence of imprudence by Ameren Missouri in the items it examined for the period of June 1, 2017 through September 30, 2018.

Table 2 identifies Ameren Missouri's Commission-approved FAC tariff sheets which were applicable for service provided by Ameren Missouri to its customers during the period of June 1, 2017 through September 30, 2018 including the tariff sheets applicable to calculation of the Fuel Adjustment Rates for the four (4) accumulation periods covered by this same period:

continued on next page

Table 2

June 1, 2017 through September 30, 2018
1st Revised Sheet No. 74
Original Sheet No. 74.1
Original Sheet No. 74.2
Original Sheet No. 74.3
Original Sheet No. 74.4
Original Sheet No. 74.5
Original Sheet No. 74.6
Original Sheet No. 74.7
Original Sheet No. 74.8
Original Sheet No. 74.9
Original Sheet No. 74.10
Original Sheet No. 74.11
Original Sheet No. 74.12
2nd Revised Sheet No. 74.13
3rd Revised Sheet No. 74.13
4th Revised Sheet No. 74.13
5th Revised Sheet No. 74.13

II. Introduction

A. Prudence Standard

In *State ex rel. Associated Natural Gas Co. v. Public Service Com'n of State of Mo.*, the Western District Court of Appeals stated the Commission defined its prudence standard as follows:

> [A] utility's costs are presumed to be prudently incurred.... However, the presumption does not survive "a showing of inefficiency or improvidence... [W]here some other participant in the proceeding creates a serious doubt as to the prudence of expenditure, then the applicant has the burden of dispelling these doubts and proving the questioned expenditure to have been prudent.
>
> In the same case, the PSC noted that this test of prudence should not be based upon hindsight, but upon a reasonableness standard: [T]he company's conduct should be judged by asking whether the conduct was reasonable at the time, under all the circumstances, considering that the company had to solve its problem prospectively rather than in reliance on hindsight. In effect, our responsibility is to determine how

> reasonable people would have performed the tasks that confronted the company.
>
> 954 S.W.2d 520, 528-29 (Mo. App. W.D., 1997) (citations omitted).

In reversing the Commission decision in that case, the Court did not criticize the Commission's definition of prudence, but held, in part, that to disallow a utility's recovery of costs from its customers based on imprudence, the Commission must determine the detrimental impact of that imprudence on the utility's customers, *Id*. at 529-30. This is the prudence standard Staff has followed in this review.

B. General Description of Ameren Missouri's FAC

Ameren Missouri's FAC requires that it accumulate its Actual Net Energy Cost ("ANEC")[2]; defined generally as variable fuel, purchased power, transmission and net emissions and insurance recoveries costs less off-system sales revenue during the four-month accumulation periods ("AP").[3] Each four-month accumulation period is followed by an eight month recovery period ("RP")[4] during which ninety-five percent (95%) of the over- or under-recovery of Actual Net Energy Cost during the previous four-month accumulation period relative to the Base Energy Cost ("B") amount[5] is returned to or collected from customers as part of a decrease or an increase of the FAC Fuel and Purchased Power Adjustment ("FPA") per kWh rate, which is the Fuel Adjustment Rate ("FAR") for each accumulation period. Because the total amount charged through the FAR rarely, if ever, will exactly match the required offset, Ameren Missouri's FAC is designed to true-up[6] the difference between the revenues billed and the revenues authorized for collection during recovery periods including interest at Ameren Missouri's short-term interest rate. Any disallowance the Commission orders as a result of a FAC prudence review shall include interest at Ameren Missouri's

[2] "Actual Net Energy Cost" (ANEC) are equal to fuel costs (FC) plus costs of purchased power (PP) plus net emissions allowances (E) plus net (R) insurance recoveries minus off-system sales revenue (OSSR) as defined on Ameren Missouri's Original Sheet No. 74.1 through Original Sheet No. 74.4.

[3] Accumulation periods are: February through May, June through September and October through January.

[4] Recovery periods are: October through May for each immediately preceding February through May accumulation period; February through September for each immediately preceding June through September accumulation period; and June through January for each immediately preceding October through January accumulation period.

[5] "Base Energy Cost" (B) as defined on Ameren Missouri's Sheet No. 74.13.

[6] True-up of FAC is defined on Ameren Missouri's Original Sheet No. 74.9.

short-term interest rate and will be accounted for as an adjustment[7] item when calculating the FPA for a future recovery period.

C. Staff Review and Reconciliation of FERC Accounts

Staff has reviewed all FERC accounts related to Ameren Missouri FAC for this review period. FERC accounts subject for this FAC review are: 411.8 Gains from Disposition of Allowances, 411.9 Losses from Disposition of Allowances, 447 Sales for Resale, 456 Other Electric Revenues[8], 501 Fuel, 509 Allowances, 518 Nuclear Fuel Expense, 547 Fuel, 555 Purchased Power, 565 Transmission by Others.

Staff created independent work papers to reconcile the General Ledger, the Monthly Reports and the FAR Reports which are based on three separate sources provided by Ameren Missouri. These work papers were created for the purpose to review and reconcile the FERC Accounts in Table 3 and included in the calculation of the components of the ANEC presented in Table 5.

Ameren Missouri provides its monthly General Ledger and General Journal to the Commission as ongoing surveillance data which is a summary of all accounting transactions for the expenses and revenues encompassed in the ANEC in Table 5. Staff sorted the General Ledger by each account reflected in the FERC Accounts listed in Table 3.

Table 3

Account Name	FERC Account Number
Fuel[9]	501
Nuclear Fuel	518
Fuel/Natural Gas	547
Short-Term Energy Purchased Power Costs	555
Long-Term Purchased Power Contracts	555
Transmission Expense	565
Net Emission Allowances	411 and 509
Transmission Revenue	456
Off System Sales Revenue	447

[7] See line item 4.3 on Ameren Missouri's Sheet No. 74.13.
[8] Effective April 1, 2017, per Case No.ER-2016-0179, 1.71% of allowable transmission revenues residing in FERC Account 456.1 are includable in the FAC.
[9] Uniform System of Accounts, Account 501.000; this account shall include the cost of fuel used in the production of steam for the generation of electricity.

The transactions and totals for each FERC account by month and year from the General Ledger were compared to those in the General Journal. In addition to verifying the total dollar amounts from these two accounting sources are equal, Staff reviewed expense and revenue transactions to identify any unusual dollar amounts, improperly categorized amounts, or categories of cost or revenue which are not allowed in the FAC's definition of ANEC.

D. Staff Regulatory Accounting Summary

Staff analyzed the ANEC based on the transactions in the FERC accounts related to the calculation of the ANEC from three different sources: the General Ledger, the Monthly Reports, and the FAR work papers provided by Ameren Missouri. Staff analyzed, reviewed and was able to reconcile these three individual sources to each other based on the individual line items categorized by Activity Code for the FERC accounts that captured Fuel Costs, Costs of Purchased Power (including Transmission Costs and Revenues), Net Emissions Allowance Costs, Off-System Sales Revenues for the ANEC.

E. Participation with Regional Transmission Organizations

As part of this review Staff reviewed Ameren Missouri's participation in Regional Transmission Organizations ("RTOs"). Ameren Missouri participates directly with 2 RTOs, Midcontinent Independent System Operator[10] ("MISO") and PJM Interconnection[11]. Staff reviewed a wide variety of Ameren Missouri's practices and procedures related to the RTOs, specifically MISO. Ameren Missouri directly participates in MISO's Day Ahead Market and Real-time Market. At a high level these markets allow Ameren Missouri to offer-in and - if cleared in the market - to sell the energy it generates to MISO. In turn Ameren Missouri must purchase back from MISO the energy needed to serve its native load. The practices and procedures related to these transactions are highly technical and complex. Ameren Missouri was required to developed specialized front and back office[12] practices and procedures to

[10] MISO is a regional transmission organization that provides electric power across all or parts of 15 U.S. states and the Canadian province of Manitoba. MISO assures consumers have an unbiased regional grid management and open access to the transmission facilities under MISO's functional supervision.

[11] PJM Interconnection (PJM) is a regional transmission organization that coordinates the movement of wholesale electricity in all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia.

[12] Front Office**:** A blanket term that refers to the portion of a company that deals with outside entities in its daily functions of buying, selling and trading of energy. Back Office: A blanket term that refers to the portion of a company made up of administration, accounting and settlement functions in support of the selling, buying and trading of energy.

manage the large amounts of data associated with its market participation. Ameren Missouri utilizes specialized software[13] to manage key components of the bid-to-settlement trading cycle and analysis modes for the Day-Ahead Market and Real-time Market bidding. These processes and software include robust capabilities for settling and disputing a wide range of market transactions. Ameren Missouri uses this software to verify and shadow complex RTO charge codes and invoices, and customize contract settlements.

For this review the Staff sent multiple Data Requests to Ameren Missouri and requested in detail, fuel procurement processes, MISO settlements/accounting practices and a variety of issues related to Ameren Missouri's FAC. As a result of Staff's understanding and experience with these practices and processes, Staff is reasonably assured that Ameren Missouri is managing its participation in these markets effectively and maintains appropriate procedures and processes to account for the results of such participation.

F. Self – Commitment of Baseload Generation Facilities into MISO

During this FAC prudence review, Staff conducted a review of commitment status of Ameren Missouri's electric generation facilities into MISO in an effort to determine any negative impacts that might be occurring because of such actions. Ameren Missouri has large and varied electric generation facilities that are designed to provide varying types of services to its customers. These generation facilities include nuclear, coal, natural gas, hydro, PV solar and wind turbines. Each one of Ameren Missouri's generation facilities has its own distinct operating characteristics and requires specific operational guidelines to be followed as to maintain the reliability of the units as determined by Ameren Missouri's plant operations team to determine optimal plant reliability and manufacturer operational guidelines.

MISO utilizes five resource offer commitment status designations[14] for its market participants ("MP"):

- **Outage** – Designates the Resource is not available for consideration in Energy and Operating Reserve Markets commitment because the Resource is on a Generator Planned Outage or Generator Forced Outage.
- **Emergency** – Designates the Resource is available for commitment in Emergency situations only.

[13] Power Cost, Inc. (PCI), PCI GenManager®.
[14] MISO, Energy and Operating Reserve Markets, Business Practices Manual, BPM-002-r19, 4.2.3.4.6, Page 93.

- **Economic** – Designates the Resource is available for commitment by MISO.
- **Must-Run (self-commit)** – Designates the Resource as committed per MP request and is available for dispatch by MISO.
- **Not Participating** – Designates that the Resource will not participate in the Day-Ahead and/or Real-Time Energy and Operating Reserve Market but is otherwise available.

A "self-commit" status designates that the MP itself is committing the resource at its unit minimum generation level and any dispatch above its unit minimum generation level would be determined by MISO, based on Location Marginal Pricing ("LMP") nodal pricing scenarios. There are three main operating characteristics that determine why Ameren Missouri would place a unit in self-commit status; 1) high cost of restart, 2) increases in operation & maintenance and capital costs due to unit cycling outside of design parameters and 3) avoid increases in plant outages. Ameren Missouri's generation units that meet all or some of these criteria and are designated "must-run" are Callaway (nuclear), Labadie, Rush Island, Sioux and Meramec 3 & 4. These units were designed to provide large quantities of base load power at low costs to Ameren Missouri customers prior to the development of the RTO markets. In response to Staff's Data Request No. 0063, Ameren Missouri provided the designation of each of its must-run units that meet some or all of this criteria. As a MP, MISO requires Ameren Missouri to offer in sufficient generation to cover its forecasted next day customer load. However, under today's RTO markets it is not just as simple as comparing an as-offered marginal production cost to the cleared market price to determine which units Ameren Missouri should offer-in on an economic basis alone. Calculating the overall benefits provided by Ameren Missouri's large baseload units outside of the narrow perspective of an LMP clearing price is a complex task. MISO's day-ahead (24 hours) market price optimization software does not take into account the three factors discussed earlier.

Staff analyzed data received from Ameren Missouri[15] to determine the financial impacts of the self-commit units as offered and cleared into the MISO Day-Ahead and Real-time market. Table 4 provides the summary of Staff's review by generating unit for the period of 6/1/2017 through 9/30/2018.

[15] Staff Data Request No. 0063 in File No. EO-2019-0257.

Table 4 – Confidential

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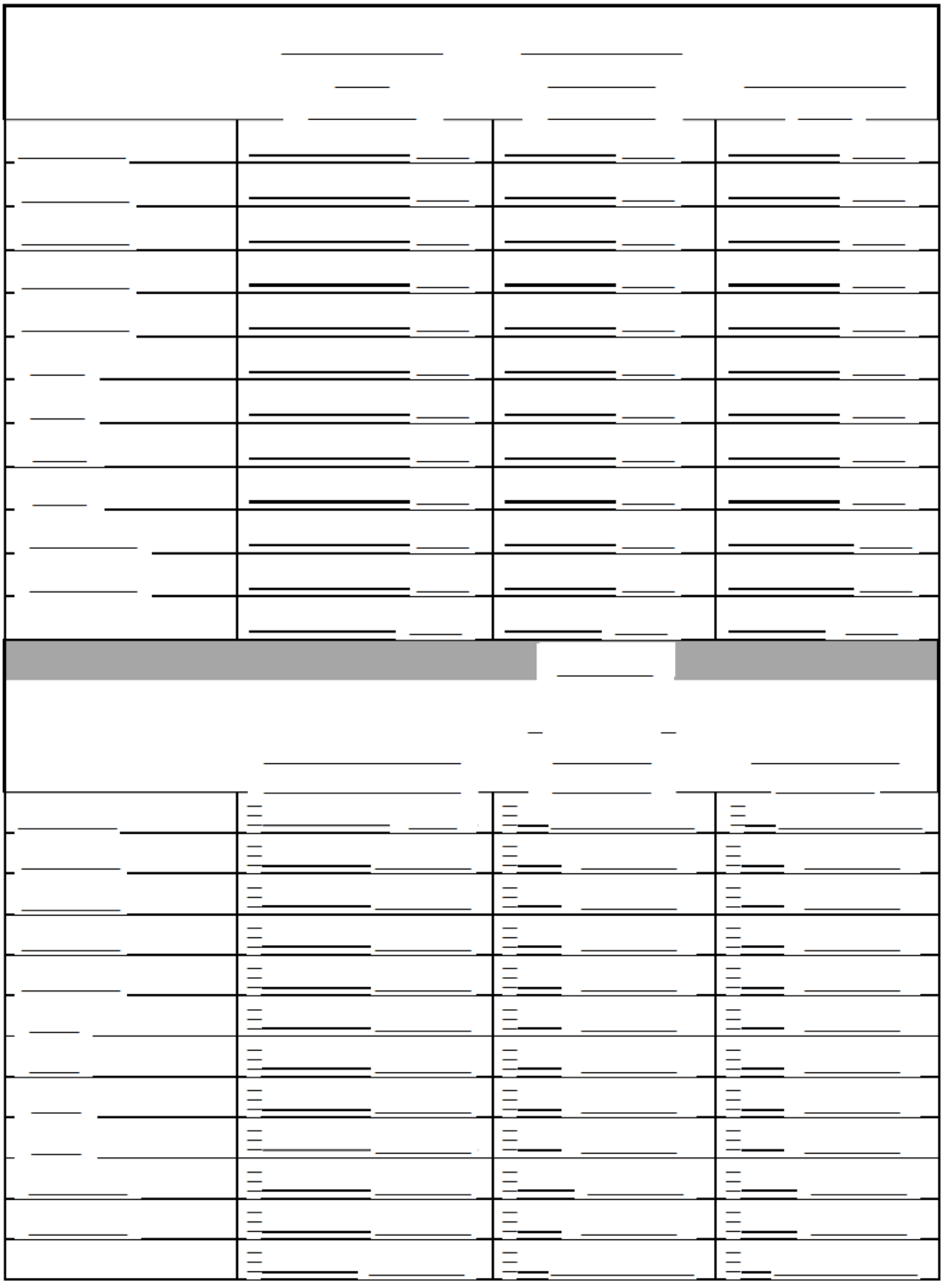

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Staff does not have the data to perform a detailed analysis as to what would have been the additional costs to the units due to high cost of restart, increases in O&M cost and

increased plant outages if Ameren Missouri would have designated these units as "Economic" instead of "Self-Commit". Staff is providing Table 4 as actual financial results of Ameren Missouri's current practice of Self-Commit of its baseload generation units as described above.

Ameren Missouri has given an example of what might be some of the financial implications if the units were not designated as "Self-Commit". In Case No. EW-2019-0370 Ameren Missouri provides the following:

> To illustrate the limitation of the MISO day-ahead model's 24-hour look ahead period, consider the operating and cost constraints of a Labadie Energy Center unit. These units each have a startup cost in excess of $70,000. If these units were to be offered as economic, they would be de-committed by MISO whenever the total market revenue for the next operating day was less than the as-offered cost for energy – regardless of market price projections for the remainder of the week, the cost to restart the unit, or cycling-related maintenance and capital costs. The unit would then only be committed by MISO if its margin is above the as-offered cost for energy and is enough to also cover the cost to restart the unit. Those restart costs are a significant hurdle to overcome and they were simply not considered by MISO's modeling when the model would decide to de-commit the unit, if the unit is in economic commit statute. Putting dollars to the illustration, assume that the unit is offered on the last day of a month and that the MISO model predicts a revenue short fall on the first day of the next month of $1,000. Assume further, however, that for the remaining 29 days (assuming a 30-day month) of that month the actual revenues would exceed costs by $20,000 per day if the unit were to remain on-line. If the unit is offered as economic, MISO would de-commit the unit for the first day of the month and it would remain unavailable until the fourth day of the month due to the minimum down time. After that, the model would also keep it off-line because the potential daily margin of $20,000 would not cover the cost to start the unit. In this illustration, the unit would have foregone a total benefit to customers (and reflected in Ameren Missouri's fuel adjustment clause) of almost $600,000 if it had been in a must run status[4], but instead it received nothing, as it was offered as economic and never ran during the month.
>
> 12. Another consequence of the model's limited forward period for analysis is that market participants do not have a clear means of informing MISO of what the cost to shut down a unit is expected to be (such costs include the cost to restart the unit, foregone expected positive margins during minimum down times, and increases in maintenance and capital costs related to unit cycling (i.e., committing/de-committing/committing again)[5]. As the Commission is likely aware, Ameren Missouri's coal-fired units are primarily designed

for baseload (continuous) operation. However, cycling them on a frequent basis decreases unit availability, and shortens component life expectancies resulting in increased maintenance and capital costs. Each time a power plant is cycled, its major and minor auxiliary components experience significant thermal.

[4] $20,000/day x 30 days; minus $1,000 for 1 day.

[5] Similarly, a simple comparison of production costs to prevailing market prices fails to account for the costs to restart cycled units and increases in maintenance and capital costs related to unit cycling.

Staff is aware of possible changes being sought by Federal Energy Regulatory Commission ("FERC") and MISO[16] addressing the self-commitment issue. On March 30, 2018 FERC filed "Notice of Technical Conference: Increasing Real-Time and Day-Ahead Market Efficiency And Enhancing Resilience Through Improved Software", Docket No. AD10-12-009.

Staff is further exploring this issue in Case No. EW-2019-0370. At this time Staff is not aware of any prudency issues related to Ameren Missouri's practice of self-commit.

III. ACTUAL NET ENERGY COSTS

The Ameren Missouri FAC definition of Actual Net Energy Costs includes three components of costs – fuel costs ("FC"), costs of purchased power ("PP") and net emissions allowance costs ("E"), and one component of revenue – off-system sales revenues ("OSSR"). Table 5 is a breakdown of Ameren Missouri's fuel costs, costs of purchased power, net emissions allowance costs and off-system sales revenues for the period of June 1, 2017 through September 30, 2018:

continued on next page

[16] https://www ferc.gov/CalendarFiles/20180626080726-T2%20-%202%20-%20Hansen%20-%20MISO_PowerGEM_MultiDay_FINAL.pdf.

Table 5

Component	Costs or Revenues	Percentage of Component	Percentage of FC + PP + E
Fuel Costs (FC)			
Coal	$855,350,360	85.65%	77.21%
Oil	$3,751,482	0.38%	0.34%
Nuclear	$106,958,032	10.71%	9.65%
Natural Gas	$32,650,501	3.27%	2.95%
Total FC	**$998,710,375**	**100.00%**	**90.15%**
Costs of Purchased Power (PP)			
Long Term Contracts	$17,950,559	16.49%	1.62%
Short Term Contracts	$90,367,366	83.00%	8.16%
Transmissions Costs	$1,488,906	1.37%	0.13%
***Plus:* Transmission Revenues**	$(932,131)	-0.86%	-0.08%
Total Purchased Power	**$108,874,700**	**100.00%**	**9.83%**
Net Emissions Allowance Costs (E)	**$295,185**	**100.00%**	**0.03%**
Total FC + PP + E	**$1,107,880,260**		**100.00%**
***Less:* Off-System Sales Revenues**	**$326,855,938**		
Actual Net Energy Cost	**$781,024,322**		

A. Risk Management

1. Description

Ameren Missouri's risk management strategies encompass a wide range of activities. The *Ameren Missouri Commodity Risk Management Policy* ("CRMP")[17] identifies the following strategies it will pursue to manage commodities' risks[18]:

Strategy Overview
Energy and Transmission Hedging
Asset Optimization
Capacity Transactions
Congestion Hedging

[17] Ameren Missouri Commodity Risk Management Policy, Versions: 2017.3, May 1, 2017; 2017.4, October 1, 2017; 2018.1, January 1, 2018; 2018.2, May 1, 2018; 2018.3, August 1, 2018; 2018.4, November 1, 2018; 2019.1, and January 1, 2019.
[18] Sections 2.1 through 2.16 in its CRMP.

Energy Arbitrage
Natural Gas LDC Supply and & Transportation Hedging
Natural Gas Generation Supply & Transportation Strategies
Coal Buy for Burn Procurement
Rail Fuel Surcharge Hedging
Fuel Oil Purchases
Nuclear Fuel Cycle Hedging
Renewable Energy Credits
Emissions Hedging
Carbon Compliance Hedging
Book Structure

Ameren Missouri's risk management strategies are directly controlled by the guidelines contained in its CRMP. A policy overview is given in the CRMP as follows:

> **1.1 Background, Purpose, and Scope of Policy**
>
> Ameren Corporation ("Ameren") has charged functional units within Union Electric Company d/b/a Ameren Missouri ("Ameren Missouri") with the responsibility of managing all of Ameren's generation, load, and other obligations in a manner consistent with the policy set forth herein. Ameren Missouri's Energy Management & Trading functional unit ("EM&T") manages generation assets, load and other obligations, and natural gas supply by engaging in wholesale energy, capacity, electricity, FTR/ARR, transmission, and natural gas transactions. EM&T also manages select power plant fuel supplies (e.g. coal, fuel oil) and emissions requirements. Ameren Missouri's Nuclear Fuel Cycle Management unit ("NFCM") manages nuclear fuel requirements through the purchase and sale of uranium, conversion services, enrichment services, and fabrication services.
>
> It is the intent of management that this Risk Management Policy ("this Policy") governs all financial risk taking and risk management/mitigation activities associated with the above activities. In order to fulfill the responsibilities described above in a financially disciplined manner, EM&T and NFCM may enter into transactions that are defined in this Policy as approved by the Risk Management Steering Committee ("RMSC"). The framework and responsibilities of the RMSC are discussed in Section 9.1 of the Ameren Corporation Commodity & Financial Markets Risk Management Policy.

2. Summary of Cost Implications

Ameren Missouri employs commodity risk management strategies in an attempt to mediate the market volatility risk of fuel, energy, capacity, emissions, and transmission congestion prices. A discussion related to hedging strategy employed for various components is contained in the sections of this report: Natural Gas Costs, Coal and Rail Transportation Costs, Fuel Oil Costs, Nuclear Fuel Costs and Transmission Costs. If Ameren Missouri did not manage its risk management strategies prudently it could result in an increase in fuel costs that are collected from customers through the Ameren Missouri FAC charge.

3. Conclusion

Staff reviews Ameren Missouri's CRMP for reasonableness and its adherence to the CRMP. As part of this review Staff reviews a wide array of market conditions which include: historic and future fuel commodity pricing, energy market forecasts,[19] US and global economic trends, technology changes, and proposed environmental regulations. Staff did not find any evidence that Ameren Missouri acted imprudently in the administration of its risk management strategies during the prudence review period.

4. Documents Reviewed

a. Ameren Missouri's responses to Staff Data Request Nos. 0015 and 0062.

Staff Expert/Witness: Brooke Mastrogiannis and Dana E. Eaves (Self-Commit)

B. Disaggregation of Commodity Fuel Cost

Table 6 represents all of the individual fuel components from each FERC Account as accounted for by Ameren Missouri for its FAC[20].

continued on next page

[19] https://www.eia.gov/outlooks/steo/.
[20] Information provided in Ameren Missouri's monthly FAC reports, tab 5Mp1, as filed with the Commission.

Table 6

FERC 501 Disaggregation	For the Period of June 1, 2017 through September 30, 2018	
Coal Commodity - Includes quality and SO2 adjustments, semi-annual inventory adjustments, broker fees and coal hedging (gains)/losses	$420,074,639	42.06%
Coal Freight - Includes trucking expenses for high sulfur coal, fuel surcharges (net of hedging) and semi-annual inventory adjustments	$408,544,854	40.91%
Railcar - Includes depreciation, lease costs, switching, repair and maintenance	$23,152,032	2.32%
Coal (Gains)/Losses on Coal Sales	$ 0	0.00%
Oil Costs	$3,751,482	0.38%
Gas Costs	$3,578,836	0.36%
FERC 501 subtotal	$859,101,842	**86.02%**
FERC 518 Disaggregation		
Nuclear Fuel Commodity - Includes nuclear fuel hedging costs	$106,958,032	10.71%
Waste Disposal Expense	$ 0-	0.00%
FERC 518 subtotal	$106,958,032	**10.71%**
FERC 547 Disaggregation		
Gas Commodity - Includes gas storage withdrawals/(injections)	$20,300,044	2.03%
Gas Capacity Reservation	$9,796,678	0.98%
Gas Transportation	$247,584	0.02%
Gas Storage	$1,230,174	0.12%
Gas Hedging	$115,903	0.01%
(Gains)/Losses on Gas Sales	$113,339	0.01%
Oil Costs	$846,778	0.08%
FERC 547 subtotal	$32,650,501	**3.27%**
Fuel Costs Grand Total	**$998,710,374**	

C. FERC Acct 501

1. Description

Ameren Missouri is required to account for fuel costs used in the production of steam for the generation of electricity in FERC Account 501. For the review period, $859,101,842 or 86.02% of Ameren Missouri's total fuel costs are booked to FERC Account 501;

see Table 6 for disaggregation of this account. Ameren Missouri generates the majority of its electricity with its coal-fired generation facilities, and, therefore, the majority of its fuel costs are related to cost of coal and the cost of transportation of coal to these facilities. The amounts for physical coal commodity was $420,074,639, the transportation/freight of the coal commodity was $408,544,854 and $23,152,032 railcar expenses, for a total of $851,771,524 directly related to coal commodity costs. During the review period Ameren Missouri burned ** _____ ** tons of coal which translates to an average ** ____ ** per ton including transportation/freight and other rail charges. Staff reviews public sources as well as subscription services in an effort to determine the reasonableness of prices paid by Ameren Missouri for its coal supply. Staff monitors U.S. Energy Information Administration ("EIA") and future market prices, supply forecasts and other market trends.

Also, contained within FERC Account 501 and reviewed during this review are fuel oil costs of $3,751,482 and natural gas costs of $3,578,836. These fuels are included in FERC Account 501 as they are used as support fuels (startup and/or burn stabilization) in the production of steam with the coal fired generation facilities.

Ameren maintains ** — ** short and long-term coal purchase contracts, ** ** rail transportation contracts, ** ** rail lease contracts, and ** ** rail storage contracts. The counterparties for the contracts are shown below in Table 7:

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Table 7 - Confidential

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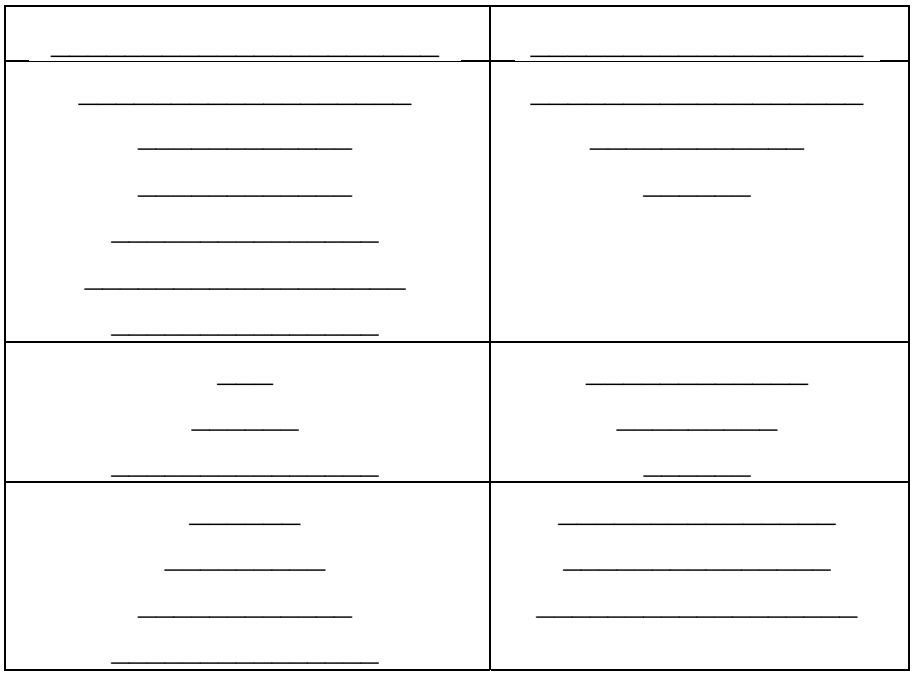

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Staff reviewed the 9 revised versions of Ameren Missouri 2018 Commodity Risk Management Policy that were in effect during the review period. Ameren Missouri's coal procurement strategy was not changed during the review period and the strategy is provided in the August 1, 2018, Commodity Risk Management Policy, page 13 and 14, as part of Ameren Missouri's response to Staff Data Request No. 0015:

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_____ **

Staff has reviewed the various components of Ameren Missouri's coal supply strategy, and concludes that Ameren Missouri has complied with its stated parameters.

Ameren Missouri utilizes a rail fuel surcharge hedge program in an effort to minimize price volatility associated with rail transportation of its coal supply. Rail carriers require shipping customers to agree to price escalators (surcharge) as part of the coal transportation contracts whenever the price of fuel exceeds an agreed to price level. Ameren Missouri's rail fuel surcharge hedge program is summarized in the Ameren Missouri Commodity Risk Management Policy, page 14:

** _____
_____
_____
_____
_____
_____
_____
_____
_____
_____

_____ -_____
_____ **

Staff has reviewed Ameren Missouri's rail fuel surcharge strategy, and determined that Ameren Missouri has complied with these stated parameters.

2. Summary of Cost Implications

If Ameren Missouri was imprudent in its purchasing decisions relating to the purchase of coal, transportation and the handling of the rail fuel surcharge hedging policy, customer harm could result from such imprudence through an increase in Ameren Missouri customer FAC charges.

3. Conclusion

Staff identified no imprudence by Ameren Missouri in its purchase of coal, transportation or other components contained in FERC Account 501 for the prudence review period.

4. Documents Reviewed

a. Ameren Missouri's response to Staff Data Request Nos. 0004, 0005, 0012, 0015, 0016, 0017, 0018, 0021, 0023, 0024, 0027, 0033, 0034, and 0057;

b. Market research: https://www.eia.gov/, http://www.cmegroup.com/ and https://www.spglobal.com/;

c. Ameren Missouri's FAC Monthly Reports during the review period;

d. Ameren Missouri's General Ledger and Journal during the review period; and

e. Ameren Missouri's work papers in File Nos. ER-2018-0142, ER-2018-0255, ER-2019-0024, and ER-2019-0152.

Staff Expert/Witness: Brooke Mastrogiannis

D. Nuclear Fuel - FERC Account 518

1. Description

For the prudency review period, $106,958,032 or 10.71% of Ameren Missouri's cost of fuel is associated with nuclear fuel used in the generation of electricity at Ameren

Missouri's Callaway facility. The nuclear fuel Ameren Missouri uses at the Callaway facility requires several processes before it becomes a product that can be used in the generation of electricity. For the review period, Ameren Missouri generated from its Callaway facility ** _____ ** MWhs with an average cost of ** ____ ** per MWh for nuclear fuel.

Ameren Missouri had 6 nuclear fuel contracts, 3 conversion contracts, 3 enrichment contracts, 1 storage contract and 1 fabrication contract that were in place during the review period. However, not all contracts that were in place during the review period had deliveries and, therefore, no costs were incurred for those contracts in the review period. Each contract provides terms and conditions for primary delivery locations and price. The nuclear fuel contracts in effect are either: fixed price, market spot price, contract price with escalation factor or a combination of these pricing scenarios. The counterparties and contract pricing terms are shown in Table 8 below:

Table 8 - Confidential

**

_____			
_____	_____	____	_____
_____	_____	_____	_____
_____	_____	_____	____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	____
_____	_____	_____	____
_____	_____	_____	_____

**

Ameren Missouri's response to Staff Data Request No. 0015 describes in detail Ameren Missouri's policies for the procurement of nuclear fuel. Staff reviewed the August 1, 2018, Commodity Risk Management Policy, which states on page 14 and 15:

**

[redacted]

Ameren Missouri's Commodity Risk Management Policy is the controlling document for the acquisition and control of nuclear fuel for the Callaway facility. Staff has reviewed the various components of Ameren Missouri's nuclear fuel purchasing practices and determined that Ameren Missouri has complied with these stated parameters.

2. Summary of Cost Implications

If Ameren Missouri was imprudent in purchasing nuclear fuel, conversions, fabrication and storage, customer harm could result from that imprudence through an increase in customer FAC charges.

3. Conclusion

Staff observed no indication of imprudence related to the purchase of nuclear fuel, conversions, fabrication and storage for the prudence review period.

4. Documents Reviewed

a. Ameren Missouri's response to Staff Data Request Nos. 0013, 0015, 0019, 0021, 0027, and 0034;

b. Ameren Missouri's FAC Monthly Reports during the review period;

c. Ameren Missouri's General Ledger and Journal during the review period; and

d. Ameren Missouri's work papers in File Nos. ER-2018-0142, ER-2018-0255, ER-2019-0024, and ER-2019-0152.

Staff Expert/Witness: Brooke Mastrogiannis

E. FERC Account 547

1. Description

For the review period, $32,650,501 or 3.27% of Ameren Missouri's total fuel costs is associated with FERC Account 547. Ameren Missouri accounts for the majority of its natural gas and natural gas transportation capacity costs used in its generation facilities in FERC Account 547 because its natural gas generation fleet is made up of non-steam generation facilities. The total natural gas cost recorded in FERC Account 547 is comprised of several components. The natural gas commodity is $20,300,044, $9,796,678 for the capacity reservation fees, and $247,584 for the transportation of the natural gas commodity. Other expenses related to Ameren Missouri's natural gas generation facilities are natural gas storage of $1,230,174, natural gas hedging expense (losses) of $115,903, and natural gas sales of $113,339.

Ameren Missouri's natural gas generation facilities are combustion turbine generators ("CTGs"). Ameren Missouri's CTGs are used for peaking units which means they are used generally when demand for electricity increases to a point other baseload units can't meet that demand. CTGs by nature are less efficient than other baseload units in Ameren Missouri's generation fleet, and, therefore, are more expensive to operate. During the review period,

Ameren Missouri's CTGs generated ** ____ ** MWhs which translates to an average of ** ____ ** per MWh for natural gas to fuel its CTG units.

MISO dispatches Ameren Missouri's generation fleet, which in effect decreases Ameren Missouri's dispatching control over these facilities other than insuring the units are operational. Even though MISO dispatches these units Ameren Missouri still must insure these CTGs have adequate fuel to operate and are maintained properly and reliably.

The following table identifies Ameren Missouri's peaking generating units that burn natural gas and oil:

Table 9

Generating Unit	Primary Fuel
Audrain 1, 2, 3, 4, 5, 6, 7, and 8;	Natural Gas
Fairgrounds	Oil
Goose Creek 1, 2, 3, 4, 5, and 6;	Natural Gas
Kinmundy 1 and 2	Natural Gas
Meramec 1, 2;	Natural Gas
Mexico	Oil
Moberly	Oil
Moreau	Oil
Peno Creek 1, 2, 3, and 4;	Natural Gas
Pinckneyville 1, 2, 3, 4, 5, 6, 7, and 8;	Natural Gas
Raccoon Creek 1, 2, 3, and 4;	Natural Gas
Venice 2, 3, 4, and 5;	Natural Gas

Staff reviewed the Ameren Missouri Commodity Risk Management Policy(s) that was in effect during the review period. Ameren Missouri's natural gas procurement strategy is summarized in the August 1, 2018, Commodity Risk Management Policy, page 13, as part of Data Request No. 0015:

** _____
_____
_____
_____
_____
_____
___

[redacted] **

Ameren Missouri employs hedging activities in an attempt to mitigate the impacts of market volatility in natural gas prices and aid in providing a reliable fuel commodity.

Financial hedges can be described as:

> Making an investment to reduce the risk of adverse price movements in an asset. Normally, a hedge consists of taking an offsetting position in a related security, such as a futures contract. An example of a hedge would be if you owned a stock, then sold a futures contract stating that you will sell your stock at a set price, therefore avoiding market fluctuations. Investors use this strategy when they are unsure of what the market will do. A perfect hedge reduces your risk to nothing (except for the cost of the hedge).[21]

For the prudency review period, $846,778 or 0.08% of Ameren Missouri's total fuel costs, cost of purchased power, transmission costs, and net emission costs is associated with the fuel oil used in generating electricity. The cost of fuel oil includes various other miscellaneous charges such as rail and/or ground transportation service charges and other various fuel handling expenses.

Ameren Missouri's response to Staff Data Request No. 0015 describes in detail Ameren Missouri's policies for the procurement of fuel oil. Staff reviewed the August 1, 2018, Commodity Risk Management Policy, which states on page 14:

** _____ - _____ _____ _____ **

Staff has reviewed the various components of Ameren Missouri's fuel oil procurement strategy, and determined that Ameren Missouri has complied with these stated parameters. Ameren Missouri includes fuel oil costs in FERC Accounts 501 and 547 as it is used as a support fuel[22] in Ameren Missouri's coal or natural gas generation facilities.

2. Summary of Cost Implications

If Staff determined that Ameren Missouri was imprudent in its purchasing decisions relating to natural gas commodity, reservation, transportation, storage, hedging, sales and oil costs customer harm could result from that imprudence by an increase in FAC charges.

[21] www.investopedia.com.
[22] Fuel oil that is used as a start-up and/or burn stabilization fuel.

3. Conclusion

Staff observed no indication of imprudence associated with Ameren Missouri's natural gas commodity purchases for the prudence review period.

4. Documents Reviewed

a. Ameren Missouri's response to Staff Data Request Nos. 0004, 0005, 0005.1, 0011, 0012, 0015, 0018, 0021, 0022, 0027, and 0034;

b. Market research: https://www.eia.gov/, http://www.cmegroup.com/, and https://www.spglobal.com/;

c. Ameren Missouri's FAC Monthly Reports during the review period;

d. Ameren Missouri's General Ledger and Journal during the review period; and

e. Ameren Missouri's work papers in File Nos. ER-2018-0142, ER-2018-0255, ER-2019-0024, and ER-2019-0152.

Staff Expert/Witness: Brooke Mastrogiannis

F. FERC Account 555 - Purchased Power – Long Term Contracts and Short Term Energy

1. Description

During the Review Period of June 1, 2017, through September 30, 2018, $108,317,925 was attributed to long-term and short-term[23] purchased power costs. The total purchased power costs related to long-term contracts for this review period is $17,950,559 which is comprised of the Pioneer Prairie Wind contract for ** _____ ** and the remaining balance of ** ____ ** to other long-term contracts, and boundary line agreements. Ameren Missouri also purchases short-term energy in the MISO and PJM day-ahead markets (hourly) and through bilateral agreements[24]. For this review period the total amount attributable to short term purchased power expense is $90,367,366. Typically, Ameren Missouri relies on

[23] These purchased power contracts are broken down as long-term and short-term in the Company's FAR work papers, tab (A)1.C.

[24] Boundary line and bilateral agreements are in place to serve customers in rural areas when disruptions to certain areas of the distribution system occurs and Ameren needs the load for emergency and other operational needs are required.

these short-term energy sources to help it meet its load during forced, planned or derating[25] generation plant outages and when the market price for that short-term energy is both below the marginal cost of providing that energy from Ameren Missouri's generating units and below the cost of longer-term capacity purchases.

In addition to review of purchased power agreements, Staff requested the supporting documentation for the transactions found in the General Ledger for FERC Account 555 during this review period of June 1, 2017 through September 30, 2018. Invoices were requested and analyzed for transactions in this account with the following descriptions; ** _____ _____ _____ ____ ** Staff was able to reconcile these invoices to the transactions located in FERC Account 555 Purchased Power.

Staff reviewed the Renewable Resource Power Purchase Agreement by and between Pioneer Prairie Wind Farm I, LLC, and Ameren Missouri ("Pioneer Prairie PPA"). The Pioneer Prairie PPA is a ** _____ ** that expires ** _____ ** and provides a capacity of ** ____ ** MW and estimated annual energy purchases of ** ____ ** MWhs at a price of ** ____ ** per MWh of which ** ____ ** per MWh is for the purchase of energy which flows through the FAC and ** ____ ** per MWh is for the purchase of renewable energy attributes which may be used for compliance with 4 CSR 240-20.100 Electric Utility Renewable Energy Standard Requirements and do not flow through the FAC. Total costs of electricity under the Pioneer Prairie PPA was ** _____ ** with revenue associated with sales of ** _____ ** which resulted in a net loss of ** _____ ** for the Review Period.

During the period June 1, 2017, through September 30, 2018, Ameren Missouri did not issue any requests for proposal, which had a proposed delivery period within the specified time period.[26] However, Ameren Missouri's response to Data Request No. 0012 in this case referenced a purchased power agreement ("PPA") supplied in response to Staff Data Request No. 0017 in File No. EO-2012-0074.

[25] *See* Section IX. Plant Outages section of this Prudency Review Report for definitions of forced, planned and derating outages.
[26] Staff's Data Request No. 0008 in File No. EO-2019-0257.

When Ameren Missouri was asked[27] to provide a copy of all purchased power contracts that were in effect during the period June 1, 2017, through September 30, 2018, Mark J. Peters, Ameren Missouri's Manager, Load Forecasting and Market Analysis, responded as follows:

> Ameren Missouri is a party to large number of master enabling agreements, including various interconnection agreements and EEI Master Power Purchase and Sale Agreements. These agreements provide for the general terms and conditions under which Ameren Missouri and the counterparty may transact at points in the future. These agreements do not, in and of themselves, obligate the counterparty to sell power and energy to Ameren Missouri, nor do they specify the pricing, term and any special conditions of specific transactions. Transactions other than hourly transactions are normally confirmed with either a written confirmation or electronically. These confirmations contain the specifics regarding volume, price, delivery location and any special conditions. Ameren Missouri has contracts in conjunction with the operation of its Commission approved tariff providing for Electric Power Purchases from Qualifying Facilities.

2. Summary of Cost Implication

If Ameren Missouri was imprudent by purchasing energy to meet its demand at a cost that exceeded Ameren Missouri's cost to generate that energy itself, customer harm could result from that imprudence through an increase in FAC charges.

3. Conclusion

Staff identified no evidence of imprudence related to Ameren Missouri's long-term and purchased power agreements during the prudence review period.

Staff identified no evidence that Ameren Missouri acted imprudently with regard to purchases of short-term energy in the MISO and PJM day-ahead markets or bilateral agreements during the prudence review period.

4. Documents Reviewed

a. Ameren Missouri's responses to Staff Data Request Nos. 0008, 0034, 0060, 0060.1, 0061, and 0064;

[27] *Ibid.*

b. Ameren Missouri FAC Monthly Reports;

c. Ameren Missouri General Ledger and General Journal;

d. Ameren Missouri 2017 Renewable Energy Standard Compliance Plan;

e. Ameren Missouri 2018-2020 Renewable Energy Standard Compliance Plan; and

f. Ameren Missouri's work papers in File Nos. ER-2018-0142, ER-2018-0255, ER-2019-0024, and ER-2019-0152.

Staff Expert/Witness: Brooke Mastrogiannis

G. FERC Account 565 and 456.1 - Transmission Costs and Revenues

1. Description

For the period June 1, 2017 through September 30, 2018, $1,488,906 of Ameren Missouri's FAC costs were for MISO transmission costs associated with purchased power costs. As a result of Ameren Missouri's general rate case, Case No. ER-2012-0166, Ameren Missouri began flowing MISO transmission revenues through the FAC.

For the review period, $932,131 represents transmission revenues that off-set transmission costs. As a result of Ameren Missouri's 2017 general rate case, Case No. ER-2016-0179,[28] Ameren Missouri was ordered by the Commission to include 1.71 percent of MISO transmission revenues and 1.71 percent MISO transmission costs in the FAC. The effective date of this modification to the FAC was April 1, 2017, which impacts the full sixteen months of the review period.

Ameren Missouri's response to Staff Data Request No. 0015 describes in detail Ameren Missouri's policies for hedging transmission costs. Staff reviewed Ameren Missouri's *Commodity Risk Management Policy*, section 2.5 on page 10; this document describes Ameren Missouri's hedging strategy to mitigate transmission costs:

** _____
_____
_____
_____
_____
_____

[28] Effective April 1, 2017, Ameren Missouri's MO.P.S.C. Schedule No. 6, Original Sheet No. 74.3.

_____
_____
_____

_____
_____
_____
_____
_____
_____
_____ **

2. Summary of Cost Implications

If Ameren Missouri was imprudent in hedging transmission expense or in accounting for its transmission costs, customer harm could result from that imprudence through an increase in customer FAC charges.

3. Conclusion

Staff identified no indication of imprudence related to transmission costs, transmission revenues, and hedging transmission costs for the prudence review period.

4. Documents Reviewed

a. Ameren Missouri's response to Staff Data Request Nos. 0007, 0015, 0028, and 0056;

b. Ameren Missouri's work papers in File Nos. ER-2018-0142, ER-2018-0255, ER-2019-0024, and ER-2019-0152;

c. Ameren Missouri's Monthly Reports during the review period; and

d. Ameren Missouri's General Ledgers and Journals during the review period.

Staff Expert/Witness: Lisa Wildhaber

H. Emission Allowances

1. Description

The Cross-State Air Pollution Rule ("CSAPR") is a ruling by the United States Environmental Protection Agency ("EPA") that requires a number of states, including

Missouri, to reduce power plant emissions that contribute to ozone and/or fine particle pollution in other states. The CSAPR replaced EPA's 2005 Clean Air Interstate Rule ("CAIR"), following the direction of a 2008 court decision that required EPA to issue a replacement regulation. CSAPR implementation began on January 1, 2015.

The CSAPR requires Missouri to reduce its annual emissions of sulfur dioxide ("SO_2") and nitrous oxides ("NO_x") to help downwind states attain the 24-hour National Ambient Air Quality Standards ("NAAQS"). The CSAPR also requires Missouri to reduce ozone season emissions of NO_x to help downwind states attain the 8-hour NAAQS.

On September 7, 2016, the EPA revised the CSAPR ozone season NO_X program by finalizing an update to CSAPR for the 2008 ozone NAAQS, known as the CSAPR Update. The CSAPR Update ozone season NO_X program largely replaced the original CSAPR ozone season NO_X program on May 1, 2017. The CSAPR Update will further reduce summertime NO_X emissions from power plants in the eastern U.S.

The primary mechanism of CSAPR is a cap-and-trade program that allows a major source of NO_X and/or SO_2 to trade excess allowances when its emissions of a specific pollutant fall below its cap for that pollutant. Originally, the EPA issued a model cap-and-trade program for power plants, which could have been used by states as the primary control mechanism under CAIR. This model, with modifications, had continued under CSAPR.

The requirements of CSAPR and CSAPR Update were in effect for the entire Review Period from June 1, 2017 through September 30, 2018. Missouri was part of the twenty-two (22) states that the Update affected and per Staff's review, Ameren Missouri units were in compliance with the CSAPR and CSAPR update limits for both SO_2 and NO_x.

Ameren Missouri's inventory of SO_2 allowances consists of allowance that were granted by the EPA and therefore are valued at zero cost leaving no value of the SO_x inventory Account 158.001. There was an inventory amount for NO_x emissions under FERC Account 158.002, Clean Air Allowances. The value of the NO_x Ozone Allowances inventory on September 30, 2018 was $18,923. There were two different times during this Review Period that NO_x Ozone Allowances were purchased in order to cover generation: 1) $245,000 in June 2017 and $67,500 in June 2018. Over the Review Period of June 2017 through

September 2018, Ameren Missouri's SO_2 and NO_x allowances consumed was slightly above Ameren Missouri's budgeted allowances for the period, but below the EPA allowances.

Ameren Missouri, during this review period, did not sell emission allowances due to need for its own generation. Staff verified the cost of emissions during the Review Period of June 1 2017 through September 30, 2018 of $295,185 by reviewing the FAC monthly reports, tab 5C page 1.

The management of emission allowances is described in Ameren Missouri's response to Staff's Data Request Nos. 0029, 0030, 0031, 0031.1, 0032, 0032.1, 0059, 0059.1 and 0059.2. Staff reviewed Ameren Missouri's Hedge plan and Ameren Missouri Risk Management Steering Committee Report concerning emission allowances. Staff found that Ameren Missouri has appropriate practices and processes in place to effectively manage its emission allowances for this review period.

2. Summary of Cost Implications

If Ameren Missouri imprudently used, purchased, sold or banked its SO_2 and NO_x allowances, customer harm could result from an increase in Ameren Missouri's FAC charges.

3. Conclusion

Staff observed no indication of imprudence associated with Ameren Missouri's management of its emission allowances during the Prudence Review Period.

4. Documents Reviewed

a. Ameren Missouri response to Staff Data Request Nos. 0029, 0030, 0031, 0032, and 0059;

b. Ameren Missouri Monthly Reports during the Review Period;

c. Ameren Missouri General Ledger and Journal during the Review Period: and,

d. Ameren Missouri's work papers in File Nos. ER-2018-0142, ER-2018-0255, ER-2019-0024, and ER-2019-0152.

Staff Expert/Witness: Cynthia M. Tandy

I. FERC 447 - Off-System Sales Revenue ("OSSR")

1. Description

Staff reviewed the off-system sales quantities and off-system sales revenues and costs (reduction due to power broker fees) in FERC Account 447 for the prudence review period. Ameren Missouri's MO P.S.C. Schedule No 6 Original Sheet No. 74.4 describes off-system sales revenues or "OSSR" as:

> OSSR = Costs and revenues in FERC Account 447 for:
>
> **A. Capacity**;
> **B. Energy**;
> **C. Ancillary services**, including:
> a. Regulating reserve service (MISO Schedule 3, or its successor);
> b. Energy Imbalance Service (MISO Schedule 4, or its successor);
> c. Spinning reserve service (MISO Schedule 5, or its successor); and
> d. Supplemental reserve service (MISO Schedule 6, or its successor);
> **D. Make-whole payments**, including:
> a. Price volatility; and
> b. Revenue sufficiency guarantee; and
> **E. Hedging.**

For the review period Ameren Missouri's OSSR amount is $326,855,938.

With respect to **A. Capacity** and in reference to electricity, capacity transactions (sales) as defined by FERC are: "The acquisition of a specified quantity of generating capacity from another utility for a specified period of time. The utility selling the power is obligated to make available to the buyer a specified quantity of power." For the review period the total amount of revenue from capacity sales was $26,230,926. Per *Ameren Missouri's Commodity Risk Management Policy*, section 2.4 page 10; "After supplying load and reserve margin, Ameren Missouri will attempt to sell any excess capacity in the bilateral or RTO markets."

With respect to **B. Energy** and as defined by FERC, Energy Sales are "The transfer of title to an energy commodity from a seller to a buyer for a price or the quantity transferred during a specified period". For the review period the total amount of revenue from energy sales was $271,775,196. In accordance with the MISO tariff and provided in Ameren Missouri's response to Staff Data Request No. 0057: "The dispatch of Ameren Missouri's generation is governed by the MISO Tariff, in particular Module C Energy and Operating

Reserve Markets and Module F Coordination Services", and "Ameren Missouri's role in the dispatch decisions is to provide MISO with the necessary economic and operating parameters for each generation asset for inclusion in MISO's Security Constrained Economic Dispatch ("SCED") algorithm."

With respect to **C. Ancillary services** as defined by FERC: "those services necessary to support the transmission of electric power from seller to purchaser, given the obligations of control areas and transmitting utilities within those control areas, to maintain reliable operations of the interconnected transmission system."

a. Regulating reserve service is defined in FERC's Electric Tariff, Schedule 3;

> Regulating Reserve is necessary to i) continuously balance the total output of all Resources within the MISO Balancing Authority Area with the total demand of all loads (including losses) within the MISO Balancing Authority Area plus the Net Scheduled Interchange of the MISO Balancing Authority Area and ii) assist in maintaining the difference between scheduled Interconnection frequency and actual Interconnection frequency within acceptable limits based on Applicable Reliability Standards.

For the review period Ameren Missouri received ** _____ ** for regulating reserve services provided to MISO.

b. Energy Imbalance Service is described in FERC Electric Tariff, Schedule 4:

> Energy Imbalance Service is provided when a difference occurs between the Energy scheduled in the Day-Ahead Energy Market and the actual delivery of Energy to a Load located within the MISO Balancing Authority Area over a single hour in the Real-Time Energy Market.

For the review period Ameren Missouri received ** ____ ** for Energy Imbalance Services provided to MISO.

c. Spinning Reserve Service is described in FERC Electric Tariff, Schedule 5:

> Spinning Reserve is required to immediately offset deficiencies in Energy supply that result from a Resource contingency or other abnormal event. Spinning Reserve may be provided by Resources that are Spin Qualified Resources available to provide Spinning Reserve. The obligation to maintain this immediate response capability to contingency events lies with the MISO Balancing Authority.

For the review period Ameren Missouri received ** _____ ** for Spinning Reserve Services provided to MISO.

d. Supplemental Reserve Service is described in FERC Electric Tariff, Schedule 6:

> Supplemental Reserve is required to offset deficiencies in Energy supply that result from a Resource contingency or other abnormal event. Supplemental Reserve may be provided by Resources that are Supplemental Qualified Resources that are available to supply Supplemental Reserve. The obligation to maintain this response capability to contingency events lies with the MISO Balancing Authority.
>
> For the review period Ameren Missouri received ** _____ ** for Supplemental Reserve Services provided to MISO.

With respect to **D. Make Whole Payments** and as explained by MISO, make whole payments are provided to generation or demand resources during certain market conditions, to ensure that these resources do not operate at a loss when required to dispatch. MISO further explains: "Make whole payments are needed to allow resources to recover their offer costs: to compensate resources committed by MISO when LMP payments do not cover resource start-up and no-load costs, and to compensate resources when intra-hour dispatch movement coupled with intra-hour price volatility causes under-recovery of offer costs." It provides a process to guarantee electric utilities the recovery of production offers for energy and ancillary services for resources committed by MISO. These revenue payments are a result of MISO's dispatch instructions given to Ameren Missouri and guarantees the generators do not incur additional costs related to MISO's operational decisions. Since Ameren Missouri has little or no control over this process, Staff only reviewed these transactions for accounting accuracy. For the review period Ameren Missouri received ** _____ ** in make whole payments.

With respect to **E. Hedging** (Financial Energy Swaps) are financial energy transactions related to the trading of power future contracts in organized markets such as Intercontinental Exchange ("ICE") and Nodal Exchange ("NEX"). Ameren Missouri is in a long position with its generation, which allows Ameren Missouri to sell its excess generation into the market. Ameren Missouri has chosen to lock in prices on a certain portion of this excess generation instead of relying completely on market spot price. These transactions settle outside of MISO and the results are accounted for as off-system sales revenue. Ameren Missouri has experienced a decrease in OSSR since MISO created the

day-ahead and real-time market and optimized pricing. Ameren Missouri uses several different futures products in an effort to broaden its opportunities to make additional off-system sales. The following is a list of financial products Ameren Missouri uses in its trading activities in the ICE and NEX trading platforms.

MISO Indiana Hub Real-Time Peak Fixed Price Future
MISO Indiana Hub Real-Time Peak Daily Fixed Price Future
MISO Indiana Hub Day-Ahead Peak Daily Fixed Price Future
MISO Indiana Hub Day-Ahead Peak Fixed Price Future
MISO Cinergy Hub RT LMP, Peak Monthly
PJM Western Hub Real-Time Peak Daily
MISO INDIANA.HUB Monthly Day Ahead On-Peak Power Contract
MISO INDIANA.HUB Monthly Real Time On-Peak Power Contract
MISO AMIL.BGS6 Monthly Day Ahead On-Peak Power Contract
MISO.AMIL.BGS9 Day Ahead On Peak Power Contract

Based upon Ameren Missouri's power trading activities Ameren Missouri had forward purchases in the amount of ** _____ ** and settlement swaps in the amount of ** _____ ** for a settlement loss of ** _____ ** related to its financial energy swaps. However, there were additional brokers fees in the amount of ** _____ ** and other accounting adjustments in the amount of ** _____ **, which reduced costs, for a net trading loss of ** _____ **.

2. Summary of Cost Implications

Ameren Missouri's revenues from off-system sales and ancillary services are offset against total fuel, purchased power and net emissions allowance costs. If Ameren Missouri was imprudent, either because it did not maximize or did not make off-system sales and ancillary services, customers could be harmed by that imprudence through an increase in FAC charges.

3. Conclusion

Staff identified no incidents of imprudence related to off-system sales and ancillary services for the prudence review period.

4. Documents Reviewed

a. Ameren Missouri's response to Staff Data Request Nos. 0009, 0014, 0028, 0035, 0036, 0056 and 0062;

b. Ameren Missouri's work papers in File Nos. ER-2018-0142, ER-2018-0255, ER-2019-0024, and ER-2019-0152;

c. Ameren Missouri's General Ledger and Journals during the review period;

d. MISO Schedules and MISO Tariff Module C and F from https://www.misoenergy.org/; and

e. FERC Definitions from https://www.eia.gov/.

Staff Experts/Witnesses: Lisa Wildhaber (Capacity, Energy, Ancillary Services, and Make Whole Payments), Dana E. Eaves (Hedging)

IV. Interest

1. Description

For each month of the FAC accumulation periods and recovery periods, Ameren Missouri is required to calculate the interest associated with the over- or under- recovered balances due to: 1) difference between ANEC and B, 2) refunds as a result of prudence reviews ("P"), and 3) amounts approved in true-up cases. Ameren Missouri applies its short-term interest rate to the over- or under- recovered balance and the interest is compounded on a monthly basis. This interest amount is component "I" of the FPA calculation described on 2nd, 3rd, 4th and 5th Revised Sheet No. 74.13. Interest is calculated monthly at a rate equal to the daily weighted average interest rate paid on the Company's short-term debt, then applied to the month-end balance over- or under-recovery amount.

For the review period, Ameren Missouri applied an interest amount of $67,599 to the over- or under- recovered balances for the FAC. Staff reviewed Ameren Missouri's monthly source data for short-term interest rates, calculation of its monthly weighted average interest rates, and calculations of the monthly interest amounts. Staff found all calculations to be correct.

2. Summary of Cost Implications

If Ameren Missouri was imprudent in its identification of monthly short-term interest rates and/or in its calculation of monthly interest amounts, customers could be harmed through increased FAC charges.

3. Conclusion

Staff observed no evidence of imprudence with regard to the Ameren Missouri's monthly short-term interest rates and the calculation of monthly interest amounts applied to the over- or under- recovered balances.

4. Documents Reviewed

a. Ameren Missouri Response to Staff Data Request No. 0043; and

b. Ameren Missouri's work papers in File Nos. ER-2018-0142, ER-2018-0255, ER-2019-0024, and ER-2019-0152.

Staff Expert/Witness: Cynthia M. Tandy

V. FERC ROE Cases/Entergy Dispute

1. Description

The Signatories agreed in Case No. ER-2016-0179 (pages 7 – 8) that the regulatory liability arising from FERC Docket No. EL14-12-002, FERC ROE Impact Case/Entergy Dispute (the "First FERC ROE Case") would be deferred for recovery beginning with the effective date of new rates in Ameren Missouri's next general rate proceeding, based on actual refunds Ameren Missouri received from the First FERC ROE Case. The Signatories further agreed that the revenue requirement treatment of any refunds Ameren Missouri receives that arise from FERC Docket No. EL15-45-0000, FERC ROE Impact Case/Entergy Dispute (the "Second FERC ROE Case") shall be addressed in Ameren Missouri's next general rate proceeding. On 7/03/2019 Ameren Missouri filed a general rate case, Case No. ER-2019-0335.

2. Summary of Cost Implications

If Ameren Missouri was imprudent in its handling of the revenue requirement treatment of any refunds resulting from the FERC ROE cases, customers could be harmed through increased FAC charges.

3. Conclusion

Staff will address any regulatory liability arising from the FERC ROE Impact Cases/Entergy Dispute in Ameren Missouri's current general rate case, Case No. ER-2019-0335.

4. Documents Reviewed

a. Unanimous Stipulation and Agreement, Case No. ER-2016-0179.

Staff Expert/Witness: Lisa Wildhaber

VI. Failure to Follow Dispatch Instructions

1. Description

In its operating procedure MS-OP-031-r29, MISO defines the Failure to Follow dispatch Flag ("FFDF") as an "hourly flag which is set for any Resource that has Dispatch Interval Excessive Energy ("EXE") or Dispatch Interval Deficient Energy ("DFE") in four or more consecutive Dispatch Intervals in a given Hour."

As a member of MISO, Ameren Missouri is provided and expected to follow electronic dispatching instructions as directed by MISO. These dispatch instructions are tailored to each generation resource based upon a specific set of operational characteristics predefined for each generation resource as well as the type of service being offered. Periodically, Ameren Missouri is unable to meet these specific instructions due to equipment operational issues, hold points for starting or stopping equipment, units ramping downward faster than anticipated for nightly deslagging of boilers, real-time price volatility, and limited time in communicating changes to unit capability. When these deviations occur, MISO charges Ameren Missouri for each specific occurrence. These occurrences do not happen at a single location or at a single generation facility because MISO provides dispatch instruction for each of Ameren Missouri's generation units for each hour of every day. For this review period MISO charged Ameren Missouri an additional $58,412.03 in total Excessive/Deficient Energy Deployment charges. However, Ameren Missouri further explained that the failure to follow dispatch flag occurred only 1.04% of the total hours in question during this review period.

2. Summary of Cost Implications

If Ameren Missouri was imprudent in its management of MISO's dispatch instructions, customers could be harmed through increased FAC charges.

3. Conclusion

Staff is not recommending a disallowance for this review period related to Ameren Missouri's failure to follow dispatch instructions. Ameren Missouri and others are involved with changes/modifications to MISO processes[29] related to this issue. Staff will monitor MISO's progress and final determination, if any, on this issue. Staff reserves the right to review the $58,412.03 for failure to follow dispatch instructions in future FAC prudence reviews and/or general rate cases.

4. Documents Reviewed

a. Ameren Missouri's responses to Staff Data Request Nos. 0038 and 0038.1; and

b. MISO Operating Procedure MS-OP-031-r29.

Staff Expert/Witness: Dana E. Eaves and Lisa Wildhaber

VII. Utilization of Generation Capacity

1. Description

Ameren Missouri's generation consists of a mixture of Nuclear, Coal, Natural Gas, Solar, Methane Gas, #2 Fuel Oil and Hydro generating stations as indicated in Table 10. Table 11 contains the net-generation and reported nameplate capacity rating for Ameren Missouri's fleet. Table 12 contains the net-generation broken down by unit type for Ameren Missouri's fleet. These tables illustrate how Ameren Missouri's generation fleet is being called upon by MISO in actual operation throughout the period from June 1, 2017 through September 30, 2018.

continued on next page

[29] https://www rtoinsider.com/ameren-miso-ramp-rates-77425/.

Table 10[30] - Confidential

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[31]			

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[30] Ameren response to Staff Data Request No. 0022.
[31] Retired Unit as of 1/01/18.

Table 11 - Confidential

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	[32]	[33]

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[32] *Ibid*.

[33] Ameren response to Staff Data Request No. 0034.

Table 12 - Confidential

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_____	_____ [34] ____	_____ _____
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____	____	____
_____	_____	____
____	____	____
_____	_____	____

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2. Summary of Cost Implications

Ameren Missouri's electricity generating units are dispatched in the MISO day-ahead ("DA") and real-time ("RT") markets as a function of each generating unit's offered cost per kWh relative to the MISO Locational Marginal Price ("LMP") at the unit node and subject to the unit's operating characteristics and commitment status as provided by Ameren Missouri. Ameren Missouri's role in the dispatch decisions is to provide MISO with the necessary economic and operating parameters for each generation unit for inclusion in MISO's Security Constrained Economic Dispatch ("SCED") algorithm. The algorithm is capable of clearing, dispatching, and pricing Energy, Operating Reserve, Up Ramp Capability, and Down Ramp Capability in a simultaneously co-optimized basis that minimizes Production Costs and Operating Reserve Costs while enforcing multiple security constraints.[35] In order to perform proper optimization of commitment and dispatch calculations, MISO requires production cost data for generators to be provided in a three-part offer format: startup cost, no-load cost, and incremental energy cost.[36]

Units which are must run in normal operations, may be offered into the MISO market as economic when returning from an outage, (and before the unit has been restarted) by the Trade Floor, based upon their knowledge and experience, and upon review of next day market conditions. By doing so, the MISO DA market process is used to determine when it is

[34] *Ibid*
[35] Ameren Response to Staff Data Request No. 0057.
[36] Ameren Response to Staff Data Request No. 0057.1.

economical to return the unit to service. This mitigates the risk of restarting the unit in a non-profitable period without incurring additional stress on the units such as that which would be expected to occur with unit cycling (as the unit was already off line for the outage).[37]

For Meramec 3-4, the Trade Floor analyzes the near term markets to determine if removing these units from service would reasonably be expected to result in a reduction in cost (net of lost sales opportunities). The units are must run during periods of expected profitable operation, and allowed to cycle off as a function of the MISO day-ahead market when market prices are expected to be below incremental operating costs for an extended period. Given that the MISO markets do not optimize unit operations beyond the next day in their day-ahead algorithms, not "must running" the units in actual operations would result in frequent cycling of the units, in excess of those levels identified by plant operating management as reasonable for a facility of its age. The methodology employed by the Trade Floor balances concerns with additional costs arising from frequent cycling with the economic impact of operating the unit in low price periods.[38]

3. Conclusion

Staff did not observe any evidence of imprudent utilization of generation resources during this prudence review.

4. Documents Reviewed

a. Ameren Missouri's responses to Staff Data Request Nos. 0022, 0034, 0037, and 0057.

Staff Experts/Witnesses: Jordan Hull and Brooke Mastrogiannis

VIII. Heat Rates

1. Description

Heat rates of generating units are an indicator of unit performance. A heat rate is a calculation of total volume of fuel burned for electric generation multiplied by the average heat content of that volume of fuel divided by the total net generation of electricity in kilowatt hours (kWh) for a given time period.

[37] Ameren Response to Staff Data Request No. 0037.
[38] *Ibid.*

2. Summary of Cost Implications

Heat rates are inversely related to the efficiency of the generating unit. Increasing heat rates of specific units over time may be an indication that a specific unit's efficiency is declining. Heat rates can vary greatly depending on operating conditions including but not limited to load, hours of operation, shut downs and startups, unit outages, derates, and weather conditions. Therefore, a good indication of unit performance for those units that are utilized frequently is an analysis of the trend of heat rates over time. A permanent increase in monthly heat rates is commonly the result of a decrease in a generating unit's efficiency whenever additional emissions reduction equipment is added to the backend of the generating unit. Continued utilization of units with sustained elevated heat rates could result in Ameren Missouri incurring higher fuel costs per unit of electricity generated than it would otherwise have incurred. If Ameren Missouri was imprudent in response to the ongoing trend of a unit's heat rate, customer harm could result from an increase in the fuel costs that are collected through Ameren Missouri's FAC charges.

The monthly heat rates for Meramec 1 and 2 demonstrated a positive trend since the conversion from coal to gas in 2016 and then a substantial increase in the heat rates in the summer months of 2018. The increases are due to the units being fired less frequently compared to when the units were coal-fired. The data supplied by Ameren Missouri and reviewed by Staff was an average of hours of operation where the unit load was 90% or greater than the expected capability of the unit for the month. In general, the higher heat rates are due to the limited number of hours of operation at full load which leads to little time to complete cycle isolation checks on the unit. Dispatch frequencies and durations have both declined. These factors lead to more variability in heat rate measurements which may yield less reliable heat rate results.[39]

3. Conclusion

In reviewing the monthly heat rates of Ameren Missouri's generating units dating back to May 2012, Staff found no indication that Ameren acted imprudently during the Review Period.

[39] Ameren response to Staff Data Request No. 0054.1.

4. Documents Reviewed

a. Ameren Missouri's responses to Staff Data Request Nos. 0054 and 0054.1; and

b. Monthly Outage data submitted by Ameren Missouri in compliance with Rule 4 CSR 240-3.190.

Staff Expert/Witness: Jordan Hull

IX. Plant Outages

1. Description

Outages occurring at any of the generating units can have an impact on how much Ameren Missouri pays for fuel and purchased power and could result in Ameren Missouri paying more for fuel and purchased power cost than is necessary. Ameren Missouri is required by the North American Electric Reliability Corporation ("NERC") to submit data for every outage in accordance with Generating Availability Data System ("GADS") data reporting instructions effective January, 2012. Generating unit outages generally can be classified as scheduled outages, forced outages, or partial outages (derating).

Staff examined the outages of Ameren Missouri's generation fleet and the timing of these outages to determine if the outages were imprudently taken. Any planned outage during peak load demand times or a period of high replacement energy prices has the potential result of Ameren Missouri paying more for fuel and purchased power costs than it would have paid if the outage were planned during forecasted low load times. Periodic planned outages are required to maintain each generating unit in peak operating condition to minimize forced or maintenance outages that could occur during peak load demand or periods of high replacement energy prices. Ameren Missouri has little or no control over the timing of maintenance or forced outages of the generating stations it owns and operates when such outages are the result of unforeseen events. These types of outages are not included as a part of this prudence review.

2. Summary of Cost Complications

An imprudent outage could result in Ameren Missouri purchasing expensive spot market energy or running its more expensive units to meet demand and could result in customer harm through an increase in customer FAC charges.

3. Conclusion

Staff did not observe any evidence of imprudent outages during the time period examined in this prudence review.

4. Documents Reviewed

a. Ameren Missouri's responses to Staff Data Requests Nos. 0025, 0026, 0045, 0046 and 0050.

Staff Expert/Witness: Jordan Hull

BEFORE THE PUBLIC SERVICE COMMISSION

OF THE STATE OF MISSOURI

In the Matter of the Seventh Prudence Review of Costs Subject to the Commission-Approved Fuel Adjustment Clause of Union Electric Company d/b/a Ameren Missouri	))))	File No. EO-2019-0257

AFFIDAVIT OF DANA E. EAVES

STATE OF MISSOURI	)	
	)	ss.
COUNTY OF COLE	)	

COMES NOW DANA E. EAVES and on his oath declares that he is of sound mind and lawful age; that he contributed to the foregoing *Staff Report - Seventh Prudence Review*; and that the same is true and correct according to his best knowledge and belief.

Further the Affiant sayeth not.

DANA E. EAVES

JURAT

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Cole, State of Missouri, at my office in Jefferson City, on this 28th day of August 2019.

D. SUZIE MANKIN
Notary Public - Notary Seal
State of Missouri
Commissioned for Cole County
My Commission Expires: December 12, 2020
Commission Number: 12412070

Notary Public

BEFORE THE PUBLIC SERVICE COMMISSION

OF THE STATE OF MISSOURI

In the Matter of the Seventh Prudence Review of Costs Subject to the Commission-Approved Fuel Adjustment Clause of Union Electric Company d/b/a Ameren Missouri	))))	File No. EO-2019-0257

AFFIDAVIT OF JORDAN HULL

STATE OF MISSOURI)
) ss.
COUNTY OF COLE)

COMES NOW JORDAN HULL and on his oath declares that he is of sound mind and lawful age; that he contributed to the foregoing *Staff Report - Seventh Prudence Review*; and that the same is true and correct according to his best knowledge and belief.

Further the Affiant sayeth not.

Jordan Hull
JORDAN HULL

JURAT

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Cole, State of Missouri, at my office in Jefferson City, on this 28th day of August 2019.

D. SUZIE MANKIN
Notary Public - Notary Seal
State of Missouri
Commissioned for Cole County
My Commission Expires: December 12, 2020
Commission Number: 12412070

D Suzie Mankin
Notary Public

BEFORE THE PUBLIC SERVICE COMMISSION

OF THE STATE OF MISSOURI

In the Matter of the Seventh Prudence Review of Costs Subject to the Commission-Approved Fuel Adjustment Clause of Union Electric Company d/b/a Ameren Missouri	))))	File No. EO-2019-0257

AFFIDAVIT OF BROOKE MASTROGIANNIS

STATE OF MISSOURI	)	
	)	ss.
COUNTY OF COLE	)	

COMES NOW BROOKE MASTROGIANNIS and on her oath declares that she is of sound mind and lawful age; that she contributed to the foregoing *Staff Report - Seventh Prudence Review*; and that the same is true and correct according to her best knowledge and belief.

Further the Affiant sayeth not.

Brooke Mastrogiannis

BROOKE MASTROGIANNIS

JURAT

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Cole, State of Missouri, at my office in Jefferson City, on this 28th day of August 2019.

D. SUZIE MANKIN
Notary Public - Notary Seal
State of Missouri
Commissioned for Cole County
My Commission Expires: December 12, 2020
Commission Number: 12412070

D Suzie Mankin

Notary Public

BEFORE THE PUBLIC SERVICE COMMISSION

OF THE STATE OF MISSOURI

In the Matter of the Seventh Prudence Review of Costs Subject to the Commission-Approved Fuel Adjustment Clause of Union Electric Company d/b/a Ameren Missouri	))))	File No. EO-2019-0257

AFFIDAVIT OF CYNTHIA M. TANDY

STATE OF MISSOURI)
) ss.
COUNTY OF COLE)

COMES NOW CYNTHIA M. TANDY and on her oath declares that she is of sound mind and lawful age; that she contributed to the foregoing *Staff Report - Seventh Prudence Review*; and that the same is true and correct according to her best knowledge and belief.

Further the Affiant sayeth not.

CYNTHIA M. TANDY

JURAT

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Cole, State of Missouri, at my office in Jefferson City, on this 28th day of August 2019.

D. SUZIE MANKIN
Notary Public - Notary Seal
State of Missouri
Commissioned for Cole County
My Commission Expires: December 12, 2020
Commission Number: 12412070

Notary Public

BEFORE THE PUBLIC SERVICE COMMISSION

OF THE STATE OF MISSOURI

In the Matter of the Seventh Prudence Review of Costs Subject to the Commission-Approved Fuel Adjustment Clause of Union Electric Company d/b/a Ameren Missouri	))))	File No. EO-2019-0257

AFFIDAVIT OF LISA WILDHABER

STATE OF MISSOURI	)	
	)	ss.
COUNTY OF COLE	)	

COMES NOW LISA WILDHABER and on her oath declares that she is of sound mind and lawful age; that she contributed to the foregoing *Staff Report - Seventh Prudence Review*; and that the same is true and correct according to her best knowledge and belief.

Further the Affiant sayeth not.

Lisa Wildhaber

LISA WILDHABER

JURAT

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Cole, State of Missouri, at my office in Jefferson City, on this 28th day of August 2019.

D. SUZIE MANKIN
Notary Public - Notary Seal
State of Missouri
Commissioned for Cole County
My Commission Expires: December 12, 2020
Commission Number: 12412070

D Suzie Mankin

Notary Public