



Callaway Plant

October 25, 2016

ULNRC-06333

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

10 CFR 50.55a

Ladies and Gentlemen:

**DOCKET NUMBER 50-483
CALLAWAY PLANT UNIT 1
UNION ELECTRIC CO.
RENEWED FACILITY OPERATING LICENSE NPF-30
REQUEST FOR RELIEF FROM ASME SECTION XI CODE
INSERVICE INSPECTION REQUIREMENTS (RELIEF REQUEST I4R-04)**

Pursuant to 10 CFR 50.55a(g)(5)(iii), Union Electric Company (Ameren Missouri) hereby requests NRC approval of the attached relief request, identified as 10CFR50.55a Request Number I4R-04, for the Callaway Plant. The requested relief is intended for the fourth inspection interval of Callaway's Inservice Inspection (ISI) Program. With regard to the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, i.e., Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," the Code Edition (and Addenda) applicable to Callaway's fourth 10-year ISI interval is the 2007 Edition with 2008 Addenda.

The relief request pertains to examination requirements for dissimilar metal and austenitic welds associated with the safe-ends connecting reactor coolant system piping to the reactor pressure vessel inlet and outlet nozzles. After a surface-connected indication was found in one of these welds in 2004, review of the depth-sizing procedure used by Callaway's contractor determined that the accuracy requirement of Supplement 14 to Appendix VIII of ASME Section XI could not be achieved. Ameren Missouri then requested and obtained relief from the depth-sizing accuracy requirement for the second and third 10-year ISI intervals. (Refer to the references listed in the attached relief request.)

The surface-connected indication in the subject weld was identified during the third period of the second 10-year ISI interval, which ended on December 18, 2005. The weld was re-examined in the first period of the third 10-year ISI interval, in accordance with the schedule specified in Subsection IWB-2420(b) of the Code. Ameren Missouri subsequently requested and was granted relief from the re-inspection frequency requirements of Subsection IWB-2420(b) of the Code in order to defer the

second re-examination from the second period to the third period of the third 10-year ISI interval. (Refer to the references listed in the attached relief request.)

On December 19, 2014, the transition from Callaway's third ten-year ISI interval to the plant's fourth ten-year ISI interval occurred. To satisfy Subsection IWB-2420(b) of the Code, the third re-examination of the subject weld needs to be performed in the first period of the fourth 10-year ISI interval. The intent is to perform the third re-examination of the subject weld using the same or similar equipment and the same procedure as used for the examination performed in 2004 and the first and second re-examinations.

The requested relief (if approved) would apply to depth-size evaluation of any surface-connected indications that may be identified during the third re-examination of the subject weld or other examinations of welds within the scope of the relief request, in the same way that it has been applied to the evaluation of the previous examination and re-examinations of the subject weld. On this basis, Ameren Missouri is requesting application of the requested relief for the fourth 10-year ISI interval for Callaway.

The attached 10 CFR 50.55a request is needed to support re-examination of the subject weld during the next refueling outage (Refuel 22) which is currently scheduled to begin in October 2017. In order to allow performance of the depth-sizing evaluation associated with re-examination of the subject weld, Ameren Missouri respectfully requests NRC review and approval of the attached relief request by October 25, 2017.

This letter does not contain new commitments.

If there are any questions, please contact me at 573-676-8719.

Sincerely,

 10/25/16
R. C. Wink 6381

Manager, Regulatory Affairs

JPK

Attachment: 10 CFR 50.55a Request Number I4R-04

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Proposed Alternative **In Accordance with 10 CFR 50.55a(g)(5)(iii)** **--Inservice Inspection Impracticability--**

1. ASME Code Component(s) Affected

The components covered under relief request I4R-04 include four dissimilar metal hot-leg welds, four dissimilar metal cold-leg welds, and eight austenitic welds. The inspections of the dissimilar metal welds are conducted according to ASME Code Case N-770-1, Inspection Item A-2, "Unmitigated butt weld at Hot Leg operating temperature $(-2410) \leq 625^{\circ}\text{F}$ (329°C)," and Inspection Item B, "Unmitigated butt weld at Cold Leg operating temperature $(-2410) \geq 525^{\circ}\text{F}$ (274°C) and $< 580^{\circ}\text{F}$ (304°C)." The dissimilar metal welds are detailed in Table 1.

The austenitic welds are inspected in accordance with Callaway's risk-informed ISI program. In accordance with ASME Code Case N-716, these welds are categorized as Inspection Category RA Item Number R1.20, "Elements not Subject to a Damage Mechanism." The austenitic welds are detailed in Table 2.

Table 1: Large Bore Dissimilar Metal (DM) Welds

Weld Designation	N-770-1 Item	Weld Description	Inner Diameter	Nominal Wall Thickness
2-RV-301-121-A	A-2	Loop 1 outlet nozzle to safe-end	29 in.	2.5 in.
2-RV-301-121-B	A-2	Loop 2 outlet nozzle to safe-end	29 in.	2.5 in.
2-RV-301-121-C	A-2	Loop 3 outlet nozzle to safe-end	29 in.	2.5 in.
2-RV-301-121-D	A-2	Loop 4 outlet nozzle to safe-end	29 in.	2.5 in.
2-RV-302-121-A	B	Loop 1 inlet safe-end to nozzle	27.5 in	2.38 in.
2-RV-302-121-B	B	Loop 2 inlet safe-end to nozzle	27.5 in	2.38 in.
2-RV-302-121-C	B	Loop 3 inlet safe-end to nozzle	27.5 in	2.38 in.
2-RV-302-121-D	B	Loop 4 inlet safe-end to nozzle	27.5 in	2.38 in.

Table 2: Large Bore Austenitic Welds

Weld Designation	Weld Description	Inner Diameter	Nominal Wall Thickness
2-BB-01-F103	Loop 1 outlet safe-end to pipe	29 in.	2.5 in.
2-BB-01-F102	Loop 1 inlet elbow to safe-end	27.5 in	2.38 in.
2-BB-01-F203	Loop 2 outlet safe-end to pipe	29 in.	2.5 in.
2-BB-01-F202	Loop 2 inlet elbow to safe-end	27.5 in	2.38 in.
2-BB-01-F303	Loop 3 outlet safe-end to pipe	29 in.	2.5 in.
2-BB-01-F302	Loop 3 inlet elbow to safe-end	27.5 in	2.38 in.
2-BB-01-F403	Loop 4 outlet safe-end to pipe	29 in.	2.5 in.
2-BB-01-F402	Loop 4 inlet elbow to safe-end	27.5 in	2.38 in.

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2. Applicable Code Edition and Addenda

The current inservice inspection program at Callaway is based on the ASME Code, Section XI, 2007 Edition with 2008 Addenda. Testing of personnel, procedures, and equipment for the ultrasonic examination of applicable Class 1 and 2 components is governed by Appendix VIII, "Performance Demonstration for Ultrasonic Examination Systems," of the ASME Code, Section XI.

3. Applicable Code Requirement

The dissimilar metal welds of Table 1 are fabricated from Alloys 82 and 182 and fall under the requirements of ASME Code Case N-770-1, which requires ultrasonic examination of dissimilar metal welds. The austenitic safe-end to piping welds of Table 2 are covered under Callaway's risk-informed ISI program as Inspection Category R-A, Item R.120 (formerly Code Category B-F, B5.10) in the ASME Code Section XI, 2007 Edition with 2008 Addenda.

The inspections will be conducted from the inner diameter (ID) of the welds, and the specified ultrasonic examinations are to be conducted per Appendix VIII Supplement 14. Relief is requested from the qualification requirements contained in ASME Code Section XI Supplement 14, which states in part that procedures are "qualified for depth-sizing when the flaw depths estimated by ultrasonics, as compared with the true depths, do not exceed 0.125 in. (3 mm) RMS [root-mean-square]."

4. Impracticality of Compliance

To date, although examination vendors have qualified for detection and length-sizing in accordance with the Appendix VIII requirements for examinations from the ID, despite numerous attempts, the vendors have not met the established RMS error of 0.125-in. for depth-sizing, due to the configuration of the safe-end welds. Consequently, relief from the specified 0.125-in. RMS error depth-sizing accuracy requirement is necessary to support evaluation of findings from examinations when conducted from the inside surface.

5. Burden Caused by Compliance

While the welds can be accessed from the outer diameter (OD), attempts to qualify the examination have not been successful due to the OD configuration (cast austenitic piping to austenitic safe-end adjacent to austenitic safe-end to DM weld nozzle). In addition, there is a significant radiological dose associated with OD inspections. The outside diameter of the reactor safe-end welds can only be accessed through removable covers in the refueling cavity floor that lead to an annulus that surrounds the reactor vessel. The annulus is a relatively confined area and does not allow unrestricted work access to the

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welds. Attempts to reduce dose levels by shielding are impractical due to the essentially omnidirectional source from the reactor and coolant piping.

6. Proposed Alternative and Basis for Use

Ameren Missouri proposes to use a vendor qualified for ID detection and length-sizing per Appendix VIII as applicable to the welds identified in this request. The Appendix VIII examination process will also be used to examine the cast stainless steel side of the cold-leg elbow to safe-end welds (identified in Table 2) in lieu of Appendix III and Supplement 1 requirements. All ID examinations will be augmented with inside surface profilometry and eddy current examination.

If a reportable flaw is detected and determined to be ID surface connected during examination of the applicable welds, Ameren Missouri will provide a flaw evaluation, including the measured flaw size as determined by ultrasonic examination, for review by NRC. Eddy current testing will be used to determine if flaws are surface connected. Additional data including details of the surrounding ID surface contour in the region of the flaw and percentage of the exam area where UT probe lift-off is evident, if any, will be included.

In the event that any flaw(s) requiring depth sizing is detected during examination of the welds identified in this relief request, the following criteria shall be applied:

- For ID-connected flaws detected and measured as less than 50 percent through-wall in depth, the recorded flaw depth shall be adjusted by adding a correction factor such that the adjusted flaw depth is equal to the measured flaw depth plus 0.245-in. (i.e., the contractor's RMS depth-sizing accuracy performance) minus 0.125-in. (i.e., the RMS depth-sizing accuracy specified in Supplement 14), prior to comparison to the applicable acceptance criteria.
- If an ID connected flaw(s) is detected and measured as 50 percent through-wall depth or greater and is to remain in service without mitigation or repair, Ameren Missouri shall submit flaw evaluation(s) for review and approval by NRC prior to reactor startup. The flaw evaluation shall include:
 - Information concerning the mechanism that caused the flaw.
 - Information concerning the inside surface roughness/ profile of the region surrounding the flaw.
 - Information concerning areas where UT probe lift-off is observed.

It should be noted that Ameren Missouri is currently monitoring two flaws in weld 2-BB-01-F302. The flaw evaluations adhere to the above criteria in accordance with ASME Sec XI IWB 2420(b) since they were subject to prior Relief Requests ISI-27, ISI-33 and I3R-13. (See References.) No propagation has been detected during the first and second successive re-inspections. The third successive re-inspection will be performed during the fall of 2017.

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All welds included in this request were examined from the ID with an Appendix VIII qualified detection and length sizing process in Refuel 13. The ultrasonic examinations were supplemented by surface profilometry and eddy current testing. Greater than 90 percent coverage of the required exam area was achieved in all cases. This inspection history confirms that the inside surface profiles of the welds included in this request are suitable for ultrasonic examination from the ID in accordance with the referenced requirements as modified by the proposed alternative sizing requirements.

7. Duration of Proposed Alternative

The duration of the proposed alternative is for the remainder of Callaway's fourth 10-year ISI interval, which began on December 19, 2014 and is nominally scheduled to end on December 18, 2024.

8. Precedents

As described in references 9.a through 9.f listed below, relief from the depth-sizing accuracy requirements of Appendix VIII Supplement 14 was previously requested and granted for Callaway's second and third 10-year ISI inspection intervals. In addition, as described in references 9.g and 9.h below, relief from the re-examination frequency requirements of ASME Sec XI IWB 2420(b) was also requested and granted, which has resulted in the need to perform the third required re-examination of the subject weld during Callaway's fourth 10-year ISI inspection interval.

9. References

- a. Callaway 10 CFR 50.55a Request Number ISI-27 (submitted via AmerenUE letter ULNRC-04879, dated August 14, 2003) – ADAMS Accession No. ML032340608
- b. Safety Evaluation by the Office of Nuclear Reactor Regulation, Related to Relief Requests ISI-27 Through ISI-31, Union Electric Company, Callaway Plant Unit 1, Docket No. 50-483 (issued via NRC Letter dated April 7, 2004, "Relief Requests ISI-27 Through ISI-31 Pertaining to Implementation of ASME Section XI Appendix VIII Requirements (TAC Nos. MC0478 Through MC0482, Respectively)") – ADAMS Accession No. ML0410005162
- c. Callaway 10 CFR 50.55a Request Number ISI-33 (submitted via AmerenUE letter ULNRC-05290, dated May 18, 2006) – ADAMS Accession No. ML061460043
- d. Callaway Response to Request for Additional Information Regarding 10 CFR 50.55a Request ISI-33 (submitted via AmerenUE letter ULNRC-05351, dated December 12, 2006) – ADAMS Accession No. ML063530466

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- e. Safety Evaluation by the Office of Nuclear Reactor Regulation, Related to Relief Request ISI-33 (issued via NRC Letter dated March 15, 2007, "Callaway Plant, Unit 1 - Authorization of Relief Request No. ISI-33 for the Second and Third 10-Year Inservice Inspection Intervals (TAC No. MD2033)") – ADAMS Accession No. ML070580333
- f. Corrected Safety Evaluation by the Office of Nuclear Reactor Regulation, Related to Relief Request ISI-33 (issued via NRC Letter dated March 29, 2007, "Correction to Authorization of Relief Request No. ISI-33 for the Second and Third 10-Year Inservice Inspection Intervals (TAC No. MD2033)") – ADAMS Accession No. ML070871014
- g. Callaway 10 CFR 50.55a Request Number I3R-13 (submitted via Ameren Missouri letter ULNRC-05822, dated October 31, 2011) – ADAMS Accession No. ML113050122
- h. Safety Evaluation by the Office of Nuclear Reactor Regulation, Related to Relief Request I3R-13 (issued via NRC Letter dated February 16, 2012, "Relief Request I3R-13 from ASME Code Requirements for Reactor Pressure Vessel Flange Insert Non-Destructive Examination during Third 10-Year Inservice Inspection Interval (TAC No. ME7504) ") – ADAMS Accession No. ML120190748