CALLAWAY PLANT UNIT 1
LICENSE RENEWAL APPLICATION

REQUEST FOR ADDITIONAL INFORMATION (RAI) SET #22 RESPONSES

## RAI A4-1

Background:

By letter dated December 15, 2011, Union Electric Company (Ameren Missouri) (the applicant) applied to the U.S. Nuclear Regulatory Commission (NRC) for renewal of the Callaway Plant, Unit 1 (Callaway), Operating License No. NPF-30 for an additional 20 years beyond the current expiration date, October 18, 2024. Included in the license renewal application (LRA) Section A4, Table A4-1, "License Renewal Commitments," are commitments for license renewal and an associated schedule for when Ameren Missouri plans to implement or complete the commitments.

The staff is reviewing the Callaway's LRA for compliance with the requirements of Title 10 of the *Code of Federal Regulations* (CFR) Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," and will document its preliminary findings in its "Safety Evaluation Report with Open Items Related to the License Renewal of Callaway Plant Unit 1."

Upon the issuance of a renewed license, the NRC will impose a generic condition on the license. Specifically, the license condition will state that the applicant's final safety analysis report (FSAR) supplement describes certain programs to be implemented and activities to be completed prior to the period of extended operation and that Ameren Missouri shall implement those new programs and enhancements to existing programs no later than 6 months prior to the period of extended operation. The license condition will also state that Ameren Missouri shall complete those inspection or testing activities as noted in certain commitments either before the end of the last refueling outage prior to the period of extended operation or 6 months prior to the period of extended operation, whichever occurs later. The purpose of requiring the completion of implementation, inspection, and testing either before the end of the last refueling outage or prior to the 6-month time frame is to ensure that the implementation of programs and completion of specific activities can be verified by the NRC's oversight process before the plant enters the period of extended operation.

The license condition will state:

> The licensee's FSAR supplement submitted pursuant to 10 CFR 54.21(d), as revised during the license renewal application review process, and as supplemented by Appendix A of NUREG-[XXXX], "Safety Evaluation Report Related to the License Renewal of Callaway Plant Unit 1" dated [Month Year], describes certain programs to be implemented and activities to be completed prior to the period of extended operation.
>
> a. The licensee shall implement those new programs and enhancements to existing programs no later than 6 months prior to PEO.
>
> b. The licensee shall complete those inspection and testing activities before the end of the last refueling outage prior to the PEO or 6-months prior to PEO, whichever occurs later.
>
> The licensee shall notify the NRC in writing within 30 days after having accomplished item (a) above and include the status of those activities that have been or remain to be completed in item (b) above.

Issue:

As proposed in Callaway's LRA Section A4, Table A4-1, the implementation schedule for some commitments may conflict with the implementation schedule intended by the generic license condition.

Request:

1. Identify those commitments to implement new programs and enhancements to existing programs. Indicate when the implementation of these programs will be completed.

2. Identify those commitments to complete inspection or testing activities. Indicate when the completion of these inspection and testing activities will occur.

## Callaway Response

1. LRA Appendix A Introduction, LRA Table A4-1, and LRA Appendix B1.2 have been revised as shown in LRA Amendment 22 to indicate when the commitments to implement new programs and enhancements to existing programs will be completed. Specifically, Ameren Missouri will complete implementation of new programs and enhancements to existing programs no later than 6 months prior to period of extended operation (PEO).
2. LRA Appendix A Introduction, LRA Table A4-1, and LRA Appendix B1.2 have been revised as shown in LRA Amendment 22 to indicate when the inspection and testing activities will be completed. Specifically, Ameren Missouri will complete inspection and testing activities by the 6-month date prior to PEO or the end of the last refueling outage prior to the PEO, whichever occurs later.

## Corresponding Amendment Changes

Refer to the Enclosure 2 Summary Table "Amendment 22, LRA Changes from RAI Responses and Typographical Corrections," for a description of LRA changes with this response.

## RAI B2.1.10-3b

Background:

The response dated November 20, 2012, to RAI B2.1.10-3a states that Callaway does not rely on estimated service life to manage internal coatings, and performs visual inspections as the primary method of monitoring coating conditions. The response cites statements from Electric Power Research Institute (EPRI) TR 1019157, "Guideline on Nuclear Safety-Related Coatings," to support its use of visual inspections. The response also states that corrective actions, extent of condition reviews, and evaluations for continued service are performed consistent with American Society for Testing and Materials (ASTM) D7167, "Standard Guide for Establishing Procedures to Monitor the Performance of Safety-Related Coating Service Level III Lining Systems in an Operating Nuclear Power Plant."

The response notes that this standard addresses performance of physical tests, such as dry film thickness or pull-off adhesion testing, and that physical testing is at the discretion of the evaluator.

The staff notes that Callaway's Open-Cycle Cooling Water System aging management program (AMP) implements coatings inspections through procedures EDP-ZZ-01112, "Heat Exchanger Predictive Performance Manual," and EDP-ZZ-3001, GL 89-13; Heat Exchanger Inspection." Neither procedure refers to ASTM D7167, nor discusses the need to assess the integrity of degraded coatings through physical testing. The staff also notes that the signs of coating degradation, given in EDP-ZZ-3001 for as-found inspection criteria, only include "chips, iron deposits on the surface (indicative of holidays in the coating surface), scrapes, and any other sign of surface abrasion." The staff further notes that, although it addresses macrofouling, EDP-ZZ-01112 does not include loss of coating integrity in macrofouling. In addition, the staff notes that coatings in applicable heat exchangers and strainers are inspected every 5 years and 6 years, respectively.

Issue:

Callaway's current implementing procedures do not appear to include inspection criteria for coating delamination and do not address the need to assess the integrity of degraded coatings through physical tests, such as pull-off adhesion testing. It is not clear to the staff that coating delamination is considered and that the extent of delamination can be bounded through visual inspections. In addition, since Callaway does not account for the service life of coatings, the staff needs additional assurance that the current inspection frequencies of 5 years and 6 years are adequate.

Request:

1) Verify that the Open-Cycle Cooling Water System AMP includes inspections for signs of coating detachment (e.g., blistering, flaking/peeling/delamination) and provide the acceptance criteria for these inspections. Otherwise, provide the bases for not including signs of coating detachment in the inspections of coatings where degradation may adversely affect downstream components.

2) Describe the Open-Cycle Cooling Water System AMP activities that verify coating integrity when visual indications of coating detachment are identified during periodic inspections. Include industry standards as appropriate. If these activities do not include physical testing

such as adhesion testing, provide the technical bases to demonstrate that downstream components will not be adversely affected by coating degradation.

3) Describe the timing of coatings inspections for the related heat exchangers and strainers in redundant trains. Specifically, discuss whether these inspections are staggered between redundant trains during subsequent outages and if applicable provide the time span between these alternating inspections. Include information to verify that the identical coating materials were installed with the same installation requirements in the redundant trains with the same operating conditions.

## Callaway Response

1) The Open-Cycle Cooling Water System program implementing procedures will be enhanced to specify that coatings inspections will look for signs of coating detachment (e.g. blistering, flaking/peeling/delamination). The Open-Cycle Cooling Water System program implementing procedures will also be enhanced to include the following acceptance criteria for signs of detachment which could affect downstream components:

   - Peeling, flaking, or delamination are not allowed.
   - Blisters are acceptable if limited to intact blister that is completely surrounded by sound coating bonded to the surface.
   - Cracking is not considered a failure unless it is accompanied by detachment or loss of adhesion.

   LRA Appendix B2.1.10 and LRA Table A4-1 item 6 have been revised as shown on Amendment 22 in Enclosure 2 to identify an enhancement for inspection of coating detachment and identification of acceptance criteria for those inspections.

2) The Open-Cycle Cooling Water System program implementing procedures will be enhanced to inspect for coating detachment, include inspection acceptance criteria, and require coating evaluation/testing as noted below.

   Coating detachments that are not repaired or removed to leave sound coating bonded to the surface will be evaluated to confirm downstream components are not adversely affected by coating detachment. The evaluation will include confirmation that the coating manufacturer installation requirements have been met. Physical testing such as those identified in ASTM-D7167 (e.g. dry film thickness test or adhesion test) will be required to determine if the coating is bonded to the surface. Coating detachments that are not repaired or removed to leave sound coating bonded to the surface will be trended.

   LRA Appendix B2.1.10 and LRA Table A4-1 item 6 have been revised as shown on Amendment 22 in Enclosure 2 to identify an enhancement for coating evaluation and testing.

3) The following Open-Cycle Cooling Water System program components have coated internal surfaces:

   - Component cooling water heat exchangers (one each in A and B trains)
   - Control room air conditioners (one each in A and B trains)
   - Class 1E electrical equipment air conditioners (one each in A and B trains)
   - Essential Service Water (ESW) system strainers (one each in A and B trains)

The coated Open-Cycle Cooling Water System program components are routinely inspected on a staggered outage basis between redundant trains. Therefore, there would be approximately 18 months between alternate train inspections, and 36 months between specific component inspections. This is the normal practice at Callaway. There may be times when the same train may be out of service 2 outages in a row. In this case, rather than put both trains out of service during the same refueling outage, the equipment in the same train may be inspected during 2 outages in a row. In no case would any of the coated surfaces of the Open-Cycle Cooling Water System program heat exchangers and strainers go more than 5 years between inspections as required by NRC GL 89-13.

The Open-Cycle Cooling Water System program components with coatings are constructed of carbon steel and experience the same operating conditions. All of the heat exchangers noted above are coated with Chesterton 855 coating. The ESW strainers are coated with Carboline 891. Therefore, for the same components in redundant trains, the same material/environment conditions are being inspected every refueling outage.

## Corresponding Amendment Changes

Refer to the Enclosure 2 Summary Table "Amendment 22, LRA Changes from RAI Responses and Typographical Corrections," for a description of LRA changes with this response.