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

May 31 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)

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 were discussed with Henry Lee, 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 at 301-415-1427 or e-mail Richard.Plasse@nrc.gov.

Sincerely,

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

Docket No. 50-327 and 50-328

Enclosure:
Requests for Additional Information

cc w/encl: Listserv

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

LRA Section B.1.2 – Bolting Integrity

RAI B.1.2-1

Background:

License renewal application (LRA) Sections A.1.2 and B.1.2 state that bolting inspection activities include those required by ASME Section XI for ASME Code Class 1, 2, and 3 pressure-retaining components. For non-ASME Code class bolting, these LRA sections state that periodic system walkdowns and inspections occur at least once per refueling cycle.

The "detection of aging effects" program element of Generic Aging Lessons Learned (GALL) Report aging management program (AMP) XI.M18, "Bolting Integrity," recommends that periodic system walkdowns and inspections to detect leakage be performed at least once per refueling cycle for both ASME Code class bolting and non-ASME Code class bolting. The staff noted that ASME Code Class 2 and 3 pressure-retaining components are required to be inspected for leakage every inspection period, or 40 months, under the ASME Section XI, Tables IWC-2500-1 and IWD-2500-1.

Issue:

Given that ASME Code Class 2 and 3 pressure-retaining components will not be inspected for leakage every refueling outage, it is not clear to the staff how age-related degradation of closure bolting will be detected and corrected prior to the leakage becoming excessive.

Request:

State why inspections performed every ASME Section XI inspection period, rather than at least once per refueling outage, will be adequate to detect leakage from ASME Code Class 2 and 3 bolted connections.

RAI B.1.2-2

Background:

LRA Tables 3.3.2-11 and 3.3.2-14 include bolting items in the essential raw cooling water and spent fuel pit cooling systems that are exposed externally to water and managed by the Bolting Integrity Program.

The "detection of aging effects" program element of GALL Report AMP XI.M18, "Bolting Integrity," recommends periodic system walkdowns and inspections of ASME Code class bolting and non-ASME Code class bolting to detect leakage that is indicative of age-related degradation of closure bolting.

ENCLOSURE

Issue:

It is not clear to the staff how degradation of bolted connections that are submerged will be detected.

Request:

1. Describe the configuration of the submerged bolting in the essential raw cooling water and spent fuel pit cooling systems.

2. Describe the aging management activities (method, frequency, etc.) for the submerged bolting and state how these activities are capable of detecting bolting loss of material and loss of preload.

LRA Section B.1.6 – Containment Inservice Inspection – IWE

RAI B.1.6-1

Background:

Title 10 of the *Code of Federal Regulations* (CFR) 50.55a(b)(2)(ix), "Examination of metal containments and the liners of concrete containments," references ASME Code Section XI, Subsection IWE and specifies additional inspection requirements for inaccessible areas. It states that the licensee is to evaluate the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of or result in degradation to such inaccessible areas. ASME Code Subsection IWE-1240 discusses surface areas requiring augmented examinations that include concrete-to-steel shell or liner interfaces, embedment zones, and leak chase channels. In addition, the applicant stated in IWE AMP B.1.6, that, "SQN has augmented the IWE program to emphasize the inspection of the steel shell at the concrete floor embedment and inaccessible portions (behind mechanical equipment) of the shell."

Issue:

1. The carbon steel pressure test piping that connect to the embedded leak chase channels in the containment base slab concrete were found to be corroded. Some of the pipes had through wall corrosion. The applicant has issued a design change notice (DCN) that allows, as an option, permanent sealing the pressure test piping by a steel plate after removing a portion of the piping. It is not clear how this change will prevent further corrosion of the pressure test piping, containment liner plate, including the full penetration welds in the base slab, and associated embedded leak chase channels.

2. During the audit, the staff reviewed photographs that show evidence of corrosion in the steel containment shell at the moisture barrier due to water leakage. The moisture barrier had been found to be degraded in certain areas. The water may have also leaked beyond past the degraded moisture barrier into the inaccessible area of steel containment embedded in the concrete resulting in corrosion of the liner plate.

Request:

Discuss the actions the applicant has initiated or planned to ensure that the steel containment pressure boundary integrity will be maintained during the period of extended operation relative to the issues noted above. The response should include:

1. Details of any periodic tests to be performed on the liner plate and leak chase channel.

2. Plans, if any, for an ultrasonic test (UT) examination of the steel containment below the moisture barrier from the annulus area, exposure of a portion of the embedded liner plate and rebars in concrete to determine the presence and extent of corrosion.

RAI B.1.6-2

Background:

LRA Section B.1.6 states that the applicant's Inservice Inspection – IWE program, with enhancement, is consistent with the program described in NUREG-1801 (GALL Report), Section XI.S1, ASME Section XI, Subsection IWE. GALL Report AMP XI.S1 "scope of program," program element includes examinations of Class MC, steel containment pressure-retaining components and their integral attachments, metallic shell and penetration liners of Class CC concrete containments and their integral attachments, containment hatches and airlocks, containment moisture barriers, containment pressure-retaining bolting, and metal containment surface areas, including welds and base metal. 10 CFR 50.55a imposes inservice inspection (ISI) requirements per ASME Code, Section XI, Subsection IWE, which in Article IWE-2412, has specific recommendations for examination of welds that are added to the inspection program during an inspection interval.

Issue:

During steam generator replacement (SGR) for Sequoyah Nuclear Plants (SQN), Units 1 and 2, in 2004 and 2012 respectively, the steel containments dome were cut and full penetration welds were added. The LRA Section B.1.6, "Containment Inservice Inspection - IWE," states that in 2011, the program was revised to change the scope of examinations performed on the containment vessel dome cut welds, based on operating experience. However, the details of the change are not identified in the AMP. It is not clear whether the change satisfies the requirements of IWE-2412 for welds added during an inspection interval.

Request:

1. Describe the details of the change in scope of the examinations performed and will continue to be performed on the containment vessel dome cut welds during the period of extended operation.

2. The response should include the operating experience across the fleet that was used to implement a change in the scope and whether this change meets the requirements of IWE-2412.

LRA Section B.1.7 – Containment Leak Rate

RAI B.1.7-1

Background:

The SQN, Units 1 and 2, LRA Section B.1.7 Containment Leak Rate AMP states that the applicant has implemented Option B for the 10 CFR Part 50 Appendix J for leak rate testing (LRTs) and it is consistent with no exceptions or enhancements with the GALL Report, Revision 2, AMP XI.S4. The GALL Report AMP XI.S4, "10 CFR Part 50, Appendix J," "parameters monitored or inspected," program element states that parameters to be monitored include leakage rates through containment shells, liners, and associated welds.

10 CFR Part 50, Appendix J rule requires containment leak rate tests to "assure that (a) leakage through these containments or systems and components penetrating these containments does not exceed allowable leakage rates specified in the technical specifications and (b) integrity of the containment structure is maintained during its service life."

Issue:

The applicant in Section B.1.7, "Containment Leak Rate," AMP in the LRA states that the Containment Leak Rate Program detects degradation of the containment shell and liner and components that may compromise the containment pressure boundary. The AMP also states that the parameters monitored are leakage rates of the steel containment vessel and associated welds, penetrations, fittings, and other access openings. However, during the audit the staff noted that the applicant has issued a DCN 23160 that allows permanent sealing of the pressure test piping that is connected to leak chase channels embedded in the concrete base slab. These leak chase channels were originally provided to test the leak tightness of the containment base slab liner plate full penetration welds. It is not clear how the applicant plans to monitor leakage rate through containment base slab liner plate and associated welds during the future ILRTs as recommended in GALL Report AMP, "10 CFR 50, Appendix J," with the pressure test piping, that is connected to the leak chase channels embedded in the concrete base slab, permanently sealed.

Request:

Describe how the GALL Report AMP, "10 CFR 50, Appendix J" recommendations will be met or justify alternatives to the LRTs to assure the integrity of containment base slab liner plate welds is maintained during the period of extended operation.

RAI B.1.7-2

Background:

The SQN, Units 1 and 2, LRA B.1.7 Containment Leak Rate program states that the applicant has implemented Option B for the 10 CFR Part 50 Appendix J for LRTs and is consistent with no exceptions or enhancements with the GALL Report, Revision 2, AMP XI.S4. The GALL

Report AMP XI.S4, "10 CFR Part 50, Appendix J," "scope of program," program element states that "the scope of the containment LRT program includes all containment boundary pressure-retaining components."

10 CFR Part 50, Appendix J, rule requires containment LRTs to assure that (a) leakage through the components penetrating the containment does not exceed allowable leakage rates specified in the technical specifications or associated bases; and (b) periodic surveillance of reactor containment penetrations and isolation valves is performed so that proper maintenance and repairs are made during the service life of the containment, and systems and components penetrating primary containment. 10 CFR Part 54.21(a) rule requires all containment boundary pressure-retaining components to be age managed.

Issue:

SQN, Units 1 and 2, final safety analysis report (FSAR) and Supplement 1 of the original safety evaluation report (SER), indicate that a number of penetrations and valves are excluded from local LRTs (LLRTs). It is not clear how the applicant will manage the aging effects for any components that are not included in "its scope of program," program element.

Request:

1. For those components (valves, penetrations, and other components) that have been excluded from the Containment Leak Rate program, identify how aging effects will be managed during the period of extended operation.

2. Indicate which AMPs and/or aging management review (AMR) line items will be used to manage the aging effects for each of the exempted/excluded components, or justify why an AMP and/or AMR line item is not necessary for the period of extended operation.

LRA Section B.1.11 – Fatigue Monitoring

RAI B.1.11-1

Background:

The "scope of program" program element of GALL Report AMP X.M1, "Fatigue Monitoring," states that the program monitors and tracks the number of critical thermal and pressure transients for the components that have been identified to have a fatigue time-limited aging analysis (TLAA).

Issue:

The staff noted that updated FSAR (UFSAR) Table 5.2.1-1 includes 18,300 cycles of "Loading and unloading power changes per unit at 5% per minute" and 2,000 cycles of "Step load increase and decrease of 10% per unit". LRA Section 4.3.1.6 includes 15 cycles of design tensioning cycle limit for reactor coolant pump (RCP) hydraulic studs/nuts. LRA Section 4.3.2.3 identifies the following five additional transients for the fatigue calculations for Chemical and

Volume Control System (CVCS) Regenerative Heat Exchangers: (1) 2,000 cycles of "Step changes in letdown stream fluid temperature from 100°F to 560°F;" (2) 24,000 cycles of "Step changes in letdown stream temperature from 400°F to 560°F;" (3) 200 cycles of "Changes in letdown stream temperature from 100°F to 560°F occurring over four hours;" (4) 200 cycles of "Changes in letdown stream fluid temperature from 560°F to 140°F occurring over 20 hours;" and, (5) 200 cycles of "Pressurizations to respective design pressure and temperature."

The staff also noted that aforementioned eight transients were inputs to various metal fatigue TLAAs dispositioned in accordance with 10 CFR 54.21(c)(1)(iii). However, these transients were not included in LRA Tables 4.3-1 and 4.3-2 and it is not clear to the staff whether these transients are monitored by the applicant's Fatigue Monitoring program.

Request:

1. Clarify whether all these transients will be monitored as part of the Fatigue Monitoring program.

2. If not, for each of the transients, justify why the transient would not need to be monitored by the Fatigue Monitoring program during the period of extended operation.

RAI B.1.11-2

Background:

Enhancement 3 of the Fatigue Monitoring program stated that "[f]atigue usage factors for the RCS limiting components will be determined to address the Cold Overpressure Mitigation System (COMS) event (i.e., low temperature overpressurization event) and the effects of the structural weld overlays." The applicant identifies that Enhancement 3 is included on the "scope of program" program element of the AMP. The "scope of program" program element of GALL Report AMP X.M1, "Fatigue Monitoring," states that the program monitors and tracks the number of critical thermal and pressure transients for the components that have been identified to have a fatigue TLAA.

Issue:

The applicant has not identified the components that are within the scope of the stated enhancement. Furthermore, the staff noted that the effects of the structural weld overlays for fatigue usage factors may include, but are not limited to, the update or addition of components and transients to existing fatigue analyses. The staff seeks further clarifications on the impacts that the presence of structural weld overlays will have on the following aspects of the program: (a) list of components, (b) design transients, (c) cycle counting activities, and, (d) cumulative usage factor (CUF) analyses. Without such information, the staff cannot determine whether the "scope of program" element of the Fatigue Monitoring program, when enhanced, would be consistent with that of GALL Report AMP X.M1.

Request:

1. Identify all plant systems and components that are within the scope of license renewal that have been affected by or will be affected by occurrences of COMS events.
   a) With respect to these components, clarify and define what is meant by the statement: "[f]atigue usage factors for the RCS limiting components will be determined to address the COMS event."

2. Identify all systems and components that are within the scope of license renewal that have been or will be subjected to structural weld overlay modifications.
   a) With respect to these components, identify and explain all impacts (effects) that the presence of structural weld overlays will have on the scope of the Fatigue Monitoring program, including (but not limited to) impacts of the following aspects of the program:
      1) list of components,
      2) design transients,
      3) cycle counting activities, and
      4) CUF analyses.

3. In light of the responses that will be made to Parts (a) and (b), justify why the proposed enhancement, when implemented, provides assurance that the "scope of program" element of the Fatigue Monitoring program will be consistent with that in GALL Report AMP X.M1, "Fatigue Monitoring." Revise LRA Section A.1.11 accordingly.

LRA Section B.1.13 – Fire Water System

RAI B.1.13-1

Background:

The program description of the Fire Water System program, LRA Section B.1.13, states that the program manages loss of material and fouling for fire protection components that are tested in accordance with the Fire Protection Report.

During its review of the UFSAR, the staff noted that the two safety-related standby fire/flood mode pumps are used to provide makeup to the steam generators and reactor coolant system during a flooding event. Based on the staff's review of LRA Sections 2.3.3.2, 3.3, 3.4, and LRA Drawing 1,2-47W850-24, "Mechanical Flow Diagram Fire Protection," it appears that the pumps, and suction and discharge piping of these pumps, are being age-managed by the Fire Water System program.

The "scope of program" program element in GALL Report AMP XI.M27 states, "[t]he AMP focuses on managing loss of material due to corrosion, MIC, or biofouling of steel components in fire protection systems exposed to water."

GALL Report Item VIII.G.SP-136 recommends GALL Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," to age-manage steel

piping exposed to raw water. GALL Report Table VII. E1, "Chemical Volume and Control System (PWR)," does not include steel piping exposed to a raw water environment.

Issue:

It is not clear to the staff that given the scope of inspections recommended in GALL Report AMP XI.M27, that the Fire Water System program is appropriate to manage the portion of a system whose intended functions as described in 10 CFR 54.4 are to support auxiliary feedwater and reactor coolant system make-up.

Request:

1. State whether the safety-related standby fire/flood mode pumps and associated suction and discharge piping aging effects will be managed by the Fire Water System program.

2. State why reasonable assurance can be established that the components will meet their intended function consistent with the current licensing basis, or if the aging effects of the components will be managed by the Fire Water System program, propose an alternative aging management program.

In considering the response to question 2, review the proposed changes to GALL Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," included in draft LR-ISG-2012-02, "Aging Management of Internal Surfaces, Service Level III and Other Coatings, Atmospheric Storage Tanks, and Corrosion under Insulation."

RAI B.1.13-2

Background:

LRA Section B.1.13, Fire Water System, Enhancement No. 4, associated with the "detection of aging effects" program element of the LRA AMP states, "[r]evise Fire Water System Program procedures to consider implementing the flow testing requirements of NFPA 25 or justify why the flow testing requirements of NFPA should not be implemented."

GALL Report AMP XI.M27 recommends that system flow testing be used to ensure that corrosion and biofouling are not occurring and that the system's intended function is maintained.

Issue:

It is not clear to the staff whether flow testing is or is not included in the program. The staff cannot complete its evaluation of the program until it understands the basis for not including flow testing or flow testing is included in the program.

Request:

State the basis for why reasonable assurance, in the absence of flow testing, can be established that the fire water system components will be adequately age-managed to meet

their intended function consistent with the current licensing basis, or include flow testing in accordance with NFPA 25, "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems," 2011 Edition.

RAI B.1.13-3

Background:

During the audit, the staff reviewed Problem Evaluation Report 690236 which stated that the fire jockey pump is running continuously. During the audit, the applicant stated that the nominal flowrate of the fire jockey pump is 50 gallons per minute (gpm) and in the early 2000s, leakage was identified as 13–18 gpm.

The "detection of aging effects" program element of GALL Report AMP XI.M27 states that, "[c]ontinuous system pressure monitoring, system flow testing, and wall thickness evaluations of piping are effective means to ensure that corrosion and biofouling are not occurring and that the system's intended function is maintained." The "parameters monitored/inspected" program element states, "the parameters monitored are the system's ability to maintain pressure." In addition, the GALL Report AMP XI.M27 program description states, " these systems are normally maintained at required operating pressure and monitored such that loss of system pressure is immediately detected and corrective actions initiated."

Issue:

The degraded system performance is inconsistent with the GALL Report AMP XI.M27 program description, and the "detection of aging effects" and "parameters monitored/inspected" program elements in that the jockey pump run times cannot be used to monitor for further system degradation. It is not clear to the staff how the Fire Water System program will be adjusted during the period of extended operation if the jockey pump is running continuously.

Request:

State how the Fire Water System program will be adjusted during the period of extended operation if the jockey pump is running continuously.

LRA Section B.1.17 – Containment Inservice Inspection – IWF

RAI B.1.17-1

Background:

The GALL Report recommends that the extent, frequency, and examination methods for Class 1, 2, 3, and MC component supports and related hardware (i.e., structural bolting, high strength structural bolting, support anchorage to the building structure, accessible sliding surfaces, constant and variable load spring hangers, guides, stops, and vibration isolation elements) to be based on ASME Section XI, Subsection IWF, per 10 CFR 50.55a imposed ISI requirements.

part of the inspection sample are reworked to as-new condition, they are no longer typical of the other supports and related hardware in the population. Subsequent IWF inspections of the same sample would not represent the age-related degradation of the rest of the population.

Request:

When corrective actions are not required per the ASME Code, Section IWF, acceptance criteria, but a support within the IWF inspection sample is repaired to as-new condition without an expansion of the ISI sample population size, describe how the ASME Section XI, Subsection IWF Program will be effective in managing aging of similar/adjacent Class 1, 2, 3, and MC component supports and related hardware that are not included in the ISI Program sample population.

LRA Section B.1.19 – Internal Surfaces in Miscellaneous Piping and Ducting

RAI B.1.19-1

Background:

The GALL AMP XI.M38, "Inspection of Internal Surface in Miscellaneous Piping and Ducting Components" states that this program is not intended for use on piping and ducts where repetitive failures have occurred from loss of material that resulted in loss of intended function. AMP XI.M38 further recommends using a plant-specific program if operating experience indicates that there have been repetitive failures.

During the audit, a review of the Operating Experience Summary and "operating experience" program element for the Internal Surfaces in Miscellaneous Piping and Ducting Components program was performed. The applicant stated that it would be inappropriate to manage aging effects for these material-environment combinations in these systems:

- copper-alloy – condensation, and carbon steel – waste water
- ventilation, station drains, waste disposal, and diesel generators

The applicant further stated that the plant-specific Periodic Surveillance and Preventive Maintenance Program would be used to manage the effects of aging for these systems.

Issue:

The following LRA tables contain material/environment/system combinations where repetitive failures are known to occur, however those combinations are being age-managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components program.

3.3.2-4: carbon steel & waste water
3.3.2-5: copper alloy & condensation
3.3.2-8: carbon steel & waste water
3.3.2-13: carbon steel & waste water
3.3.2-15: carbon steel & waste water

There is a reasonable assurance that a properly implemented IWF inspection program will be effective to detect, evaluate, or repair age-related degradation before there is a loss of component support intended function. The VT-3 examination method specified by the program can reveal loss of material due to corrosion and wear, verification of clearances, settings, physical displacements, loose or missing parts, debris or dirt in accessible areas of the sliding surfaces, or loss of integrity at bolted connections.

Issue:

As part of the audit, the staff performed a walkdown of the essential raw cooling water (ERCW) building. During the walkdown, the staff noted that one of the strainer's support is exposed to continuous leakage and has evidence of corrosion of bolts and support plates.

Request:

Describe the actions planned to be taken to ensure that corrosion is mitigated and that the degradation of the strainer's support will not prevent it from performing its intended function during the period of extended operation.

RAI B.1.17-2

Background:

LRA Section B.1.17 states that the applicant's Inservice Inspection – IWF program, with enhancement, is consistent with the program described in NUREG-1801 (GALL Report), Section XI.S3, ASME Section XI, Subsection IWF. GALL Report AMP XI.S3, "monitoring and trending," program element, states that examinations of Class 1, 2, 3, and MC component supports and related hardware (i.e., structural bolting, high strength structural bolting, support anchorage to the building structure, accessible sliding surfaces, constant and variable load spring hangers, guides, stops, and vibration isolation elements) that reveal unacceptable conditions which exceed the acceptance criteria and require corrective measures are extended to include additional examinations in accordance with ASME Code Section XI, Subsection IWF-2430.

Issue:

Upon review of plant-specific operating experience, the staff noted cases in which degraded conditions were found during IWF examinations of Class 1, 2, 3, and MC component supports and related hardware. Engineering evaluation determined that the as-found component/hardware was acceptable-as-is, but the component/hardware was still re-worked to as-new condition. Since it was determined that the as-found condition did not affect the support's capability to perform its design function, the licensee did not apply ASME Sections IWF-2420 and IWF-2430 for successive or additional examinations.

The ASME Code, Section XI, Subsection IWF program requires the inspection of the same sample of the total population of component supports and related hardware at each inspection interval. The staff's concern with respect to aging management is that if IWF supports that are

Request:

Describe how the Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Components Program is adequate to monitor the material/environment and system combinations listed above, when operating experience indicates that a plant-specific program should be used to monitor the aging effects of repetitive failures.

LRA Section B.1.21 – Metal Enclosed Bus

RAI B.1.21-1

Background:

In element 10 (operating experience) of the LRA AMP B.1.21, Metal Enclosed Bus Inspection, the applicant states that the Metal Enclosed Bus (MEB) program is a new program for which there is no operating experience at SQN involving the aging effects managed by this program. In the GALL Report AMP XI.E4, it states that industry operating experience has shown that failures have occurred on MEBs caused by cracked insulation and moisture or debris buildup internal to the MEB. During the audit on March 26, 2013, the staff became aware of a MEB failure event in 2009 which resulted in the tripping of both units. In problem event report (PER) 166884, the applicant states that the bus failed catastrophically on August 5, 2009. The applicant determined that the failure of the bus was caused by cracked Noryl insulation and moisture intrusion inside the bus.

Issue:

Based on the MEB failure identified in PER 166884, the staff is concerned that SQN operating experience may not support the applicant's conclusion that LRA AMP B.1.21 will be effective in managing the aging effect of MEBs for the period of extended operation.

Request:

1. Describe corrective actions taken or planned to prevent recurrence of a MEB failure within the scope of license renewal.

2. Revise element 10 of the LRA to incorporate lessons learned from this operating experience (OE) and explain why LRA AMP B.1.21 will be effective in managing MEB aging effects.

RAI B.1.21-2

Background:

During the review of a plant procedure, SQN-1-Bus-202-CC/CE, the staff identified an issue with verifying proper torque. Section 5.7.e of the procedure requires verifying bolts are properly torqued. EPRI TR-104213, Bolted Joint Maintenance & Application Guide, states that bolts

should not be retorqued unless the joint requires service or the bolts are clearly loose. Verifying the torque is not recommended. The torque required to turn the fastener in the tightening direction (restart torque) is not a good indicator of the preload once the fastener is in service. Due to relaxation of the parts of the joint, the final loads are likely to be lower than the install loads. The GALL AMP XI.E4 recommends checking bus connections for increased resistance by using thermography or by measuring connection resistance using a micro-ohmmeter.

Issue:

Re-torque is not recommended per industry guidance.

Request:

Explain why procedure SQN-1-Bus-202-CC/CE requires the verification that bolts are properly torqued versus the industry recommended practice not to retorque once the fastener is in service.

RAI B.1.21-3

Background:

During the audit, the applicant indicated that it currently performs thermography of the MEB connections with the MEB covers in place with the bus fully loaded. The thermography test case was not able to identify enough detail (distinction by temperature between component parts was not apparent) to consider this method effective. The staff noted that typically, infrared (IR) windows are installed on MEB covers for the purpose of thermography inspection.

Issue:

Without the installation of IR windows, the MEB cover may mask the temperature difference between the buses and will not be able to detect bus connection high resistance due to bolt loosening.

Request:

If thermography is used, explain how this test will be effective to detect bus connection high resistance due to bolt loosening?

LRA Section B.1.23 – Nickel Alloy Inspection

RAI B.1.23-1

Background:

LRA Section B.1.23 and applicant's program basis document state that the Nickel Alloy Inspection Program detects RCP boundary cracking and leakage due to primary water stress corrosion cracking (PWSCC). LRA Section B.1.23 states that the program uses the

examination and inspection requirements of 10 CFR 50.55a and industry guidelines (e.g., MRP-139), consistent with GALL Report AMP XI.11B, "Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (PWRs only)."

During the audit, the staff noted that evidence of borated-water leakage and corrosion was identified in the visual inspection of the Unit 1 reactor vessel bottom head and keyway area during the 2006 refueling outage. The applicant's plant event record related to this inspection indicates that the affected components were the reactor vessel, vertical and horizontal section of mirror insulation surrounding the reactor vessel, thimble tubes and thimble tube support structure, and concrete wall surrounding the reactor pressure vessels.

Issue:

The LRA does not address which component was the source of the borated-water leakage discussed above or whether the leakage resulted from aging-related degradation of reactor vessel and piping components. The staff also needs confirmation on whether the applicant took adequate corrective action for the observed leakage.

In addition, the staff needs to clarify how the applicant's program manages and resolves the situation that borated-water leakage and associated corrosion products interfere with the visual examination of the components within the scope of the program (e.g., the visual examination of ASME Code Cases N-770-1, N-729-1 and N-722-1).

Request:

1. Describe the source of the borated-water leakage that was observed during the 2006 refueling outage for Unit 1.
    a) As part of the response, clarify whether the leakage resulted from aging-related degradation of reactor vessel and piping components.
    b) If so, identify the component and aging effect that induced the leakage.

2. Clarify whether the applicant has cleaned the past borated-water leakage residues and corrosion products. If not, justify why borated-water leakage residues and corrosion products left in service would not interfere with the visual examination that are included in the program.

3. Clarify how the program manages and resolves the situation that borated-water leakage and associated corrosion products interfere with the visual examination of the components that are included in the scope of the program.

RAI B.1.23-2

Background:

LRA Section B.1.23 for the Nickel Alloy Inspection Program states that the program detects and manages reactor coolant pressure boundary cracking and leakage due to primary water stress corrosion cracking (PWSCC). The LRA also states that the program uses the examination and inspection requirements of 10 CFR 50.55a and industry guidelines (e.g., MRP-139), consistent with GALL Report AMP XI,11B, "Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (PWRs only)."

During the audit, the staff noted the following operating experience of the applicant. During the volumetric examinations of the Unit 1 reactor vessel upper head penetration nozzles in accordance with NRC Order EA-03-009, the applicant found wear indications on control rod drive mechanism (CRDM) penetration nozzles 1, 2, 3, 4 and 5.

The applicant's plant event record regarding this operating experience also indicates that these wear indications were due to the interaction between the inside surfaces of the CRDM penetration nozzles and the centering pads of the CRDM thermal sleeves located inside the penetration nozzles. The applicant's PER further indicates that the typical wear indication was approximately 0.7 inches long in the axial direction and 360 degrees in circumference.

Issue:

The LRA or applicant's program basis document does not describe how these wear indications will be monitored and managed to maintain the integrity of the CRDM penetration nozzles and to prevent potential reactor coolant pressure boundary leakage.

Request:

1. Provide the following baseline information related to the observed wear indications:
    a) The total number of the CRDM penetration nozzles for each unit, and the number of CRDM penetration nozzles that have been found with wear in each unit
    b) Clarification on whether any of the wear indications are located in the RCP boundary portions of the penetration nozzles.
    c) Clarification on whether all of the wear indications are located within the examination volumes that are inspected in the scope of the program (e.g., within the examination volume of the volumetric examination specified in ASME Code Case N-729-1).
    d) The maximum depth of the observed wear indications in each unit, and the nominal wall thickness of the CRDM penetration nozzles
    e) The acceptance criteria that were used to justify the continued service of the penetration nozzles with the wear indications, and the technical basis of the acceptance criteria

2. Clarify whether the other types of applicant's reactor vessels upper head penetration nozzles (e.g., vent line nozzles) are susceptible to wear due to the interaction with penetration thermal sleeves.
   a) If so, provide the baseline information, which is requested in Part 1 of this RAI, as applied to the non-CRDM-type penetration nozzles.

3. Clarify why the LRA does not identify loss of material due to wear as an applicable aging effect that should be managed for the CRDM penetration nozzles and other types of reactor vessel upper head penetration nozzles.

4. If loss of material due to wear is determined to be an applicable aging effect for the reactor vessel upper head penetration nozzles, describe the inspection method, scope, frequency, and acceptance criteria that will be used to detect and manage the aging effect for the period of extended operation.
   a) In addition, describe the technical bases of the applicant's inspection approach and acceptance criteria

5. Ensure that the LRA is consistent with the response, including program enhancements and additional AMR items as necessary.

LRA Section B.1.25 – Non-EQ Inaccessible Power Cables

RAI B.1.25-1

Background:

NUREG-1801, Revision 2, the GALL Report addresses inaccessible power cables in AMP XI.E3, "Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements." The purpose of this AMP is to provide reasonable assurance that the intended functions of inaccessible or underground power cables (400V to 35 kV), that are not subject to environmental qualification requirements of 10 CFR 50.49 and are exposed to wetting or submergence will be maintained consistent with the current licensing basis. The scope of the program applies to inaccessible (e.g. in conduit, duct bank, or direct buried installations) power cables within the scope of license renewal that are subject to significant moisture. Significant moisture is defined as periodic exposures to moisture that last more than a few days (e.g., cable wetting or submergence in water). NUREG- 1800, Revision 2, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants" (SRP), Table 3.0-1 provides guidance for FSAR supplements for aging management of applicable systems, including the GALL Report AMP XI.E3.

Industry operating experience provided by NRC licensees in response to GL 2007-01 has shown: (a) that there is an increasing trend of cable failures with length in service, (b) that the presence of water/moisture or submerged conditions appears to be the predominant factor contributing to inaccessible or underground power cable failure. The staff has determined, based on the review of the cable failure data, that an annual inspection of manholes and a cable test frequency of at least every 6 years (with evaluation of inspection and test results to

determine the need for an increased inspection or test frequencies) is a conservative approach to ensure the operability of power cables and, therefore, should be considered.

In addition, industry operating experience has shown that some NRC licensees have experienced cable manhole water intrusion events, such as flooding or heavy rain, that subjects cables within the scope of GALL Report, AMP XI.E3 to significant moisture. The staff has determined that event driven inspections of cable manholes, in addition to the one year periodic inspection frequency, is a conservative approach and, therefore, should be considered. The GALL Report AMP XI.E3 states that periodic actions should be taken to prevent inaccessible cables from being exposed to significant moisture. Examples of periodic actions are inspecting for water collection in manholes and conduits and draining water as needed. The inspection should include direct observation that cables are not wetted or submerged, and cables/spices and cable support structures are intact, and that dewatering/drainage systems (sump pumps) and associated alarms operate properly.

Issue:

During review of the applicant's operating experience, including work orders, PERs, and inspection reports, the staff identified unresolved cases of unacceptable levels of water in manholes and hand-holes which could potentially expose in-scope power cables to significant moisture.

When a power cable is exposed to wet or submerged conditions for which it is not designed, an aging effect of reduced insulation resistance may result, causing a decrease in the dielectric strength of the conductor insulation. This insulation degradation caused by wetting or submergence can potentially lead to failure of the cable's insulation system. Sequoyah inaccessible power cable operating history includes reference to PERs 432510, 585074, 589672, 622595, 432510, and letter dated March 12, 2013, to S.L. Harvey, "Response to Corporate Oversight- Level 1 Escalation letter (ERCW Duct bank dewatering efforts)," that identify unresolved concerns with standing water and timely dewatering of manholes. NRC Integrated Inspection Report 05000327/2012002, 05000328/2012002 identified a green finding for the applicant's failure to meet the requirements of corrective action program procedure NPG-SPP-03.1.7, PER Actions, Revision 2. The finding involved the applicant's failure to ensure that the corrective action plan and associated actions addressed the required action and schedule associated with PER 432510. The issue was entered into the applicant's corrective action program as PERs 433761, 432510, and 505259.

The staff is concerned that the applicant's manhole inspections, including maintenance of sump pumps and cable support structures may not be adequate to prevent in-scope inaccessible power cables form being subjected to significant moisture. Additional information is required before a determination can be made regarding the sufficiency of LRA AMP B.1.25 to detect and manage the effects of aging.

Requests:

1. Additional information is required that demonstrates proactive and satisfactory manhole, sump pump, and cable support structure inspection, maintenance and corrective actions

to prevent in-scope inaccessible power cables from being exposed to significant moisture.

a) Include a summary discussion of corrective actions and schedule for completion.

2. Describe how plant specific and industry operating experience will be evaluated and incorporated into the GALL Report LRA AMP B.1.25 to prevent exposure of in-scope inaccessible power cables to significant moisture before and during the period of extended operation.

3. Describe inaccessible power cable testing, test frequencies and test applicability that demonstrate that in-scope inaccessible power cables, including inaccessible low voltage power cable, will continue to perform their intended function before and during the period of extended operation.

RAI A.1.25-1

Background:

LRA FSAR Supplement Section A.1.25 does not include the test techniques consistent with SRP Table 3.0-1, as follows: "the applicant can assess the condition of the cable insulation with reasonable confidence using one or more of the following techniques: Dielectric loss (Dissipation Factor/Power Factor), AC Voltage withstand, Partial Discharge, Step Voltage, Time Domain Reflectometry, Insulation Resistance and Polarization Index, Line Resonance Analysis, or other testing that is state-of-the-art at the time the tests are performed. One or more tests are used to determine the condition of the cables so they will continue to meet their intended function during the period of extended operation."

Issue:

In the absence of these testing techniques in the applicant's program description, this makes the FSAR Supplement inconsistent with the basis document SQN-RPT-10-LRD04 and the GALL Report, AMP XI.E3, Program Description and Detection of Aging Effects which list the specific tests.

Request:

Provide an adequate program description in the FSAR Supplement consistent with the GALL Report AMP XI.E3 and SRP Table 3.0-1 including the test techniques.

RAI A.1.25-2

Background:

LRA FSAR Supplement Section A.1.25 does not provide periodic inspection specifics consistent with SRP Table 3.0-1 as follows: "the applicant shall include periodic inspection specifics as follows: The inspection should include direct observation that cables are not wetted or

submerged, that cables/splices and cable support structures are intact, and dewatering/drainage systems (i.e., sump pumps) and associated alarms operate properly. In addition, operation of dewatering devices should be inspected and operation verified prior to any known or predicted heavy rain or flooding events."

Issue:

In the absence of these specifics for periodic inspection, the FSAR Supplement is inconsistent with the basis document SQN-RPT-10-LRD04 and GALL Report AMP XI.E3, Preventive Actions, which list the periodic inspection specifics.

Request:

Provide an adequate program description in the FSAR Supplement consistent with GALL Report AMP XI.E3 and SRP Table 3.0-1, including inspection specifics.

LRA Section B.1.26 – Non-EQ Instrumentation Circuits Test Review

RAI B.1.26-1

Background:

SRP Table 3.0-1, FSAR Supplement for Aging Management of Applicable Systems under AMP XI.E2 states that in the case where cables are not part of the calibration or surveillance program, a proven test (such as insulation resistance tests, time domain reflectometry tests, or other test judged to be effective) for detecting deterioration of insulation system are performed. LRA Section A.1.26 states that for sensitive instrumentation circuit cables that are disconnected during instrumentation calibrations, testing will be performed using a proven method for detecting deterioration for the insulation.

Issue:

The applicant does not identify the type of tests that can be used in the FSAR Supplement. In the absence of these testing techniques, the UFSAR Supplement is inconsistent with GALL Report AMP XI.E2 and SRP Table 3.0-1 which provides guidance on the specific tests.

Request:

Provide a list of proven test that will be performed for detecting deterioration of insulation system for instrumentation cables. Revise the LRA Section A.1.26 to be consistent with SRP Table 3.0-1.

LRA Section B.1.30 – One-Time Inspection – Small-Bore Piping

RAI B.1.30-01

Background:

LRA Sections B.1.30 and A.1.30 do not provide the number of in-scope small-bore piping welds for its two units. The GALL Report AMP, "detection of aging effects" program element recommends that if an applicant's units have not experienced a failure of its ASME Code Class 1 piping, and it has extensive operating history (>30 years) at the time of submitting the application, the inspection sample size should be at least 3% of the weld population or a maximum of 10 welds of each weld type for each operating unit.

In addition, the "detection of aging effects" program element of the GALL AMP recommends that for socket welds, opportunistic destructive examination can be performed in lieu of volumetric examination. Because more information can be obtained from a destructive examination than from a nondestructive examination, the applicant may take credit for each weld destructively examined equivalent to having volumetrically examined two socket welds.

Issue:

It is not clear to the staff how the inspection sample size would be calculated, since the total population of Class 1 butt welds and socket welds for each unit within scope of the program are not provided in the applicant's LRA. In addition, it is not clear to the staff if the applicant will use opportunistic destructive examination for butt welds, and how it will be credited when they are performed in lieu of volumetric examinations.

Request:

1. Provide the type and number of in-scope small-bore piping welds for each of the units.

2. In addition, clarify if opportunistic destructive examinations will be used for butt welds, and how they will be credited.

3. Amend LRA Sections B.1.30 and A.1.30 accordingly, to include the total population for both units, and to clearly state how opportunistic destructive examination will be credited, if they are performed in lieu of volumetric examinations for butt welds and/or socket welds.

LRA Section B.1.35 – Reactor Vessel Surveillance

RAI B.1.35-1

Background:

The "Detection of Aging Effects" program element of GALL Report AMP XI.M31 states, in part, that:

1. the withdrawal schedule shall be submitted as part of a license renewal application for NRC review and approval in accordance with 10 CFR Part 50, Appendix H, and

2. the program withdraws one capsule at an outage in which the capsule receives a neutron fluence of between one and two times the peak reactor vessel wall neutron fluence at the end of the period of extended operation (PEO) and tests the capsule in accordance with ASTM E 185-82.

Issue:

The applicant's program, as modified by the enhancements, includes:

1. an enhancement to the "Detection of Aging Effects" program element that has a general discussion of a change to be made to the capsule withdrawal schedule, but no specifics, and
2. an enhancement to the "Monitoring and Trending" program element for withdrawal and testing of a standby capsule to cover the peak fluence expected at the end of the period of extended operation

During the audit, the staff noted that by letter dated January 10, 2013, the applicant submitted to the NRC its proposed changes to the surveillance capsule withdrawal schedule that does demonstrate that a capsule will be withdrawn and tested at a fast neutron fluence level between one and two times the peak neutron fluence for the PEO. However, the LRA with its enhancements does not include specific discussion of items 1 and 2 shown above from GALL Report AMP XI.M31.

Request:

1. The staff requests that the applicant include a specific reference to the January 10, 2013, submittal.

2. Clarify whether these proposed changes to the capsule schedule are consistent with GALL Report AMP XI.M31.

LRA Section B.1.40 – Structures Monitoring

RAI B.1.40-1

Background:

GALL Report AMP XI.S6, "Structures Monitoring," program element "preventive action," states that if the structural bolting consists of ASTM A325, ASTM F1852, and/or ASTM A490 bolts, the preventive actions for storage, lubricants, and stress corrosion cracking potential discussed in Section 2 of the Research Council for Structural Connections (RCSC) publication "Specification for Structural Joints Using ASTM A325 or A490 Bolts," need to be used.

Issue:

SQN LRA states that the Structures Monitoring program, with enhancements, will be consistent with the program described in GALL Report AMP XI.S6, "Structures Monitoring." While auditing the program basis documentation, the staff noted that the "preventive action" program element of the LRA AMP states that the preventive actions of Section 2 of RCSC have been considered in the existing procedures for ASTM A325 and A490 bolting. It is not clear that the preventive actions for storage, lubricants, and corrosion potential are being used as recommended in the GALL Report.

Request:

1. Clarify that the preventive actions for storage, lubricants, and corrosion potential described in Section 2 of RCRS, "Specification for Structural Joints Using ASTM A325 or A490 Bolts," will be used or describe alternate methods used, if any.

2. Provide justification for their use and any deviations from Section 2 of RCRS.

RAI B.1.40-2

Background:

GALL Report AMP XI.S6, "Structures Monitoring," program element "detection of aging effects," states that inspector qualifications should be consistent with industry guidelines and standards. The GALL Report further states that qualifications of inspection and evaluation personnel specified in ACI 349.3R are acceptable for license renewal.

Issue:

SQN LRA states that the Structures Monitoring program, with enhancements, will be consistent with the program described in GALL Report AMP XI.S6, "Structures Monitoring." While auditing the program basis documentation, the staff noted that the "detection of aging effects" program element of the LRA AMP states that the inspection and evaluation personnel qualifications are consistent with industry guidelines and standards and guidance for implementing 10 CFR 50.65

and meet the intent of ACI 349.3R; however, the qualifications of personnel described in the plant procedures do not align with those described in ACI 349.3R.

Request:

1. Describe the qualifications of personnel performing the evaluations, i.e., responsible engineer, and qualifications of personnel performing the inspections or testing.

2. If the qualifications of personnel are not consistent with those recommended in Chapter 7 of ACI 349.3R, describe and provide justification for deviations thereof.

RAI B.1.40-3

Background:

GALL Report AMP XI.S6, "Structures Monitoring," program element "acceptance criteria," states that the Structures Monitoring program calls for inspection results to be evaluated by qualified engineering personnel, based on acceptance criteria selected for each structure/aging effect to ensure that the need for corrective actions is identified before loss of intended functions. The criteria are derived from design bases codes and standards that include ACI 349.3R, ACI 318, ANSI/ASCE 11, or the relevant AISC specifications, as applicable, and consider industry and plant operating experience. The GALL Report further states that applicants who are not committed to use ACI 349.3R and elect to use plant-specific criteria for concrete structures should describe the criteria and provide a technical basis for deviations from those in ACI 349.3R.

Issue:

SQN LRA states that the Structures Monitoring program, with enhancements, will be consistent with the program described in GALL Report AMP XI.S6, "Structures Monitoring." While auditing the program basis documentation, the staff noted that the "acceptance criteria" program element of the LRA AMP states that the program will be enhanced to prescribe acceptance criteria considering information provided in industry codes, standards, and guidelines including NEI 96-03, ACI 201.1R-92, ANSI/ASCE 11-99, and ACI 349.3R; however, the acceptance criteria defined in procedures are qualitative and determine conditions as "acceptable," "acceptable with deficiencies," or "unacceptable." It is not clear how the qualitative acceptance criteria listed in the applicant's audited procedures will be aligned with the quantitative criteria described in Chapter 5 of ACI 349.3R, during the period of extended operation.

Request:

1. Clarify how the qualitative acceptance criteria align with the quantitative acceptance criteria of ACI 349.3R.

2. If not committed to follow ACI 349.3R acceptance criteria and elect to use plant-specific criteria, describe and provide a technical basis for each deviation.

RAI B.1.40-4

Background:

A review of the Structures Monitoring AMP plant operating experience has shown that the Turbine Building at SQN has been experiencing groundwater infiltration through degraded expansion/isolation joints for at least 16 years. During a walkdown of the Turbine Building, the staff observed dampness and water in-leakage through degraded expansion/isolation joints and cracks in exterior walls. In addition, the staff noted the presence of concrete leaching, spalling, and rust colored stains on the walls. In some areas, groundwater was seeping through cracks in the basement floor. Audited "Maintenance Rule Structural Inspection" Revisions 0 and 7, indicate that this groundwater in-leakage and the resulting aging effects continue to be an issue.

The staff also noted a large diagonal crack on the north wall extending upward and eastward approximately 6 feet, which appeared to be much greater than 40 mils.

Issue:

Concrete exposed to groundwater in-leakage over a period of time can lead to corrosion of rebars, concrete cracking, loss of material (spalling, scaling), aggregate reactions, and leaching resulting in increased porosity and permeability and loss of strength. As stated in ACI 349.3R, for concrete "if this leaching progresses without mitigation, the leaching process can produce a loss of mechanical properties, such as compressive strength and modulus of elasticity." ACI 349.3R also states that "leaching is a concern for potentially increasing the exposure of steel reinforcement to corrosion cell formation."

For observed concrete surface conditions that exceed the acceptance limits provided in Section 5.2 of ACI 349.3R (e.g., cracks widths greater than 40 mils), conditions should be considered unacceptable and need further technical evaluation. Cracks of this size expose rebar to corrosion and concrete to further deterioration that may affect the structural integrity of affected structures.

LRA Sections 3.5.2.2.1.9, 3.5.2.2.2.1.4, and 3.5.2.2.2.3.3, address leaching in inaccessible areas of concrete and state that increase in porosity and permeability due to leaching is not an applicable aging effect requiring management. Based on the observed leaching and water infiltration in accessible areas of concrete, the staff does not understand how this conclusion was reached.

Request:

1. In areas susceptible to moisture or groundwater infiltration, describe and provide the technical basis for actions that have been and will be taken to assure that reinforced concrete walls and floor retain their strength and durability, and that there is no active corrosion of the rebar taking place. Ensure that the response includes an explanation of how this will be accomplished for inaccessible concrete areas susceptible to moisture or groundwater infiltration.

2. For the diagonal crack on the north wall of the Turbine Building as described above, provide a summary of any evaluation that may have been performed documenting the acceptability of the crack. Describe and justify any actions that will be taken to demonstrate that for this and other similar cracks, the effects of aging will be adequately managed, during the period of extended operation.

RAI B.1.40-5

Background:

During a walkdown of the spent fuel pool, the staff noted concrete leaching on the outer surfaces of the spent fuel pool walls. The staff also noted that one of the open tell tale drains was not collecting borated water leakage, which may indicate that the leak chase channel is clogged or blocked.

Issue:

Concrete leaching of the spent fuel pool walls, is indicative of leakage originating from the spent fuel pool. If the leak chase channels are clogged or blocked, borated water leakage could accumulate in the channels, behind the liner, and eventually migrate through the concrete, possibly causing degradation of the leak chase system, concrete, and reinforcing steel.

Request:

1. Indicate whether the concrete leaching is active, and explain how the borated water leakage may have affected the condition of the concrete and rebar, by describing what steps have been taken, or will be taken, to ensure that there would be no loss of strength for the concrete, no bond deterioration between rebar and concrete, and no active corrosion of steel rebars and embedded leak chase channels, during the period of extended operation.

2. Discuss actions that have been or will be taken to ensure the leak chase system (channels, tubes, trenches, valve bodies, etc) remains free and clear so that it can effectively prevent borated-water from seeping into and thus contributing to the aging of the reinforced concrete.

LRA Section B.1.41 – Thermal Aging Embrittlement of CASS

RAI B.1.41-1

Background:

LRA Section B.1.41 describes the applicant's Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) Program. The LRA states that this program is a new program to manage cracking and reduction in fracture toughness due to thermal aging embrittlement in

CASS piping and piping components, consistent with GALL Report AMP XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Program (CASS)."

The "scope of program " program element of GALL Report AMP XI.M12 states that in the susceptibility screening method, ferrite content is calculated by using the Hull's equivalent factor (described in NUREG/CR-4513, Revision 1) or a staff-approved method for calculating delta ferrite in CASS materials.

Issue:

During the audit, the staff noted that the applicant's program basis document does not clearly address whether the applicant's screening method for susceptibility to thermal aging embrittlement uses the Hull's equivalent factor, as described in NUREG/CR-4513, Revision 1, or a staff-approved method.

Request:

1. Clarify whether the applicant's screening method for susceptibility to thermal aging embrittlement uses the Hull's equivalent factor, as described in NUREG/CR-4513, Revision 1, or an alternative staff-approved method to determine the ferrite contents of the CASS piping components.

2. If an alternative method will be used to determine the ferrite contents, identify the specific alternative method and clarify whether the alternative method has been approved for use by the NRC.
    a) In addition, provide the applicant's technical basis of the alternative method to confirm the adequacy of the method.

RAI B.1.41-2

Background:

LRA Section A.1.41 describes the applicant's UFSAR supplement for the Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) Program. In addition, LRA Section B.1.41 states that this AMP is a new program to manage cracking and reduction in fracture toughness in CASS piping and piping components, consistent with GALL Report AMP XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Program (CASS)."

The UFSAR supplement in LRA Section A.1.41 states that for potentially susceptible components, aging management is accomplished through qualified visual inspections, such as enhanced volumetric examination, qualified ultrasonic testing methodology, or component-specific flaw tolerance evaluation.

Issue:

The staff noted that the UFSAR supplement description, "qualified visual inspections, such as enhanced volumetric examination," needs to state "qualified visual inspections, such as enhanced visual examination," in order to be consistent with GALL Report AMP XI.M12.

The staff also noted that LRA Sections B.1.41 (program description) and 3.1.2.2.6 need to be revised in a similar manner to correctly identify the inspection methods used in the program, consistent with GALL Report AMP XI.M12.

Request:

If claiming consistency with the GALL Report for this program, ensure that LRA Sections A.1.41, B.1.41, and 3.1.2.2.6 correctly identify the inspection methods used in the program, consistent with GALL Report AMP XI.M12.

RAI B.1.41-3

Background:

LRA Section B.1.41 describes the applicant's Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) Program. The LRA states that this program is a new program to manage cracking and reduction in fracture toughness due to thermal aging embrittlement in CASS piping and piping components, consistent with GALL Report AMP XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Program (CASS)."

GALL Report AMP XI.M12 states that for "potentially susceptible" piping components, aging management is accomplished through either (a) qualified visual inspections, such as enhanced visual examination; (b) a qualified ultrasonic testing (UT) methodology; or (c) a component-specific flaw tolerance evaluation. The GALL Report also indicates that if the inspection option is used, the scope of the inspection should cover those portions of the components determined to be limiting from the standpoint of applied stress, operating time, and environmental considerations.

Issue:

The LRA does not address the scope of inspection for potentially susceptible CASS components, which the applicant's program uses when the inspection option is selected for aging management (e.g., what percent of the potentially susceptible components including welds is to be inspected in the applicant's aging management program).

Request:

1. Describe the scope of inspection that will be used when the inspection option is selected for aging management (e.g., what percent of the potentially susceptible components including welds is to be inspected in the aging management program).

2. In addition, provide the technical basis for the applicant's inspection scope in order to demonstrate the adequacy of the inspections for aging management.

Generic RAI – Electrical AMPs (B.1.21, B.1.24, B.1.25, B.1.26, and B.1.27)

RAI E-1

Background:

In the LRA Appendix B.1.21, B.1.24, B.1.25, B.1.26 and B.1.27, under element 10 (operating experience), the applicant states that these AMPs are new programs and that industry operating experience will be considered in the implementation of this program. The applicant also stated that plant operating experience will be gained as the program is executed and will be factored into the program via the confirmation and corrective action elements of the SQN 10 CFR 50 Appendix B quality assurance program. The applicant further stated in LRA B.1.21, that there is no operating experience at SQN involving the aging effects managed by these programs. The applicant concluded that there is reasonable assurance that these new AMPs will be effective during the period of extended operation.

SRP-LR Section A.1.2.3.10 states that for new AMPs that have yet to be implemented at an applicant's facility, the programs have not yet generated any operating experience . However, there may be other relevant plant-specific operating experience at the plant that is relevant to the AMP's program elements even though the operating experience was not identified as a result of implementation of the new program. Thus, for new programs, an applicant may need to consider the impact of relevant operating experience that results from the past implementation of its existing AMPs that are existing programs and the impact of relevant generic operating experience on developing the program elements.

Therefore, operating experience applicable to a new program should be discussed. In the License Renewal Interim Staff Guidance (LR-ISG) 2011-05, the staff stated that it intends for the ongoing review of operating experience to inform every AMP, regardless of the AMP's implementation schedule. The staff noted that there were instances of operating experiences relating to electrical AMPs which were not discussed in the operating experience program element. For example, a MEB failed in August 2009 which resulted in the tripping of both units. The failure of the bus was caused by cracked Noryl insulation and moisture intrusion inside the MEB. This represents plant specific operating experience directly applicable to the aging mechanisms and effects relating to the MEB program AMP.

Issue:

Operating experience from existing plant programs relevant to LRA Appendix B, AMPS B.1.21, B.1.24, B.1.25, B.1.26 and B.1.27 are not provided in the LRA. For new AMPs, applicable plant specific and generic OE should be considered on an ongoing review basis to ensure the effectiveness of the new AMP' program elements.

Request:

The operating experience being considered should include plant-specific OE at the plant that is relevant to the AMP's program elements even though the OE was not identified as a result of implementation of the program.

1. Describe relevant plant specific OE and lessons learned, as discussed above, for each electrical AMP.

2. Identify areas where the aging management program was enhanced.

3. Revise the LRA Appendix B operating experience elements, as appropriate.

May 31, 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)

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 licenses DPR-77 and DPR-79 for Sequoyah Nuclear Plant, Units 1 and 2, for review by the U.S. Nuclear Regulatory Commission 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 were discussed with Henry Lee, 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 at 301-415-1427 or by e-mail at Richard.Plasse@nrc.gov.

Sincerely,

/RA Yoira K. Diaz-Sanabria for/

Richard 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 w/encl: Listserv
DISTRIBUTION: See following pages
ADAMS Accession No.: ML13128A519 *concurred via email

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NAME	I King	MYoo	YDiaz-Sanabria	RPlasse (YDiaz-Sanabria for)
DATE	5/17/13	5/20/2013	5/31/13	5/31/13

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Letter to J. Shea from R. Plasse dated May 31, 2013

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)

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RidsNrrDlrRpb2 Resource
RidsNrrDlrRerb Resource
RidsNrrDlrRarb Resource
RidsNrrDlrRasb Resource

beth.mizuno@nrc.gov	<OGC>
brian.harris@nrc.gov	<OGC>
john.pelchat@nrc.gov	<gov't liaison officer>
gena.woodruff@nrc.gov	<gov't liaison officer>
siva.lingam@nrc.gov	<dorl PM>
wesley.deschaine@nrc.gov	<res insp>
galen.smith@nrc.gov	<res insp>
scott.shaeffer@nrc.gov	(RII)
jeffrey.hamman@nrc.gov	(RII)
craig.kontz@nrc.gov	(RII)
caudle.julian@nrc.gov	(RII)
generette.lloyd@epa.gov	(RIV
gmadkins@tva.gov	
clwilson@tva.gov	
hlee0@tva.gov	
dllundy@tva.gov	