POTENTIAL OPEN ITEMS

POI-1

The staff requests that the applicant address the following issues in Section 2.1:

a. During the AMR inspection team's review of the on-site engineering analysis (EA)-FC-00-149, the applicant identified piping systems and associated reference drawings for those systems that have met the 54.4(a)(2) criteria for spatial interaction. The applicant indicated that some of these systems are already within the scope of license renewal but some are not. The applicant also stated that flow accelerated corrosion, chemistry, general corrosion of external surfaces, and structure monitoring program are the applicable AMPs to manage aging effects for components in these systems. On the basis of its review, the staff determined that the information as provided by the applicant is not sufficient for the staff's scoping and aging management reviews for these 10 CFR 54.4(a)(2) SSCs. For the additional SSCs that have been brought into scope to meet the 10 CFR 54.4(a)(2) criterion, the applicant needs to provide scoping information to the component level, equivalent to that of the original license renewal application. This information is necessary for the staff to be able to determine, with reasonable assurance, that all the components required by 10 CFR 54.4(a)(2) to be within the scope of license renewal and subject to an AMR have been correctly identified. Also, the applicant needs to provide revised and/or new Section 2 tables, including links to Section 3 tables, so that the staff may perform an aging management review to determine whether the applicant has identified the proper aging effects for the combination of the material and environment, and has provided an adequate AMP for managing the corresponding aging effects for these SSCs.

b. The ATWS Rule (10 CFR 50.62) has the following requirements:

> "(c) Requirements.
>
> (1) Each pressurized water reactor must have equipment from sensor output to final actuation device, that is diverse from the reactor trip system, to automatically initiate the auxiliary (or emergency) feedwater system and initiate a turbine trip under conditions indicative of an ATWS. This equipment must be designed to perform its function in a reliable manner and be independent (from sensor output to the final actuation device) from the existing reactor trip system.
>
> (2) Each pressurized water reactor manufactured by Combustion Engineering or by Babcock and Wilcox must have a diverse scram system from the sensor output to interruption of power to the control rods. This scram system must be designed to perform its function in a reliable manner and be independent from the existing reactor trip system (from sensor output to interruption of power to the control rods)."

The applicant has identified the systems which meet above requirement (c)(2). The applicant has not identified the systems used to meet above requirement (c)(1). In response to RAI 2.1.4-1, the applicant identified the design and installation of the diverse scram system (DSS) as meeting the requirements found in 10 CFR 50.62(c)(1) and (2). As described in the USAR Section 7.2.11, the DSS provides an independent means of initiating a reactor trip. USAR Section 7.2.11 does not identify that the DSS performs the functions required by 10 CFR 50.62(c)(1). The applicant needs to identify which additional systems, if any, are used to meet the requirements of 10 CFR 50.62(c)(1). This information is necessary in order for the staff to have reasonable assurance that all the SSCs have been correctly identified as being within scope and subject to an AMR in accordance with 10 CFR Part 54. The information previously provided by the applicant does not specifically address the requirements in 10 CFR 50.62(c)(1). In addition, the applicant made a general comment in the RAI response that:

> "As a general comment, 10 CFR 54.21, Contents of Application, does not require the application to identify in the LRA the criterion by which a component ultimately ends up being in scope for LR and subject to aging management review. It focuses only on those SCs subject to aging management review. The component-by-component identification of the criteria by which SSCs are within scope for license renewal is contained in the individual system LR Engineering Analyses (EAs) that are available for inspection at the Fort Calhoun site"

The staff feels that the above statement is not applicable in this case, the reason for the request for additional information was based on 10 CFR 54.4(a)(3) which states that plant systems, structures, and components which meet the following criteria are within the scope of license renewal:

> "(3) All systems, structures, and components relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48), environmental qualification (10 CFR 50.49), pressurized thermal shock (10 CFR 50.61), anticipated transients without scram (10 CFR 50.62), and station blackout (10 CFR 50.63)."

The applicant did not identify in the LRA all systems, structures, and components relied on in safety analyses or plant evaluations to demonstrate compliance with 10 CFR 50.62. As a result, the staff needed additional information in order to draw a conclusion that there was reasonable assurance that the applicant has adequately identified the systems and structures within the scope of license renewal in accordance with the requirements of 10 CFR 54.4(a)(3).

c. The intended functions of a fuse holder are to provide mechanical support for the fuse and to maintain electrical contact with the fuse blades or metal end caps to prevent the disruption of the current path during normal operating conditions when the circuit current is at or below the current rating of the fuse. Fuse holders perform the same primary function as connections, of "providing electrical connections to specified sections of an electrical circuit to deliver rated voltage, current, or signals. These intended functions of fuse holders meet the criteria of 10 CFR 54.4(a). In addition, these intended functions are performed without moving parts or a change in configuration or properties, as described in 10 CFR 54.21(a)(1)(i). The fuse holders into which fuses are placed are typically constructed of blocks of rigid insulating material, such as phenolic resins. Metallic clamps are attached to the blocks to hold each end of the fuse. The clamps can be spring-loaded clips that allow the fuse ferrules or blades to slip in, or they can be bolt lugs to which the fuse ends are bolted. The clamps are typically made of copper.

Operating experience, as discussed in NUREG-1760, “Aging Assessment of Safety-Related Fuses Used in Low- and Medium-Voltage Applications in Nuclear Power Plants,” identified that aging stressors such as vibration, thermal cycling, electrical transients, mechanical stress, fatigue, corrosion, chemical contamination, or oxidation of the connection surfaces, can result in fuse holder failure. The staff requests the applicant to clarify whether fuse holders at FCS are within scope and subject to AMR, or provide justification for their exclusion. The staff also requests the applicant to clarify how fuse holders subject to an AMR will be managed for aging. If additional holders are brought into scope, provide the associated aging management information (material, environment, aging effect(s), and AMPs) so that the staff can determine whether the fuse holders will be adequately managed during the period of extended operation.

d. During the scoping and screening inspection, the team reviewed engineering analysis (EA)-FC-00-127, “Miscellaneous Systems, Penetrations, and Components,” and found that the compressed air, demineralized water, and steam generator feedwater blowdown systems contained components were functionally realigned. The team noted that this was inconsistent with LRA Table 2.2-1 and LRA Section 2.3.2.2. LRA Table 2.2-1 states that containment isolation and/or pressure boundary components in the compressed air, demineralized water, and blowpipe systems were functionally realigned to the commodity group "Containment Penetration and System Interface Components for Non-CQE Related System." However, LRA Section 2.3.2.2, which describes this commodity group, states that the group contains CIVs from the feedwater blowdown, compressed air, blowpipe, and demineralized water systems, as well as the piping between the containment penetrations and the CIVs. It also states that the demineralized water heat exchangers are included in the commodity group to maintain the CCW system pressure boundary. LRA Table 2.2-1 and the description in LRA Section 2.3.2.2 are inconsistent in that the blowdown system is not identified in LRA Table 2.2-1 as having components that were functionally realigned. The applicant should resolve the discrepancies between LRA Table 2.2-1 and the description in LRA Section 2.3.2.2 and provide revised Section 2 tables and, if necessay, Section 3 tables to accurately describe which systems and/or components have been functionally realigned and how the components will be managed.

POI-2

The staff requests that the applicant address the following issues in LRA Section 2.3.1:

Steam generators (SG) are generally equipped with flow restrictors, one of whose intended functions is to limit steam line flow during a steam line rupture. Over the extended life of the plant, it is essential to maintain the flow area of the flow restrictors used in the CLB to calculate the amount of steam released. The staff also believes that such components are susceptible to aging effects such as loss of material, cracking and/or wall thinning, which can cause the flow area to increase during the period of extended operation. Accordingly, in RAI 2.3.1.2-3, the staff requested the applicant to provide the following information:

a. Are the SGs at FCS equipped with such components?

b. If so, include the components within the scope of license renewal and subject to an AMR, so that the intended function mentioned above can be maintained over the period of extended operation, or provide a justification for their exclusion.

In response, the applicant stated that the FCS flow limiters are of the venturi type, and are fabricated of Inconel. They are built into the piping downstream of the first elbow in the horizontal main steam system piping runs leaving the steam generators. For license renewal, they are treated as part of the piping in which they are contained. This piping, including the limiters, is included in Table 2.3.4.3-1 of the LRA, main steam and turbine steam extraction, under the component type "Pipes & Fittings." The applicant further stated that the flow limiters are credited for a main steam line break by limiting the cross sectional area equivalent to fifty percent of that of the inside diameter of the main steam piping such that steam flow is restricted to less than $11x10^6$ pounds per hour following a main steam line break incident. As a result, the applicant agreed to add "Flow Restriction" as a license renewal intended function in Table 2.3.4.3-1 of the LRA. The applicant, however, concluded that since the venturi is fabricated of Inconel, there is no plausible aging related degradation in the secondary side steam flow environment, and as a result, there is no AMP needed to manage the venturi throat diameter. The applicant should submit the revised Table 2.3.4.3-1 of the LRA showing "Flow Restriction" as an intended function to be maintained during the period of extended operation, and provide a corresponding link in the table. The link should take the reader to an appropriate sub-section within Section 3 of the LRA, "Aging Management Review," for a discussion as to why the applicant believes that no AMP is required.

POI-3

The staff requests that the applicant address the following issues in LRA Section 2.3.3:

a. By letter dated October 11, 2002, the staff requested the applicant to justify the location of the license renewal boundaries (piping connected to a portion of the raw water system discharge header piping passing through the auxiliary building and turbine building) located at design class boundaries, but do not coincide with isolation valve locations, with regard to protection of essential systems from internal flooding in the event of failure of the pressure boundary of the non-safety related piping outside of the license renewal scope boundary (RAI 2.3.3.15-1).

By letter dated November 22, 2002, the applicant responded to this request by stating that an engineering analysis and a calculation have demonstrated that the design class boundaries are acceptable at a non-valve location. This analysis determined that internal flooding of the turbine building due to failure of the piping will not affect any safe shutdown equipment nor will floods propagate from the turbine building to the auxiliary building. Additionally, the analysis showed that the floor drains in the auxiliary building can easily handle a postulated flood resulting from rupture of any of the lines that tie into the backup raw water header in the auxiliary building. Section 2.3.3.17 of the LRA states that the auxiliary building floor drains perform an intended function for flood mitigation and referenced drawings show that the floor drains are within the license renewal scope boundaries. Finally, the analysis determined that a postulated break in any of the non-safety related piping in question would not impair the ability of the raw water system to perform its intended safety function.

The staff evaluated the above information. The staff concluded that there is reasonable assurance that the failure of the pressure boundary of the non-safety related piping outside of the license renewal scope boundary would not affect equipment necessary for safe shutdown or for mitigation of design basis events through flooding. However, during evaluation of this information, the staff noted that Section 2.3.3.15 of the LRA describes the raw water discharge from the component cooling water heat exchangers and the discharge from the direct cooling raw water header flow into the circulating water discharge tunnel. Table 2.2-1 of the LRA designated the circulating water system as outside of license renewal scope without specific justification, but failure of the pressure boundary of buried piping or tunnels creates the potential for a loss of flow. Therefore, the location of the license renewal boundary at the discharge pipes for the raw water system rather than at the outlet from the circulating water discharge tunnel has not been adequately justified. On the basis of the above discussion, the applicant should provide justification for the location of the license renewal boundary.

b. NRC Inspection Report 50-285/02-07, which focused on the scoping and screening process at FCS for license renewal, identified Open Item 50-285/02-07-01 related to the CCW system pressure boundary for the safety injection tank leakage cooler subsystem. Boundary Drawing 11405-M-40, Sheet 3, indicated that the safety injection tank leakage cooler subsystem was excluded from the scope of license renewal. This included the four coolers, associated piping, valves, and instrumentation. Component cooling water is supplied to the four leakage coolers via 3-inch piping at approximately 300 gpm. Component cooling water will automatically isolate on a containment isolation signal. The inspectors asked what affect a pipe break, in this non-safety related subsystem, would have on the component cooling water system. The applicant stated that if leakage were to occur, it would be noticed in the containment sump coupled with a change in flow that would be sensed by flow elements downstream of the coolers. However, due to the size of the containment sump, leakage may not be immediately noticed. Additionally, neither the flow indicators nor the flow elements were included within scope of the Rule. The applicant has not submitted sufficient information to demonstrate that loss of pressure boundary integrity within this non-safety related subsystem would not prevent completion of the intended functions of the CCW system and, therefore, the subsystem could be excluded from the scope of license renewal in accordance with 10 CFR 54.4.

c. The applicant provided the proprietary vendor drawings showing the interior of the three equipment cabinets on drawing 11405-M-1, Sheet 2 in response to RAI 2.3.3.20-1. Upon review of those drawings, the staff has the following questions.

1. On all three of the vendor drawings, the license renewal boundaries end in the middle of pipes with no physical means of isolation. Justify placing the boundaries at these locations.

2. The housings for the following gas samplers: RE-052, RM-062, and RE-051 are within the scope of license renewal but are not listed in LRA Table 2.3.3.20-1. These housings appear to perform a pressure boundary and/or fission product retention function. Therefore, these housings should be listed in LRA Table 2.3.4.1-1 as being subject to an AMR in accordance with 10 CFR 54.21. Justify not making the gas samplers housings subject to an AMR.

POI-4

The staff requests that the applicant address the following issue in LRA Section 2.3.4:

There are numerous pressure and level transmitters highlighted on drawing 11405-M-253, Sheet 1. From the drawing, it appears the instrument housings form part of a pressure boundary with their associated piping. While the instruments themselves may not be subject to an AMR, the instrument housings should be listed in LRA Table 2.3.4.1-1 as being subject to an AMR in accordance with 10 CFR 54.21 if they perform a pressure boundary function. In its response to RAI 2.3.4.1-1, the applicant did not address the instrument housings. Justify not making the instrument housings subject to an AMR.

POI-5

The staff requests that the applicant address the following issues in LRA Section 2.4:

a. In response to RAI 2.4.1-2, the applicant stated that the airlock seal is periodically replaced and is not subject to an AMR. The applicant needs to provide information on (1) how often the airlock seal is replaced, (2) how often the airlock seal is inspected, and (3) provide a discussion on the program that's used to maintain the airlock seal.

b. In a letter dated December 19, 2002, in response to RAI 2.4.2.5-1, the applicant stated that since the aging management of cranes is consistent with the NUREG-1801, "Generic Aging Lessons Learned (GALL) Report," which does not provide a detailed listing of crane/lifting device subcomponents, OPPD did not deem it necessary to list subcomponents in LRA Table 2.4.2.5-1. The GALL report does not address scoping of structures and components for license renewal. Scoping is plant specific, and the results depend on plant design and current licensing basis. The GALL report states that "the inclusion of a certain structure or component in the GALL report does not mean that the particular structure or component is within the scope of license renewal for all plants. Conversely, the omission of a certain structure or component in the GALL report does not mean that the particular structure or component is not within the scope of license renewal for any plants." In essence, the GALL report is not applicable to plant scoping for license renewal, although, certain structures and components evaluated within the GALL report may be within the scope of license renewal for a specific plant.

The applicant's letter of December 19, 2002, in response to RAI 2.4.2.5-1, did not identify and list the structures and components subject to an AMR in accordance with 10 CFR 54.21(a)(1). Therefore, the SCs for the fuel handling equipment and heavy load cranes have not been identified and listed in Table 2.4.2.5-1 in such manner as to allow the staff to determine, with reasonable assurance, that all of the SCs have been included within the scope of license renewal. The staff requests the applicant to provide a list of these SCs for the fuel handling equipment and heavy load cranes.

c. In its letter dated December 19, 2002, the applicant provided its response to RAI 2.4.2.5-2. In RAI 2.4.2.5-2, the staff stated that the boral panels protected with stainless steel, that are attached to the spent fuel pool storage racks, support the prevention of criticality in the spent fuel pool. As such, they perform an intended function of preventing criticality and they should be included within the scope of license renewal and subject to an AMR. In addition, LRA Table 2.4.2.5-1 should be revised to include the boral panels and their stainless steel covering. The applicant, in the RAI response, indicated that the boral panels have been included in LRA Table 2.4.2.1-1, “Auxiliary Building,” with the component type "Spent Fuel Storage Racks," and are managed for aging following item 3.3.1.09 of the LRA. The staff reviewed Table 2.4.2.1-1 and did not find the component type of spent fuel storage racks listed in the table. The applicant should provide a revised LRA Table 2.4.2.1-1, including link 3.3.1.09.

POI-6

The staff requests that the applicant address the following issues in LRA Section 2.5:

a. By letter dated October 11, 2002, the staff issued RAI 2.5-1, requesting the applicant to identify the applicable offsite power SSCs within the scope of license renewal and subject to an AMR as a result of meeting the 10 CFR 54.4(a)(3) scoping criterion for SBO. By letter dated December 19, 2003, the applicant responded to the RAI. The applicant's aging management review results for the electrical components for external environments are shown in Table 2 of the applicant's response. This table also refers to FCS-specific programs that have been credited for aging management of SBO restoration system components. However, several SBO components (high-voltage bus work/duct, aluminum conductor, steel reinforced (ACSR) transmission cables and insulators associated with the transmission conductors) are not identified in Table 2 as requiring an AMR. The staff believes that these components meet the SBO scoping criterion and are passive and long-lived, as are the surge arrestors. Therefore, the staff requests the applicant to clarify whether these components are within scope and subject to an AMR, or justify their exclusion. If these components are within scope, provide the associated aging management information to allow the staff to determine whether the components will be adequately managed during the period of extended operation. In addition, it is not clear to the staff why the 125 vdc and (120 vac) control and instrumentation cables associated with the SBO restoration system components are not included in the table. The applicant should clarify whether these components are subject to an AMR and provide the associated aging management information.

b. In LRA Table 2.5.20-1, the applicant identifies electrical bus bars and bus bar standoffs as components that are within the scope of license renewal and subject to an AMR. Table 2.5.20-1 also states that these components have no aging effects requiring management. The basis for the applicant's conclusion is unclear to the staff. The applicant should provide information on the component materials and environments, along with the basis for concluding that these components have no aging effects requiring management.

POI-7

The staff requests that the applicant address the following issues in LRA Appendix B:

a. In its response to RAI B.1.1-1, the applicant did not state why stress corrosion cracking (SCC) regarding high-strength carbon steel bolting in plant indoor air is not an aging factor and does not require a management program. The applicant should provide justification to the exception to GALL. Specifically, the applicant should provide justification for why SCC in high-strength carbon steel bolting in plant indoor air is not a credible aging effect, and why an ASME Section XI, Subsection IWF visual VT-3 inspection is adequate to inspect supports rather than volumetric inspections?

b. With regard to the containment inservice inspection program (B.1.3), for inspection of concrete components of the FCS containment, the applicant is committing to use GALL Program XI.S2, "ASME Section XI, Subsection IWL" during the period of extended operation. The GALL program recognizes the absence of explicit acceptance criteria for concrete components (in Element 6, Acceptance Criteria), and recommends the use of Chapter 5 of ACI 349.3R. The applicant is requested to provide information regarding the acceptance criteria to be used for examination of containment concrete at FCS.

c. The staff asked several RAIs related to the aging management of the fire protection fuel oil storage tank and its associated piping and fittings. RAI 3.3.2-3 related to how the diesel fuel monitoring and storage program (B.2.3), which focuses on internal oil environments, would be used to monitor for the external corrosion of the carbon steel and galvanized steel piping and fittings and the copper-zinc alloy tubing, that are exposed to an above-ground, buried in gravel (and protected from the elements) environment. RAI B.2.3-1 relates to an exception that the diesel fuel monitoring and storage program takes to GALL Program XI.M30, "Fuel Oil Chemistry," where the applicant proposes to use leakage detection in lieu of ultrasonic testing on the fire protection diesel fuel tank due to inaccessibility. In its December 19, 2002, responses to these RAIs, the applicant continues to rely on leakage detection to monitor for internal and external corrosion of the fire protection diesel fuel tank and the associated piping. The LRA states that the diesel fuel monitoring and storage program will be enhanced to add the removal of sediment and water from the bottom of the fire protection diesel fuel tank, which indicates that this has not historically been performed. The current condition of the tank is unknown, and the staff does not consider leakage detection to be effective aging management for internal and external corrosion of the tank, pipes, fittings, and tubing.

1. Provide additional information on the current condition of the tank and associated piping and fittings to justify that the condition of this tank is comparable to other fuel oil storage tanks.

2. The December 19, 2002, response to RAI B.2.3-1 states that inspections are performed on other diesel fuel storage tanks. Explain why the inspections of other tanks would be leading indicators of degradation of the fire protection diesel fuel oil tank considering that the oil in the fire protection diesel fuel oil tank has not been maintained to the same standards (as implied by the LRA statements that actions would be <u>added</u> to remove water and sediment from the bottom of the tank).

3. Explain why boroscopes or other instruments cannot be used to evaluate the condition of the tank internals and piping internals.

4. Describe any measures that have been taken to maintain the tank and piping externals in a benign environment, thereby minimizing the potential for loss of material.

d. 1. In response to RAI B.2.9-2, the applicant indicates that the secondary shell, secondary handholds, secondary head, secondary manway, and transitional cone are visually inspected for loss of material (general, pitting, and crevice corrosion) to ensure pressure boundary integrity. Since these components are all the same material in the same environment, at least one of these components is "representatively" visually inspected each refueling outage. Scope is expanded based on discovery of unexpected change in degradation, where change is based on review of past inspections. Site operating experience indicates relatively little degradation relative to the thickness of these pressure boundaries. Furthermore, site Class Cleanliness Standards (see below) allow only a small amount of degradation before a condition report is required. The corrective action program provides acceptable means of review, evaluation, and corrective action. Therefore, the representative visual inspections are considered adequate aging management of these pressure boundaries.

The applicant stated that Class C Cleanliness Standards, required for the secondary side indicate that; "Thin uniform rust or magnetite films are acceptable. Scattered areas of rust are permissible provided that the area of rust does not exceed 15 square inches in 1 square foot on corrosion resistant alloys."

The applicant's RAI response does not include sufficient detail for the staff to determine whether the proposed inspection will provide reasonable assurance that this aging effect will be adequately managed during the period of extended operation. 1) The applicant states that at least one of these components is "representatively" visually inspected each refueling outage. Explain what "representatively" means in this context and the basis for the appropriateness of this level of inspection (i.e., sample size). 2) In order to detect pitting and crevice corrosion, the visual inspection must be performed in accordance with specified requirements (e.g., ASME Code VT-1). Describe the method or technique (including codes and standards) used to perform the visual inspection. 3) The applicant should specify the acceptance requirements utilized to analyze the condition of the component once a condition report is initiated which ensures that the structure and component intended function(s) are maintained under all CLB design conditions during the period of extended operation.

2. Loss of section thickness due to flow-accelerated corrosion in tube support lattice bars made of carbon steel is managed by the steam generator program. In response to RAI B.2.9-2, the applicant indicates that tube supports (batwings, eggcrates, and vertical grids) are visually inspected for loss of material (flow-accelerated corrosion, general, pitting, crevice, and galvanic corrosion). A portion of the batwings are inspected each refueling outage. In addition, in 1998, a remote video camera was used to video the peripheral eggcrate locations from three drop points, with nearly all eggcrate elevations inspected from each drop point. No degradation of the eggcrate tube supports was noted. Furthermore, eddy current testing (ECT) each refueling outage has not resulted in any indications of missing or severely damaged tube supports in the areas adjacent to the tubes. Because operation has continued for 29 years with insignificant degradation, and all these components are carbon steel in the same environment, visual examination (augmented by ECT) is adequate management of these tube supports for structural function.

   The applicant's RAI response does not include sufficient detail for the staff to determine whether the proposed inspection will provide reasonable assurance that this aging effect will be adequately managed during the period of extended operation. 1) The applicant indicates that tube supports (batwings, eggcrates, and vertical grids) are visually inspected for loss of material (flow-accelerated corrosion, general, pitting, crevice, and galvanic corrosion), and that a portion of the batwings are inspected each refueling outage. It is not clear to the staff exactly what components (batwings, eggcrates and/or vertical grids) are inspected each refueling outage, the inspection method (i.e., visual and/or eddy current testing) of each sample, the sample size, and the applicant's basis for the inspection population and sample size. 2) The applicant did not describe the method or technique (including codes and standards) used for the visual inspection. 3) The applicant should specify the acceptance requirements utilized to analyze the condition of the component based on the inspection results.

3. The applicant states that ligament cracking due to corrosion could occur in carbon steel components in the steam generator tube support plate is managed by the steam senerator (B.2.9) and chemistry (B.1.2) programs. The staff's review of the steam generator program (B.2.9) is discussed here. In response to RAI B.2.9-2, the applicant indicates that tube supports (batwing, eggcrates, and vertical grids) are visually inspected for loss of material (flow accelerated corrosion, general, pitting, crevice, and galvanic corrosion). The applicant does not describe the inspections, sample size, and acceptance criteria implemented to detect the presence of ligament cracking. The applicant should specify these requirements.

4. In response to RAI B.2.9-2, the applicant described the inspection program related to nozzles, nozzle safe ends and the feedring (i.e., steam generator feedwater, steam and instrument nozzles, steam and feedwater nozzle safe ends, and the steam generator feedring) as follows: the applicant indicated that the aging effect managed by this program for these components is loss of material due to general, pitting, and crevice corrosion. The feedring additionally has galvanic corrosion as an aging effect. Ultrasonic testing (UT) for wall thinning of the feedring in 2002 revealed little or no degradation. The external surface of the feedring is visually inspected each refueling outage for corrosion. Scope is expanded based on discovery of unexpected change in degradation, where change is based on review of past inspections. Since the feedring internal and external surfaces are in the same environment, the visual examination of the external surface is considered representative of the internal surface for these aging effects. The nozzles and nozzle safe ends are not inspected, but are bounded by the visual inspection of the carbon steel feedring, which is more susceptible to aging than the low alloy steel or carbon steel nozzles and nozzle safe ends. Site Class Cleanliness Standards allow only a small amount of degradation before a condition report is required. The corrective action program provides acceptable means of review, evaluation, and corrective action. Because the UT revealed little or no degradation 29 years into operation, and site Class Cleanliness Standards would require corrective action far before the pressure boundary integrity of the nozzles and nozzle safe ends or flow distribution of the feedring are compromised, this visual inspection is adequate aging management.

   The applicant's RAI response does not include sufficient detail for the staff to determine whether the proposed inspection will provide reasonable assurance that this aging effect will be adequately managed during the period of extended operation. 1)The applicant states that the nozzles and nozzle safe ends are not inspected, but are bounded by the visual inspection of the carbon steel feedring, which is more susceptible to aging than the low alloy steel or carbon steel nozzles and nozzle safe ends. The applicant should provide the basis for the statement that the carbon steel feedring is more susceptible to aging than the carbon steel nozzles and nozzle safe ends. 2) The applicant states that the external surface of the feedring is visually inspected each refueling outage for corrosion, but does not indicate the extent of the feedring that is inspected, nor the basis for this extent. 3) The visual inspection must be performed in accordance with specified requirements (e.g., ASME Code VT-1). Describe the method or technique (including codes and standards) used to perform the visual inspection. 4) The applicant should specify the acceptance requirements utilized to analyze the condition of the component once a condition report is initiated which ensures that the structure and component intended function(s) are maintained under all CLB design conditions during the period of extended operation.

5. In response to RAI B.2.9-2, the applicant described the inspection program related to the secondary-side tubesheet as follows: The secondary side tubesheet is visually inspected and supplemented by tube eddy-current testing each refueling outage for loss of material (general, pitting, and crevice corrosion). A camera is placed on top of the tubesheet and transported along the periphery of the tube bundle and down the blowdown line. In addition, eddy current testing of the tubes would indicate if the adjacent tubesheet was degrading. The corrective action program provides an acceptable means of review, evaluation, and corrective action. Because the tubesheet is over 22 inches thick and eddy current testing can reflect tubesheet loss, this visual inspection (augmented by eddy current testing) is adequate to maintain the pressure boundary function of the tubesheet.

   The applicant's RAI response does not include sufficient detail for the staff to determine whether the proposed inspection will provide reasonable assurance that this aging effect will be adequately managed during the period of extended operation. The applicant does not specify the acceptance criteria (for the visual and eddy current testing), nor the basis for the acceptance criteria. The applicant should specify these requirements.

6. In response to RAI B.2.9-2, the applicant described the inspection program related to the primary-side tubesheet and primary head as follows: these components are visually inspected for cracking. Portions of the primary-side tubesheet and primary head are inspected using a remote camera each refueling outage. The tubesheet and primary head are thick, so the initiation of a crack, which could grow to be a pressure boundary threat, could easily be detected with the camera. Because the tubesheet and primary head are the same material in the same environment and there is no operating history of cracks to these components at FCS, this visual inspection is adequate to maintain the pressure boundary function of the tubesheet and primary head.

The applicant’s RAI response does not include sufficient detail for the staff to determine whether the proposed inspection will provide reasonable assurance that this aging effect will be adequately managed during the period of extended operation. 1) The applicant does not specify the extent (other than "portions") of the tubesheet and head that are visually inspected, or the basis for this extent. 2) The applicant did not describe the method or technique (including codes and standards) used for the visual inspection. 3) The applicant should specify the acceptance requirements, and the basis for these acceptance requirements, utilized to analyze the condition of the component based on the inspection results.

e. In LRA Section B.3.1, Omaha Public Power District (OPPD) states that the chemistry-related portions of Alloy 600 program are addressed in the FCS chemistry program, and that this is a deviation against the [Scope] and [Preventative Actions] program attributes for GALL AMP XI.M11, “Nickel-Alloy Nozzles and Penetrations.” This implies that OPPD considers that implementation of the chemistry program, as related to controlling the ingress of ionic impurities and dissolved oxygen into the RCS coolant, can prevent or mitigate degradation in the FCS Alloy 600 components and their associated Alloy 182/82 weld materials.   Staff review of the chemistry program (LRA Section B.1.2) finds no indication that the chemistry AMP, as implemented consistent with GALL program XI.M2, “Water Chemistry,” contains the chemistry-related portions of the Alloy 600 Program. Since this has been identified as an exception to the [Scope] program attribute for XI.M11, OPPD needs to amend the description of the chemistry program, as provided in Section B.1.2 of Appendix B to the FCS LRA to state that the scope of the program includes the chemistry-related portions of the FCS Alloy 600 Program.

f. OPPD’s Alloy 600 program for the FCS VHP nozzles and other RCS Class 1 components made from nickel-based alloys (including associated Alloy 182/82 filler metals) and the applicant’s response to NRC Bulletin 2002-02 indicates that the aging management program (AMP) is mainly dependent on visual examinations that are implemented in accordance with the OPPD boric acid inspection program. In RAI B.3.1-1, the staff requested a commitment by OPPD to implement these recommended inspection methods, inspection frequencies, and acceptance criteria that result from industry initiatives by the CEOG or the MRP Integrated Task Group on Inconel materials (including Alloy 600 and Alloy 182/82 materials) and are recommended for managing stress corrosion cracking (including PWSCC) of Inconel components, as found acceptable by the NRC, as well as any additional requirements that may result from the staff’s resolution of the industry’s responses to NRC Bulletin 2002-02, and/or the V.C. Summer hot-leg nozzle cracking issue. The applicant’s response to RAI B.3.1-1, dated December 19, 2002, did not provide the type of commitment requested by the staff. Instead, the response to RAI B.3.1-1 stated that the issue of PWSCC in the FCS Alloy 600 components was an issue that would be resolved during the current operating term for FCS.

Although the staff does concur that the issue of PWSCC in the VHP nozzles of domestic PWRs is a current licensing term issue that is outside of the scope of license renewal pursuant to 10 CFR 54.30, the staff is currently assessing the industry's responses to NRC Bulletin 2002-02 to determine whether the industry's inspection program for the VHP nozzles of domestic PWRs is sufficient to manage PWSCC in these nozzles prior to a loss of structural integrity, and specifically, for OPPD, prior to a loss of structural integrity in any of the VHP nozzles at FCS. The staff is currently not in agreement with the industry as to which type of inspection methods will be sufficient to manage PWSCC in the VHP nozzles of domestic PWRs. The staff, therefore, reiterates its request for a commitment from OPPD to implement those recommended inspection methods, inspection frequencies, and acceptance criteria that result from industry initiatives by the CEOG or the MRP Integrated Task Group on nickel-based alloys and are recommended for managing stress corrosion cracking (including PWSCC) in Class 1 nickel-based alloy components (including Class 1 components fabricated from Alloy 600 base metals and Alloy 182/82 filler materials), as found acceptable by the NRC, as well as any additional requirements that may result from the staff's resolution of the industry's responses to NRC Bulletin 2002-02 and/or the V.C. Summer hot-leg nozzle cracking issue.

POI-8

The staff requests that the applicant address the following issues in LRA Section 3.1:

a. The leakage detection lines, or closure head vent lines, have been included within the scope of license renewal and are addressed in Table 2.3.1.3-1 under the component type "Pipes & Fittings, CEDM Housings." The applicable components are linked to AMR Results Items 3.1.1.01, 3.1.1.06, and 3.1.1.24. Item A2.1.4 in Section IV of NUREG 1801 indicates vessel flange leak detection lines require further plant-specific evaluation. Since this line functions as a pressure boundary for the vessel flange, the applicant is requested to address the plant-specific review in item A2.1.4 in Section IV of NUREG-1801, and identify the materials used in the leakage detection line, the method of pressurizing the lines and the inspection methods that are used to detect crack initiation and growth due to stress corrosion cracking that initiates on the inside surface.

b. Loss of section thickness due to erosion could occur in steam generator feedwater impingement plates and supports. The GALL report recommends further evaluation of a plant-specific aging management program to ensure that this aging effect is adequately managed. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this standard review plan). The staff reviews the applicant's proposed program to ensure that an adequate program will be in place for the management of these aging effects.

   The applicant indicates that this aging effect is not applicable to FCS. The applicant has not indicated why it is not applicable to FCS. If FCS has steam generator feedwater impingement plates and supports, or their equivalent, the applicant must provide the results of its AMR, identify aging management programs to manage loss of section thickness due to erosion and provide justification for the program. The applicant should clarify whether FCS has steam generator feedwater impingement plates and supports, or their equivalent. If so, provide the results of the AMR and identify aging management programs to manage loss of section thickness due to erosion.

c. LRA Table 3.1-3, row 03, “Bolt-Thermal Shield,” credits the inservice inspection program for managing loss of preload in the thermal shield bolts. As stated in the justification column of 3.1.3.03, the basis for crediting ISI is that the material, environment, and aging effects are the same as for components evaluated in Volume 2, IV.B3.4-h, of the GALL report. This section of the GALL report states that GALL programs XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD,” and XI.M14, “Loose Part Monitoring,” are credited with managing aging in the components similar to the thermal shield bolts. On page B-3 of the LRA, the applicant states that a loose parts monitoring program is not credited for license renewal at FCS. Instead, the reactor vessel internals inspection program (RVII, LRA Section B.2.8) is credited with managing aging. In RAI 3.1.3-1, the staff requested the applicant to identify plant-specific experience with respect to cracking and loss of preload of thermal shield bolting.

In response to RAI 3.1.3-1, the applicant committed to incorporate an augmented inspection of the thermal shield bolting or pins within the reactor vessel internals inspection program. The thermal shield monitoring program generated data from 1988 through 1990 that indicated the early stages of loosening of the thermal sleeve positioning pins. During the 1992 refueling outage, visual inspection of the support lugs and the positioning pins was performed. The preload of 11 of the 16 lower positioning pins was also performed. Based on the measurements and an analytical evaluation of preload, 7 lower and 4 upper pins were replaced. This action reduced vibrations back to normal levels.

No abnormal vibration has been detected since 1992 and OPPD continues to monitor thermal shield vibrations as a task within the reactor vessel internals inspection program. Based on the success of the thermal shield monitoring program in detecting loss of preload, and the commitment to incorporate this program in the reactor vessel internals inspection program, the staff agrees that a loose parts monitoring program is not necessary and the reactor vessel internals inspection program will be adequate for detecting aging effects for the thermal shield bolting or pins. The USAR supplement for the reactor vessel internals inspection program (A2.2.20) does not identify that the thermal shield monitoring program is included within the reactor vessel internals inspection program. The applicant should include this information within its USAR supplement

d. In response to RAI 3.1.2-1 the applicant indicates that the reactor coolant pump (RCP) thermal barriers are not accessible for routine maintenance or inspection. During the 2001 refueling outage, the "A" RCP rotating assembly was replaced with a new rotating assembly and the existing assembly was sent to a vendor for refurbishment. As part of the refurbishment, the thermal barrier on the "A" RCP was visually inspected and a dye-penetrant examination was performed. No indications of cracks were identified. A visual inspection was performed on the "C" RCP after it was removed for refurbishment during the 2002 refueling outage. No indication of degradation was identified. The applicant indicates that they will continue to visually inspect and perform a dye-penetrant exam on the two remaining RCP thermal barriers when the rotating assemblies are refurbished. Based on the operating and inspection results to date on the RCP thermal barriers, the staff agrees that periodic inservice inspection of the RCP thermal barriers is not necessary. The staff agrees that visual inspection and dye penetrant examination during refurbishment will be adequate to monitor crack initiation and growth in the RCP thermal barriers. This inspection program should be continued during the license renewal period. The staff requests that during the license renewal period the applicant commit to visual inspection and dye-penetrant examination of RCP thermal barriers that are accessible during refurbishment. If cracks are discovered during refurbishment, the applicant should implement a program for inspection of the RCP thermal barriers in the other RCPs.

e. Attachment 3 to the FCS engineering analysis (EA-FC-00-088) provides a program description and a direct comparison of the ten elements in GALL AMP XI.M32 and the FCS activity to implement the one-time inspection program. EA-FC-00-088 indicates that the one-time inspection program will include RC system small-bore piping that is susceptible to crack initiation and growth due to stress corrosion cracking or cyclic loading. Although the FCS engineering analysis document specifies the criteria in GALL AMP XI.M.32, cyclic loading is a general requirement. In order to designate locations that are most susceptible to failure from cyclic loading, the mechanism which could cause age-related degradation must be specified. The staff is concerned that cyclic loading that is caused by thermal fatigue resulting from thermal stratification or turbulent penetration could lead to the loss of function in small bore piping. Therefore, the applicant should clarify whether the one-time inspection program will include RC system small-bore piping that is susceptible to crack initiation and growth due to stress corrosion cracking or thermal fatigue resulting from thermal stratification or turbulent penetration

Attachment 6 to EA-FC-00-88 identifies all components that are to be included in the one-time inspection program. This document indicates that RC stainless steel small-bore piping components in borated treated water will receive augmented inspection using volumetric examination or equivalent. This document does not address carbon steel small-bore piping in the RC system. The applicant should confirm that there is no carbon steel small-bore piping with full penetration welds in the RC system. If there is carbon steel small-bore piping with full penetration welds in the RC system, the applicant should include this piping in its one-time inspection program or justify its exclusion.

f. Programs identified in NUREG-1801 are generic programs. When components experience unusual aging effects, the programs identified in NUREG-1801 may not be applicable. CRD housings (LRA Table 3.1-1, row 3.1.1.25) are identified as being susceptible to SCC and PWSCC with aging management provided by the inservice inspection (B.1.6) and chemistry (B.1.2) programs. Cracking has been reported on CRD housings at FCS (January 25, 2002, letter from OPPD) and Palisades (Nuclear

Management Company letters to the NRC dated August 20, 2001, and March 14, 2002). The Palisades and FCS CRD housings have similar designs.

Because this operating experience was not considered in the development of the LRA, the staff requested the applicant to consider whether the proposed inservice inspection and chemistry programs would be adequate for managing the aging effect of cracking of the CRD housings at FCS. In response to RAI 3.1.1-4, the applicant indicates that OPPD in 1999 began a proactive approach to dealing with the CEDM housing cracking phenomenon with the establishment of a CEDM Material Reliability Management Plan to monitor the CEDMs, on an outage-by-outage basis, through the performance of eddy current testing of the CEDMs. Details of the OPPD approach are contained in a letter from OPPD (R. L. Phelps) to NRC (Document Control Desk), dated January 25, 2002, "Fort Calhoun Station (FCS) Discussion of Control Element Drive Mechanism (CEDM) Housing Reliability" (LIC-02-0007), and in a letter from OPPD (R. L. Phelps) to NRC (Document Control Desk), dated October 15, 2001, "Fort Calhoun Station (FCS) Control Element Drive Mechanism (CEDM) Housing Reliability Management" (LIC-01-0095).

The applicant considers this to be a current licensing basis issue, with the resolution to be incorporated into the appropriate AMPs. The applicant indicates that it will continue to be involved in industry/regulatory activities relative to this issue and will apply recommended or mandated activities to the maintenance of the FCS CEDM housings as applicable. The applicant’s commitment to apply recommended or mandated activities resulting from the CEDM Material Reliability Management Plan ensures that CRD housings will receive adequate aging management during the license renewal term. The staff requests the applicant to include a description of the program to manage CRD housings in the USAR Supplement.

POI-9

The staff requests that the applicant address the following issues in LRA Section 3.2:

a. In LRA Table 3.2-1, row 3.2.1.08, the applicant stated that the ESF components in FCS are not serviced by an open-cycle cooling system. The AMR inspection was to confirm that there are no heat exchangers in the ESF systems that will be serviced by the open-cycle cooling water system program of NUREG-1801. Based on the information provided by the applicant, the AMR inspection found that there are several ESF heat exchangers for which raw water would be utilized should CCW not be available in an emergency situation. The staff considers that the worst-case scenario should be accounted for in the AMR for these heat exchangers. The applicant is, therefore, requested to identify the aging effects requiring management for these heat exchangers, which will be exposed to raw water environments during emergency situations, and the associated AMP.

b. In RAI 3.2.2-1, the staff requested the applicant to clarify the statement made in LRA Table 3.2-1, row 3.2.1.04, under "Discussion". Specifically, the applicant clarified in its letter of December 19, 2002, that it should read, " No FCS containment isolation valves and associated piping in systems that are addressed in this or other sections of this application were determined to be ....,." in place of "No FCS containment isolation valves and associated piping in systems that are not addressed in this or other sections of ...." In a meeting held on November 21, 2003, the staff clarified that the applicant should provide the basis of its determination that the above components are not subject to the aging effect of loss of material due to MIC. This information was not provided in the applicant's letter of December 19, 2002. The applicant is, therefore, requested to discuss the relevant material/environment combinations for the subject components to ensure that the components will not be subject to the aging effect of loss of material due to MIC.

POI-10

The staff requests that the applicant address the following issues in LRA Section 3.3:

a. With regard to the chemical and volume control system, in RAI 3.3-1, the staff asked for clarification for several links in the LRA. In its response dated December 12, 2002, the applicant clarified that link 3.3.1.08 would be used instead of 3.4.1.10 for the letdown heat exchanger. During the AMR inspection, in response to the staff's questions about the aging management of this component, the applicant also clarified that the letdown heat exchanger would be managed using the cooling water corrosion program (link 3.3.1.08), and that the inspection would cover both the primary side and the cooling water side of the heat exchanger. The staff finds that this clarification is consistent with the GALL recommendations and is acceptable. However, the applicant should provide this clarification under oath and affirmation.

b. The LRA indicated that the aging effects and aging management of the regenerative heat exchanger are consistent with GALL. However, during the onsite inspection of the applicant's aging management programs, the staff identified that this was not the case. In a conversation with the staff during the inspection, the applicant stated that the regenerative heat exchanger is made of stainless steel with an all-welded construction, such that the internals are inaccessible. The applicant also stated that the aging management of the regenerative heat exchanger would consist of the chemistry program, with further evaluation of cracking due to SCC provided by inspection of the welds via the inservice inspection program. The applicant considered this adequate aging management to support the pressure boundary intended function. The applicant stated that they would docket this information.

However, the staff notes that degradation of the regenerative heat exchanger internals could allow inventory to flow from the charging to the letdown side of the chemical and volume control system. This would reduce the effectiveness of the system for managing reactor coolant system chemistry, and may also reduce the ability of the system to inject borated water during an event; therefore, the proposed aging management may not be adequate to ensure that the intended function of the heat exchanger is maintained.

Describe inspections of the regenerative heat exchanger internals that would verify the absence of the identified aging effects, or justify that degradation of the internals would not result in loss of function.

c. In LRA Table 2.3.3.8-1, the applicant identified a link to LRA AMR item 3.3.1.07 for the accumulators. During the AMR inspection, the applicant clarified that link 3.3.1.07 should be 3.3.1.05. The applicant should revise LRA Table 2.3.3.8-1 and submit it for staff review.

d. The staff noted that LRA Table 2.3.3.17-1 deals primarily with external environments and did not appear to cover the internal environments that would be expected in the liquid waste disposal system. In RAI 3.3.1-12, the staff asked the applicant to describe the internal environment(s) of the system. By letter dated December 19, 2002, the applicant stated that the system internal environment was primarily borated treated water inside containment, and raw water (fire water) in the auxiliary building. The applicant stated that the link to LRA Table 3.3.2 item 96 covered the stainless steel piping in the borated water environment. The applicant added a link to LRA Table 3.3.1 item 16 to cover carbon steel and stainless steel pipes, fittings, and valve bodies in raw water. Since for many plants the liquid waste disposal system is connected to floor drains, the staff questions the applicant's assertion that the piping inside containment is only subjected to borated, treated water. The staff believes that the environment may contain higher concentrations of impurities than would be found in borated, treated water and, consequently, the applicant may not have adequately identified the aging effects for the piping inside containment. Discuss the frequency of inspections of the liquid waste disposal system piping inside containment. Justify the inspection frequency considering the expected internal environment, including the potential for high impurity concentrations due to system connections to floor drains or other potential sources of impurities, and subsequent evaporation/concentration of impurities.

e. Table 3.3-2 of the LRA states that the periodic surveillance and preventative maintenance program will provide aging management for the stainless steel components in the borated treated water environment. Section 2.3.3.17 of the LRA indicates that these components are within the scope of license renewal due to their function to provide containment isolation. The staff notes that, while borated treated water may be the expected environment during an event for which this system has a license renewal intended function, in many plants the liquid waste system is connected to floor drains and, as such, the piping inside containment is likely to contain water with higher impurities than borated, treated water. Therefore, citing this environment may not result in an adequate frequency of inspection or inspection for all applicable aging effects. Discuss the frequency of inspections of the liquid waste disposal system piping inside containment. Justify the inspection frequency considering the expected internal environment, including the potential for high impurity concentrations due to system connections to floor drains or other potential sources of impurities, and subsequent evaporation/concentration of impurities.

f. In RAI 3.3.1-13, the staff asked for clarification of the aging effects of carbon steel piping in concrete, since experience has shown that steels can degrade in a concrete environment. By letter dated December 19, 2002, the applicant stated that, if through-wall perforation of liquid waste disposal system piping occurred, there would still be a clear channel for drainage of fire suppression water from the area of concern down to the sump, and therefore no aging management is required. While this is generally in keeping with the intended function of the system, the applicant has not demonstrated that the aging would be limited to a through-wall perforation as opposed to blockage of the piping. Justify the assumption that aging of the piping in question cannot lead to blockage.

g. Section 2.3.3.17 of the LRA indicates that the components in the auxiliary building are within the scope of license renewal due to their function of providing flood mitigation. These components are connected to floor drains. The staff notes that the LRA Table 3.3.1 item 16 link that was added in the response to RAI 3.3.1-12 for these components credits the cooling water corrosion program for aging management. For the raw water environment, the cooling water corrosion program is essentially a Generic Letter (GL) 89-13 program designed for cooling water systems. It is not clear to the staff how this program will be used to manage the aging of piping in the liquid waste disposal system. Explain how the cooling water corrosion program will be used to effectively manage the aging of piping in the liquid waste disposal system.

h. It appears that the applicant has incorrectly determined that the GALL recommendations for the spent fuel pool cooling system (link 3.3.1-01) do not apply to FCS. For the piping, fittings, and other stainless steel components in the spent fuel pool cooling system exposed to borated, treated water, the applicant's December 12, 2002, response to RAI 3.3-1 clarified that the aging management is through link 3.3.3-01. This link addresses stress corrosion cracking of stainless steel in borated treated water, and uses the chemistry program with no backup inspections based on the GALL recommendations for ECCS systems with similar materials and environments. However, for the same materials and environments in the spent fuel pool cooling system, the GALL (link 3.3.1.01) recommends that the loss of material due to general, pitting, and crevice corrosion be addressed by the chemistry program coupled with inspections to verify that aging effects are not occuring, due to the potential for impurities to reach high concentrations in areas of low flow. Therefore, it is the staff's position that inspections should be performed to verify the effectiveness of the chemistry program for the stainless steel components in the spent fuel pool cooling system, as discussed in SRP-LR Section 3.3.2.2.1. Describe the inspections what will be performed of the spent fuel pool system components to verify that a loss of material is not occurring.

i. In a conversation with the staff during the AMR inspection, the applicant stated that the regenerative heat exchanger is stainless steel and is of an all-welded construction, such that the internals are inaccessible, and that aging management of the regenerative heat exchanger would consist of the chemistry program with further evaluation of cracking due to SCC provided by inspection of the welds via the inservice inspection program. The staff notes that degradation of the regenerative heat exchanger internals could result in bypassing of system flow. This would reduce the effectiveness of the system for managing reactor coolant system chemistry, and may also reduce the ability of the system to inject borated water during an event; therefore, the proposed aging management may not be adequate to ensure that the intended function of the heat exchanger is maintained. Describe inspections of the regenerative heat exchanger internals that would verify the absence of the identified aging effects, or justify that degradation of the internals would not result in loss of function.

POI-11

The staff requests that the applicant address the following issues in LRA Section 3.4:

LRA Table 3.4-2 states that copper alloy components operating in a deoxygenated environment are subject to loss of material due to crevice and pitting corrosion resulting from stagnant or low flow conditions, or due to wear from flow-induced vibration. The applicant credits the one-time inspection to manage this effect. This program is described in LRA Section B.3.5. The staff issued RAI 3.4.1-10 requesting the applicant to provide justification that the AMP at FCS will provide equivalent aging management for copper alloy components in the heat exchangers of the AFW system at FCS. In its response by letter dated December 19, 2002, the applicant stated that the activities of three separate programs, namely one-time inspection (B.3.5), selective leaching (B.3.6) and periodic surveillance and preventive maintenance (B.2.7), are deemed to be appropriate for providing aging management that is equivalent to the GALL report for cooling water programs.

On the basis of its review of the applicant's response, the staff concludes that a one-time inspection identified for copper alloy components in a deoxygenated treated water environment (LRA Table 3.4-2, Row numbers 3.2.0.3, 3.2.0.4) is not an adequate means of managing loss of material in that environment. The applicant should develop an AMP which will adequately manage this aging effect in the subject components during the period of extended operation. Similarly, for loss of material due to selective leaching of copper alloy in a deoxygenated treated water environment, the selective leaching program by itself is not considered an adequate means of managing loss of material in that environment. The applicant should develop an AMP which will manage this aging effect in the subject components during the period of extended operation. It is the staff's understanding that the applicant has proposed additional programs for the subject components in this environment during the AMR inspection. The applicant needs to make a commitment to this effect on the docket and modify Table 3.4-2 of the LRA accordingly.

POI-12

The staff requests that the applicant address the following issues in LRA Section 3.6:

In LRA Table 2.5.2-1, the applicant identifies containment electrical penetrations as components that are within the scope of license renewal and subject to an AMR. In this table, the applicant identifies several links, including 3.6.1.01 and 3.6.1.02. The staff believes that the electrical penetrations may include low-level pigtails, which require aging management identified in LRA Table 3.6-1, link 3.6.1.03. The applicant should clarify whether low-level pigtails are included in the containment electrical penetrations and whether they will be managed by the non-EQ cable AMP.

POI-13

The staff requests that the applicant address the following issues in LRA Section 4:

a. Item (e) in RAI 4.2-2 requested the applicant to identify the projected Charpy USE for each beltline material. In response to this item, the applicant provided a table, which indicates that the lowest predicted USE is 50.1 ft-lb. The table contains a column identified as "Position 2.2 Capsule Modified % USE Decrease." The applicant has not identified how the values in this column were determined. In addition, the initial USE for Weld Heat No. 12008/27204 is identified as 97.8 ft-lb. The actual initial Charpy USE data for this weld must be submitted to the staff for review. The staff requests that the applicant explain how the values in the column "Position 2.2 Capsule Modified % USE Decrease," were determined and provide the source and actual initial Charpy USE data for Weld Heat No. 12008/27204.

   Item (f) in RAI 4.2-2 requested the applicant to evaluate the impact of surveillance data on the projected Charpy USE. In response to RAI B.1.7-1, the applicant indicates that the FCS will be utilizing weld surveillance data from Mihama, Diablo Canyon Unit 1, Palisades supplemental capsules from FCS drop-out, and Salem Unit 2. In response to item f in RAI 4.2-2, the applicant provided a table which contains surveillance data from the FCS surveillance welds and plates and the Mihama (surveillance weld) plant; but does not contain data from Diablo Canyon Unit 1, Palisades supplemental capsules from FCS drop-out, and Salem Unit 2. In addition, the applicant has not explained the impact of the surveillance data on the projected Charpy USE for each beltline material. The staff requests that the applicant provide Charpy USE surveillance data from Diablo Canyon Unit 1, Palisades supplemental capsules from FCS drop-out, and Salem Unit 2, and explain the impact of all the surveillance data on the projected Charpy USE for each beltline material.

   Until this data is provided, the staff cannot confirm that the projected Charpy USE at the expiration of the extended license for all beltline materials will exceed 50 ft-lb in accordance with the requirements in Appendix G, 10 CFR Part 50.

b. The USAR supplement does not contain the Charpy USE analysis that was performed in response to RAI 4.2-2. Since this analysis applies to the end of the period of extended operation, the applicant should revise the USAR supplement to include the results of the Charpy USE performed in response to RAI 4.2-2.

c. The applicant's December 19, 2002, response to RAI 4.3.1-1, item 1, provided a table which lists the current cycle counts for the design transients. The applicant indicated that these cycles were recorded in accordance with plant procedure standing order (SO)-O-23 on a monthly basis. The applicant indicated that the pressure differential transients due to reactor coolant pump stops and starts are not counted because the number specified (4000) is conservative. The applicant also identified several transients that are not counted under the procedure. These cycles involve power changes, operating pressure and temperature variations, and feedwater additions with the plant in hot standby conditions. The applicant indicated that these cycles will be estimated from a review of plant operating records to determine whether they should be counted by the fatigue monitoring program (FMP).

In response to Item 3, the applicant indicated that all design basis transients will be included in the FMP. The applicant indicated that a program basis document (PBD) would be generated to capture both the current and increased scope of the FMP, which includes incorporation of automated cycle counting and the analysis for environmentally-assisted fatigue. The applicant committed to complete the PBD and implement the enhanced FMP prior to the period of extended operation.

The applicant response did not provide cycle count for chemical and volume control system (CVCS) transients identified in LRA Section 4.3. In addition, Note 1 to the response to Item 1 implies that some transients may not be monitored by the FMP, whereas the response to Item 3 indicates that all transients will be monitored either directly or indirectly by the FMP. The applicant needs to provide additional clarification regarding how these transients are monitored by the FMP.

d. The applicant's December 12, 2002, response to RAI 4.3.2-2 indicated that the environmental fatigue evaluations are complete and the analysis shows that the surge line is the only location where the cumulative usage factor (CUF) may exceed 1.0 during the period of extended operation. The applicant further indicated that the environmental fatigue of the surge line will be included in the FMP. The applicant should revise the USAR supplement to describe the completed environmental fatigue evaluation.

The applicant's December 19, 2002, response to RAI 4.3.2-3 also indicated that the limiting surge line welds would be inspected prior to the period of extended operation. The applicant further indicated the results of these inspections will be utilized to assess the appropriate approach for addressing environmentally-assisted fatigue of the surge lines. The applicant indicated that the approach developed could include one or more of the following:

1. Further refinement of the fatigue analysis to lower the CUF(s) to below 1.0, or
2. Repair of the affected locations, or
3. Replacement of the affected locations, or
4. Manage the effects of fatigue by an inspection program that has been reviewed and approved by the NRC (e.g., periodic non-destructive examination of the affected locations at inspection intervals to be determined by a method accepted by the NRC).

The applicant indicated that, if Option 4 is selected, the inspection details, including scope, qualification, method, and frequency will be provided to the NRC for review prior to the period of extended operation. The applicant should include this information in the USAR supplement.

e. The applicant's December 19, 2002, response to RAI 4.3.2–1 provided the calculated environmental usage factors for the six component locations listed in NUREG/CR-6260. The calculated usage factors are less than 1.0 for all components except for the surge line elbow. The applicant's response indicates that the usage factors for two components, the surge line elbow and the charging line nozzle, were based on anticipated cycles for a 60-year plant life consistent with Table 5-32 of NUREG/CR-6260. The statement in the applicant's response is not clear to the staff. The applicant should clarify whether the evaluations are based on the number of anticipated cycles for 60 years of operation at FCS. The applicant should also clarify whether the number of cycles assumed in these evaluations is included in the FMP to provide assurance that the evaluations remain valid during the period of extended operation.

f. The staff review of the concrete containment tendon pre-stress TLAA indicated that the applicant is missing an important acceptance criterion in the description of the TLAA. In RAI 4.5-1, the staff requested information regarding this acceptance criterion as follows:

> For acceptance criterion for tendon prestressing force, the LRA states: "If at any time surveillance testing indicates a decrease in the tendon force below the given limit line, corrective action will be taken in accordance with the Technical Specifications." This is one of the criterion in IWL-3221. Additionally, 10 CFR 50.55a(b)(2)(viii)(B) requires: "When evaluation of consecutive surveillance's of prestressing forces for the same tendon or tendons in a group indicates a trend of prestressing loss such that the tendon forces will be less than the minimum design prestress requirements before the next inspection interval, an evaluation must be performed and reported in the Engineering Evaluation Report as prescribed in IWL-3300." Based on these requirements, the staff requests the applicant to clarify whether the acceptance criterion in the LRA complies with the requirements of IWL-3221 and 10 CFR 50.55a(b)(2)(viii)(B).

In response, the applicant stated that the acceptance criterion in the LRA complies with IWL-3221 and 10 CFR 50.55a(b)(2)(viii)(B). A regression analysis of forces measured on specific tendons was conducted and included in the tendon testing report. The analysis showed satisfactory results were expected for the next surveillance. A discussion of this evaluation should be added to the USAR supplement.

g. The applicant does not provide an adequate quantitative evaluation based on the prior tendon inspections. In RAI 4.5-2, the staff requested the following information:

> Title 10 CFR 50.55a(b)(2)(viii)(B) requires the development of a trend line of measured prestressing forces so that the licensee can decide whether the prestressing tendon forces during the next inspection interval will remain above the “Lower Limit - Dome,” and “Lower-Limit-Wall,” as plotted in USAR Figure 5.10-3. The applicant addresses this TLAA using 10 CFR 54.21(c)(1)(iii) and Section X.S1 of the GALL report, as part of its operating experience. In order to confirm that the prestressing tendon forces will remain above the lower limits for the dome and wall during the period of extended operation, the staff requests that the applicant provide information related to the trend lines for wall and dome tendons compared to the established lower limits. Guidance for statistical considerations in developing the trend lines is given in Attachment 3 of IN 99-10, Revision 1, “Degradation of Prestressing Tendon Systems in Prestressed Concrete Containment.”

In response, the applicant argues that because it is using 10 CFR 54.21(c)(1)(iii), i.e., managing the TLAA through aging management, it need not provide such information. The staff recognizes the applicant’s choice. However, the staff needs the quantitative data of trend lines, as part of the operating experience, for making a reasonable assurance conclusion regarding this TLAA for the period of extended operation.

h. In its December 12, 2002, response to RAI 4.6-1, the applicant indicated that the recent analysis of the as-found buckling of the liner plate was performed using non-linear, 3D finite element analysis with loads applied in a fashion similar to the original analysis. The applicant indicated that an undeformed panel was analyzed to benchmark the new model against results from a comparable model from the original analysis. The applicant indicated that the new analysis resulted in a CUF of 0.141 for the 500 cycles of internal temperature variation due to heatup and cooldown. The applicant further indicated that 500 cycles is greater than the number of cycles expected for 60 years of plant operation. The applicant should verify that the thermal cycling due to outdoor temperature variation and LOCA does not result in insignificant fatigue usage. The applicant indicated that no penetration sleeves were contained in the new analysis. The applicant should also clarify whether the current evaluation bounds the fatigue usage in the penetration area.

i. The applicant provided a summary description of the containment liner plate and penetration sleeve fatigue TLAA in Section A.3.5 of the USAR supplement. The applicant indicates that an evaluation of the liner plate as-found buckling for a 60-year life will be completed prior to the period of extended operation. The applicant should update the USAR supplement to describe the results of the current evaluation as discussed in response to RAI 4.6-1.

j. The applicant should provide an updated USAR Supplement to Section A.3.6.2 of the application to reflect the statement in the applicant's response to RAI 4.7.2-1 regarding their commitment relative to the future resolution of the Inconel 82/182 PWSCC issue.