ATTACHMENT A

Ameren Missouri
Case Name: EO-2024-0020
Docket No(s): 2023 IRP

Response to Discovery Request: GB-GB 1.2
Date of Response: 1/2/2024
Witness: N/A

Question:For purposes of drafting its IRP, and more specifically as it relates to Chapter 6 of the IRP, did the Company study supply-side resources outside of MISO? If so, please describe. If not, please describe why other resources were not studied.

Response:

Prepared By: Matt Michels
Title: Director, Corporate Analysis
Date: December 18, 2023

Ameren Missouri studies generic resources in its IRP, as required by the Commission's IRP rules. The Company did not explicitly analyze resources assumed to be outside of the MISO footprint.

ATTACHMENT B

Ameren Missouri
Case Name: EO-2024-0020
Docket No(s): 2023 IRP

Response to Discovery Request: GB-GB 2.3 C
Date of Response: 2/13/2024
Witness: N/A

Question:2.3 Please identify all changed circumstances and other factors that explain Ameren Missouri's
decision to model GBE as a resource option in its 2020 Triennial IRP but not in its 2023 Triennial IRP, especially in light of the facts that (1) the portfolio utilizing GBE was the second-highest scoring portfolio in the 2020 Triennial IRP and (2) the development, land acquisition, and regulatory approvals for GBE are significantly more mature in 2023 than they were in 2020.

Response:

Prepared By: Matt Michels
Title: Director, Corporate Analysis
Date: January 30, 2024

Since the filing of its 2020 IRP, Ameren Missouri determined that the best path for evaluation of specific renewable projects is to evaluate them as part of its implementation efforts, such as an RFP process, given that 1) the IRP process is focused on identifying generic resources or resource types for inclusion in the Company's preferred resource plan, 2) the implementation process is not constrained by the statutory deadlines that govern the IRP process, and 3) the Company had already established the potential viability of an option like GBX at a high level in its 2020 IRP.

(Note: The Company uses the abbreviation "GBX" for the Grain Belt Express project for consistency with its prior IRP materials)

ATTACHMENT C

Ameren Missouri
Case Name: EO-2024-0020
Docket No(s): 2023 IRP

Response to Discovery Request: GB-GB 1.3
Date of Response: 12/29/2023
Witness: N/A

Question:In Chapter 6, Section 6.1, the IRP section only references projects within the MISO queue. Why does this Section not include a discussion of renewable resources outside the MISO queue?

Response:

Prepared By: Matt Michels
Title: Director, Corporate Analysis
Date: December 18, 2023

Please see response to GB 1.2.

ATTACHMENT D

Ameren Missouri
Case Name: EO-2024-0020
Docket No(s): 2023 IRP

Response to Discovery Request: GB-GB 1.11
Date of Response: 1/11/2024
Witness: N/A

Question:The IRP provides several statements indicating that the Company is seeking to ensure reliable energy service for customers in all hours and under all conditions, including extreme weather (see for example Chapter 1, page 6).
a. Did the Company consider further investment in regional or alternatively interregional transmission to address such sustainability and resiliency concerns?
b. Did the Company consider investment in geographically diverse supply-side resources to support reliability? If the Company did not consider either or both of these investment strategies, explain why not.
c. Did the Company evaluate the resource adequacy impact associated with highly correlated renewable resources in its service territory? If not, why not?
d. In periods of time when solar projects in Ameren Missouri's "region" or "service territory" are not available, what generating facilities does the Company anticipate will serve its load?
e. How does the Company intend to address challenges associated with natural gas access during periods of extreme weather, particularly in the winter when demand for gas by residential heating customers is high?

Response:

Prepared By: Matt Michels
Title: Director, Corporate Analysis
Date: December 19, 2023

a. Yes, in conjunction with the addition of resources (both demand side and supply side) to ensure sufficiently reliable supply for meeting load. This is detailed in the discussion of the transmission system and transmission upgrades, including those needed to interconnect and deliver energy from new resources, included in Chapter 7 of the 2023 IRP. The costs to Ameren Missouri customers for investments expected as part of MISO's long-range transmission plan (LRTP) are included in the Company's IRP modeling, as are the costs for transmission system investments needed for new resource additions and retirements of existing resources.
b. Yes. While IRP analysis typically involves evaluation of generic resources, including generic resources across a multi-state region, without regard to location, the implementation of the Company's IRP preferred plan includes specific

consideration of the benefits of geographically diverse resources. This is discussed in Chapter 10 of the 2023 IRP on pages 9 and 18.

c. No. The Company does not expect to be able to implement the entirety of its planned renewable resources additions solely in its franchised service territory. Rather, it expects that resources will indeed be geographically dispersed. Selection and execution of projects will happen throughout the course of the planning horizon. Therefore, analysis of resource correlation due to geographic proximity was not performed for the IRP.

d. The Company's IRP analysis, including reliability analysis using Astrape's SERVM model, is performed at a portfolio level. As a result, the needs would be met with a diverse mix of resources whose output would vary depending on market and resource conditions at any given time, so specific dispatchable, storage and renewable resources that may operate at times of low solar production would vary at any given time.

e. Ameren Missouri includes the cost of firm natural gas transportation for new combined cycle gas generators and oil backup for new simple cycle gas generators. The Company also continues to consider the role that hydrogen may plan in generator reliability and emissions reductions.

ATTACHMENT E

Ameren Missouri
Case Name: EO-2024-0020
Docket No(s): 2023 IRP

Response to Discovery Request: GB-GB 1.6
Date of Response: 1/5/2024
Witness: N/A

Question:In Chapter 6, Section 6.1.2, the IRP section appears limited to potential wind projects within Ameren Missouri's region and/or within Missouri. Why does this Section not include a discussion of wind resources outside Ameren Missouri's region and Missouri?

Response:

Prepared By: Lindsey Forsberg
Title: Strategy Consultant, Renewable Energy Development
Date: January 4, 2024

Ameren Missouri is focused on potential wind development in the "Ameren Missouri region" which for purposes of wind development can be defined as Missouri plus states bordering Missouri with projects that can demonstrate deliverability to the Ameren Missouri load (NRIS MISO interconnection). Consideration of new resource development might *start* with a focus on Missouri or Ameren Missouri's service territory specifically, but it certainly does not end there. Section 6.1.2 does include a map (Figure 6.7) that shows wind resource potential (capacity factor, existing and planned developments, and existing and planned transmission lines) across four states: Iowa, Illinois, Missouri, and Kansas. Section 6.1.2 also includes an overview of the MISO 2022 DPP cycle projects and a discussion of how many of those projects are planned for MISO Central or MISO South.

ATTACHMENT F

Ameren Missouri
Case Name: EO-2024-0020
Docket No(s): 2023 IRP

Response to Discovery Request: GB-GB 1.4
Date of Response: 12/29/2023
Witness: N/A

Question:In Chapter 6, Section 6.1.1, the IRP section appears limited to considering potential solar resources within Ameren Missouri's service territory and/or within Missouri. Why does this Section not include a discussion of solar resources outside Ameren Missouri's service territory and Missouri?

Response:

Prepared By: Lindsey Forsberg
Title: Strategy Consultant, Renewable Energy Development
Date: 12/20/2023

Ameren Missouri has not limited its consideration of potential solar resources to only Ameren Missouri's service territory or even just to Missouri. Consideration of new resource development might *start* with a focus on the AMO service territory, but it certainly does not end there. Section 6.1.1 does include a map (Figure 6.4) that shows solar resource potential (capacity factor, existing and planned developments, and existing and planned transmission lines) across multiple states – Missouri, Illinois, Iowa, and Kansas. Section 6.1.1 also includes a description of the Boomtown Solar project, which Ameren Missouri received regulatory approval to acquire in early 2023. This project is located outside of both the Ameren Missouri service territory and outside of Missouri. Ameren Missouri is also currently seeking a CCN for another project outside of its service territory, the Cass County solar facility in Cass County, Illinois – again demonstrating that the Company is in no way limiting its consideration of solar resources as this question suggests.

ATTACHMENT G

Ameren Missouri
Case Name: EO-2024-0020
Docket No(s): 2023 IRP

Response to Discovery Request: GB-GB 1.9
Date of Response: 1/2/2024
Witness: N/A

Question:Describe each reason the Company believes justifies the statement that "wind project opportunities in Ameren Missouri's region appear more limited than solar project opportunities."
a. Has the Company studied whether its conclusion that "wind project opportunities … appear more limited than solar project opportunities" is applicable to regions outside of "Ameren Missouri's region" or Missouri?
b. Unless the response to 1.9(a) is an unequivocal "no," what regions were studied and what were the conclusions of such studies?

Response:

Prepared By: Lindsey Forsberg
Title: Strategy Consultant, Renewable Energy Development
Date: 12/20/2023

This statement is based on data collected by the Company through competitive solicitations (RFPs) for solar and wind projects, ongoing conversations with project developers in the Ameren Missouri region, and publicly available data about project and technology make-up of the MISO queue.

a. The Company is focused on pursuing wind and solar opportunities in the Ameren Missouri region, as defined in the Company's response to GB 1.6. To the extent that "studied" refers to the data gathering described above: yes, the Company has and continues to study opportunities for solar and wind across the broader Ameren Missouri region. The Company has not extensively studied solar and wind opportunities for regions *beyond* the Ameren Missouri region.
b. The Ameren Missouri region continues to be the area of focus for assessing future solar and wind opportunities, and the data collection described above is ongoing.

ATTACHMENT H

Ameren Missouri
Case Name: EO-2024-0020
Docket No(s): 2023 IRP

Response to Discovery Request: GB-GB 2.1 C
Date of Response: 2/13/2024
Witness: N/A

Question:2.1 Ameren Missouri's response to MECG 1.3 indicates "at the time of project implementation, GBE may be analyzed along with other specific wind projects." How does Ameren define "project implementation" in this response?

Response:

Prepared By: S. Hande Berk
Title: Manager, Electric Resource Planning
Date: January 31, 2024

'Project implementation' means that the Company is taking actions (e.g., issuing RFPs, reviewing RFP responses, negotiating contracts, applying for CCNs) to either purchase or build new near-term resources in its preferred plan consistent with assumed in-service dates.

ATTACHMENT I

Ameren Missouri
Case Name: EO-2024-0020
Docket No(s): 2023 IRP

Response to Discovery Request: GB-GB 2.2 C
Date of Response: 2/13/2024
Witness: N/A

Question:2.2 Per MECG 1.3, Ameren Missouri states that it did not conduct an analysis of GBE as a candidate resource option in the 2023 IRP filing and by way of justification, explains that "Ameren Missouri has analyzed generic wind resources in the IRP" and that "[a]t the time of project implementation, GBE may be analyzed along with other specific wind projects." Please explain why Ameren considers "generic wind resources" comparable to GBE and why Ameren would only compare GBE to "other wind projects" when high capacity solar or hybrid solar + storage may also be resource options interconnected to GBE?

Response:

Prepared By: S. Hande Berk
Title: Manager, Electric Resource Planning
Date: February 7, 2024

For its IRP analysis, the Company includes portfolios of resources, including wind, solar and battery storage. Implementation of such resources may involve locating combinations of these resources in close geographic proximity. That determination would be made as part of the implementation process.

ATTACHMENT J

Ameren Missouri
Case Name: EO-2024-0020
Docket No(s): 2023 IRP

Response to Discovery Request: GB-GB 1.10
Date of Response: 1/16/2024
Witness: N/A

Question:In Chapter 6, Section 6.1.2, the IRP section provides that "Ameren will also be evaluating
the potential for new wind (and other technologies) around its retiring generation station using the MISO generator replacement process or combining wind (or solar) with its existing combustion turbine generation facilities to leverage the transmission capacity."
a. Has the Company evaluated the suitability of those sites for hosting solar or wind facilities? If yes, please provide the evaluation.
b. How much suitable/buildable land exists in and around retiring generating stations to host large wind or solar facilities?
c. Does the Company anticipate that a generation tie line would be needed to interconnect renewable generation at the points of interconnection (POIs) associated with retiring combustion turbine generation facilities?
d. What would be the cost associated with such generation tie lines?
e. Has the Company incorporated the cost of generation tie lines into its supply side cost assumptions for local wind interconnecting to POIs associated with retiring generation?
f. Are there environmental mitigation issues in and around the retiring generation sites that would preclude siting wind or solar facilities on the same site?

Response:

Prepared By: Lindsey Forsberg
Title: Strategy Consultant, Renewable Energy Development
Date: 1/12/2024

a. No.
b. Buildable land at retiring sites is limited. For the Meramec Energy Center, approximately 86 acres are available (avoiding coal ash). At the Rush Island Energy Center site, approximately 127 acres are available (avoiding coal ash).
c. Most likely yes, dependent on the specific details of the site and project.
d. The cost of a generation tie line will be dependent on the specific details of the site and project.
e. Supply side cost assumptions for solar and wind utilized in the IRP include generic assumptions for interconnection costs.

f. All sites have unique environmental mitigation requirements, some of which may impact solar or wind development. At this time no sites have been specifically ruled out due to environmental mitigation issues.

ATTACHMENT K

Ameren Missouri
Case Name: EO-2024-0020
Docket No(s): 2023 IRP

Response to Discovery Request: GB-GB 1.15
Date of Response: 1/16/2024
Witness: N/A

Question:In Chapter 7, Section 7.1.4, the Company notes high level interconnection costs "do not include costs for non-MISO affected systems."
a. Given the significant and well documented costs associated with affected system upgrades for MISO generators, why did the Company choose to exclude these costs from its analysis?
b. Is the Company able to include an adder to its supply side resource options that includes an average estimate of affected system upgrade costs for all generation types? If so, please provide.

Response:

Prepared By: Justin Davies
Title: Director, Transmission Planning
Date: January 11, 2024

a. To clarify, non-MISO affected systems represent neighboring transmission systems, which are neither Ameren owned nor part of MISO. Each of these entities have their own Planning criteria and interconnection processes. They are responsible for studying the impact to their system due to the connection of generators within the neighboring MISO system. We do not have adequate information to determine the non-MISO affected system upgrade costs. The cost to connect varies based on the MW amount of the GI, the POI, the higher queued generation, the other GIs in the same DPP and the topology of the models used. The cost is unknown and can vary greatly. It can be a small amount, if the GI is not too big and at a POI with greater outlet capability or it can be a large amount if the GI MW amount significantly exceeds the capability at the chosen POI. The affected system is responsible to determine that in the interconnection process.

b. No, we are not able to include an average estimate of non-MISO affected system upgrade costs; there are too many variables, including type, size, available transmission capacity, number of generators in the queue, potential connection points, potential generation retirements, MISO queue reform, and too many of them are unknown to make an estimate.

ATTACHMENT L

Ameren Missouri
Case Name: EO-2024-0020
Docket No(s): 2023 IRP

Response to Discovery Request: GB-GB 2.12 C
Date of Response: 2/16/2024
Witness: N/A

Question:2.12 In response to GB 1.15 Ameren Missouri states that it did not include affected system
upgrade costs in its supply side analysis because, "[t]he cost is unknown and can vary greatly." Please answer the following questions with regard to that response:
a. 20 CSR 4240-22.040, Supply-Side Resource Analysis, Section (3) states, "The utility shall describe and document its analysis of the interconnection and any other transmission requirements associated with the preliminary supply-side candidate resource options identified in subsection (2)(C)." and that the "… purpose of this analysis shall be to ensure that the transmission network is capable of reliably supporting the preliminary supply-side candidate resource options under consideration, that the costs of the transmission system investments associated with preliminary supply-side candidate resource options, as estimated pursuant to 4 CSR 240-22.045(3), are properly considered and to provide an adequate foundation of basic information for decisions…" (emphasis added). Please explain how excluding affected system upgrade costs, costs which fall directly under the definition of "transmission system investments associated with supply side candidate resource options" is consistent with the requirements under 20 CSR 4240-22.040.
b. If the costs are unknown and can vary, it is Ameren Missouri's position that all those costs (which will eventually be paid for via ratepayers) should be excluded from its analysis? Said another way, if the costs are difficult to estimate, it is Ameren Missouri's position that they should be zero?

Response:

Prepared By: Justin Davies
Title: Director, Transmission Planning
Date: February 2, 2024

The question mischaracterizes Ameren Missouri's response to GB 1.15, which stated non-MISO affected system upgrade costs are not included.

a. Ameren Missouri has estimated interconnection costs for new resources as contemplated by the referenced rules above and provided those in Chapter 7 of the 2023 IRP filing as well as in response to data requests.
b. Ameren Missouri's position is that trying to include the non-MISO affected system upgrade costs would add no value to the IRP analysis of generic resources.

ATTACHMENT M

Ameren Missouri
Case Name: EO-2024-0020
Docket No(s): 2023 IRP

Response to Discovery Request: GB-GB 1.16
Date of Response: 1/16/2024
Witness: N/A

Question:In Chapter 7, Section 7.1.6 "Advanced Transmission System Technologies" the Company notes "Flexibility will be key to maintaining reliable service in the face of various uncertain future scenarios." Has the Company conducted an analysis of the flexibility benefits associated with highly-controllable high voltage direct current (HVDC) systems, including but not limited to (1) resource diversity value; and (2) costeffective blackstart capability, as outlined in Schedule AP-2 in Docket No. EA-2023-0017? If yes, please provide the analysis. If no, explain why this analysis was not conducted.

Response:

Prepared By: Justin Davies
Title: Director, Transmission Planning
Date: January 10, 2024

Ameren as a company has looked at HVDC systems as a future possible technology, along with discussions with manufacturers and a site visit to an HVDC facility, which had blackstart, grid forming technology. However, our understanding and application of the technology is not mature. Ameren was involved in the MISO study of the HVDC system of Grainbelt, both the HVDC interconnection (H104, H105) and the generation interconnection system study for DPP2019.

(1) For the HVDC interconnection of Grainbelt, the interconnection is a one-way lead line from a wind farm in Kansas. Having another blackstart unit added to the Ameren system could potentially be beneficial, assuming that the source of energy is there when it is needed. A wind farm typically has a less than 50% availability, which limits it functionality as a blackstart unit, which requires availability approximating 100%. An optimal placement of a blackstart resource is one that is close to the load, with a fuel source that is available even if the grid is non-functional. The existing blackstart resource for the Ameren system is located to the West of the system, so geographically having another black start system on the North, South, Central would provide the most geographical diversity and benefit the customers the most. Having an interconnection that spans the Eastern Interconnection into the Western Interconnection or ERCOT, could provide a highly reliable blackstart path, however Grainbelt is situated

entirely within the Eastern Interconnection, so it is possible that if the entire eastern connection blacked out, it would be able to provide blackstart service as long as the wind farm had wind generation, had its own available blackstart capability and also had grid forming inverters.

Ameren is currently studying a future additional blackstart resource but has not made any firm decisions. The estimates to add that capability to existing or future Ameren units are less than a $50 million.

ATTACHMENT N

Ameren Missouri
Case Name: EO-2024-0020
Docket No(s): 2023 IRP

Response to Discovery Request: GB-GB 2.13 C
Date of Response: 2/16/2024
Witness: N/A

Question:2.13 In response to GB 1.11(e), which asked how Ameren Missouri intends to address gas availability in the winter when demand for gas by residential heating customers is high, Ameren Missouri responded that it includes the cost of firm natural gas transportation for new combined cycle gas generators and oil backup for new simple cycle gas generators in its assessment of supply side resources.
a. Please explain if, under the firm gas contracts, residential heating customers still would be prioritized in the event of a fuel shortage. If yes, please revise Ameren's response to GB 1.11(e). If no, please provide additional details on this product/contract.
b. Please explain how many hours of oil backup would be available to new simple cycle gas generators.

Response:

Prepared By: Trevor Pettus | Thomas P Callahan
Title: Director, Energy & Fuel Management | Director, Combined Cycle Execution
Date: February 5, 2024

a. Interstate pipeline transportation and storage rights for residential heating customers are contracted for separately from natural gas used for electric generation. The Company's gas supply plan for electric generation is set up to satisfy generation needs irrespective of gas used for residential heating customers' peak load. It is possible that in extreme circumstances electric or gas requirements could be prioritized for human needs through special requests.

b. Ameren Missouri's current simple cycle gas turbine project in development will be designed for 72 hours of fuel oil back-up with all engines operating at full load.

ATTACHMENT O

Ameren Missouri
Case Name: EO-2024-0020
Docket No(s): 2023 IRP

Response to Discovery Request: GB-GB 2.14 C
Date of Response: 2/16/2024
Witness: N/A

Question:2.14 With reference to Ameren Missouri's response to GB 1.10(b), how much of the land listed
as available (86 acres at Meramec and 127 acres at Rush Island) is actually buildable? Please provide an analysis that explains how many megawatts of generation capacity this acreage translates to for a wind project or a solar project.

Response:

Prepared By: Lindsey Forsberg
Title: Strategy Consultant, Renewable Energy Development
Date: February 6, 2024

The acres listed in response to GB 1.10(b) reflect expected buildable acreage (86 acres at Meramec, 127 acres at Rush Island).

For a solar facility, assuming 5-10 acres per MW, the sites could hold roughly the following:

Meramec – approximately 9 to 17 MW
Rush Island – approximately 13 to 25 MW

Placing a wind facility on either physical site would not be practical given the acreage requirements of approximately 60-100 acres per MW.