

CALLAWAY PLANT UNIT 1
LICENSE RENEWAL APPLICATION

SUPPLEMENTAL RESPONSE TO RAI SET # 30 (RAI 3.1.2.1-6)

RAI 3.1.2.1-6

Background:

By letter dated October 24, 2012, Union Electric Company (Ameren Missouri) provided License Renewal Application (LRA) Amendment No. 13 which revised LRA Table 3.1.2-1, "Reactor Vessel, Internals, and Reactor Coolant System -Summary of Aging Management Evaluation - Reactor Vessel and Internals," to provide an amended aging management review (AMR) for the reactor vessel internals clevis insert bolts. In this amended AMR, the applicant confirmed that the clevis insert bolts are fabricated from nickel alloy materials and that potential cracking and loss of material due to wear will be managed by the applicant's American Society of Mechanical Engineers (ASME) Section XI Inservice Inspection (ISI), Subsections IWB, IWC, and IWD Program.

Issue:

Appendix A to Electric Power Research Institute (EPRI) Technical Report No. 1022863, "Materials Reliability Program: Pressured Water Reactor (PWR) Internals Inspection and Evaluation Guidelines (MRP-227-A)," indicates that failures of nickel alloy (Alloy X-750) clevis insert bolts were reported by the licensee for one domestic Westinghouse-designed pressurized water reactor in 2010. The ASME Section XI visual VT-3 inspections of the clevis insert assemblies on a 10-year frequency may not be adequate to ensure the integrity of clevis insert assemblies during design basis events if multiple bolt failures occur prior to detection and a design basis event occurs.

Request:

- (a) Describe the configuration of clevis insert assemblies at Callaway Plant, Unit 1 (Callaway) including number of bolts in the assemblies. Specify the material of fabrication, including any applicable heat treatment, that were used for the design of the clevis insert bolts at Callaway.
- (b) Discuss and justify whether the operating experience associated with cracking of the clevis insert bolts is applicable to clevis insert assembly designs at Callaway.
- (c) Describe the inspections that have been performed of the clevis insert bolts, including the type of inspection (e.g., VT-3). Clarify the visual inspection coverage that was achieved during these inspections. Clarify the ASME examination category that applies to inspections of the clevis insert bolts (and identify the applicable inspection method and frequency) and whether the past examinations have resulted in the detection of any indications of cracking or failures of the clevis insert bolts that are included in the clevis insert assembly designs. If so, provide the details of the inspection results and clarify the corrective actions that were taken at the facility to justify the structural integrity of the clevis insert assemblies and the intended safety function of the plant's core support structure and its components during plant operations.
- (d) Based on your responses to Parts (a) through (c) of this request, clarify whether the 10-year ISI basis for the clevis insert bolts is sufficient to manage cracking and wear of the bolts during the period of extended operation. Justify your response to this request.

Callaway Response

For the purposes of this submittal, the terms clevis insert bolts and clevis insert cap screws are used interchangeably. Their geometry is depicted in the Clevis Assembly Diagram, as shown below.

- (a) The response to Part (a) of RAI 3.1.2.1-6 is now located in Attachments 1 and 2 to ULNRC-06108. The information is modified to use Westinghouse terminology (i.e., clevis insert cap screws vs. clevis insert bolts) and now includes heat treatment information in the proprietary Attachment 1. Ameren Missouri has reviewed and concurs with the information provided by Westinghouse.

~~The clevis insert assemblies at Callaway are comprised of eight (8) clevis insert bolts fabricated from Inconel X-750, two (2) dowel pins and an insert assembly that rests onto the clevis locations in the reactor vessel. In total there are six (6) clevis locations (0, 60, 120, 180, 240, 300 degree locations). The clevis insert bolts include a lock bar that is welded to the clevis insert face. The clevis insert bolts are attached to the interior face of the clevis insert assembly.~~

~~The Callaway material used for the clevis insert bolts is the same as used at the reference plant where cracking has been observed. The clevis insert design however is different than the reference plant in that the clevis insert bolt locations are included on the interior face of the clevis (parallel to the outside face of the radial insert key with the core barrel installed). This geometry is further depicted in the Clevis Assembly Diagram, as shown below.~~

~~Heat treatment information will be provided in a later submittal.~~

- (b) ~~The response to part (b) will be provided in a later submittal.~~
The response to Part (b) is located in Attachments 1 and 2 to ULNRC-06108.
- (c) Callaway performs VT-3 inspections on 100% of accessible components in accordance with ASME Section XI B-N-2 code categorization. Callaway has performed this inspection on multiple occasions. The most recent inspection was performed in Spring 2013 during Callaway's Refuel 19, in which 100% of the clevis insert bolt heads and lock bars were observed in conjunction with the B-N-2 inspection and no degradation or damage was identified. There were no inspection results that identified similar clevis insert bolt head detachment, as was identified at the reference plant.

Based on these considerations and inspection results, the Callaway Reactor Vessel Internals Program will not be augmented for crack detection of the lower radial support clevis insert bolts.

Callaway continues to monitor operating experience in this area and will review applicable operating experience for program modifications.

- (d) ~~The response to part (d) will be provided in a later submittal.~~

Based on the responses to Parts (a) through (c) and inspection results, the Callaway Reactor Vessel Internals Program will not be augmented for crack detection of the lower radial support clevis insert bolts.

The existing ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program would effectively detect cracking of the lower radial support clevis insert bolts. Any such occurrence would be entered into the Corrective Action Program and appropriate corrective actions taken. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the continued implementation of the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program will effectively identify aging prior to loss of intended function. Callaway will continue to monitor operating experience in this area and will review applicable operating experience for program modifications, if necessary.

Corresponding Amendment Changes

No changes to the License Renewal Application (LRA) are needed as a result of this response.

