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

October 24, 2012

Mr. Adam C. Heflin
Senior Vice President and Chief Nuclear Officer
Union Electric Company
P.O. Box 620
Fulton, MO 65251

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE CALLAWAY PLANT, UNIT 1, LICENSE RENEWAL APPLICATION, SET 16 (TAC NO. ME7708)

Dear Mr. Heflin:

By letter dated December 15, 2011, Union Electric Company d/b/a Ameren Missouri (the applicant) submitted an application pursuant to Title 10 of the *Code of Federal Regulations* Part 54 (10 CFR Part 54) for renewal of Operating License No. NPF-30 for the Callaway Plant, Unit 1 (Callaway). The staff of the U.S. Nuclear Regulatory Commission (NRC or the staff) is reviewing this application in accordance with the guidance in NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants." During its review, the staff has identified areas where additional information is needed to complete the review. The staff's requests for additional information are included in the enclosure. Further requests for additional information may be issued in the future.

Items in the enclosure were discussed with Sarah G. Kovaleski, of your staff, and a mutually agreeable date for the response is within 30 days from the date of this letter. If you have any questions, please contact me by telephone at 301-415-2946 or by e-mail at Samuel.CuadradoDeJesus@nrc.gov.

Sincerely,

Samuel Cuadrado de Jesús, Project Manager
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-483

Enclosure:
Request for additional information

cc w/encl: Listserv

CALLAWAY PLANT, UNIT 1
LICENSE RENEWAL APPLICATION
REQUEST FOR ADDITIONAL INFORMATION, SET 16

RAI B2.1.3-1a

Background:

By letter dated August 21, 2012, Union Electric Company d/b/a Ameren Missouri (the applicant) responded to request for additional information (RAI) B2.1.3-1, and stated in part that stud No. 18 became stuck in 1996, 2.625 inches above the base of the stud hole, which indicates 6.505 inches of thread engagement. The applicant also stated that since the minimum required thread engagement is 6.31 inches, stud No. 18 exceeds the requirement for minimum thread engagement. The applicant further stated that since excessive force was not used, no thread damage was caused after the stud became stuck. The applicant also stated that inspection of stud No. 18 prior to reactor vessel head installation found a small burr on the 10th and 11th threads. The burr was removed and there were no other problems noted with the stud threads. The applicant stated that the stud hole threads were also inspected, and no damage was found.

In its response, the applicant also stated that it performs inspections of stud No. 18 as required by the American Society of Mechanical Engineers (ASME) Section XI Code, which include a volumetric examination of the flange threads and the stud, and a VT-1 examination of the surface of the nuts and washers.

Issue:

The staff needs clarification of the applicant's basis for stating that the stuck stud has 6.505 inches of thread engagement remaining and that the required minimum thread engagement is 6.31 inches.

The staff finds that the applicant's response did not address the number of threads which may have been damaged as a result of stud No. 18 getting stuck, uniform wear, or corrosion. In addition, it is not clear from the applicant's response if the noted inspections associated with stud No. 18 were performed right before it became stuck. The applicant's response is also not specific in how ASME Section XI Code inspections can verify the current number of threads which are properly engaged for stud No. 18, particularly if the stud has not been removed since getting stuck in 1996.

Request:

Provide the basis for determining that all of the engaged threads for stud No. 18 are undamaged. In addition, provide justification of the evaluations used to support the basis that stud No. 18 has 6.505 inches of thread engagement, and that the required minimum thread engagement is 6.31 inches.

ENCLOSURE

RAI B2.1.3-2a

Background:

By letter dated August 21, 2012, the applicant responded to RAI B2.1.3-2, and in part identified all stud or stud hole locations which experienced degradation. Specifically, the applicant summarized the actions taken at the following stud or stud hole location numbers: 2, 4, 5, 7, 9, 13, 18, 24, 25, 39, 42, 53, and 54.

The staff also requested an explanation of the type of evaluations performed when closure stud bolting issues are detected on an individual basis and collectively for the entire reactor pressure vessel (RPV) flange assembly. The applicant stated that inputs to the evaluations consider all relevant information, including ASME Code requirements, prior evaluations and documented aging effects.

Issue:

In its review of the applicant's response, the staff noted that the applicant's summary of the problems encountered with its RPV closure stud bolting was not complete in that it did not include information regarding stud Nos. 15 and 35, whose inspection reports were reviewed by the staff during its audit and indicated that the studs for these locations were replacement studs. The staff needs additional information to understand the nature of these replacements (i.e., whether they were replaced due to damage).

In addition, based on the staff's review of the applicant's response, there was no consideration of the cumulative impact of the degraded closure stud bolting over the years on the entire RPV flange assembly. The staff is also uncertain how future RPV closure stud bolting issues will be assessed during the period of extended operation in this respect (e.g., if additional stud locations became damaged over time). The staff's concern is based on the fact that currently at least 10 closure stud bolting locations have some degradation in the form of missing threads. In addition stud No. 18 is stuck in a partially engaged position since fall of 1996.

Request:

a) Supplement the response to RAI B2.1.3-2 to include information on all RPV closure stud bolting corrective action, repair, and replacement activities performed to date, which were not included in the letter dated August 21, 2012.

b) Provide a condition assessment and evaluations which justify the adequacy of the entire RPV flange assembly, which accounts for all the locations with known closure stud bolting degradation.

RAI B2.1.10-2a

Background:

NUREG 1801, Revision 2, "Generic Aging Lessons Learned (GALL) Report," aging management program (AMP) XI.M20, "Detection of Aging Effects," states that the inspection scope and testing frequencies are in accordance with the applicant's docketed response to

Generic Letter (GL) 89-13. Callaway Plant, Unit 1's (Callaway's), response to GL 89-13, dated January 29, 1990, states that selected sections of essential service water (ESW) system piping are inspected each refueling outage (RFO) for corrosion, erosion, and biofouling, and that any piping with localized damage will be retested and trended each RFO. NUREG-1800, Revision 2, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants" (SRP-LR), Section A.1.2.3.4, "Detection of Aging Effects," states that when sampling is used in condition monitoring programs, applicants should provide the basis for the inspection population and sample size. In RAI B2.1.10-2, the staff requested the criteria used to select locations in the ESW system inspected by the Open-Cycle Cooling Water System Program and the number of these locations.

The response to RAI B2.1.10-2, dated August 21, 2012, provided a description of the criteria used to select the sections of piping that are inspected each outage. However, in addressing the sample size, the response only stated that the number of selected locations varies from outage to outage and did not provide any specific information. The staff noted that the response to RAI B2.1.10-6 states Callaway inspected 2000 feet of above-ground, carbon-steel ESW piping using low frequency electromagnetic testing (LFET) in spring 2008, inspected 300 feet of ESW piping during each RFO in fall 2008, spring 2010 and fall 2011, and planned to inspect 200 feet of ESW piping in the spring 2013 RFO.

Issue:

Although the RAI responses provided the length of piping inspected with LFET, they do not provide the context relative to the overall amount of ESW piping. It is unclear to the staff whether the reduced inspection scope is a consequence of a lesser amount of susceptible piping due to ongoing replacement activities or some other cause. In addition, the RAI response did not address the number of locations that are monitored each RFO due to previously identified localized damage, as stated in the response to GL 89-13. It is unclear to the staff whether there are any locations currently being monitored, whether the number is increasing or decreasing, and if the number is changing, whether the changes are due to specific causes.

Request:

Regarding the amount of ESW piping being inspected each RFO using LFET, provide a justification for the apparent reduction in the amount of piping inspected from 2000 feet in 2008, 300 feet in 2010 and 2011, and 200 feet in 2013, including an approximate percentage of the system that is inspected. In addition, provide the current number of locations where localized damage is being monitored each outage, and if applicable discuss the trend in this number.

RAI B2.1.10-3a

Background:

The GALL Report AMP XI.M20 relies on implementation of the recommendations in GL 89-13, which includes surveillance and control techniques to manage aging effects caused by protective coating failures. Since coatings may not have been applied at the time, and Callaway's response to GL 89-13 did not address protective coatings, RAI B2.1.10-3 requested confirmation that the program includes periodic inspections to detect coating degradation and

verification of the coating inspection frequencies. The RAI response stated that the 5- and 6-year inspection frequencies provide reasonable assurance that the program will effectively identify coating failures and aging so that corrective actions can be initiated, because "the total amount of internal coating is small and there has been no recent documented operating experience of internal coating failures."

The staff acknowledges that Callaway's recent operating experience has not identified internal coating failure; however, historically, Callaway Action Requests (CARs) 200102332, 200207034, 200407638, 200508460 and 200711241, address varying levels of coating degradation in the ESW system. In addition, the staff notes recent industry operating experience at Seabrook, which identified the use of internal linings beyond their established service life as a contributing cause of lining failure. In addition, the staff notes that lining or coating service life can be 20 years, as stated in NRC Inspection Manual Part 9900, "Maintenance – Filled Organic Coatings Used in Maintenance of Safety Related Equipment."

Issue:

For coatings installed in the ESW system, for which failure could adversely affect the safety function of downstream components, it is unclear to the staff what the service life, established as part of the initial installation, is for each coating and whether this aspect is being tracked. The staff notes that industry guidance documents, such as Electric Power Research Institute (EPRI) 1008282, "Life Cycle Management for Service Water Systems," state that all coatings degrade over time, and that when a coating degrades, ideally, it will fail in small pieces rather than in large sheets. It is unclear if periodic inspections include activities other than visual inspections to ensure that loss of adhesion is not occurring to limit the size of the failed coating pieces. In addition, with respect to the coating inspections being performed, industry guidance documents such as EPRI 1019157, "Guideline on Safety-Related Coatings" recommend that personnel performing inspections of the coatings meet certain qualifications. In its review of program basis documents, the staff did not identify information concerning qualifications of personnel that perform coating inspections.

Request:

a) For each location where coating failure may adversely affect the safety function of downstream components, provide the service life of the coating as established by the coating vendor or by other means. For locations where the coating may be approaching the end of its service life, describe program activities, other than visual inspections, that ensure downstream components are not adversely affected due to adhesion degradation of coating.

b) Describe the qualifications requirements of personnel performing the coating inspections for this AMP and if they are inconsistent with industry guidance, provide the bases for any inconsistencies.

RAI B2.1.10-5a

Background:

GALL Report AMP XI.M20, "acceptance criteria" program element states that inspected components should exhibit adequate design margin regarding design dimensions. In

RAI B2.1.10-5, the staff noted that an engineering evaluation apparently justified the structural integrity of the degraded flange by citing an incorrect manufacturing tolerance and requested Callaway to provide the acceptance criteria to be used where flange thicknesses have been adversely affected. The response to RAI B2.1.10-5 stated that the 12.5 percent manufacturing tolerance cited in CAR 200703680 did not apply to flange thickness and provided the quality control acceptance criteria for seating surface degradation with instructions that any flange face defect exceeding the criteria would require a CAR which would be evaluated by the engineering department.

Issue:

The staff noted that the flange degradation acceptance criteria pertained to the flange surface area, which would affect leakage, but it did not address loss of flange thickness, which would affect structural integrity. In addition, the staff noted the CAR 200703680 addressed a condition requiring an engineering evaluation and the engineering evaluation apparently justified the structural integrity of the flange based on tolerances that did not apply to flanges. It was not clear to the staff whether the use of the incorrect tolerance was captured in the corrective action program to determine if application of the 12.5 percent manufacturing tolerance for pipe wall thickness occurred in other circumstances.

Request:

For structural integrity evaluations that will be performed during the period of extended operation, where flange thickness has been adversely affected due to corrosion or other aging mechanisms, provide the acceptance criteria to ensure that the component intended function(s) will be maintained consistent with all current licensing basis (CLB) design conditions. Provide assurance that the use of the 12.5 percent pipe wall manufacturing tolerance will not be applied to engineering evaluations of flange structural integrity during the period of extended operation.

RAI B2.1.10-6a

Background:

RAI B.2.1.10-6 addressed several operating experience issues including a discussion in CAR 200703627 relating to the correlation between ESW system leaks and system testing for engineered safety feature actuation system (ESFAS) initiation. The CAR stated that during test procedures ESW components above elevation 2037 will naturally drain while the pump is secured, and that actions have not been effective in preventing ESW system hydraulic transients resulting from the testing. The RAI asked Callaway to confirm that transient loads, which occur during ESFAS testing and a loss of offsite power event, have been included in the structural integrity calculations for the system.

The response to this portion of the RAI stated that numerous plant modifications and plant procedures have been made over the years to address the water hammer which will occur when

the ESW pump starts, following a loss of offsite power. Although not specifically stated, these changes apparently have not prevented this hydraulic transient from occurring. The response also stated:

> Calculations of minimum wall thickness are not required to consider the transient pressure caused by a water hammer event. The Callaway pipe design standard establishes how design pressures are defined and allows pressure/temperature excursions in excess of design for short periods of time.

Issue:

The ASME Boiler and Pressure Vessel Code, provides the requirements for establishing design, service and test loads and limits. Section NCA-2142.1, "Design Loadings," states that the design pressure shall include allowances for pressure surges. In addition, although Callaway's pipe design standard may allow pressure excursions in excess of design for short periods of time, the ASME Code limits the stresses that result from these pressure excursions depending on how these loads are considered with respect to service level. It is unclear to the staff why hydraulic transient loads due to design basis events do not need to be included in the structural integrity evaluations of the ESW system for ongoing age-related degradation during the period of extended operation.

Request:

Provide documentation demonstrating that activities will continue to be conducted in accordance with the CLB for structural integrity evaluations of the ESW system due to age-related degradation. Specifically, address why the exclusion of pressure surges, caused by hydraulic transient loads during ESFAS testing and loss of offsite power events, in structural integrity evaluations meets the CLB.

October 24, 2012

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Sincerely,
/RA/
Samuel Cuadrado de Jesús, Project Manager
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-483

Enclosure:
Request for additional information

cc w/encl: Listserv
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OFFICE	PM:DLR/RPB1	LA:DLR/RPB2*	BC:DLR/RPB1	PM:DLR/RPB1
NAME	SCuadrado	IKing	DMorey	SCuadrado
DATE	10/22/12	10/18/12	10/23/12	10/24/12

OFFICIAL RECORD COPY

Letter to A. Heflin from S. Cuadrado DeJesus dated, October 24, 2012

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE CALLAWAY PLANT, UNIT 1, LICENSE RENEWAL APPLICATION, SET 16 (TAC NO. ME7708)

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