

CALLAWAY PLANT UNIT 1
LICENSE RENEWAL APPLICATION

SUPPLEMENTAL RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI)
B2.1.6-4d, PART (a)

The response RAI B2.1.6-4d, Part (a) includes information that is copywrited by Westinghouse Electric Company LLC.

RAI B2.1.6-4d

Background:

Generic Background Information- The Nuclear Regulatory Commission's (NRC's) position regarding implementation of recommended inspection and evaluation (I&E) criteria from the MRP-227-A report as part of a plant-specific aging management program (AMP) for reactor vessel internal (RVI) components is given in NRC Regulatory Issue Summary (RIS) No. 2011-07, "License Renewal Submittal Information for Pressurized Water Reactor Internals Aging Management," dated July 21, 2011. The RIS recommends that the review of the I&E bases for Category D pressurized-water reactor (PWR) facilities be assessed as part of the review of the applicant's AMP for its RVI components, including the bases for resolving any applicant/licensee action items (A/LAIs) on the MRP-227-A I&E methodology that are applicable to the design of the RVI components at the facility. These A/LAIs are identified in the NRC's revised safety evaluation (SE, Rev. 1, dated December 16, 2011) on the MRP-227-A I&E methodology. According to RIS No. 2011-07, Callaway Plant, Unit 1 (Callaway) is categorized as a Category D facility, which applies to PWR applicants that either will be submitting a license renewal application (LRA) that is based on the recommended criteria in NUREG 1801, "Generic Aging Lessons Learned (GALL) Report," Revision 2, or currently have GALL Report Revision 2 based LRAs pending an NRC review.

Plant-Specific Background Information- The staff's understanding is that the current licensed core power level for Callaway is set at 3565 MWt, as approved in the NRC's license amendment and safety evaluation of March 30, 1988, which was issued on the 4.5 percent stretch power uprate request for Callaway (ADAMS Accession No. ML021650524).

In A/LAI No. 1, the staff requested that applicants with a PWR design provide a demonstration that the bases and assumptions for the I&E methodology in Topical Report MRP-227-A are applicable and bounding for the design of the RVI components at the applicant's plant. The applicant responded to the request in A/LAI No. 1 in the applicant's response to RAI B2.1.6-4a which was provided in Ameren Letter No. ULNRC-05950, dated January 24, 2013.

In its January 24, 2013, response letter to RAI B2.1.6-4a, the applicant provided the following LRA commitment (as given in Commitment No.4 in LRA UFSAR Supplement Table A4-1) as the basis for resolving the request in A/LAI No. 1:

Each applicant/licensee is responsible for assessing its plant's design and operating history and demonstrating that the approved version of MRP-227 is applicable to the facility. Each applicant/licensee shall refer, in particular, to the assumptions regarding plant design and operating history made in the FMECA and functionality analyses for reactors of their design (i.e., Westinghouse, CE, or B&W) which support MRP-227 and describe the process used for determining plant-specific differences in the design of their RVI components or plant operating conditions, which result in different component inspection categories. The applicant/licensee shall submit this evaluation for NRC review and approval as part of its application to implement the approved version of MRP-227.

Issue:

Since Callaway is a RIS 2011-07 Category D plant, the resolution of A/LAI No. 1 needs to be resolved as part of the staff's review of the Callaway LRA and PWR Vessel Internals Program.

Request:

- (a) Clarify whether the design of RVI components at Callaway includes any non-welded or bolted austenitic stainless steel components whose design stresses are greater than 30 ksi and whose materials were cold worked to 20 percent or greater cold-work levels. If so, justify why the current I&E bases in MRP-227-A report are sufficient to provide for management of cracking or other applicable aging effects in these non-welded components. Otherwise, clarify and justify how the MRP-227-A report I&E bases for these RVI components will be adjusted as part of the applicant's response to the NRC's request in A/LAI No. 2 [\[1\]](#).
- (b) Clarify whether Ameren Missouri has ever utilized an atypical fuel design or fuel management protocols that could make the assumptions in MRP-227-A on core design, core loading, and core leakage patterns non-representative for the Callaway RVI design, including those that might have been approved for the facility under the NRC's process for reviewing power uprate/power change license amendment requests. If so, justify why the current I&E bases in MRP-227-A report are sufficient to provide for management of cracking and other applicable aging effects in the plant's RVI components based on the actual fuel loading patterns and fuel power conditions that are approved in the current licensing basis. Otherwise, clarify and justify how the MRP-227-A report I&E bases for these RVI components will be adjusted as part of the applicant's response to the NRC's request in A/LAI No. 2 [\[1\]](#).

Callaway Response

~~(a) The response to RAI B2.1.6-4d part (a) will be submitted at a later date. Callaway commits to perform one or more of the options identified by LRA Table A4-1 item 44. Callaway has conservatively included all applicable MRP-191 Table 4-4 components as potentially subject to 20% or greater cold work and 30 ksi operating stress. Callaway may revise this commitment at a future date if any of the applicable MRP-191 Table 4-4 components are determined not to be subject to 20% or greater cold work and 30 ksi operating stress. LRA Table A4-1 item 44 has been added as shown in Amendment 30 in Enclosure 2.~~

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~~Ameren Missouri contracted with Westinghouse Electric Company LLC (Westinghouse), the original nuclear steam system supplier to provide an evaluation of reactor vessel internals (RVI) to address applicant/licensee action item (A/LAI) No.1. Ameren Missouri has reviewed and accepted the Westinghouse Evaluation.~~

~~Westinghouse evaluated the Callaway Unit 1 reactor internals components according to industry guideline MRP 2013-025 {1} and the MRP-191 {2} industry generic component listings and screening criteria (including consideration of cold work as defined in MRP-175 {3}, noting the requirements of Section 3.2.3). In addition to consideration of the material fabrication, forming, and finishing process, a general screening definition of a resulting reduction in wall thickness of 20% was applied as an evaluation limit. It was confirmed that all of Callaway Unit 1 components, as applicable for the design, are included directly in the MRP-191 component lists.~~

The evaluation included a review of all plant modifications affecting reactor internals and the plant operating history. The components were procured according to ASTM International or ASME material specifications through applicable quality controlled protocols. Callaway components were binned according to the following categories for material fabrication and cold work potential:

(1) Categories include the following:

- CASS (Category 1)
- hot-formed austenitic stainless steel (Category 2)
- annealed austenitic stainless steel (Category 3)
- fasteners austenitic stainless steel (Category 4)
- cold-formed austenitic stainless steel without subsequent solution annealing (Category 5)

(2) Cold work potential based on MRP-227-A generic criteria:

- No (N) typically applies to Categories 1, 2, and 3.
- Yes (Y) typically applies to Categories 4 and 5.

Where multiple options existed for a component or assembly the bounding condition, taken as including cold work, was selected for the purposes of the assessment. In some instances cascading fabrication would appear to mitigate any potential for cold work, however, since the historical record was not detailed the potential is noted but a conservative approach was selected for this assessment.

The evaluation performed, consistent with the industry guideline, concluded that the reactor internals Category 1, 2, and 3 (non-bolting) components at Callaway Unit 1 contain no cold work greater than 20% as a result of material specification and controlled fabrication construction. Category 4 components were already assumed to have the potential for cold work in the MRP-191 generic assessments. Material fabrication specifications used for Callaway would suggest that processes were limiting and precluded the introduction of significant cold work in some of the Category 4 and 5 components. In these cases a conservative posture was selected, where applicable, to consider the component as being cold worked for the purposes of this assessment. The detailed evaluation for the Applicant/Licensee Action Item for Callaway Unit 1 cold work assessments concluded that the plant-specific material fabrication and design are consistent with the MRP-191 basis and the MRP-227-A sampling inspection aging management requirements as related to cold work are directly applicable to Callaway Unit 1.

Ameren Missouri plans to revise Commitment 44 (LRA Table A4-1) to show it closed in the next LRA amendment.

References

1. Materials Reliability Program Letter, MRP 2013-025, "MRP-227-A Applicability Template Guideline," October 14, 2013.
2. Materials Reliability Program: Screening, Categorization, and Ranking of Reactor Internals Components for Westinghouse and Combustion Engineering PWR Design (MRP-191). EPRI, Palo Alto, CA: 2006. 1013234.
3. Materials Reliability Program: PWR Internals Material Aging Degradation Mechanism Screening and Threshold Values (MRP-175). EPRI, Palo Alto, CA: 2005. 1012081.

(b) The response to part (b) is provided in the following letters:

- ULNRC-06072 dated January 16, 2014
- ULNRC-06080 dated February 14, 2014
- ULNRC-06090 dated March 13, 2014

Corresponding Amendment Changes

For Part (a) of the response, refer to the Enclosure 2 Summary Table "Amendment 30, LRA Changes" for a description of LRA changes with this response.

For Part (b) of the response refer to the Enclosure 2 Summary Table "Amendment 29, LRA Changes" for a description of LRA changes with this response (Refer to ULNRC-06072 dated January 16, 2014).

No changes to the License Renewal Application (LRA) are provided in this response. Commitment 44 (LRA Table A4-1) will be revised to show it closed in the next LRA amendment.