September 12, 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 10 PUBLIC VERSION (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,

/RA/

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

Docket No. 50-483

Enclosure:
As stated

cc w/encl: Listserv

September 12, 2012

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DISTRIBUTION:
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ADAMS Accession No.: ML12284A454 *concurrence via e-mail

OFFICE	LA:DLR/RPB1*	PM:DLR/RPB1	BC:DLR/RPB1	PM:DLR/RPB1
NAME	YEdmonds	SCuadrado	DMorey	SCuadrado
DATE	8/16/12	8/23/12	8/28/12	9/12/12

OFFICIAL RECORD COPY

Letter to A. Heflin from S. Cuadrado de Jesus dated September 12, 2012

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE CALLAWAY PLANT UNIT 1 LICENSE RENEWAL APPLICATION, SET 10 PUBLIC VERSION (TAC NO. ME7708)

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Letter to A. Heflin from S. Cuadrado de Jesus dated September 12, 2012

CALLAWAY PLANT UNIT 1
LICENSE RENEWAL APPLICATION
REQUEST FOR ADDITIONAL INFORMATION, SET 10 PUBLIC VERSION

RAI 4.2.2-1a

Background:

By letter dated June 22, 2012, the NRC staff issued request for additional information (RAI) 4.2.2-1 pertaining to the Callaway Plant, Unit 1 (Callaway) license renewal application (LRA), Section 4.2, time-limited aging analyses (TLAAs) of reactor pressure vessel (RPV) neutron embrittlement. In RAI 4.2.2-1, the staff requested that the applicant identify the source of the initial upper shelf energy (USE) and copper (Cu) content data for all extended beltline materials. The staff also requested that the applicant justify the use of these initial USE and Cu content values if they were not obtained from certified material test reports (CMTRs).

In its July 20, 2012, response to RAI 4.2.2-1, the applicant stated that the CMTRs for the Callaway inlet and outlet nozzle forgings did not contain measurements of Cu content because Cu content measurements were not required at the time of nozzle fabrication. The applicant stated that the Cu content of 0.16 weight percent for the Callaway inlet and outlet nozzle forgings is taken from the chemistry measurements available for SA-508, Class 2 forgings from Oak Ridge National Laboratory Report (ORNL) ORNL/TM-2006/530, "A Physically Based Correlation of Irradiation-Induced Transition Temperature Shifts for RPV Steels," November 2007 (ADAMS Accession Number ML081000630).

Issue:

The staff notes that the above ORNL report has not been approved by the NRC as a basis for the selection of a generic (i.e., non-heat-specific) Cu content for SA-508, Class 2 forgings. For those cases where no measured heat-specific Cu content exists, Regulatory Guide (RG) 1.99, "Radiation Embrittlement of Reactor Vessel Materials," Revision 2 recommends that an upper bound Cu content of 0.35 percent be assumed for embrittlement calculations. As an alternative to this upper bound estimation approach of the RG, the staff has occasionally accepted generic material property values derived from the statistical analysis of an industry-wide database for the material spec, if the generic value is based on a statistically-conservative position, such as the a 97.8 percent confidence limit (equivalent to a mean + 2σ upper bound to a normal distribution).

Request:

Considering the issue identified above, please provide additional justification for the selection of a 0.16 percent Cu content for the SA-508, Class 2 inlet and outlet nozzles at Callaway. Alternatively, please revise LRA Sections 4.2.2 and 4.2.3 to include a revised USE and pressurized thermal shock analysis of the inlet and outlet nozzles that is based on a more conservative Cu content, consistent with the values described above.

RAI 3.1.2.1-1

Background:

License renewal application (LRA) Table 3.1.2-1 provides a list of the aging management review (AMR) items for aging management of the Callaway reactor pressure vessel (RPV) and reactor vessel internal (RVI) components. In the LRA, aging management programs (AMPs) for aging management of the Callaway RVI components include: (a) AMP B2.1.1, ASME Section XI, Inservice Inspection, Subsection IWB, IWC, and IWD Program (ISI Program); (b) AMP B2.1.2, Water Chemistry Program; (c) AMP B2.1.6, PWR Vessel Internals Program; and (d) AMP B2.1.22, Flux Thimble Tube Inspection Program.

Issue:

The AMR items in LRA Table 3.1.2-1 for Callaway RVI components do not always match up with terminology used for Westinghouse-design RVI components in Electric Power Research Institute (EPRI) Report No. 1022863, "Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227-A)." Therefore, the staff seeks the following clarifications on nomenclature used for RVI-based AMR items in LRA Table 3.1.2-1:

a) the two AMR items for the RVI baffle-former assembly on LRA page 3.1-69

b) the four AMR items for RVI baffle-former assembly bolting at the bottom of LRA page 3.1-69 and top of LRA page 3.1-70

c) the four AMR items for the RVI control rod guide tube (CRGT) assembly on LRA page 3.1-71

d) the two AMR items for the RVI CRGT bolts listed on LRA page 3.1-72

e) the three AMR items for the RVI core barrel or core barrel assembly on LRA page 3.1-73

f) the three AMR items for the RVI core barrel assembly former bolting on pages 3.1-73 and 3.1-74

g) the two AMR items for RVI head/vessel alignment pins on page 3.1-75

h) the two AMR items for RVI incore instrumentation (ICI) core support structure bolting on LRA page 3.1-76

i) the three AMR items for RVI ICI support structure – Bottom Mounted Instrumentation (BMI) instrument columns on LRA pages 3.1-76 and 3.1-77

j) two AMR items for RVI lower core support – energy absorber assembly on LRA page 3.1-81

k) three AMR items for RVI upper core plate guide pins on LRA pages 3.1-82 and 3.1-83

Request:

a) For the two AMR items for the RVI baffle-former assembly on LRA page 3.1-69, clarify which specific baffle-former assembly components are within the scope of the AMR items.

b) For the four AMR items for the RVI baffle-former assembly bolting at the bottom of LRA page 3.1-69 and top of page 3.1-70, clarify whether the AMR items are referring to baffle-to-former bolts. Otherwise identify which specific bolts are within the scope of the AMR items.

c) For the four AMR items for the RVI CRGT assembly on LRA page 3.1-71, clarify which specific CRGT assembly components are within the scope of the AMR items.

d) For the two AMR items for the RVI CRGT bolts listed on LRA page 3.1-72, identify which specific bolts are within the scope of the AMR items.

e) For the three AMR items for the RVI core barrel or core barrel assembly on LRA page 3.1-73, identify which specific core barrel assembly components are within the scope of the AMR items.

f) For the three AMR items for the RVI core barrel assembly former bolting on LRA pages 3.1-73 and 3.1-74, clarify whether the AMR items are referring to baffle-former assembly barrel-to-former bolts, as defined in MRP-227-A. Otherwise identify which specific bolts are within the scope of the AMR items.

g) For the two AMR items for RVI head/vessel alignment pins on LRA page 3.1-75, clarify whether these components correspond to the upper core plate alignment pins in MRP-227-A (i.e., alignment and interfacing components in MRP-227-A Table 3-3). Otherwise, clarify where the pins are located and which MRP-227-A defined RVI assembly corresponds to the location of these pins.

h) For the two AMR items for RVI ICI core support structure bolting on LRA page 3.1-76; clarify where the bolts are located and which MRP-227-A defined RVI assembly corresponds to the location of these bolts. (These pins appear to be outside the scope of the condition monitoring bases in MRP-227-A.)

i) For the three AMR items for RVI ICI support structure – BMI instrument columns on LRA pages 3.1-76 and 3.1-77, clarify whether the AMR items are referring to BMI column bodies. Otherwise, identify which specific BMI column components are within the scope of the AMR items.

j) For the two AMR items for RVI lower core support – energy absorber assembly on LRA page 3.1-81, identify which energy absorber assembly components the AMR items are referring to and clarify which MRP-227-A defined assembly corresponds to the location of the components.

k) For the three AMRs for RVI upper core plate guide pins on LRA pages 3.1-82 and 3.1-83, clarify whether the AMR items correspond to the upper core plate alignment pins that are listed as Alignment and Interfacing "Existing Program" components in MRP-227-A Table 3-3. Otherwise, clarify where these pins are located and which MRP-227-A defined RVI assembly corresponds to the location of the pins.

RAI 3.1.2.1-2

Background:

LRA Table 3.1.2-1 provides a list of the AMR items for aging management of the Callaway RPV and RVI components. LRA pages 3.1-77 and 3.1-78 provide the applicant's AMR items for managing cracking, loss of fracture toughness, and loss of material in Callaway ICI support structure, upper and lower tie plates. In the AMR items, the applicant credits the Water Chemistry Program (AMP B2.1.2) to manage loss of material that may be induced in these components by pitting or crevice corrosion. The applicant credits a combination of the Water Chemistry Program and the PWR Vessel Internals Program (AMP B2.1.6) as the basis for managing cracking in these components. The applicant also credits the PWR Vessel Internals Program as the basis for managing loss of fracture toughness in the components. In the AMR items on cracking and fracture toughness, the applicant identifies that the upper and lower tie plate components are "Expansion Category" components for the applicant PWR Vessel Internals Program.

Issue:

The staff cannot correlate the ICI support structure upper and lower tie plates to any of the components that are listed for Westinghouse-designed RVI components in MRP-227-A Table 3-3 or in MRP-227-A Table 4-6, for Westinghouse "Expansion Category" components. Therefore, the staff cannot determine which MRP-227-A "Primary Category" components would potentially provide lead indications of aging for the ICI support structure upper and lower tie plates or the types of inspection bases (including method and frequency) that would be applied to the tie plates if expansion inspections were warranted.

Request:

a) Clarify whether the ICI support structure upper and lower tie plates are within scope of "Expansion Category" components in MRP-227-A. If MRP-227-A does cover the components, identify which "Expansion Category" components in Table 4-6 of MRP-227-A correlate to the ICI support structure upper and lower tie plates.

b) If these tie plates are within the scope of the current set of "Expansion Category" components in Table 4-6 of the report, identify which "Primary Category" component or components in Table 4-3 of MRP-227-A will be linked to the ICI support structure upper and lower tie plates, as "Expansion Category" components. Clarify the "Primary Category" inspection acceptance criteria that would kick in expansion inspections of the tie plates. Identify the inspection method and inspection frequency that would be applied to the tie

plates and clarify whether the tie plates would be subject to baseline inspections prior to the period of extended operation, as well as re-inspection basis during the period of extended operation, and define such bases as appropriate.

RAI 3.1.1.50-2

Background:

LRA Section B2, "Aging Management Programs," states that GALL AMP XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Program (CASS)," is not credited. LRA Table 3.1-1, item 3.1.1.050 states that since control rod drive (CRD) pressure housings are made of stainless steel, the applicable GALL Report AMR lines were not used.

In comparison, Callaway FSAR, Table 5.2-2 indicates that the CRD latch housings are made of SA-182, Grade F304 (non-cast stainless steel) or SA-351, Grade CF8 (cast stainless steel).

Issue:

Given the information regarding the CRD latch housing materials in the FSAR, the staff needs to confirm whether SA-351, Grade CF8 (cast stainless steel) has been used for the CRD latch housings. If the CASS material has been used for the CRD latch housings, the staff needs additional information regarding the applicant's material screening method for thermal aging embrittlement of the CASS material.

Request:

a) Clarify whether SA-351, Grade CF8, or SA-182, Grade F304, has been used for the CRD latch housings.

b) If the CASS material listed in FSAR, Table 5.2-2 has been used for the CRD latch housings, provide the following information to confirm that the applicant's material screening method is consistent with GALL Report AMP XI.M12.

   i. Clarify whether the CRD latch housing material is static-cast material or centrifugal-cast material.

   ii. If the CASS material was statically cast, provide the bounding-case chemical composition of the CASS material that estimates the highest ferrite content of the CRD latch housings. In addition, provide the calculated ferrite content in order to confirm that the bounding case analysis indicates no susceptibility of these CASS components to thermal aging embrittlement.

As part of the response, clarify whether the applicant's screening method is consistent with the guidance of NUREG/CR-4513, Revision 1, for ferrite content calculations using the Hull's equivalent factor as referenced in the GALL Report.