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

September 16, 2013

Mr. Joe W. Shea
Vice President, Nuclear Licensing
Tennessee Valley Authority
P.O. Box 2000
Soddy-Daisy, TN 37384

SUBJECT: REQUESTS FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION (TAC NOS. MF0481 AND MF0482) – SET 13.

Dear Mr. Shea:

By letter dated January 7, 2013, Tennessee Valley Authority submitted an application pursuant to Title 10 of the *Code of Federal Regulations* (CFR) Part 54, to renew the operating license DPR-77 and DPR-79 for Sequoyah Nuclear Plant, Units 1 and 2, for review by the U.S. Nuclear Regulatory Commission (NRC) staff. The staff is reviewing the information contained in the license renewal application and has identified, in the enclosure, areas where additional information is needed to complete the review.

These requests for additional information (RAIs), outlined in the Enclosure were discussed with Henry Lee, and a mutually agreeable date for the response to RAI B.1.34-5a is within 60 days from the date of this letter, and for the rest of the enclosed RAIs the mutually agreeable date for response is within 30 days from the date of this letter. If you have any questions, please contact me at 301-415-1427 or by e-mail at Richard.Plasse@nrc.gov.

Sincerely,

Richard A. Plasse, Project Manager
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-327 and 50-328

Enclosure:
Requests for Additional Information

cc: Listserv

September 16, 2013

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Tennessee Valley Authority
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DATE	9/13/2013	9/14/2013	9/16/2013

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SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2
LICENSE RENEWAL APPLICATION
REQUESTS FOR ADDITIONAL INFORMATION

RAI B.1.41-4a (Follow-up)

Background:

In its August 9, 2013, letter, the applicant responded to RAI B.1.41-4 which addressed plant-specific flaw tolerance evaluation of cast austenitic stainless steel (CASS) components with a ferrite content greater than 25 percent. In its response, the applicant stated that a probabilistic fracture mechanics method will be used in flaw tolerance evaluation for CASS piping components with a ferrite content greater than 25 percent. The applicant also stated that its flaw tolerance evaluation will use the percent probabilities of various levels of material fracture toughness. The applicant further stated that the flaw tolerance evaluation will calculate the maximum allowable flaw depths for a specific (very low) probability of failure based on crack tip stability, or instability, of the assumed flaws in the elastic-plastic fracture mechanics (EPFM) analysis.

Issue:

GALL Report AMP XI.M12 recommends plant-specific flaw tolerance evaluation for CASS components with a ferrite content greater than 25 percent as one of the options for aging management. However, GALL Report AMP XI.M12 recommends deterministic principles (as described in ASME Code Section XI, IWB-3640) for flaw tolerance evaluation of CASS components with a ferrite content up to 25 percent. In addition, GALL Report AMP XI.M12 does not include technical evaluation of probabilistic fracture mechanics methods for aging management. By contrast, the applicant's response to RAI B.1.41-4a indicates that its program may use probabilistic flaw tolerance evaluation for aging management of CASS components with a ferrite content greater than 25 percent. Therefore, the applicant should submit its probabilistic flaw tolerance evaluation for staff's review to demonstrate the adequacy of the evaluation.

The staff also noted that the revised updated final safety analysis report (UFSAR) supplement for the applicant's program (as described in the August 9, 2013, response) addresses flaw tolerance evaluation for detected flaws, which is not relevant to the flaw tolerance evaluation for postulated flaws. The staff further needs to clarify how the applicant will confirm that CASS components, for which flaw tolerance evaluation is performed, do not have a flaw greater than the maximum allowable flaw size of applicant's evaluation.

Request:

Submit applicant's probabilistic flaw tolerance evaluation to demonstrate that the evaluation is adequate for aging management. In addition, identify any NRC-approved methods and associated safety evaluations that are used for the applicant's flaw tolerance evaluation.

ENCLOSURE

Clarify why the revised UFSAR supplement refers to detected flaws rather than postulated flaws in relation to the flaw tolerance evaluation.

Describe how the applicant will confirm that CASS components, for which flaw tolerance evaluation is performed, do not have a flaw greater than the maximum allowable flaw size of applicant's evaluation (Please note that this request is for all CASS components in the scope of the applicant's program regardless of whether the ferrite content is greater than 25 percent).

RAI B.1.34-5a (Follow-up)

Background:

By letter dated August 9, 2013, the applicant provided its response to RAI B.1.34-5 that indicated the upper guide tube enclosure tubes, upper guide tube housing plate and upper instrumentation brackets, clamps, terminal lock and conduit straps are potentially fabricated from cast austenitic stainless steel. The applicant provided the results of the failure modes, effects and criticality analysis (FMECA) conducted on the upper guide tube enclosure tubes, upper guide tube housing plate and upper instrumentation brackets, clamps, terminal lock and conduit straps.

Issue:

The applicant indicated that after it considered the impact of the possible material changes to I CASS it was concluded that these components remained in the "no additional measures" category and that the aging management strategy is not affected. However, the staff noted that the bases for applicant's conclusions from the FMECA of these CASS components were not provided in its response.

For each of these components (i.e., upper guide tube enclosure tubes, upper guide tube housing plate and upper instrumentation brackets, clamps, terminal lock and conduit straps) the applicant indicated the likelihood of failure, likelihood of damage and FMECA Group based on the components being fabricated from an ASTM A351 Grade CF8 material; however, the technical basis that supports the new categorizations was not provided in the response to RAI B.1.34-5.

Request:

1. Provide the technical basis for the FMECA conclusion that the CASS (1) upper guide tube enclosure tubes, (2) upper guide tube housing plate and (3) upper instrumentation brackets, clamps, terminal lock and conduit straps components remained in the "no additional measures" inspection category.

2. Explain and justify the impact of considering loss of fracture toughness due to thermal embrittlement in the FMECA of the CASS (1) upper guide tube enclosure tubes, (2) upper guide tube housing plate and (3) upper instrumentation brackets, clamps, terminal lock and conduit straps as compared to the original FMECA performed for MRP-227-A. In addition, specifically address how the stress and expected loading on these components was considered in the FMECA of these CASS components on the likelihood of damage and failure from cracking of potentially thermally embrittled components.

RAI 4.7.3-3a (Follow-up)

Background:

By letter dated July 29, 2013, the applicant responded to RAI 4.7.3-3. In its response to RAI 4.7.3-3, the applicant provides additional information to support the conclusion that the time-limited aging analysis (TLAA) on the leak-before-break (LBB) analysis will remain valid for the period of extended operation, as accepted in accordance with the requirement in 10 CFR 54.21(c)(1)(i).

Issue:

The staff noted that, with the exception of the following transients, the information in LRA Tables 4.3-1 and 4.3-2 provides adequate demonstration that number of cycles projected at 60 years for the design transients assumed in the LBB analysis would not exceed the number cycles assumed for these transient in the LBB analysis. However, LRA Table 4.3-1 for Unit 1 and LRA Table 4.3-2 for Unit 2 do not provide any 60-year cycle projections for the following design basis transients.

- Load follow cycles for unit loading and unloading at a rate of 5 percent of full power/min
- Step load increases and decrease
- Cold hydrostatic test

Request:

Provide the 60-year projected cycle values and justify the 60-year projected cycle values for the following design transients assumed for in the LBB: (a) load follow cycles for unit loading and unloading at a rate of 5% of full power/min, (b) step load increases and decreases, and (c) cold hydrostatic tests. Based on the cycle projections for these transients, provide your basis for concluding that the LBB analysis for the CLB would remain valid for the period of extended operation, as dispositioned in accordance with the TLAA acceptance criterion in 10 CFR 54.21(c)(1)(i).

RAI 3.0.3-1, item (5a) (Follow-up)

Background:

The staff noted that the Aboveground Metallic Tank program, as amended by letter dated September 3, 2013, allows for a one time inspection of the tank bottom thickness conducted in accordance with the One Time Inspection program, in lieu of periodic inspections. In order to use a one time inspection, one of the following criteria will be met:

- The soil under the tank is demonstrated to be not corrosive during each 10 year period starting 10 years prior to the period of extended operation.

- The tank bottom has been cathodically protected in accordance with the availability and effectiveness criteria of LR ISG 2011 03, "Changes to the Generic Aging Lessons Learned (GALL) Report Revision 2 Aging Management Program (AMP) XI.M41, 'Buried and Underground Piping and Tanks'," Table 4a, "Inspection of Buried Pipe."

The staff also noted that the applicant proposes to conduct the alternative one time inspection within the 10 year period prior to the period of extended operation.

Issue:

Conducting a one time inspection in lieu of periodic inspections when either of the above criteria is met is acceptable. However, GALL Report AMP XI.M29, "Aboveground Metallic Tanks," recommends that tank bottom thickness inspections occur within the 5 year period of entering the period of extended operation.

GALL Report AMP XI.M32, "One Time Inspection," "detection of aging effects" program element allows one time inspections to commence 10 years prior to the period of extended operation. However, inspections associated with GALL Report AMP XI.M32 are based on aging effects that are not expected to occur or the aging effect is expected to progress very slowly. The staff is aware of two recent industry operating experience events related to degradation in tanks of similar design, which was not detected until just prior to entering the period of extended operation.

Request:

Explain why conducting a one time inspection of the tank bottom 10 years prior to entering the period of extended operation will be adequate to confirm that age-related degradation will not cause a loss of intended function during the period of extended operation. Alternatively, amend the Aboveground Metallic Tank program to conduct the alternative one time thickness measurements within the 5 year period prior to the period of extended operation.

RAI 3.4.2.1.1-2 (Follow-up)

Background:

By letter dated September 3, 2013, TVA amended LRA Table 3.3.2-10 to include the chemical and volume control system (CVCS) hold up stainless steel tanks exposed to concrete, which will be managed for loss of material by the Aboveground Metallic Tanks program. The AMR item cited LRA Table 3.4 1, item 3.4.1-31, and plant specific note 312, which states, "[t]he CVCS holdup tanks are indoor tanks on a concrete foundation with an oiled sand cushion." LRA Table 3.3.2-10 states that the outside surfaces of the tanks externally exposed to indoor air have no aging effect requiring management and no recommended aging management program.

LRA Table 3.0-1, "Service Environments for Mechanical Aging Management Reviews," states that the indoor air environment includes the air indoor uncontrolled GALL Report environment.

Issue:

GALL Report Section IX.D, "Selected Definitions and Use of Terms for Describing and Standardizing Environments," states that for the air indoor uncontrolled environment, condensation can occur. Given the potential for periodic condensation, minor amounts of halides can accumulate and result in cracking over time. The staff is aware of industry operating experience where indoor stainless steel atmospheric storage tanks have experienced stress corrosion cracking.

Request:

Explain how cracking will be managed on the external surfaces of the CVCS hold up tanks, or state the basis for why cracking will not occur.

RAI A.1-1 (Follow-up)

Background:

LRA Section A.1, as amended by letter dated July 29, 2013, provides the UFSAR supplement summary description of the applicant's ongoing operating experience review activities.

Issue:

The applicant's July 29, 2013, response to B.0.4-1 states that the operating experience review activities include:

- review of revisions to NUREG-1801, "Generic Aging Lessons Learned (GALL) Report," as a source of industry operating experience; and
- evaluation of age-related operating experience items based on consideration of affected plant systems, structures, and components; materials; environments; aging effects, aging mechanisms; AMPs; and the activities, criteria, and evaluations integral to the elements of the AMPs.

The summary description in LRA Section A.1 does not address these activities.

Request:

Revise LRA Section A.1 to include a description of the activities identified above. Otherwise, provide a justification for not including such a description in the UFSAR supplement.

Letter to J. Shea from R. Plasse dated September 16, 2013

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