



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

October 5, 2023

Mr. Fadi Diya
Senior Vice President and
Chief Nuclear Officer
Ameren Missouri
Callaway Energy Center
8315 County Road 459
Steedman, MO 65077

SUBJECT: CALLAWAY PLANT, UNIT NO. 1 – EXEMPTION FROM THE REQUIREMENTS
OF 10 CFR 50.46, AND APPENDIX K TO 10 CFR PART 50 REGARDING USE
OF M5® CLADDING MATERIAL (EPID L-2022-LLE-0030)

Dear Mr. Diya:

The U.S. Nuclear Regulatory Commission has approved the enclosed exemption from the specific requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors," and 10 CFR Part 50, Appendix K, "ECCS [Emergency Core Cooling System] Evaluation Models," for the Callaway Plant, Unit No. 1.

This action is in response to Union Electric Company's, doing business as Ameren Missouri (the licensee's), application dated October 12, 2022, as supplemented by letters dated December 1, 2022, May 9, 2023, June 21, 2023, and August 3, 2023, that pursuant to 10 CFR 50.12, requested an exemption from the above regulations to use Framatome M5® alloy as a fuel rod cladding material.

The exemption is being forwarded for publication to the Office of the Federal Register. The NRC staff's safety evaluation is provided as an enclosure to this letter.

If you have any questions, please contact me at 301-415-8371 or by email at Mahesh.Chawla@nrc.gov.

Sincerely,

/RA/

Mahesh L. Chawla, Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-483

Enclosures:

1. Exemption
2. Safety Evaluation

cc: Listserv

ENCLOSURE 1

EXEMPTION FROM THE REQUIREMENTS OF 10 CFR 50.46, AND
APPENDIX K TO 10 CFR PART 50 REGARDING USE OF M5® CLADDING MATERIAL

UNION ELECTRIC COMPANY

CALLAWAY PLANT, UNIT NO. 1

DOCKET NO. 50-483

ENCLOSURE 2

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO EXEMPTION FOR USE OF M5® CLADDING

UNION ELECTRIC COMPANY

CALLAWAY PLANT UNIT NO. 1

DOCKET NO. 50-483



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO EXEMPTION FOR USE OF M5® CLADDING

UNION ELECTRIC COMPANY

CALLAWAY PLANT UNIT NO. 1

DOCKET NO. 50-483

1.0 INTRODUCTION

By letter dated October 12, 2022 (Reference 1), as supplemented by letters dated December 1, 2022 (Reference 2); May 9, 2023 (Reference 3); June 21, 2023 (Reference 4); and August 3, 2023 (Reference 5), Union Electric Company, doing business as (dba) Ameren Missouri (the licensee), submitted a license amendment request (LAR) for Callaway Plant Unit No. 1 (Callaway), proposing to load a limited number of Framatome GAIA fuel assemblies starting in operating cycle 27 to obtain incore performance data and acquire operational experience associated with the GAIA fuel design. Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.12, "Specific exemptions," the licensee requested an exemption from certain requirements of 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors," and 10 CFR Part 50, Appendix K, "ECCS [Emergency Core Cooling System] Evaluation Models," for Callaway in enclosure 2 to the LAR dated October 12, 2022.

This exemption request relates solely to the specific types of cladding materials for which 10 CFR 50.46 and Appendix K to 10 CFR Part 50 are expressly applicable, namely zircaloy and ZIRLO™. Since these regulations specifically apply only to zircaloy and ZIRLO™, an exemption would be required to apply them to fuel clad with other materials (i.e., M5®). Therefore, the licensee has requested such an exemption to support the introduction of Framatome Inc. (Framatome) GAIA fuel with the M5® cladding. The proposed request does not exempt Callaway from the requirements of 10 CFR 50.46 or Appendix K to 10 CFR Part 50 regarding acceptance criteria, evaluation model features and documentation, reporting of changes or errors, etc.

This safety evaluation (SE) is specific to the M5® cladding material exemption request only. The technical analysis necessary to support proposed loading of a limited number of Framatome GAIA fuel assemblies starting in operating cycle 27 is documented in the safety evaluation for the related license amendment request (Reference 6).

The U.S. Nuclear Regulatory Commission (NRC) has previously approved similar exemption requests for fuel clad with Framatome M5® for St. Lucie Plant, Unit Nos. 1 and 2 (References 7 and 8, respectively) and Palo Verde Nuclear Generating Station, Units 1, 2, and 3 (Reference 9).

2.0 REGULATORY EVALUATION

2.1 Regulatory Requirements

The regulation in 10 CFR 50.46(a)(1)(i) states, in part:

Each boiling or pressurized light-water nuclear power reactor fueled with uranium oxide pellets within cylindrical zircaloy or ZIRLO cladding must be provided with an emergency core cooling system (ECCS) that must be designed so that its calculated cooling performance following postulated loss-of-coolant accidents conforms to the criteria set forth in paragraph (b) of this section. ECCS cooling performance must be calculated in accordance with an acceptable evaluation model and must be calculated for a number of postulated loss-of-coolant accidents of different sizes, locations, and other properties sufficient to provide assurance that the most severe postulated loss-of-coolant, accidents are calculated.

Since 10 CFR 50.46 specifically refers to fuel with zircaloy or ZIRLO™ cladding, its application to fuel clad with materials other than zircaloy or ZIRLO™ requires an exemption from this section of the regulations.

Paragraph I.A.5, “Metal – Water Reaction Rate,” of Appendix K to 10 CFR Part 50 states, in part:

The rate of energy release, hydrogen generation, and cladding oxidation from the metal/water reaction shall be calculated using the Baker-Just equation (Baker, L., Just, L.C., “Studies of Metal Water Reactions at High Temperatures, III. Experimental and Theoretical Studies of the Zirconium-Water Reaction,” [Argonne National Laboratory] ANL-6548, page 7, May 1962).

The requirement for using the Baker-Just equation in Appendix K-conformant loss-of-coolant accident (LOCA) evaluation models presume use of zircaloy- or ZIRLO™-clad fuel rods. Therefore, application of 10 CFR Part 50, Appendix K to cladding materials other than zircaloy or ZIRLO™ also requires an exemption.

The exemption request from the licensee relates solely to the types of fuel cladding materials specified in these regulations. As written, the regulations presume the use of zircaloy or ZIRLO™ cladding. Thus, an exemption is necessary to apply 10 CFR 50.46 and Appendix K to cladding materials, (i.e., M5), other than zircaloy or ZIRLO™ cladding. The proposed request does not exempt Callaway from any other requirements of 10 CFR 50.46 or Appendix K to 10 CFR Part 50 regarding acceptance criteria, evaluation model features and documentation, reporting of changes or errors, etc.

Pursuant to 10 CFR 50.12, the Commission may grant exemption from requirements of the regulations in 10 CFR Part 50 provided that (1) the exemption is authorized by law, (2) the exemption will not present an undue risk to the public health and safety, (3) the exemption is consistent with the common defense and security, and (4) special circumstances, as defined in 10 CFR 50.12(a)(2), are present. The licensee’s submittal identifies that the special circumstance associated with its exemption request is that restricting application of

10 CFR 50.46 and Appendix K to 10 CFR Part 50 to fuels clad with only zircaloy or ZIRLO™ is not necessary to achieve the purpose of these regulations.

2.2 NRC Staff Review Objectives

The primary objectives for the NRC staff's review of the licensee's proposed exemption request for Callaway are to:

1. ensure the acceptance criteria and prescribed methods in 10 CFR 50.46 and Appendix K to 10 CFR Part 50 are applicable to the M5 fuel cladding material, and
2. ensure the proposed exemption adheres to the requirements of 10 CFR 50.12, which are summarized in section 2.1 of this SE.

3.0 TECHNICAL EVALUATION

Pursuant to 10 CFR 50.12, the licensee requested an exemption from the requirements of 10 CFR 50.46, and Appendix K to 10 CFR Part 50. The proposed exemption request would permit application of the requirements of 10 CFR 50.46 and Appendix K to 10 CFR art 50 to fuel rods clad with M5® at Callaway.

The technical basis for the use of fuel clad with M5® in pressurized-water reactors (PWRs) is documented in Topical Report (TR) BAW-10227P-A, Revision 1, "Evaluation of Advanced Cladding and Structural Material (M5) in PWR Reactor Fuel," dated June 2003 (Reference 10). This TR describes Framatome's evaluation for the use of the M5® alloy in PWR fuel assemblies as a replacement for Zircaloy-4. This TR discusses material properties of M5, as well as its behavior under normal operation, anticipated transients, and postulated accident conditions.

As identified in TR BAW-10227P-A, Revision 1, the M5® alloy is a proprietary variant of zirconium 1 percent Niobium (Zr1Nb). This material has zirconium alloyed with a small amount of niobium, in lieu of the tin used in zircaloy. Framatome stated that the M5® alloy was developed to provide enhanced performance with respect to corrosion, hydrogen pickup, axial growth, and diametral creep. While demonstrating relevant differences in certain material properties and physical behavior, TR BAW-10227P-A, Revision 1 identifies that the basic physical properties of M5® are similar to zircaloy.

3.1 Staff Evaluation of Acceptance Criteria

In its review of TR BAW-10227P-A, Revision 1, the NRC staff evaluated the applicability of the requirements of 10 CFR 50.46 and Appendix K to 10 CFR Part 50 to Framatome's M5® cladding material.

Section 4.2 of TR BAW-10227P-A, Revision 1 provides Framatome's rationale for concluding that each of the acceptance criteria in 10 CFR 50.46(b) is applicable to fuel clad with M5. Framatome's conclusions are as follows:

- a) A peak cladding temperature limit of 2200 degrees Fahrenheit (°F) would maintain acceptable margin for M5 against both cladding embrittlement that could cause shattering upon core quench and the metal-water reaction reaching an autocatalytic threshold. As discussed in Appendix G to TR BAW-10227P-A, Revision 1, Framatome based its conclusion upon the material properties of M5, quench tests performed on

M5® cladding, and high-temperature oxidation kinetics testing demonstrating consistent reaction rates between zircaloy and M5 at temperatures near the 2200°F limit in 10 CFR 50.46(b)(1).

- b) A limit on maximum local oxidation of 17 percent would, in conjunction with the peak cladding temperature limit of 2200 °F discussed above, prevent the brittle fracture of fuel rods clad with M5 during core quench. Appendix G to TR BAW-10227P-A, Revision 1 states that a series of cold-water plunge tests were performed to demonstrate that the expected oxidation threshold at which quench-induced brittle failure of M5® would occur is in the same range as that of zircaloy. Therefore, the 17 percent limit for maximum local oxidation would provide a level of protection for M5 cladding consistent with that which the NRC established for zircaloy.
- c) A limit on core-wide oxidation of 1 percent would prevent the accumulation of a combustible amount of hydrogen within the reactor building from fuel clad with M5®. Section 4.2 of TR BAW-10227P-A, Revision 1, states that high-temperature oxidation testing demonstrates that the behavior of M5 is similar to that of zircaloy. Hence, Framatome concludes that the same conservative margin exists when applying the Baker-Just correlation to both cladding materials.
- d) The requirement for maintaining a coolable geometry applies to cores composed of fuel clad with M5. As described in the Commission's (formerly the U.S. Atomic Energy Commission) Opinion on the rulemaking hearing concerning the ECCS acceptance criteria in 10 CFR 50.46 (Reference 11), the purpose of the limits on peak cladding temperature and maximum local oxidation is to ensure that the cladding remains sufficiently intact to retain fuel pellets in separate rods that constitute an easily coolable array. Framatome concluded that the limits in 10 CFR 50.46 concerning peak cladding temperature and maximum local oxidation are appropriate for the M5® cladding. As described in section 4.2 of TR BAW-10227P-A, Revision 1, Framatome has also concluded that the limiting blockage associated with M5 cladding would remain below the limit which could compromise a coolable geometry.
- e) The requirement for maintaining adequate long-term cooling applies equally to cores composed of fuel clad with M5. Section 4.2 of TR BAW-10227P-A, Revision 1 identifies that this requirement is associated with the plant design and is not specific to the fuel cladding material.

Appendix D of TR BAW-10227P-A, Revision 1 provides Framatome's rationale for concluding that the Baker-Just correlation may be conservatively applied to M5® fuel cladding. As described above, Framatome performed high-temperature testing to demonstrate that the oxidation performance of M5® is essentially the same as zircaloy. Hence, Framatome concluded that extending application of the Baker-Just correlation, which the NRC currently requires for calculating high-temperature oxidation of zircaloy and ZIRLO in Appendix K-conformant evaluation models, to M5 is justified.

As documented in the NRC staff's SE on TR BAW-10227P-A, Revision 1, the staff concluded that the criteria of 10 CFR 50.46 are acceptable for application to M5 cladding, and that the Baker-Just correlation is acceptable for calculating the metal-water reaction rate for M5® cladding. The technical basis for the NRC staff's conclusions is the testing and analysis Framatome performed in support of the M5® alloy that is summarized above and further described in the NRC staff's relevant safety evaluation (Reference 10). Despite finding

application of 10 CFR 50.46 and Appendix K to 10 CFR Part 50 to M5® acceptable from a technical perspective, in its safety evaluation, the NRC staff noted that exemptions for use of new cladding materials would be necessary to support such applications.

3.2 Staff Evaluation of 10 CFR 50.12 Requirements

The exemption to apply 10 CFR 50.46 and 10 CFR Part 50, Appendix K to fuel clad with M5® at Callaway satisfies the requirements of 10 CFR 50.12 as described below:

- (1) *The exemption is authorized by law.* The NRC has authority under 10 CFR 50.12 to grant exemptions from the requirements of 10 CFR Part 50 upon demonstration of proper justification. The fuel that will be irradiated at Callaway is clad with a zirconium-based alloy that is not expressly within the scope of 10 CFR 50.46 and 10 CFR Part 50, Appendix K. However, the NRC staff considers all other aspects of these regulations (e.g., acceptance criteria, prescribed methods, reporting requirements) applicable to the M5® cladding material, and the licensee states that it will ensure that these regulations are satisfied for operation with fuel clad with M5®. As discussed below, the NRC staff determined that special circumstances exist, which support granting the proposed exemption. Furthermore, granting the exemption would not result in a violation of the Atomic Energy Act of 1954, as amended, or the NRC's regulations. Therefore, the exemption is authorized by law.
- (2) *The exemption will not present an undue risk to public health and safety.* As summarized above in section 3.1, the NRC staff's previous review of TR BAW-10227P-A, Revision 1, which concerns the properties of the M5® alloy, provides assurance that predicted chemical, thermal, and mechanical characteristics of M5-alloy cladding are acceptable under normal operation, anticipated transients, and postulated accidents. The NRC staff finds that by utilizing the methods and properties listed in the NRC-approved TR (i.e., BAW-10227P-A), the licensee meets the acceptance criteria and analytical methods in 10 CFR 50.46 and Appendix K to 10 CFR Part 50, and thus, ensures acceptable safety margins for fuel clad with M5® that are consistent with those the Commission has established for zircaloy and ZIRLO. Callaway cores involving M5 cladding will continue to be subject to the operating limits specified in the technical specifications and core operating limits report (COLR). Thus, granting this exemption request does not pose undue risk to public health and safety.
- (3) *The exemption is consistent with the common defense and security.* The proposed exemption will allow the licensee to use an enhanced fuel rod cladding material relative to the zircaloy material for which the requirements of 10 CFR 50.46 and Appendix K to 10 CFR Part 50 were originally established. In addition to its review of the exemption request described in this safety evaluation, the NRC staff has evaluated all licensing-basis changes necessary to support loading fuel clad with M5 in a separate SE for the related license amendment request for fuel transition. Based on these reviews, the NRC staff concludes that the use of M5® fuel rod cladding at Callaway will not significantly affect plant operations and is therefore consistent with the common defense and security.
- (4) *Special circumstances are present.* Neither 10 CFR 50.46 nor Appendix K to 10 CFR Part 50 explicitly applies to fuel clad with M5. However, the underlying purpose of 10 CFR 50.46 and Appendix K to 10 CFR Part 50 is to provide requirements capable of ensuring adequate core cooling following the most limiting postulated loss-of-coolant

accident. As discussed above, Framatome has demonstrated in an NRC-approved TR (i.e. BAW-10227P-A) that application of the acceptance criteria and analytical methods required in 10 CFR 50.46 and Appendix K to fuel clad with M5 is acceptable. The licensee stated in the exemption request that the core reload safety analyses will be used to confirm on a cycle-specific basis that there is no adverse impact on ECCS performance for Callaway. Therefore, strict application of the material-specific requirements for fuel cladding in 10 CFR 50.46 and Appendix K to 10 CFR Part 50 is not necessary to achieve the underlying purpose of ensuring adequate core cooling in this instance. Furthermore, granting an exemption to allow application of the balance of these regulations to fuel clad with M5 at Callaway would be consistent with the underlying regulatory purpose.

4.0 ENVIRONMENTAL CONSIDERATION

The exemption request from the provisions of 10 CFR 50.46 and Appendix K of 10 CFR Part 50 would allow for the use of up to eight Framatome GAIA fuel assemblies to demonstrate operating characteristics for supporting the option of transitioning from the use of fuel manufactured by Westinghouse Electric Company. The exemption is being issued to support a proposed amendment that would revise the Callaway technical specifications to allow use of Framatome GAIA fuel with M5 as a fuel cladding material. As discussed below, based on the licensee's response to an NRC regulatory audit (Reference 12), the NRC has staff determined that the exemptions discussed herein meet the eligibility criteria for the categorical exclusion set forth in 10 CFR 51.22(c)(9) because they are related to a requirement concerning the installation or use of a facility component located within the restricted area, as defined in 10 CFR Part 20, and the granting of this exemption involves: (i) no significant hazards consideration, (ii) no significant change in the types or a significant increase in the amounts of any effluents that may be released offsite, and (iii) no significant increase in individual or cumulative occupational radiation exposure. Therefore, in accordance with 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the NRC's consideration of this exemption request.

The basis for the NRC staff's determination is discussed as follows with an evaluation against each of the requirements in 10 CFR 51.22(c)(9).

Requirements in 10 CFR 51.22(c)(9)(i)

The NRC staff evaluated the issue of no significant hazards consideration, using the standards described in 10 CFR 50.92(c), as presented below:

1. Does the proposed exemption involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No.

The proposed exemption to allow the use of M5 fuel rod cladding does not involve a significant increase in the probability or consequences of an accident previously evaluated.

For the set of previously evaluated accidents, their probability is governed by the failure or malfunction of equipment or components other than the fuel rod cladding. The fuel rod cladding itself is not an accident initiator and does not

affect the accident probability. Therefore, the change in fuel rod cladding material does not affect the probability of previously evaluated accidents.

The proposed exemption does not involve a significant increase in the consequences of previously evaluated accidents. This conclusion is demonstrated by the analysis submitted by the licensee in support of the proposed use of M5 cladding that the NRC staff has reviewed in support of the proposed license amendment. The licensee's analysis shows that fuel clad with M5 material performs comparably to fuel cladding materials that have been used previously. This satisfies the acceptance criteria in 10 CFR 50.46(b) for the LOCA event.

Therefore, the proposed exemption does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed exemption create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No.

The use of M5 fuel rod cladding does not create the possibility of a new or different kind of accident from any previously evaluated. The fuel rod cladding is not an accident initiator. The use of M5 cladding has been assessed by the licensee and vendor, and it has been found to exhibit comparable or enhanced behavior relative to the zircaloy cladding material specifically identified in 10 CFR 50.46 and Appendix K to 10 CFR 50. The NRC staff has previously reviewed this information in its safety evaluation approving TR BAW-10227P-A. Use of Framatome fuel with M5 cladding in the Callaway reactor core is compatible with the plant design and does not introduce any new safety functions for plant structures, systems, or components. Furthermore, the introduction of M5 cladding does not affect any accident mitigation systems and does not introduce any new accident initiation methods.

Therefore, the proposed exemption does not create the possibility of a new or different kind of accident than any previously evaluated.

3. Does the proposed exemption involve a significant reduction in a margin of safety?

Response: No.

The proposed exemption does not involve a significant reduction in the margin of safety. The licensee's analysis of the spectrum of postulated LOCA events for fuel rods clad with M5 exhibits results comparable to those for the fuel currently in use at Callaway for the small-break and the large-break LOCA events. Furthermore, the fuel vendor has generically evaluated the performance of M5 cladding relative to the zircaloy cladding specifically identified in 10 CFR 50.46 and Appendix K to 10 CFR 50. The vendor concluded that the performance of the M5 cladding material is quite similar to or enhanced relative to zircaloy-4. The NRC staff has performed a review of these conclusions and documented in its safety evaluation on TR BAW-10227P-A that the M5 material properties and

mechanical design methodology are in accordance with applicable regulations and regulatory guidance.

Therefore, the proposed exemption does not involve a significant reduction in a margin of safety.

Based on the above, the NRC staff concludes that the proposed exemption presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of no significant hazards consideration is justified (i.e., satisfies the provision of 10 CFR 51.22(c)(9)(i)).

Requirements in 10 CFR 51.22(c)(9)(ii)

The proposed exemption would allow the use of M5® fuel rod cladding material in the reactors. The use of the M5® fuel rod cladding material will not significantly change the types of effluents that may be released offsite, or significantly increase the amount of effluents that may be released offsite. Therefore, the provision of 10 CFR 51.22(c)(9)(ii) is satisfied.

Requirements in 10 CFR 51.22(c)(9)(iii)

The proposed exemption would allow the use of the M5® fuel rod cladding material in the reactors. The use of the M5® fuel rod cladding material will not significantly increase individual occupational radiation exposure, or significantly increase cumulative occupational radiation exposure. Therefore, the provision of 10 CFR 51.22(c)(9)(iii) is satisfied.

5.0 CONCLUSION

Based upon the NRC staff's evaluation of the proposed exemption request, as documented above, the staff concludes that: (1) the proposed application of 10 CFR 50.46 and Appendix K to 10 CFR Part 50 to fuel clad with M5® is acceptable for Callaway, and (2) the underlying intent of 10 CFR 50.46 and Appendix K to 10 CFR Part 50 will continue to be satisfied for the planned operation of Callaway with fuel clad with M5® under the proposed exemption. In addition, the NRC staff has determined that, pursuant to 10 CFR 50.12, the exemption is authorized by law, will not present an undue risk to the public health and safety, and is consistent with the common defense and security. Also, special circumstances are present. Therefore, the staff concludes that, pursuant to 10 CFR 50.12(a), the proposed exemption allowing application of 10 CFR 50.46 and Appendix K to 10 CFR Part 50 to fuel clad with M5® at Callaway is justified.

6.0 REFERENCES

1. Farnsworth, D. E, Union Electric Company, dba Ameren Missouri letter, to NRC "Docket Number 50-483, Callaway Plant, Unit 1, Union Electric Co., Renewed Facility Operating License NPF-30, Application for Technical Specification Change and Exemption Request Regarding Use of Framatome GAIA Fuel," (LDCN 22-0002), dated October 12, 2022 (Agencywide Documents Access and Management System (ADAMS) Package Accession No. ML22285A115).

2. Farnsworth, D. E, Union Electric Company, dba Ameren Missouri letter, to NRC “Docket Number 50-483, Callaway Plant, Unit 1, Union Electric Co., Renewed Facility Operating License N dated December 1, 2022 PF-30, Supplement to License Amendment and Exemption Request Regarding Use Framatome GAIA Fuel (LDCN 22-0002) (EPID L-2022-LLA-0150 and L-2022-LLE-0030) dated December 1, 2022 (Package ML22335A497).
3. Farnsworth, D. E, Union Electric Company, dba Ameren Missouri letter, to NRC, “Docket Number 50-483, Callaway Plant, Unit 1, Union Electric Co., Renewed Facility Operating License NPF-30, Post-Audit Supplement to License Amendment Request and Exemption to Allow Use of Framatome GAIA Fuel (LDCN 22-0002) (EPID 2022-LLA-0150 and EPID L-2022-LLE-0030),” dated May 9, 2023 (Package ML23129A793).
4. Jungmann, B. L., Union Electric Company, dba Ameren Missouri letter, to NRC, “Docket Number 50-483, Callaway Plant, Unit 1, Union Electric Co., Renewed Facility Operating License NPF-30, Post-Audit Follow-Up Information in Support of Callaway’s License Amendment Request and Proposed Exemption to Allow Use of Framatome GAIA Fuel (LDCN 22-0002) (EPID -2022-LLA-0150 and EPID L-2022-LLE-0030),” dated June 21, 2023 (ML23172A145).
5. Witt, T. A., Union Electric Company, dba Ameren Missouri letter, to NRC, “Docket Number 50-483, Callaway Plant, Unit 1, Union Electric Co., Renewed Facility Operating License NPF-30, “Supplement to License Amendment and Exemption Request Regarding Use Framatome GAIA Fuel, (LDCN 22-0002) (EPID -2022-LLA-0150 and EPID L-2022-LLE-0030),” dated August 3, 2023 (Package ML23215A196).
6. Chawla, M. L., NRC, letter to F. Diya, Union Electric Company, dba Ameren Missouri, “Callaway Plant, Unit No. 1 – Issuance of Amendment No. 235 to Revise Technical Specifications to use Framatome GAIA Fuel (EPID L-2022-LLA-0150),” dated October 5, 2023 (ML23240A369; publicly available and ML23240A368; not publicly available, proprietary information).
7. Regner, L. M., NRC, letter to M. Nazar, NextEra Energy, “St. Lucie Plant, Unit 1 – Exemption from the Requirements of 10 CFR Part 50, Section 50.46 and Appendix K to 10 CFR Part 50 to Allow the Use of M5® Alloy Fuel Rod Cladding (TAC No. MF1820),” dated March 31, 2014 (Package ML14087A023).
8. Gladney, R. for Buckberg, P. H., NRC, letter to M. Nazar, NextEra Energy, St. Lucie Plant, Unit No. 2- Exemption from the Requirements of 10 CFR Part 50, Section 50.46 and Appendix K to 10 CFR Part 50 to Allow the Use of M5® Fuel Rod Cladding (CAC No. MF5494),” dated April 19, 2016 (Package ML16027A141).
9. Lingam, S. P., NRC, letter to M. Lacal, Arizona Public Service Company, “Palo Verde Nuclear Generating Station, Units 1, 2 and 3 - Exemption from the Requirements of the 10 CFR Part 50, Section 50.46 and Appendix K to 10 CFR Part 50 for Use of Framatome M5® Alloy cladding (EPID L-2018-LLE-0010),” dated March 4, 2020 (ML20022A109).

10. Framatome "Evaluation of Advanced Cladding and Structural Material (M5) in PWR Reactor Fuel, BAW-10227P-A, Revision 1, dated June 2003 (ADAMS Package No. ML15162B043).
11. U.S. Atomic Energy Commission, Opinion of the Commission, In the Matter of Rulemaking Hearing on "Acceptance Criteria for Emergency Core Cooling Systems for Light-Water-Cooled Nuclear Reactors" (CLI-7-39, 6 AEC 1085), dated December 28, 1973 (ML120960378, not publicly available).
12. Callaway Plant, Unit No. 1 - Regulatory Audit Summary Regarding License Amendment and Regulatory Exemptions Request for Fuel Transition to Framatome Gaia Fuel (EPIDS L-2022-LLA-0150 and L-2022-LLE-0030) (ML23206A199).

Principal Contributor: S. Bhatt

Date: October 5, 2023

SUBJECT: CALLAWAY PLANT, UNIT NO. 1 – EXEMPTION FROM THE REQUIREMENTS OF 10 CFR 50.46, AND APPENDIX K TO 10 CFR PART 50 REGARDING USE OF M5® CLADDING MATERIAL (EPID L-2022-LLE-0030) DATED OCTOBER 5, 2023

DISTRIBUTION:

PUBLIC	JDean, NRR
PM File Copy	MPanicker, NRR
RidsACRS_MailCTR Resource	SBhatt, NRR
RidsNrrDorlLpl4 Resource	RGrover, NRR
RidsNrrDssSnsb Resource	AKeim, NRR
RidsNrrDssSfnb Resource	GStirewalt, NMSS
RidsNrrDssStsb Resource	DPalmrose, NMSS
RidsNrrDrolqyb Resource	GWerner, RIV
RidsNrrLAPBlechman Resource	SSchwind, RIV
RidsNrrPMCallaway Resource	JJosey, OEDO
RidsRgn4MailCenter Resource	TKeene, OEDO
ASallman, NRR	

ADAMS Accession Nos.
ML23234A159 Package
ML23234A152 Letter/Safety Evaluation
ML23234A153 Exemption
ML23234A154 FRN (not included in package))

*by email

OFFICE	NRR/DORL/LPL4/PM	NRR/DORL/LPL4/LA*	NRR/DSS/SNSB/BC*	OGC -NLO
NAME	MChawla	PBlechman	PSahd	AGhosh
DATE	8/22/2023	9/1/2023	7/18/2023	10/2/2023
OFFICE	NRR/DORL/LPL4/BC*	NRR/DORL/D*	NRR/DORL/LPL4/PM*	
NAME	JDixon-Herrity	BPham	MChawla	
DATE	10/5/2023	10/5/2023	10/5/2023	

OFFICIAL RECORD COPY