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

March 25, 2014

Mr. Fadi Diya
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 31 (TAC NO. ME7708)

Dear Mr. Diya:

By letter dated December 15, 2011, Union Electric Company (Ameren Missouri or 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 David E. Shafer 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 301-415-3873 or by e-mail at John.Daily@nrc.gov.

Sincerely,

John W. Daily, Senior Project Manager
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-483

Enclosure:
As stated

cc: Listserv

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See next page

ADAMS Accession No.: ML14065A592 ***concurred via email**

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DATE	3/19/2014	3/20/2014	3/24/2014	3/25/2014

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Letter to F. Diya from J. Daily dated March 25, 2014

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CALLAWAY PLANT, UNIT 1
LICENSE RENEWAL APPLICATION
REQUEST FOR ADDITIONAL INFORMATION, SET 31

RAI 3.0.3-2a, Loss of Coating Integrity (Followup)

Background:

1. RAI 3.0.3-2 Request (c) requested that the frequency of coating inspections be stated. The response to the RAI, dated December 20, 2013, stated in part, "[i]f no indications are found during inspection of one train, the redundant train would not be inspected". The response further stated that the scope of internally coated components includes heat exchangers, air conditioners, and strainers.
2. The response to the RAI stated that the interior surfaces of the fuel oil storage tanks are managed by the Fuel Oil Chemistry program. The "detection of aging effects" program element of GALL Report AMP XI.M30, "Fuel Oil Chemistry," states that, at least once every 10 years, each diesel fuel tank is drained and cleaned, and the internal surfaces are visually inspected. LRA Section B2.1.16 states that the Fuel Oil Chemistry program is consistent with GALL Report AMP XI.M30. LRA Section B2.1.16, "operating experience" example number five describes a 10-year cleaning and inspection frequency for emergency fuel oil system storage tanks.
3. The response to the RAI stated that peeling and delamination are not permitted and testing will be performed to confirm that the blisters are completely surrounded by sound coating bonded to the surface.
4. The response to the RAI did not address inspection of a component's base material if its coatings are credited for corrosion prevention (e.g., the corrosion allowance in design calculations is zero, the "preventive actions" program element credits the coating) and the base metal has been exposed.
5. The revised LRA Sections A1.10 and A1.23 state that the internal coatings are periodically inspected.
6. LRA Sections B2.1.10 and A1.23 were revised to address activities associated with coating inspections; however:
    a. LRA Sections B2.1.10 and B2.1.23 do not state: (a) that a baseline inspection will be conducted in the 10-year period prior to the period of extended operation, (b) the inspection interval for subsequent inspections, (c) the extent of inspections, (d) a summary description of how monitoring and trending of the coatings will be conducted, and (e) a summary description of corrective actions when coating degradation is detected.
    b. LRA Section B2.1.23 does not state the qualifications for individuals performing activities associated with coating inspections, and acceptance criteria.
7. The response to the RAI states, "[m]onitoring and trending will include pre-inspection reviews of previous inspection results. Inspection results will be compared to previous inspection results."
8. LRA Tables 3.3.2-4, 3.3.2-5, 3.3.2-7, 3.3.2-11, and 3.3.2-20 state that carbon steel (with coating or lining) components exposed to raw water (internal) are being managed for loss of material by the Open-Cycle Cooling Water System, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components, and Fire Water System programs.

ENCLOSURE

Issue:

1. The staff has concluded that if no indications are found during inspection of one train, the redundant train would not need to be inspected as long as components within the redundant trains are not subject to turbulent conditions. Turbulent conditions are those where fluid flow is such that the velocity at a given point varies erratically in magnitude and direction and mechanical damage to coatings can occur (e.g., heat exchanger end bells). The staff has also concluded that baseline inspections of the internal coatings on the in-scope heat exchangers, air conditioners, and strainers in all trains conducted in the 10-year period prior to the period of extended operation would demonstrate whether coatings are being degraded due to turbulent conditions.
2. The staff has concluded that coating inspections for diesel fuel oil storage tanks may be conducted at the frequency stated in the Fuel Oil Chemistry program as long as: (a) no peeling, delamination, blisters, or rusting are observed during inspections, and (b) any cracking and flaking has been found acceptable by a coating specialist. If this is not the case, inspections should be conducted more frequently. The staff noted that the Fuel Oil Chemistry program was not revised to include activities associated with coatings inspections (e.g., acceptance criteria, inspector qualifications).
3. The staff has concluded that where the visual inspection of the coated surfaces determines that the coating is deficient or degraded, physical tests, where physically possible are performed in conjunction with the visual inspection. The staff also concluded that physical testing should consist of destructive or nondestructive adhesion testing using ASTM International standards endorsed in RG 1.54 with a minimum of three sample points being conducted adjacent to the defective area. Physical testing is necessary to ensure that the extent of underlying degradation is detected.
4. The staff has concluded that if coatings are credited for corrosion prevention and the component's base material has been exposed or is beneath a blister, the base metal should be examined to determine if minimum wall thickness is met and will be met until the next inspection.
5. The staff has concluded that the UFSAR Supplement should include key aspects of the program associated with coating degradation such as the inspection method, followup testing that will be conducted when degradation is determined not to meet acceptance criteria, and the basis for the training and qualification of individuals involved in coating inspections.
6. The staff has concluded that the programs credited for detecting loss of coating integrity should include a summary description of (a) when baseline inspections will be conducted, (b) the inspection interval for subsequent inspections, (c) the extent of inspections, (d) qualifications for individuals performing activities associated with coating inspections, (e) a summary description of how monitoring and trending of the coatings will be conducted, (f) acceptance criteria, and (g) a summary description of corrective actions when coating degradation is detected.
7. The staff has concluded that a coatings specialist should prepare a post-inspection report to include: a list and location of all areas evidencing deterioration, a prioritization of the repair areas into areas that must be repaired before returning the system to service and areas where repair can be postponed to the next refueling outage, and where possible, photographic documentation indexed to inspection locations. The RAI response and associated LRA changes lacks this specificity. The post-inspection report

should be compiled or approved by a coatings specialist and it should include sufficient information to ensure that degraded areas are appropriately dispositioned through the corrective action program and future inspection locations are selected based on known areas where degradation has occurred.

8. Draft LR-ISG-2013-01, "Aging Management of Loss of Coating Integrity for Internal Service Level III (augmented) Coatings," states that the applicable aging effect for internal coatings is loss of coating integrity. In addition, GALL Report Items CP-152 and TP-301 state that the aging effect for Service Level I coatings is loss of coating integrity. While the GALL Report definition of loss of material incorporates aging mechanisms that are applicable to coatings (e.g., fretting, erosion, wastage, wear), the definition of loss of coating integrity in LR-ISG-2013-01 includes the concepts of consequential damage due to unanticipated or accelerated corrosion and debris generation that are not described in the definition of loss of material.

Request:

1. State the basis for why turbulent conditions sufficient to degrade internal coatings on the in-scope heat exchangers, air conditioners, and strainers described in the RAI response cannot occur. Alternatively, revise the Open Cycle Cooling Water System and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components programs to include baseline inspections of all trains conducted in the 10-year period prior to the period of extended operation of the internal coatings on the in-scope heat exchangers, air conditioners, and strainers described in the RAI response and revise the proposed frequency of inspections (i.e., redundant trains would be inspected for components susceptible to turbulent flow) based on the results of the inspections.
2. Confirm that the internal surfaces of the internally coated fuel oil storage tanks are inspected every 10 years. State the periodicity of inspections, and basis for the periodicity of inspections if the prior inspection detected peeling, delamination, blisters, rusting, or unacceptable cracking and flaking. State how activities associated with coatings inspections (e.g., acceptance criteria, inspector qualifications) will be managed given that they are not included in the Fuel Oil Chemistry program. Revise LRA Sections A1.16 and B2.1.16 accordingly as described in Issue items 5 and 6 above.
3. State what testing will be performed when peeling, delamination or blisters are detected during inspections and the coating is not repaired or replaced. If the testing does not include destructive or nondestructive adhesion testing, state why the testing will effectively detect the extent of the degraded condition. State how it will be determined that a repair or replacement of a coating is extended to sound coating material.
4. State whether a component's base material will be inspected if its coatings have been credited for corrosion prevention and the base metal has been exposed or is beneath a blister. In addition, state the inspection method and acceptance criteria. If inspections will not be conducted, state the basis for why there is reasonable assurance that the current licensing basis intended function of the component will be met.
5. Revise LRA Sections A1.10 and A1.23 to include a summary description of the followup testing that will be conducted when degradation is determined not to meet acceptance criteria and the basis for the training and qualification of individuals involved in coating inspections.

6. Revise LRA Sections B2.1.10 and B2.1.23 to include (a) when baseline inspections will be conducted, (b) the inspection interval for subsequent inspections, (c) the extent of inspections, (d) qualifications for individuals performing activities associated with coating inspections, (e) a summary description of how monitoring and trending of the coatings will be conducted, (f) acceptance criteria, and (g) a summary description of corrective actions when coating degradation is detected.
7. State who will prepare and approve post-inspection reports and the key information that will be included in the report.
8. State why the term "loss of material" as an aging effect for coatings as cited in LRA Tables 3.3.2-4, 3.3.2-5, 3.3.2-7, 3.3.2-11, and 3.3.2-20 is sufficient to convey the consequential concepts of unanticipated or accelerated corrosion, and debris generation. Alternatively, revise the aging effect to loss of coating integrity in the cited AMR tables.

RAI 3.0.3-3a, Firewater system (Followup)

Background:

1. As amended by letter dated December 20, 2013, LRA Section B2.1.14 states an exception to conducting main drain tests. Alternative testing and inspections are listed, including annual fire protection loop flow tests; fire protection water system flushes; hydrant flushes; and wet pipe, deluge, and preaction system visual inspections. Alternatively, the basis for the exception states the fire suppression system is fed from two or more directions such that failure of one isolation valve will not impair the system and long runs of pipe are flow tested.
2. As amended by letter dated December 20, 2013, LRA Section B2.1.14 is inconsistent with the response to RAI 3.0.3-3 Request (d) in regard to augmented testing or inspections of portions of the fire water system that are periodically subject to flow, but designed to be normally dry.
    a. LRA Section B2.1.14 and Commitment No. 10 state, "[i]n each five-year interval, beginning five years prior to the period of extended operation, either conduct a flow test or flush sufficient to detect potential flow blockage, or conduct a visual inspection of 100 percent of the internal surface of piping segments that cannot be drained or allow water to collect."
    b. The RAI response states, [i]nspections will be performed in each five-year interval beginning five years prior to the period of extended operation. A 100 percent baseline inspection will be performed prior to the period of extended operation with 20 percent of the inspections performed in each five year interval of the period of extended operation."
3. The response to RAI 3.0.3-3 Request (a) and LRA Section B2.1.14, in relation to NFPA 25, "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems," Section 14.2, "Internal Inspection of Piping," in part state, "[t]he internal surface of piping and branch lines is inspected for foreign material every five years by flushing wet pipe system piping." The response to Request (b) states, "[i]nternal visual inspections are performed during plant maintenance activities and the five year flush of wet pipe system piping."

Issue:

1. The basis for the exception lacks sufficient detail for the staff to conclude that the listed alternative tests and inspections are capable of detecting potential flow blockage in system risers.
2. The staff has concluded that in order to provide reasonable assurance that flow blockage has not occurred in portions of the fire water system that are periodically subject to flow, but designed to be normally dry, inspections or tests should be conducted on 100 percent of the portions that do not drain every 5 years commencing 5 years prior to the period of extended operation. The RAI response appears to state that only 20 percent of the piping will be inspected at 5-year intervals during the period of extended operation.
3. The response to RAI 3.0.3-3 Request (a) related to NFPA 25 Section 14.2 internal inspections appears to rely solely on flushes and not internal visual inspections. The staff has concluded that inspections conducted in accordance with NFPA 25, Section 14.2, should include internal visual inspections. While flushing procedures can detect loose corrosion products, internal conditions such as tubercules (NFPA Section 14.2.1.2) may not be detected with a flush. The response to Request (b) states that internal visual inspections will be conducted during maintenance activities and the 5-year flush of wet pipe systems; however, the minimum amount or percentage of piping that will be visually inspected was not stated.

Request:

1. Describe the alternative tests and inspections with sufficient detail to demonstrate that they are capable of detecting potential flow blockage in system risers. Alternatively, revise the program to include main drain tests per NFPA Section 13.2.5 or provide technical justification for performing a representative sample of main drain tests.
2. Revise LRA Section B2.1.14 or the RAI response to be consistent. If inspections or tests will not be conducted on 100 percent of the portions of the fire water system that: (a) are periodically subject to flow, (b) are designed to be normally dry, and (c) do not drain, every 5 years commencing 5 years prior to the period of extended operation, state the basis for why there is reasonable assurance that flow blockage will not occur in this piping.
3. State the minimum amount of wet pipe system piping, excluding private fire service main piping that will be internally visually inspected on a 5-year basis. In addition, state the basis for why this amount of piping provides a sufficient sample to establish sufficient insight into the internal condition of wet pipe system piping.

RAI 3.0.3-4a, Aboveground tanks (Followup), RAI 3.0.3.5a, Corrosion under insulation (Followup), and RAI 3.0.3-6, Minimum sample size, LR-ISG-2012-02, have been deleted from this RAI set as discussed in the summary for the Callaway RAI set 31 conference call held on February 27 and March 4, 2014 (ADAMS Accession No. ML14070A078).

RAI 3.3.2-2a, Submerged Bolting (Followup)

Background:

By letter dated December 2, 2013, the staff issued RAI 3.3.2-2, requesting details on the parameters that would be inspected to detect bolting degradation in submerged environments. The response dated January 16, 2014, described the bolting inspections as follows:

1. Essential Service Water (ESW) Pump Closure Bolting: a representative sample of submerged closure bolting of the ESW pumps will be visually inspected for degradation when they are made accessible during dewatering of the ESW intake bays for structures monitoring inspections. Dewatering of the ESW pump house intake bays is performed on a four refueling outage frequency (six years). The ESW pumps are tested at least quarterly and are repaired or refurbished when necessary, based on trending of pump parameters such as pressure, flow, and vibration.
2. Service Water Pump Closure Bolting: each service water pump is replaced nominally every six years with a refurbished pump. Because the pumps are periodically replaced every six years with a refurbished pump, the pumps and associated bolting are not subject to aging management requirements.
3. Waste Water Pump Closure Bolting: a representative sample of submerged pump closure bolting in the oily waste system and the floor and equipment drainage system will be visually inspected for degradation when they are made accessible during pump maintenance activities. The bolting will be inspected on a four refueling outage frequency (six years) if an opportunistic inspection has not been performed. The waste water sumps are monitored during operator rounds to confirm that the sumps are being drained.

The RAI response deleted pumps from LRA Table 2.3.3-5, "Service Water System," and closure bolting and pumps from LRA Table 3.3.2-5.

Issue:

1. Visual inspections of the ESW and waste water pump closure bolting are capable of detecting loss of material of only the exposed bolt heads. Given that crevices (e.g., threaded regions or the shank below the bolt heads) likely represent locations with the most aggressive environments, the staff considers it important that these areas are evaluated for loss of material on at least an opportunistic basis (e.g., during repair and replacement activities).
2. The staff does not agree with the proposal that managing the aging effects of the service water pump and its closure bolting is not required. Pump refurbishments frequently result in many passive long-lived parts being reused (e.g., casings, closure bolting).
3. The staff requires greater specificity regarding the frequency of the operator rounds that confirm that the waste water sumps are being drained.

Request:

1. For the ESW and waste water pumps' closure bolting, describe how loss of material will be identified in crevice locations that are not readily visible, or describe an alternative method

for evaluating degradation of those regions. If opportunistic inspections are proposed, provide historical information regarding how often the pumps have been disassembled in the past such that an inspection of crevice regions could have been conducted.

2. For the service water pumps and associated closure bolting, state whether the in-scope components are replaced every 6 years during refurbishment without using condition monitoring to conclude that replacement was not necessary. If these components are not necessarily replaced, propose appropriate means to manage the applicable aging effects.
3. State the frequency of the operator rounds that confirm that the waste water sumps are being drained.
4. State what procedures or logs have been revised to appropriately capture the basis of these aging management activities (e.g., operator rounds to inspect waste water sumps, work orders that contain steps to conduct a visual inspection of bolt regions that are not readily observable, quarterly pump testing procedure).