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Witness:	Mark Birk
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Sponsoring Party:	Union Electric Company
File No.:	ER-2022-0337
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MISSOURI PUBLIC SERVICE COMMISSION

FILE NO. ER-2022-0337

DIRECT TESTIMONY

OF

MARK BIRK

ON

BEHALF OF

UNION ELECTRIC COMPANY

D/B/A AMEREN MISSOURI

St. Louis, Missouri
August, 2022

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DIRECT TESTIMONY

OF

MARK BIRK

FILE NO. ER-2022-0337

REBUTTAL TESTIMONY

OF

MARK C. BIRK

FILE NO. ER-2022-0337

I. INTRODUCTION

Q. Please state your name and business address.

A. Mark C. Birk, 1901 Chouteau Avenue, St. Louis, Missouri 63103.

Q. By whom are you employed and what is your position?

A. I am the President of Union Electric Company d/b/a Ameren Missouri ("Ameren Missouri" or the "Company").

Q. Please describe your educational background and employment experience.

A. I received my Bachelor of Science degree in Electrical Engineering from the University of Missouri-Rolla in 1986 and my Master of Science in Electrical Engineering from the same institution in 1991. In 2009, I also received a Master of Business Administration from Washington University in St. Louis. I am a licensed professional engineer in the State of Missouri. I began my employment with Union Electric Company in 1986 as an assistant engineer in the nuclear function. In 1989, I transferred to Union Electric's Meramec Energy Center as an electrical engineer. In 1996, I transferred to the Energy Supply Operations Group and became a Power Supply Supervisor. I became Manager of Energy Supply Operations in the spring of 2000. I became General Manager of Energy Delivery Technical Services in the fall of 2001 and Vice President of that department in 2002. I became Vice President of Ameren Energy, Inc., Ameren Corporation's short-term trading affiliate, in the fall of 2003 and assumed the position with Ameren Missouri as Vice President of Power Operations in September of 2004. In 2012, I was promoted to Senior Vice President of Corporate Planning and Business Risk Management, and in 2015, I became Senior Vice President of Corporate Safety, Planning, and Operations Oversight. In 2017 I became Sr. Vice President, Customer and Power Operations, and I assumed my current position in December of last year.

II. PURPOSE OF TESTIMONY

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to update the Commission on the status of the Rush Island Energy Center's ("Rush Island") operations post-the opinion last Fall by the U.S. Eighth Circuit Court of Appeals. As the Commission is aware, the Eighth Circuit upheld the District Court's judgment that had concluded that Ameren Missouri failed to obtain certain permits that the District Court concluded were required by the New Source Review ("NSR") provisions of the federal Clean Air Act ("CAA") when work was done at Rush Island during planned outages in 2007 and 2010. That judgment also required the Company to install flue gas desulfurization units (i.e., "scrubbers") at Rush Island. In my testimony I will:

1. Provide the Commission the pertinent facts regarding the work done in 2007 and 2010 that ultimately led to the federal court litigation, the outcome of that litigation, and the consequences of that outcome on Rush Island's operations, including Ameren

Missouri's decision to retire Rush Island in lieu of installing scrubbers, since retirement is clearly in our customers' best interest;

2. Explain the status of Ameren Missouri's efforts to obtain an appropriate order from the District Court to allow retirement in lieu of installing scrubbers, consistent with ensuring that the retirement can be accomplished in an orderly manner that preserves system reliability for our customers;

3. Describe what we expect going forward regarding Rush Island's operations, including transmission system upgrades to be completed to ensure reliable system operations following its retirement; and

4. Explain why Ameren Missouri's actions were prudent and reasonable, including its determination that permits were not required for the 2007 and 2010 work and its above-mentioned decision to retire Rush Island in the next few years instead of installing expensive scrubbers.

Q. Are there other witnesses providing testimony regarding Rush Island?

A. Yes. Environmental attorney and former U.S. Environmental Protection Agency ("EPA") Assistant Administrator Jeffrey Holmstead provides testimony concerning the regulatory framework for NSR permitting in Missouri at the time of the projects, and why under that framework it was reasonable for Ameren Missouri to conclude that no permits were required for its projects at Rush Island. While Company witness Holmstead provides perspective from the standpoint of an environmental regulator, Company witness Karl Moor, a longtime Southern Company Sr. Vice-President, attorney, and also a former Deputy Assistant Administrator at EPA provides testimony demonstrating that based on what the industry (including Ameren Missouri) knew or should have known at the time concerning EPA's interpretation and application of the NSR program, it was clearly reasonable for Ameren Missouri not to have sought permits. In addition, Company witness Andrew Meyer provides details on how Rush Island is expected to operate until it is retired, given that the Midcontinent Independent System Operator, Inc. ("MISO") needs it to support reliability pending completion of certain transmission projects which I discuss below. And finally, Company witness Matt Michels provides analytical support demonstrating that retirement of Rush Island in the next few years instead of installing scrubbers is in our customers' best interest.

III. PERTINENT FACTS, DISTRICT COURT CASE STATUS, FURTHER RUSH ISLAND OPERATIONS

Q. How did the issues that have led to the current situation with Rush Island arise?

A. In 2007 and 2010, Ameren Missouri took planned outages at Rush Island Unit 1 and Unit 2, respectively, to complete a number of projects, including to replace several of the units' main components, such as the units' reheaters, economizers, lower slopes and additionally on Unit 1, the air preheaters. I was involved in the planning for these outages, which had begun in approximately 2005, since at that time I was Vice-President of Power Operations for Ameren Missouri, with responsibility for the Company's fossil-fueled generation fleet. These were original components that had not been replaced since the plant originally commenced operations in 1976-1977. In the mid-90s Ameren Missouri began burning lower sulfur Powder River Basin coals at our energy centers to reduce fuel costs and lower emissions. Burning the lower-cost, lower -sulfur coal has provided significant benefit to our customers. The components that were replaced during these outages had become unreliable due to aging and frequent plugging associated with burning lower sulfur coals, which led to increased forced outages and de-rates. The projects simply replaced those original components with like-kind equipment as part during our normal, planned outage cycle to maintain unit availability and prevent future forced outages for the benefit of our customers.

The replacements did not increase the maximum rated design capacity of the units given continuous year-round operation, did not increase actual emissions, and were the kind of projects routinely undertaken by Ameren Missouri and in the industry, as addressed in detail in the direct testimonies of witnesses Holmstead and Moor.

In 2010, the EPA issued Notices of Violation (the last amendment of which was issued in May, 2011) claiming that the subject work was performed without first seeking permits required by the NSR regulations. In January 2011, the EPA filed a civil lawsuit seeking redress for the claimed violations. In January, 2017, the District Court concluded that the Company should have obtained permits and in September, 2019, ordered the Company to install scrubbers at Rush Island. The District Court also ordered the installation of dry-sorbent injection equipment at the Labadie Energy Center, not because of any claim that there were CAA violations involving Labadie, but as a "remedy" for the claimed violations at Rush Island.

These orders were designed to redress environmental harms the District Court concluded had occurred due to Ameren Missouri's failure, as the District Court saw it, to obtain permits prior to the 2007 and 2010 projects. The District Court then stayed most aspects of its 2019 ruling pending appeal to the Eighth Circuit. In September of last year, the Eighth Circuit affirmed the District Court's decision as to Rush Island but reversed it as to the ordered actions at Labadie. The Company sought rehearing of the Eighth Circuit's decision (as did the EPA as to that part of the decision reversing the District Court respecting the order regarding Labadie). The Eighth Circuit denied rehearing, exhausting Ameren Missouri's right to appeal.

Given the outcome of the litigation, Ameren Missouri assessed whether it should comply with the District Court's ruling (i.e., install scrubbers at Rush Island) or take some other action, such as retire the plant. Ameren Missouri's focus was on what course of action would be more beneficial for its customers. As discussed in the direct testimony of witness Michels, the Company's analysis of the question concluded that installing scrubbers was not in customers' best interest, leading to Ameren Missouri's December 2021 decision to retire Rush Island following completion of the necessary transmission upgrades to ensure system reliability.

Q. What were the key events relating to Rush Island after the Company decided to retire it?

A. Since the literal terms of the District Court's ruling still required the Company to install scrubbers at Rush Island, the Company filed a motion with the District Court asking that it instead be allowed to retire Rush Island, once transmission system upgrades needed to maintain transmission system reliability in Rush Island's absence could be completed. In advance of filing that motion, the Company had begun the retirement process with the MISO by making a "Y-2" filing, which is a MISO process by which a preliminary assessment of whether a unit can be retired on a given date without compromising transmission system reliability can be obtained from MISO. The Y-2 results, which were provided to the District Court, suggested that certain upgrades were required to ensure reliability prior to the retirement of Rush Island. Additional filings and conferences with the District Court followed, including issuance of an order by the District Court that required Ameren Missouri to proceed with a formal Attachment Y retirement study from MISO. The District Court's order required that the Attachment Y study assume a retirement date of September of 2022.

Q. What were the results of the formal Attachment Y study?

A. As suggested by the Y-2 study and reaffirmed by the Attachment Y study, MISO determined that continued plant operations are required beyond September of 2022 until the Company can complete certain specified transmission system upgrades. A copy of the Attachment Y Report issued by MISO is attached to my testimony as Schedule MCB-D1. In summary, the following transmission upgrades need to be completed before Rush Island can retire (the estimated completion timeline is also shown below):

Project	Estimated Completion Date
Installation of a Capacitor Bank at the Overton Substation to address voltage issues	Spring/Fall 2023
Replacement of a Transformer at the Wildwood Substation in St. Louis County to address overload concerns	Spring 2024
Upgrading of a bus bar tie position at a substation adjacent to Rush Island to address voltage issues	Spring/Fall 2023
Installation of four (4) STATCOMs in the St. Louis Metropolitan area to provide reactive power support; installations to occur as equipment becomes available 2024-2025	Final STATCOM Fall 2025, perhaps earlier

Q. Given the results of the Y study, where does the District Court case stand?

A. Once we understood the Y study results, we developed operational plans for Rush Island that would have Rush Island available to operate as and when needed to ensure transmission system reliability, but not more than that. We took that approach because we knew that the District Court would expect the plant to retire (if scrubbers were not to be installed) as soon as it could, consistent with reliability needs in the region, and with as little emissions as possible, also consistent with reliability needs in the region. We then made an additional filing with the District Court proposing those plans. Witness Meyer's direct testimony provides an overview of the plant's expected future operations and the status of the District Court filing but, in summary, we anticipate that both units will need to operate at certain minimum levels during summer and winter peaking seasons, and they will be dispatched by MISO during those seasons above those minimum levels according to system needs. We also anticipate that they will not operate outside the summer and winter unless MISO calls upon them in an emergency. In terms of the timeline for those operations, we anticipate that operations will continue in this fashion through 2024 and into 2025 until the final STATCOM can be completed, as summarized in the above table. At that time, the plant will be retired.

Q. What are the transmission projects expected to cost?

A. We have preliminary estimates at this time, subject to completion of engineering and receiving bids which we are in the process of soliciting. Our preliminary estimate for the work at the Overton Substation **__________**; for the work at the Wildwood substation **__________**; for the work at the Rush Island switchyard **_________**; and for all four STATCOMs **__________** – for a total of approximately **__________**. I should note that one of the four STATCOM units (at the Bugle Substation) was planned to provide additional reactive support even if we were not retiring Rush Island. Therefore, the incremental transmission investment associated with Rush Island's retirement (some of all of which would have likely been invested even if Rush Island continued to operate to 2039) is estimated to be approximately **__________**, since each STATCOM has an estimated cost of **_ _____**.

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Q. Were the costs of upgrading the transmission system if Rush Island retired accounted for in the analysis that supported the Company's decision to retire Rush Island in lieu of installing scrubbers?

A. Yes. Our triennial Integrated Resource Plan ("IRP") filings have for many years anticipated that significant transmission upgrades would be required if Rush Island were to retire, although we were not able to identify exactly what those would be or to estimate the cost with a high level of accuracy given the dynamic nature of the transmission system. But we did include estimates of significant costs in our retirement analysis. While those costs would be avoided until the ultimate retirement of Rush Island, it was still clearly better for customers to retire the plant sooner and incur the transmission costs now. As I mentioned, witness. Michel's direct testimony provides details on this issue

IV. THE PRUDENCE OF THE COMPANY'S ACTIONS

Q. Rush Island was the Company's newest coal-fired generating plant and according to the Company's 2020 IRP, it was not planned for retirement until 2039. If someone were to claim that the Company's actions were imprudent and have led to a premature retirement that is harmful to customers, would you agree?

A. For the reasons given below in my testimony, and as further outlined in the direct testimonies of witnesses Michels, Holmstead, and Moor, I firmly believe that the facts demonstrate that Ameren Missouri has made prudent decisions designed to promote the best interests of our customers at every turn. I acknowledge of course that the District Court determined that the Company's decision not to seek permits before completing the 2007 and 2010 projects violated the CAA (and that the court of appeals affirmed that part of the District Court's decision), and I further acknowledge that because of that decision the plant will need to retire sooner than we expected. However, it does not follow from those outcomes that Ameren Missouri acted imprudently in causing them.

Q. At the most basic level, why do you contend Ameren Missouri did not act imprudently respecting Rush Island?

A. As I noted, we acted prudently because we made reasonable decisions in light of what we knew or should have known when we completed the projects in 2007 and 2010 and in 2021 when we decided to retire Rush Island in lieu of installing expensive scrubbers. As the Commission is well-aware, principles that the Commission has adhered to during my 36 years in the utility industry – and I believe much longer -- hold that utility decisions are evaluated based on the state of affairs at the time the utility made any decisions that have been placed at issue. Put another way, hindsight simply cannot be used to punish utilities later for decisions that did not, after-the-fact, turn out as expected. Counsel tells me that under Missouri law, the question of whether a utility has made an imprudent decision and thus should bear the consequences of that decision is whether the utility's conduct "was reasonable at the time [the decision was made], under all circumstances, considering that the company had to solve its problem prospectively" without reliance on hindsight.[1] As the Commission itself puts it, "[i]n effect, our responsibility [when deciding a question of prudence] is to determine how reasonable people would have performed the tasks that confronted the company."[2]

[1] *Associated Nat. Gas Co. v. Pub. Serv. Comm'n of Missouri*, 954 S.W.2d 520, 529 (Mo. App. W.D. 1997).
[2] *In re: Union Electric Co., 27 Mo. P.S.C. (N.S.) 183, 194 (1985)*.

Q. What are the key decisions that were made?

A. The first decision we had to make was whether to replace the aged components at the plant. Like one's car or house, utility assets must be maintained in order for them to remain in good condition and perform as intended. Rush Island was a valuable, highly economic plant back when the projects were under consideration and there is no doubt in my mind that had we not undertaken these projects to keep the plant in top running condition, we would have had reduced availability, increased risk to reliability, increased customer costs and potentially faced claims that we were imprudently operating the plant. Such claims would have alleged that we were unnecessarily increasing production costs and lowering off-system sales margins, which were being passed through to customers via our fuel adjustment clause, to the detriment of customers. Replacing the components that we replaced was unquestionably the right thing to do and customers benefitted from that decision. On that point, I doubt there is any disagreement at all.

The second key decision we had to make was whether permits were required before we could complete this work. As witnesses Holmstead and Moor's direct testimonies demonstrate, whether or not the District Court, roughly 10 years later, disagreed with our judgment (and the District Court did disagree) is completely beside the point given that, based on what we knew or should have known at the time, "reasonable people would have performed the tasks that confronted the company [making the permit decision]" *exactly as Ameren Missouri performed that task* – completing the projects without seeking those permits.

The last key decision we had to make, once we, unfortunately, ended up on the wrong end of the NSR decision (unlike most others in the industry who litigated the issue) was to decide whether to execute on the District Court's judgment and spend close to $1 billion to put scrubbers on Rush Island, or instead take actions that would be more economical for our customers, including retiring the plant. As witness Michel's testimony demonstrates, the Company's analysis demonstrated that scrubbing the plant was the wrong answer for our customers, so we did not do it.

To put a finer point on it, every time we had a decision that contributed to the current circumstances, we have made decisions that were in the best interest of our customers. One case found that one of those decisions violated the CAA. With hindsight, we now know that, but that does not in any way make our decision not to seek permits unreasonable or imprudent in any way.

Does this conclude your testimony?

A. Yes, it does.

Public

Attachment Y Study Report

Union Electric Company – Ameren Missouri
Rush Island 1 and 2: 1195 MW
Start Date: September 1, 2022

July 6, 2022

MISO

P.O. Box 4202
Carmel, IN 46082-4202
Tel.: 317-249-5400 Fax: 317-249-5703
http://www.misoenergy.org

EXECUTIVE SUMMARY

On February 28, 2022, Union Electric Company – Ameren Missouri submitted an Attachment Y notice to *MISO* for the suspension of Rush Island Units 1 and 2 effective September 1, 2022.

MISO performed a Transmission System reliability assessment of Rush Island 1 and 2 set forth in the MISO Business Practices Manuals and was discussed and reviewed with the impacted Transmission Owners (TOs): *Ameren Missouri, Ameren Illinois, South Illinois Power Cooperative, and Wabash Valley Power Alliance.*

After being reviewed for power system reliability impacts as provided for under Section 38.2.7 of MISO's Open Access Transmission, Energy, and Operating Reserve Markets Tariff ("Tariff"), the analysis determined that there are reliability issues identified related to the suspension of *Rush Island* that require the generators to be designated as a System Support Resources ("SSR") units.

There were both severe steady state and stability violations that require the generators to be designated SSR units. In the summer peak case, there were five stability violations that did not meet Ameren voltage recovery criteria and would result in over 1,000 MW of load loss, which, if allowed, would be considered a potential Interconnection Reliability Operating Limit (IROL) within the MISO footprint in accordance with BPM-020 Section L.3.6. All voltage violations seen can be mitigated with load shed per MISO SSR criteria and additionally per WVPA there already exists operating guides to mitigate the known issues.

Prior to this Attachment Y, MISO also studied an Attachment Y-2 submitted by Union Electric Company – Ameren Missouri. This study had an effective date of June 1, 2023, but there were no other changes to study assumptions or system topology between the time the Attachment Y was submitted and the final Y-2 report. Therefore, the results of the Attachment Y-2 study will also be used to determine SSR need. The Attachment Y-2 report is included as an Appendix to this Attachment Y report. Three thermal violations were identified in three different scenarios in 2023 that require mitigation based on Ameren's Local Planning Criteria and one steady state voltage violation was identified for the winter peak case in 2023 and several stability voltage violations were identified for the summer peak case in 2023 that require *Rush Island* to be designated as System Support Resources ("SSR") units following the stakeholder process.

The transmission system was also evaluated for Ameren Local Planning Criteria with two different scenarios including non-coincident peak loads in Ameren territory and Winter Storm Uri. The results show thermal violations that would require mitigation, but these violations should not be utilized in designating Rush Island generation as an SSR.

In addition, MISO performed an analysis to determine if both units are required to mitigate the violations identified. That analysis determined that with one unit online, violations still exist that require *Rush Island* to be designated as System Support Resources ("SSR") units.

Table I-1: Overview of SSR Violations for Rush Island Attachment Y

Study	Year	Scenario	Steady State - Thermal Analysis	Steady State - Voltage Analysis	Stability Analysis
Attachment Y	2022	Summer Shoulder	No violations that met criteria	No violations that met criteria	No TVR violations met criteria
		Summer Peak	No violations that met criteria	Voltage violations can be mitigated per the MISO SSR Criteria	TVR violations that result in greater than 1,000 MW of load loss
		Summer low Load	No violations that met criteria	Voltage violations can be mitigated per the MISO SSR Criteria	No TVR violations met criteria
		Winter Peak	No violations that met criteria	Voltage violations can be mitigated per the MISO SSR Criteria	No TVR violations met criteria
Attachment Y-2	2023	Summer Shoulder	No violations that met criteria	Voltage violations can be mitigated per the MISO SSR Criteria	No TVR violations met criteria
		Summer Peak	Thermal violations can be mitigated per the MISO SSR Criteria, but need mitigation as per Ameren's LPC.	Voltage violations can be mitigated per the MISO SSR Criteria	TVR violations that result in greater than 1,000 MW of load loss
		Summer Low Load	Thermal violations can be mitigated per the MISO SSR Criteria, but need mitigation as per Ameren's LPC.	Voltage violations can be mitigated per the MISO SSR Criteria	No TVR violations met criteria
		Winter Peak	Thermal violations can be mitigated per the MISO SSR Criteria, but need mitigation as per Ameren's LPC.	P12 violation that cannot be mitigated per the MISO SSR Criteria	No TVR violations met criteria
	2031	Summer Peak	No violations that met criteria	No violations that met criteria	N/A

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1. INTRODUCTION

The Market Participant *Union Electric Company – Ameren Missouri* submitted an Attachment Y notice to *MISO* on February 28, 2022 for the suspension of *Rush Island 1 and 2* effective September 1, 2022.

The total capacity of *Rush Island* is 1195 MW based on its Generator Verification Test Capacity (GVTC) Value. It is connected to the 345 kV transmission systems, and is located in Festus, MO.

1-I Study Unit

Power Flow Area	Unit Description	kV Network[1]	Total MW[2]	Start Date
AMMO	Rush Island Unit 1	345	597.2	09/01/2022
AMMO	Rush Island Unit 2	345	597.8	09/01/2022
Total			**1,195**	

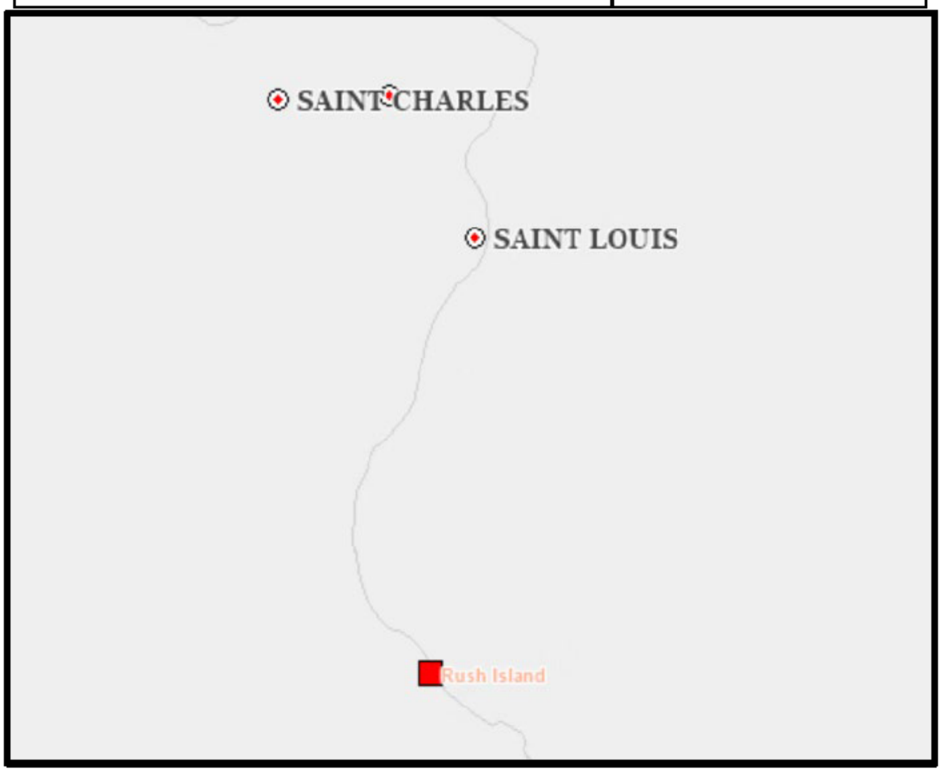

Figure 1: General Location Rush Island Generating Station

[1] In study models

[2] Generator Verification Test Capacity (GVTC) Value. Auxiliary Loads of Study Units will not be modelled. These values are the Net MW Output.

2. STUDY OBJECTIVE

Under Section 38.2.7 of MISO's Tariff, SSR procedures maintain system reliability by providing a mechanism for MISO to enter into agreements with Market Participants (MP) that own or operate Generation Resources or Synchronous Condenser Units (SCUs) that have requested to either Retire or Suspend, but are required to maintain system reliability.

The principal objective of an Attachment Y study is to determine if the unit(s) for which a change in status requested is necessary for system reliability based on the criteria set forth in the MISO Business Practices Manuals. The study work included monitoring and identifying the steady state branch/voltage violations on transmission facilities due to the unavailability of the Generation Resource or SCU. The relevant MISO Transmission Owner(s) and/or regional reliability criteria are used for monitoring such violations.

The purpose of this study is to assess the reliability impacts from the suspension of *Rush Island 1 and 2* located in Festus, MO effective September 1, 2022.

3. STUDY ASSUMPTIONS & INPUTS

3.1 Study Models

Studies performed using the following power flow models:

- The near-term starting models will be from the MISO MTEP21 2022 case, changes will be made to the models to reflect system topology for the start date of the generation's change of status request:
    - 2022 Summer Shoulder (Source: MISO21_2022_SHAW_TA)
    - 2022 Summer Peak (Source: MISO21_2022_SUM_TA)
    - 2022 Summer Low Load (Source: MISO21_2022_SLL40_TA)
    - 2022 Winter Peak (Source: MISO21_2022_WIN_TA)

- Results from the out-term case in the recently complete Attachment Y-2 Study regarding Rush Island Units 1 and 2 were used to satisfy the Attachment Y out term model requirement. Please refer to Appendix 10.4 for model and assumptions information.

For each model, two scenarios were created which represent the "before" and "after" generator change of status.

3-I Study Models

Model Name	Loads	Topology	Study Unit(s)	Dispatch Type[3]	Contingencies Category
2022SH_RUSH_ISLAND_OFF	Summer Shoulder	2022	OFF	SCED	P1,P2,P4,P5,P7, Selected P3, P6
2022SH_RUSH_ISLAND_ON	Summer Shoulder	2022	ON	SCED + Scale	P1,P2,P4,P5,P7, Selected P3, P6
2022SP_RUSH_ISLAND_OFF	Summer Peak	2022	OFF	SCED	P1,P2,P4,P5,P7, Selected P3, P6
2022SP_RUSH_ISLAND_ON	Summer Peak	2022	ON	SCED + Scale	P1,P2,P4,P5,P7, Selected P3, P6
2022SL_RUSH_ISLAND_ON	Summer Low Load	2022	ON	SCED + Scale	P1,P2,P4,P5,P7, Selected P3, P6
2022SL_RUSH_ISLAND_ON	Summer Low Load	2022	ON	SCED + Scale	P1,P2,P4,P5,P7, Selected P3, P6

[3] Dispatching according to procedure explained in BPM-020. "SCED + Scale" in the online cases means that all generators in the vicinity of the generator under study will remain dispatched at their SCED values identified in the corresponding offline case, and the rest of MISO will be scaled down to balance the overall generation in MISO after turning on the study units.

2022WP_RUSH_ISLAND_OFF	Winter Peak	2022	OFF	SCED	P1,P2,P4,P5,P7, Selected P3, P6
2022WP_RUSH_ISLAND_ON	Winter Peak	2022	ON	SCED + Scale	P1,P2,P4,P5,P7, Selected P3, P6

3.2 Study Assumptions

3.2.1 Generation

- All applicable approved Attachment Y (Retirement/Suspension) generators were modelled offline
- Only new generators with signed GIA were modelled.

3-II Generation Assumptions

Generation Type	Unit(s) Description	2022
Nearby Approved Attachment Y	[redacted]	[redacted]
	Dallman 31 and 32	Offline
	[redacted]	[redacted]
	[redacted]	[redacted]
	[redacted]	[redacted]

3.2.2 Transmission

A Future Projects included in 2022 study models

3-III Future Projects in Models

MOD Project Name	MOD ID	Project Type	Status	MOD Effective Date
AM_GrandTower-Retire-ATT-Y	120771	Generator	Planned	6/1/2019
AM_Shelbyville Retirement	120773	Generator	Planned	6/1/2019
AM_MB-20 Richwoods Renewable	129513	Generator	Planned	6/1/2020
AM_MB-21 Utica at Lathrop	129515	Generator	Planned	6/1/2020
AM_MB-22 Green City Renewable at Kirksville	129517	Generator	Planned	6/1/2020
AM_DG18004 Salem Solar 10.5 MW	129501	Generator	Planned	12/1/2020
AM-TP1229-16794-Cahokia-Meramec	134872	MTEP A	Planned	12/1/2020
TP-961-11973-Cane-Grand Island Switching Station	23479	MTEP C	Target MTEP A	12/31/2020
AM-TP1288-16549-Lincoln-Meister	134333	Non-MISO Network	Planned	12/31/2020
AM_DG_DG17004 Duupue Substation 20 MW solar	129497	Generator	Planned	3/31/2021
AM-TP131-3033-Beehive substation	24625	MTEP A	Planned	7/13/2021

MOD Project Name	MOD ID	Project Type	Status	MOD Effective Date
AM-TP131-3033-Beehive substation	24625	MTEP A	Planned	7/13/2021
AM-TP131-3033-Beehive substation	24625	MTEP A	Planned	7/13/2021
AM-TP131-3033-Beehive substation	24625	MTEP A	Planned	7/13/2021
AM_TPSIRP005-11929 N Coult 230-345 conv	24775	MTEP A	Planned	10/2/2021
AM-TP1295-17324-J1055-GLACIER WF	129346	Generator	Planned	10/15/2021
AM-BASECASE-MACHINE DATA-UPDATES_ALSEY-G2-MOD32	148562	Generator	In Service	10/25/2021
AM-BASECASE-MACHINE DATA-UPDATES_G545	148564	Generator	In Service	10/25/2021
AM-TP1392-18311-J813	129475	Generator	Planned	10/31/2021
AM-TP1443-Upgrade Casey West-Sullivan 345 kV line	142114	Generator	Planned	10/31/2021
AM-TP1028-13795-Cahokia-Roxford	119150	MTEP A	Planned	11/1/2021
AM-J845-TP1400-18321-Ford WF	131740	Generator	Planned	11/1/2021
AM-TP970-12964-Boar Substation	23693	MTEP A	Planned	12/1/2021
AM-TPSIRP004-11928-Commodore 230-345kV conversion	24771	MTEP A	Planned	12/1/2021
AM-TP928-11966-Gateway Substation	25364	MTEP A	Planned	12/1/2021
AM-TP1024-15524-Sioux 345-138kV TX Replacement	118098	MTEP A	Planned	12/1/2021
AM-TP1121-16491-Sioux_Meppen-Sioux-Huster	120183	MTEP A	Planned	12/1/2021
AM-TP1129-16554-Maline	120206	MTEP A	Planned	12/1/2021
AM-TP1184-7862-Galena	120899	MTEP A	Planned	12/1/2021
AM-TP1133-17065-Tegler Breakers	123802	MTEP A	Planned	12/1/2021
AM-TP597-17224-Pershall substation	123814	MTEP A	Planned	12/1/2021
AM_DG_DG18003-Canton South	129499	Generator	Planned	12/1/2021
AM-TP1273-16709-Venice-ashely	130548	MTEP A	Planned	12/1/2021
AM-TP868-9733-Page Over stress breakers	130568	MTEP B	Target MTEP A	12/1/2021
AM-TP1291-11951-J800 BMTWN solar	134381	Generator	Planned	12/1/2021
AM-TP1047-17344-Berkeley sub repl brkers	140613	MTEP A	Planned	12/1/2021
AM-TP1257-15329-St Franc-Rivermines-2-Rebuild	140709	MTEP A	Planned	12/1/2021

MOD Project Name	MOD ID	Project Type	Status	MOD Effective Date
AM-TP1020-17829 Loose Creek Reactor	130604	MTEP A	Planned	12/2/2021
AM_TP866_9732-Mason Breaker replacement	119545	MTEP A	Planned	12/8/2021
AM-TP1256-16227 Marblehead Terminal upgrade	119619	MTEP A	Planned	12/8/2021
AM-TP1442-J1102-20905-Mulligan Solar	143348	Generator	Planned	12/21/2021
AM-TP1158-16793-Montgomery B12 upgrade	144064	MTEP A	Planned	12/30/2021
AM-TP1305-17665-Barrett Station 2nd TX	129914	MTEP A	Planned	12/31/2021
AM-TP1395-18315-J844-Sandburg WF	130902	Generator	Planned	5/1/2022
AM-TP1394-18314-J826 McLean WF	131119	Generator	Planned	5/1/2022
AM-TP1401-18322-J848	134029	Generator	Planned	5/28/2022
AM-TP938-11947-Greenback Substation	24560	MTEP A	Planned	6/1/2022
AM-TP965-12173-Miller substation	24680	MTEP A	Planned	6/1/2022
AM-TP974-15528-Dirksen	108686	MTEP A	Planned	6/1/2022
AM-TP891-9830-Meramec-Jachim	125768	MTEP A	Planned	6/1/2022
AM-TP1269-16705-Pana-Shelbyville Rebuild	130545	MTEP A	Planned	6/1/2022
AM-MB23-9843_20365-Normal E 138/69kV TX	136900	MTEP A	Planned	6/1/2022
AM-TP1416-19085-Shelbyville ring bus	139300	MTEP A	Planned	6/1/2022
AM-TP1433-19968-J1025-Fabius Substation	140454	Generator	Planned	6/1/2022
AM-TP1283-16990-Kline Ring Bus	141043	MTEP A	Planned	6/1/2022
AM-TP1359-18085-Tazewell XFMR 1 Replacement	141208	MTEP A	Planned	6/1/2022
AM-TP1339-18034-Tazewell Bkr Replacements	141475	MTEP A	Planned	6/1/2022
AM-TP735-17644-Rt51 sub	141497	MTEP A	Planned	6/1/2022
AM-TP1351-18074-Jacksonville IP BKR 1302	142254	MTEP A	Planned	6/1/2022
AM-TP914-11906-Casey West-Kansas 345 kV Line	142257	MTEP A	Planned	6/1/2022
AM-TP1458-21325-Rossville-Vermilion-Rebuild	144695	MTEP B	Target MTEP A	6/1/2022
AM-TP1381-18250-Robinson STATCOM	130919	MTEP A	Planned	6/2/2022
AM-TP1145-15490-Rador Breaker Additions	141484	MTEP A	Planned	6/2/2022
AM_DG18005 - Pilot Grove Solar 25 MW hamilton	129503	Generator	Planned	6/30/2022
AM_DG18006 Blue Willow Solar 25 MW Blandsville	129505	Generator	Planned	6/30/2022

3.3 Monitoring and contingencies

3.3.1 Monitor

Monitor all 100 kV and above facilities in areas AECI, SIPC, AMMO, and AMIL.

3.3.2 Contingencies

NERC Category P1, P2, P4, P5, and P7 used in MTEP21 study of facilities within areas AECI, SIPC, AMMO, and AMIL.

Category P3 contingencies were created using all single generator contingencies (P1-1), extracted from the P1 contingencies provided above, combined with all P1 contingencies provided above. To limit the number of possible P3 combinations:

- Only Category P1 events of facilities 100 kV or above within 8 (eight) Buses from the Study Unit(s) were used in creating the required P3 combinations.
- Generator contingencies (Category P1-1) with aggregated generation above 50 MW were used in creating the required P3 contingencies.

Similarly, Category P6 contingencies were created using all non-generator contingencies (P1-2 to P1-5) of facilities 100 kV or above within 8 (eight) Buses from the Study Unit(s).

Per Ameren Local Planning Criteria additional system sensitivity analysis was also performed.

- Non-coincident peak load in the Summer Peak case
- Winter Storm Uri scenario from February 15, 2021, using the State Estimator Model
    - Additional contingencies run by Ameren Transmission were also added to this analysis

4. STUDY CRITERIA

4.1 Applicable Reliability Criteria

4.1.1 Steady State Thermal Reliability Criteria

Ameren Transmission Planning Criteria applied for thermal analysis:

- For System Intact (NERC Category P0), all thermal loadings within 95% of the normal rating.
- For NERC Category P1-P7 contingencies, all thermal loadings within 95% of the emergency rating.

Southern Illinois Power Cooperative Transmission Planning Criteria applied for thermal analysis:

- For System Intact (NERC Category P0), all thermal loadings within 100% of the normal rating.
- For NERC Category P1-P7 contingencies, all thermal loadings within 100% of the emergency rating.

4.1.2 Steady State Voltage Reliability Criteria

Ameren Transmission Planning Criteria applied for voltage analysis:

- For NERC Category P0 (System Intact) – Pre-Contingent
- For NERC Category P1-P7 contingencies – Post-Contingent

Rated Voltage	Pre-Contingent		Post-Contingent	
	Min PU	Max PU	Min PU	Max PU
345	0.95	1.05	0.95	1.075
230, 161, 138	0.95	1.05	0.93	1.075

Southern Illinois Power Cooperative Transmission Planning Criteria applied for voltage analysis:

- For NERC Category P0 (System Intact) – Pre-Contingent
- For NERC Category P1-P7 contingencies – Post-Contingent

Rated Voltage	Pre-Contingent		Post-Contingent	
	Min PU	Max PU	Min PU	Max PU
All	0.95	1.07	0.91	1.09

4.1.3 Stability Analysis Monitored Facilities and Performance Criteria

MISO will monitor all generators and buses within the AMMO and AMIL control area. Simulation results will be interpreted and compiled against MISO planning criteria.

The following criteria will be used to evaluate the simulation results:

- All on-line generating units are stable
- No unexpected generator tripping
- Post-fault transient voltage limits: 1.2 per unit maximum, 0.7 per unit minimum
- Post-fault steady-state voltage limits: 1.1 per unit maximum, 0.9 per unit minimum
- All machine rotor angle oscillations must be positively damped with a minimum damping ratio of 0.81633% for disturbances with a fault or 1.6766% for line trips without a fault
- Ameren transient voltage recovery criteria:
  - Following the clearing of a fault resulting from single or multiple contingency events (Planning Events P1- P7), transmission voltages should return to 80% of nominal or greater within two seconds and 90 % of nominal or greater within ten seconds unless the system becomes radial following the outage of multiple contingencies.
  - Small signal analysis would show satisfactorily damped post-disturbance response with damping ratios of 3% or higher with modelled excitation system parameters based on field-tested data. Otherwise, damping ratios of 5% or greater would demonstrate satisfactory damping.
- Local Planning Criteria, if applicable as determined by the Transmission Owner

4.2 MISO Transmission Planning BPM SSR Criteria

In accordance with MISO BPM-020, System Support Resource (SSR) criteria for determining if an identified facility is impacted by the generator change of status are:

- Under NERC Category P0 conditions and category P1-P7 contingencies, branch thermal violations are only valid if the flow increase on the element in the "after" retirement scenario is equal to or greater than:
  - Five percent (5%) of the "to-be-retired" unit(s) MW amount (i.e. 5% PTDF) for a "base" violation compared with the "before" scenario, or
  - Three percent (3%) of the "to-be-retired" unit(s) MW amount (i.e. 3% OTDF) for a "contingency" violation compared with the "before" scenario.
- Under NERC category P0 conditions and category P1-P7 contingencies, high and low voltage violations are only valid if the change in voltage is greater than one percent (1%) as compared to the "before" scenario

Available mitigation may be applied for the valid NERC Category P1-P7 thermal and voltage violations describe above as allowed by NERC Standards.

- The need for the SSR is determined by the presence of unresolved violations of reliability criteria that can only be alleviated by the SSR generator and where no other mitigation is available.
- Evaluation of mitigation solutions will consider the use of operating procedures and practices such as equipment switching and post-contingent Load Shedding plans allowed in the operating horizon.

Ameren LPC will also be accounted for when determining if the facility will be required as an SSR and when determining potential mitigations for identified violations.

5. STUDY METHODOLOGY

5.1 Steady-State Performance Analysis

PTI – PSS/E version 34 and PowerGEM – TARA version 2102.1 were used to perform AC contingency analysis and SCED. Cases were solved with automatic control of LTCs, phase shifters, DC taps, switched shunts enabled (regulating), and area interchange disabled. Contingency analysis was performed on before and after cases. The results were compared to find if there were any criteria violations due to the unit(s) change of status.

5.2 Stability Analysis

MISO's stability analysis examined the impact of the Retiring Generating Facility by evaluating local and regional stability performance on the MISO transmission system in the Bench and Study cases. The most recent dynamics data from Ameren was used to develop these cases. DSATools – TSAT was used to perform transient voltage analyses. Fault analysis was performed on bench and study cases for the fault lists as specified by Ameren. The results were compared to find if there are any criteria violations due to the unit(s) change of status.

6. STABILTIY RESULTS

MISO's stability analysis identified violations that result in the loss of load due to Transient Voltage Recovery (TVR) issues with the suspension of *Rush Island 1 and 2*, including several scenarios that result in cascading voltage issues and loss of load. Detailed below are the contingencies with the most severe impact on the transmission system due to the suspension of *Rush Island 1 and 2*. Appendix 10.1 includes further information and the full results of MISO's stability study.

6.1.1 2022 Summer Shoulder TVR Issues

- No TVR violations met MISO or Ameren LPC criteria within the study area

6.1.2 2022 Summer Low Load TVR Issues

- No TVR violations met MISO or Ameren LPC criteria within the study area

6.1.3 2022 Winter Peak TVR Issues

- No TVR violations met MISO or Ameren LPC criteria within the study area

6.1.4 2022 Summer Peak TVR Issues

- The TVR violations reported in Table 7-I detail the most severe violations for the 2022 Summer Peak case.

6-I Top Voltage Violations 2022 Summer Peak Offline Case

Con Name	Monitored Bus	Vmin	Voltage Threshold	Duration	Time Threshold	Load At Risk
[redacted]	345156	0.7616	0.9000	5.517	3.000	1031 MW
[redacted]	345156	0.7612	0.9000	5.004	3.000	1017 MW
[redacted]	345156	0.7606	0.9000	3.4	3.000	1032 MW
[redacted]	345156	0.7613	0.9000	3.4	3.000	1023 MW
[redacted]	345148	0.7525	0.9000	3.284	3.000	1119 MW

7. STEADY STATE RESULTS

Appendices 10.2 of this report includes all constrained elements impacted by the suspension of *Rush Island*.

7.1 2022 Summer Shoulder Analysis

Analysis of the 2022 Summer Shoulder case identified the following

7.1.1 2022 Summer Shoulder Post-Contingent Thermal Overloads

- No thermal overloads met the MISO SSR criteria
    - ≥ 3% OTDF or ≥ 5% PTDF of the study unit

7.1.2 2022 Summer Shoulder Post-Contingent Voltage Issues

- No voltage violations met the MISO SSR criteria
    - ≥ +/- 1% adverse impact of study unit

7.2 2022 Summer Low Load Analysis

Analysis of the 2022 Summer Low Load case identified the following

7.2.1 2022 Summer Low Load Post-Contingent Thermal Overloads

- No thermal overloads met the MISO SSR criteria
  - ≥ 3% OTDF or ≥ 5% PTDF of the study unit

7.2.2 2022 Summer Low Load Post-Contingent Voltage Issues

- The top Post-Contingent voltage issues reported in Table 6-IV met the MISO SSR criteria
  - +/- 1% adverse impact of study unit
- All Post-Contingent voltage issues that met the MISO SSR Criteria can be mitigated
  - Details are provided in Appendix 10.2
- Pre-Existing and Non-SSR issues are provided for informational purposes

7-I Top Post-Contingent Voltage Issues 2022 Summer Low Load Offline Case

Area Name	Monitored Bus	Voltage [ON]	Voltage [OFF]	Voltage [DIF] (>1%)
AMMO	345301	0.9368	0.9231	-0.0137
AMMO	345302	0.9368	0.9231	-0.0137
AMMO	345301	0.9368	0.9231	-0.0137
AMMO	345302	0.9368	0.9231	-0.0137
AMMO	345305	0.9368	0.9231	-0.0137
AMMO	345305	0.9368	0.9231	-0.0137

7.3 2022 Summer Peak Analysis

Analysis of the 2022 Summer Peak case identified the following

7.3.1 2022 Summer Peak Post-Contingent Thermal Overloads

- No thermal overloads met the MISO SSR criteria
  - ≥ 3% OTDF or ≥ 5% PTDF of the study unit

7.3.2 2022 Summer Peak Post-Contingent Voltage Issues

- The top Post-Contingent voltage issues reported in Table 6-VI met the MISO SSR criteria
  - +/- 1% adverse impact of study unit
- All Post-Contingent voltage issues that met the MISO SSR Criteria can be mitigated
  - Details are provided in Appendix 10.2
- Pre-Existing and Non-SSR issues are provided for informational purposes

7-II Top Post-Contingent Voltage Issues 2022 Summer Peak Offline Case

Area Name	Monitored Bus	Voltage [ON]	Voltage [OFF]	Voltage [DIF] (>1%)
AMMO	345310	0.9404	0.9263	-0.0141
AMMO	345310	0.9404	0.9266	-0.0138
AMMO	345485	0.9362	0.9233	-0.0129
AMMO	345486	0.9362	0.9233	-0.0129
AMMO	345489	0.9362	0.9233	-0.0129

7.4 2022 Winter Peak Analysis

Analysis of the 2022 Summer Peak case identified the following

7.4.1 2022 Winter Peak Post-Contingent Thermal Overloads

- No thermal overloads met the MISO SSR criteria
  - ≥ 3% OTDF or ≥ 5% PTDF of the study unit

7.4.2 2022 Winter Peak Post-Contingent Voltage Issues

- The top Post-Contingent voltage issues reported in Table 6-VI met the MISO SSR criteria
  - +/- 1% adverse impact of study unit
- All Post-Contingent voltage issues that met the MISO SSR Criteria can be mitigated
  - Details are provided in Appendix 8.2
- Pre-Existing and Non-SSR issues are provided for informational purposes

7-III Top Post-Contingent Voltage Issues 2022 Winter Peak Offline Case

Area Name	Monitored Bus	Voltage [ON]	Voltage [OFF]	Voltage [DIF] (>1%)
AMMO	344099	0.9354	0.9253	-0.0101
AMMO	344094	0.9354	0.9253	-0.0101
AMMO	345301	0.9315	0.9214	-0.0101
AMMO	345302	0.9315	0.9214	-0.0101
AMMO	345305	0.9315	0.9214	-0.0101
AMMO	345485	0.9397	0.927	-0.0127
AMMO	345485	0.9397	0.927	-0.0127
AMMO	345486	0.9397	0.9269	-0.0128
AMMO	345486	0.9397	0.9269	-0.0128
AMMO	345489	0.9397	0.9269	-0.0128
AMMO	345489	0.9397	0.9269	-0.0128

8. LOCAL PLANNING CRITERIA ANALYSIS

Ameren Local Planning Criteria and NERC TPL standards require that the transmission system be evaluated under NERC Category P0 through P7 contingencies for core scenarios involving Summer Peak, Light Load, Winter Peak and Summer Shoulder Scenarios. MISO's Attachment Y and Y2 results indicate that there would be both thermal and Voltage violations for these core scenarios which require Rush Island generation to be designated as SSR until those violations are mitigated. Here are the four violations in three different scenarios that require mitigation.

1. Winter Peak Scenario: Wildwood 345 /138 kV transformer would overload for the [redacted] with Rush Island generation offline. Ameren's LPC in section 2.2.2.1 requires that no interruption of firm transmission service will be permitted for P6 outages involving two 345 kV lines. Apart from thermal violation, under winter peak scenario there was a Voltage violation at Overton 345 kV substation for the [redacted] which will require a mitigation as per the NERC standards and Ameren LPC.
2. Summer Light Load Scenario: Rush Island 345 kV bus tie would overload for the [redacted] with Rush Island generation offline. This overload needs to be mitigated as per Ameren's LPC.
3. Summer Peak Scenario: Moro – Laclede North section of Wood River – North Staunton 138 kV line would overload for the [redacted] This violation needs to be mitigated as per Ameren's LPC and NERC TPL standard. After the Rush Island Y2 report has been published Ameren has aligned the In-Service Dates of the Moro Project (MISO Project id# 11948) and Roxford Transformer addition (MISO Project Id#19988) which would mitigate the thermal violation on this 138 kV line.

Apart from core scenarios mentioned above, Ameren's Local Planning Criteria (LPC) and NERC Transmission Planning standards also require that assessments of the transmission system be made with wide ranging scenarios from system peak load to various weather sensitivities. For this Attachment Y study, Ameren Transmission team suggested to consider two specific scenarios on top of the core scenarios that were considered, these include Non-Coincident 1 day in 10-year peak load and Winter Storm Uri.

Ameren recognizes that the issues identified under the Ameren's Local Planning Criteria are sensitivity scenarios that needs mitigation but should not be utilized for the designation of the Rush Island as an SSR.

Ameren Transmission team working with MISO evaluated the impact of Rush Island generation retirement under these scenarios and the results are included in Appendix 10.3.

Non-Coincident peak load scenario:

In this scenario, non-coincident peak loads were utilized for the Ameren Missouri and Ameren Illinois control areas instead of MISO coincident peak load. The rationale for choosing this scenario was to test the impact of Rush Island retirement during summer peak conditions as the weather in the St. Louis Metropolitan area has historically shown hotter conditions compared to the rest of MISO. Ameren believes that this is a high likely scenario and recommended that this scenario be evaluated with Rush Island Generation offline. The results of this scenario indicate that there could be voltage issues in the St. Louis Metro East and Metro South regions under single contingency (N-1) conditions.

For the outage of [redacted] the voltage at Dupo Ferry, Valmeyer and Selma substations could drop below acceptable levels without Rush Island generation. These voltages are below acceptable values from Ameren's planning criteria and will require a mitigation.

Winter Storm Uri Scenario:

Ameren requested MISO team to consider impact of Rush Island generation offline during Winter Storm Uri as the second sensitivity scenario. MISO utilized state estimator model to evaluate this scenario, and when Rush Island generation was turned offline the power flow case became unstable. MISO had to dispatch Callaway generation even though this plant was offline during Winter Storm Uri. The instability in the power flow case indicates that there is a potential for a local area collapse if Rush Island generation would have been offline during this time. The local area collapse could exceed 1500 MW in the St. Louis metro area and could have affected significant number of customers in both Ameren Missouri and Ameren Illinois.

The results of the analysis showed multiple thermal issues for NERC Category P3 (N-1 + Generator) and significant number of thermal issues (more than 80 unique overloads) for category P6 (N-1-1) contingency events. Ameren recommends that the issues identified for NERC P1 (N-1) and P3 (N-1+ Generator) events be mitigated for this scenario.

There was a total of nine thermal issues identified under P1 and P3 events, out which five of them could be mitigated either with projects currently under construction or with projects that are in advanced stages of planning like MISO LRTP Tranche 1. There are four thermal violations that Ameren recommends be mitigated which include the overloads on

(1) Effingham NW – Neoga South 138 kV line
(2) Hannibal West – Palmyra 161 kV line
(3) Spalding – Hannibal West 161 kV line
(4) Coffeen North – Roxford 345 kV line.

9. ALTERNATIVES ANALYSIS

9.1 New Generation or Generation Re-dispatch

No new generation interconnection projects provide immediate mitigation for the reliability issue.

Investigation of the possibility of converting Rush Island Units 1 and 2 into synchronous condenser units as presented in stakeholder feedback showed that it would likely alleviate the transient voltage recovery violations identified. However, the conversion could not be completed before the requested suspension date and was unable to resolve the steady state issue identified.

Re-dispatch of existing generation was determined to be ineffective or unavailable for the type and category of violations identified.

9.2 System Reconfiguration and Operating Guides

No operating guides are currently available to provide system reconfiguration to resolve the violations identified and none were presented as alternatives during stakeholder feedback.

9.3 Demand Response or Load Curtailment

No contracted demand response alternative exists to provide load curtailment relief for the reliability issues identified in the study.

Investigation of the load curtailment plan provided during stakeholder feedback determined that it would require manual intervention. Therefore, this alternative could not be activated in time to meet transient voltage recovery criteria.

9.4 Transmission Projects

Several planned or proposed transmission projects outlined below are required to address the violations identified. Analysis results indicate that the completion of these transmission projects would sufficiently mitigate the reliability issues that require the continued operation of Rush Island Units 1 and 2 as an SSR units and eliminate the need for the SSR Agreement. However, these projects are unable to be completed in time for the requested suspension date.

9-I Planned/Proposed Transmissions Projects

#	Constraint	MISO Project ID	Mitigation	Estimated ISD
1	Overton Voltage issue	22807	Install 67 MVAR Cap bank at Overton 161 kV substation	4/1/2024
2	Rush Island 345 kV bus tie	22808	Upgrade 345 kV bus conductor at Rush Island to 3000 Amps	4/1/2024

3	Wildwood 345/138 kV transformer overload	22786	Upgrade 560 MVA transformer to 700 MVA transformer	4/1/2024
4	Address TVR issues	22065; 22808	Install 250 MVAR STATCOM's at Bugle, Arnold, Mason, and Highway N substations	6/1/2025

10. CONCLUSION

After being reviewed for power system reliability impacts as provided for under Section 38.2.7 of MISO's Open Access Transmission, Energy, and Operating Reserve Markets Tariff ("Tariff"), the analysis determined that there are reliability issues identified related to the suspension of *Rush Island* that require the generators to be designated as System Support Resources ("SSR") units.

There were both severe steady state and stability violations that would require the generators to be designated SSR units. In the summer peak case, there were five stability violations that did not meet Ameren voltage recovery criteria and would result in over 1,000 MW of load loss, which, if allowed, would be considered a potential Interconnection Reliability Operating Limit (IROL) within the MISO footprint in accordance with BPM-020 Section L.3.6. All voltage violations seen can be mitigated with load shed per MISO SSR criteria and additionally per WVPA there already exists operating guides to mitigate the known issues.

Prior to this Attachment Y, MISO also studied an Attachment Y-2 submitted by Union Electric Company – Ameren Missouri. This study had an effective date of June 1, 2023, but there were no other changes to study assumptions or system topology between the time the Attachment Y was submitted and the final Y-2 report. Therefore, the results of the Attachment Y-2 study will also be used to determine SSR need. The Attachment Y-2 report is included as an Appendix to this Attachment Y report. Three thermal violations were identified in three different scenarios in 2023 that require mitigation based on Ameren's Local Planning Criteria. One steady state voltage violation was identified for the winter peak case in 2023 and several stability voltage violations were identified for the summer peak case in 2023 that require *Rush Island* to be designated as System Support Resources ("SSR") units.

In addition, MISO performed an analysis to determine if both units are required to mitigate the violations identified. That analysis determined that with one unit online, violations still exist such that *Rush Island 1 and 2* would both need to be designated as System Support Resources ("SSR") units.

11. APPENDICES

11.1 Stability Study Results

Appendix 10.1 is attached to this report.

11.2 Steady State Study Results

Appendix 10.2 is attached to this report

11.3 Sensitivity Study Results

Appendix 10.3 is attached to this report. For the Winter Storm Uri case, the files with the format "Winter_Storm_Uri_[Result Type]" were run by MISO and the file labelled with "Ameren" was run by Ameren. For the Non-Coincident Load case, the file labelled "2022SP_NC" is the transient voltage recovery analysis results and the files with the format "Non-Coincident_Load_[Result Type]" are the steady state analysis results.

11.4 Attachment Y-2 Report

Appendix 10.4 is attached to this report.

11.5 Possible SSR Mitigations Analysis

11.5.1 Overview

Additional mitigation analysis was also conducted for this study to determine whether both units are needed for grid reliability. The analysis determined that there are reliability issues identified related to the suspension of *Rush Island* that would require both generators to be designated as a System Support Resources ("SSR") units. There still exists one TVR violation that did not meet Ameren voltage recovery criteria and would result in over 1,000 MW load loss. Further details regarding this analysis are provided in Appendix 10.5.2.

11.5.2 SSR Mitigation Analysis Results

Appendix 10.5.2 is attached to this report.

11.6 Preliminary SSR Cost Allocation

Column descriptions:

- EP Node - Registered load EP Node name in the MISO Commercial model for the period analyzed
- Season - Seasonal conditions (e.g. Summer, Shoulder) for which the constraint occurs
- Constraint - Thermal or voltage proxy constraint which was identified to require the need for the SSR unit
- Ctg Type - The contingency category defined by NERC Reliability Standards
- Ctg - The contingency event causing the thermal or voltage constraint
- Dist Factor - The load distribution factor calculated for the load EP Node

11-I Preliminary Cost Allocation – Impacted EP Nodes

EP Node	Season	Constraint	Ctg Type	Ctg	Dist Factor
L AMMO BRST XFMR_1	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO BRKH2 T2	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO CNWY CNWY_73	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO CNWY CNWY_72	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO ASHLEY00 BUS_D	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO BAB BAB_71	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO VSSL VSSL_71	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO BERK BERK_71	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO BERK BERK_72	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO BERK BERK-84	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO BIGR BIGR_72	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO BLCH BLCH_71	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545

L AMMO CRL CRL_71	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO CNTL CNTL_71	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO EUC EUC_71	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO FRKN FRKN_71_POSN11	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO SDCK SDCK_71	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO GM 13KV_BUS_1	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO GRAT BUS_D	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO LKSH LKSH71	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO LEMY LEMY_71	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO MRSL MRSL_71	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO MASN MASN-71	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO MCLY MCLY_72	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO OFAL OFAL_71	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO POP BUS_1A	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO PTPR PTPR_71	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO RKWD RKWD_71	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO RUSL RUSL_71	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO SAND3 SAND_72	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO WRSN WRSN_71	2022 Summer Peak	RUSH_ISLAND_SSR_0001	P1	[redacted]	0.9545
L AMMO BRST XFMR_1	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545
L AMMO BRKH2 T2	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545
L AMMO CNWY CNWY_73	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545
L AMMO CNWY CNWY_72	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545

L AMMO ASHLEY00 BUS_D	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545
L AMMO BAB BAB_71	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545
L AMMO VSSL VSSL_71	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545
L AMMO BERK BERK_71	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545
L AMMO BERK BERK_72	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545
L AMMO BERK BERK-84	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545
L AMMO BIGR BIGR_72	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545
L AMMO BLCH BLCH_71	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545
L AMMO CRL CRL_71	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545
L AMMO CNTL CNTL_71	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545
L AMMO EUC EUC_71	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545
L AMMO FRKN FRKN_71_POSN11	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545
L AMMO SDCK SDCK_71	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545
L AMMO GM 13KV_BUS_1	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545
L AMMO GRAT BUS_D	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545
L AMMO LKSH LKSH71	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545
L AMMO LEMY LEMY_71	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545
L AMMO MRSL MRSL_71	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545
L AMMO MASN MASN-71	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545
L AMMO MCLY MCLY_72	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545
L AMMO OFAL OFAL_71	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545
L AMMO POP BUS_1A	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545
L AMMO PTPR PTPR_71	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545

L AMMO RKWD RKWD_71	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545
L AMMO RUSL RUSL_71	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545
L AMMO SAND3 SAND_72	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545
L AMMO WRSN WRSN_71	2022 Summer Peak	RUSH_ISLAND_SSR_0002	P1	[redacted]	0.9545
L AMMO BRST XFMR_1	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO BRKH2 T2	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO CNWY CNWY_73	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO CNWY CNWY_72	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO ASHLEY00 BUS_D	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO BAB BAB_71	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO VSSL VSSL_71	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO BERK BERK_71	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO BERK BERK_72	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO BERK BERK-84	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO BIGR BIGR_72	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO BLCH BLCH_71	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO CRL CRL_71	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO CNTL CNTL_71	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO EUC EUC_71	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO FRKN FRKN_71_POSN11	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO SDCK SDCK_71	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO GM 13KV_BUS_1	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO GRAT BUS_D	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546

L AMMO LKSH LKSH71	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO LEMY LEMY_71	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO MRSL MRSL_71	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO MASN MASN-71	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO MCLY MCLY_72	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO OFAL OFAL_71	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO POP BUS_1A	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO PTPR PTPR_71	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO RKWD RKWD_71	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO RUSL RUSL_71	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO SAND3 SAND_72	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO WRSN WRSN_71	2022 Summer Peak	RUSH_ISLAND_SSR_0003	P1	[redacted]	0.9546
L AMMO BRST XFMR_1	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMMO BRKH2 T2	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMMO CNWY CNWY_73	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMMO CNWY CNWY_72	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMMO ASHLEY00 BUS_D	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMMO BAB BAB_71	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMMO VSSL VSSL_71	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMMO BERK BERK_71	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMMO BERK BERK_72	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMMO BERK BERK-84	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMMO BIGR BIGR_72	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545

L AMMO BLCH BLCH_71	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMMO CRL CRL_71	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMMO CNTL CNTL_71	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMMO EUC EUC_71	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMMO FRKN FRKN_71_POSN11	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMMO SDCK SDCK_71	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMMO GM 13KV_BUS_1	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMMO GRAT BUS_D	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMMO LKSH LKSH71	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMMO LEMY LEMY_71	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMMO MRSL MRSL_71	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMMO MASN MASN-71	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMMO MCLY MCLY_72	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMMO OFAL OFAL_71	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMMO POP BUS_1A	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMMO PTPR PTPR_71	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMMO RKWD RKWD_71	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMMO RUSL RUSL_71	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMMO SAND3 SAND_72	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMMO WRSN WRSN_71	2022 Summer Peak	RUSH_ISLAND_SSR_0004	P1	[redacted]	0.9545
L AMIL VENICE_C 14KV_2001	2022 Summer Peak	RUSH_ISLAND_SSR_0005	P1	[redacted]	0.9608
L AMIL CAHOKIA BUS_1	2022 Summer Peak	RUSH_ISLAND_SSR_0005	P1	[redacted]	0.9608
L AMIL GCTY_STL 69	2022 Summer Peak	RUSH_ISLAND_SSR_0005	P1	[redacted]	0.9608

L AMIL GCLDAREA AIRPROD	2022 Summer Peak	RUSH_ISLAND_SSR_0005	P1	[redacted]	0.9608
L AMIL WANDA_IP TR2_12KV	2022 Summer Peak	RUSH_ISLAND_SSR_0005	P1	[redacted]	0.9608
L AMIL STALLING STLG_3331	2022 Summer Peak	RUSH_ISLAND_SSR_0005	P1	[redacted]	0.9608
L AMIL COT_HLS CTHL_3320	2022 Summer Peak	RUSH_ISLAND_SSR_0005	P1	[redacted]	0.9608
L AMIL GCLDAREA LD3	2022 Summer Peak	RUSH_ISLAND_SSR_0005	P1	[redacted]	0.9608
L AMIL WOODRIVE RAT1	2022 Summer Peak	RUSH_ISLAND_SSR_0005	P1	[redacted]	0.9608
L AMIL WOODRIVE WOODRIVE_3472	2022 Summer Peak	RUSH_ISLAND_SSR_0005	P1	[redacted]	0.9608
L AMIL 6658_TP1 CST1	2022 Summer Peak	RUSH_ISLAND_SSR_0005	P1	[redacted]	0.9608
L AMIL MADIND TR3	2022 Summer Peak	RUSH_ISLAND_SSR_0005	P1	[redacted]	0.9608
L AMIL VENICE_C 14KV_2001	2023 Winter Peak	RUSH_ISLAND_SSR_0006	P1	[redacted]	0.9608
L AMIL CAHOKIA BUS_1	2023 Winter Peak	RUSH_ISLAND_SSR_0006	P1	[redacted]	0.9608
L AMIL GCTY_STL 69	2023 Winter Peak	RUSH_ISLAND_SSR_0006	P1	[redacted]	0.9608
L AMIL GCLDAREA AIRPROD	2023 Winter Peak	RUSH_ISLAND_SSR_0006	P1	[redacted]	0.9608
L AMIL WANDA_IP TR2_12KV	2023 Winter Peak	RUSH_ISLAND_SSR_0006	P1	[redacted]	0.9608
L AMIL STALLING STLG_3331	2023 Winter Peak	RUSH_ISLAND_SSR_0006	P1	[redacted]	0.9608
L AMIL COT_HLS CTHL_3320	2023 Winter Peak	RUSH_ISLAND_SSR_0006	P1	[redacted]	0.9608
L AMIL GCLDAREA LD3	2023 Winter Peak	RUSH_ISLAND_SSR_0006	P1	[redacted]	0.9608
L AMIL WOODRIVE RAT1	2023 Winter Peak	RUSH_ISLAND_SSR_0006	P1	[redacted]	0.9608

L AMIL WOODRIVE WOODRIVE_3472	2023 Winter Peak	RUSH_ISLAND_SSR_0006	P1	[redacted]	0.9608
L AMIL 6658_TP1 CST1	2023 Winter Peak	RUSH_ISLAND_SSR_0006	P1	[redacted]	0.9608
L AMIL MADIND TR3	2023 Winter Peak	RUSH_ISLAND_SSR_0006	P1	[redacted]	0.9608
L AMIL VENICE_C 14KV_2001	2023 Summer Peak	RUSH_ISLAND_SSR_0007	P1	[redacted]	0.9608
L AMIL CAHOKIA BUS_1	2023 Summer Peak	RUSH_ISLAND_SSR_0007	P7	[redacted]	0.9608
L AMIL GCTY_STL 69	2023 Summer Peak	RUSH_ISLAND_SSR_0007	P7	[redacted]	0.9608
L AMIL GCLDAREA AIRPROD	2023 Summer Peak	RUSH_ISLAND_SSR_0007	P7	[redacted]	0.9608
L AMIL WANDA_IP TR2_12KV	2023 Summer Peak	RUSH_ISLAND_SSR_0007	P7	[redacted]	0.9608
L AMIL STALLING STLG_3331	2023 Summer Peak	RUSH_ISLAND_SSR_0007	P7	[redacted]	0.9608
L AMIL COT_HLS CTHL_3320	2023 Summer Peak	RUSH_ISLAND_SSR_0007	P7	[redacted]	0.9608
L AMIL GCLDAREA LD3	2023 Summer Peak	RUSH_ISLAND_SSR_0007	P7	[redacted]	0.9608
L AMIL WOODRIVE RAT1	2023 Summer Peak	RUSH_ISLAND_SSR_0007	P7	[redacted]	0.9608
L AMIL WOODRIVE WOODRIVE_3472	2023 Summer Peak	RUSH_ISLAND_SSR_0007	P7	[redacted]	0.9608
L AMIL 6658_TP1 CST1	2023 Summer Peak	RUSH_ISLAND_SSR_0007	P7	[redacted]	0.9608
L AMIL MADIND TR3	2023 Summer Peak	RUSH_ISLAND_SSR_0007	P7	[redacted]	0.9608
L AMMO BRST XFMR_1	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465
L AMMO BRKH2 T2	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465
L AMMO CNWY CNWY_73	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465
L AMMO CNWY CNWY_72	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465
L AMMO ASHLEY00 BUS_D	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465
L AMMO BAB BAB_71	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465

L AMMO VSSL VSSL_71	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465
L AMMO BERK BERK_71	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465
L AMMO BERK BERK_72	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465
L AMMO BERK BERK-84	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465
L AMMO BIGR BIGR_72	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465
L AMMO BLCH BLCH_71	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465
L AMMO CRL CRL_71	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465
L AMMO CNTL CNTL_71	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465
L AMMO EUC EUC_71	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465
L AMMO FRKN FRKN_71_POSN11	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465
L AMMO SDCK SDCK_71	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465
L AMMO GM 13KV_BUS_1	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465
L AMMO GRAT BUS_D	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465
L AMMO LKSH LKSH71	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465
L AMMO LEMY LEMY_71	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465
L AMMO MRSL MRSL_71	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465
L AMMO MASN MASN-71	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465
L AMMO MCLY MCLY_72	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465
L AMMO OFAL OFAL_71	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465
L AMMO POP BUS_1A	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465
L AMMO PTPR PTPR_71	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465
L AMMO RKWD RKWD_71	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465
L AMMO RUSL RUSL_71	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465

L AMMO SAND3 SAND_72	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465
L AMMO WRSN WRSN_71	2023 Summer Peak	RUSH_ISLAND_SSR_0008	P4	[redacted]	0.9465

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of Union Electric Company d/b/a Ameren Missouri's Tariffs to Adjust Its Revenues for Electric Service.	)))	Case No. ER-2022-0337

AFFIDAVIT OF MARK BIRK

STATE OF MISSOURI)
) ss
CITY OF ST. LOUIS)

Mark Birk, being first duly sworn states:

My name is Mark Birk and on my oath declare that I am of sound mind and lawful age; that I have prepared the foregoing *Direct Testimony*; and further, under the penalty of perjury, that the same is true and correct to the best of my knowledge and belief.

/s/ Mark Birk
Mark Birk

Sworn to me this 1st day of August, 2022.