SeabrookNPEm Resource

From:	Plasse, Richard
Sent:	Wednesday, December 08, 2010 12:05 PM
To:	Cliche, Richard
Subject:	draft AMR RAIs
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Seabrook Station
License Renewal Application
DRAFTRequest for Additional Information Set 6**DRAFT**
Aging Management Review

dRAI 3.1.2.1-1

Background
GALL Report item IV.C2-3, recommends the Water Chemistry Program and a plant specific aging management program to manage cracking due to stress corrosion cracking, intergranular stress corrosion cracking, and thermal and mechanical loading for cast austenitic stainless steel (CASS) Class 1 piping, piping elements and piping components. The GALL Report further recommends that the plant-specific program include adequate inspection methods to ensure detection of cracks and flaw evaluation methodology for the components susceptible to thermal aging embrittlement based on the material susceptibility criteria described in NUREG-0313, Rev. 2.

LRA Table 3.1.1, item 3.1.1-24 addresses CASS Class 1 pump casing, piping and fittings, and valve body exposed to reactor coolant, which are being managed for cracking due to stress corrosion cracking, intergranular stress corrosion cracking, and thermal and mechanical loading by the applicant's Water Chemistry Program and the ASME Section XI Inservice Inspection Subsections IWB, IWC and IWD Program. LRA Section 3.1.2.2.7.2 states that the ASME Inservice inspection Program relies on VT-2 examinations to identify and evaluate the degradation of the CASS components to ensure that there is no loss of intended function. The staff noted that a VT-2 examination detects leakage from pressure retaining components during a system leakage test.

In comparison with the VT-2 examination the applicant credited, the staff noted that as a typical example, Table IWB-2500-1 in the 1995 edition, including 1996 and 1997 addenda, of the ASME Code Section XI, includes the following requirements: (1) Item No. B9.11 requires surface and volumetric examinations of pressure retaining circumferential welds in piping NPS 4 or larger, (2) Item No. B12.10 requires volumetric examination of pump casing welds, (3) Item No. 12.30 requires surface examination of valve body welds for valves less than NPS 4, and (4) Item No. 12.40 requires volumetric examination of valve body welds for valves NPS 4 or larger. The staff further noted that ASME Code Case N-481 referenced in the LRA addresses a requirement for VT-1 examination of the external surfaces of the pump casing weld as part of the alternative to ASME Code Section XI, Examination Category B-L-1, Item No. 12.10.

Issue
It is not clear to the staff whether the visual VT-2 examination specified in LRA Subsection 3.1.2.2.7.2 is the only technique that is credited to detect cracks for the applicant's management of the aging effect in the components. The staff noted that because the VT-2 examination relies on the detection of leakage, it does not provide detection of the aging effect prior to a loss of the

intended function, which is pressure boundary integrity. In contrast, the volumetric examination can detect a crack before leakage. The staff also noted that the surface examination or VT-1 examination provides the better resolution for detection of the aging effect than the VT-2 examination and is capable of detecting a crack initiated from the outer surface of the components due to thermal or mechanical loading before leakage.

If VT-2 examination is the only examination method that is used to manage the aging effect, the staff needs justification why the VT-2 examination method alone is adequate to manage the cracking due to stress corrosion cracking, intergranular stress corrosion cracking, and thermal and mechanical loading of the CASS Class 1 components, such that the intended functions of the pressure boundary components will be maintained.

Request

1. Clarify whether the VT-2 examination is the only method used to detect the aging effect in CASS Class 1 piping, piping elements and components.

2. If another examination method such as volumetric, surface or VT-1 examination is used to manage the aging effect of the components, clarify what the examination method is. In addition, taking into account the ASME Code Section XI requirements for volumetric, surface, and VT-1 examinations as applicable, justify why the applicant's aging management method is adequate to detect and manage the aging effect.

If the VT-2 examination is the only examination method used to detect the aging effect in the CASS Class 1 components, taking into account the ASME Code Section XI requirements for volumetric, surface and VT-1 examinations as applicable, justify why the use of the VT-2 examination without volumetric, surface and VT-1 examinations is adequate to detect and manage the aging effect.

dRAI 3.1.1.60-01

Background

In LRA Table 3.1.1, Item 3.1.1-60, the applicant stated that this item is not applicable to the Seabrook Station LRA. The applicant stated that loss of material due to wear does not need to be identified and managed for the flux core thimble tubes, because Seabrook Station utilizes a double-concentric thimble tube design fabricated from wear resistant, seamless nickel alloy material (Inconel 600).

GALL Report Item IV.B2-13 recommends GALL AMP XI.M37, "Flux Thimble Tube Inspection" to manage the loss of material due to wear for stainless steel flux thimble tubes (with or without chrome plating). The staff noted that GALL Report Section IV.B2 currently does not include an applicable generic AMR item for management of loss of material due to wear in flux thimble tubes fabricated from nickel alloy materials.

The "detection of aging effects" program element in GALL AMP XI.M37 states the following for inspections of Westinghouse design flux thimble tubes that are made from more wear resistant materials:

If design changes are made to use more wear-resistant thimble tube materials (e.g., chrome-plated stainless steel) sufficient inspections will be conducted at an adequate inspection frequency, as described above, for the new materials.

Issue
The staff noted that LRA Table 3.1.1, Item 3.1.1-60 in states that Seabrook Station uses flux thimble tubes fabricated from seamless nickel alloy material, specifically Inconel 600 and that this material is wear resistant. The staff noted that this is the applicant's basis for concluding that a Flux Thimble Tube Inspection Program does not need to be credited for aging management of loss of material due to wear in its flux thimble tubes.

GALL AMP XI.M37 recommends the need to perform appropriate inspections of thimble tubes even if they are fabricated from improved wear-resistant materials, such as those that are fabricated from chrome-plated stainless steels or nickel alloy materials. GALL AMP XI.M37 does not state that wear would not need to be managed if the flux thimble tubes are fabricated from improved wear-resistant materials.

Request

Based on the recommendations in GALL AMP XI.M37 to perform inspections of flux thimble tubes that are fabricated from more wear-resistant materials, justify not including an applicable AMR line item to manage loss of material due to wear in the nickel alloy flux thimble tubes. Also, justify why a Flux Thimble Tube Inspection Program is not credited to manage loss of material due to wear for these nickel alloy flux thimble tubes.

dRAI 3.1.1.60-02

Background
LRA Table 3.1.2-3 includes an applicable AMR item to manage cracking in the flux thimble tubes that are fabricated from nickel alloy with its PWR Vessel Internals Program and Water Chemistry Program.

The applicant's PWR Vessel Internals Program is described in LRA Section B.2.1.7 and is based on the augmented and existing program recommendations in "Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227-Rev. 0)" The staff noted that MRP-227-Rev. 0 identifies Westinghouse-design flux thimble tubes as existing MRP-227-Rev. 0 methodology components and credits an applicant's existing Flux Thimble Tube Inspection Program to manage loss of material due wear, only, in these components. The MRP-227-Rev. 0 methodology does not credit any augmented program inspections or existing program inspections to detect and manage cracking in Westinghouse-design flux thimble tube components.

The staff noted that the LRA does not credit a Flux Thimble Tube Inspection Program for detection and management of aging related degradation in the flux thimble tubes.

Issue
The applicant's proposal to use the PWR Vessel Internals Program to manage cracking in the flux thimble tubes may not be valid because: (1) the MRP-227-Rev. 0 recommendations do not

include recommendations to manage potential fatigue-induced or stress corrosion-induced cracking in these type of components, and (2) the LRA does not include a Flux Thimble Tube Inspection Program to manage cracking or loss of material due to wear, as addressed in RAI 3.1.1.60-01for the flux thimble tubes.

Request
Justify using the PWR Vessel Internals Program to manage cracking in the flux thimble tubes, considering that MRP-227-Rev. 0 does not contain recommendations for managing cracking in Westinghouse-design flux thimble tubes.

dRAI 3.1.2.2.2.4-01

Background

SRP-LR Section 3.1.2.2.2, item 4, discusses loss of material due to general, pitting, and crevice corrosion in the steel PWR steam generator upper and lower shell and transition cone exposed to secondary feedwater and steam. If the steam generators are not Westinghouse Models 44 or 51, the GALL Report credits the Water Chemistry program to mitigate corrosion and the In-service Inspection program to detect loss of material.

Seabrook Station has Model F steam generators and, in accordance with the SRP-LR and the GALL Report, augmented inspections to detect pitting and crevice corrosion are not needed.

The LRA Section 3.1.2.2.2, item 4, states that in addition to the upper and lower shell and transition cone, other steam generator steel components (feedwater and main steam nozzles, secondary handholes, secondary manways, and shell penetrations) are subject to loss of material due to general, pitting, and crevice corrosion, and that the aging effect will be managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD, Program to verify the effectiveness of the Water Chemistry Program.

Issue

The staff noted that the circumferential welds that join the upper and lower shell to the transition cone are subject to volumetric examination in accordance with ASME Code Section XI Examination Criteria C-A, item C1.10.

Furthermore, volumetric examination in accordance with ASME Code Section XI is effective in detecting cracking and gross loss of material. However, visual examination normally is more effective in detecting early indications of corrosion, such as surface discoloration, and minor pitting, and would be more effective in confirming the effectiveness of the Water Chemistry Program with regard to a variety of different components.

Request

a) Clarify what types of examinations will be used to verify effectiveness of the Water Chemistry Program to mitigate loss of material due to general, pitting and crevice corrosion for each of the components included in LRA Section 3.1.2.2.2, item 4.

b) If visual examinations are not included, provide a justification that volumetric examination, alone, is adequate to detect early indications of loss of material due to general, pitting, and crevice corrosion.

dRAI 3.1.2.2.14-01

Background

LRA Table 3.1.1, item 3.1.1-32 and LRA Section 3.1.2.2.14 state that the Steam Generator Tube Integrity Program will be used to manage the aging effect of wall thinning in the steel steam generator steel feedwater inlet ring and supports. LRA Section B.2.1.10 states that the Steam Generator Tube Integrity Program will manage the aging effect of wall thinning, but it does not describe what techniques would be used to manage this aging effect.

Issue

GALL AMP XI.M17, Flow-Accelerated Corrosion, which is credited with managing wall thinning due to flow accelerated corrosion for many steel components, includes analysis, inspection, and verification to ensure that flow accelerated corrosion is not occurring at an unacceptable rate and that components are repaired or replaced before wall thinning becomes unacceptable. However, it is not clear to the staff whether the applicant's Steam Generator Tube Integrity Program uses both analysis and inspection to verify that unacceptable wall thinning is not occurring.

Request

1) Describe the analytical methodology and inspection technique used to manage wall thinning in the steel steam generator feedwater inlet ring and supports.

2) Justify that the analytical methodology, together with verification by inspection, are adequate to ensure that loss of component intended function does not occur during the period of extended operation.

3) Alternatively, if inspection alone is credited to manage the aging effect, justify that the inspection and its associated acceptance criteria are adequate to ensure that the need for corrective action is identified in a timely manner, so that corrective actions are taken before loss of component intended function occurs.

dRAI 3.2.2.3-01

Background

The GALL Report does not specifically address an AMR line item for stainless steel heat exchanger components in the engineered safety features exposed to treated borated water greater than 60 °C (140 °F) and subject to cracking due to stress corrosion cracking. However, GALL Report item VII.E1-5 addresses stainless steel heat exchanger components exposed to treated borated water greater than 60 °C (140 °F) in the chemical and volume control system of the auxiliary systems and recommends the Water Chemistry Program and a plant-specific program that verifies the effectiveness of the Water Chemistry Program by confirming the absence of cracking due to stress corrosion cracking

LRA Table 3.2.2-3 indicates that cracking is an aging effect applicable for stainless steel heat exchanger components exposed to treated borated water (internal) greater than 60 °C (140 °F), specifically the 1-RH-E-188A and 188B and the 1-RH-E-9A and 9B components. For these components, the applicant referenced LRA Table 3.2.1, line item 3.2.1-48, which indicates cracking due to stress corrosion cracking is managed by the applicant's Water Chemistry Program.

Issue
The GALL Report typically recommends a plant-specific program to verify the absence of cracking due to stress corrosion cracking in heat exchanger components and to verify the effectiveness of the Water Chemistry Program as described in GALL Report item VII.E1-5. The staff found a need to further clarify why the Water Chemistry Program alone is adequate to manage the aging effect in the heat exchanger components.

Request
Justify why the Water Chemistry Program alone is adequate to manage cracking due to stress corrosion cracking in these heat exchanger components exposed to treated borated water greater than 60 °C (140 °F) and, as part of the justification, evaluate the operating experience to clarify whether it supports the applicant's aging management review results. Otherwise, in lieu of a justification, provide a plant-specific program that will verify the absence of cracking due ro stress corrosion cracking in the components and verify the effectiveness of the Water Chemistry Program.

dRAI 3.3.2.15-01

Background
The GALL Report does not specifically address an AMR line item for stainless steel heat exchanger components exposed to steam subject to cracking due to stress corrosion cracking. For heat exchanger components in other environments, the GALL Report typically recommends the Water Chemistry Program in conjunction with a plant-specific program that verifies the absence of cracking. For example, GALL item VII.E1-5 recommends the Water Chemistry Program with a plant-specific program to verify the effectiveness of the Water Chemistry Program by confirming the absence of cracking due to stress corrosion cracking in stainless steel heat exchanger components, which are exposed to treated borated water greater than 60 °C, in the chemical and volume control system of the auxiliary systems. .

LRA Tables 3.3.2-15 and 3.4.2-5 indicates that cracking is an aging effect applicable for stainless steel heat exchanger components (FP-E-46 & 47 and 1-CO-E-111 components) exposed to steam. For these components, the applicant referenced LRA Table 3.4.1, line item 3.4.1-39, which indicates cracking is due to stress corrosion cracking is managed by the applicant's Water Chemistry Program.

Issue
The GALL Report typically recommends a plant-specific program to verify the absence of cracking due to stress corrosion cracking for the aging management of heat exchanger components as described in GALL Report item VII.E1-5. The staff found a need to further clarify why the Water Chemistry Program alone is adequate to manage the aging effect in the heat exchanger components.

Request
Justify why the Water Chemistry Program alone is adequate to manage cracking due to stress corrosion cracking in these heat exchanger components exposed to steam and, as part of the justification, evaluate the operating experience to clarify whether it supports the applicant's aging management review results. Otherwise, in lieu of a justification, provide a plant-specific program that will verify the absence of cracking due to stress corrosion cracking in the components and verify the effectiveness of the Water Chemistry Program.

dRAI 3.4.2.3-01

Background
GALL Report Volume 1, Table 4, item 39 recommends that stainless steel piping, piping components, and piping elements exposed to steam be managed for cracking due to stress corrosion cracking by the Water Chemistry Program. LRA Table 3.4.2-3 states that stainless steel filter elements, heat exchanger components, and valve bodies exposed to steam is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program for stress corrosion cracking. LRA Section B.2.1.25 describes that the program uses inspections of opportunity and that the inspection techniques utilized to detect this aging effect of the components will be either visual inspection with a magnified resolution as described in 10 CFR 50.55a (b)(2)(xxi)(A) or an ultrasonic inspection method. These LRA AMR items also cite generic note E and refer to LRA item 3.4.1-39, which indicates that the cracking is due to stress corrosion cracking.

Issue
The applicant's program proposed to manage the aging effect in steam includes inspections of opportunity and does not include water chemistry control. In view of the lack of water chemistry control, the staff found a need to further clarify why the inspections of opportunity are adequate to manage the cracking due to stress corrosion cracking in the components exposed to a steam environment with no chemistry control.

Request
Clarify why the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Component Program, which relies on inspections of opportunity without water chemistry control, is adequate to detect and manage cracking due to stress corrosion cracking in the stainless steel components exposed to steam. As part of the justification, provide information on how the frequency of the inspections will be adequate to manage the aging effect.

dRAI 3.1.2.1-01

Background
GALL Report item IV.C2-3 recommends the Water Chemistry Program to manage the cracking due to stress corrosion cracking of cast austenitic stainless steel (CASS) Class 1 piping, piping components and piping elements exposed to reactor coolant. The GALL Report item further recommends a plant-specific program for CASS Class 1 components, which have carbon content greater than 0.035% or ferrite content less than 7.5%, based on the material susceptibility criteria described in NUREG-0313, Rev. 2. The GALL Report recommends that the plant-specific program include adequate inspection methods to ensure detection of cracks and flaw evaluation methodology for CASS component susceptible to thermal aging embrittlement. The staff noted the recommendation of GALL item IV.C2-3 may be applicable for the CASS components depending on the Code Class of the components.

LRA Table 3.1.2-1, LRA Table 3.2.2-3 and LRA Table 3.3.2-3 address CASS “Valve Body” items, which are exposed to treated borated water > 140 °F and are subject to cracking. The applicant indicated that the AMR line items in LRA Tables 3.1.2-1 and 3.2.2-3 reference line item 3.2.1-48 and the AMR line item in LRA Table 3.3.2-3 reference line item 3.3.1-90, which state that cracking due to stress corrosion cracking is managed by the Water Chemistry Program.

Issue
The staff needs to clarify whether any of these CASS valves is a Class 1 component, for which the GALL Report recommends a plant-specific program in addition to the Water Chemistry Program to manage the cracking due to stress corrosion cracking based on the material susceptibility criteria described in NUREG-0313, Rev. 2.

Request
1. Clarify whether any of the CASS valves in the reactor coolant system, residual heat removal system and chemical and volume control system is a Class 1 component, for which the GALL Report recommends a plant-specific program in addition to the Water Chemistry Program, to manage stress corrosion cracking based on the material susceptibility criteria described in NUREG-0313, Rev. 2.

2. If any of these CASS valves is a Class 1 component that has carbon content greater than 0.035% or ferrite content less than 7.5%, justify why the Water Chemistry Program alone, without a plant-specific program, is adequate to manage the cracking due to stress corrosion cracking for the CASS Class 1 component.

dRAI B.2.1.31-5

Background

NRC staff review has determined that structures in the scope of the Structures Monitoring Program should be monitored at an interval not to exceed five years. Some structures of lower safety significance, and subjected to benign environmental conditions, may be monitored at an interval exceeding five years; however, these structures should be listed along with the environment they are exposed to and a summary of past degradation.

Issue:
In Appendix B of the LRA, the applicant states that structures in a harsh environment are inspected on a five year basis and all others are inspected on a ten year basis. The applicant explains that a harsh environment is one that is routinely subject to outside ambient conditions, very high temperatures, frequent exposure to caustic materials, or extremely high radiation levels. However, the applicant did not provide a list of the structures that would be inspected on a ten year frequency, or a justification for the longer period.

Request:
Identify the structures that will be inspected on a ten year frequency along with their environments and a summary of past degradation.

dRAI 3.5.2.2.1.2-1

Background
SRP-LR Sections 3.5.2.2.1.2, 3.5.2.2.2.1, and 3.5.2.2.2.2 address cracks and distortion due to increased levels from settlement. The SRP states that further evaluation is necessary if a de-watering system is relied upon, or the aging effect is not within the scope of the applicant's structures monitoring program.

Issue
In the corresponding sections of the LRA the applicant states that structures are founded on sound bedrock, fill concrete or engineered backfill and do not have any potential areas of settlement. However, the applicant does not state that the Structures Monitoring Program will continue to inspect for degradation due to settlement. In addition, although the applicant does not use a dewatering system to control settlement, a dewatering system is used in an attempt to control groundwater leakage. The applicant did not discuss the effects, if any, of this dewatering on settlement.

Request
a. Provide historic settlement results which demonstrate that this aging effect does not need to be included within the scope of the Structures Monitoring Program.
b. Discuss what effects dewatering has had on settlement and if any programs have been put in place to ensure that future dewatering programs do not lead to additional settlement.

dRAI 3.5.2.2.1.4-1

Background

SRP-LR Section 3.5.2.2.1.4 addresses steel elements of accessible and inaccessible areas of containments which are managed for loss of material due to general, pitting, and crevice corrosion by the ASME Section XI, Subsection IWE and 10 CFR Part 50, Appendix J Programs. The GALL Report Item II.A1-11 states that for inaccessible areas (embedded steel shell or liner) loss of material due to corrosion is not significant if the following four conditions are satisfied: (1) concrete meeting the specifications of ACI 318 or 349 and the guidance of ACI 201.2R was used for the containment concrete in contact with the embedded containment shell or liner; (2) the concrete is monitored to ensure that it is free of penetrating cracks that provide a path for water seepage to the surface of the containment shell or liner; (3) the moisture barrier, at the junction where the shell or liner becomes embedded, is subject to aging management activities in accordance with ASME Section XI, Subsection IWE requirements; and (4) water ponding on the containment concrete floor is not common and when detected is cleaned up in a timely manner.

<u>Issue</u>
The LRA does not address item (4) above and does not discuss any plant-specific operating experience related to water ponding on the containment floor.

<u>Request</u>
Discuss plant-specific operating experience related to water ponding on the containment floors, including frequency and resulting corrective actions.

<u>dRAI 3.5.2.2.2.2-1</u>

<u>Background</u>
SRP-LR Section 3.5.2.2.2.2, Item 1 addresses loss of material (spalling, scaling) and cracking due to freeze-thaw that could occur in below-grade inaccessible concrete areas of Groups 1-3, 5, and 7-9 structures. GALL Report Item III.A3-6 for concrete located in moderate to severe weathering conditions suggests existing concrete exposed to potential freeze-thaw have an air content of 3% to 6% and a water-to-cement ratio between 0.35 and 0.45.

<u>Issue</u>
The LRA does not provide a water-to-cement ratio for the concrete, as discussed in SRP-LR Section 3.5.2.2.2.2.

<u>Request</u>
Provide a water-to-cement ratio for the concrete to verify that it meets the recommendations of GALL Report Item III.A3-6 for concrete structures located in regions corresponding to moderate to severe weathering conditions, or explain how the aging effect will be managed during the period of extended operation focusing on additional inspections or evaluations that may be necessary.

<u>dRAI 3.5.2.3.6-1</u>

Background
GALL Report Table 5, ID# 49 recommends the ASME Section XI, Subsection IWF Program to manage loss of material of support members. The GALL Report Table 5 item is associated with GALL Unique Item III.B1.1-11, which lists the material as stainless steel and steel in a treated water environment.

Issue:
LRA Table 3.5.2-6 contains two AMR line items which reference LRA Table 3.5.1, item 49 and credit the ASME Section XI, Subsection IWF Program for aging management of stainless steel ASME Class 2/3 supports in a raw water environment. One of the line items references Note A, while the other references Note H and plant specific Note 514, which states, "Seabrook Station will age mange this condition through the Structures Monitoring Program." However, the entry for the referenced item 49 in LRA Table 3.5.1 states "BWR only," with no discussion provided. This appears to be contradictory information, and does not clearly address how the stainless steel ASME Class 2/3 supports in a raw water environment are being managed for loss of material.

Request
Identify which AMP will manage aging of AMSE Class 2/3 stainless steel supports in a raw water environment, and explain why the identified AMP is appropriate for the material-environment combination.

dRAI 3.5.2.3.6-2

Background
GALL Report Table 5, ID# 52 and 56, recommend the Structures Monitoring Program and the ASME Section XI, Subsection IWF Programs, respectively, to manage loss of mechanical function of sliding support surfaces.

Issue:
For the "Discussion" column of LRA Table 3.5.1, items 52 and 56, the LRA states, "there are no sliding support bearings of surfaces at Seabrook that are subject to this aging effect." However, items in LRA Tables 3.5.2-1, -5, and -6 reference these line items and credit the Structures Monitoring Program or the ASME Section XI, Subsection IWF Program for management of loss of mechanical function. This appears to be contradictory with the information provided in LRA Table 3.5.1 and does not clearly addresss how in-scope sliding surfaces are being managed for loss of mechanical function.

Request:
Identify which AMP(s) will manage in-scope sliding supports for loss of mechanical function, and explain why the identified AMP(s) is appropriate for the material-environment combination.

dRAI 3.3.2.2-1

Background

LRA Section 3.3.2.2.11, associated with LRA Table 3.3.1, item 3.3.1-31, addresses loss of material due to pitting, crevice, and galvanic corrosion in of copper alloy piping, piping components, and piping elements that are exposed to treated water. The applicant stated that this item is not applicable because Item Number 3.3.1-31 is applicable to BWRs only. The staff reviewed LRA Sections 2.3.4 and 3.4 and found that there are in-scope copper alloy instrumentation elements, valve bodies and heat exchanger components exposed to treated water in the Auxiliary Steam Condensate and Feedwater systems thus these components are potentially vulnerable to manage loss of material due to pitting, crevice and galvanic corrosion.

Issue
The staff noted that although loss of material due to selective leaching for these components is managed with Selective Leaching of Materials Program, there are no actions identified to manage loss of material due to pitting, crevice and galvanic corrosion for these components. The GALL Report states, in part, that loss of material due to pitting and crevice corrosion could occur for copper alloy exposed to treated water.

Request
Provide additional justification supporting the conclusion that copper alloy piping, piping components, and piping elements exposed to treated water would not be vulnerable to loss of material due to pitting, crevice and galvanic corrosion or describe the aging management program to be applied to mange pitting, crevice and galvanic corrosion of copper alloy components.

dRAI 3.1.2.4-1

Background
The GALL Report does not contain an aging management review for steam generator tubes exposed to reactor coolant that could be affected by a reduction in heat transfer. For other materials and environments, the GALL Report typically suggests using a water chemistry program in conjunction with an inspection program for managing the reduction of heat transfer aging effect. In LRA Table 3.1.2-4, the applicant has indicated that a reduction of heat transfer is an aging effect relevant to the primary side of the steam generator tubes. The applicant has indicated it plans to use the Water Chemistry Program to manage this aging effect.

Issue
The applicant has indicated in the LRA that a water chemistry program will be used to manage the aging effect of reduction of heat transfer for steam generated tubes exposed to reactor coolant. This appears to be in contrast to the GALL Report recommendation for a water chemistry program in conjunction with an inspection program to be used for managing the aging effect of reduction of heat transfer. It is not clear to the staff how a water chemistry program alone will adequately manage the aging effect of reduction of heat transfer.

Request
Justify how the Water Chemistry Program alone is sufficient to determine that steam generator tubes are not affected by reduction of heat transfer when exposed to reactor coolant.

dRAI 3.3.2.15-1

Background
The GALL Report does not contain an aging management review for heat exchangers exposed to steam affected by reduction in heat transfer. For other materials and environments, the GALL Report typically suggests using a water chemistry program in conjunction with an inspection program for managing the reduction of heat transfer aging effect. In LRA Table 3.3.2-15, the applicant has indicated that reduction of heat transfer is an aging effect relevant to heat exchanger tubes exposed to steam. The applicant has indicated it plans to use the Water Chemistry Program to manage this aging effect.

Issue
The applicant has indicated in the LRA that it plans to only use a water chemistry program to manage the reduction of heat transfer for heat exchanger tubes exposed to reactor coolant. This appears to be in contrast to the GALL Report typical management of this aging effect. It is not clear to the staff how management of water chemistry alone will ensure that reduction of heat transfer is appropriately managed.

Request
Justify how the Water Chemistry Program alone is sufficient to determine that heat exchanger tubes are not affected by reduction of heat transfer when exposed to steam.

dRAI 3.3.2.12-1

Background
The program description in GALL Report XI.M24, “Compressed Air Monitoring” states that “The program manages the effects of corrosion and the presence of unacceptable levels of contaminants on the intended function of the compressed air system. The AMP includes frequent leak testing of valves, piping, and other system components, especially those made of carbon steel and stainless steel.” LRA Table 3.3.2-12 credits the Compressed Air Monitoring Program to manage the hardening and loss of strength aging effect for elastomer flexible hoses exposed to condensation (internal).

Issue
The applicant’s Compressed Air Monitoring AMP is being applied to materials beyond steel, stainless steel and copper alloys, which are the materials specified in GALL for this AMP. Elastomer components exhibit different aging mechanisms than steel, and the observable indications of aging are substantially different from those of steel, stainless steel, or copper alloys. For example, the hardening of elastomer components can not be identified by air sampling. Therefore the inspections must be adapted to address detection of aging for the additional in-scope materials.

Request
Provide details on the additional inspection methods to be used to ensure that the AMP will adequately address potential aging effects of the elastomer materials.

dRAI 3.3.2.2-1

Background

The GALL Report recommends that elastomer and metallic components exposed to raw water be managed for hardening and loss of strength or loss of material by the Open-Cycle Cooling Water System Program. The Open-Cycle Cooling Water System Program consists of both preventive measures (chemical control to minimize microbial activity) and monitoring and trending (inspections and testing to detect aging). The LRA states that various components exposed to raw water will be managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Component Program because the Open-Cycle Cooling Water System Program is not applicable to the raw water environments found in the boron recovery system, the chlorination system, ground water, radioactive liquid waste, domestic water, etc.

Issue
The proposed program to manage these components in raw water is only an inspection program and does not include chemical treatments to eliminate biological activity. It is not clear how the opportunistic visual inspections in the Internal Surfaces in Miscellaneous Piping and Ducting Program will be able to manage aging of components in raw water systems that do not include chemical treatments.

Request
Justify the use of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Component Program, which is only a visual inspection program to manage aging in the raw water environment.

dRAI 3.4.2.2-1

Background
SRP-LR Table 3.4-1, item 8 recommends that steel piping, piping components, and piping elements exposed to raw water be managed for loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion and fouling by a plant specific program. In LRA Tables 3.4.2-2 and 3.4.2-3, the applicant stated that for steel and gray cast iron components exposed to raw water, the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program will be used to manage the aging effects of loss of material. LRA Section B.2.1.25 states that this program relies on opportunistic visual inspections. The LRA AMR items refer to Table 3.4.1, item 3.4.1-8, and cite generic note E.

Issue
The staff noted that the GALL Report item VIII.E-6 recommends that for steel heat exchanger components exposed to raw water in condensate systems that the GALL Report AMP XI.M20 "Open-Cycle Cooling Water System" be used to manage the aging. The staff also noted that the LRA Table 3.4.2-2 and 3.4.2-3 items are similar to the GALL Report item VIII.E-6. The staff further noted that the GALL Report AMP XI.M20 is not applicable, because the components in the LRA items do not transfer heat from a safety-related component to the ultimate heat sink; however, given that the LRA and GALL Report items are constructed of the same materials and exposed to the same environment, the staff believes that a preventative program with chemical treatments may be appropriate in the applicant's plant-specific program, particularly in light of the potential infrequent inspections that may occur due to managing these components with the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program.

Request

Justify how loss of material in steel and gray cast iron components exposed to raw water will be managed in the absence of preventative chemical treatments, in light of the potential infrequent inspections that may occur due to managing these components with the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program.

dRAI 3.4.2.3-1

Background
SRP-LR Table 3.4-1, item 37 recommends that steel, stainless steel, and nickel-based alloy components exposed to steam be managed for loss of material due to pitting and crevice corrosion by the GALL Report AMP XI.M2 “Water Chemistry". In LRA Table 3.4.2-3, the applicant stated that for steel, stainless steel, and gray cast iron components exposed to steam, the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program will be used to manage the aging effects of loss of material. LRA Section B.2.1.25 states that this program relies on opportunistic visual inspections.

Issue
GALL Report AMP XI.M2 “Water Chemistry” recommends preventive actions such as specifications for chemical species, sampling and analysis frequencies, and corrective actions to control water chemistry. The applicant’s proposed program to manage the items in LRA Table 3.4.2-3 relies on opportunistic visual inspections and no preventive actions.

Request
Justify how loss of material in steel, stainless steel, and gray cast iron components exposed to steam will be managed in the absence of preventative actions, in light of the potential infrequent inspections that may occur due to managing these components with the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program.

dRAI 3.5.2.5-1

Background
SRP-LR Table 3.5-1, item 46 states that Group 5 fuel pool liners are subject to aging effects of cracking due to stress corrosion cracking and loss of material due to pitting and crevice corrosion and recommends that the aging effects be managed by the GALL Report AMP XI.M2 “Water Chemistry” and monitoring of spent fuel pool water level and leakage from the leak chase channels. In LRA Tables 3.5.2-5 and 3.5.2-6, the applicant stated that for stainless steel components exposed to treated water or treated borated water, the Water Chemistry Program will be used to manage the aging effect of loss of material. These LRA AMR items refer to LRA Table 3.5.1, item 3.5.1-46 for Group 5 fuel pool liners.

Issue
The AMR items reference LRA Table 3.5.1, item 3.5.1-46 for Group 5 fuel pool liners; however, the applicant did not state that monitoring of spent fuel pool water level and leakage from the leak chase channels will be implemented to manage aging of these components.

Request

Justify why monitoring of spent fuel pool water level and level of fluid in the leak chase channel will not be implemented to manage the aging effect of loss of material due to pitting and crevice corrosion.

dRAI 3.5.2.5-02

Background
The GALL Report recommends that metallic components exposed to raw water be managed for loss of material by the Open-Cycle Cooling Water System Program. The Open-Cycle Cooling Water System Program consists of both chemical control to minimize microbial activity and also inspection activities to detect aging. The LRA states that various components exposed to raw water will be managed by the Structures Monitoring Program rather than the Open-Cycle Cooling Water System Program because the raw water is in lined and unlined concrete sumps.

Issue
The applicant's proposed program to manage these components in raw water is only an inspection program and does not include chemical treatments to eliminate biological activity. It is not clear how the opportunistic visual inspections will be able to manage aging of components in a raw water system that does not include chemical treatments.

Request
Justify the use of the Structures Monitoring Program, which is only a visual inspection program to manage aging in the raw water environment.

dRAI 3.3.2.3.4-1

Background
In LRA Tables 3.3.2-4, 3.3.2-15, and 3.3.2-36, the applicant stated that for fiberglass piping, fittings, and filter housings (travelling screen housing) exposed to condensation (external) or raw water (internal) there is no aging effect and no AMP is proposed. The associated AMR items cite generic note F and plant specific notes 1, 5, and 6 which state that "Fiberglass components in a condensation environment (external) or a Raw Water environment (internal) are not exposed to high levels of ultraviolet radiation, high temperatures, or ozone, and therefore have no aging effects that require aging management. This is consistent with plant operating experience."

Issue
The staff reviewed the associated items in the LRA and found that fiberglass piping exposed to condensation (external) or raw water (internal) is not specifically addressed in the GALL Report. However, the staff noted that the environments of interest could cause water infiltration into the fiber glass which could induce blistering, spalling, or cracking.

Request
State why the specific specification/grade of fiberglass material utilized in these components is not susceptible to blistering, spalling, or cracking of when exposed to condensation environment (external) or raw water environment (internal) or propose how the aging effects will be managed.

dRAI 3.2.2.2.6-01

Background
SRP-LR, Section 3.2.2.2.6, discusses stainless steel miniflow orifices in the high pressure safety injection pumps' minimum flow lines. The SRP-LR references LER 50-275/94-023 which documents operating experience where extended use of a centrifugal high pressure safety injection pump for charging caused erosion in the miniflow orifice and resulted in lower than required flow being available through the injection line.

The SRP-LR recommends that a plant-specific AMP be evaluated for erosion of the orifice. Appendix A.1.2.3.4 states that detection of aging effects should occur before there is a loss of the structure's or component's intended function(s).

Seabrook LRA Section 2.3.3.3 states that one of the intended functions of the chemical and volume control system (CVCS) is to provide emergency core cooling and that a portion of the system is used to provide high head emergency cooling water injection. Seabrook LRA Table 3.2.1, item 3.2.1-12, and Section 3.2.2.2.6 state that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program will be used to manage loss of material due to erosion of stainless steel high pressure pump miniflow orifices in the CVCS.

Seabrook LRA Section B.2.1.25, states that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program provides visual inspections that are capable of detecting loss of material due to erosion and that program inspections will be inspections of opportunity, performed during pre-planned periodic system and component surveillances or during maintenance activities when the systems are opened and the surfaces made accessible for visual inspection.

Issue
If inspections are performed in a timely manner, the staff considers visual inspections performed in accordance with the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program to be adequate to detect loss of material due to erosion in a flow orifice before loss of the orifice's intended function. However, it is not clear to the staff whether the high pressure pump miniflow orifice(s) in the CVCS are periodically available for visual inspection due to scheduled preventive maintenance or periodic surveillances, or whether they would become available for inspection only as the result of corrective maintenance.

Request
a) Explain whether the CVCS high pressure pump miniflow orifice(s) are routinely available for inspection due to scheduled preventive maintenance or periodic surveillances.

   1) If they are routinely available, state the typical interval between inspections.

   2) If they are not routinely available, explain how inspection timing will be controlled to ensure that erosion of the miniflow orifices would be detected prior to failure of its intended function.

b) Describe the visual inspection that will be done on the miniflow orifices and state whether any physical measurement of the orifice diameter would be made.

dRAI 3.3.2.2.4-1

Background
LRA Section 3.3.2.2.4, item 1 states that cracking due to stress corrosion cracking (SCC) and cyclic loading in stainless steel non-regenerative heat exchanger components is managed by the Water Chemistry Program and the effectiveness of the Water Chemistry Program will be confirmed by the One-Time Inspection Program. The acceptance criteria in SRP-LR Section 3.3.2.2.4 item 1 states that cracking due to SCC is managed by monitoring and controlling primary water chemistry but states that the effectiveness of water chemistry control programs should be verified, because water chemistry controls do not preclude cracking due to SCC and cyclic loading. The GALL Report recommends that a plant-specific AMP be evaluated to ensure these aging effects are adequately managed and an acceptable verification program includes temperature and radioactivity monitoring of the shell side water and eddy current testing of tubes.

Issue
LRA Section B.2.1.20, One-Time Inspection, states that the inspection sample includes locations where the most severe aging effect(s) would be expected to occur, and that inspection methods may include visual (or remote visual), surface or volumetric examinations, or other established nondestructive examination techniques. However, it is not clear whether the non-regenerative heat exchangers will be included in the sample of components to be inspected and what inspection techniques will be used to manage the aging effect of cracking in the heat exchanger tubes.

In addition, the LRA does not discuss whether temperature and radioactivity monitoring of the shell side water is performed to verify the integrity of the heat exchangers.

Request
1) Confirm whether the non-regenerative heat exchangers will be included in the sample of components to be inspected, and identify the inspection technique that will be used to detect cracking in the heat exchanger tubes.

2) Confirm that temperature and radioactivity monitoring of the shell side water is performed to verify the integrity of the heat exchangers, or provide the bases for not performing these recommended activities.

dRAI 3.4.1-37-01

Background

LRA Table 3.4.1 item 3.4.1-37 loss of material from steam generator orifices, steam generator feedwater inlet rings (J tube), steam generator feedwater nozzles (thermal sleeve) and steam generator tubes exposed to secondary feedwater/steam. The applicant proposes to manage this aging process through the use of its aging management program “Water Chemistry” (LRA B.2.1.2). The GALL Report recommends that this aging process be managed through the use of the aging management program “Water Chemistry” (GALL Report XI.M2). The applicant proposes that the aging management review items are consistent with the GALL Report (generic note A).

Issue

In its review of components associated with item number 3.4.1-37 the staff noted three potential inconsistencies between the aging management approach taken for these components and the approach contained in or implied by the GALL Report.

The first potential inconsistency involves the environment to which the components are exposed. The environment listed in the LRA for these items is "secondary feedwater/steam". The environment for the corresponding GALL Report item is steam. The staff notes that the GALL Report recommends managing aging for nickel alloy components exposed to steam through the use of the Water Chemistry program, XI.M2. The staff also notes that the GALL Report recommends managing aging for steam/water environments through the use of the Water Chemistry program, XI.M2 plus an inspection based verification program. For piping and pressure boundary components the inspection program is typically One Time Inspection, or XI.M32, ASME Section XI In Service Inspection, XI.M1. For steam generator internal components the inspection program is typically Steam Generator Tube Integrity, XI.M19. This difference in environment appears to make the use of item number 3.4.1-37 inappropriate for these components

The second potential inconsistency involves the aging effects postulated for these components. Based on LRA table 3.2.1-4, Steam Generator, it appears that the aging effects "cracking" and "loss of material" are being applied to the steam generator tubes while only the aging effect "loss of material" is being applied to the remaining components. Although the remaining components are not specifically addressed in the GALL Report, the staff finds no specific distinction in the GALL Report which would indicate that both the aging effects "cracking" and "loss of material" should not be applied to all the components under consideration.

The third potential inconsistency involves the classification of the components. SRP Item number 3.4-1 ID 37 classifies the components under consideration as "piping, piping components, or piping elements. The staff concurs with the applicant that the orifices and the steam generator feedwater nozzle (thermal sleeve) may be appropriately considered piping, piping components, and piping elements. The staff finds that the steam generator feedwater inlet ring (J tube) and the steam generator tubes are more appropriately classified as steam generator internal components. This classification appears to make the use of item 3.4.1-37 inappropriate for the J tubes and the steam generator tubes.

Request

Please: a) propose to manage aging of these components using water chemistry and an appropriate verification AMP as indicated by the GALL Report for the management of aging in a secondary feedwater/steam environment or justify why the use of a verification AMP is either inconsistent with the GALL Report or technically unnecessary; b) justify why is it unnecessary to consider both the aging effects "loss of material" and "cracking" for each of the components under consideration; c) classify the steam generator feedwater inlet ring (J tube) and the steam generator tubes as steam generator components (making the appropriate verification AMP the Steam Generator Tube Integrity program) or justify why these components should be considered piping, piping components, or piping elements as proposed by item 3.4.1-37.