ENCLOSURE 1

RESPONSE TO REQUESTED INFORMATION

References:
1. Ameren Missouri letter ULNRC-06768, "Application for Technical Specification Change and Exemption Request Regarding Use of Framatome GAIA Fuel (LDCN 22-0002)," dated October 12, 2022. (ADAMS Accession No. ML22285A115)
2. NRC e-mail capture, Subject: "Final – LIC-109 Acceptance Review (Unacceptable for Review with Opportunity to Supplement) - Callaway Plant, Unit 1 – LAR for proposed changes to TS and Exemption Request Regarding use of Framatome GAIA Fuel – EPID L-2022-LLA-0150 & L-2022-LLE-0030," dated November 17, 2022. (ADAMS Accession No. ML22322A006)

By e-mail dated November 17, 2022, (Reference 2) the NRC staff requested supplemental information needed to support acceptance of the Reference 1 license amendment request (LAR). The requested information is needed to support the NRC staff's independent assessment regarding the acceptability of the proposed amendment in terms of regulatory requirements for the protection of public health and safety and the environment. This information is being provided to enable the NRC staff to begin its detailed technical review.

In order to make the application described in Reference 1 complete, the NRC staff requested that Ameren Missouri supplement the application to address the following individual information requests (in bold text). Ameren Missouri's response immediately follows each request.

1. Regarding control rod ejection accident analysis, Enclosure 1, pdf page 12 states: "The results of the analysis are available for NRC review (Reference 45)." The Reference 45 in Enclosure 1 is ANP-4012P, "Callaway Rod Ejection Accident Analysis," dated July 2022. Please submit ANP-4012P as a supplement to the license amendment request (LAR) or make it readily available on an electronic portal.

Ameren Missouri Response:

A proprietary version of ANP-4012P, "Callaway Rod Ejection Accident Analysis," Revision 1 dated November 2022 is contained in Enclosure 4 of this letter. Revision 1 was created to allow identification of proprietary content consistent with the requirements of 10 CFR 2.390 in support of submittal to the NRC. No technical changes were

associated with this revision. Enclosure 3 contains the non-proprietary version of this document.

2. It is not clear in the LAR whether the locations of the 8 GAIA fuel assemblies in the Cycle 27 core are in limiting or non-limiting locations. In Enclosure 1, pdf page 4/24, the second paragraph states:

> **"Note that the technical reports were written to support a full transition to Framatome GAIA fuel including intermediate batch load quantities of fuel. *Operation with eight assemblies starting in operating cycle 27 is bounded by the evaluations performed although not explicitly stated in all locations.* A separate license amendment request will be required at a later date, to address the potential transition to Framatome GAIA fuel." The demonstration analysis presented in the attachments to Enclosure 1 are all based on Framatome methodologies.**

Please clarify if the *italicized* sentence in the above statement implies that the 8 GAIA assemblies in Cycle 27 core are in limiting positions, such that the demonstration analysis presented in the attachments to Enclosure 1 is bounding for these assembly locations. [Note that italicized text was substituted for highlighted text.]

Ameren Missouri Response:

Regarding operating cycle 27, the final core design has not yet been established, and it cannot be stated with certainty whether any of the GAIA fuel assemblies will be located in limiting locations. The purpose of the LAR submitted in Reference 1 is to allow unrestricted use of GAIA assemblies regardless of the ultimate final location of the assemblies.

The italicized sentence (and quoted paragraph) was an attempt to explain that the four supporting summary reports[1] provided as attachments to Enclosure 1 of the LAR were originally written to support the complete transition to GAIA fuel. The reports discuss batch loading in which a mix of Framatome GAIA and Westinghouse fuel would be present up to (and concluding with) complete transition to GAIA fuel. The summary reports addressed the interim cycle (i.e., operating cycle 27) intended to include eight GAIA assemblies, but they did not always explicitly call this out.

The analyses provided in the four supporting summary reports[1] that were provided as attachments to Enclosure 1 were developed using Framatome analysis methods with representative Callaway core design data, operating parameters and operating limits. As

[1] Specifically, the four supporting summary documents referenced here are Attachments 9 through 12 of Enclosure 1 of Reference 1: 1) ANP-3943P, Revision 1, "Callaway Small Break LOCA Analysis with GAIA Fuel Design," dated October 2022; 2) ANP-3944P, Revision 1, "Callaway Realistic Large Break LOCA Analysis with GAIA Fuel Design," dated October 2022; 3) ANP-3947P, Revision 3, "Callaway Unit 1 License Amendment Request Inputs for Use of Framatome Fuel," dated October 2022; and 4) ANP-3969P, Revision 2, "Callaway Non-LOCA Summary Report," dated October 2022.

discussed in Section 3 of Attachment 9 to Enclosure 1 (i.e., ANP-3947P), Framatome computer models were benchmarked against the existing Westinghouse core design operating characteristics to ensure the neutronics models met the uncertainty verification criteria established in their respective topical reports. As stated in Table 3-1 of Attachment 9, the existing Westinghouse-established Technical Specification (TS) power distribution Core Operating Limits Report (COLR) limits were used as inputs in these analyses. These analyses demonstrate the specified acceptable fuel design limits are satisfied for normal and anticipated operational occurrences when operating in compliance with the current Westinghouse-established COLR limits. Similarly, the transient and accident analysis summary reports provided in Attachments 10 through 12 of Enclosure 1 demonstrate that the GAIA fuel assemblies meet regulatory acceptance criteria when the transients and accidents initiate within the existing TS power distribution COLR limits.

The response to Question 3 elaborates on the core design process and the treatment of the GAIA assemblies.

3. In response to question 2, in case the GAIA assemblies are in limiting locations, please clarify what Technical Specifications (TS) would be applicable during Cycle 27 operation. The LAR does not include the Framatome fuel TS 3.2 "Power Distribution Limits" and Framatome methodologies in TS 5.6.5, "Core Operating Limit Report."

Ameren Missouri Response:

The TS requirements that will be applicable during operating cycle 27 are those currently contained in the TSs, specifically, in Section 3.2, "Power Distribution Limits," which are TS 3.2.1, "Heat Flux Hot Channel Factor ($F_Q(Z)$)"; TS 3.2.2, "Nuclear Enthalpy Rise Hot Channel Factor ($F^N_{\Delta H}$)"; TS 3.2.3, "Axial Flux Difference (AFD) (Relaxed Axial Offset Control (RAOC) Methodology)"; and TS 3.2.4, "Quadrant Power Tilt Ratio (QPTR)." These power distribution limit (PDL) TSs will continue to cite the limits given in the COLR. The COLR limits will continue to be those developed by Westinghouse using the methods identified in TS 5.6.5.b. Framatome's methods will not be used to define any COLR limit. Limiting fuel assemblies, regardless of the manufacturer, will be required to meet the COLR limits established using the Westinghouse methods.

The LAR does not propose any changes to the Section 3.2 PDL TSs, nor does it propose to change the description of the COLR methods (e.g., TS 5.6.5.b list of methodologies). Any change to these sections will be addressed by a future LAR addressing transition to Framatome GAIA fuel. The Framatome methods will be listed in the Final Safety Analysis Report along with descriptions of the analysis results based on those analysis methods.

The reload analysis process involves Westinghouse's proprietary method and is described in WCAP-9272-P-A, "Westinghouse Reload Safety Evaluation Methodology," which is an NRC-approved method listed as item b.1 in TS 5.6.5, "Core Operating Limits Report (COLR)." The method described in the WCAP involves the solicitation and aggregation

of pertinent data and potential plant changes using the Reload Safety and Licensing Checklist (RS&LC), confirmatory analyses, assessment against design and licensing standards, and generation of the Reload Safety Analysis Checklist (RSAC). This process has been used numerous times over the life of Callaway.

Ameren Missouri, with Framatome's permission, has provided pertinent GAIA fuel assembly design data to Westinghouse for its use in constructing a core model containing GAIA fuel. The ability of Westinghouse to provide core reload power distribution predictions to support confirmation of Framatome GAIA fuel safety analysis fuel design limits by Framatome has been previously demonstrated when the first four GAIA lead fuel assemblies were placed in the core during operating cycle 25. The power distribution predictions were also used to confirm that the lead fuel assemblies in cycle 25 met the criteria for non-limiting locations. Given the application of this process for the four GAIA lead fuel assemblies, Ameren Missouri has confidence in its application to the four additional GAIA assemblies to be loaded in operating cycle 27.

Ameren Missouri is using the Westinghouse-developed core design, its supporting analyses and the RSAC to determine the acceptability of the core design for use in the subsequent operating cycle. The Westinghouse TS COLR power distribution limits used in these analyses were also used by Framatome to perform bounding safety analysis that support the use of GAIA fuel in unrestricted locations. Independent of the Westinghouse activities, Framatome, as part of their standard reload design process, will develop a cycle-specific core model using their approved methods and independently ensure that the cycle-specific predicted power distributions meet the Westinghouse-established COLR limits. Ameren Missouri could not accept a core design in which the TS limits were not satisfied by both fuel vendors.

Lastly, the ability to operate within the TS power distribution limits relies on the ability to predict and monitor core power peaking effectively, specifically $F_{\Delta H}$ and F_Q. The ability to effectively monitor core power distribution given the presence of GAIA fuel assemblies has already been demonstrated in operating cycle 25. Further, the limits established in TS 3.2.1 and TS 3.2.2 require the ability to predict power peaking consistently, and the design similarities of the fuel assemblies do not adversely impact that ability. As Framatome concluded in Section 4 of Attachment 9 to Enclosure 1, the existing Westinghouse-established limits of TS 3.2.1 and TS 3.2.2 remain applicable to GAIA fuel with use of the Westinghouse fuel vendor's power distribution control methodology. The ability to accurately predict power distributions in GAIA fuel is not dependent on whether the acceptance criteria is the non-limiting peaking factor limits for lead fuel assemblies or the TS COLR limits for unrestricted use.