your energy partner
OPPD
Omaha Public Power District

Fort Calhoun Station
P.O. Box 550, Highway 75
Fort Calhoun, NE 68023-0550

July 7, 2003
LIC-03-0089

U. S. Nuclear Regulatory Commission
ATTN.: Document Control Desk
Washington, DC 20555

References:
1. Docket No. 50-285
2. Letter from NRC (P. T. Kuo) to OPPD (R. T. Ridenoure) dated April 21, 2003 (NRC-03-076)
3. Letter from NRC (P. T. Kuo) to OPPD (R. T. Ridenoure) dated May 15, 2003 (NRC-03-102)
4. Letter from OPPD (S. K. Gambhir) to NRC (Document Control Desk) dated May 16, 2003 (LIC-03-0068)

SUBJECT: License Renewal Safety Evaluation Report for Fort Calhoun Station, Unit 1- Comments and Responses to Open and Confirmatory Items

The Reference 2 letter transmitted the License Renewal Safety Evaluation Report (SER) for Fort Calhoun Station, Unit 1. The letter requested that Omaha Public Power District (OPPD) provide comments and responses to the included Open Items and Confirmatory Items. The Reference 3 letter identified an additional open item regarding a pressurizer weld repair, and requested that this issue be added to the SER Open Items.

Attachment 1 includes the SER Open and Confirmatory Items with OPPD responses as applicable. Also included is a revised commitment paragraph for the OPPD response to the additional Open Item regarding the pressurizer weld repair; the initial response to this item was included in the Reference 4 letter (Annual Update) submitted earlier. The revised commitment paragraph addresses reviewer comments on flaw size and corrosion; this commitment paragraph supersedes that provided in Reference 4.

Commitments to the NRC are included in several of the responses. These commitments are revisions or additions to commitments previously included in correspondence applicable to the Fort Calhoun Station License Renewal Application. The Commitment Listing in Appendix A of the SER has been updated accordingly; the updated listing is provided with other comments on various SER sections in Attachment 2.

If you have any questions or require additional information, please contact T. C. Matthews at (402) 533-6938.

A090

I declare under penalty of perjury that the foregoing is true and correct. (Executed on July 7, 2003)

Sincerely,

7-7-03

R. L. Phelps
Division Manager
Nuclear Engineering

TCM/tcm

Attachment

c: T. P. Gwynn, Acting NRC Regional Administrator, Region IV
W. C. Walker, NRC Region IV, Senior Project Engineer
W. F. Burton, NRC Project Manager
A. B. Wang, NRC Project Manager
J. G. Kramer, NRC Senior Resident Inspector
Division Administrator - Public Health Assurance, State of Nebraska
Winston & Strawn

Omaha Public Power District
Responses to Open and Confirmatory Items In
Safety Evaluation Report Related to the
License Renewal Application of the
Fort Calhoun Station, Unit 1

SER Open Items and OPPD Responses

Open Item 2.2-1

During the AMR inspection and audit, the team reviewed the on-site engineering analysis (EA)-FC-00-149, "NSR Steam and Water Systems Impacting SSC Within Scope For License Renewal." 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 (FAC), chemistry, general corrosion of external surfaces, and structure monitoring programs 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 should 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 should 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 effect for these SSCs. By letter dated February 20, 2003, the staff issued POI-1(a), requesting that the applicant provide the above information. By letter dated March 14, 2003, the applicant provided the requested information. The staff has reviewed the information and finds that the applicant has adequately identified the structures and components within the scope of license renewal as a result of the meeting the 54.4(a)(2) scoping criterion. POI-1(a) is resolved. The staff must review the AMR results for the additional components brought into scope and subject to an AMR. The results of the staff's review will be provided in the final SER.

Response

No OPPD action is required for this item.

Open Item 2.2-2

The EA stated that the compressed air, demineralized water, and steam generator feedwater blowdown systems contained components that 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 component cooling water 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. By letter dated February 20, 2003, the staff issued POI-1(d), requesting the applicant to resolve this discrepancy between LRA Table 2.2-1 and the description in LRA Section 2.3.2.2 and provide revised Section 2 tables and, if necessary, revised Section 3 tables to accurately describe which systems and/or components have been functionally realigned and how the components will be managed.

By letter dated March 14, 2003, the applicant responded to POI-1(d), providing revisions to LRA Table 2.2-1 and LRA Section 2.3.2.2, and providing an additional drawing to clearly identify the blowpipe system. On the basis of the applicant's response, POI-1(d) is resolved. However, the staff must review the information provided to ensure that all components within scope and subject to an AMR have been identified.

Response

No OPPD action is required for this item.

Open Item 2.3.3.15-1

Section 2.3.3.15 of the LRA describes that the raw water discharge from the CCW system 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 RW system rather than at the outlet from the circulating water discharge tunnel has not been adequately justified. By letter dated February 20, 2003, the staff issued POI-3(a), requesting the applicant to justify the location of the license renewal boundary.

By letter dated March 14, 2003, the applicant responded to this POI, stating that the location for the raw water discharge license renewal boundary at check valves CW-188 and CW-189, upstream of the circulating water discharge tunnel, has been revised. The applicant included the circulating water discharge tunnel within the scope for license renewal as part of the intake structure. The applicant referenced a separate letter dated March 14, 2003, which included revised boundary drawing 11405-M-100 and new boundary drawing 11405-M-257, Sh. 2, as attachments. These drawings show that a continuous flow path from the raw water system to the river outfall has been included within scope for license renewal. This resolves the scoping issues associated with POI-3(a), but the expansion of scope introduces the need for evaluation of the applicant's aging management review for the discharge tunnel.

In its POI response, the applicant provided the following discussion regarding the aging management review of the discharge tunnel:

I. The circulating water discharge tunnel is constructed of reinforced concrete with a nominal wall thickness of 2' or greater and nominal floor/ceiling thicknesses of 2'-6" or greater throughout. The concrete circulating water discharge tunnel walls, floor and ceiling are constructed of Type B concrete in accordance with ACI 201.2R as specified in NUREG-1557.

II. The concrete is not exposed to aggressive river water or groundwater. The concrete that surrounds the embedded steel has a pH greater than or equal to 12.5. The concrete mix design specified a water-to-cement ratio of 0.44 and air entrainment of 5.00% + 1.00% for Class B concrete. The concrete at FCS was designed in accordance with ACI 318-63 (per USAR Section 5.3.1 Revision 0 and USAR Section 5.11.3.1 Revision 2).

III. The maximum flow rate in the circulating water tunnel is well below the velocity of 25 fps required to initiate abrasion. The calculated highest water velocity for a closed conduit is in the warm water recirculating tunnel at 12.6 fps. Therefore, this aging effect is not credible.

IV. Per NUREG-1557, corrosion of embedded steel is not significant for concrete structures above or below grade that are exposed to a non-aggressive environment. A non-aggressive environment, as defined by NUREG-1557, is one with a pH greater than 11.5 or chlorides less than 500 ppm. NUREG-1557 also concludes that corrosion of embedded steel is not significant for concrete structures exposed to an aggressive environment but have a low water-to-cement ratio, adequate air entrainment, and designed in accordance with ACI 318-63 or ACI 349-85. A low water-to-cement ratio is defined as 0.35 to 0.45 and adequate air entrainment is defined as 3 to 6 percent. Therefore, corrosion of embedded steel is not credible.

V. The freeze/thaw exposure category is "Severe" since the concrete of concern is in direct contact with the soil. Based on recent analyses, the groundwater and river water contain minimal amounts of chlorides (8.0 ppm and 14.0 ppm respectively), sulfates (79 ppm and 229 ppm respectively), and the pH is slightly alkaline (7.48 and 8.39 respectively); therefore, the exposure category for sulfates, chlorides, and acids is "Mild", and concrete degradation is not credible for the circulating water discharge tunnel.

VI. The total flow of the raw water equates to less than 5% of the total volume of the circulating water discharge tunnel.

Based on the installation conditions enumerated above, the conditions specified in NUREG-1557 have been satisfied; therefore, minimal or no aging effects will be realized in the circulating water discharge tunnel. Tunnel failure will not occur to the point that the raw water intended function would be impacted or jeopardized during the period of extended operation. To verify this assumption, the applicant will perform a one-time inspection of the circulating water discharge tunnel per the one-time inspection program (B.3.5).

The staff evaluated the information provided in response to POI-3(a) and finds it acceptable because the applicant has brought the circulating water discharge tunnel within scope. Therefore, POI-3(a) is resolved. The staff's review of the aging management review associated with the expanded scope will be provided in the final SER.

Response:

As described above, OPPD commited to a one-time inspection of the circulating water discharge tunnel under the One-Time Inspection Program (B.3.5) in the response to Potential Open Item 3(a). This was documented as Commitment Item Number 11 in the Appendix A Commitment Listing in the NRC Safety Evaluation Report (SER) issued April 21, 2003.

Based on additional evaluation, OPPD has determined that the one-time inspection of the discharge tunnel should instead be implemented under the Structures Monitoring Program (B.2.10). Therefore, the commitment noted above is superseded by the commitment in the following paragraph. Appendix A of the SER should be updated to reflect this revised commitment. No revision is required to LRA Table 2.4.2.3-1, because the applicable Component Types in that table already credit the Structures Monitoring Program.

The circulating water discharge tunnel has been included within the scope of license renewal as part of the intake structure. OPPD will perform a one-time inspection of the circulating water discharge tunnel under the Structures Monitoring Program (B.2.10).

Open Item 3.0-1

In its letter dated March 14, 2003, the applicant provided revisions to many tables in LRA Sections 2 and 3. The staff will review the revised information to determine whether the revisions change the staff's conclusions as documented in the SER.

Response:

In Appendix A of the referenced letter, OPPD resubmitted LRA Tables incorporating changes made since the April 2002 LRA revision. The revised tables were formatted to indicate which changes were made as a result of responses to NRC RAIs/POIs or as a result of additional OPPD reviews of LR system Engineering Analyses.

Subsequent to that submittal, the NRC Project Manager created a summary matrix of the LRA Table changes. On May 28 and 29, 2003, the NRC conducted a public meeting to discuss the FCS SER Open Items and Confirmatory Items. During the course of that meeting, the LRA Table changes and bases for the changes were discussed with the applicable NRC reviewers. OPPD has revised the summary matrix to reflect the meeting conclusions; Appendix A of this attachment contains the revised Summary of Revisions to FCS LRA Tables matrix. The matrix columns include the line item number, the table in which the change is made, a description of the change, the reason for the change, whether the change was accepted at the public meeting, and clarification about the change where requested by the NRC reviewers.

Of the 212 line items, 9 were not accepted at the meeting by the applicable reviewers. Further clarifications have been provided for these items (numbers 10, 31, 43, 44, 79, 123, 135, 145, and 154).

Six of the line items were accepted based on information provided during the meeting discussions of those items. The additional information provided at the meeting has been included in the "Clarification" column. These are line item numbers 5, 22, 41, 103, 140, and 197.

During the meeting discussions, the participants determined that 9 of the line items included changes that were inappropriate. Therefore, OPPD is retracting the applicable changes to the tables submitted on March 14, 2003. The applicable changes retracted are addressed in line item numbers 61, 93, 97, 124, 138, 142, 149, 186, and 203.

There was one item added to the table subsequent to the meeting that represents a new LRA table change as a result of one of the clarifications provided for a rejected change. The new item is number 147 and it was provided in support of item number 10.

The rest of the matrix line items were accepted by the applicable reviewers with no changes as a result of the meeting discussions.

Open Item 3.3.2.4.1.2-1

For the regenerative heat exchanger, which is constructed of stainless steel and exposed to chemically treated borated water, LRA Table 2.3.3.1-1 cites link 3.3.1.08 for aging management of cracking due to SCC, consistent with the GALL. This link states that the aging management will consist of the chemistry program, with the effectiveness of the chemistry program verified by inspections performed using either the one-time inspection program, cooling water corrosion program, or periodic surveillance and preventative maintenance program. In discussions during the AMR inspection and audit, the applicant stated that the regenerative heat exchanger is welded such that the internals are not accessible. Due to the construction of the regenerative heat exchanger, the applicant 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 ISI program. The applicant considered this adequate aging management to support the pressure boundary intended function of the heat exchanger shell. Though the staff agrees that this is acceptable for the external pressure boundary, the staff notes that it would not detect degradation of the regenerative heat exchanger tubes which 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 CVCS 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 this intended function of the heat exchanger is maintained. By letter dated February 20, the staff issued POI-10(b) and POI-10(i), requesting the applicant to 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. By letter dated March 14, 2003, the applicant responded to POI-10(b) and POI-10(i), stating that a potential failure of the internal boundary between the two sides of the regenerative heat exchanger would not affect the inventory available for injection during an accident. The only function of the boundary is to provide for heat transfer during normal letdown operation. This function is not required during an accident. On the basis of its review of the information in the POI responses, the staff finds that the applicant's response does not explain how the plant can withstand the regulated events if the pressure boundary fails.

This pressure boundary function is important for at least two reasons over and above the normal CVCS function of maintaining RCS water chemistry. The first is getting adequate boron injection during an event. The second is isolating a letdown line break, which is a containment bypass LOCA (note that the CVCS injection path is the normally used path for the controlled cooldown during Appendix R events).

With regard to injection during an event, letdown is designed to isolate during any event in which there is need for injection. If the letdown heat exchanger tubes leak sufficiently, there could be a continued loss of inventory via the letdown flow path because one of the two letdown isolation valves is upstream of the heat exchanger, meaning it would be bypassed. This would rely on a single valve to isolate letdown and support injection.

Letdown is also designed to isolate during any breaks in the system to stop containment bypass. Again, if the letdown heat exchanger tubes leak sufficiently, the inboard isolation valve is bypassed and a single train/single valve is now relied on to stop the containment bypass LOCA.

On the basis of this information, the staff requests the applicant to provide additional information to demonstrate how degradation of the heat exchanger internals will not adversely impact on the injection function, or provide information on how the internals will be managed during the period of extended operation to ensure that the injection function is maintained.

Response

Flow through a tube leak in the Regenerative Heat Exchanger (RHX) is not possible during design basis events (DBEs) because the letdown (tube) side of the RHX would be isolated in response to the events. This isolation would occur automatically upstream at the inboard containment isolation valve from the hot leg (TCV-202), and downstream at the outboard containment isolation valve (HCV-204). Backflow from the RCS through the RHX shell side is not possible due to the charging header check valves to the loops (CH-283 and -284) and the spray line (CH-285). Additionally, the containment isolation valves, as well as the Letdown Control Valves (LCV-101-1 and -2), fail closed upon loss of air, loss of power, or loss of signal. The charging pumps, the RHX, and letdown are not credited in the USAR Chapter 14 safety analyses for plant shutdown nor are they used during a DBE (see Section 9.2.5 of the USAR); therefore, speculation about a tube failure and RHX tube leakage during a DBE is not applicable.

During normal operation, a tube-side to shell-side leak within the RHX would become very apparent due to inability to maintain the system temperature balance. Diagnostics would be performed to determine that such a leak had occurred and necessary corrective actions would

be taken accordingly. Although this would affect normal operation of the plant and would undoubtedly result in plant shutdown to resolve the problem, safe shutdown of the plant in the event of an emergency would not be affected.

The only regulated event that is applicable to CVCS and the RHX is 10 CFR 50.48 (Fire Protection). With respect to the statement, "CVCS injection path is the normally used path for the controlled cooldown during Appendix R events," the following clarification of the intended function is provided:

(1) CVCS is not used for cooldown, but is one of the flow paths available for reactivity control (long-term boration) as required by Appendix R.

(2) Based on the Appendix R analysis, there are numerous flow paths that can be used to accomplish reactivity control: two (2) flow paths utilize CVCS through the normal charging header (and the RHX) and six (6) other flow paths utilize either the HPSI header or Pressurizer Auxiliary Spray. The reactivity control function can, therefore, be accomplished without the RHX flow path.

(3) Appendix R does not require licensees to couple an Appendix R event with a single failure (RHX tube failure). In Section III.c(iii) of the Statements of Consideration, the NRC indicates that "Consideration of hypothetical failures that could result from system interdependencies, that are not part of the current licensing basis and that have not been previously experienced is not required."

Open Item 3.6.2.3.1.2-1

The staff reviewed the USAR Supplement for the non-EQ cable AMP and found that the supplement does not provide an adequate description of the revised program, as required by 10 CFR 54.21(d). The applicant should submit to the staff a revised USAR Supplement that is consistent with the descriptions for GALL AMPs XI.E1, XI.E2, and XI.E3 to satisfy 10 CFR 54.21(d).

Response

The following revised USAR Supplement description supersedes the Section A.2.15 previously submitted:

A.2.15 Non-EQ Cable Aging Management Program

The FCS Non-EQ Cable Aging Management Program is a new program that provides aging management of (1) non-environmentally qualified electrical cables and connections exposed to an adverse localized environment caused by heat, radiation, or moisture; (2) non-environmentally qualified electrical cables used in instrumentation circuits that are sensitive to reduction in conductor insulation resistance, and are exposed to an adverse localized environment caused by heat, radiation, or moisture; and (3) non-environmentally qualified inaccessible medium-voltage cables exposed to an adverse localized environment caused by moisture and voltage exposure.

Aging management is provided by the following actions:

1) Accessible electrical cables and connections installed in adverse localized environments will be inspected prior to the period of extended operation and at least once every 10 years for cable and connector jacket surface anomalies, such as embrittlement, discoloration, cracking, swelling, or surface contamination.

2) Electrical cables used in circuits with sensitive, low-level signals, such as radiation monitoring and nuclear instrumentation, are tested as part of the instrumentation loop calibration at the normal calibration frequency.

3) In-scope medium voltage cables exposed to significant moisture and significant voltage will be tested prior to the period of extended operation and at least once every 10 years to provide an indication of the condition of the conductor insulation. The test will be a state-of-the-art test at the time the test is performed.

This program considers the technical information and guidance provided in UREG/CR-5643, IEEE Std. P1205, SAND96-0344, EPRI TR-109619, and EPRI TR-103834-P1-2.

Open Item 3.6.2.4.3.2-1

LRA Table 2.5.20-1 states that electrical bus bars and bus bar standoffs have no aging effects that require management. The basis for the applicant's conclusion was unclear to the staff. By letter dated February 20, 2003, the staff issued POI-6(b), requesting the applicant to provide information on the components' materials and environments, along with the basis for concluding that these components have no plausible aging effects. By letter dated March 14, 2003, the applicant responded to POI-6(b), stating that:

> The bus bar materials are copper and aluminum; their environment is in indoor air and outdoor air. In accordance with EPRI TR-114882, Non-Class1 Mechanical Implementation Guideline and Mechanical Tools, Revision 2, 1999, no aging effects were identified for aluminum, aluminum alloys, copper, or copper alloys (brass, bronze) in an indoor or outdoor air environment.
>
> The stand offs include fiberglass reinforced polyester resin and porcelain materials that are in ambient air external environment and are not continuously wetted. Internal environments are not applicable.
>
> Table 7-17 of EPRI NP-1558, A Review of Equipment Aging Theory and Technology lists the continuous use temperature of plastics. The continuous use temperature[a] listed for polyester with 40% glass content is 266 EF[b] (compared with the bounding temperature value of 122 EF). Applying the Arrhenius methodology, it is clear that fiberglass reinforced polyester is acceptable. Figure C-2 of EPRI NP-1558 contains the relative radiation stability of thermosetting resins. The threshold for gamma radiation for

polyester (glass filled) is 1,000,000,000 Rads (compared with the bounding 60-year radiation dose of less than 1,000 Rads).

a Continuous use temperatures were determined as the temperatures corresponding to 100,000 hours (11.4 years) on the Arrhenius curve of the material for an endpoint of 50% reduction in tensile strength.

b. Based on retention of tensile strength taken at 500 degrees F.

On the basis of its review of the applicant's response the POI-6(b), the staff was concerned that the applicant may not have considered all the aging effects of the bus bars/ducts. The staff discussed this issue with the applicant, pointing out that the industry experience has indicated several problems with the bus bar/duct, such as loosening of splice plate bolts, degradation of Noryl insulation, presence of moisture or debris, oxidation of aluminum electrical connections, and corrosion of metallic components. The staff requests the applicant to provide a description of the aging management program used to detect the above aging effects, or provide justification why such a program is not needed.

Response

When scoping and screening were performed for bus bars at FCS, as a conservative measure, all bus bars were included in the scope of license renewal with the exception of those associated with SBO. SBO beyond the plant boundary was added later in response to a staff RAI and the NRC Interim Staff Guidance on SBO. All of the in-plant bus bars are inside the enclosure of an active component, such as switchgear, power supplies, etc., and are considered to be piece parts of the larger assembly. Per 10 CFR 54.21, OPPD considers them outside the scope for license renewal.

The following discussion is applicable to the SBO restoration buses (non-segregated and iso-phase), which are fed from the 161 Kv and 345 Kv transmission lines from the switchyard primary side of the transformers (auxiliary and main), and connect to the plant from the secondary side of the transformers by bus work (non-segregated from the auxiliary transformers and iso-phase from the main). The iso-phase bus connects the main transformer to the main generator and to the unit auxiliary transformers; the iso-phase bus is an aluminum tube contained in a tube-like aluminum enclosure. The iso-phase bus is continuously air-cooled. No moisture accumulation has ever been observed. The iso-phase bus connects from the main to the auxiliary transformers with bolted connections. The connections of the buses to the transformers are inspected and greased periodically in accordance with OPPD Substation Maintenance Department procedures. The inspections are performed on a "train outage schedule" (in one refueling outage, one bus is inspected and during the next outage, the other bus is inspected).

The auxiliary transformers utilize non-segregated copper buses to connect to the 4160-volt distribution system. Use of flexible copper buses minimizes the effects of vibration from end devices. The connections of the buses to the transformers are inspected and greased periodically in accordance with OPPD Substation Maintenance Department procedures.

The non-segregated bus work is insulated. However, past inspections of this area revealed peeling or flaking of the insulation (inspections were performed during the early to mid 1970s, prior to implementation of the current corrective action program). To preclude further

degradation, OPPD taped a good portion of all non-segregated buses, including the affected areas. The taping was done with Bishops High Voltage tape, with the ends taped off with Scotch 88 tape.

OPPD inspects these buses on a train outage schedule. These buses are inspected using a plant maintenance procedure, which inspects the bus and the switchgear cubicles associated with that bus.

The bus bars credited in the SBO restoration path are all connected to the auxiliary transformers by bolted connections. The aging of the bolted connections is managed through implementation of the OPPD Periodic Surveillance and Preventive Maintenance Program. The OPPD Substation Maintenance crew periodically inspects all bolted connections. The torque values of the bolted connections are periodically checked. Routine inspection and cleaning of the buses by Substation Maintenance Department and FCS Maintenance Department crews preclude the build-up of any dirt or debris or the existence of loose bolting.

The description of the Periodic Surveillance and Preventive Maintenance Program in LRA Section A.2.18 (the USAR Supplement) is not at the level of detail that warrants mention of bus bar aging management; this section has not been revised. OPPD has revised the Periodic Surveillance and Preventive Maintenance Program description in LRA Section B.2.7 to include Substation – SBO Restoration in the program scope. The program activities also check bus connectors for loss of torque and degradation of insulation wrap. The revised LRA Section B.2.7 provided below supersedes previous versions.

B.2.7 PERIODIC SURVEILLANCE AND PREVENTIVE MAINTENANCE (PM) PROGRAM

The stated purpose of the PM program is to prevent or minimize equipment breakdown and to maintain equipment in a condition that will enable it to perform its normal and emergency functions. The program and the site administrative control processes provide for a systematic approach in establishing the method, frequency, acceptance criteria, and documentation of results.

The FCS Periodic Surveillance and Preventive Maintenance Program consists of periodic inspections and tests that are relied on to manage aging for system and structural components and that are not evaluated as part of the other aging management programs addressed in this appendix. The preventive maintenance and surveillance testing activities are implemented through periodic work orders that provide for assurance of functionality of the components by confirmation of integrity of applicable parameters.

EVALUATION AND TECHNICAL BASIS

(1) Scope of Program:

The FCS Periodic Surveillance and Preventive Maintenance Program provides for periodic inspection and testing of components in the following systems and structures.

- Auxiliary Building
- Auxiliary Building HVAC
- Auxiliary Feedwater
- Chemical and Volume Control
- Component Cooling
- Containment
- Containment HVAC
- Control Room HVAC and Toxic Gas Monitoring
- Diesel Generator Lube Oil
- Duct Banks
- Emergency Diesel Generators
- Fire Protection
- Fuel Handling Equipment/Heavy Load Cranes
- Intake Structure
- Liquid Waste Disposal
- Containment Penetration, and System Interface Components for Non-CQE Systems
- Reactor Coolant
- Safety Injection and Containment Spray
- Ventilating Air
- Substation – SBO Restoration

(2) Preventive Actions:

The Periodic Surveillance and Preventive Maintenance Program includes periodic refurbishment or replacement of components, which could be considered to be preventive or mitigative actions. The inspections and testing to identify component aging degradation effects do not constitute preventive actions in the context of this element.

(3) Parameters Monitored or Inspected:

Inspection and testing activities monitor parameters including surface condition, loss of material, presence of corrosion products, signs of cracking and presence of water in oil samples.

(4) Detection of Aging Effects:

Preventive maintenance and surveillance testing activities provide for periodic component inspections and testing to detect the following aging effects and mechanisms:

- Change in Material Properties
- Cracking
- Fouling
- Loss of Material – General Corrosion
- Loss of Material - Pitting Corrosion
- Loss of Material - Pitting/Crevice/Gen. Corrosion

- Loss of Material
- Loss of Material – Wear
- Loss of Material – Crevice Corrosion
- Separation
- Loss of Material – Fretting
- Loss of Torque
- Degradation of insulation wrap

The extent and schedule of the inspections and testing assures detection of component degradation prior to the loss of their intended functions. Established techniques such as visual inspections and dye penetrant testing are used.

(5) Monitoring and Trending:

Preventive maintenance and surveillance testing activities provide for monitoring and trending of aging degradation. Inspection intervals are established such that they provide for timely detection of component degradation. Inspection intervals are dependent on the component material and environment and take into consideration industry and plant-specific operating experience and manufacturers' recommendations.

The program includes provisions for monitoring and trending with the stated intent of identifying potential failures or degradation and making adjustments to ensure components remain capable of performing their functions. PM review and update guidelines are provided that include adjustment of PM task and frequency based on the as-found results of previous performance of the PM. In particular, responsible system engineers are required to periodically review the results of preventive maintenance and recommend changes based on these reviews. The program includes guidance to assist the system engineers in achieving efficient and effective trending.

(6) Acceptance Criteria:

Periodic Surveillance and Preventive Maintenance Program acceptance criteria are defined in the specific inspection and testing procedures. They confirm component integrity by verifying the absence of the aging effect or by comparing applicable parameters to limits based on the applicable intended function(s) as established by the plant design basis.

(7) Corrective Actions:

Identified deviations are evaluated within the FCS corrective action process, which includes provisions for root cause determinations and corrective actions to prevent recurrence as dictated by the significance of the deviation. The FCS corrective action process is in accordance with 10 CFR 50 Appendix B.

(8) Confirmation Process:

The FCS corrective action process is in accordance with 10 CFR 50 Appendix B and includes:

- Reviews to assure that proposed actions are adequate;
- Tracking and reporting of open corrective actions; and
- For root cause determinations, reviews of corrective action effectiveness.

(9) Administrative Controls:

All credited aging management activities are subject to the FCS administrative controls process, which is in accordance with 10 CFR 50 Appendix B and requires formal reviews and approvals.

(10) Operating Experience:

Periodic surveillance and preventive maintenance activities have been in place at FCS since the plant began operation. These activities have a demonstrated history of detecting damaged and degraded components and causing their repair or replacement in accordance with the site corrective action process. With few exceptions, age-related degradation adverse to component intended functions was discovered and corrective actions were taken prior to loss of intended function.

Conclusion:

The Periodic Surveillance and Preventive Maintenance Program assures that various aging effects are managed for a wide range of components at FCS. Based on the program structure and administrative processes and FCS operating experience, there is reasonable assurance that the credited inspection and testing activities of the Periodic Surveillance and Preventive Maintenance Program will continue to adequately manage the identified aging effects of the applicable components so that the intended functions will be maintained consistent with the current licensing basis for the period of extended operation.

Open Item 3.6.2.4.4.2-1

The aging effect for the transmission ACSR conductor is loss of conductor strength and vibration. The applicant has addressed the vibration and the aluminum portion of the conductor, but did not address the steel portion. The most prevalent mechanism contributing to loss of conductor strength is corrosion, which includes corrosion of steel core and aluminum strand pitting. The staff requests the applicant to provide a description of its aging management programs used to manage the aging effects in high voltage conductors, or provide justification for why such programs are not needed.

Response

OPPD has performed a thorough review of industry operating experience related to aging effects on high voltage components, including ACSR. For detailed discussion related to aging

of high voltage components other than ACSR steel core, please see the OPPD response to POI-6a (LIC-03-0035, dated March 14, 2003). The portion of that discussion on surface contaminants also applies to ACSR steel core.

The aging effects identified for high-voltage insulators, transmission conductors, switchyard bus and un-insulated ground conductors are not heat-related so Ohmic heating is not required to be addressed (License Renewal Electrical Handbook, EPRI 1003057, Final Report, December 2001, page 12-2, Ohmic Heating for Power Applications).

For ACSR conductors, corrosion degradation begins as a loss of zinc from the galvanized steel core wires. Corrosion rates depend largely on air quality, which includes suspended particles chemistry, SO_2 concentration in air, precipitation, fog chemistry and meteorological conditions (Reference 24, EPRI License Renewal Electrical Handbook, pages 581, 584). Corrosion of ACSR conductors is a very slow-acting aging effect that is even slower for rural areas with generally less suspended particles and SO_2 concentrations in the air than in urban areas. Tests performed by Ontario Hydroelectric showed a 30% loss of composite conductor strength of an 80-year old ACSR conductor due to corrosion.

There is a set percentage of composite conductor strength established at which a transmission conductor is replaced. As illustrated in EPRI License Renewal Electrical Handbook, Final Report 1003057, December 2001, page 13-6, there is ample strength margin to maintain the transmission conductor intended function through the period of extended operation.

On the basis of the above, OPPD has determined that corrosion on high voltage conductors is not a significant aging mechanism at FCS, and loss of conductor strength is, therefore, not an aging effect requiring management. There are no applicable aging effects that could cause the loss of the intended function of the transmission conductors for the period of extended operation.

Open Item 3.6.2.4.5.2-1

In LRA Section 2.5.1, "Cables and Connectors," the applicant identifies fuse blocks as components within the scope of license renewal and subject to an AMR. The staff was unsure whether fuse holders were included within the component type "Fuse Block." By letter dated February 20, 2003, the staff issued POI-1(c), requesting the applicant to clarify whether fuse holders are within the scope of license renewal and subject to an AMR, and, if fuse holders are brought in and require aging management, to provide the associated aging management information.

By letter dated March 14, 2003, the applicant provided the requested information, stating that:

> Fuse holders are in the scope of license renewal as part of the cable and connector scoping and screening analysis. There are no fuse holders attached to electrical penetrations at FCS. Fuse holders at FCS that are within active enclosures such as power supplies, switchgear, and Motor Control Centers are considered outside the scope for license renewal. There are no fuse holders at FCS exposed to vibration or environments that would cause corrosion, chemical contamination, or oxidation of the connecting surfaces. Fuse holders within enclosures that are not considered active and subject to mechanical stress, fatigue and electrical transients will be included in the Fatigue-Monitoring Program(B.2.4).

The staff reviewed the applicant's response to POI-1(c) regarding whether fuse holders within the enclosures are considered active and whether they are subject to stress and fatigue. The staff discussed this issue with the applicant. The applicant believed that there are no fuse holders that would fall within the definition of being in an outside environment that would need aging management review, but was not sure. The staff is still unclear regarding the aging management of fuse holders. ISG-5, which discusses scoping, screening, and aging management of fuse holders, states that fuse holders inside the enclosure of an active component, such as switchgear, power supplies, power inverters, battery chargers, and circuit boards, are considered to be piece parts of the larger assembly, and thus 10 CFR 54.21 considers them outside the scope for license renewal.

The staff requests the applicant to make a positive statement that all fuse holders are within active enclosures and hence need not be subject to an AMR. If the applicant cannot make this statement, the applicant should clarify how fuse holders within the scope of license renewal and subject to an AMR will be managed during the period of extended operation.

The staff was also concerned that the applicant may have missed fuse holders which are used in circuits to isolate safety loads from non-safety loads. The staff requests the applicant to investigate and confirm whether there are no fuse holders which fall into this category.

Response

Fuse Blocks (Fuse Holders) at FCS are either in active components (panels, switchgear, or cabinets), which are outside the scope of license renewal, or are in enclosures (junction boxes) that are in controlled environments. OPPD will manage the aging of fuse holders in accordance with ISG-5.

FCS does not have any fuse holders in circuits used to isolate safety loads from non-safety loads that are in areas of environmental extremes or that are subject to aging management.

Open Item 4.7.2.2-1

The staff has evaluated the information provided by the applicant in its LRA and in response to RAI 4.7.2-1. The staff has concluded that the applicant appropriately identified those TLAAs (fatigue crack growth, aging of CASS RCS piping and components, and primary water stress corrosion cracking (PWSCC) of Inconel 82/182 RCS welds), which may impact the extension of the applicant's existing LBB analysis through the period of extended operation. The applicant has committed to perform a plant-specific LBB analysis prior to entering the period of extended operation which will address these TLAAs and project the analysis to the end of the period of extended operation. However, the applicant's commitment does not appear to meet 10 CFR 54.21(c)(1), which requires the applicant to demonstrate that (i) the analysis remains valid for the period of extended operation, (ii) the analysis has been projected to the end of the period of extended operation, or (iii) the effects of aging on the intended function(s) will be adequately managed for the period of extended operation. The applicant should provide the information needed for the staff to determine whether (i) the applicant's LBB analysis remains valid for the

period of extended operation, (ii) the applicant's LBB analysis has been projected to the end of the period of extended operation, or (iii) the effects of aging on the intended function(s) of the components within the scope of the LBB analysis will be adequately managed for the period of extended operation.

Response

Omaha Public Power District (OPPD) has elected to defer completion of the plant-specific LBB evaluation. Based on NEI 95-10, Rev. 3 guidance (Section 5.1.4), the following details are provided to explain how the effects of aging will be addressed for the plant-specific FCS LBB evaluations.

OPPD will complete a plant-specific LBB evaluation of the RCS piping using the latest LBB criteria. The LBB analysis will incorporate the effects of thermal aging, plant-specific materials, operating temperatures/pressures, loads at welds on primary loops, and weld fabrications. The plant-specific methodology will also use the existing plant's RCS leak detection capability and the piping stress analysis loads for the FCS RCS configuration. The analysis will be applicable for the period of extended operation, and will use an approved methodology from Westinghouse Electric Company for thermal aging considerations. Westinghouse has performed over 30 plant-specific LBB analyses approved by the NRC, and addressed thermal aging effects of the cast materials as applicable. For the primary loop piping, the latest LBB SER which includes the Westinghouse analysis methodology was for D. C. Cook Units 1 and 2. The SER was issued in December 1999 (docket numbers 50-315 and 50-316).

Acceptance criteria used to determine the adequacy of the structure or component when the LBB analysis is performed will be in accordance with SRP 3.6.3 "Leak-Before-Break Evaluations Procedures", Federal Register/Vol. 52, No. 167, Friday, August 28, 1987 and NUREG-1061, Vol. 3.

The plant-specific LBB analysis shall include evaluation of corrective actions that can be performed to provide reasonable assurance that the component in question will perform its intended function when called upon, or will not be outside of its design basis established by the plant's current license basis. One such corrective action is to maintain the current licensing basis RCS leak rate program as defined in FCS Technical Specification (TS) 2.1.4 during the period of extended operation. The leak detection capability of the systems noted in TS 2.1.4 meet the intent of Regulatory Guide 1.45 and will be capable of performing their designed function during the period of extended operation.

OPPD will submit a License Amendment Request containing the plant-specific LBB evaluation described above to the NRC no later than December 2006, which is well before the period of extended operation. This submittal schedule supports OPPD's planning decisions for possible changes to RCS operation or configuration.

To summarize, OPPD will perform a plant-specific LBB analysis for FCS that will remain valid for the period of extended operation. This plant-specific LBB analysis will include the effects of thermal aging through the extended period. Any prescribed corrective actions for management of the intended functions of the components for the period of extended operation will be

reconciled with the LBB analysis. Therefore, OPPD concludes that the effects of aging will be adequately addressed and managed.

Response to new Open Item on pressurizer J-weld

Add a new **LRA Section 4.7.4** to address the pressurizer lower shell J-Weld analysis as follows:

4.7.4 ALLOY 600 J-WELD LEFT IN PLACE

The temperature nozzle in the pressurizer lower shell was repaired by adding a weld pad to the existing weld build-up to the lower shell OD and welding this pad to the existing nozzle. This moved the pressure boundary from the ID to this location. The Alloy 600 J-weld and original crack were left in place at the inside surface of the pressurizer as part of the repaired configuration.

- In a letter dated October 25, 2000, Westinghouse provided OPPD the technical justification for the weld on the liquid space Alloy 600 instrument nozzle on the OD of the pressurizer. This letter stated that the subject repair should be made in accordance with later editions of Section III, or the 1992 Edition (or later) of Section XI.
- In April 2002, Westinghouse notified OPPD that their technical justification of October 2000 only considered the effects of the repair on the requirements of ASME Section III, and did not consider the Section XI requirements related to leaving the flaw in place after the repair was completed and the vessel returned to service.
- In April 2003, OPPD received the "calculation note" titled "Evaluation of Fatigue Crack Growth of Postulated Flaw at Omaha Fort Calhoun Pressurizer Lower Shell Instrumentation Nozzle," dated January 8, 2003, that evaluated the Section XI requirements related to leaving the flaw in place after the repair was completed and the vessel returned to service.

Omaha Public Power District (OPPD) has evaluated the crack, and any potential future growth of the crack, and determined it does not impact the structural integrity of the vessel for the current licensed 40 year life. OPPD has elected to defer completion of the evaluation that demonstrates that the crack and any potential future growth of the crack does not impact the structural integrity of the vessel for the period of extended operation. Based on NEI 95-10, Rev. 3 guidance (Section 5.1.4), the following details are provided to explain how the effects of aging will be addressed for this evaluation.

OPPD will perform the fracture mechanics evaluation of the small-bore instrument nozzle j-weld region at the repaired instrument nozzle in the side of the pressurizer lower shell. A general outline of the evaluation process is provided below. Design specification transients are typically used to determine the applied stresses. In certain cases, it has been determined that the use of the design specification cooldown transients generates excessively conservative results. In these cases, a more realistic transient was developed, based on typical plant operating parameters, and was used for analysis. This resulting governing rate would then be carried through to the Fatigue Crack Growth

evaluation. The new flaw size would then be used in a final flaw stability check to confirm that the IWB-3600 criterion is satisfied.

Analyses are performed for the repaired pressurizer nozzle location. The general methodology is summarized as follows:
1) Design drawings are reviewed to determine vessel, nozzle and J-weld dimensions and materials.
2) The initial flaw size to be used in the evaluation is calculated.
3) Manufacturing records are reviewed to determine the RT_{NDT} of the base metal at the location of interest.
4) Design operation transients are reviewed to determine their appropriateness for use in the generation of stresses for use in the flaw analysis.
5) When the design transients are not appropriate, a realistic bounding transient is developed for analysis purposes.
6) Thermal transient analyses are performed to determine through-wall temperatures for use in the stress analysis.
7) Stress analyses are performed at various time points during each plant operating event of interest.
8) Pressure and mechanical load stresses are calculated.
9) A survey of the combined pressure, thermal and mechanical stresses is conducted to determine the limiting time point for evaluation.
10) Stresses are determined to calculate the applied stress intensity factor, K_I.
11) The applied stress intensity factor is calculated for comparison to allowable values.
12) Fatigue crack growth of the flaw is calculated over the 60 years.
13) The final flaw size is used to confirm flaw stability over the remaining life of the plant.
14) The flaw stability checks defined above are performed for normal and upset conditions and emergency and faulted conditions using the respective allowable define per ASME Section XI.
15) Primary stress limits per NB-3000 are checked considering the effect of the final flaw size.

The following acceptance criteria will be applied in the evaluation.

Linear Elastic Fracture Mechanics (LEFM)

Section XI, IWB-3610 states that the flaw is acceptable for continued service during the evaluated time period if the following two criteria are satisfied:
1. Either the criteria of IWB-3611 or IWB-3612.
- In this evaluation, paragraph IWB-3612 is utilized.
Specifically, the acceptance criterion of IWB-3612 is based on applied stress intensity factor. Acceptability is shown if the applied stress intensity factors at the flaw size a_f satisfy the following criteria:

$$K_I < \frac{K_{Ia}}{\sqrt{10}} \text{ (Equation 1)}$$

$$K_I < \frac{k_{Ic}}{\sqrt{2}} \text{ (Equation 2)}$$

where:

K_I = the maximum applied stress intensity factor for normal (including upset and test) conditions for the flaw size a_f using Equation 1 and for emergency and faulted conditions using Equation 2.

a_f = the maximum size to which the detected flaw is calculated to grow in a specified time period

K_{Ia}, K_{Ic} = the available fracture toughness based on crack arrest and crack initiation respectively for the corresponding crack tip temperature. Values were determined as follows.

Curves for the lower bound K_{Ia} and K_{Ic} values for the base metal steels are provided in Figure A-4200-1 in Section XI. Equations to calculate the value of K_{Ia} are provided in articles A-4200(b) and G-2110(a) of Section XI.

$$K_{Ia} = 26.78 + 1.223e^{[0.0145(T - RT_{NDT} + 160)]}$$

$$K_{Ic} = 33.20 + 2.806e^{[0.0200(T - RT_{NDT} + 100)]}$$

where,
K_{IA} = Crack arrest reference stress intensity factor, ksi-$\sqrt{in}$
K_{IC} = Crack initiation reference stress intensity factor, ksi-$\sqrt{in}$
T = Temperature at the postulated crack tip, °F
RT_{NDT} = Adjusted reference nil ductility temperature at postulated crack tip, °F

The fatigue crack growth rate is defined in Article A-4300 of Section XI.

The values of $K_{Ia}/\sqrt{10}$ and $K_{Ic}/\sqrt{2}$ are also referred to as the allowable fracture toughness criteria. The crack depth at which the stress intensity factor equals the allowable fracture toughness is the maximum allowable crack depth. The allowable fracture toughness limits must be satisfied for remaining life of the plant.

2. The primary stress limits of NB-3000, assuming a local area reduction of the pressure retaining membrane, accounting for the presence of the flaw.

Elastic-Plastic Fracture Mechanics (EPFM)

ASME Section XI, Appendix K, provides guidance on performing an EPFM evaluation to demonstrate flaw stability. The criterion specifies that a flaw in a component is acceptable for continued service when the criteria of K-2200, K-2300, and K-2400 are satisfied.

In this evaluation, rather than utilizing the various safety factors specified for different load types in these criteria, a conservative safety factor of 3.0 is applied to the calculated combined plastic-zone adjusted stress intensity factor used to calculate J-Applied. As is demonstrated later in this evaluation, the principal criteria that a flaw is considered acceptable and stable for continued service if the applied J-integral curve for the crack falls below the material resistance J-value, the J-R curve, continues to be satisfied.

The fracture mechanics evaluation of the small-bore instrument nozzle j-weld region at the repaired instrument nozzle shall include evaluation of corrective actions that can be performed to provide reasonable assurance that the component in question will perform its intended function when called upon, or will not be outside of its design basis established by the plant's current license basis. Such corrective actions include assuring that the pressure at any temperature should not be any higher than the higher of the following two limits:
[1] The saturation pressure plus 200 psi
[2] 350 psi and maximum rate of temperature decrease is 200°F/hr.

OPPD will submit a License Amendment Request, containing the fracture mechanics evaluation of the small-bore instrument nozzle j-weld region at the repaired instrument nozzle described above, to the NRC before the period of extended operation. **This evaluation will include bounding the flaw size by the size of the j-weld itself, and addressing the possibility of corrosion in the presence of a flaw.**

Revise **LRA Table 4.1-1**, *Time-Limited Aging Analyses Applicable to FCS*, by adding a new sub-row in TLAA Category as shown below.

TLAA Category	Analyses	§ 54.21(c)(1) Resolution
Other TLAAs	Alloy 600 J-weld left in place at the inside surface of the pressurizer as part of the repaired configuration of the temperature nozzle in the lower shell	(i) The analyses remain valid for the period of extended operation. (4.7.4)

SER Confirmatory Items and OPPD Responses

Confirmatory Item 2.1.3.1.2-1

As part of its review of the implementation and results of the applicant's scoping activities, the staff performed a license renewal scoping and screening inspection at the FCS site during the week of November 8, 2002, and an inspection of the applicant's aging management programs (AMPs) during the weeks of January 6 and January 20, 2003. The inspectors reviewed the applicant's engineering evaluations, documentation of the portions of the systems added to scope, and selected layout markup drawings and discussed the process with the cognizant individuals responsible for the evaluations. Additionally, the NRC inspectors performed walkdowns of selected areas of the plant containing SSCs of interest. The inspection team identified one item which should be considered by the applicant for inclusion within scope based on the 10 CFR 54.4(a)(1) criterion. Inspection Open Item 50-285/02-07-02 identified unqualified safety injection tank level and pressure indicators that should be considered in the scope of license renewal. These indicators are used to ensure that assumptions are met for the mitigation of a loss of coolant accident analysis. The applicant reviewed this issue and committed to include these components within scope.

Response:

OPPD included the safety injection tank level and pressure indicators in scope. However, these components were screened out as active components, resulting in no changes to the License Renewal Application. On-site documentation will be updated to reflect this.

Confirmatory Item 3.0.3.12.2-1

During the staff's AMR inspection, the applicant committed to revise the general corrosion of external surfaces program to include the spent fuel pool cooling system.

Response:

OPPD has added the Spent Fuel Pool Cooling System (SFPCS) to the scope of the General Corrosion of External Surfaces Program because of the material of the spent fuel pool heat exchanger shell. This heat exchanger subcomponent is the only SFPCS piping system component within scope of license renewal that is fabricated of carbon steel. All other system components are fabricated of stainless steel. The heat exchanger shell, therefore, requires external surface aging management for loss of material. The following revised Section B.3.3 of the FCS License Renewal Application supersedes previous versions:

B.3.3 General Corrosion of External Surfaces Program

The General Corrosion of External Surfaces Program at FCS is credited for aging management of the effects of loss of material and cracking for applicable components, including piping, valves, supports, tanks, and bolting, which are made of cadmium plated steel, carbon steel, cast iron, copper alloy, galvanized steel, low alloy steel, and neoprene.

(1) Scope of Program

The General Corrosion of External Surfaces Program consists of several FCS activities that manage the aging effects of loss of material and cracking for components in the following systems:

- Auxiliary Boiler Fuel Oil
- Auxiliary Building HVAC
- Auxiliary Feedwater (AFW)
- Chemical and Volume Control
- Component Cooling Water (CCW)
- Containment HVAC
- Control Room HVAC
- Diesel Generator Lube Oil
- Diesel Jacket Water
- Starting Air
- Spent Fuel Pool Cooling
- Feedwater
- Fire Protection Fuel Oil
- Gaseous Waste Disposal
- Instrument Air
- Main Steam (MS) and Turbine Steam Extraction
- Containment Penetration, and System Interface Components for Non-CQE Systems
- Nitrogen Gas
- Primary Sampling
- Raw Water
- Ventilating Air

(2) Preventive Actions

This program does not prevent aging.

(3) Parameters Monitored or Inspected

Surface conditions of components are monitored through visual observation and inspection to detect signs of external corrosion and to detect conditions that can result in external corrosion, such as fluid leakage.

(4) Detection of Aging Effects

The aging effects of concern are loss of material and cracking. These effects can be detected by visual observation and inspection of external surfaces. Inspection for evidence of leaking fluids also provides indirect monitoring of certain components that are not routinely accessible.

(5) Monitoring and Trending

Various plant personnel including operators and system engineers perform periodic material condition inspections and observations outside containment. These inspections are performed in accordance with approved plant procedures. Evidence of fluid leaks, significant coating damage, or significant corrosion is documented. Inspections and observations are performed at intervals based on previous inspections and industry experience. Operator rounds occur several times daily and system engineer walkdowns occur at least quarterly. Inspections inside containment are conducted each refueling outage by a team that includes knowledgeable subject matter experts from Engineering and Quality Control. The in-containment inspections for corrosion are part of the containment coatings inspections described in the OPPD response to NRC Generic Letter 98-04, *"Potential for Degradation of the Emergency Core Cooling System and the Containment Spray System after a Loss-of-Coolant Accident Because of Construction and Protective Coating Deficiencies and Foreign Material in Containment."*

(6) Acceptance Criteria

Plant procedures provide criteria for determining the acceptability of as-found conditions and for initiating the appropriate corrective action. The acceptance criteria and guidance are related to avoiding unacceptable degradation of the component intended functions, and include existence of leakage, presence of corrosion products, coating defects, and elastomer cracking. Appropriate provisions of NRC and industry guidance are incorporated.

(7) Corrective Action

The FCS corrective action process provides measures to verify completion and effectiveness of corrective action.

(8) Confirmation Process

The FCS corrective action process is in accordance with 10 CFR 50 Appendix B and includes:

- Reviews to assure that proposed actions are adequate;
- Tracking and reporting of open corrective actions; and
- For root cause determinations, reviews of corrective action effectiveness.

(9) Administrative Controls

The procedures governing inspections and observations for external corrosion are subject to the site administrative controls process which implements the requirements of 10 CFR 50, Appendix B.

(10) Operating Experience

The activities relied on to detect loss of material, cracking, and fouling of accessible cadmium plated steel, carbon steel, cast iron, copper alloy, galvanized steel, low alloy steel, and neoprene component external surfaces and the precursors thereof are a subset of a larger number of inspection activities that result in redundant inspections. The activities credited for license renewal were selected based on their effectiveness as indicated by a review of site corrective action documents. The activities are elements of established FCS programs that

have been ongoing for years. They have been enhanced over the years based on site and industry experience. Review of plant records indicates they are effective in detecting loss of material due to corrosion and its precursors for accessible external surfaces. These findings are consistent with the findings of recent internal and external assessments of these activities, such as audits and NRC inspections.

Conclusion:

The General Corrosion of External Surfaces Program provides reasonable assurance that aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

Confirmatory Item 4.3.2-1

Section 4.3.2 of the LRA contains a discussion of the proposed aging management program to address fatigue of the FCS pressurizer surge line. The discussion indicates the aging management program will consist of an inspection program. The LRA also indicates that the results of the surge line inspections will be used to assess the appropriate approach for addressing environmentally-assisted fatigue of the surge lines. However, Section 4.3.3 of the LRA indicates that a reevaluation of the fatigue usage of critical areas of the surge line will be performed prior to the period of extended operation and that the bounding locations will be included in the FMP. In RAI 4.3.2-3, the staff requested that the applicant describe how the effect of the reactor water environment will be considered in the reevaluation of the critical areas of the surge line and how the results of this evaluation will be monitored by the FMP.

The applicant's December 19, 2002, response 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 used to assess the appropriate approach for addressing environmentally-assisted fatigue of the surge lines. The applicant indicated that the approach would include one or more of the following options:

1. further refinement of the fatigue analysis to lower the CUF(s) to below 1.0
2. repair of the affected locations
3. replacement of the affected locations
4. management of the effects of fatigue by an inspection program that has been reviewed and approved by the NRC (e.g., periodic nondestructive 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 by license amendment to the NRC staff for review and approval prior to the period of extended operation. An AMP under this option would be a departure from the design basis CUF evaluation described in the USAR Supplement, and therefore would require a license amendment pursuant to 10 CFR 50.59. The applicant needs to confirm that the submittal will be made by license amendment.

Response:

If Option 4 is adopted, the inspection details, including scope, qualification method, and frequency, will be submitted to the NRC for review and approval as a license amendment request pursuant to 10 CFR 50.59.

Confirmatory Item 4.3.2-2

Section 4.3.4 of the LRA contains a discussion of the analysis of Class II and III components at FCS. American National Standards Institute (ANSI) B31.1 requires that a reduction factor be applied to the allowable bending stress range if the number of full-range thermal cycles exceeds 7000. The LRA indicates that the USAS B31.1 limit of 7000 equivalent full-range cycles may be exceeded during the period of extended operation for the nuclear steam supply system (NSSS) sampling system and that the affected portions of the NSSS sampling system would be tracked by the FMP. In RAI 4.3.4-1, the staff requested that the applicant provide the calculated thermal stress range for these affected portions of the NSSS sampling system.

The applicant's December 12, 2002, response indicated that the small-bore piping at FCS was designed and supported based on nomographs developed in accordance with the USAS B31.1 code. As a consequence, there were no specific stress calculations. The applicant committed that, as part of the FMP, the sampling piping will be analyzed and a stress calculation performed to determine the thermal stress range for the line. The applicant should submit the calculation by license amendment for NRC staff review and approval prior to entering the period of extended operation. The applicant needs to confirm that the submittal will be made by license amendment.

Response:

The stress calculation results for the small bore sampling system piping, when completed, will meet USAS B31.1 requirements.

LIC-03-0089

Attachment 2

OPPD Comments on SER

(Note: Sections/items with no comments have been excluded)

ABSTRACT

This SER presents the status of the staff's review of information submitted to the NRC through April 4, 2003, the cutoff date for consideration in the SER. The staff has identified open items that must be resolved before the staff can make a determination on the application. These items are summarized in Section 1.5 of this report. In order to close these items, the staff requires the additional information identified in the open items. The staff will present its final conclusion on the review on the FCS application in its update to this SER.

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1.4 Interim Staff Guidance

Fire Protection (FP) System Piping **(ISG-4)**	To clarify staff position for wall thinning of FP piping system in GALL AMPs (XI.M26 and XI.M27). New guidance is that there is no need to disassemble FP piping, as oxygen can be introduced in the FP piping which can accelerate corrosion. Instead, use non-intrusive method such as volumetric inspection. Testing of sprinkler heads should be performed every 50 years and 10 years after initial service. Eliminated Halon/carbon dioxide system inspections for charging pressure, valve line ups, and automatic mode of operation test from GALL, as the staff considers these test verifications to be operational activities.	3.0.3.9

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SECTION 2

STRUCTURES AND COMPONENTS SUBJECT TO AN AGING MANAGEMENT REVIEW

2 Scoping and Screening Methodology for Identifying Structures and Components Subject to an Aging Management Review, and Implementation Results

The staff conducted a scoping and screening inspection from November 4-8, 2002 to examine activities that supported the LRA, including the inspection of procedures and representative records and interviews with personnel regarding the process of scoping and screening plant equipment to select SSCs within the scope of the Rule and subject to an AMR. The inspection team found several SSCs which the applicant reviewed for license renewal but concluded they were outside the scope of license renewal. The NRC Review Team came to conclude these SSCs were within scope of license renewal and requested the applicant to include. The applicant agreed to include the additional SSCs. When such SSCs were found, the inspection team expanded its inspection to determine whether additional SSCs had been omitted. In each case, no additional SSCs were found to be omitted from scope. On this basis, the NRC staff concluded that the applicant's scoping and screening process was successful in identifying those SSCs required to be considered for aging management. In addition, for a sample of plant systems, the inspection team performed visual examinations of accessible portions of the systems to observe any effects of equipment aging. Finally, the inspection concluded that the scoping and screening portion of the applicant's license renewal activities were conducted as described in the LRA and that documentation supporting the application is in an auditable and retrievable form. Inspection open items that were identified during the inspection are discussed in this SER.

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2.1.3.1.2 Methodology for the Application of the Scoping Criteria in 10 CFR 54.4(a)

Scoping Criteria in 10 CFR 54.4(a)(2)

As part of its review of the implementation and results of these activities, the staff performed a license renewal scoping and screening inspection at the FCS site during the week of November 8, 2002, and an inspection of the applicant's aging management programs (AMPs) during the weeks of January 6 and January 20, 2003. The inspectors reviewed the applicant's engineering evaluation, documentation of the portions of the systems added to scope, and selected layout markup drawings and discussed the process with the cognizant individuals responsible for the evaluations. Additionally, the NRC inspectors performed walkdowns of selected areas of the plant containing SSCs of interest. The inspection team determined that the applicant's implementation of the supplementary evaluation was comprehensive. However, the inspection team identified two items which the applicant had scoped out of LR which should be reconsidered by the applicant for inclusion within scope based on the 10 CFR 54.4(a)(2) criterion (1) the safety injection leakage cooler in the CCW system (inspection report Open Item 50-285/02-07-01) and (2) the warm water recirculation path to the intake structure (inspection report Open Item 50-285/02-07-04). With regard to inspection report Open Item 50-285/02-07-01, the applicant reviewed the issue and committed to include these components within the scope of license renewal. The resolution of this inspection open item can be found in NRC

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Inspection Report 50-285/03-07, dated March 20, 2003, and the staff's evaluation can be found in Section 2.3.3.16 of this SER. With regard to inspection report Open Item 50-285/02-07-04, during the colder winter months, a portion of the heated water in the circulating water discharge tunnel is directed to a release point upstream of the intake screens to warm the river water entering the intake structure. The purpose of this recirculation flow path is to prevent the formation of frazil ice, which can block raw water flow to the heat exchangers that help maintain adequate cooling for safety-related components. Currently, the applicant considers the systems, structures, and components supporting warm water recirculation not to be within the scope of license renewal. However, the staff found documents supporting the inclusion of this function within the scope of license renewal. After discussions with the applicant, the staff determined that warm water recirculation issue is a 10 CFR Part 50 issue, in that the issue is relevant for the current operating term and not unique to license renewal. Therefore, the issue has been referred to the operating reactors staff for followup. The staff's evaluation can be found in Section 2.3.3.15 of this SER.

2.2.2 Staff Evaluation

The staff also determined that additional information was needed to complete its review based on information provided by the applicant during the AMR inspection. During the AMR inspection and audit, the team reviewed the onsite engineering analysis (EA)-FC-00-149, "NSR Steam and Water Systems Impacting SSC Within Scope For License Renewal." The staff reviewed this EA to identify any systems meeting 10 CFR 54.4(a)(2) that were not identified by the applicant. The applicant's EA identified piping systems and associated reference drawings for those systems that have met the 54.4(a)(2) criteria for spatial interaction. However, after discussions with the staff, the applicant indicated that some of these systems are already identified as being within the scope of license renewal but were not identified as being within scope. The applicant also stated that FAC, chemistry, general corrosion of external surfaces, and structures monitoring programs 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 should 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 should 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 materials and environments and has provided an adequate AMP for managing the corresponding aging effects for these SSCs. By letter dated February 20, 2003, the staff issued POI-1(a), requesting that the applicant provide the above information. By letter dated March 14, 2003, the applicant provided the requested information. The staff has reviewed the information and finds that the applicant has adequately identified the structures and components within the scope of license renewal as a result of meeting the 54.4(a)(2) scoping criterion. POI-1(a) is resolved. The staff must review the AMR results for the additional components brought

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into scope and subject to an AMR. The results of the staff's review will be provided in the final SER. This is Open Item 2.2-1.

Functional Realignment

"Functional realignment" for license renewal is defined as the transfer of om scope components from one system into another system based on a common in-scope function, common materials and environments or alignment to GALL. (Note: Discussed Later).

Component transfers occur for one of three reasons. The first reason is the use of commodity groups. Once the plant-level scoping was completed and the list of in-scope systems was compiled, the applicant identified certain commodity groups that would be used to simplify the IPA process. These commodity groups would then be populated with the matching components from the in-scope systems. Examples of components that were commoditized are cables, duct banks, component supports, bus bars, pilings, fuel-handling equipment and heavy loads cranes, and containment penetration and pressure boundary components.

Additionally, there are some components which are located at the interface between two systems. During original plant design, these components were assigned to systems based mainly on engineering judgment. During the IPA process, some of these components at the system interfaces were realigned from one system to another based on materials and environments. For example, a control valve on an instrument air line to the actuator on a safety injection valve may be classified as a safety injection valve. However, for the purposes of aging management, it is transferred to the instrument air system because the materials and environment for that component better align with instrument air.

Another reason for component transfers was for better alignment with the GALL Report. If a component type is identified in GALL as being evaluated in a different system such as the component cooling water heat exchangers being evaluated in the system generating the heat load, then it was typically transferred to the heat generating system to align with GALL.

The EA stated that the compressed air, demineralized water, and steam generator feedwater blowdown systems contained components that 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 (containment ILRT pressure penetration), 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 component cooling water 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. By letter dated February 20, 2003, the staff issued

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POI-1(d), requesting the applicant to resolve this discrepancy between LRA Table 2.2-1 and the description in LRA Section 2.3.2.2 and provide revised Section 2 tables and, if necessary, revised Section 3 tables to accurately describe which systems and/or components have been functionally realigned and how the components will be managed.

2.2.3 Evaluation Findings

The staff reviewed all SSCs at FCS to determine whether any SSCs that met the 10 CFR 54.4 scoping criteria had been omitted. On the basis of its review, the staff found several systems and components that were reviewed by the applicant and scoped out of license renewal, which the NRC staff disagreed. These systems and components were subsequently brought into scope. The staff reviewed the remainder of the out-of-scope SSCs and found no other omissions. On the basis of its review, including the identification of additional systems and components brought into scope, the staff concludes that there is reasonable assurance that all systems, structures, and components within the scope of license renewal have been identified, in accordance with the requirements of 10 CFR 54.4. The staff's evaluation of the additional SSCs brought into scope will be provided in the final SER as part of the resolution of Open Items 2.2-1 and 2.2-2.

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2.3.1.2.2 Staff Evaluation

The FCS CLB for fire protection (FP) complies with certain sections of Appendix R, particularly Section III.G, which provides the requirements for the fire protection safe shutdown capability. In RAI 2.3.1.2-1, the staff requested the applicant to discuss if the pressurizer spray head and associated piping are credited and relied upon in the fire protection safe shutdown analysis to bring the plant to cold shutdown conditions within a given time for compliance with Appendix R. If it is credited in the fire protection safe shutdown analysis, the pressurizer spray head and associated piping would satisfy 10 CFR 50.48 Appendix R requirements and, therefore, should be included within the scope of license renewal. The specific intended function of the subject components which meets the 10 CFR 54.4(a)(3) requirement is the spray function, and the particular components which help perform this function are the section of piping and the spray head located inside the pressurizer. The subject components do not have a pressure boundary function. The staff believes that with the loss of spray function, it may not be possible to bring the plant to cold shutdown conditions within a given time for compliance with Appendix R and, therefore, the spray head and associated piping inside the pressurizer and the spray function should be identified as within the scope of license renewal. Furthermore, the applicant should propose an AMP for the spray head and associated piping inside the pressurizer, which provides reasonable assurance that adequate spray function will be maintained during the period of extended operation. In response, the applicant stated that the pressurizer spray is one of three means available for RCS pressure reduction and subsequent cooldown. In the event of a fire followed by a reactor trip, the auxiliary spray system (which uses the pressurizer spray head supplied by CVCS) or the PORVs may be used to depressurize the RCS. In the event that these two methods are unavailable, primary system depressurization is accomplished by RCS charging and sufficient secondary decay heat removal via the steam generator safety valves and auxiliary feedwater system. The SSCs associated with this depressurization method

are within the scope of license renewal, and those that are passive and long-lived are subject to an AMR. The applicant concluded that the pressurizer auxiliary spray head at FCS is not relied on to demonstrate compliance with certain postulated fire events, as discussed above; accordingly, the spray head is not within the scope of license renewal. On the basis of the applicant's assessment that the subject component is not relied upon to demonstrate compliance with 10 CFR 50.48, Appendix R requirements, the staff concurs that the component is not within the scope.

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2.3.3.8.2 Staff Evaluation

During the review of LRA Section 2.3.3.8, the staff determined that additional information was needed to complete the review. By letter dated October 11, 2002, the staff issued RAIs 2.3.3.8-1 and 2.3.3.8-2 on the CA and IA systems, respectively. LRA Section 2.3.2.2 states that containment isolation valves and associated piping in the CA system are subject to an AMR. LRA Section 2.3.3.8 states that the function of the CA system is to serve as the source of air for the IA system. Section 9.12 of the USAR describes the CA system to include air compressors, receivers, and air dryers. The staff requested the applicant to justify the exclusion of these components, as well as valve bodies, piping, bolting, and valve operator bodies of the CA system, from the scope of license renewal. The staff also requested more information concerning the intended function of this system. In a letter dated November 22, 2002, the applicant responded that as described in Section 9.12 of the USAR, the non-safety-related CA system provides compressed air to the instrument air and the service air headers. The instrument air header provides air for pneumatic controls and the actuation of valves, dampers, and similar devices, as well as the fuel-handling machine in containment. The CA system is not relied on to perform any intended function as defined in 10 CFR 54.4. The air compressors are not loaded onto the EDGs, and during a design basis event, the CA system is assumed to be unavailable. Because the air supply is unavailable during a design basis event, all air-operated valves and dampers required to control design basis events are (1) designed to fail to the required post-accident position on loss of air pressure, (2) provided with safety grade instrument air accumulators, or (3) provided with nitrogen backup systems. Most of the IA system is not safety-related and does not meet the scoping criteria for license renewal. The portions of the IA system that meet the scoping requirements of 10 CFR 54.4 are those components required to operate engineered safety features or essential safeguards and are included within the scope of license renewal. Drawing C-4175, Sheet 1, shows how boundaries for the typical arrangement were scoped. The boundaries were determined to occur at a check valve or trip valve, as applicable. For the IA system, the component types determined to be in scope are accumulator tanks, bolting, filter housing, pipes and fittings, tubing, valve bodies, and valve operators. Pressure boundary is the only intended function for license renewal. On the basis of the information provided in response to RAIs 2.3.3.8-1 and 2.3.3.8-2, the staff finds that the applicant has provided adequate justification for the exclusion of components in the CA system, and provided information on the IA and CA system functions. On the basis of this additional information, the staff concludes that the applicant has adequately identified the SSCs within the IA system that are within the scope of license renewal and subject to an AMR.

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2.4.1.1 Summary of Technical Information in the Application

The boundary of the containment in scope includes all the concrete, steel, elastomer, and fire barrier components of the containment internals and the domed roof and cylinder wall of the containment building. The containment structure also includes any components attached to the outside of the cylinder wall or dome above the auxiliary building roof. Various penetrations through the containment cylindrical wall are provided for the passage of piping and electrical conduits. The pipe sleeves, welds between the sleeve and the liner of the mechanical and electrical penetrations, and welds between the sleeve and the penetration are included in the boundary of the containment structure. The component supports (e.g., pipe supports, cable tray supports, equipment supports, and associated anchorage), fuel-handling equipment, heavy load cranes, and building piles are evaluated as the commodities in LRA Section 2.4.2, "Other Structures."

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2.4.1.2 Staff Evaluation

In its response, the applicant stated that the cranes are in scope and subject to an AMR for license renewal. These cranes are discussed in LRA Section 2.4.2.5, "Fuel Handling Equipment and Heavy Load Cranes," and their components are listed in LRA Table 2.4.2.5-1. The passive and long-lived subcomponents of the containment cranes in scope include crane/trolley rail systems, hoist monorails, and structural members used for the support of the crane bridge and trolley. The component types in LRA Table 2.4.2.5-1 associated with cranes or similar lifting devices represent only those subcomponents that are within the scope of license renewal and subject to AMR. All other subcomponents are considered to be active or have no intended function and therefore are not within the scope of license renewal. The components not in scope include brakes, antennas, motors, wheels, gears, shafts, cables, control panels, and junction boxes. The staff found that the applicant has clarified the scoping process of the components for the cranes and lifting devices in the containment.

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2.4.2.5.1 Summary of Technical Information in the Application

The applicant describes the fuel-handling equipment and heavy load cranes in LRA Section 2.4.2.5 and provides a list of components subject to an AMR in LRA Table 2.4.2.5-1. Additional information concerning fuel-handling systems and cranes is given in Section 9.5 of the FCS USAR.

In Section 2.1 of the LRA, the applicant describes its process for identifying structures within the scope of license renewal and subject to an AMR. Based on its methodology, the applicant, in LRA Table 2.2-1, identifies the fuel-handling system and heavy load cranes within the scope of license renewal and describes the results of its scoping methodology in Section 2.4.2.5 of the LRA.

This commodity includes all components used in the storage and handling of new/spent fuel and in the hoisting of loads. The fuel-handling portion of this commodity consists of the refueling machine, tilting machines in containment and auxiliary building, fuel transfer conveyor, fuel

transfer carrier box, fuel transfer tube, new and spent fuel-handling tools, new and spent fuel storage racks, and spent fuel bridge. The heavy load cranes portion consists of eight cranes of varying types (e.g., overhead crane, hoist with monorail, and jib crane).

The applicant identified component types for the fuel-handling equipment and heavy load cranes that are subject to an AMR in Table 2.4.2.5-1 of the LRA. This table lists the component types with their passive function identified and a link to their AMR results. The applicant identified the following component groups for the fuel-handling equipment and heavy load cranes that are subject to an AMR: concrete slab removal cranes, containment crane, containment equipment hatch crane and jib, decorating demineralizing area crane, fuel transfer conveyor, fuel transfer carrier box, fuel transfer tube, new and spent fuel handling tools, new fuel storage racks, tilting machines, upper guide lift rig, waste evaporator equipment handling crane, reactor vessel closure head lift rig, and crane expansion anchors.

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2.5.2 Staff Evaluation

Finally, the staff reviewed the information submitted by the applicant and determined whether the applicant had omitted or misclassified any electrical components requiring an AMR. The staff first reviewed the applicant's evaluation to determine whether it has appropriately identified the SSCs required to comply with 10 CFR 50.63 (the SBO rule). The staff found that the screening results in Section 2.5 did not include any offsite power system structures or components related to the recovery of offsite power from an SBO event. The license renewal rule, Section 10 CFR 54.4(a)(3), requires that all SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission regulation for SBO be included within the scope of license renewal. Section 50.63(a)(1) of the SBO rule requires that each light-water-cooled power plant licensed to operate be able to withstand and recover from an SBO of a specified duration (the coping duration) that is based upon factors that include: "(iii) The expected frequency of loss of offsite power, and (iv) The probable time needed to recover offsite power." Licensees' plant evaluations followed the guidance in NRC Regulatory Guide (RG) 1.155 and NUMARC 87-00 to determine their required plant-specific coping duration. The criteria specified in RG 1.155 to calculate a plant-specific coping duration were based upon the expected frequency of loss of offsite power and the probable time needed to restore offsite power, as well as the other two factors (onsite emergency ac power source redundancy and reliability) specified in 10 CFR 50.63(a)(1). In requiring that a plant's coping duration be based on the probable time needed to restore offsite power, 10 CFR 50.63(a)(1) specifies that the offsite power system be an assumed method of recovering from an SBO. Disregarding the offsite power system as a means of recovering from an SBO would not meet the requirements of the SBO rule and would result in a longer required coping duration. The function of the offsite power system within the SBO rule is, therefore, to provide a means of recovering from the SBO. This meets the 10 CFR 54.4(a)(3) criteria as a system that performs a function that demonstrates compliance with the Commission's regulations on SBO. Based on this information, the staff requires that applicable offsite power system structures and components need to be included within the scope of license renewal and subject to an AMR, or additional justification for its exclusion needs to be provided. Therefore, by letter dated October 11, 2002, the staff issued RAI 2.5-1, requesting the applicant to address this issue.

Comment: The staffs' evaluation should reflect that SBO (ISG-02) was not issued at the time of tendering the application and therefore the substation equipment was not included in the scope of LR, however subsequent to the issuance of the ISG on SBO, the applicant extended the electrical LR boundary to include all of the equipment in the restoration and recovery paths associated with SBO.

SECTION 3

AGING MANAGEMENT REVIEWS

Section 3 - Table of Contents

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3.0 Aging Management Review

Comment: *[Throughout the document, the references to the LRA AMR items (line items from the AMR 3.X-X tables are inconsistent. They are called AMR items, LRA Table 3.X-X, item number, line number, and variations. They should be referred to in a consistent manner to eliminate any confusion to the reader.]*

The Omaha Public Power District (OPPD) is the first license renewal applicant to fully utilize the Generic Aging Lessons Learned (GALL) process. The purpose of GALL is to provide the staff with a summary of staff-approved aging management programs (AMPs) for the aging of structures and components that are subject to an aging management review (AMR). If an applicant commits to implementing these staff-approved AMPs, the time, effort, and resources used to review an applicant's license renewal application (LRA) will be greatly reduced, thereby improving the efficiency and effectiveness of the license renewal review process. The GALL Report is a compilation of existing programs and activities used by commercial nuclear power plants to manage the aging of structures and components within the scope of license renewal and which are subject to an AMR. The GALL Report summarizes the aging management evaluations, programs, and activities credited for managing aging for most of the structures and components used throughout the industry. The report also serves as a reference for both applicants and staff reviewers to quickly identify those AMPs and activities that the staff has determined will provide adequate aging management during the period of extended operation.

The GALL Report identifies (1) systems, structures, and components, (2) component materials, (3) the environments to which the components are exposed, (4) the aging effects associated with the materials and environments, (5) the AMPs that are credited with managing the aging effects, and (6) recommendations for further applicant evaluations of aging effects and their management for certain component types.

In order to determine whether the GALL process would improve the efficiency of the license renewal review, the staff conducted a demonstration project to exercise the GALL process and to determine the format and content of a safety evaluation based on this process. The results of the demonstration project confirmed that the GALL process will improve the efficiency and effectiveness of the LRA review while maintaining the staff's safety focus. The Standard Review Plan for License Renewal (SRP-LR) was prepared based on both the GALL model and the lessons learned from the demonstration project.

During its review of the FCS LRA, the staff performed an aging management review (AMR) inspection from January 6-10, 2003, and from January 20-23, 2003. The purpose of the inspection was to examine activities that support the LRA, and consisted of a selected examination of procedures, representative records, and interviews with the applicant regarding proposed aging management activities. The inspection team also reviewed the proposed implementation of 19 of the 24 AMPs credited in the LRA for managing aging. On the basis of the inspection team's review of the proposed implementation of the 19 AMPs, the staff finds that the applicant will adequately implement the AMPs credited for managing aging during the extended period of operation. The inspection team concluded that the existing aging management activities are being conducted as described in the LRA and that new aging management activities appear to be acceptable for managing plant aging.

Concurrent with the AMR inspection, the staff performed a separate audit of specific issues raised by staff reviewers. On the basis of the information gathered during the audit, the staff finds that the applicant has adequately addressed the specific issues raised by the staff reviewers. The audit issues can be found in the staff's audit report dated April 9, 2003, and are addressed in this SER.

In its letter dated March 14, 2003, the applicant provided revisions to many tables in license renewal application (LRA) Sections 2 and 3. The staff will review the revised information to determine whether the revisions change the staff's conclusions as documented in this safety evaluation report (SER). This is Open Item 3.0-1.

As a result of the staff's review of the FCS application for license renewal, including the additional information and clarifications submitted subsequently, the staff identified two license conditions. The first license condition requires the applicant to include the USAR Supplement in the next USAR update required by 10 CFR 50.71(e) following issuance of the renewed license. The second license condition requires that the future inspection activities identified in the USAR Supplement be completed prior to the period of extended operation.

3.0.2 The Staff's Review Process

The staff's review of the FCS LRA was performed in three phases. In Phase 1, the staff reviewed the applicant's AMP descriptions to compare those AMPs for which the applicant claimed consistency with those reviewed and approved in the GALL Report. For those AMPs for which the applicant claimed consistency with the GALL AMPs, the staff conducted an inspection to confirm that the applicant's AMPs were consistent with the GALL AMPs. Several FCS AMPs were described by the applicant as being consistent with GALL, but with some deviation from GALL. By letter dated October 11, 2002, the staff issued request for additional information (RAI) B.1-1, requesting the applicant to define the AMP deviations contained in the LRA. By letter dated December 19, 2002, the applicant addressed this RAI by defining the following three types of AMP deviations

(1) Exceptions to GALL are defined as specified GALL requirements that the applicant does not intend to meet or implement

(2) Clarifications to GALL are defined as GALL requirements that the applicant intends to meet, but that may deviate from the exact wording or criteria specified in the GALL Report as documented in the LRA

(3) Enhancements to GALL are defined as revisions or additions to plant procedures or program activities that will be implemented prior to the period of extended operation. Enhancements to an AMP may expand the scope of the AMP, but will not reduce its scope, thus ensuring that the AMP still meets the consistency requirements provided in the GALL Report.

Comment: This definition is different than what was provided in the response to B.1-1. This definition as used in later sections implies that the enhancements committed to in the specific FCS programs are adding additional criteria that is more than what is in the current GALL requirements. KRH

For each AMP that had one or more of these deviations, the staff reviewed each deviation to determine (1) whether the deviation is acceptable, and (2) whether the AMP, as modified, would adequately manage the aging effect(s) for which it is credited.

For those AMPs that are not evaluated in GALL, the staff evaluated the AMP against the 10 program elements defined in Branch Technical Position (BTP) RLSB-1 in Section A-1 of SRP-LR Appendix A and used in previous LRA evaluations.

The staff also reviewed the updated safety analysis report (USAR) Supplement for each AMP to determine whether it provided an adequate description of the program or activity, as required by Section 54.21(d) of Chapter 10 of the *Code of Federal Regulations* (10 CFR 54.21(d)).

The AMRs and associated AMPs in the GALL Report fall into two broad categories: those AMRs and associated AMPs that GALL concludes are adequate to manage the aging of the components referenced in GALL, and those AMRs and associated AMPs for which GALL concludes that aging management is adequate, but further evaluation must be done for certain aspects of the aging management process. In Phase 2, the staff compared the applicant's AMR results and associated AMPs to the AMR results and associated AMPs in GALL to determine whether the applicant's AMRs and associated AMPs were consistent with those reviewed and approved in the GALL Report. For those AMR results and associated AMPs for which the applicant claimed to be consistent with GALL, and for which GALL did not recommend further evaluation, the staff conducted an inspection to confirm that the applicant's AMRs and associated AMPs were consistent with the GALL AMRs and associated AMPs. For those AMRs and associated AMPs for which GALL recommended further evaluation, in addition to its confirmatory inspection, the staff reviewed the applicant's evaluation to determine whether it addressed the additional issues recommended in the GALL Report. Finally, for AMRs and associated AMPs that were not consistent with GALL, the staff's review determined whether the AMRs and associated AMPs were adequate to manage the aging effects for which they were credited.

Once it had determined that the applicant's AMRs and associated AMPs were adequate to manage aging, the staff performed Phase 3 of its review by reviewing plant-specific structures and components to determine whether the applicant demonstrated that the effects of aging will be adequately managed so that there is reasonable assurance that the intended function(s) will be maintained consistent with the current licensing basis (CLB) for the period of extended operation, as required by 10 CFR 54.21(a)(3). Specifically, this review involved a component-by-component review to determine whether the applicant properly applied the GALL program to the aging management of components within the scope of license renewal and subject to an AMR (i.e., the staff evaluated whether the applicant had properly identified the aging effects, and the AMPs credited for managing the aging effects, for each FCS structure and component within the scope of license renewal and subject to an AMR). For structures and components evaluated in GALL, the staff reviewed the adequacy of aging management against the GALL criteria. For structures and components not evaluated in GALL, the staff reviewed the adequacy of aging management against the 10 criteria in Appendix A of the SRP-LR. Some FCS structures and components were not evaluated in GALL, but the applicant determined that the

GALL AMR results could be applied to these structures and components and provided justification to support this determination. In these cases, the staff reviewed the adequacy of aging management against the GALL criteria to determine whether the GALL AMPs were adequate to manage the aging effects for which they were credited.

As part of the staff's review, an AMR inspection was performed from January 6-10, 2003 and from January 20-23, 2003 to examine activities that support the LRA. The inspection consisted of a select examination of procedures and representative records and interviews with personnel regarding the proposed aging management activities to support license renewal. The inspection concluded that the existing aging management activities are being conducted as described in the LRA and proposed aging management activities appear acceptable to manage plant aging.

Concurrent with this inspection, the staff performed a separate audit of specific issues raised by staff reviewers. The audit findings were issued on April 9, 2003.

3.0.3.1 Bolting Integrity Program

3.0.3.1.1 Summary of Technical Information in the Application

The applicant's bolting integrity program is discussed in LRA Section B.1.1, "Bolting Integrity Program." The applicant states that the program is consistent with GALL programs XI.M3, "Reactor Head Closure Studs," and XI.M18, "Bolting Integrity," with the exception that the applicant did not identify stress corrosion cracking (SCC) as an aging effect requiring management for high-strength carbon steel bolting in plant indoor air. The applicant also states that it will utilize American Society of Mechanical Engineers (ASME) Section XI, Subsection IWF, visual VT-3 inspection requirements rather than volumetric inspections for the inspection of supports.

This AMP is credited with managing aging in bolts in the reactor, ESF, auxiliary, and steam and power conversion systems.

The applicant performed inspections of bolted components under the FCS inservice inspection (ISI) program, the boric acid corrosion (BAC) prevention program, and the structures monitoring program (SMP). The SMP inspects structural bolts. Visual inspections conducted under the BAC prevention program included the inspection of bolted components in borated systems. Any indication of boric acid residue or damage is reported and evaluated to determine if a component can remain in service per established procedures. Documentation of operating experience is included as part of the BAC prevention program. On occasion, visual observations have identified BAC damage. These deficiencies were documented in accordance with the FCS corrective action program (CAP) and resulted in repair or replacement, if required. Review of the plant-specific operating experience indicates that the inspections have been effective in managing the aging effects of bolted components.

Comment: The titles for the FCS programs are not capitalized here or in other sections of the document. KRH

On the basis of the above discussion, the applicant concluded that the bolting integrity program provides reasonable assurance that the bolting aging effects will be adequately managed.

3.0.3.2 Chemistry Program

3.0.3.2.1 Summary of Technical Information in the Application

The applicant's water chemistry program is discussed in LRA Section B.1.2, "Chemistry Program." The applicant states that the program is consistent with GALL program XI.M2, "Water Chemistry," and includes the chemistry-related portions of the program in GALL XI.M21, "Closed-Cycle Cooling Water System." This extends its applicability to the systems containing closed-cycle cooling water.

Comment: This does not address POI 6.e response which includes the chemistry-related portions of the Alloy 600 Program. DLL

This AMP is credited with managing aging effects caused by primary and secondary water chemistries, and by the water chemistry in the component cooling water (CCW) system. It is based on the Electric Power Research Institute (EPRI) water chemistry guidelines. These guidelines are referenced in the following EPRI reports, Topical Report (TR)-105714 for primary water chemistry, TR-102134 for secondary water chemistry, and TR-107396 for closed-cycle cooling water chemistry.

The chemistry program will also manage the aging effects on components which either are not evaluated in GALL, or, although not specifically evaluated, are relying on the AMPs in GALL. These components are listed in Tables 3.1-2 through 3.5-2 and Tables 3.1-3 through 3.5-3 of the LRA. They are included in reactor systems, engineering safety features, auxiliary systems, steam and power conversion systems, and containment, structures and component supports. The components are made of carbon steel, stainless steel, cast austenitic stainless steel (CASS), low-alloy steel, cast iron, and nickel-based and copper alloys. When exposed to the environments of primary, secondary, or closed-cycle cooling water, the resulting aging effect is cracking and loss of material caused by general, crevice, pitting, galvanic, and microbiologically-induced corrosion. The chemistry program manages these aging effects by specifying water chemistries which minimize corrosive damage.

Comment: They have not addressed the "plant-specific" portions of Tables 3.1.1 through 3.5.1, which were managed by the Chemistry Program (i.e., 3.1.1.10, 3.1.1.17, etc.).As I've previously commented, our application incorrectly was worded for all programs and did not capture this as well. Their wording more accurately reflects what the Table 2s and 3s represent, but also doesn't capture the "plant-specific" portions of 3.1.1 through 3.5.1. DLL

Deleted: corrosion

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On the basis of the above discussion, the applicant concluded that the chemistry program provides reasonable assurance that the aging effects caused by plant water chemistry will be adequately managed.

3.0.3.2.2 Staff Evaluation

In LRA Section B.1.2, "Chemistry Program," the applicant described its AMP to manage aging effects by controlling primary, secondary and closed-cycle cooling water chemistries. The LRA stated that this AMP is consistent with the chemistry program in Section XI.M2 of the GALL Report with an enhancement resulting from the inclusion of the chemistry-related portions of the GALL closed-cycle cooling water system program. The staff confirmed the applicant's claim of consistency during the AMR inspection. Furthermore, the staff reviewed the enhancement and its justification to determine whether the AMP, with the enhancement, remains adequate to manage the aging effects for which it is credited. The staff also reviewed the USAR Supplement to determine whether it provides an adequate description of the program.

Comment: We are not controlling the CCW system. We are controlling the chemistry of the closed-cycle cooling water.DLL

Deleted: and

Deleted: and by the CCW system.

Comment: Doesn't address the POI response to 6.e regarding the chemistry-related portions of the Alloy 600 Program.DLL

The inclusion of the information discussed above causes changes in some attributes of the GALL chemistry program. Therefore, the staff reviewed this AMP against only those attributes of the applicant's program which deviate from the attributes of the GALL chemistry program, using the guidance in BTP RLSB-1 in Appendix A of the SRP-LR.

[Preventive Actions] In addition to controlling water chemistry to minimize exposure of the affected components to aggressive chemistry environments, the preventive action attribute of the water chemistry program in the LRA also addresses maintaining proper corrosion inhibitor concentrations in the closed-cycle cooling water systems. The staff finds that this additional requirement in the applicant's chemistry program extends its preventive function to the closed-cycle cooling water systems, and therefore, finds it acceptable.

[Monitoring and Trending] The monitoring and trending attribute in the water chemistry program in GALL is modified by specifying the need for sampling water chemistry on a continuous, daily, weekly, or as needed basis, as indicated by plant operating conditions. The staff finds this modification acceptable because it will improve aging management by closely maintaining controlled water chemistry.

Comment: This is not "modified"; GALL states frequency "varies (e.g. continuous, daily, weekly, or as needed)"...and our application supports this.DLL

Comment: This is not a "modification". See above comment. DLL

[Acceptance Criteria] The acceptance criteria in the GALL water chemistry program are extended by requiring the water in the closed-cooling water systems to maintain concentrations of corrosion inhibitors within the specified limits of EPRI TR-107396. The staff finds this modification acceptable because it will ensure that the corrosion damage to the components in these systems will be minimized.

[Operating Experience] The plant operating experience has indicated that over the operating history of the plant, several incidents have occurred which could be attributed to improper water chemistry. These included steam generator (SG) tube leaks, condenser tube leaks, and some resin intrusion into the primary storage tank. This last incident is discussed in the FAC AMP. However, in all cases, proper corrective actions were implemented to prevent reoccurrence. In addition, the chemistry management of aging effects was continuously upgraded based on plant personnel and industry experience.

Comment: Oddly enough, this last FAC item was originally in my Chemistry Program draft presented to SARC, but was removed prior to finalization of the EA. Why would it again be listed here ? Did someone give the NRC drafts of our EAs ? Although the incident is discussed in the FAC Program, the FAC Program does not attribute it to Chemistry. DLL

Deleted: , and major pipe breaks due to flow-accelerated corrosion (FAC)

Such operating experience has provided feedback to revisions of the EPRI water chemistry guideline document. The staff concluded that the EPRI guideline document, which was developed based on operating experience, has been effective over time with widespread use.

3.0.3.6 Boric Acid Corrosion Prevention Program

3.0.3.6.1 Summary of Information in the Application

The applicant's BAC prevention program is discussed in LRA Section B.2.1, "Boric Acid Corrosion Prevention Program." The applicant states that the program is consistent with GALL

program XI.M10, "Boric Acid Corrosion." with the exception of enhancements which will be made prior to the period of extended operation.

The AMP is credited with managing the aging effects in the systems carrying water containing boric acid. The program will manage the aging effects in the components which either are not evaluated in GALL, or, although not specifically evaluated, are relying on the AMPs in GALL. These components are listed in Tables 3.1-2, 3.1-3, and 3.3-3 of the LRA. They are included in the reactor and auxiliary systems. The components are made of carbon steel, low-alloy steel, cast iron, cadmium plated steel, galvanized steel, and copper alloys. When exposed to leakage of boric acid, the resulting aging effect is loss of material.

The program relies on implementation of the recommendations of NRC Generic Letter (GL) 88-05 to monitor the condition of the reactor coolant pressure boundary for boric acid leaks. Periodic visual inspections of adjacent structures, components, and supports for evidence of leakage and corrosion are the elements of the program.

On the basis of the above discussion, the applicant concluded that the BAC prevention program provides reasonable assurance that the aging effects due to boric acid leakage will be adequately managed.

3.0.3.6.2 Staff Evaluation

In LRA Section B.2.1, "Boric Acid Corrosion Prevention Program," the applicant described its AMP to manage aging effects due to boric acid leakage. The LRA stated that this AMP is consistent with GALL AMP XI.M10, "Boric Acid Corrosion," with the exception of enhancements that will be made prior to the period of extended operation. The enhancements increase the scope of inspections and provide specific guidance to the inspectors. The staff confirmed the applicant's claim of consistency during the AMR inspection.

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The inclusion of the information discussed above causes changes in some attributes of the GALL BAC prevention program. Therefore, the staff reviewed this AMP against only those attributes of the applicant's program which deviate from the attributes of the GALL's BAC program, defined in BTP RLSB-1, found in Appendix A of the SRP-LR. The staff also reviewed the USAR Supplement to determine whether it provides an adequate description of the program.

Comment: The enhancements do not change the GALL attributes, but are revisions to the existing FCS BAC program that must be made to make the FCS program consistent with the attributes in the GALL BAC program. KRH

[Scope of Program] The applicant added to the scope of the GALL BAC program, specific guidance for inspection of the components, structures, and electrical components where boric acid may have leaked. It also added the need for inspecting the fuel pool cooling and waste disposal systems. The staff finds this acceptable because these additional inspections will make the program more comprehensive, and improve the management of aging effects in the components potentially exposed to boric acid leaks.

Comment: Enhancement did not add anything to scope of current GALL BAC program. Enhancement will ensure FCS BAC program includes specific wording to inspect electrical components so the FCS program scope is consistent with the GALL program scope. KRH

[Parameters Monitored or Inspected] The applicant's BAC prevention program specifies the parameters monitored and inspected, with an enhancement to include the spent fuel pool

cooling and waste disposal systems to the scope of the program. The staff finds this acceptable because this will broaden the program and enhance the program for managing the existing aging effects.

[Monitoring and Trending] The monitoring and trending attribute in the applicant's program will be enhanced by implementing specific guidance to require maintenance personnel to report boric acid leakage to the BAC prevention program engineer. These procedures will improve the way the plant systems containing boric acid are monitored and trended, and will contribute to better management of the aging effects caused by boric acid corrosion. Therefore, the staff finds this enhancement acceptable.

[Operating Experience] The plant operating experience included severe boric acid corrosion of pump studs, which prompted the applicant to introduce significant improvement in its BAC prevention program. The staff agrees with the applicant that the current program routinely identifies and corrects borated water leakage in the RCS and other systems carrying borated water, and adequately manages aging effects caused by boric acid corrosion.

The applicant provided its USAR Supplement for the BAC prevention program in Section A.2.3 of the LRA. The staff reviewed the USAR Supplement and finds that the summary description contains a sufficient level of information, as required by 10 CFR 54.21(d), and is acceptable.

The staff is currently reviewing the issues associated with NRC Bulletin 2002-01. This bulletin was issued as a result of a control rod drive mechanism nozzle cracking event at Davis Besse, which resulted in severe degradation of the reactor vessel head due to exposure to concentrated boric acid. To date, all licensees (except Davis Besse) have responded to the bulletin, providing information about their boric acid corrosion control programs. Any future regulatory actions that may be required as a result of those reviews will be addressed by the staff in a separate regulatory action. This is considered a current operating issue and will be handled as such. The staff will resolve this issue in accordance with 10 CFR 54.30 outside of the license renewal process.

3.0.3.7 Cooling Water Corrosion Program

3.0.3.7.1 Summary of Technical Information in the Application

The applicant's cooling water corrosion program is discussed in LRA Section B.2.2, "Cooling Water Corrosion Program." The applicant states that the program is consistent with GALL program XI.M20,"Open-Cycle Cooling Water System," modified by moving the reference to external coatings to Section B.3.3, "General Corrosion of External Surfaces Program," in the LRA. The cooling water corrosion program is also consistent with the non-chemistry related portions of GALL program XI.M21, "Closed-Cycle Cooling Water System," modified by removing from the license renewal commitments reference to (1) fluid flow, which is an active function, and (2) testing the systems performing active functions.

Comment: The GALL programs were not enhanced. The FCS program will be enhanced to meet the attributes defined in the GALL programs. KRH

Deleted: Both of these GALL programs were enhanced by inspecting various components in open-cycle and closed-cycle water systems based on the evaluation of their susceptibility. These inspection activities will be commensurate with the GALL program.

Deleted: The modifications introduced to the GALL programs are reflected in the applicant's cooling water corrosion program attributes, some of which deviate from the attributes of the programs in GALL.

This AMP is credited with managing aging effects in the open-cycle and closed-cycle cooling water systems.

The cooling water corrosion program will also manage the aging effects in the components which are either not evaluated in GALL, or, although not specifically evaluated, are relying on the AMP in GALL. These components are listed in Tables 3.2-2, 3.3-2, and 3.3-3 of the LRA. They are included in the sections of the LRA addressing the ESF and auxiliary systems. These components are made from Alloy 600, brass, bronze, copper and copper alloy, nickel-based alloy, carbon and stainless steel, and cast iron. They are exposed to the environments of corrosion-inhibited treated water, oxygenated or deoxygenated treated water, raw water, and lubricating oil.

The resulting aging effects are caused by cracking and by loss of material (i.e., crevice, pitting, galvanic, general and microbiologically-influenced corrosion). The aging management activities of the applicant's Cooling Water Corrosion Program is based on the EPRI guidelines in TR-107396.

On the basis of the above discussion, the applicant concluded that the cooling water corrosion program provides reasonable assurance that the aging effects due to corrosion will be adequately managed.

3.0.3.7.2 Staff Evaluation

In LRA Section B.2.2, "Cooling Water Corrosion Program," the applicant described its AMP to manage aging effects due to corrosion. The LRA stated that this AMP is consistent with GALL program XI.M20,"Open-Cycle Cooling Water System," modified by moving the reference to external coatings to Section B.3.3, "General Corrosion of External Surfaces Program," in the LRA. The cooling water corrosion program is also consistent with the non-chemistry related portions of GALL program XI.M21, "Closed-Cycle Cooling Water System," modified by removing from the license renewal commitments reference to (1) fluid flow, which is an active function, and (2) testing the systems performing active functions. The staff confirmed the applicant's claim of consistency during the AMR inspection. The chemistry-related portions of XI.M21 are addressed in the FCS chemistry program (LRA Section B.1.2) which is evaluated by the staff in Section 3.0.3.2 of this SER.

The deviations of the program caused changes in some attributes of the GALL open-cycle and closed-cycle cooling water system programs. Therefore, the staff reviewed this AMP against only those attributes of the applicant's programs which deviate from the attributes of the GALL's open- and closed-cycle cooling water system programs, as defined in BTP RLSB-1, found in Appendix A of the SRP-LR. The staff also reviewed the USAR Supplement to determine whether it provides an adequate description of the program.

[Scope of Program] The scope of the applicant's cooling water corrosion program consists of the scope of GALL program, augmented by additional inspections of various raw water and closed-cycle cooling system components based on a susceptibility evaluation. The staff finds

Comment: "Plant-specific" items addressed by the Cooling Water Corrosion Program in Tables 3.3.1 (i.e., 3.3.1.08) is not captured and needs to be.DLL

Deleted: , raw water, and lubricating oil.

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Deleted: corrosion, cracking,

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Comment: It is important to make this clarification, because there are many things in the EPRI CCCW Guidelines which we are not related to aging management and to which we do not want to unnecessarily commit ourselves to just because they are in the EPRI CCCW Guidelines. DLL

this acceptable because including these additional inspections makes the program more comprehensive and ensures better management of the aging effects.

Comment: This whole paragraph doesn't convey the truth. We are enhancing our current program to include inspections based on a susceptibility evaluation to bring us consistent with GALL. The way this paragraph reads, it is implying we are doing additional inspections over and above what GALL requires, thereby making our program "more comprehensive and ensuring better management". DLL

[Preventive or Mitigative Actions] The preventive actions attribute in the applicant's program is modified by removing the chemistry-related portions in the GALL's closed-cycle cooling water program. The preventive actions specified in the removed portions address the need for maintaining corrosion inhibitor concentrations within specified limits, and monitoring and controlling cooling water chemistry. The staff finds this modification acceptable because these preventive actions are addressed in the applicant's chemistry program.

[Parameters Monitored or Inspected] The parameters monitored or inspected attribute in the applicant's program is modified by removing the need for monitoring and inspecting external coatings in the GALL's open-cycle cooling water system and relaxing the requirements for the frequency of monitoring in the closed-cycle cooling water system. The staff finds this acceptable because external coatings are addressed in the applicant's general corrosion of external surfaces program, and the need for specific monitoring frequency is not required by the EPRI guidelines on which the program is based.

Comment: We are not modifying the frequency in this criteria, we are disregarding a GALL requirement which is incorrectly based on "active function" monitoring, which is not related to LR. DLL

[Detection of Aging Effects] The detection of aging effects attributed in the applicant's program is modified by removing the need for detecting aging effects caused by defective external protective coatings in the open-cycle cooling water system and by the addition, to both the open- and closed-cycle cooling water systems of more component inspections based on a susceptibility evaluation. The detection of aging effects caused by defective external protective coatings is addressed in the applicant's general corrosion of external surfaces program, and additional inspections will improve detection of the aging effects. Therefore, the staff finds the deviation from the GALL program to be acceptable.

Comment: Not true. We are not adding more inspections than required by GALL, we are requiring inspections to be compliant to GALL. DLL

Comment: Not an issue of adding more inspections required by GALL. DLL

[Monitoring and Trending] The monitoring and trending attribute is required to demonstrate system capability to remove heat from the cooling water. In the applicant's program, this consists of modifying the GALL attribute to add inspections of various components in the open-cycle and closed-cycle cooling water systems, based on evaluations of their susceptibility. Also, the applicant moved the monitoring of the conditions of the surface coatings to its general corrosion of external surfaces program. The staff finds the modification of the monitoring and trending attribute of the applicant's program to be acceptable because it includes additional inspections, and the monitoring and trending functions removed from the GALL programs are addressed in other programs.

Comment: Not an issue of adding more inspections required by GALL. DLL

[Operating Experience] The plant operating experience has identified the need for some component repair and replacement due to corrosion and cracking in the component cooling water and raw water environments. Appropriate long-term corrective actions were implemented based on these experiences. As a result, the staff agrees that the current cooling water corrosion program provides reasonable assurance that the aging effects will be properly managed.

The applicant provided its USAR Supplement for the cooling water corrosion program in Section A.2.8 of the LRA. The staff reviewed the USAR Supplement and finds that the summary description contains a sufficient level of information, as required by 10 CFR 54.21(d), and is acceptable.

3.0.3.8.2 Staff Evaluation

LRA Section B.2.4 describes the applicant's AMP to manage fatigue of RCS components. The LRA states that this AMP is consistent with GALL AMP X.M1, "Metal Fatigue of Reactor Coolant Pressure Boundary." The staff confirmed the applicant's claim of consistency during the AMR inspection. Furthermore, the staff reviewed the program enhancements and the applicant's justifications for the enhancements to determine whether the AMP is adequate to manage the aging effects for which it is credited. The staff also reviewed the USAR Supplement to determine whether it provides an adequate description of the revised program.

The applicant indicated the scope of the FMP includes those plant-specific components identified in Table 3.1-2 of the LRA for which the FMP is identified as an AMP. However, Table 3.1-2 only lists the FMP as an AMP for the reactor vessel internals flow skirt. In RAI B.2.4-1, the staff requested that the applicant clarify the scope of the components covered by the FMP. In its December 12, 2002, response to RAI B.2.4-1, the applicant indicated that the statement should have referred to the components identified in Section 4.3 of the LRA. Section 4.3 of the LRA addresses metal fatigue of reactor coolant pressure boundary components. The staff considers the applicant's clarification acceptable.

The applicant indicated that the scope of the program was enhanced to include the pressurizer surge line bounding locations. The scope of the program specified in GALL program X.M1 includes metal components of the reactor coolant pressure boundary. The staff finds that inclusion of the pressurizer surge line locations is consistent with the GALL. The applicant also indicated that the scope of the program was enhanced to include additional Class 2 and 3 components. These components include portions of the primary sampling system. As discussed in Section 4.3 of this SER, the staff finds the inclusion of these Class 2 and 3 components in the FMP acceptable.

The applicant discussed the operating experience at FCS that led to enhancements to the FMP. The LRA indicates that an assessment of the operation of the CVCS was performed to ensure that the appropriate transients were monitored by the FMP. In RAI B.2.4-2, the staff requested that the applicant describe the enhancements to the FMP that resulted from this assessment. The applicant's December 19, 2002, response indicated that additional cycle counting requirements for CVCS transients, as discussed in Section 4.3.1 of the LRA, were incorporated in the monitoring procedure. The staff finds the applicant's clarification acceptable. The staff discussion of the CVCS transients is contained in Section 4.3 of this SER.

The applicant indicated that the program would be enhanced to include site-specific calculations to address environmental fatigue concerns identified in NUREG/CR-6260. The program

specified in GALL X.M1 requires that the program include an evaluation of the impact of the reactor coolant environment on the components identified in NUREG/CR-6260. Therefore, the applicant's program is consistent with the GALL Report. Section 4.3 of this SER contains additional discussion of the NUREG/CR-6260 components.

The applicant provided its USAR Supplement for the FMP program in Section A.2.10 of the LRA. The staff reviewed the USAR Supplement and finds that the summary description contains a sufficient level of information, as required by 10 CFR 54.21(d), and is acceptable.

Comment: *[This calculation has been done as discussed at the OI/CI resolution meetings and ACRS; therefore, this write-up needs revision.]*

3.0.3.9.2 Staff Evaluation

The staff finds the applicant's response acceptable because it is consistent with GALL.

The staff has proposed a revision to GALL program XI.M27 related to inspections for wall thinning of piping due to corrosion. The revised staff position states that each time the system is opened, oxygen is introduced into the system, thus accelerating the potential for general corrosion. Therefore, the staff has recommended that a non-intrusive means of measuring wall thickness, such as ultrasonic inspection, be used to detect this aging effect. The staff recommends that, in addition to a baseline ultrasonic inspection of the fire protection piping that is performed before exceeding the current licensing term, the applicant should perform ultrasonic inspections at 10-year intervals thereafter. In RAI B.2.5-2, the staff asked the applicant whether the inspection criteria for the FPP conforms with the staff position outlined above. By letter dated December 12, 2002, the applicant responded that enhancements will be made to the FPP prior to the period of extended operation to implement the interim staff guidance. The staff finds this acceptable, and the RAI issue is considered to be resolved.

Comment: Should the specific ISG document be referenced here? KRH

3.0.3.11.2 Staff Evaluation

LRA Section B.2.10 described the SMP, which is credited with managing the aging of several structural components. The LRA states that this AMP is consistent with GALL programs XI.S5, "Masonry Wall Program," XI.S6, "Structures Monitoring Program," and XI.S7, RG 1.127, "Inspection of Water-Control Structures Associated with Nuclear Power Plants," with two clarifications. The first clarification is that FCS does not have the support components made from lubrite that are identified in the GALL Report, Volume 2, Chapter III, Item A4.2-b. The second clarification is that FCS is not committed to RG 1.127. In addition, the staff also determined whether the applicant properly applied the SMP to its facility. Furthermore, the staff reviewed the applicant's claim that the SMP, with these clarifications and enhancements, is adequate to manage the aging effects for which it is credited.

With regard to the first clarification to GALL, the applicant states that FCS does not have the support components made from lubrite that are identified in GALL Chapter III, Item A4.2-b (reactor pressure vessel supports); however, FCS does have support components made of

Deleted: coolant pump

lubrite for other ASME components (e.g., SG supports), as identified in GALL Chapter III.B. The applicant stated that these components are inspected under the ISI program. The staff's evaluation of the ISI program is covered in Section 3.0.3.5 of this SER. For the second clarification, the applicant states that while FCS is not committed to RG 1.127, the applicable attributes from RG 1.127 have been incorporated into the SMP. The staff finds that the applicant's explanation and treatment of these two deviations to be adequate.

The applicant provided its USAR Supplement for the SMP in Section A.2.23 of the LRA. The staff reviewed the USAR Supplement and finds that the summary description contains a sufficient level of information to satisfy 10 CFR 54.21(d), and is acceptable.

3.0.3.12.2 Staff Evaluation

In LRA Section B.3.3, "General Corrosion of External Surfaces Program," the applicant described its AMP to manage the effects of loss of material and cracking for various components due to corrosion. This AMP is not consistent with a GALL AMP. Therefore, the staff reviewed this AMP against the 10 program elements defined in BTP RLSB-1, found in Appendix A of the SRP-LR. The staff also reviewed the USAR Supplement to determine whether it provides an adequate description of the program.

[Program Scope] As indicated in the LRA, the program consists of several FCS activities that manage the aging effects of loss of material and cracking for components in auxiliary boiler fuel oil, auxiliary building HVAC, auxiliary feedwater (AFW), chemical and volume control, CCW, containment ventilation, control room HVAC, diesel generator lube oil, starting air, feedwater, fire protection fuel oil, gaseous waste disposal, instrument air, main steam (MS) and turbine steam extraction, containment penetration systems and system interface components for non-CQE systems, nitrogen gas, primary sampling, raw water, and ventilating air. The staff finds that relevant systems and structures are included in the scope of the program, and therefore, the scope is acceptable.

[Preventive or Mitigative Actions] The applicant did not identify any preventive actions taken as part of this program. The staff recognizes that while this program may not prevent the occurrence of the aging effects stated, the program description should clearly describe the manner in which this program will be used to manage aging effects.

By letter dated October 11, 2002, the staff requested, in RAI B.3.3-1, that the applicant describe what this program accomplishes. In its response dated December 19, 2002, the applicant responded that this program is a condition monitoring program which identifies evidence of corrosion on external surfaces, or significant degradation of coatings, sealants, and caulking through visual inspections, and initiates corrective action prior to any loss of intended function. The staff notes that aging management of bolts is performed by several programs: bolting for mechanical systems is managed by this program and the bolting integrity program, structural bolting is managed by the structures monitoring program, and bolting degradation due to exposure to boric acid is identified by the boric acid corrosion prevention program

Based on the applicant's response to the RAI, the staff concurs with the applicant that preventive actions are not needed because this is a condition monitoring program.

[Parameters Monitored or Inspected] The applicant stated that the surface conditions of components are monitored through visual observation and inspection to detect signs of external corrosion and to detect conditions that can result in external corrosion, such as fluid leakage.

By letter dated October 11, 2002, the staff requested, in RAI B.3.3-2, that the applicant describe the parameters, besides fluid leakage, that detect degradation of surface conditions on components within the scope of this program, and to justify why these parameters need not be included in this program to manage the aging of components within the program scope. In its response dated December 19, 2002, the applicant responded that fluid leakage was identified only as an example of a condition which could lead to component degradation if not corrected. Fluid leakage is an indicator of a degraded condition which, in addition, could lead to corrosion on surrounding components if allowed to continue. The applicant responded further by stating that this program includes monitoring of components and their external coatings for evidence of cracking, checking, blistering, rusting, pinholes, abrasions, delamination, and significant substrate defects (e.g., corrosion pits). The monitoring of these indications ensures that component degradation is identified and corrected prior to any loss of pressure boundary.

Based on the applicant's response to the RAI, the staff finds that the program monitors conditions that relate to the aging effects of concern.

[Detection of Aging Effects] The applicant indicated that the aging effects of loss of material and cracking are detected by visual observation and inspection of external surfaces. In addition, evidence for leaking fluids also provides indirect monitoring of certain components that are not routinely accessible.

By letter dated October 11, 2002, the staff requested, in RAI B.3.3-3, that the applicant describe the methods, besides the observance of fluid leakage, that will be used to detect loss of material and cracking in locations that may be inaccessible, such as the bottom of a tank, and provide a justification for why these methods are not material to demonstrate adequate aging management for components within the scope of the program. In its response dated December 12, 2002, the applicant stated that this program relies on visual observations and inspections, and is only applicable to those components accessible to this type of inspection. Aging management activities on components inaccessible to visual inspections, such as ultrasonic testing of buried emergency diesel fuel oil tank, are incorporated into other plant programs.

The staff finds the applicant's response to be reasonable and adequate because this program inspects for the aging effects of accessible components, in conjunction with other programs which inspect components not readily accessible.

[Monitoring and Trending] As described in Section B.3.3 of the LRA, various plant personnel perform periodic material condition inspections and observations outside containment. These

inspections are performed in accordance with approved plant procedures and include documentation of the evidence of fluid leaks, significant coating damage, or significant corrosion. The inspections and observations are performed at intervals based on previous inspections and industry experience. For example, operator rounds occur several times a day and system engineer walk downs are performed at least quarterly. In addition, inspections inside containment are performed at each refueling outage and are part of the inspections described in the OPPD response to GL 98-04, "Potential for Degradation of the Emergency Core Cooling System and the Containment Spray System after a Loss-of-Coolant Accident Because of Construction and Protective Coating Deficiencies and Foreign Material in Containment."

By letter dated October 11, 2002, the staff requested, in RAI B.3.3-4, additional information on the extent of the documentation process, including whether inspections are documented and the results trended, or whether only significant findings are documented using a corrective action process. In its response dated December 12, 2002, the applicant responded that deficiencies identified during operator and system engineer walk downs are documented under the maintenance work order or corrective action process. Deficiencies identified during the containment coating inspection procedure would result in the initiation of a corrective action item if the deficiencies are significant as documented in this procedure. In addition, system engineers monitor and report ongoing and significant system deficiencies for their respective systems in their system report cards.

Based on the staff's review of the LRA, the applicant's response to the staff's RAI, and the findings of the AMR inspection, the staff finds that the activities associated with this program are appropriate because these activities and their frequency ensure that the aging effects of components within the scope of this program will be detected and corrected before compromising the components' intended functions.

[Acceptance Criteria] The applicant stated that plant procedures provide criteria for determining the acceptability of as-found conditions and for initiating the appropriate corrective action. These procedures incorporate appropriate provisions of NRC and industry guidance to avoid unacceptable degradation of the component intended functions by inspecting for the existence of leakage, presence of corrosion products, coating defects, and elastomer cracking.

By letter dated October 11, 2002, the staff requested, in RAI B.3.3-5, that the applicant discuss the NRC or industry guidance and operating experience used to establish the acceptance criteria. In its response dated December 19, 2002, the applicant responded that guidance from RG 1.54, "Service Level I, II, and III Protective Coatings Applied to Nuclear Power Plants," is incorporated in the containment coatings inspection discussed in Section 5.2.5 of the FCS USAR. In addition, the system engineer and operator walk downs initiate maintenance work orders or corrective action documents based on engineering judgement and operating experience. Initiation of a corrective action document is based on procedural guidance to identify damage or degradation that adversely affects the functional capability of a structure, system, or component. The applicant further responded that the procedural guidance is being enhanced as part of the implementation of this new program.

Comment: Sp - judgment

3.0.3.14 Selective Leaching Program

3.0.3.14.1 Summary of Technical Information in the Application

The applicant's selective leaching program is discussed in LRA Section B.3.6,"Selective Leaching Program." The applicant states that the program is consistent with the GALL program XI.M33,"Selective Leaching of Materials," with the exception that the applicant will not perform an evaluation of selective leaching by means of hardness testing during the one-time inspection.

The AMP is credited with managing aging effects in the systems containing plant-specific components susceptible to the selective leaching mechanism. The aging effects are managed in the components which either are not evaluated in GALL, or, although not specifically evaluated, are relying on the AMP in GALL. These components are listed in Tables 3.2-2, 3.3-2, 3.3-3, 3.4-2, and 3.5-3 of the LRA and are included in ESF, auxiliary, and steam and power conversion systems, and containment structures and components. These components are made from cast iron, copper alloy, copper-zinc alloy, brass, ductile iron, and bronze. Selective leaching takes place when these components are exposed to raw water, corrosion-inhibited treated water, oxygenated and deoxygenated treated water, or are buried underground. The applicant's selective leaching program relies on inspection of the affected components.

Comment: Domestic Treated Water is oxygenated. DLL

Deleted: or

On the basis of the above discussion, the applicant concluded that the selective leaching program provides reasonable assurance that the aging effects associated with selective leaching will be adequately managed.

3.0.3.14.2 Staff Evaluation

In LRA Section B.3.6, "Selective Leaching Program," the applicant described its AMP to manage aging effects due to selective leaching. The LRA stated that this AMP is consistent with GALL AMP XI.M33, with the clarification that the applicant will not perform an evaluation of selective leaching by means of hardness testing during the one-time inspection. The staff confirmed the applicant's claim of consistency during the AMR inspection. Furthermore, the staff reviewed the clarification and its justification to determine whether the AMP, with the clarification, remains adequate to manage the aging effects for which it is credited, and reviewed the USAR Supplement to determine whether it provides an adequate description of the revised program.

The clarification of the program causes changes in some attributes of the GALL selective leaching program. Therefore, the staff reviewed this AMP against only those attributes of the applicant's program which deviate from the attributes of the GALL's selective leaching of materials program using the guidance in BTP RLSB-1, found in Appendix A of the SRP-LR.

[Scope of Program] The scope of the applicant's selective leaching program and the scope of the corresponding program in GALL do not address evaluating selective leaching in the buried

copper-zinc pipes. However, in response to the staff's RAI B.3.6-2, issued by letter dated October 11, 2002, the applicant, by letter dated December 19, 2002, indicated that the selective leaching program will credit the inspections performed by the "Buried Surfaces External Corrosion Program" in Section B.3.2 of the LRA. The staff finds this acceptable because the buried surfaces external corrosion program scope includes the copper-zinc pipes. The staff's evaluation of the buried surfaces external corrosion program can be found in Section 3.3.2.3.2 of this SER.

Comment: FYI. GALL Program Scope also doesn't address copper alloy or ductile iron, which is credited by FCS. DLL

[Parameters Monitored or Inspected] The applicant's selective leaching program deviates from the program in GALL by not requiring evaluation of selective leaching by means of hardness testing with a one-time inspection. By letter dated October 11, 2002, the staff issued RAI B.3.6-1, requesting the applicant to describe how the degradation due to leaching can be evaluated without hardness measurements, particularly for cases in which visual inspection cannot produce meaningful results. By letter dated December 19, 2002, the applicant justified this deviation by pointing out that there is no suitable equipment for performing these tests in the field. The staff finds this acceptable because the applicant is not able to perform this evaluation with its equipment.

Comment: Although we added this in our response based on their wishes, not having equipment to perform evaluation seems like a weak argument to be justified OK. Real reason is that visual can easily detect SL well in advance of a pressure boundary problem, and SL materials do not give accurate, repeatable hardness results. DLL

The applicant provided its USAR Supplement for the selective leaching program in Section A.2.21 of the LRA. The staff reviewed the USAR Supplement and finds that the summary description contains a sufficient level of information to satisfy 10 CFR 54.21(d), and is acceptable.

3.0.3.14.3 Conclusions

On the basis of its review and inspection of the applicant's program, the staff finds that those portions of the program for which the applicant claims consistency with GALL are consistent with GALL. In addition, the staff has reviewed the clarification to the GALL program and finds that the applicant's program provides for adequate management of the aging effects for which the program is credited. The staff also reviewed the USAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, on the basis of its review, the staff concludes that the applicant has demonstrated that the selective leaching program will effectively manage aging in the structures and components for which this program is credited so that there is reasonable assurance that the intended functions of the associated components and systems will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.0.3.15 Evaluation Findings

Comment: Based on the Table of Contents, this short paragraph is applicable to the entire 14 programs which precede it. I believe this should be deleted, since each program has an evaluation section and it adds no value. If it is required for some unknown reason, then how does it capture all the other programs which are embedded in the system sections ? DLL

The staff has reviewed the common AMPs in Appendix B of the LRA. On the basis of its review, including the applicant's commitments discussed above, the staff concludes that the applicant has demonstrated that these AMPs will effectively manage aging in the structures and components for which these AMPs are credited so that there is reasonable assurance that these components will perform their intended functions in accordance with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3). In addition, the staff has

reviewed the the USAR Supplements for these AMPs and concludes that the USAR Supplements provide an acceptable description of the programs and activities for managing the effects of aging of the components for which the AMPs are credited, as required by 10 CFR 54.21(d).

3.1.2.2.9 Loss of Preload Due to Stress Relaxation

As stated in the SRP-LR, loss of preload due to stress relaxation could occur in baffle/former bolts in Westinghouse and B&W reactors. Loss of preload on baffle/former bolts is due to neutron irradiation and could occur in components that are susceptible to SCC or IASCC. Since baffle/former bolts in CE reactors are not susceptible to SCC or IASCC, they would not be susceptible to loss of preload due to stress relaxation. FCS is a CE reactor and therefore this issue does not apply.

On the basis of its review, the staff finds that the applicant has adequately evaluated the management of the loss of preload due to stress relaxation for components in the reactor systems, as recommended in the GALL Report. On the basis of this finding, and the finding that the remainder of the applicant's program is consistent with GALL, the staff concludes that there is reasonable assurance that this aging effect will be adequately managed during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Comment: It is not clear what "program" is being referred to here. The previous paragraph notes the aging effect is not applicable to FCS. No program is referenced in this section. KRH

3.1.2.2.10 Loss of Section Thickness due to Erosion

As stated in the SRP-LR, 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 AMP to ensure that this aging effect is adequately managed. Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP). The staff reviewed 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 because FCS does not utilize impingement plates and supports for supplying feedwater to the steam generators. By letter dated February 20, 2003, the staff issued POI-8(b), requesting the applicant to clarify whether FCS has steam generator feedwater impingement plates and supports. By letter dated March 14, 2003, the applicant directed the staff to LRA AMR Item 3.1.1.14. On the basis of the applicant's response to POI-8(b), the staff finds that feedwater is supplied to steam generators through the steam generator feedwater feed ring. The steam generator feedwater feed ring is susceptible to cumulative fatigue and loss of material. Based on plant operating experience, it is not susceptible to loss of section thickness due to erosion. Since FCS does not utilize impingement plates and associated supports, and the steam generator feedwater feed ring is not susceptible to loss of section thickness due to erosion, this aging effect is not applicable to FCS. POI-8(b) is resolved.

On the basis of its review, the staff finds that the applicant has adequately evaluated the management of the loss of section thickness due to erosion for components in the reactor

systems, as recommended in the GALL Report. On the basis of this finding, and the finding that the remainder of the applicant's program is consistent with GALL, the staff concludes that there is reasonable assurance that this aging effect will be adequately managed during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Comment: It is not clear what "program" is being referred to here. The previous paragraph notes the aging effect is not applicable to FCS. No program is referenced in this section. KRH

3.1.2.3 Aging Management Programs for Reactor Systems Components

In SER Sections 3.1.2.1 and 3.1.2.2, the staff determined that the applicant's AMRs and associated AMPs will adequately manage component aging in the reactor systems. The staff then reviewed specific components in the reactor systems to ensure that they were properly evaluated in the applicant's AMR.

To perform its evaluation, the staff reviewed the components listed in LRA Tables 2.3.1.1-1 through 2.3.1.3-1 to determine whether the applicant had properly identified the applicable AMRs and AMPs needed to adequately manage component aging effects. This portion of the staff review involved identification of the aging effects for each component, ensuring that each aging effect was evaluated using the appropriate AMR in Section 3, and that management of the aging effect was captured in the appropriate AMP. The results of the staff's review are provided below.

The staff also reviewed the USAR Supplements for the AMPs credited with managing aging in reactor system components to determine whether the program description adequately describes the program.

The applicant credits 12 AMPs to manage the aging effects associated with components in the reactor systems. Seven of the AMPs are credited for managing the aging of components in several system groups (common AMPs), while five AMPs are credited with managing aging only for reactor system components. The staff's evaluation of the common AMPs is provided in Section 3.0.3 of this SER. A list of the common AMPs follows.

a. Bolting Integrity Program - SER Section 3.0.3.1
s Chemistry Program - SER Section 3.0.3.2
s Flow-Accelerated Corrosion Program - SER Section 3.0.3.4
s Inservice Inspection Program - SER Section 3.0.3.5
s Boric Acid Corrosion Prevention Program - SER Section 3.0.3.6
s Fatigue Monitoring Program - SER Section 3.0.3.8
s One-Time Inspection - SER Section 3.0.3.13

The staff's evaluation of the five reactor system AMPs is provided below.

3.1.2.3.1 Reactor Vessel Integrity Program3.1.2.3.1Reactor Vessel Integrity Program

3.1.2.3.1.1 Summary of Technical Information in the Application

The applicant's reactor vessel integrity program (RVIP) is documented in Section B.1.7 of the LRA. The applicant states that the RVIP is consistent with GALL program XI.31, "Reactor Vessel Surveillance," as identified in The GALL Report, with the enhancement that the revised, optimized withdrawal and test schedule was submitted for review and approval per OPPD Letter LIC-01-0107 dated November 8, 2001. This AMP is credited for managing loss of fracture toughness due to neutron irradiation embrittlement of the reactor vessel beltline shell and welds.

3.1.2.3.1.2 Staff Evaluation

The staff reviewed the enhancement and its justification to determine whether the AMP, with the enhancement, remains adequate to manage the aging effects for which it is credited. The staff also reviewed the USAR Supplement to determine whether it provides an adequate description of the revised program. The staff further reviewed the applicant's evaluation to determine whether it addressed the additional issues recommended in the GALL Report, and confirmed that the AMP would adequately address these issues.

In LRA Section B.1.7, "Reactor Vessel Integrity Program," the applicant described its AMP to manage aging in the reactor vessel beltline shell and welds. The LRA stated that this AMP is consistent with GALL AMP XI.31, with an enhancement that the revised, optimized withdrawal and test schedule was submitted for review and approval per OPPD Letter LIC-01-0107 dated November 8, 2001. For this AMP, GALL recommends further evaluation. The proposed withdrawal schedule was reviewed and approved by the staff in a letter from S. Dembek (NRC) to R. T. Ridenoure (OPPD) dated May 2, 2002. In this letter, the staff found the revised withdrawal schedule acceptable for 60 years. In addition, the staff approved an integrated surveillance program for FCS as described in CEN-636, Revision 2, in a safety evaluation dated June 6, 2001. The use of the integrated surveillance program allows OPPD to utilize data originating from the surveillance programs at Mihama 1, Palisades, and Diablo Canyon Unit 1, to monitor neutron irradiation embrittlement to the FCS reactor vessel beltline. The weld materials in Mihama 1, Palisades, and Diablo Canyon Unit 1 surveillance capsules contain material that is representative of the weld materials in the FCS beltline. The staff review that was documented in letters dated June 6, 2001, and May 2, 2002, satisfies the SRP recommendation for further evaluation.

The applicant provided its USAR Supplement for the RVIP in Section A.2.19 of the LRA. The staff reviewed the USAR Supplement and finds that the summary description contains a sufficient level of information to satisfy 10 CFR 54.21(d), and is acceptable.

3.1.2.3.1.3 Conclusion

On the basis of its review of the applicant's program, the staff finds that those portions of the program for which the applicant claims consistency with GALL are consistent with GALL. In addition, the staff has reviewed the enhancements to the GALL program and finds that the applicant's program provides for adequate management of the aging effects for which the program is credited. The staff also reviewed the USAR Supplement for this AMP and finds that it provides an adequate summary description of the program to satisfy 10 CFR 54.21(d).

Therefore, on the basis of its review, the staff concludes that the applicant has demonstrated that the RVIP will effectively manage aging in the components for which this program is credited so that there is reasonable assurance that the intended functions of the associated components and systems will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.3.2 Reactor Vessel Internals Inspection Program

3.1.2.3.2.1 Summary of Technical Information in the Application

The applicant's reactor vessel insternals inspection (RVII) program is discussed in LRA Section B.2.8, "Reactor Vessel Internals Inspection Program." The applicant states that the program is consistent with GALL programs XI.M13, "Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)," and XI.M16, "PWR Vessel Internals," with the exception that no augmented inspection of bolting is scheduled and the chemistry-related portions of the program are addressed in the FCS chemistry program. The tensile stresses on the reactor vessel internals bolting are lower than the industry levels where cracking was observed as an aging effect. The applicant also states that fluence and stress analyses discussed in GALL programs XI.M13 and XI.M16 will be performed to identify critical locations. A fracture mechanics analysis for critical locations will be performed to determine flaw acceptance criteria and resolution required to detect flaws. Appropriate inspection techniques will be based on these analyses. This AMP is credited for managing change of dimension due to void swelling and crack initiation and growth due to SCC and IASCC in reactor vessel internals.

Comment: typo - internals

3.1.2.3.2.2 Staff Evaluation

In LRA Section B.2.8, the applicant described its AMP to manage aging in reactor internals. The LRA stated that this AMP is consistent with GALL AMPs XI.M13 and XI.M16 with the exception that no augmented inspection of bolting is scheduled and the chemistry-related portions of the program are addressed in the FCS chemistry program. For these AMPs, GALL recommends further evaluation. GALL XI. M13 indicates that an applicant can implement either a supplemental examination of the affected component as a part of the 10-year ISI program during license renewal, or a component-specific evaluation to determine the component's susceptibility to loss of fracture toughness. GALL XI.M16 further indicates that an applicant's program should identify the most limiting component, develop appropriate inspection techniques, and implement the inspections during the license renewal term. These recommendations have been satisfied since the applicant indicates that fluence and stress analyses discussed in GALL programs XI.M13 and XI.M16 will be performed to identify critical locations. A fracture mechanics analysis for critical locations will be performed to determine flaw acceptance criteria and resolution required to detect flaws. Appropriate inspection techniques will be based on these analyses.

The staff confirmed the applicant's claim of consistency during the AMR inspection. Furthermore, the staff reviewed the exceptions and their justification to determine whether the

AMP, with the exceptions, remains adequate to manage the aging effects for which it is credited. The staff also reviewed the USAR Supplement to determine whether it provides an adequate description of the revised program. The staff further reviewed the applicant's evaluation to determine whether it addressed the additional issues recommended in the GALL Report and confirmed that the AMP would adequately address these issues.

For bolted components, GALL XI.M16 indicates that an augmented ISI is recommended to detect cracks between the bolt head and shank unless the applicant performs component-specific mechanical analyses to preclude cracking. In the "operating experiences" portion of the RVII program, the applicant provided an evaluation of the susceptibility of cracking in baffle former bolts and CEA shroud bolts. The Combustion Engineering Owners Group (CEOG) provided an assessment of the cracking of the baffle former bolts reported in foreign PWRs, including the potential impact of the cracking on domestic CE plants. The results are in CEOG Report CE NPSD-1098 for CEOG Task 1011, "Evaluation of the Applicability of Baffle Bolt Cracking to Ft. Calhoun and Palisades Internals Bolts," Final Report, Revision 0, April 1998. The most likely mechanism for the cracking of cold-worked 316 stainless steel baffle former bolts in foreign plants is IASCC. There are only two CE-designed plants (FCS and Palisades) that use bolts to attach the core shroud panels (i.e., the baffle plates) to the former plates. The report indicates that these bolts in FCS are less susceptible to IASCC because (1) the material used in these bolts is annealed 316 stainless steel, which is not cold-worked (2) the bolt stress from preload, as a percentage of yield strength, is much less than the foreign PWRs that cracked, (3) the differential pressure across the core shroud panels does not result in tensile loads on the panel (i.e., the baffle bolts) during normal operation and (4) the core shroud panel design allows for some flexing of the former plate relative to the core barrel, thus reducing the load on the panel bolts. Since CE NPSD-1098 was issued, cracking has been discovered in Point Beach baffle bolts. However, as with the foreign PWR experience, cracked bolts were highly stressed during preload, tensile stresses were applied during operation because of the Westinghouse design, and the bolts were fabricated with cold-worked 316 stainless steel. Based on the difference in the design, materials, and preload between the Point Beach and the foreign PWR that experienced baffle former bolt cracking, the FCS baffle former bolts are less susceptible to cracking and augmented inspection is not necessary.

SCC was identified in Babcock and Wilcox (B&W) lower thermal shield and lower core barrel bolts that were fabricated with Alloy A-286. Most of the failed bolts were highly stressed to at or over the yield strength. Although there have been no failures of CEA shroud bolts in CE-designed reactor vessel internals, there is a concern that SCC may occur since these bolts are fabricated with Alloy A-286. CE provided an evaluation of the stress level for these bolts in CEN-282, "Investigation and Evaluation of A286 Bolt Applications in CE's NSSS," September 1984. This report indicates that the operating stress levels are just below 32 Ksi. The stress concentration factor for the CEA shroud bolts is 2.06, leading to a local stress of approximately 66 Ksi. Yield strength for A-286 is about 115 Ksi, so the stress is approximately 60 percent of yield. Most of the failed B&W bolts had working stresses of approximately 65 Ksi and a local stress of 134 Ksi which is above the yield strength of the material. There were no failed bolts with working stresses of 35 Ksi. The conclusion of the report indicates a low probability for cracking of the CEA shroud bolts. Based on the difference in the operating stresses on the CEA

shroud bolts and the failed B&W bolts, and the fact that there have been no failures of CEA shroud bolts in CE-designed reactor vessel internals, the CEA shroud bolts are less susceptible to SCC and augmented inspection is not necessary.

The applicant provided its USAR Supplement for the RVII program in Section A.2.20 of the LRA. The staff reviewed the USAR Supplement and finds that the summary description contains a sufficient level of information to satisfy 10 CFR 54.21(d), and is acceptable.

3.1.2.3.2.3 Conclusion

On the basis of its review and inspection of the applicant's program, the staff finds that those portions of the program for which the applicant claims consistency with GALL are consistent with GALL. In addition, the staff has reviewed the exceptions and enhancements to the GALL program and finds that the applicant's program provides for adequate management of the aging effects for which the program is credited. The staff also reviewed the USAR Supplement for this AMP and finds that it provides an adequate summary description of the program to satisfy 10 CFR 54.21(d).

Therefore, on the basis of its review, the staff concludes that the applicant has demonstrated that the RVII program will effectively manage aging in the components for which this program is credited so that there is reasonable assurance that the intended functions of the associated components and systems will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.3.3 Steam Generator Program

3.1.2.3.3.1 Summary of Technical Information in the Application

The applicant's steam generator program (SGP) is discussed in LRA Section B.2.9, "Steam Generator Program." The applicant states that the program is consistent with GALL program XI.M19, "Steam Generator Tube Integrity," with the clarifications that the applicant has included aging management activities to address plant-specific AMP requirements identified in Table 3.1.1 of the LRA, and the enhancement that the applicant has added plant-specific components beyond those discussed in GALL and identified in Table 3.1.2 of the LRA, for which the SGP is identified as an AMP. The applicant also identified an enhancement which states that an annunciator response procedure for the loose parts monitor in the SG will be written.

This AMP is credited with managing aging in the SG shell assembly; SG tubes, repair sleeves, and plugs; tube support lattice bars made of carbon steel; carbon steel tube support plates; SG lower head and primary side tube sheet; secondary side of the tubesheet, SG feedwater, steam and instrument nozzles, and feedwater nozzle safe ends; SG steam nozzle safe end; and SG feed ring.

The applicant stated that SG management of aging effects has evolved and improved over the years based on industry experience. The applicant has adopted industry practices throughout

the years and continues to do so. Past NRC inspections of this program cited sample plans and inspection evaluation as a strength. Only one noteworthy situation occurred at FCS. In 1984, a tube with ODSCC in the U-bend region of the SG ruptured. Re-evaluation of the eddy current data from the previous inspection indicated that flaws were present and had been missed during the data analysis due to human error. This situation was corrected and long-term corrective actions were implemented to prevent recurrence. Currently, the applicant's practices are state-of-the-art. The overall experience illustrates that the SGP is effective in managing aging.

On the basis of the above discussion, the applicant concluded that the SGP provides reasonable assurance that the SG component aging effects will be adequately managed.

3.1.2.3.3.2 Staff Evaluation

In LRA Section B.2.9, the applicant described its AMP to manage aging in SG components. The LRA stated that this AMP is consistent with GALL AMP XI.M19, with the exception that the applicant included aging management activities to address plant-specific AMP requirements identified in Table 3.1-1 of the LRA, and the applicant added plant-specific components, beyond those discussed in GALL and identified in Table 3.1-2 of the LRA, for which the SGP is identified as an AMP. The applicant also identified an enhancement which states that an annunciator response procedure for the loose parts monitor in the SG will be written prior to the period of extended operation. For this AMP, GALL recommends further evaluation. Furthermore, the staff reviewed the clarifications and enhancements, and the applicant's justifications, to determine whether the AMP remains adequate to manage the aging effects for which it is credited. The staff reviewed the USAR Supplement to determine whether it provides an adequate description of the revised program. The staff further reviewed the applicant's evaluation to determine whether it addressed the additional issues recommended in the GALL Report to confirm whether the AMP would adequately address these issues.

3.1.2.3.3.2.1 Annunciator Response Procedure Enhancement

The applicant's LRA indicates that an annunciator response procedure will be written for the loose parts monitor in the SG, which was identified as an enhancement to the SGP AMP. In RAI B.2.9-1, the staff stated that it was not clear why the SGP was being enhanced to write an annunciator response procedure for the loose parts monitor for the SG, since the LRA states that loose parts monitoring is not credited for aging management. In response to RAI B.2.9-1, the applicant states that it has committed to NEI 97-06, "Steam Generator Program Guidelines," which states, "Licensees should have alarm response procedures for the loose parts monitoring system." Therefore, the applicant credits the annunciator response procedure for NEI 97-06 compliance, not as an AMP. In addition, the applicant stated that they have an annunciator response procedure that complies with the guidance in NEI 97-06. The staff finds the response acceptable and considers this issue closed.

On the basis of the applicant's response to RAI B.2.9-1, the staff concludes that the enhancement to the SGP will adequately address the management of loose parts at FCS to satisfy 10 CFR 54.21(a)(3).

3.1.2.3.3.2.2 Loss of Material Due to Pitting and Crevice Corrosion

As stated in the SRP-LR, loss of material due to pitting and crevice corrosion could occur in the PWR SG shell assembly. The existing program relies on control of chemistry to mitigate corrosion, and ISI to detect loss of material. The extent and schedule of the existing SG inspections are designed to ensure that flaws cannot attain a depth sufficient to threaten the integrity of the welds. However, according to NRC IN 90-04, "Cracking of the Upper Shell-to-Transition Cone Girth Welds in Steam Generators," dated January 26, 1990, if general corrosion pitting of the shell exists, the program may not be sufficient to detect pitting and corrosion. The GALL Report recommends augmented inspection to manage this aging effect. The staff review verifies that the applicant has proposed a program that will manage loss of material due to pitting and crevice corrosion by providing enhanced inspection and supplemental methods to detect loss of material and ensure that the component intended function will be maintained during the period of extended operation.

In response to RAI 3.1.1-1, the applicant indicated that the pitting and crevice corrosion discussed in IN 90-04 is applicable to Westinghouse Model 44 and Model 51 vertical, recirculating, U-tube SGs with feedwater ring design. FCS has CE SGs. Based on an evaluation from CE, the applicant concluded that the shell-to-cone girth welds at FCS will not be susceptible to cracking that is similar to that identified in IN 90-04.
In addition, 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 made from 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 a discovery of an 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 CAP provides an 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 did 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 for the following reasons.

(1) The applicant states that at least one of these components is "representatively" visually inspected each refueling outage. The applicant needed to explain what

"representatively" means in this context and the basis for the appropriateness of this level of inspection (i.e., sample size).

(2) To detect pitting and crevice corrosion, the visual inspection must be performed in accordance with specified requirements (e.g., ASME Code VT-1). The applicant needed to describe the method or technique (including codes and standards) used to perform the visual inspection.

(3) The applicant needed to specify the acceptance requirements utilized to analyze the condition of the component once a condition report is initiated, thus ensuring that the structure and component intended function(s) are maintained under all CLB design conditions during the period of extended operation.

By letter dated February 20, 2003, the staff issued POI-7(d)(1), requesting the applicant to address these issues. By letter dated March 14, 2003, the applicant responded to POI-7(d)(1) by stating that "representatively" implies that the item inspected bounds items that are not inspected. The manways and handholds are visually inspected each time. Since these components are all low-alloy steel in a deoxygenated treated water environment, and there is no site or industry experience with significant degradation to these components, then the inspection of the internal surfaces of the manways and handholds are representative of the other non-inspected items. A detailed crawl-through of the SG secondary side occurs and allows observation of other internal surfaces as well.

There is no specific industry standard for acceptance criteria established for visual inspections of the secondary side pressure boundary surfaces. The condition of the secondary side SG components is considered acceptable if the knowledgeable personnel responsible for the performance of the inspections determine that there is no evidence of damage or degradation sufficient to warrant further evaluation or performance of repair/replacement activities. Although inspections are not required to be performed in accordance with ASME VT-1 requirements, inspections are overseen by Quality Control personnel who are VT-1 qualified. OPPD continues to perform these secondary side pressure boundary inspections as presented in OPPD's response to GL 97-06, dated March 25, 1998. In the NRC closeout of that response, dated September 29, 1999, the staff found these inspection practices provided reasonable assurance that the SG internals are in compliance with the current licensing basis. NUREG/CR-6754 concluded that there are no near-term problems nor is there a need for any immediate change in the current SG internals inspections. Furthermore, these same components are inspected for loss of material at the weld locations by ultrasonic testing by the inservice inspection program. Since there is no site or industry experience with significant pressure boundary degradation, OPPD considers these inspections as adequate aging management for the period of extended operation.

The staff has reviewed the applicant's response to POI-7(d)(1) and finds it acceptable because (1) the response clarifies what a representative visual inspection entails and that the scope of the inspections is adequate to represent the population of components of concern, (2) the applicant clarified that there are no specific acceptance criteria used across the industry, for

visual inspections of secondary side pressure boundary surfaces and has provided information on the current activities used by FCS to manage aging of these surfaces, including inspector qualifications, and has noted the staff's approval of these activities, and (3) these activities will be continued during the period of extended operation. On this basis, POI-7(d)(1) is resolved.

The staff finds that the applicant has adequately evaluated the management of loss of material due to pitting and crevice corrosion for components in the reactor systems, including the SG shell assembly, as recommended in the GALL Report. Further, on the basis of this finding, the staff concludes that there is reasonable assurance that this aging effect will be adequately managed during the period of extended operation to satisfy 10 CFR 54.21(a)(3).

The staff also reviewed the USAR Supplement for this AMP and finds that it provides an adequate summary description of the program to satisfy 10 CFR 54.21(d).

3.1.2.3.3.2.3 Loss of Section Thickness Due to Erosion

As stated in the SRP-LR, loss of section thickness due to erosion could occur in SG feedwater impingement plates and supports. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that this aging effect is adequately managed.

The applicant indicates that the components are not applicable to FCS. This item is further discussed in Section 3.1.2.2.10 of this SER.

On the basis of its review, the staff finds that the applicant has adequately evaluated the management of the loss of section thickness due to erosion for components in the reactor systems, as recommended in the GALL Report. On the basis of this finding, and the finding that the remainder of the applicant's program is consistent with GALL, the staff concludes that there is reasonable assurance that this aging effect will be adequately managed during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.3.3.2.4 Crack Initiation and Growth Due to PWSCC, ODSCC, or Intergranular Attack, or Loss of Material Due to Wastage and Pitting Corrosion, or Loss of Section Thickness Due to Fretting and Wear, or Denting Due to Corrosion of Carbon Steel Tube Support Plate

As stated in the SRP-LR, crack initiation and growth due to PWSCC, ODSCC, or IGA or loss of material due to wastage and pitting corrosion, or deformation due to corrosion, could occur in Alloy 600 components of the SG tubes, repair sleeves and plugs.

All PWR licensees have committed voluntarily to an SG degradation management program described in NEI 97-06, "Steam Generator Program Guidelines." The GALL Report recommends that an AMP based on the recommendations of staff-approved NEI 97-06 guidelines, or some other alternate regulatory basis for SG degradation management, should be developed to ensure that this aging effect is adequately managed.

At present, the staff does not plan to endorse NEI 97-06 or detailed industry guidelines referenced therein. The staff is working with the industry to revise plant technical specifications to incorporate the essential elements of the industry's NEI 97-06 initiative as necessary to ensure tube integrity is maintained. This would require implementation of programs to ensure that performance criteria for tube structural and leakage integrity are maintained, consistent with the plant design and licensing basis. NEI 97-06 provides guidance on programmatic details for accomplishing this objective. These guidelines apply to all degradation or damage mechanisms. However, these programmatic details would be outside the scope of the technical specifications.

As part of the NRC Reactor Oversight Program, the NRC would monitor the effectiveness of these programs in terms of whether the bottom line goals of these programs are being met particularly whether the tube structural and leakage integrity performance criteria are in fact being maintained. 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 for the period of extended operation.

The applicant has proposed to manage by the Steam Generator Program (B.2.9) and the Chemistry Program (B.1.2) (1) crack initiation and growth due to PWSCC, ODSCC, or IGA, or (2) loss of material due to wastage and pitting corrosion, (3) loss of section thickness due to fretting and wear, or (4) denting due to corrosion of carbon steel tube support plates in the SG tubes, repair sleeves, and plugs. The staff's review of the Steam Generator Program (B.2.9) is discussed here. The staff's review of the Chemistry Program is discussed in Section 3.0.3.2. of this SER. In response to RAI B.2.9-1, the applicant indicated that the SGP is consistent with GALL program XI.19, "Steam Generator Tube Integrity Program," and with guidance contained in NEI 97-06.

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The staff reviewed the USAR Supplement for this AMP and finds that it provides an adequate summary description of the program to satisfy 10 CFR 54.21(d).

On the basis of its review, the staff finds that the applicant has adequately evaluated the management of (1) crack initiation and growth due to PWSCC, ODSCC, or IGA, or (2) loss of material due to wastage and pitting corrosion, (3) loss of section thickness due to fretting and wear, or (4) denting due to corrosion of carbon steel tube support plate in the SG tubes, repair sleeves and plugs, as recommended in the GALL Report. On the basis of this finding, and the finding that the remainder of the applicant's program is consistent with GALL, the staff concludes that there is reasonable assurance that these aging effects will be adequately managed during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.3.3.2.5 Loss of Section Thickness Due to Flow-Accelerated Corrosion

As stated in the SRP-LR, loss of section thickness due to FAC could occur in tube support lattice bars made of carbon steel. The GALL Report recommends that a plant-specific AMP be evaluated and, on the basis of the guidelines of NRC GL 97-06, an inspection program for SG internals be developed to ensure that this aging effect is adequately managed. The staff

reviewed the applicant's proposed program to ensure that an adequate program will be in place for the management of these aging effects for the period of extended operation.

Loss of section thickness due to FAC in tube support lattice bars made of carbon steel is managed by the SGP. In response to RAI B.2.9-2, the applicant indicated that tube supports (batwings, eggcrates, and vertical grids) are visually inspected for loss of material due to FAC, 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 did 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 for the following reasons.

(1) The applicant indicates that tube supports (batwings, eggcrates, and vertical grids) are visually inspected for loss of material due to FAC, 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 used (i.e., visual and/or ECT) for 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 did not specify the acceptance requirements utilized to analyze the condition of the component based on the inspection results.

By letter dated February 20, 2003, the staff issued POI-7(d)(2), requesting the applicant to address these issues.

By letter dated March 14, 2003, the applicant responded to POI-7(d)(2) by stating that the inspection includes visible tube support structures as seen on a detailed crawlthrough of the SG secondary side. Visible tube support structures include visible portions of the vertical and diagonal supports protruding from the top of the tube bundle, the periphery of the # 8 tube support plates and small portions of the periphery of the # 7 eggcrate support. Also included are portions of the supports which are visible through the handholes. The results are documented in the inspection procedure and in photographs taken during the inspection with standard and macro-capable photographic equipment.

Comment: sp crawl through

Further, the applicant explained that the method and technique were described and there are no specific industry codes and standards for the visual examination of these secondary side internals. Eddy-current testing of the tubes is performed per technical specifications and NEI 97-06 guidance documents.

In addition, the response stated that there is no specific industry standard for acceptance criteria established for visual inspections of the secondary side pressure boundary surfaces. The condition of the secondary side SG components is considered acceptable if the knowledgeable personnel responsible for the performance of the inspections determines that there is no evidence of damage or degradation sufficient to warrant further evaluation or performance of repair/replacement activities. The Combustion Engineering Owners Group (CEOG) Evaluation of Degraded Secondary Internals Operability Assessment, (performed as an industry response to GL 97-06), concluded that even those plants which had experienced degradation of tube supports could continue to operate safely because there was adequate margin against tube damage and the damage could be detected in the normal eddy current examinations. Therefore the detection level is not an issue. Furthermore, the CEOG evaluation concludes that this damage mechanism only occurs when there is fouling sufficient to redistribute the flow to the periphery of the bundle. No steam pressure loss has been noted at FCS which would be apparent if fouling were occurring at a level sufficient to redistribute the flow. These tube support inspections were presented in OPPD's response to GL 97-06, dated March 25, 1998. In the NRC closeout of that response, dated September 29, 1999, the staff found the inspection practices provided reasonable assurance that the SG internals are in compliance with the current licensing basis. Furthermore, since site operating experience has not found flow-accelerated corrosion in the supports, OPPD concludes that these inspections are adequate aging management.

The staff reviewed the applicant's response and finds it acceptable because it addresses the staff's issues with regard to the scope, techniques, and acceptance criteria associated with the management of the subject components with regard to loss of section thickness due to FAC. On the basis of the information provided in the POI response, the staff concludes that loss of section thickness due to FAC in tube support lattice bars made of carbon steel will be adequately managed by the SGP during the period of extended operation. POI-7(d)(2) is resolved.

The staff reviewed the USAR Supplement for this AMP and finds that it provides an adequate summary description of the program to satisfy 10 CFR 54.21(d).

On the basis of its review, the staff finds that the applicant has adequately evaluated the management of the loss of section thickness due to FAC for tube supports (batwings, eggcrates, and vertical grids), as recommended in the GALL Report. Further, on the basis of this finding, the staff concludes that there is reasonable assurance that this aging effect will be adequately managed during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.3.3.2.6 Ligament Cracking Due to Corrosion

As stated in the SRP-LR, ligament cracking due to corrosion could occur in carbon steel components in the SG tube support plate. All PWR licensees have committed voluntarily to a SG degradation management program described in NEI 97-06. The GALL Report recommends that an AMP based on the recommendations of staff-approved NEI 97-06 guidelines, or some other alternate regulatory basis for SG degradation management, be developed to ensure that this aging effect is adequately managed.

At present, the staff does not plan to endorse NEI 97-06 or detailed industry guidelines referenced therein. The staff is working with the industry to revise plant technical specifications to incorporate the essential elements of the industry's NEI 97-06 initiative as necessary to ensure tube integrity is maintained. This would require implementation of programs to ensure that performance criteria for tube structural and leakage integrity are maintained, consistent with the plant design and licensing basis. NEI 97-06 provides guidance on programmatic details for accomplishing this objective. These guidelines apply to all degradation or damage mechanisms. However, these programmatic details would be outside the scope of the technical specifications.

As part of the NRC Reactor Oversight Program, the NRC would monitor the effectiveness of these programs in terms of whether the bottom line goals of these programs are being met particularly whether the tube structural and leakage integrity performance criteria are being maintained. The staff reviewed the applicant's proposed program to ensure that an adequate program will be in place for the management of these aging effects.

Ligament cracking due to corrosion in the carbon steel SG tube support plates is managed by the Steam Generator Program (B.2.9) and the Chemistry Program (B.1.2). The staff's review of the Steam Generator Program (B.2.9) is discussed here. The staff's review of the Chemistry Program is discussed in Section 3.0.3.2 of this SER. 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 (FAC, 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. By letter dated February 20, 2003, the staff issued POI-7(d)(3) requesting the applicant to provide this information.

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By letter dated March 14, 2003, the applicant responded to POI-7(d)(3) by stating that cracking was inadvertently left off the list when the revised RAI response was submitted. Information regarding inspection sample size were already provided. There is no industry acceptance criteria related to detecting the presence of ligament cracking on support plates. Although minor cracking has occurred in the upper most tube support plates, this cracking was the result of stresses being relieved after a rim cut modification to allow expansion of the plates. As stated in NUREG/CR-6754, the rim cut modification was a proactive measure to minimize the possibility of denting and delaying the onset of ligament cracking. The CEOG Evaluation of Degraded Secondary Internals Operability Assessment concluded that support plate cracking is not detrimental to the safe operation of the plant and there are no reported tube wear indications directly related to tube support degradation. Therefore, the level of detectability of cracks is not

an industry issue. Furthermore, these tube support inspections were presented in OPPD's response to GL 97-06, dated March 25, 1998, and the staff found the inspection practices provided reasonable assurance that the SG internals are in compliance with the current licensing basis. Therefore, the applicant concludes that management of aging is adequate for this aging mechanism.

The staff reviewed the applicant's response to POI-7(d)(3) and finds it acceptable because the applicant provides the requested information regarding scope, techniques, acceptance criteria, and experience associated with detecting ligament cracking due to corrosion in carbon steel components in the SG tube support plate. On the basis of this POI response, the staff finds that the SGP at FCS will adequately manage ligament cracking in the tube support plate during the period of extended operation. POI-7(d)(3) is resolved.

The staff reviewed the USAR Supplement for this AMP and finds that it provides an adequate summary description of the program to satisfy 10 CFR 54.21(d).

On the basis of its review, the staff finds that the applicant has adequately evaluated the management of the ligament cracking due to corrosion for tube supports (batwings, eggcrates, and vertical grids), as recommended in the GALL Report. On the basis of this finding, the staff concludes that there is reasonable assurance that this aging effect will be adequately managed during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.3.3.2.7 Plant-Specific Components from Table 3.1-2 of the LRA

The applicant identified a number of plant-specific components in Table 3.1-2 of the LRA which identified the SGP as the program that manages aging of the components. The staff's evaluation of these components is documented below.

3.1.2.3.3.2.7.1 Nozzles, Nozzle Safe Ends, and Feedring

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., SG feedwater, blowdown, steam and instrument nozzles, steam and feedwater nozzle safe ends, and the SG feedring). 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 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 a discovery of an 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 an acceptable

Comment: Their paraphrased listing is incorrect. Response stated "nozzles (blowdown, feedwater, instrument, steam), nozzle safe ends (feedwater, steam)". DLL

means of review, evaluation, and corrective action. Because the UT revealed little or no degradation in 29 years of operation, and site Class Cleanliness Standards would require corrective action long 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 did 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 must provide the basis for the statement that the carbon steel feedring is more susceptible to aging that 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 needed to 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. By letter dated February 20, 2003, the staff issued POI-7(d)(4), requesting the applicant to address these issues.

By letter dated March 14, 2003, the applicant responded to POI-7(d)(4) by stating that the nozzles, nozzle safe ends and feedring are all in the same environment of deoxygenated treated water >200°F. The carbon steel feedring is more susceptible to corroding than low-alloy steel nozzles and nozzle safe ends, and therefore is bounding. The carbon steel feedring is equally susceptible to corroding as the carbon steel nozzles and nozzle safe ends. Furthermore, the material of the feedring is thinner than the thickness of the nozzles and nozzle safe ends.

Comment: *[Per discussion at the OI/CI resolution meeting, need to include the SGBD nozzles.]*

Comment: This statement was in POI response and is apparently omitted.

The POI response also stated that the visible portions of the feedring inspected include almost the entire feedring, excluding the underside. The basis of this extent is accessibility. In addition, POI-7(d)(1) discusses ASME Code VT-1. There are no codes and standards for performing this visual inspection. Finally, once a condition report is written, the site Corrective Action Program provides the means of review, evaluation, and corrective action. The results of evaluations determine the acceptance criteria and may be based on many variables.

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The staff reviewed the applicant's response to POI-7(d)(4) and finds it acceptable because the response (1) provides the basis for using the carbon steel feedring as a bounding component for management of the nozzles and safe ends, (2) provides the extent of the feedring inspection and its basis, (3) clarifies the techniques, used for the inspections, and (4) clarifies the inspection acceptance criteria. On the basis of the information provided in the POI response,

the staff finds that the SGP at FCS will adequately manage nozzles, nozzle safe ends, and the feedring during the period of extended operation. POI-7(d)(4) is resolved.

The staff reviewed the USAR Supplement for this AMP and finds that it provides an adequate summary description of the program to satisfy 10 CFR 54.21(d).

On the basis of its review, the staff finds that the applicant has adequately evaluated the management of the loss of material due to general, pitting and crevice corrosion, and galvanic corrosion for the nozzles, nozzle safe ends, and feedring. On the basis of this finding, the staff concludes that there is reasonable assurance that this aging effect will be adequately managed during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.3.3.2.7.2 Secondary-Side Tubesheet

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 ECT during each refueling outage for loss of material due to 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 lane. In addition, ECT of the tubes would indicate if the adjacent tubesheet was degrading. The Corrective Active Program provides an acceptable means of review, evaluation, and corrective action. Because the tubesheet is over 22 inches thick and ECT can reflect tubesheet loss, this visual inspection (augmented by ECT) is adequate to maintain the pressure boundary function of the tubesheet.

Comment: Although the response had "line", it is actually "lane". The blowdown lane is the blank area between the tubes on the tubesheet below the "U" bend region. DLL

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The applicant's RAI response did 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 did not specify the acceptance criteria (for the visual and ECT) and the basis for the acceptance criteria. By letter dated February 20, 2003, the staff issued POI-7(d)(5) requesting the applicant to address these issues.

By letter dated March 14, 2003, the applicant responded to POI-7(d)(5) by stating that there are no industry acceptance criteria for visual inspections of the tubesheet. Eddy-current testing of the tubes is performed per technical specifications and NEI 97-06 guidance documents. Based on the thickness of the tubesheet and that there is no site or industry experience related to loss of material, OPPD considers this inspection adequate management of the pressure boundary.

The staff reviewed the applicant's response to POI-7(d)(5) and finds it acceptable because it provides clarifying information with regard to the methods and acceptance criteria associated with the inspection of the SG tube sheet. On the basis of the information provided in the POI response, the staff concludes that the SGP will adequately manage the secondary side tubesheet during the period of extended operation. POI-7(d)(5) is resolved.

The staff reviewed the USAR Supplement for this AMP and finds that it provides an adequate summary description of the program to satisfy 10 CFR 54.21(d).

On the basis of its review, the staff finds that the applicant has adequately evaluated the management of the loss of material due to general, pitting, and crevice corrosion for the secondary-side tubesheet. Further, on the basis of this finding, the staff concludes that there is reasonable assurance that this aging effect will be adequately managed during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.3.4.3 USAR Supplement

The applicant's USAR Supplement for the Alloy 600 program is documented in Section A.2.1 of Appendix A to the LRA and provides an overview of the program as described in Section B.3.1 of Appendix B to the LRA. The CLB description for the Alloy 600 program, as reflected in Section A.2.1 of the USAR Supplement, is only reflective of the applicant's responses to GL 97-01, and not NRC Order EA-03-009 (February 11, 2003), as well as the applicant's responses to NRC Bulletin 2001-01, 2002-01, and 2002-02. In RAI B.3.1-1, Part 3, the staff requested that OPPD incorporate its responses to RAI B.3.1-1, Parts 2 and 3 into the next revision to the USAR Supplement description for the Alloy 600 program because the staff anticipated that the responses to the RAIs would provide clarifying content as to how the AMP would be sufficient to manage cracking in ASME Code Class 1 components made from Alloy 600 or Alloy 182/82 materials (i.e., Inconel alloy materials).

By letter dated December 19, 2002, the applicant provided the following response to RAI B.3.1-1, Part 3:

> The level of detail provided in response to Part 2 of this RAI is not consistent with the level of detail provided in the FCS USAR and will not be included in the USAR Supplements. OPPD will incorporate appropriate information from the OPPD responses to GL 97-01 and NRC Bulletins 2001-01, 2002-01, and 2002-02.

The staff's acceptance of the FCS Alloy 600 program is dependent upon a satisfactory description of the Alloy 600 program, that reflects final industry recommendations. Because the current USAR Supplement does not describe the applicant's final program that reflects its commitment to implement the recommendations resulting from industry initiatives, the staff has documented in Appendix A of this SER, the applicant's commitment to submit the AMPs and associated USAR Supplements, prior to the period of extended operation.

Comment: I did not see this specific commitment identified in Appendix A of this SER. KRH

3.1.2.4.2.2 Staff Evaluation

This section provides the results of the staff's evaluation of the applicant's AMR for the aging effects and the AMPs credited for managing them, in the RCS. The staff also reviewed the applicable USAR Supplements to ensure that the program descriptions adequately describe the AMPs.

Aging Effects

In accordance with Section 3.1 of the LRA, the applicant has performed a review of industry experience and NRC generic communications relative to the RCS components to provide reasonable assurance that the AERMs for a specific material-environment combination are the only aging effects of concern for FCS.

The LRA identified the following applicable aging effects for the RCS:

- loss of material
- loss of fracture toughness due to thermal embrittlement
- cracking
- loss of preload
- fatigue

The passive, long-lived components in the RCS that are subject to an AMR are identified in LRA Tables 3.1-1, 3.1-2, and 3.1-3. LRA Table 3.1-1 includes components which were evaluated in the GALL Report. Components that the applicant indicates are consistent with GALL need no additional evaluation because GALL components and programs that are identified in GALL, and require no further evaluation, are acceptable to the staff. Components that require further evaluation are discussed in SER Section 3.1.2.2. The materials and environment for these components are identified in GALL.

LRA Table 3.1-2 includes components which were not evaluated in GALL. The table identifies the aging effects, materials, environments, and programs proposed for managing the aging effect. The staff has reviewed the information in this table and finds that the applicant has identified the applicable aging effects.

LRA Table 3.1-3 includes components which were not evaluated in GALL, but that the applicant has determined that the component materials, environments, and aging effects can be adequately managed using AMPs evaluated in the GALL Report. The staff has reviewed this table and concludes that the applicant has identified the applicable aging effects.

On the basis of its review, the staff finds the applicant has identified the appropriate aging effects for the materials and environments associated with the RCS.

Aging Management Programs

The applicant has credited the following AMPs to manage the aging effects described above for the RCS:

- Bolting Integrity Program - SER Section 3.0.3.1
- Chemistry Program - SER Section 3.0.3.2
- Flow-Accelerated Corrosion Program - SER Section 3.0.3.4
- Inservice Inspection Program - SER Section 3.0.3.5
- Boric Acid Corrosion Prevention Program - SER Section 3.0.3.6
- Cooling Water Corrosion Program - SER Section 3.0.3.7

- General Corrosion of External Surfaces Program - SER Section 3.0.3.12
- One-Time Inspection Program - SER Section 3.0.3.13
- Steam Generator Program - SER Section 3.1.2.3.3
- Alloy 600 Program - SER Section 3.1.2.3.4
- Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Program - SER Section 3.1.2.3.5

LRA Table 3.1-2 includes components which were not evaluated in GALL. The table identifies the aging effects, materials, environments, and programs proposed for managing the aging effects. The staff has reviewed the information in this table and finds that the applicant has identified appropriate AMPs to manage the aging effects identified in LRA Table 3.1-2.

LRA Table 3.1-2, rows 3.1.2.04 and 3.1.2.05, indicate that the SG lower head, manway cladding, primary side tubesheet and reactor coolant pump (RCP) thermal barrier are subject to cracking and the AMP is the chemistry program. The chemistry program will, to some extent, mitigate cracking but will not monitor cracking. In RAI 3.1.2-1, the staff requested that the applicant provide its basis for concluding that monitoring of crack initiation and growth is not necessary for these components. The applicant's program for managing the aging effects for the SG lower head, manway cladding, and primary side tubesheet is discussed in SER Section 3.1.2.3.3.

Comment: Verify with #11 of the Matrix Table. Per DLL 3.1.2.04 is correct for Steam Generator Primary head (Cladding)

In response to RAI 3.1.2-1, the applicant indicated that the 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 it will continue to visually inspect and perform a dye-penetrant exam on the two remaining RCP thermal barriers when the rotating assemblies are refurbished. This was confirmed in the response to POI-8(d), which was issued by the staff on February 20, 2003. Based on the operating and inspection results to date on the RCP thermal barriers, the applicant does not believe that periodic ISI of the RCP thermal barriers is necessary. However, the applicant has agreed to include the RCP thermal barriers within its one-time inspection program. Since cracking has not been observed in all the inspections performed to date, the staff agrees that periodic ISI of the RCP thermal barriers is not necessary and that the one-time inspection program will be an acceptable program to determine whether this cracking is a significant aging effect for the RCP thermal barriers. In addition to the RCP thermal barriers, the applicant will also credit the one-time inspection program for the inspection of the seal water coolers, which are part of the RCP rotating assembly. This one-time inspection will perform an air drop test on the seal water coolers to ensure tube integrity.

3.2.2.1 Aging Management Evaluations in the GALL Report That Are Relied on for License Renewal, Which Do Not Require Further Evaluation

For component groups evaluated in GALL for which the applicant has claimed consistency with GALL, and for which GALL does not recommend further evaluation, the staff sampled components in these groups during its inspection and audit conducted from January 6-10, 2003, and from January 20-23, 2003, to determine whether the plant-specific components contained in these GALL component groups were bounded by the GALL evaluation. The staff also sampled component groups during its inspection and audit to determine whether the applicant had properly identified those component groups in GALL that were not applicable to its plant. Specifically, the staff sampled the following three audit items for the ESF systems:

1. In LRA Tables 2.3.2.1-1 and 2.3.2.2-1, closure boltings of the ESF systems are linked to rows 3.2.1.11 and 3.2.1.12 of LRA Table 3.2-1. The audit was to confirm that, for all in-scope closure bolting in the ESF systems, the bolt materials are consistent with those specified in The GALL Report, Vol. 2.

2. 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 audit 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 The GALL Report, Vol. 2.

Comment: *format inconsistency for 2. below]*

3. In LRA Table 2.3.2.1-1, the heat exchanger is shown to be linked to LRA Table 3.2-1, row 3.2.1.09. The audit was to confirm that the heat exchanger materials and environments are consistent with those specified in The GALL Report, Vol. 2.

3.2.2.4.2 Containment Penetrations and System Interface Components for Non-CQE Systems

3.2.2.4.2.1 Summary of Technical Information in the Application

The AMR results for the containment penetrations and system interface components for non-CQE systems are presented in Tables 3.2-1, 3.2-2, and 3.2-3 of the LRA. The applicant used the GALL Report format to present its AMR of these components in LRA Table 3.2-1. In LRA Tables 3.2-2 and 3.2-3, the applicant identified the component group designation along with its (1) material, (2) environment, (3) aging effect(s), and (4) aging management program(s).

The description of the containment penetration and system interface components for non-CQE systems can be found in Section 2.3.2.2 of this SER. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.2.2-1. The components, aging effects, and AMPs are provided in LRA Tables 3.2-1, 3.2-2, and 3.2-3.

Aging Effects

Components of the containment penetration and system interface are described in LRA Section 2.3.2.2 as being within the scope of license renewal and subject to an AMR. Table 2.3.2.2-1 of the LRA lists individual components of the system including bolting, heat exchanger, pipes and fittings, primary containment penetrations, and valve bodies.

Stainless steel components are identified as being subject to loss of material due to crevice and pitting corrosion from exposure to oxygenated treated water environments and halogen and sulfates, respectively. Stainless steel components in corrosion-inhibited treated water are subject to loss of material due to general, pitting, and crevice corrosion, and cracking.

Carbon and low-alloy steel closure bolting may be subject to loss of material due to general corrosion, loss of preload due to stress relaxation, and crack initiation and growth due to cyclic loading or SCC resulting from exposure to air, moisture, humidity and leaking fluid environments. Carbon and low-alloy steel components are identified as being subject to loss of material due to corrosion from the exposure to borated water environments. Carbon steel components are identified as being subject to the aging effect of loss of material due to general, pitting, and crevice corrosion from exposure to steam or treated water environments. Carbon steel components are identified as being subject to loss of material (wall thinning) due to FAC from exposure to treated water and saturated steam.

Aging Management Programs

The following AMPs are utilized to manage aging effects in the containment penetrations and system interfaces:

- Bolting Integrity Program (B.1.1)
- Chemistry Program (B.1.2)
- Flow Accelerated Corrosion Program (B.1.5)
- Boric Acid Corrosion Prevention Program (B.2.1)
- Cooling Water Corrosion Program (B.2.2)
- Periodic Surveillance and Preventive Maintenance Program (B.2.7)
- General Corrosion of External Surfaces Program (B.3.3)
- One-Time Inspection Program (B.3.5)

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A description of these AMPs is provided in Appendix B of the LRA. The applicant concludes that the effects of aging associated with the components of the containment penetrations and system interfaces will be adequately managed by these AMPs during the period of extended operation.

3.2.2.4.2.2 Staff Evaluation

Aging Effects

The staff reviewed the information in LRA Tables 2.3.2.2-1, 3.2-1, 3.2-2, and 3.2-3 for the containment penetrations and system interfaces. During its review, the staff determined that additional information was needed to complete its review. The staff's RAIs (see RAIs 3.2.1-1 and 3.2.1-2 in SER Sections 3.2.2.2.4 and 3.2.2.4.1.2, respectively), along with the applicant's

responses provided in letters dated December 19 and December 12, 2002, respectively, addressed the staff's concerns.

On the basis of its review of the information provided in the LRA, and the applicant's responses to the staff's RAIs, the staff finds that the aging effects that result from contact of containment penetrations and system interface SCCs to the environments described in LRA Tables 2.3.2.2-1, 3.2-1, 3.2-2, and 3.2-3, are consistent with industry experience for these combinations of materials and environments. Therefore, the staff finds the applicant has identified the appropriate aging effects for the materials and environments associated with the components in the containment penetrations and system interfaces.

Aging Management Program

The applicant credited the following AMPs for managing the aging effects in the containment penetrations and system interfaces:

- Bolting Integrity Program - SER Section 3.0.3.1
- Chemistry Program - SER Section 3.0.3.2
- Flow-Accelerated Corrosion Program - SER Section 3.0.3.4
- Boric Acid Corrosion Prevention Program - SER Section 3.0.3.6
- Cooling Water Corrosion Program - SER Section 3.0.3.7
- Periodic Surveillance and Preventive Maintenance Program – SER Section 3.0.3.10
- General Corrosion of External Surfaces Program - SER Section 3.0.3.12
- One-Time Inspection Program - SER Section 3.0.3.13

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The above AMPs are credited for managing the aging effects of several components in other structures and systems and are, therefore, considered common AMPs. The staff has evaluated these common AMPs and found them to be acceptable for managing the aging effects identified for this system. The staff's evaluation of these AMPs is documented in Sections 3.0.3.1, 3.0.3.2, 3.0.3.4, 3.0.3.6, 3.0.3.7, 3.0.3.10, 3.0.3.12, and 3.0.3.13, respectively, of this SER.

After evaluating the applicant's AMR for each of the components in the containment penetration and system interface components for non-CQE systems, the staff evaluated the AMPs listed above to determine if they are appropriate for managing the identified aging effects. For those components identified in Table 3.2-1 of the LRA, the staff verified that the applicant credited the AMP(s) recommended by the GALL Report. For the components identified in LRA Tables 3.2-2 and 3.2-3, the staff verified that the applicant credited an AMP that is appropriate for the identified aging effect(s). In addition, the staff found the associated program descriptions in the USAR Supplement to be acceptable to satisfy 10 CFR 54.21(d).

3.3.2.2.1 Loss of Material Due to General, Pitting, and Crevice Corrosion

Loss of material due to general, pitting, and crevice corrosion could occur in the channel head and access cover, tubes, and tubesheets of the heat exchanger in the spent fuel pool cooling

system, while loss of material due to pitting and crevice corrosion could occur in the filter housing, valve bodies, and nozzles of the ion exchanger in the spent fuel pool cooling system. The water chemistry program relies on monitoring and control of reactor water chemistry to manage the effects of loss of material from general, pitting, or crevice corrosion. However, high concentrations of impurities at crevices and locations of stagnant flow conditions could cause general, pitting, or crevice corrosion. Therefore, verification of the effectiveness of the chemistry control program should be performed to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to manage loss of material from general, pitting, and crevice corrosion to verify the effectiveness of the water chemistry program, and the SRP-LR states that a one-time inspection of select components at susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

The above is described in the GALL and SRP-LR background for LRA Item 3.3.1.01. The applicant has determined that the GALL AMR for the spent fuel pool cooling system, as identified in LRA Table 3.3.1-01, is not applicable to FCS.

Many of the GALL AMR items covered by Item 3.3.1.01 are elastomer-lined carbon steel components, and the applicant has stated that these items are not applicable to FCS. The staff considers this to be a plant-specific design issue and finds the applicant's conclusion acceptable.

GALL/SRP item 3.3.1-01 also addresses the heat exchangers in the spent fuel pool cooling system. For the heat exchangers, the applicant has elected to use the chemistry program and the cooling water corrosion program, as indicated by the LRA Table 2.3.3.2-1 links to items 3.2.1.09 and 3.3.3.01. The inspections of the heat exchanger that are performed under the cooling water corrosion program cover both the cooling water side and the spent fuel pool side of the heat exchanger, as was verified during the staff's AMR inspection and audit conducted from
January 6-10, 2003, and from January 20-23, 2003. The staff finds this acceptable. The staff's evaluation of these AMPs is documented in Sections 3.0.3.2 and 3.0.3.7 of this SER, respectively.

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3.3.2.2.3 Cumulative Fatigue Damage

Fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). The staff reviewed the evaluation of this TLAA in Section 4.3 of this SER, following the guidance in Section 4.3 of the SRP-LR.

For the chemical and volume control system, the applicant identified that time-limited aging analyses are applicable to the filter/strainer housing, heat exchangers, pipes, fittings, and tubing, pump casings, tanks, and valve bodies. The applicant also identified a TLAA for the heat exchanger in the primary sampling system. The applicant discussed the TLAAs in Section 4.3.1 of the LRA, "Reactor Coolant and Associated System Fatigue." This TLAA is evaluated in Section 4.3 of this SER.

Deleted: flow element/orifice
Deleted: ion exchangers,

On the basis of its review, the staff finds that the applicant has adequately evaluated the management of cumulative fatigue damage for components in the applicable FCS auxiliary systems, as recommended in the GALL Report. On the basis of this finding, the staff concludes that there is reasonable assurance that this aging effect will be adequately managed during the period of extended operation, as required by 10 CFR 54.21(a)(3), for these components.

3.3.2.2.5 Loss of Material Due to General, Microbiologically-Influenced, Pitting, and Crevice Corrosion

The GALL Report recommends further evaluation of programs to manage the loss of material due to general, pitting, and crevice corrosion of the piping and filter housing and supports in (1) the control room area, the auxiliary and radwaste area, and the primary containment heating and ventilation systems, (2) the piping of the diesel generator building ventilation system, and (3) the above ground piping and fittings, valves, and pumps in the diesel fuel oil system, and of the diesel engine starting air, combustion air intake, and combustion air exhaust subsystems in the emergency diesel generator system. The GALL Report also recommends further evaluation of programs to manage the loss of material due to general, pitting, and crevice corrosion and MIC of the duct fittings, access doors, closure bolts, equipment frames, and housing of the duct due to pitting and crevice corrosion of the heating/cooling coils of the air handler heating/cooling, and due to general corrosion of the external surfaces of all carbon steel structures and components, including bolting exposed to operating temperatures less than 212 EF in the ventilation systems. The staff reviewed the applicant's proposed program to ensure that an adequate program will be in place for the management of these aging effects. The applicant credited the PS/PMP and the general corrosion of external surfaces program for managing the aging effects of loss of material due to general, pitting, and crevice corrosion, and MIC for the above components that are applicable to FCS auxiliary systems. The staff's evaluation of these AMPs is documented in Sections 3.0.3.10 and 3.0.3.12 of this SER respectively.

Comment: *[some kind of formatting issue here]*

3.3.2.2.10 Loss of Material Due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion

Loss of material due to general, pitting, and crevice corrosion and MIC could occur in the underground piping and fittings in the open-cycle cooling water system (service water system) and in the diesel fuel oil system. The buried piping and tanks inspection program described in GALL XI.M34 relies on industry practice, frequency of pipe excavation, and operating experience to manage the effects of loss of material from general, pitting, and crevice corrosion, and MIC. The staff reviews the effectiveness of the buried piping and tanks inspection program, including its inspection frequency and operating experience, to ensure that loss of material is not occurring and that the component's intended function will be maintained during the period of extended operation.

Comment: This should reference the GALL. Otherwise it makes it confusing on whether you are referring to the FCS program or GALL.

The applicant credits the buried surfaces external corrosion program for managing the potential loss of material on buried external surfaces. The staff's evaluation of this program is discussed in Section 3.3.2.3.2 of this SER.

3.3.2.3.1.2 Staff Evaluation

In RAI B.2.3-2, the staff asked the applicant to discuss the nature of the fuel analysis and day tank inspection, including the constituents to be analyzed, the frequency of the analyses and inspections, the acceptance criteria, and the corrective actions if degradation is found. In its December 19, 2002, response, the applicant stated that the day tank activities addressed in this question are enhancements and are not the only aging management activities for these tanks. The applicant stated that the inspections for the other tanks are consistent with GALL program XI.M30. The specific activities are (1) the DG day/engine tanks will be cleaned, flushed, and visually inspected every third refueling outage; (2) the fire protection day tank will have a one-time boroscope inspection performed; (3) the DG day tanks have water and sediment analysis performed semi-annually; (4) the DG engine tanks have water and sediment analysis semi-annually and microbiological activity performed semi-annually; and (5) the fire protection day tank will be sampled quarterly for water and sediment, and semi-annually for microbiological activity. The acceptance criteria for water and sediment is less than 0.05 percent by volume, and the acceptance criteria for microbiological activity is "none detectable." Due to the monthly surveillance runs, the fuel in the day/engine tanks does not remain stagnant and would not warrant quarterly analyses. If degradation is found to exceed Class C cleanliness (thin uniform rust or magnetite films are acceptable, and 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), corrective actions are initiated. The staff finds the applicant's response reasonable and acceptable, and the RAI B.2.3-2 issues are resolved.

3.3.2.3.2.2 Staff Evaluation

The applicant further responded that buried piping and tanks will be inspected when portions are excavated for maintenance. Part of the applicant's PM tasks includes defueling, cleaning, and inspecting the emergency diesel and auxiliary boiler diesel fuel tanks on a 9-year frequency. The most recent inspection of the emergency diesel and auxiliary boiler fuel tanks was performed in 1995 and resulted in no UT indication of degradation. UT is also performed on the internal surfaces of the tanks to identify any loss of material, which may be occurring due to corrosion on the external surfaces. The applicant has scheduled future tank inspections to be performed in 2004, which will include a UT of the excavated portions of the tanks' surfaces. The top of the tank's exterior surface around the vent and fill pipes will be excavated to conduct a visual inspection of the pipes, tank surface, welded connections, and hold down bands.

The applicant provided the results of maintenance activities performed on the emergency diesel generator fuel oil storage tanks in 1987. The inspection included a UT inspection. The results showed that the original tank wall thickness has been maintained, the welds were satisfactory,

Comment: This does not represent the 12/19/02 response, but rather the Set # 8 response. Missing additional information provided in the 12/19/02 response. However, if response is to be changed to the 12/29/02 response, keep 0.05 from Set # 8 response instead of "no adverse trend". DLL

Comment: The commitment should remain that we are consistent with GALL. GALL talks of a quarterly frequency. This RAI response was based on what we are doing now. It should allow us the freedom to increase to quarterly. DLL

Comment: The NRC has already approved the logic based on the third from the last sentence of that paragraph "Due to the monthly surveillance runs, the fuel in the day/engine tanks does not remain stagnant and would not warrant quarterly analyses." We want to keep these consistent. At the time, Chemistry was performing the day tank analysis on a monthly basis. GALL specifies quarterly. Our already approved logic would allow semi-annual, so we want to keep the day/engine tanks consistent with the longer period. DLL

Deleted: monthly

Comment: Do not recall procedure specifying UT of external surface of excavated portion...only visual.

and there was no evidence of pitting. In general, the inspection showed the tank to be in excellent condition. The applicant also performed excavations of buried piping in 2000, 2001, and 2002, exposing sections of the fire protection and raw water system piping. These excavations were performed to repair degraded valves, repair potable water piping, and make modifications to fire protection system piping. Based on discussions with FCS system engineers and photos taken of exposed sections of the buried piping, the applicant concluded that the pipe coatings are well maintained with no evidence of degradation. These excavations are typically performed every 2 to 3 years.

Comment: Procedures don't require this 2 to 3 year excavation, so don't think this should be in SER. DLL

Based on the applicant's responses, the staff finds that the elements of this new program will meet the intent of the GALL AMP because it includes visual and non-destructive examination of representative components at a frequency to ensure proper detection and correction of a degraded condition.

The applicant provided its USAR Supplement for the buried surfaces external corrosion program in LRA Section A.2.4. The staff reviewed the USAR Supplement and finds that the summary description contains a sufficient level of information to satisfy 10 CFR 54.21(d).

3.3.2.4.1 Chemical and Volume Control

3.3.2.4.1.1 Summary of Technical Information in the Application

Aging Management Programs

The following AMPs are utilized to manage aging effects in the CVCS:

$ Bolting Integrity Program (B.1.1)
$ Chemistry Program (B.1.2)
$ Inservice Inspection Program (B.1.6)
$ Boric Acid Corrosion Program (B.2.1)
$ Cooling Water Corrosion Program (B.2.2)
$ Periodic Surveillance and Preventive Maintenance Program (B.2.7)
$ General Corrosion of External Surfaces Program (B.3.3)
$ One-Time Inspection Program (B.3.5)

The filter/strainer housing, heat exchangers, pipes, fittings, tubing, pump casings, tanks, and valve bodies are also covered by time-limited aging analyses to address fatigue.

Deleted: flow element/orifice,
Deleted: ion exchangers,

The applicant concluded that the effects of aging associated with the components of the CVCS will be adequately managed by these AMPs and TLAA during the period of extended operation.

3.3.2.4.1.2 Staff Evaluation

On the basis of this information, the staff requests the applicant to provide additional information to demonstrate how degradation of the heat exchanger internals will not adversely impact on the

injection function, or provide information on how the internals will be managed during the period of extended operation to ensure that the injection function is maintained. This is Open Item 3.3.2.4.1.2-1.

Comment: *[Revise the above discussion base on the resolution to OI 3.3.2.4.1.2-1.]*

On the basis of its review, pending satisfactory resolution of Open Item 3.3.2.4.1.2-1, the staff finds the applicant has credited the appropriate AMPs to manage the aging effects for the materials and environments associated with CVCS. In addition, the staff found the associated program descriptions in the USAR Supplement to be acceptable to satisfy 10 CFR 54.21(d).

Comment: *[Revise wording of above paragraph due to resolution of the referenced OI.]*

3.3.2.4.1.3 Conclusions

On the basis of its review, the staff concludes that, pending satisfactory resolution of Open Item 3.3.2.4.1.2-1, the applicant has adequately identified the aging effects and has adequate AMPs and TLAAs for managing the aging effects, for components in the CVCS, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation to satisfy 10 CFR 54.21(a)(3).
The staff also reviewed the applicable USAR Supplement program descriptions and concludes that the USAR Supplement provides an adequate program description of the AMPs credited for managing aging in the CVCS to satisfy 10 CFR 54.21(d).

3.3.2.4.2.2 Staff Evaluation

Aging Management Programs

The applicant credited the following AMPs for managing the aging effects in the SFPC:

$ Chemistry Program
$ Cooling Water Corrosion Program
$ Periodic Surveillance and Preventive Maintenance Program
$ General Corrosion of External Surfaces Program
$ One-Time Inspection Program

These AMPs are credited for managing the aging effects of components in several structures and systems and, therefore, are considered common AMPs. The staff has evaluated these common AMPs and has found them to be acceptable for managing the aging effects identified for this system. These AMPs are evaluated in Sections 3.0.3.2, 3.0.3.7, 3.0.3.10, 3.0.3.12, and 3.0.3.13 of this SER.

For the SFPC heat exchangers, the applicant has elected to use the chemistry program and the cooling water corrosion program, as indicated by LRA Table 2.3.3.2-1 link to items 3.2.1.09 and 3.3.3.01. During the AMR inspection and audit, the staff verified that the inspections of the heat exchanger that are performed under the cooling water corrosion program cover both the cooling water side and the spent fuel pool side of the heat exchanger. The staff concludes that the

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inspections can verify the effectiveness of the chemistry program for the spent fuel pool (SFP) side of the heat exchanger; therefore, the staff finds this acceptable.

3.3.2.4.3 Emergency Diesel Generators

3.3.2.4.3.1 Summary of Technical Information in the Application

The description of the emergency diesel generators (EDGs) can be found in Section 2.3.3.3 of this SER. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.3.3-1. In addition, the applicant also added component type "mechanical function unit" which refers to the hinged cap on the end of the diesel generator exhaust piping. The components, aging effects, and AMPs are provided in LRA Tables 3.3-1, 3.3-2, and 3.3-3.

3.3.2.4.4.3 Conclusions

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and has adequate AMPs for managing the aging effects, for components in the DGLO and DGFO system, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable USAR Supplement program descriptions and concludes that the USAR Supplement provides an adequate program description of the AMPs credited for managing aging in the DGLO amd DGFO system to satisfy 10 CFR 54.21(d).

Comment: Typo

3.3.2.4.6 Diesel Jacket Water

3.3.2.4.6.1 Summary of Technical Information in the Application

The description of the EDG jacket water system can be found in Section 2.3.3.6 of this SER. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.3.6-1. The components, aging effects, and AMPs are provided in LRA Tables 3.3-1, 3.3-2, and 3.3-3.

Aging Effects

Table 2.3.3.6-1 of the LRA lists individual system components that are within the scope of license renewal and subject to an AMR. The components include bolting, electric heaters (sleeves), heat exchangers (radiators), indicators (sightglasses), pipes and fittings, pump casings, tanks, and valve bodies.

Comment: Typo – sight glasses

3.3.2.4.7.2 Staff Evaluation

Aging Management Program

The applicant credited the general corrosion of external surfaces program (3.0.3.12) for managing the aging effects in the diesel starting air system. This AMP is credited for managing the aging effects of several components in other structures and systems and is, therefore, considered a common AMP. The staff has evaluated this common AMP and found it to be acceptable for managing the aging effects identified for this system. The staff's evaluation of this AMP is documented in Section 3.0.3.12 of this SER. On the basis of its review of the information provided in the LRA, the staff concludes that the above identified AMP will effectively manage the aging effects of the diesel starting air system.

Comment: *[period missing here]*

On the basis of its review, the staff finds the applicant has credited the appropriate AMPs to manage the aging effects for the materials and environments associated with the diesel starting air system. In addition, the staff found the associated program descriptions in the USAR Supplement to be acceptable to satisfy 10 CFR 54.21(d).

3.3.2.4.10 Containment Ventilation

3.3.2.4.10.1 Summary of Technical Information in the Application

The description of the containment ventilation system can be found in Section 2.3.3.10 of this SER. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.3.10-1. The components, aging effects, and AMPs are provided in LRA Tables 3.3-1, 3.3-2, and 3.3-3.

Aging Effects

Components of the containment ventilation system are described in LRA Section 2.3.3.10 as being within the scope of license renewal, and subject to an AMR. LRA Table 2.3.3.10-1 lists individual components of the system, including blowers and fan housing, bolting, filter housing, duct, dampers, heat exchangers, pipes and fittings, and valve bodies. Carbon steel, cast iron, cadmium-plated steel, and galvanized steel components are identified as being subject to loss of material due to general, pitting, and crevice corrosion, and MIC from exposure to ambient (warm, moist) air. Exposure of stainless steel, brass, and bronze components to ambient air has no aging effects. Closure bolting, including galvanized steel bolting material, and external surfaces of carbon steel, low-alloy steel, cast iron, cadmium-plated steel, galvanized steel, and copper alloy components are identified as being subject to loss of material due to boric acid corrosion from exposure to borated water leaking from adjacent systems or components containing borated treated water. Brass, copper, and copper alloy components are identified as being subject to cracking and loss of material due to crevice and pitting corrosion, galvanic corrosion, selective leaching, and MIC from exposure to corrosion-inhibited treated water. Elastomer seals are identified as being subject to hardening, cracking, and loss of strength due to elastomer degradation and loss of material due to wear from exposure to ambient (warm, moist) air.

Aging Management Programs

The following AMPs are utilized to manage aging effects in the containment ventilation system:

$ Chemistry Program (B.1.2)
$ Boric Acid Corrosion Prevention Program (B.2.1)
$ Cooling Water Corrosion Program (B.2.2)
$ Periodic Surveillance and Preventive Maintenance Program (B.2.7)
$ General Corrosion of External Surfaces Program (B.3.3)
$ Selective Leaching Program (B.3.6)

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A description of these AMPs is provided in Appendix B of the LRA. The applicant concludes that the effects of aging associated with the components of the containment ventilation system will be adequately managed by these AMPs during the period of extended operation.

3.3.2.4.10.2 Staff Evaluation

Aging Effects

The staff reviewed the information in LRA Tables 2.3.3.10-1, 3.3-1, 3.3-2, and 3.3-3 for the containment ventilation system. During its review, the staff determined that additional information was needed to complete its review.

In LRA Table 2.3.3.10-1, the applicant identified two intended functions - heat transfer and pressure boundary - for the heat exchanger, and referred to LRA Tables 3.3-1, 3.3-2, and 3.3-3 (rows 3.3.1.05, 3.3.2.01, 3.3.2.10, 3.3.2.17, 3.3.2.39, 3.3.2.84, and 3.3.3.09) for the AMR results for the heat exchanger. In LRA Table 3.3-2, row 3.3.2.39, the applicant identified loss of material as the applicable aging effect and credited the chemistry program and cooling water corrosion program for managing the aging effect. However, the staff notes that fouling is another aging effect that will result in a loss of the intended function of heat transfer. By letter dated October 11, 2002, the staff requested, in RAI 3.3.2-4, the applicant to provide a technical basis for not identifying fouling as an applicable aging effect for the heat exchanger that has an intended function of heat transfer, or to provide a program to manage fouling in the heat exchanger.

In its response dated December 19, 2002, the applicant stated that fouling has not been identified as an AERM because the cooling medium for these coolers is CCW. For these containment ventilation coils, FCS operating experience has shown that fouling does not occur. Consistent with the GALL Report, fouling is only applicable as an AERM for heat exchangers when an open-cycle cooling water system is used. The only open-cycle cooling water heat exchangers at FCS are the CCW/RW heat exchangers. Visual inspections for fouling of the CCW/RW heat exchangers is currently performed every 18 months, and heat transfer performance verified every six months. The applicant further stated that the exception noted in FCS' cooling water corrosion program (B.2.2) is for fluid flow and not for the heat transfer function. Heat transfer performance testing on applicable heat exchangers is performed per

OPPD's response to GL 89-13. Therefore, despite no evidence of fouling, it will monitor for fouling as part of the FCS' cooling water corrosion program.

On the basis of its review, the staff finds that the applicant's response is reasonable and acceptable because heat transfer performance testing on applicable heat exchangers is performed per OPPD's response to GL 89-13 and the FCS' cooling water corrosion program and will adequately monitor for fouling of the heat exchanger in the containment ventilation system.

By letter dated October 11, 2002, the staff issued RAI 3.3-2 pertaining to the description of the internal and external environments included in the LRA. The staff's evaluation of the applicant's response is documented in Section 3.3.2.5.1 of this SER and is characterized as resolved.

By letter dated October 11, 2002, the staff issued RAI 3.3.1-1 pertaining to aging effects for elastomer components in ventilation systems. The staff's evaluation of the applicant's response is documented in Section 3.3.2.5.2 of this SER and is characterized as resolved.

By letter dated October 11, 2002, the staff issued RAI 3.3.3-1 pertaining to aging effects of boric acid corrosion of components in air exposed to leaking and dripping borated treated water. The staff's evaluation of the applicant's response is documented in Section 3.3.2.5.3 of this SER and is characterized as resolved.

On the basis of its review of the information provided in the LRA, and the additional information included in the applicant's response to the above RAIs, the staff finds that the aging effects that result from contact of the containment ventilation system SSCs to the environments described in LRA Tables 2.3.3.10-1, 3.3-1, 3.3-2, and 3.3-3 are consistent with industry experience for these combinations of materials and environments. Therefore, the staff finds the applicant has identified the appropriate aging effects for the materials and environments associated with the components in the containment ventilation system.

Aging Management Programs

The applicant credited the following AMPs for managing the aging effects in the containment ventilation system:

$ Chemistry Program (3.0.3.2)
$ Boric Acid Corrosion Prevention Program (3.0.3.6)
$ Cooling Water Corrosion Program (3.0.3.7)
$ Periodic Surveillance and Preventive Maintenance Program (3.0.3.10)
$ General Corrosion of External Surfaces Program (3.0.3.12)
$ Selective Leaching Program (3.0.3.14)

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These AMPs are credited for managing the aging effects of several components in other structures and systems and are, therefore, considered common AMPs. The staff has evaluated these common AMPs and found them to be acceptable for managing the aging effects identified

for this system. The staff's evaluation of these AMPs is documented in Sections 3.0.3.2, 3.0.3.6, 3.0.3.7, 3.0.3.10, 3.0.3.12, and 3.0.3.14 respectively, of this SER.

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Based on its review of the information provided in the LRA, the staff concludes that the above identified AMPs will effectively manage the aging effects of the containment ventilation system.

3.3.2.4.11 Auxiliary Building Ventilation

3.3.2.4.11.1 Summary of Technical Information in the Application

The description of the auxiliary building ventilation system can be found in Section 2.3.3.11 of this SER. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.3.11-1. The components, aging effects, and AMPs are provided in LRA Tables 3.3-1, 3.3-2, and 3.3-3.

Aging Effects

Components of the auxiliary building ventilation system are described in LRA Section 2.3.3.11 as being within the scope of license renewal, and subject to an AMR. LRA Table 2.3.3.11-1 lists individual components of the system including blowers and fan housing, bolting, filter/strainer housing, fire blocking damper, flow element housing, duct, dampers, pipes and fittings, and valve bodies. Carbon steel, cast iron, cadmium-plated steel, and galvanized steel components are identified as being subject to loss of material due to general, pitting, and crevice corrosion, and MIC from exposure to ambient (warm, moist) air. Exposure of stainless steel and aluminum components to ambient air has no aging effects. Closure bolting including galvanized steel bolting material, and external surfaces of carbon steel, low-alloy steel, cast iron, cadmium-plated steel, galvanized steel, and copper alloy components are identified as being subject to loss of material due to boric acid corrosion from exposure to borated water leaking from adjacent systems or components containing borated treated water. Elastomer seals are identified as being subject to hardening, cracking, and loss of strength due to elastomer degradation and loss of material due to wear from exposure to ambient (warm, moist) air.

3.3.2.4.12 Control Room HVAC and Toxic Gas Monitoring

3.3.2.4.12.1 Summary of Technical Information in the Application

The description of the control room HVAC and toxic gas monitoring system can be found in Section 2.3.3.12 of this SER. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.3.12-1. The components, aging effects, and AMPs are provided in LRA Tables 3.3-1, 3.3-2, and 3.3-3.

Aging Effects

Components of the control room HVAC and toxic gas monitoring system are described in LRA Section 2.3.3.12 as being within the scope of license renewal, and subject to an AMR. LRA

Table 2.3.3.12-1 lists individual components of the system, including blowers and fan housing, bolting, filter/strainer, fire blocking damper, duct, heat exchanger, pipes and fittings, and valve bodies. Carbon steel, cast iron, cadmium-plated steel, and galvanized steel components are identified as being subject to loss of material due to general, pitting, and crevice corrosion, and MIC from exposure to ambient (warm, moist) air. Exposure of stainless steel, aluminum, brass, bronze, copper, copper alloy, and copper zinc components to ambient air has no aging effects. Exposure of copper, copper alloy, brass, and cast iron components to gas-refrigerant has no aging effects. Brass, copper, and copper alloy components are identified as being subject to loss of material due to crevice, pitting, and galvanic corrosion, and MIC from exposure to corrosion-inhibited treated water. Cast iron components are identified as being subject to loss of material due to general, pitting, crevice corrosion, and selective leaching from exposure to corrosion-inhibited treated water. Carbon steel and stainless steel components are identified as being subject to loss of material due to general, pitting, and crevice corrosion, and MIC from exposure to corrosion-inhibited treated water. Elastomer seals are identified as being subject to hardening, cracking, and loss of strength due to elastomer degradation and loss of material due to wear from exposure to ambient (warm, moist) air.

Deleted: Copper pipes and fittings exposed to ambient air are identified as being subject to loss of material due to wear.

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Aging Management Programs

The following AMPs are utilized to manage aging effects in the control room HVAC and toxic gas monitoring system:

$ Chemistry Program (B.1.2)
$ Boric Acid Corrosion Prevention Program (B.2.1)
$ Cooling Water Corrosion Program (B.2.2)
$ Periodic Surveillance and Preventive Maintenance Program (B.2.7)
$ General Corrosion of External Surfaces Program (B.3.3)
$ Selective Leaching Program (B.3.6)

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A description of these AMPs is provided in Appendix B of the LRA. The applicant concludes that the effects of aging associated with the components of the control room HVAC and toxic gas monitoring system will be adequately managed by these AMPs during the period of extended operation.

3.3.2.4.12.2 Staff Evaluation

Aging Effects

The staff reviewed the information in LRA Tables 2.3.3.12-1, 3.3-1, 3.3-2, and 3.3-3 for the control room HVAC and toxic gas monitoring system. During its review, the staff determined that additional information was needed to complete its review.

By letter dated October 11, 2002, the staff issued RAI 3.3-2 pertaining to descriptions of the internal and external environments included in the LRA. The staff's evaluation of the applicant's response is documented in Section 3.3.2.5.1 of this SER and is characterized as resolved.

In LRA Table 2.3.3.12-1, the applicant identified two intended functions, heat transfer and pressure boundary for the heat exchanger, and referred to LRA Tables 3.3-1 and 3.3-2, rows 3.3.1.05, 3.3.2.29, 3.3.2.30, 3.3.2.39, 3.3.2.40, and 3.3.3.10 for the AMR results for the heat exchanger. In LRA Table 3.3-2, rows 3.3.2.29 and 3.3.2.39, the applicant identified loss of material as the applicable aging effect and credited the chemistry program and cooling water corrosion program for managing the aging effect. However, the staff notes that fouling is another aging effect that will result in a loss of the intended function of heat transfer. The applicant was requested to provide a technical basis for not identifying fouling as an applicable aging effect for this heat exchanger, or provide a program to manage fouling in the heat exchanger. By letter dated October 11, 2002, the staff requested, in RAI 3.3.2-5, the applicant to provide a technical basis for not identifying fouling as an applicable aging effect for the heat exchanger that has an intended function of heat transfer, or to provide a program to manage fouling in the heat exchanger.

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Aging Management Programs

The applicant credited the following AMPs for managing the aging effects in the control room HVAC and toxic gas monitoring system:

$ Chemistry Program (3.0.3.2)
$ Boric Acid Corrosion Prevention Program (3.0.3.6)
$ Cooling Water Corrosion Program (3.0.3.7)
$ Periodic Surveillance and Preventive Maintenance Program (3.0.3.10)
$ General Corrosion of External Surfaces Program (3.0.3.12)
$ Selective Leaching Program (3.0.3.14)

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These AMPs are credited for managing the aging effects of several components in other structures and systems and are, therefore, considered common AMPs. The staff has evaluated these common AMPs and found them to be acceptable for managing the aging effects identified for this system. The staff's evaluation of these AMPs is documented in Sections 3.0.3.2, 3.0.3.6, 3.0.3.7, 3.0.3.10, 3.0.3.12, and 3.0.3.14 of this SER.

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On the basis of its review of the information provided in the LRA, the staff concludes that the above identified AMPs will effectively manage the aging effects of the control room HVAC and toxic gas monitoring system.

On the basis of its review, the staff finds the applicant has credited the appropriate AMPs to manage the aging effects for the materials and environments associated with the control room HVAC and toxic gas monitoring system. In addition, the staff found the associated program descriptions in the USAR Supplement to be acceptable to satisfy 10 CFR 54.21(d).

3.3.2.4.14 Fire Protection

3.3.2.4.14.1 Summary of Technical Information in the Application

The description of the fire protection system can be found in Section 2.3.3.14 of this SER. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.3.14-1. The components, aging effects, and AMPs are provided in LRA Tables 3.3-1, 3.3-2, and 3.3-3.

Aging Effects

LRA Table 2.3.3.14-1 lists individual system components that are within the scope of license renewal and subject to an AMR. The components include bolting, filters/strainers, flow element/orifice, fire protection sprinkler/spray nozzle, halon system nozzle, hose, hose cabinet, pipes and fittings, piping spray shield, pressure vessels, pump casings, switch/bistable housing, tank, and valve bodies.

The LRA identifies that carbon steel, galvanized steel, cast iron, and copper in air are subject to loss of material due to general external corrosion, and carbon steel and low alloy steel in dripping boric acid are subject to loss of material due to boric acid corrosion. The LRA also identifies that stainless steel, carbon steel, cast iron, and bronze in raw water are subject to loss of material due to general, pitting, and crevice corrosion, MIC, and biofouling. Galvanized steel in raw water is subject to loss of material from general, pitting and crevice corrosion, MIC, and galvanic corrosion. Brass in raw water is subject to loss of material due to pitting and crevice corrosion, MIC, and galvanic corrosion. Aluminum in raw water is subject to loss of material due to crevice and pitting corrosion, and MIC. Copper in oil (in the RCP oil collection system) is subject to loss of material due to general, pitting, and crevice corrosion, and galvanic corrosion, and stainless steel in oil is subject to general corrosion due to contamination and pooling. Buried cast iron is subject to general corrosion and selective leaching. The LRA does not identify any aging effects for stainless steel, brass, bronze, copper, copper alloy, zinc alloy, or aluminum in air, coated carbon steel or brass in halon, or concrete in a raw water or buried environment.

Deleted: steel

Aging Management Programs

The following AMPs are utilized to manage aging effects in the fire protection system:

$ Boric Acid Corrosion Prevention Program (B.2.1)
$ Fire Protection Program (B.2.5)
$ Periodic Surveillance and Preventive Maintenance Program (B.2.7)
$ General Corrosion of External Surfaces Program (B.3.3)
$ Selective Leaching Program (B.3.6)

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A description of these AMPs is provided in Appendix B of the LRA. The applicant concluded that the effects of aging associated with the components of the fire protection system will be adequately managed by these AMPs during the period of extended operation.

3.3.2.4.14.2 Staff Evaluation

Aging Management Programs

The applicant credited the following AMPs for managing the aging effects in the fire protection system:

$ Boric Acid Corrosion Prevention Program (3.0.3.6)
$ Fire Protection Program (3.0.3.9)
$ Periodic Surveillance and Preventive Maintenance Program (3.0.3.10)
$ General Corrosion of External Surfaces Program (3.0.3.12)
$ Selective Leaching Program (3.0.2.14)

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These AMPs are credited for managing the aging effects of components in several structures and systems and, therefore, are considered common AMPs. The staff has evaluated these common AMPs and found them to be acceptable for managing the aging effects identified for this system. These AMPs are evaluated in Sections 3.0.3.6, 3.0.3.9, 3.0.3.10, 3.0.3.12, and 3.0.3.14, respectively, of this SER.

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On the basis of its review of the information provided in the LRA, the staff concludes that the above identified AMPs will effectively manage the aging effects of the fire protection system.

On the basis of its review, the staff finds the applicant has credited the appropriate AMPs to manage the aging effects for the materials and environments associated with fire protection system. In addition, the staff found the associated program descriptions in the USAR Supplement to be acceptable to satisfy 10 CFR 54.21(d).

3.3.2.4.16 Component Cooling Water

3.3.2.4.16.1 Summary of Technical Information in the Application

The description of the CCW can be found in Section 2.3.3.16 of this SER. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.3.16-1. The components, aging effects, and AMPs are provided in LRA Tables 3.3-1, 3.3-2, and 3.3-3.

Aging Effects

LRA Table 2.3.3.16-1 lists individual system components that are within the scope of license renewal and subject to an AMR. The components include accumulators, bolting, filters/strainers, flow element/orifice, heat exchanger, indicator (sight glass), pipes and fittings, pump casings, and valve bodies.

The LRA states that carbon steel, galvanized steel, and copper in air are subject to loss of material due to general external corrosion. Carbon steel, low-alloy steel, galvanized steel,

cadmium-plated steel, cast iron, and copper alloy in dripping boric acid are subject to loss of material due to boric acid corrosion. The LRA also states that stainless steel and carbon steel exposed to corrosion-inhibited treated water are subject to loss of material due to general, pitting, and/or crevice corrosion, MIC, and/or cracking. Copper alloy and nickel-base alloy in corrosion-inhibited treated water is subject to loss of material due to crevice and pitting corrosion, galvanic corrosion, and MIC, and copper alloy in corrosion-inhibited treated water is subject to cracking due to SCC. Brass in corrosion-inhibited treated water is subjected to cracking due to SCC. Cast iron and bronze in raw water and soil are subject to selective leaching. Carbon steel and cadmium-plated steel exposed to lubricating oil (with potential water contamination) are subject to loss of material. The LRA does not identify any aging effects for stainless steel or glass in air, carbon steel in nitrogen gas, or glass in corrosion-inhibited treated water.

3.3.2.4.17.2 Staff Evaluation

Aging Effects

It should be noted that the applicant's response to RAI 3.3.1-12 also stated that the pump casings were not within the scope of license renewal because the pumps are not required for the LWD system to perform its intended license renewal function of firewater removal. However, LRA Table 2.2.3.17-1 includes pump casings as a component that requires an AMR. This is consistent with the system description in the LRA and the associated boundary drawings; therefore, the staff finds this acceptable.

Comment: *[Should this be reworded since the RAI response serves to remove the pumps from scope?]*

Aging Management Programs

In addition to the three AMPs identified in the LRA, the applicant's response to RAI 3.3.1-12 states that the cooling water corrosion program will be used for the piping in the auxiliary building. The following AMPs are credited for managing the aging effects in the liquid waste disposal system:

Comment: The RAI response does not specifically "state" the CWCP is credited, it only notes the component link to LRA AMR 3.3.1.16. Explanation on next page related to POI-10(g) explains how this is an error. KRH

$ Bolting Integrity Program (3.0.3.1)
$ Boric Acid Corrosion Prevention Program (3.0.3.6)
$ Cooling Water Corrosion Program (3.0.3.7)
$ General Corrosion of External Surfaces Program (3.0.3.12)

3.3.2.4.20 Radiation Monitoring-Mechanical

3.3.2.4.20.1 Summary of Technical Information in the Application

The description of the radiation monitoring system (RMS) can be found in Section 2.3.3.20 of this SER. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.3.20-1. The components, aging effects, and AMPs are provided in LRA Tables 3.3-1, 3.3-2, and 3.3-3.

Aging Effects

LRA Table 2.3.3.20-1 lists individual components of the system including bolting, filters/strainers, pipes and fittings, pressure vessel, pump casings, transmitter element, and valve bodies. The LRA states that the components are constructed of stainless steel, brass, bronze, copper, copper alloy and/or copper-zinc alloy, and are exposed to air. In addition, the LRA states that exposure of these components to ambient air does not result in any aging effects requiring management.

Aging Management Programs

The LRA states that exposure of the RMS components to ambient air does not result in any aging effects requiring management; therefore, the applicant did not identify any AMPs for this system.

3.4.2.4.2.2 Staff Evaluation

This section of the SER provides the staff's evaluation of the applicant's AMR for the aging effects and the appropriateness of the programs credited for the aging management of the AFW system components at FCS. The staff's evaluation includes a review of the aging effects considered and the basis for the applicant's elimination of certain aging effects. In addition, the staff has evaluated the appropriateness of the AMPs that are credited for managing the identified aging effects for the AFW system components.

In addition to Section 3.4 of the LRA, the staff reviewed the pertinent information provided in Section 2.3.4, "Steam and Power Conversion Systems," and the applicable AMP descriptions provided in Appendix B of the LRA to determine whether the aging effects for the AFW system components have been properly identified and will be adequately managed during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Aging Effects

The component groups identified in LRA Table 2.3.4.2-1 for the AFW system are (1) bolting, (2) filters/strainers, (3) flow element/orifice housing, (4) heat exchanger, (5) indicator/recorder, (6) pipes and fittings, (7) pump casings, (8) tanks, (9) transmitter element, (10) turbine casing, and (11) valve bodies. The materials used for these component groups in the AFW system are (1) steel, (2) copper alloy, (3) aluminum, and (4) glass.

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3.5.2.2.1.7 Cracking due to Cyclic Loading and SCC

As stated in the SRP-LR, the GALL Report recommends further evaluation of the AMPs to manage cracking of containment penetrations (including penetration sleeves, penetration bellows, and dissimilar metal welds) due to cyclic loading or SCC for all types of PWR containments. Containment ISI and leak rate testing may not be sufficient to detect cracks. The staff evaluated the applicant's proposed programs to verify that adequate inspection methods will be implemented to ensure that cracking of containment penetrations is detected.

The applicant addressed the further evaluation recommendations in the GALL Report with regard to cracking of containment penetrations in LRA Table 3.5-1. In row entry 3.5.1.02 of LRA Table 3.5-1, the applicant stated the following with regard to the aging effect cracking due to cyclic loading or SCC:

> Stress corrosion cracking for stainless steel bellows with dissimilar metal welds is applicable only if the susceptible material is exposed to a corrosive environment. The bellows at FCS are not exposed to a corrosive environment; therefore, SCC is not an aging effect requiring management.

In RAI 3.5.1-9, the staff requested that the applicant clarify the above conclusion regarding the susceptibility of bellows to SCC in a non-corrosive environment. In addition, the staff requested the applicant to provide further detail regarding the aging management of cracking of containment penetrations in general. Specifically, the staff requested the applicant to state whether ASME Section XI, Subsection IWE examination categories E-B (visual VT-1) and E-F (surface) of FCS bellows and dissimilar metal welds will be implemented during the period of extended operation. In its response to RAI 3.5.1-9, the applicant stated the following:

> Cracking due to cyclic loading of these bellows will be managed, per LRA AMR Item 3.5.1.02 (based on GALL Report Items II.A3.1-c and -d), by the containment ISI (B.1.3) and leak rate (B.1.4) programs which are consistent with programs XI.S1 and XI.S4 outlined in the GALL Report (i.e., the visual examination categories identified in the RAI are included in the credited programs).
>
> Relative to SCC, however, GALL Report Item II.A3.1-d identifies that "In the case of bellows assemblies, SCC may cause aging effects particularly if the material is not shielded from a corrosive environment." For stainless steel, the corrosive environment needed for SCC to occur is a high-temperature, wetted, chloride environment (see response to RAI 3.2.1-2). At FCS, the bellows are normally in an air environment. There are no bolted connections near these bellows assemblies that could result in leakage that would provide the necessary environmental conditions. LRA AMR Item 3.5.1.02 Discussion column, Item 4 is based on these operating parameter assumptions.

Comment: *[Revise the above based on Item 123 from the OI 3.0-1 Table.] MF*

The staff finds the applicant's response to RAI 3.5.1-9 to be adequate since the ASME Section XI, Subsection IWE examination categories E-B (visual VT-1) and E-F (surface) of FCS bellows and dissimilar metal welds will be implemented during the period of extended operation. In addition, since the bellow assemblies are not exposed to a corrosive environment, the staff finds that cracking due to SCC is unlikely. However, the staff notes that cracking as an aging effect will be managed by the applicant's containment ISI and containment leak rate AMPs.

3.5.2.4.1.2 Staff Evaluation

In addition to Section 3.5 of the LRA, the staff reviewed the pertinent information provided in Section 2.4, "Scoping and Screening Results: Structures," and the applicable AMP descriptions provided in Appendix B of the LRA, to determine whether the aging effects for the containment components have been properly identified and will be adequately managed during the period of extended operation, as required by 10 CFR 54.21(a)(3).

This section of the SER provides the staff's evaluation of the applicant's AMR for the aging effects and the appropriateness of the programs credited for the aging management of the containment structural components at FCS. The staff's evaluation includes a review of the

aging effects considered and the basis for the applicant's elimination of certain aging effects. In addition, the staff has evaluated the appropriateness of the AMPs that are credited for managing the identified aging effects for the containment components.

Aging Effects
For stainless steel components that are exposed to only ambient air, the applicant did not identify any applicable aging effects. This latter category includes stainless steel threaded fasteners. In RAI 3.5.1-11, the staff requested that the applicant justify its conclusion regarding the aging management of stainless steel threaded fasteners. Specifically, the staff pointed out that these stainless steel fasteners may be subject to aging effects if exposed to a wetted or moist environment. In its response the applicant stated the following:

> These stainless steel threaded fasteners are for the fuel transfer tube blind flange (containment side). The blind flange is removed prior to filling the refueling canal; therefore, the fasteners are not subject to an environment that would support aging effects.

Since the stainless steel threaded fasteners are not exposed to a wetted or moist environment, the staff supports the applicant's conclusion that there are no applicable aging effects for these fasteners. As such, the staff considers RAI 3.5.1-11 to be closed.

Comment: Staff needs to address change of bolting material as indicated in the Annual Update to the LRA.

The staff finds that the applicant's approach for evaluating the applicable aging effects for steel components in containment to be reasonable and acceptable. The staff concludes that the applicant has properly identified the aging effects for steel components in containment.

3.5.2.4.2.2 Staff Evaluation

For stainless steel components, the applicant identified loss of material as an applicable aging effect for (1) the intake structure pump gland bolting, which is exposed to raw water and (2) the fuel transfer penetration fasteners, which are exposed to borated treated water. The applicant also identifies cracking as an applicable aging effect for the stainless steel spent fuel pool liner and the refueling canal liner; and the pipe penetrations for the Safety Injection and Refueling Water Tank. For structural stainless steel in ambient air the applicant did not identify any applicable aging effects.

Comment: See Annual Update to LRA for bolting material change

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The staff finds that the applicant's approach for evaluating the applicable aging effects for steel components in structures outside the containment to be reasonable and acceptable. The staff concludes that the applicant has properly identified the aging effects for steel components in these structures.

3.5.2.4.3.2 Staff Evaluation

In addition to Section 3.3 of the LRA, the staff reviewed the pertinent information provided in Section 2.4, "Scoping and Screening Results: Structures," and the applicable AMP descriptions provided in Appendix B of the LRA to determine whether the aging effects for the fuel handling

equipment and heavy load cranes commodity group have been properly identified and will be adequately managed during the period of extended operation, as required by 10 CFR 54.21(a)(3).

This section of the SER provides the staff's evaluation of the applicant's AMR for the aging effects and the appropriateness of the programs credited for the aging management of the fuel handling equipment and heavy load cranes commodity group at FCS. The staff's evaluation includes a review of the aging effects considered and the basis for the applicant's elimination of certain aging effects. In addition, the staff has evaluated the appropriateness of the AMPs that are credited for managing the identified aging effects for the fuel handling equipment and heavy load cranes commodity group.

Aging Effects

Steel: Consistent with the recommendations of the GALL Report, the applicant identified loss of material and aging of component materials as applicable aging effects for each of the carbon steel components in the fuel handling equipment and heavy load cranes commodity group. For stainless steel components in this commodity group that are exposed to ambient air and borated water, the applicant identified cracking and loss of material as applicable aging effects. For stainless steel components that are exposed to only ambient air, the applicant did not identify any applicable aging effects.

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3.5.2.4.4.2 Staff Evaluation

Aging Effects

Steel: Consistent with the recommendations of the GALL Report, the applicant identified loss of material as an applicable aging effect for the carbon steel component supports. In addition, for the high-strength carbon steel threaded fasteners, the applicant identified cracking due to SCC, as well as loss of material, as applicable aging effects. For stainless steel component supports in borated water, the applicant identifies loss of material and cracking as applicable aging effects. However, for stainless structural steel in ambient air, the applicant did not identify any applicable aging effects. Finally, for stainless steel threaded fasteners, the applicant identified cracking as an applicable aging effect. The staff finds that the applicant's approach for evaluating the applicable aging effects for steel component supports to be reasonable and acceptable. The staff concludes that the applicant has properly identified the aging effects for steel component supports.

Comment: Format

Miscellaneous Material (lubrite, trisodium phosphate)-For lubrite plates used for component supports, the applicant identified loss of mechanical function as an applicable aging effect. However, this material is not directly specified in LRA Table entry 3.5.1.28. In RAI 3.5.1-18, the staff requested that the applicant clarify its aging management for lubrite plates. In response, the applicant stated that this LRA table entry should have referred also to non-steel components (including lubrite plates) and that loss of mechanical function will be managed for this

Comment: *[the TSP baskets are made of SS and contain TSP; therefore, reference to TSP as a component material is incorrect.] MF & KH*

Comment: Trisodium phosphate is not used as construction material See comment in next paragraph. KRH

component. The applicant's response adequately clarifies the aging management for lubrite plates and is therefore, acceptable to the staff.

For trisodium phosphate baskets in ambient air, the applicant did not identify any applicable aging effects. Since these trisodium phosphate baskets are not exposed to a harsh environment, the staff concurs with the applicant's conclusion that there are no applicable aging effects.

Comment: The baskets are made of stainless steel which had no aging effects for exposure to ambient air. Some of the baskets have carbon steel frame and anchor components which credited the Structures Monitoring Program for loss of material. KRH

3.6.2.3.1.2 Staff Evaluation

The staff reviewed the applicant's non-EQ cable AMP credited for the aging management of insulated cables and connections at FCS. The staff's evaluation includes a review of the aging effects considered. The staff reviewed this section of the LRA to determine whether the applicant has demonstrated that the effects of aging on cables will be adequately managed during period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR Supplement for this AMP to determine whether it provides an adequate summary description of the program, as required by 10 CFR 54.21(d). The staff noticed that although the applicant referenced GALL as an AMP, all the elements of the AMP were not consistent with GALL. Therefore, the staff was unclear how the proposed AMP will manage aging of electrical components that are within the scope of the license renewal and subject to an AMR, but that are not subject to 10 CFR 50.49 environmental qualification requirements (including those used in instrument circuits as well as inaccessible medium voltage cables). In addition, for inaccessible medium-voltage (2 kV to 15 kV) cables (e.g., installed in conduit or direct buried) not subject to 10 CFR 50.49 EQ requirements, no aging program was proposed by the applicant. The LRA stated that modifications were made to the duct banks to preclude moisture intrusion; therefore there is no aging effect requiring management. However, it was not clear to the staff what periodic actions will be taken during the period of extended operation to assure that the modifications made to prevent inaccessible non-EQ medium-voltage cables from being exposed to significant moisture will remain intact. By letter dated October 11, 2002, the staff issued RAI B.3.4-1, requesting the applicant to clarify the following three items:

Comment: The staff evaluation of the electrical AMPs should more appropriately reflect what Butch said at the ACRS, that is, that the AMP presented in the LRA was written prior to the acceptance of GALL and the SRP format, and therefore was not consistent with GALL. The applicant subsequently submitted a revision that accepted and was consistent with the GALL Programs. (Phil D.)

3.6.2.4.3.2 Staff Evaluation

The staff reviewed the AMR results for the aging management of bus bars and standoffs at FCS to determine whether the applicant has demonstrated that the effects of aging on bus bars and standoffs will be adequately managed during the period of extended operation, as required by 10 CFR 54.21(a)(3).

The bus bars are a pre-assembled raceway design, with bus bars mounted on insulated supports (standoffs). The intended function of the standoffs is to support the electrical bus bars.

Aging Effects

The LRA stated that there are no aging effects requiring management for the electrical bus bars and bus bar standoffs. As discussed in Section 2.5.2.5.2 of this SER, the staff issued POI-6(b) requesting the applicant to provide information on the components' materials and environments, along with the basis for concluding that these components have no plausible aging effects. By letter dated March 14, 2003, the applicant responded to POI-6(b), stating the following:

> The bus bar materials are copper and aluminum; their environment is in indoor air and outdoor air. In accordance with EPRI TR-114882, Non-Class1 Mechanical Implementation Guideline and Mechanical Tools, Revision 2, 1999, no aging effects were identified for aluminum, aluminum alloys, copper, or copper alloys (brass, bronze) in an indoor or outdoor air environment.
>
> The stand offs include fiberglass reinforced polyester resin and porcelain materials that are in ambient air external environment and are not continuously wetted. Internal environments are not applicable.
>
> Table 7-17 of EPRI NP-1558, A Review of Equipment Aging Theory and Technology, lists the continuous use temperature of plastics. The continuous use temperature[(a)] listed for polyester with 40% glass content is 266 EF[(b)] (compared with the bounding temperature value of 122 EF). Applying the Arrhenius methodology, it is clear that fiberglass reinforced polyester is acceptable. Figure C-2 of EPRI NP-1558 contains the relative radiation stability of thermosetting resins. The threshold for gamma radiation for polyester (glass filled) is 1,000,000,000 Rads (compared with the bounding 60-year radiation dose of less than 1,000 Rads).
>
> (a) Continuous use temperatures were determined as the temperatures corresponding to 100,000 hours (11.4 years) on the Arrhenius curve of the material for an endpoint of 50% reduction in tensile strength.
>
> (b) Based on retention of tensile strength taken at 500 degrees F.

On the basis of its review of the applicant's response to POI-6(b), the staff was concerned that the applicant may not have considered all the aging effects of the bus bars/ducts. The staff discussed this issue with the applicant, pointing out that industry experience has indicated several problems with the bus bar/duct, such as loosening of splice plate bolts, degradation of Noryl insulation, presence of moisture or debris, oxidation of aluminum electrical connections, and corrosion of metallic components. On the basis of this experience, the staff requests that the applicant provide a description of the aging management program used to detect the above aging effects, or provide justification why such a program is not needed. This is Open Item 3.6.2.4.3.2-1.

Comment: The staff evaluation of the electrical AMPs should more appropriately reflect what Butch said at the ACRS, that is, that the AMP presented in the LRA was written prior to the acceptance of GALL and the SRP format, and therefore was not consistent with GALL. The applicant subsequently submitted a revision that accepted and was consistent with the GALL Programs.

3.6.2.4.4.2 Staff Evaluation

In a letter dated October 11, 2002, the staff issued RAI 2.5-1 regarding the scoping and screening of SSCs which are required to comply with the SBO rule. Specifically, the staff requested the applicant to clarify why switchyard systems were not relied upon in safety analyses to perform a function in the recovery from SBO. The applicant responded to RAI 2.5-1 by letter dated December 19, 2002, stating that it will revise the license renewal documentation to comply with the NRC ISG-02 on SBO.

The applicant identified the following passive, long-lived electrical components comprising the offsite power system that are within the scope of license renewal and subject to an AMR:

-high voltage bus work/duct
-aluminum conductor, steel reinforced (ACSR) transmission cables
-insulators associated with the transmission conductors
-transmission towers and supports
-non-EQ cables (4 kV and 600 V)
-125 volt (120 Vac)control cables

Also, as discussed in Section 3.6.2.4.3.2 of this SER, the staff pointed out that industry experience has identified several problems with the bus bars/ducts. The staff's review of bus bars/ducts can be found in Section 3.6.2.4.1.2 of this SER. In addition, the aging effect for the transmission ACSR conductor is loss of conductor strength and vibration. The applicant has addressed the vibration and the aluminum portion of the conductor, but did not address the steel portion. The most prevalent mechanism contributing to loss of conductor strength is corrosion, which includes corrosion of steel core and aluminum strand pitting. The staff requests the applicant to provide a description of its aging management programs used to manage the aging effects in high voltage conductors, or provide justification for why such programs are not needed. This is Open Item 3.6.2.4.4.2-1.

Comment: Open item has been resolved. KRH

3.6.2.4.4.3 Conclusions

The staff reviewed Section 2.5 and 3.6 to determine whether the SCs subject to an AMR have been identified and adequately managed. On the basis of its review, the staff concludes that, pending satisfactory resolution of Open Item 3.6.2.4.4.2-1, the applicant has identified the SCs that are subject to an AMR, and has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

Deleted: has identified

3.6.2.4.5 Fuse Holders

3.6.2.4.5.1 Summary of Technical Information in the Application

In LRA Section 2.5.1, "Cables and Connectors," the applicant identifies fuse blocks as components within the scope of license renewal and subject to an AMR.

3.6.2.4.5.2 Staff Evaluation

In a letter dated May 16, 2002, the staff forwarded to the NEI and UCS, a proposed ISG (ISG-5) on screening of electrical fuse holders. The staff position indicated that fuse holders should be scoped, screened, and included in the AMR in the same manner as terminal blocks and other types of electrical connections that are currently being treated in the process. This position only applies to fuse holders that are not part of a larger assembly such as switchgear, power supplies, power inverters, battery chargers, circuit boards, etc. Fuse holders in these types of

active components would be considered to be piece parts of the larger assembly and not subject to an AMR.

Comment: The SER should clarify that the applicant had always considered fuse blocks as a component requiring an AMP, however, in response to the concerns raised in ISG 5 the applicant expanded the AMP to include fatigue monitoring of the fuse clips in applicable fuse blocks. (Phil D)

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 without 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 connections surfaces can result in fuse holder failure. The final staff position on this issue is under development in discussions with NEI.
In LRA Section 2.5.1, "Cables and Connectors," the applicant identifies fuse blocks as components within the scope of license renewal and subject to an AMR. The staff was unsure whether fuse holders were included within the component type "Fuse Block." By letter dated February 20, 2003, the staff issued POI-1(c), requesting the applicant to clarify whether fuse holders are within the scope of license renewal and subject to an AMR, and, if fuse holders are brought in and require aging management, to provide the associated aging management information.

By letter dated March 14, 2003, the applicant provided the requested information, stating that:

> Fuse holders are within the scope of license renewal as part of the cable and connector scoping and screening analysis. There are no fuse holders attached to electrical penetrations at FCS. Fuse holders at FCS that are within active enclosures such as power supplies, switchgear, and motor control centers are considered outside the scope for license renewal. There are no fuse holders at FCS exposed to vibration or environments that would cause corrosion, chemical contamination, or oxidation of the connecting surfaces. Fuse holders within enclosures that are not considered active and subject to mechanical stress, fatigue and electrical transients will be included in the Fatigue-Monitoring Program(B.2.4).

The staff reviewed the applicant's response to POI-1(c) regarding whether fuse holders within the enclosures are considered active and whether they are subject to stress and fatigue. The staff discussed this issue with the applicant. The applicant believed that there are no fuse holders that would fall within the definition of being in an outside environment that would need aging management review, but was not sure. The staff is still unclear regarding the aging

management of fuse holders. ISG-5, which discusses scoping, screening, and aging management of fuse holders, states that fuse holders inside the enclosure of an active component, such as switchgear, power supplies, power inverters, battery chargers, and circuit boards, are considered to be piece parts of the larger assembly, and thus 10 CFR 54.21 considers them outside the scope for license renewal. The staff requests the applicant to make a positive statement that all fuse holders are within active enclosures and hence need not be subject to an AMR. If the applicant cannot make this statement, the applicant should clarify how fuse holders within the scope of license renewal and subject to an AMR will be managed during the period of extended operation. This is Open Item 3.6.2.4.5.2-1(a). The staff was also concerned that the applicant may have missed fuse holders which are used in circuits to isolate safety loads from non-safety loads. The staff requests the applicant to investigate and confirm whether there are no fuse holders which fall into this category. This is Open Item 3.6.2.4.5.2-1(b).

Comment: Open item has been resolved. KRH

3.6.2.4.5.3 Conclusions

On the basis of its review, the staff concludes that, pending satisfactory resolution of Open Item 3.6.2.4.5.2-1, the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the fuse holders, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the applicable USAR Supplement program description and concludes, pending satisfactory resolution of Open Item 3.6.2.3.1.2-1, that the USAR Supplement provides an adequate program description of the AMP credited for managing aging in the fuse holders, as required by 10 CFR 54.21(d).

3.6.3 Evaluation Findings3.6.3 Evaluation Findings

The staff has reviewed the information in Sections 2.5 and 3.6 of the LRA. On the basis of its review, pending satisfactory resolution of Open Items 3.6.2.3.1.2-1, 3.6.2.4.3.2-1, 3.6.2.4.4.2-1, and 3.6.2.4.5.2-1, the staff concludes that the applicant has demonstrated that the aging effects associated with the identified components of the electrical and I&C systems will be adequately managed so that there is reasonable assurance that these components will perform their intended functions in accordance with the current licensing basis during the period of extended operation, as required by 10 CFR 54.21(a)(3). In addition, the staff also concludes that, pending satisfactory resolution of Open Item 3.6.2.3.1.2-1, the USAR Supplement provides an acceptable description of the programs and activities for managing the effects of aging of the electrical and I&C system components for the period of extended operation, as required by 10 CFR 54.2

SECTION 4

TIME-LIMITED AGING ANALYSES

Comment: *[There is inconsistency throughout for the formatting of bullets and numbering.]*

[The SER (all sections - not just this one) would be so much more readable, shorter, and thus cost the applicant less money for the NRC to produce it, if there was not so much unnecessary repetition of information even within each subsection. The NRC should look at this and figure out how to improve the SERs.]

4.2.3.2 Staff Evaluation

Based on the staff and applicant evaluation of surveillance data and using the methodology from RG 1.99, all FCS reactor vessel beltlinematerials are projected to have Charpy USE at 48 EFPY greater than 50 ft-lb and will meet the screening criteria for Charpy USE in Appendix G, 10 CFR Part 50 at the expiration of the extended license. This completes the staff evaluation of Reactor Vessel USE and resolves POI-13(a).

Deleted: beltine

4.5.2 Staff Evaluation

In response, the applicant stated that because it is using 10 CFR 54.21(c)(1)(iii), i.e managing the TLAA, it need not provide such information. However, the staff needs the quantitative data of trend lines, as part of the operating experience, to make a reasonable assurance conclusion regarding this TLAA for the period of extended operation. In Appendix C to its March 14, 2003, letter, the applicant provided the quantitative trend lines based on the containment tendon inspections performed thus far at FCS. It should be noted that the future prestressing force measurements could change the predictions. However, because the applicant is going to continue monitoring the tendon forces as required by ASME Section XI, Subsection IWL, the staff finds the process, and the quantitative data provided by the applicant in its March 14, 2003, letter, acceptable.

Deleted: peroiod

4.6.1 Summary of Technical Information in the Application

The applicant indicated that the design CUF for the liner plate and attachments was 0.05. The applicant indicated that this value was computed based on an assumed inward curvature of the liner plate between stiffeners of 1/16 inch. The applicant indicated that actual measurements of the containment liner found values of 1/4 to 3/4 inch. The applicant indicated that this condition was evaluated and found acceptable for the current term. The applicant also indicated that a new evaluation considering the actual measured values was performed. The re-analysis of the as-found buckling in the liner plate was performed using state-of-the-art, non-linear, 3D finite element analysis methods with loads applied in a fashion similar to the original analysis. Both the original analysis and the re-analysis predict that panel stresses will exceed the material yield strength for the assumed loads. The purpose of the recent analysis was to determine the effect on fatigue usage by the existing buckling and the greater strains that will be incurred as compared to the original analysis. The CUF derived in the original analysis was 0.05 for 500 cycles of loading. The new analysis derived a CUF=0.141 for 500 cycles. The allowable usage factor is 1.0. It is not anticipated that 500 cycles of assumed loads will be incurred within the extended period of operation. Therefore, the applicant concludes that the containment liner plate and penetrations are acceptable through the period of extended operation. The staff has reviewed the applicant's analysis results and agrees that the effect on these components as a result of the liner buckling is acceptable.

Comment: *[The content of the above paragraph is repeated below. Is it needed in both places?]*

4.6.2 Staff Evaluation

The design of the FCS liner and anchorage system is described in Sections 5.5 and 5.6 of the USAR. The USAR indicates that the 1/4-inch thick liner is anchored at 14-1/2 inch centers by continuous structural tees. Section 5.6 of the USAR indicates that an analysis of the liner steel was performed for 500 cycles of operating conditions, and the calculated CUF of 0.05 was compared with an allowable value of 1.0 permitted by ASME, Section III, N415.2(e)(6). The USAR also indicates that an inward curvature of 1/16 inch of a single panel was assumed in the analysis of the linear plate for the most critical case. As discussed previously, the applicant indicated that actual measurements found larger displacements and that an analysis of the as-found displacements for the 60-year period would be completed prior to the period of extended operation. In RAI 4.6-1, the staff requested that the applicant describe the analysis that was performed to show the containment liner plate/penetration sleeve meets acceptance criteria for the current term and to provide the calculated usage factor obtained from this analysis.

4.7.2.2 Staff Evaluation

The staff has evaluated the information provided by the applicant in its LRA and in response to RAI 4.7.2-1. The staff has concluded that the applicant appropriately identified those TLAAs (fatigue crack growth, aging of CASS RCS piping and components, and primary water stress corrosion cracking (PWSCC) of Inconel 82/182 RCS welds), which may impact the extension of the applicant's existing LBB analysis through the period of extended operation. The applicant has committed to perform a plant-specific LBB analysis prior to entering the period of extended operation which will address these TLAAs and project the analysis to the end of the period of extended operation. However, the applicant's commitment does not appear to meet 10 CFR 54.21(c)(1), which requires the applicant to demonstrate that (i) the analysis remains valid for the period of extended operation, (ii) the analysis has been projected to the end of the period of extended operation, or (iii) the effects of aging on the intended function(s) will be adequately managed for the period of extended operation. The applicant should provide the information needed for the staff to determine whether (i) the applicant's LBB analysis remains valid for the period of extended operation, (ii) the applicant's LBB analysis has been projected to the end of the period of extended operation, or (iii) the effects of aging on the intended function(s) of the components within the scope of the LBB analysis will be adequately managed for the period of extended operation. This is Open Item 4.7.2.2-1.

Comment: *[The above paragraph needs to be revised based on the resolution of OI 4.7.2.2-1.]*

4.7.2.4 Conclusions

On the basis of its review, the staff concludes that, pending satisfactory resolution of Open Item 4.7.2.2-1, there is reasonable assurance that the applicant will be able to provide, prior to entering the period of extended operation, an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), regarding the projection of its leak-before-break analysis for resolution of USI A-2

Comment: *[reword based on resolution of the OI]*

TLAA, through the end of the period of extended operation. The applicant's commitment to submit an updated LBB analysis, which addresses the TLAAs identified above, is documented in Appendix A to this SER. The staff also concludes that the USAR Supplement contains an appropriate summary description of the LBB analysis for resolution of USI A-2 TLAA evaluation for the period of extended operation, as required by 10 CFR 54.21(d). Therefore, pending satisfactory resolution of Open Item 4.7.2.2-1, the staff has reasonable assurance that the safety margins established and maintained during the current operating term will be maintained during the period of extended operation, as required by 10 CFR 54.21(c)(1).

4.7.3 High-Energy Line Break

4.7.3.1 Summary of Technical Information in the Application

The applicant described its evaluation of high-energy line breaks (HELBs) in Section 4.7.3 of the LRA. The applicant indicated that fatigue analyses were performed for the B31.7 Class I portions of main steam (MS) and main feedwater (MFW) outside containment to identify locations with CUF greater than 0.1, which is the criterion for postulating pipe breaks. The applicant indicated that, for the MFW piping, breaks were postulated at the end of each pipe segment. The applicant indicated that the Class I portions of the MFW outside containment are wrapped in steel "barrel slat" enclosures to prevent lateral pipe movement and the formation of longitudinal and axial jets, which could impact nearby structures and equipment. The applicant further indicated that pipe whip restraints are installed to limit pipe movement due to circumferential breaks. Consequently, the applicant concluded that any additional locations on the Class I portion of the piping will be bounded by the existing break locations. The applicant indicated that a similar design existed for the Class I MS piping with one potential exception. The applicant indicated that an evaluation had not been performed to determine whether the slat enclosures protected the piping connections to the isolation valves. The applicant indicated that the design CUFs at these locations were less than 0.001 and, therefore, would not exceed the 0.1 criterion during the period of extended operation.

Comment: *[consistency with the rest of the SER]*

4.8 Evaluation Findings

The staff has reviewed the information in Section 4 of the LRA. On the basis of its review, the staff concludes that the applicant has provided an adequate list of TLAAs, as defined in 10 CFR 54.3. Further, the staff concludes that, pending satisfactory resolution of Open Item 4.7.2.2-1, the applicant has demonstrated or will demonstrate that the TLAAs (1) will remain valid for the period of extended operation, as required by 10 CFR 54.21(c)(1)(i); (2) have been projected to the end of the period of extended operation, as required by 10 CFR 54.21(c)(1)(ii); or (3) the aging effects will be adequately managed for the period of extended operation, as required by 10 CFR 54.21(c)(1)(iii). In addition, the staff concludes that there are no plant-specific exemptions in effect that are based on TLAAs, as required by 10 CFR 54.21(c)(2). Finally, the

Comment: *[reword based on resolution of the OI]*

staff has reviewed the USAR Supplements and concludes that the applicant has provided or will provide adequate descriptions of the TLAAs credited for license renewal, as required by 10 CFR 54.21(d).

On this basis, pending satisfactory resolution of Open Item 4.7.2.2-1, the staff has reasonable assurance that the aging effects associated with the structures and components subject to TLAAs are addressed such that there is reasonable assurance that the structures and components will perform their intended functions in accordance with the current licensing basis during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Comment: ***[reword based on resolution of the OI]***

Appendix A: Commitment Listing

ITEM NUMBER	COMMITMENT	IMPLEMENTATION SCHEDULE	
11	OPPD will perform a one-time inspection of the circulating water discharge tunnel per the one-time inspection program (B.3.5). The circulating water discharge tunnel will be included within the scope of license renewal as part of the intake structure.	Prior to the period of extended operation	Comment: [Move to the Structures Monitoring Program section below]
28	These cycle counts are gross estimates due to incomplete logs. ...A condition report (CR) is being generated to address this issue within the corrective action program so that a more accurate transient count/determination can be performed for the indicated transients prior to entry into the period of extended operation.	Prior to the period of extended operation	Comment: [This should be expanded to indicate the specific CVCS transients to which it applies.]

32	The following FCS-specific tasks will be added to the SMP: Performance of periodic sampling and evaluation of ground water. Guidance to inspect structural components when exposed by excavation. XI.S5 Specific guidance will be added to inspect masonry walls for cracking and condition of steel bracing. Specific acceptance criteria will be added to inspection procedures to be commensurate with industry codes, standards, and guidelines. XI.S6 Specific guidance will be added for inspection of component supports, new fuel storage rack, and the plant-specific components identified in the LRA Section 3 tables. Aging management activities related to these components will be commensurate with industry standards and practices as identified in the NUREG-1801 Structures Monitoring Program criteria. Additional guidance commensurate with industry codes, standards, and guidelines, will be added to inspection procedures.	Prior to the period of extended operation.	Comment: [Add Item on Circ. Water tunnel inspection from Item 11 above] Comment: [Thought this was part of the Buried Surfaces Program above.]

New Item	OPPD will manage the aging of fuse holders in accordance with ISG-5.	Prior to the period of extended operation	OI 3.6.2.4.5.2-1
New Item **[Note: this may supersede Item 37.]**	OPPD will complete a plant-specific LBB evaluation of the RCS piping using the latest LBB criteria. The LBB analysis will incorporate the effects of thermal aging, plant-specific materials, operating temperatures/pressures, loads at welds on primary loops, and weld fabrications. The plant-specific methodology will also use the existing plant's RCS leak detection capability and the piping stress analysis loads for the FCS RCS configuration. The analysis will be applicable for the period of extended operation, and will use an approved methodology from Westinghouse Electric Company for thermal aging considerations... Acceptance criteria used to determine the adequacy of the structure or component when the LBB analysis is performed will be in accordance with SRP 3.6.3 "Leak-Before-Break Evaluations Procedures", Federal Register/Vol. 52, No. 167, Friday, August 28, 1987 and NUREG-1061, Vol. 3. The plant-specific LBB analysis shall include evaluation of corrective actions that can be performed to provide reasonable assurance that the component in question will perform its intended function when called upon, or will not be outside of its design basis	December 2006	OI 4.7.2.2-1

	established by the plant's current license basis. One such corrective action is to maintain the current licensing basis RCS leak rate program as defined in FCS Technical Specification (TS) 2.1.4 during the period of extended operation. The leak detection capability of the systems noted in TS 2.1.4 meet the intent of Regulatory Guide 1.45 and will be capable of performing their designed function during the period of extended operation. OPPD will submit a License Amendment Request containing the plant-specific LBB evaluation described above to the NRC no later than December 2006, which is well before the period of extended operation. This submittal schedule supports OPPD's planning decisions for possible changes to RCS operation or configuration.		
New Item	OPPD will submit a License Amendment Request, containing the fracture mechanics evaluation of the small-bore instrument nozzle j-weld region at the repaired instrument nozzle described above, to the NRC before the period of extended operation. **This evaluation will include bounding the flaw size by the size of the j-weld itself, and addressing the possibility of corrosion in the presence of a flaw.**	Prior to period of extended operation.	New open item

LIC-03-0089
Appendix A

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
1	2.2-1	*161 KV substation equipment brought into scope*	*Response to RAI 2.5-1*	YES	
2	2.2-1	*345 KV substation equipment brought into scope*	*Response to RAI 2.5-1*	YES	
3	2.2-1	*Revised SG FW blowdown to SG blowdown and brought into scope*	*Response to POI-1(d)*	YES	
4	2.2-1	*SBO restoration substation equipment brought into scope*	*Response to RAI 2.5-1 and POI-6(a)*	YES	
5	2.2-1	*Turbine Plant Cooling System brought into scope*	*Response to POI-1(a)*	**YES, with additional clarification**	***OPPD has revised Table 2.2-1 to include Auxiliary Steam (includes Condensate Return), Secondary Side Chemical Feed, Turbine Plant Cooling Water, and Potable Water/service water systems in scope by changing "no" to "yes" in the "Within Scope of License Renewal?" column. Corrected Table 2.2-1 is included as Appendix B of this letter.***

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
6	2.3.1.1-1	Added link 3.1.1.01 to following components: CSB, core support ring, CSB snubber spacer block, ICI support plate & gusset, instrument tube and support. Deleted 3.1.1.01 from ICI guide tube and supports, thermal shield, and thermal shield-positioning pin and shim	AMR Item 3.1.1.01 was inadvertently omitted for CSB, core support ring, CSB snubber spacer block, ICI support plate & gusset, instrument tube and support. They are included in AMR Groups within the AMR Reports that call for Fatigue to be an AERM. AMR Item 3.1.1.01 was deleted for the ICI guide tube and supports, thermal shield, and thermal shield-positioning pin and shim because the AMR for RVI prepared by CE for the CEOG did not identify Fatigue as an AERM.	YES	
7	2.3.1.1-1	Added links 3.1.1.08 and 3.1.3.01 to thermal shield-positioning pin and shim	AMR Item 3.1.1.08 was inadvertently omitted from these components and was added in for consistency with the AMR of similar components and with the Discussion provided in Item 3.1.1.08. AMR Item 3.1.3.01 was inadvertently omitted from the submittal. 3.1.3.01 and 3.1.3.02 are meant to go together for GALL Report consistency.	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
8	2.3.1.2-1	Deleted link 3.1.1.25 from pzr spray and surge nozzle thermal sleeves	AMR Item 3.1.1.25 was removed as a link for these components because it was redundant to AMR Item 3.1.1.11, which specifically addresses Alloy 600 pressurizer sleeves.	YES	
9	2.3.1.2-1	Revised 3.1.2.02 to 3.1.2.15 for pzr vessel welds.	AMR Item 3.1.2.02 was incorrect since it applies to Alloy 600 components. The pressurizer vessel and welds are low alloy steel, which AMR Item 3.1.2.15 addresses.	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
10	2.3.1.2-1	Replaced 3.1.1.25 with 3.3.3.01 for RCP seal water cooler tubes and added a link to new AMR Item 3.1.2.17 (see entry #148 in this table).	It was determined after LRA submittal that the RCP seal water cooler tubes are not included in the ISI program. Because they are SS HXs in a borated treated water environment, AMR Item 3.3.3.01 applied.	**NO, needs further clarification (also see related item #148 in this table)**	**The seal water cooler is part of the rotating assembly of the pumps. The tubes are part of a coil enclosed in a welded annulus. The tubes inside of the cooler, therefore, are not accessible and cannot be part of the ISI Program. As part of the one-time RCP rotating assembly refurbishment described in the RAI 3.1.2-1 response (performance of dye-penetrant exam on the RCP thermal barriers), an air drop test is also performed on the seal water coolers to ensure tube integrity. For the seal water cooler tubes, therefore, OPPD will credit the same One-Time Inspection described for the pump thermal barriers in the RAI 3.1.2-1 response. New AMR Link 3.1.2.17 was created for this item (see #148 in this table). Additionally, since the tubes are included in the Cooling Water Corrosion Program (see the other AMR Item links in Table 2.3.1.2-1), the results of other system inspections of stainless steel components exposed to CCW will serve as an indication of the condition of these tubes.**

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
11	2.3.1.2-1	*Replaced 3.1.2.04 with 3.1.1.33 for SG primary head (cladding).*	*Response to RAI 3.1.2-1*	YES	
12	2.3.1.2-1	*Deleted 3.1.2.07 from SG tube plugs*	*Response to RAI B.2.9-2*	YES	
13	2.3.1.2-1	*Added 3.1.2.06. Deleted 3.4.1.02 and 3.4.1.05 from SG blowdown nozzles*	*Responses to RAIs 3.1-1*	YES	
14	2.3.1.3-1	Replaced 3.1.1.25 with 3.1.1.09 for Keyways and core barrel support ledge	AMR Item 3.1.1.09 is a better fit for these components than AMR Item 3.1.1.25 since it specifically addresses the core barrel support ledge (core support pads) and is specific to Alloy 600. Additionally, these components are included in the Alloy 600 Program.	YES	
15	2.3.1.3-1	*Added heat transfer, 3.3.3.13, and 3.3.3.15 to "Pipe & Fittings, CEDM Housing"*	*Responses to RAI 2.3.3.16-2*	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
16	2.3.2.1-1	Deleted 3.2.1.01 from "Heat exchanger"	This was an incorrect link for this component. AMR Item 3.2.1.01 applies to fatigue of ESF pipes, valves, and fittings only. It does not include HXs and Fatigue is not identified as an AERM for ESF HXs in the GALL Report.	YES	
17	2.3.2.1-1	Deleted 3.3.2.17 and 3.3.2.18 from "Pipes & Fittings"	AMR Items 3.3.2.17 and 3.3.2.18 apply to Brass and Brass, Copper Alloy HXs, respectively. The links were included for these Safety Injection/Core Spray "Pipes & Fittings" in error.	YES	
18	2.3.2.1-1	Deleted 3.2.2.07 from "valve bodies"	AMR Item 3.2.2.07 addresses carbon steel valves in a dry air/gas environment. There are no CS valves in Safety Injection/Core Spray. All system valves are SS. The link was made in error.	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
19	2.3.2.2-1	Added 3.3.2.74 to "heat exchanger"	This link was inadvertently omitted for the demineralized water heat exchangers that have been included under this system. The link addresses cracking of SS heat exchanger components in closed cycle cooling water and provides for aging management with the Chemistry and Cooling Water Corrosion Programs.	YES	
20	2.3.2.2-1	*Added 3.3.2.78 to "pipes & fittings"*	*Response to RAI 2.3.3.8-1*	YES	
21	2.3.2.2-1	Added 3.2.2.07 to "Primary containment penetrations"	This addition was made to address the inside of sealed carbon steel electrical penetrations enclosures. There are no aging effects.	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
22	2.3.2.2-1	Added 3.2.2.07 *and 3.3.2.78 to "valve bodies"*	This was added for the drain valves on the Safety Injection penetration enclosures. There are no internal aging effects. *Response to RAI 2.3.3.8-1*	**YES, with additional clarification**	**AMR Item 3.2.2.07 applies to the internal environment of the Safety Injection System containment penetration sub-hull and drain valves.** ***AMR Item 3.3.2.78 applies to the internal environment of the Compressed Air System containment penetration components.***
23	2.3.3.1-1	Changed 3.3.2.64 to 3.3.2.75 for "bolting"	AMR Item 3.3.2.64 was duplicated by AMR Item 3.3.2.75, resulting in both items being used interchangeably. Corrected by linking only to 3.3.2.75 and removing AMR Item 3.3.2.64 from 3.3.2 Table.	YES	
24	2.3.3.1-1	*Changed 3.3.1.08 to 3.3.3.01* and 3.3.2.64 to 3.3.2.75 for "filter/strainers	*Response to RAI 3.3.1-15* 3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
25	2.3.3.1-1	Deleted 3.3.1.03. Added 3.3.2.50. *Changed 3.3.1.08 to 3.3.3.01* and 3.3.2.64 to 3.3.2.75 for "flow element/orifice"	AMR Item 3.3.1.03 was incorrectly included since this component will not experience cumulative fatigue; therefore, this AMR Link was deleted. AMR Link to 3.3.2.50 was inadvertently omitted for this component type in the April 2002 submittal. *Response to RAI 3.3.1-15* 3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
26	2.3.3.1-1	*Deleted 3.4.1.10.* Changed 3.3.2.64 to 3.3.2.75 for "heat exchanger"	*Response to RAI 3.3-1* 3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
27	2.3.3.1-1	Deleted 3.3.1.03. *Changed 3.3.1.08 to 3.3.3.01* and 3.3.2.64 to 3.3.2.75 for "ion exchangers"	AMR Item 3.3.1.03 was incorrectly included since this component will not experience cumulative fatigue; therefore, this AMR Link was deleted. *Response to RAI 3.3.1-15* 3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
28	2.3.3.1-1	Added 3.3.2.70. *Deleted 3.3.3.04. Changed 3.3.1.08 to 3.3.3.01* and 3.3.2.64 to 3.3.2.75 for "pipe, fittings, & tubing	Link to 3.3.2.70 was inadvertently omitted in the April 2002 LRA. This link correctly associates SS pipe with H_2 environment to AMR Item 3.3.2.70. *Responses to RAIs 3.3.3-3 and 3.3.1-15* 3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
29	2.3.3.1-1	Change 3.3.2.64 to 3.3.2.75 for "pump casings"	3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
30	2.3.3.1-1	*Added 3.3.3.01. Deleted 3.3.1.08.* Changed 3.3.2.64 to 3.3.2.75 for "tanks"	*Response to RAI 3.3.1-15* 3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
31	2.3.3.1-1	Added new line item "transmitter/element"	Flow element was originally screened as active; however, it is passive and has a pressure boundary function. Therefore; it was added to scope with the appropriate AMR links.	**NO, needs further clarification**	**Only the pressure boundary function of these two devices is applicable. Refer to system boundary drawing E-23866-210-120, Sht. 1A (P&ID 137). FE-212 (E-2) is the Ion Exchanger Loop Letdown Flow Element. It is at the inlet to the IX; therefore, T<140°F. FE-236 (A/B-8) is the Charging Pump Discharge Header Flow Element; therefore, T<150°F.**

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
32	2.3.3.1-1	Added 3.3.3.07 and 3.3.3.09. *Deleted 3.3.3.04. Changed 3.3.1.08 to 3.3.3.01, 3.4.1.02 to 3.3.3.03,* and 3.3.2.64 to 3.3.2.75 for "valve bodies"	Added 3.3.3.07 because the material types for these valves is not included in GALL AMR Item 3.3.1.05; however, they are managed by the same AMP. Added 3.3.3.09 because the material types for these valves is not included in GALL AMR Item 3.3.1.13; however, they are managed by the same AMP. *Response to RAIs 3.3.1-15, 3.3-1 and 3.3.3-3* 3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
33	2.3.3.2-1	Changed 3.3.2.64 to 3.3.2.75 for "bolting"	3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
34	2.3.3.2-1	*Changed 3.2.1.10 to 3.3.3.01* and 3.3.2.64 to 3.3.2.75 for "filter/strainer"	*Response to RAI 3.3-1* 3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
35	2.3.3.2-1	Added 3.3.1.05 and 3.3.2.74. Deleted 3.3.1.08 and 3.3.1.14. *Changed 3.2.1.10 to 3.3.3.01, 3.4.1.10 to 3.2.1.09*, and 3.3.2.64 to 3.3.2.75 for "heat exchanger"	Added ARM Item 3.3.1.05 which was inadvertently omitted from the April 2002 submittal. Added 3.3.2.74 to manage "Cracking" as an AERM for this material and environment. AMR Item 3.3.1.08 is CVCS HX specific and was incorrectly referenced here; therefore, it was deleted. AMR Item 3.3.1.14 was deleted and the link to AMR Item 3.2.1.09 (per the RAI response) was chosen because it matches GALL Item VII.3A.4 for stainless steel. Response to RAI 3.3-1 3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
36	2.3.3.2-1	*Changed 3.2.1.10 to 3.3.3.01* and 3.3.2.64 to 3.3.2.75 for "ion exchanger"	*Response to RAI 3.3-1* 3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
37	2.3.3.2-1	*Changed 3.2.1.10 to 3.3.3.01* and 3.3.2.64 to 3.3.2.75 for "pipes & fittings"	*Response to RAI 3.3-1* 3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
38	2.3.3.2-1	*Changed 3.2.1.10 to 3.3.3.01* and 3.3.2.64 to 3.3.2.75 for "pump casings"	*Response to RAI 3.3-1* 3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
39	2.3.3.2-1	*Changed 3.2.1.10 to 3.3.3.01* and 3.3.2.64 to 3.3.2.75 for "valve bodies"	*Response to RAI 3.3-1* 3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
40	2.3.3.3-1	Changed 3.3.2.64 to 3.3.2.75 for "pipes & fittings"	3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
41	2.3.3.3-1	Added new component "mechanical function unit"	This component was inadvertently omitted from the April 2002 submittal.	**YES, with additional clarification**	**"Mechanical function unit" refers to the hinged cap on the end of the diesel generator exhaust piping.**
42	2.3.3.4-1	Changed 3.3.2.64 to 3.3.2.75 for "bolting"	3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
43	2.3.3.4-1	Deleted 3.3.3.05 and 3.3.1.05. Added explanation on use of PS/PMP for "hose"	These components were inadvertently linked to AMR tables when in fact they are replaced based on condition.	**NO, needs further clarification**	**The diesel generator maintenance procedures (one for each diesel) require the inspection of hoses as follows: "Inspect all rubber/elastomer hoses for any signs of paint, cracking, or other signs of general deterioration. Record results of any inspection anomalies on Comment Sheets and notify System Engineer for evaluation of the need for replacement." The system is also inspected with the aid of a black light for leakage.**
44	2.3.3.4-1	Deleted 3.3.3.05 and 3.3.1.05. Added explanation on use of PS/PMP for "hose coupling"	These components were inadvertently linked to AMR tables when, in fact, they are replaced based on condition.	**NO, needs further clarification**	**Since the hose couplings are part of the hoses, they are included in the above inspections. If a hose needs to be replaced, the couplings will also be replaced. If a coupling exhibits deterioration or leakage, the associated hose will also be replaced.**

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
45	2.3.3.4-1	Added 3.3.3.07 for "pump casings"	Added Item 3.3.3.07 because the material type for these pump casings is not included in the linked GALL AMR Item 3.3.1.05.; however, they are managed by the same AMP.	YES	
46	2.3.3.4-1	Added 3.3.2.32 for "tanks"	3.3.2.32 was inadvertently omitted as a link for coated carbon steel tanks with a fuel oil environment.	YES	
47	2.3.3.4-1	Changed 3.3.2.64 to 3.3.2.75 for "tubing"	3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
48	2.3.3.4-1	Changed 3.3.2.64 to 3.3.2.75 for "valve bodies"	3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
49	2.3.3.5-1	Added 3.3.2.87. Deleted 3.3.3.06 for "pump casings"	Pump casing are cast iron, not carbon steel; therefore, AMR link to 3.3.3.06 was incorrect. Correct AMR Link is to 3.3.2.87.	YES	
50	2.3.3.5-1	Added 3.3.2.86. Deleted 3.3.3.06 for "tanks"	Tanks are coated carbon steel, not carbon steel; therefore, AMR link to 3.3.3.06 was incorrect. Correct AMR Link is to 3.3.2.86.	YES	
51	2.3.3.5-1	Changed 3.3.2.64 to 3.3.2.75 for "valve bodies"	3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
52	2.3.3.6-1	Added 3.3.2.30. Changed 3.3.2.64 to 3.3.2.75 for "pipes & fittings"	Some components in this Component Type are subject to selective leaching; therefore, this AMR link was added. 3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
53	2.3.3.6-1	Changed 3.3.1.05 to 3.3.3.07 for "pump casings"	Added 3.3.3.07 because the material types for these pump casings is not included in GALL AMR Item 3.3.1.05.; however, they are managed by the same AMP.	YES	
54	2.3.3.7-1	Changed 3.3.2.64 to 3.3.2.75 for "bolting"	3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
55	2.3.3.8-1	Changed 3.3.1.07 to 3.3.1.05 for "accumulators"	3.3.1.07 was an incorrect AMR item for these components in this environment. Corrected AMR Link to 3.3.1.05	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
56	2.3.3.8-1	Changed 3.3.2.71 to 3.3.2.75 for "tubing"	AMR Item 3.3.2.71 was inadvertently duplicated for the "Tubing" Component Type. Item 3.3.2.71 is for the internal aging management of instrument air in SS tubing. The second entry was meant to be for external aging management of SS tubing. It was, therefore, changed to AMR Item 3.3.2.75.	YES	
57	2.3.3.8-1	Changed 3.3.2.71 to 3.3.2.75 for "valve body"	AMR Item 3.3.2.71 was inadvertently duplicated for the "Valve Body" Component Type. Item 3.3.2.71 is for the internal aging management of instrument air in SS valves. The second entry was meant to be for external aging management of SS valves. It was, therefore, changed to AMR Item 3.3.2.75.	YES	
58	2.3.3.10-1	Added 3.3.3.09 for "bolting"	Added 3.3.3.09 to include galvanized steel bolting material which is not included in the linked GALL AMR Item 3.3.1.13.	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
59	2.3.3.10-1	Changed 3.3.1.13 to 3.3.3.09 for "duct"	Added 3.3.3.09 to include galvanized steel ducting material which is not included in the linked GALL AMR Item 3.3.1.13.	YES	
60	2.3.3.10-1	Changed 3.3.1.13 to 3.3.3.09 for "damper"	Added 3.3.3.09 to include galvanized steel damper material which is not included in the linked GALL AMR Item 3.3.1.13.	YES	
61	2.3.3.10-1	*Added 3.3.2.01*, 3.3.2.17, and 3.3.2.84. ~~Deleted 3.3.3.09~~ for "heat exchangers."	*Response to RAI 2.3.3.10-1* Added 3.3.2.17 to include AERM of cracking. This AMR Item was inadvertently omitted from the April 2002 submittal. Added 3.3.2.84 to include AERM of selective leaching. This AMR Item was inadvertently omitted from the April 2002 submittal. ~~The deletion of 3.3.3.09 is incorrect. This AMR Item is correct and should remain in the table. The heat exchangers contain galvanized steel which is subject to boric acid corrosion.~~	YES	The deletion of 3.3.3.09 was incorrect so this change has been retracted and will not be made.

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
62	2.3.3.10-1	Added 3.3.3.10 for "valve bodies"	Added 3.3.3.10 to include AERM for the cast iron valve bodies. Cast iron is not in the linked GALL AMR Item 3.3.1.05, but it has the same aging effects; therefore, this link was added.	YES	
63	2.3.3.10-1	*Changed 3.1.3.13 to 3.3.1.13 for "pipes & fittings"*	*Response to RAI 2.3.3.10-1*	YES	
64	2.3.3.10-1	*Deleted valve operators*	*Response to RAI 3.3-1*	YES	
65	2.3.3.11-1	Added 3.3.3.09 to "blower and fan housings"	Added 3.3.3.09 to include galvanized steel fan housing material which is not included in the linked GALL AMR Item 3.3.1.13.	YES	
66	2.3.3.11-1	Added 3.3.3.09 to "bolting"	Added 3.3.3.09 to include galvanized steel bolting material which is not included in the linked GALL AMR Item 3.3.1.13.	YES	
67	2.3.3.11-1	Added 3.3.3.09 to "filter/strainer housings"	Added 3.3.3.09 to include galvanized steel filter/strainer housing material which is not included in the linked GALL AMR Item 3.3.1.13.	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
68	2.3.3.11-1	New component "flow element housing"	This component type was inadvertently omitted from the April 2002 submittal.	YES	
69	2.3.3.11-1	Added 3.3.1.05. Deleted 3.3.2.48 and 3.3.3.10 for "duct"	Added 3.3.1.05 because this AMR Link replaces redundant AMR links 3.3.2.48 and 3.3.3.10. Deleted 3.3.2.48 and 3.3.3.10 because the AERMs and AMP are a duplicate of 3.3.1.05.	YES	
70	2.3.3.11-1	Added 3.3.1.05 for "valve bodies"	Added 3.3.1.05 since this AMR Link was inadvertently omitted from the April 2002 submittal.	YES	
71	2.3.3.12-1	Added new component "fire blocking damper"	This component type was inadvertently omitted from the April 2002 submittal.	YES	
72	2.3.3.12-1	Added 3.3.2.30 and 3.3.3.10 to "heat exchanger"	Added AMR Links to 3.3.2.30 and 3.3.3.10 for the cast iron heat exchanger components subject to selective leaching and LOM. These AMR Links were inadvertently omitted from the April 2002 submittal.	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
73	2.3.3.12-1	Deleted 3.3.2.91 from "pipes & fittings"	Deleted 3.3.2.91 because it was determined that this AERM does not apply to this component type and environment.	YES	
74	2.3.3.12-1	Added 3.3.2.30 and 3.3.2.40 to "valve bodies"	Added AMR Links to 3.3.2.30 and 3.3.2.40 since these AMR Links were inadvertently omitted from the April 2002 submittal.	YES	
75	2.3.3.14-1	Added 3.3.1.13 to "bolting"	Boric acid corrosion is a potential AERM because these components are in the Auxiliary Building in the vicinity of systems containing boric acid; therefore, added AMR Link to 3.3.1.13.	YES	
76	2.3.3.14-1	*Added 3.3.1.05, 3.3.1.11,* 3.3.1.13, *and 3.3.3.11 to "filters/strainers"*	*Responses to RAIs 2.3.3.14-2* Boric acid corrosion is a potential AERM because these components are in the Auxiliary Building in the vicinity of systems containing boric acid; therefore, added AMR Link 3.3.1.13.	YES	
77	2.3.3.14-1	*Added 3.3.3.11 to "flow element/orifice"*	*Response to RAI 2.3.3.14-2*	YES	
78	2.3.3.14-1	*Added 3.3.3.11 to "FP sprinkler/spray nozzle"*	*Response to RAI 2.3.3.14-2*	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
79	2.3.3.14-1	Added 3.3.1.13, *3.3.2.27, 3.3.2.47, and 3.3.3.11.* Deleted 3.3.1.06. Changed 3.3.2.64 to 3.3.2.75 for "pipes & fittings"	Boric acid corrosion is a potential AERM because these components are in the Auxiliary Building in the vicinity of systems containing boric acid; therefore, added AMR Link to 3.3.1.13. *Response to RAI 2.3.3.14-2* 3.3.2.64 to 3.3.2.75 - Duplicate Clarification	**NO, needs further clarification**	**The reviewer requested additional information about how the RCP oil collection tubing is managed for aging. In Table 2.3.3.14-1, under Pipes & Fittings, the aging management of the lines for the RCP Oil Collection sub-system is addressed by AMR Items 3.3.2.73 (internal environment) and 3.3.2.75 (external environment). AMR Item 3.3.2.73 credits a One Time Inspection on this sub-system to determine if any internal aging effects are present. See related Item #83 in this table.**
80	2.3.3.14-1	Deleted 3.3.2.73 and 3.3.2.75 from "pressure vessels"	Deleted these two AMR Items from Component Type "Pressure Vessel" because they were associated with the RCP Lube Oil Collection Tanks. These tanks were relocated to new Component Type "Tanks"	YES	
81	2.3.3.14-1	Added 3.3.1.05, *3.3.2.27, 3.3.2.30, 3.3.2.93, and 3.3.3.11* for "pump casings"	3.3.1.05 was inadvertently omitted from the April 2002 submittal. *Response to RAI 2.3.3.14-2*	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
82	2.3.3.14-1	*Added 3.3.3.11. Changed 3.3.2.10 to 3.3.2.40* for "switch/bistable housing"	*Response to RAI 2.3.3.14-2*	YES	
83	2.3.3.14-1	*Added new component "tanks"*	*Response to RAI 2.3.3.14-2*	YES	
84	2.3.3.14-1	*Added 3.3.2.03, 3.3.2.30, 3.3.2.95, and 3.3.3.11.* Deleted 3.3.2.10 from "valve bodies"	*Response to RAI 2.3.3.14-2* Deleted AMR Item 3.3.2.10 since the material type is included in AMR Item 3.3.2.40.	YES	
85	2.3.3.15-1	*Deleted 3.3.2.77.* Changed 3.3.1.05 to 3.3.3.07 for "filters/strainers"	*Response to RAI 3.3.2-1* Change from AMR Item 3.3.1.05 to 3.3.3.07 provides clarification of material/component type that is not in GALL AMR Item 3.3.1.05, but has the same AERMs and AMPs.	YES	
86	2.3.3.15-1	Changed 3.3.2.64 to 3.3.2.75 for "indicator/recorder (sight glass)"	3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
87	2.3.3.15-1	Changed 3.3.2.64 to 3.3.2.75 for "orifice plate"	3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
88	2.3.3.15-1	Changed 3.3.2.64 to 3.3.2.75 for "pipes & fittings"	3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
89	2.3.3.15-1	Deleted 3.3.2.95 from "traveling screen frame"	AMR Item 3.3.2.95 was redundant to AMR Item 3.3.3.14 with the exception of the AMP. Item 3.3.2.95 credited the PS/PM Program and Item 3.3.3.14 credited the Cooling Water Corrosion Program. Item 3.3.3.14 is the correct link so Item 3.3.2.95 was deleted from this table. Additionally, Item 3.3.2.95 in Table 3.3-2 was replaced with a new AMR Item. See that discussion below.	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
90	2.3.3.15-1	Added 3.3.1.05, 3.3.1.13, 3.3.3.07, 3.3.3.09. Deleted 3.3.3.10 from "valve bodies"	The links to AMR Items 3.3.1.05, 3.3.1.13, 3.3.3.07, and 3.3.3.09 were inadvertently excluded from this component type. The link to GALL AMR Item 3.3.1.05 ensures AERMs for CS material in an ambient air environment are managed. The link to AMR Item 3.3.3.07 ensures AERMs for other similar materials in an ambient air environment not listed in GALL AMR Item 3.3.1.05 are also managed. The link to GALL AMR Item 3.3.1.13 ensures boric acid corrosion is managed for CS valve material potentially susceptible to borated water leakage and the link to AMR Item 3.3.3.09 includes other similar valve body materials not included in GALL AMR Item 3.3.1.13. Deleted 3.3.3.10 because the PS/PM Program is not used for valves in this system and ambient air environment.	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
91	2.3.3.16-1	Changed 3.3.2.64 to 3.3.2.75 for "bolting"	3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
92	2.3.3.16-1	Changed 3.3.2.64 to 3.3.2.75 for "flow element/orifice"	3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
93	2.3.3.16-1	~~Deleted 3.3.2.41 from "heat exchangers"~~		N/A	This change has been retracted and will not be made.
94	2.3.3.16-1	Changed 3.3.2.64 to 3.3.2.75 for "pipes & fittings"	3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
95	2.3.3.16-1	Added 3.3.2.25. Changed 3.3.2.64 to 3.3.2.75 for "valve bodies"	This link was inadvertently omitted from the April 2002 submittal. There are no AERMs associated with this material and environment. 3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
96	2.3.3.17-1	*Deleted water suppression support function for bolting*	*Response to POI-10(d)*	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
97	2.3.3.17-1	Changed 3.3.2.64 to 3.3.2.75. *Deleted water suppression support function* ~~and 3.3.2.22~~ for pipes and fittings	3.3.2.64 to 3.3.2.75 - Duplicate Clarification *Response to POI-10(d)* ~~Deleted link to AMR Item 3.3.2.22 since the component type in this environment is inaccessible (see response to POI-10(d).~~	YES	The deletion of 3.3.2.22 is incorrect so this change has been retracted and will not be made.
98	2.3.3.17-1	*Deleted water suppression support function* and changed 3.3.2.64 to 3.3.2.75 for valve bodies	*Response to POI-10(d)* 3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
99	2.3.3.17-1	*Removed component "pump casing"*	*Response to RAI 3.3.1-12*	YES	
100	2.3.3.18-1	Changed 3.3.2.64 to 3.3.2.75 for bolting.	3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
101	2.3.3.18-1	Changed 3.3.2.64 to 3.3.2.75 for pipes & fittings	3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
102	2.3.3.18-1	Changed 3.3.2.64 to 3.3.2.75 for valve bodies	3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
103	2.3.3.19-1	Added ~~3.2.1.09 and~~ 3.3.2.39. *Deleted heat transfer,* 3.3.1.03, 3.3.2.18, 3.3.2.41, ~~and 3.3.3.08~~ from "heat exchanger"	~~Added AMR Item 3.2.1.09, which was inadvertently omitted from the April 2002 submittal.~~ Replaced link 3.3.2.18 with duplicate link 3.3.2.39 and deleted the link to 3.3.2.18. *Response to RAI 2.3.3.19-1* Deleted 3.3.1.03 since this AMR link was in error. Deleted 3.3.2.41 because the HX tubes are copper, not copper alloy; therefore, cracking is not an AERM. ~~Deleted 3.3.3.08 because it was a duplicate entry to AMR Item 3.2.1.09 for carbon steel heat exchanger components.~~	**YES, with additional clarification**	**In the corrected tables submitted with Appendix A of OPPD Letter LIC-03-0035, dated March 14, 2003, AMR Item 3.3.3.08 for the Component Type "Heat Exchanger" in Table 2.3.3.19-1 was replaced with AMR Item 3.2.1.09. Both AMR Items provide for identical aging management. Since the Primary Sample System is an Auxiliary System as opposed to an Engineered Safety Feature System, it is preferable to credit 3.3.3.08; therefore, that change is retracted and will not be made.**
104	2.3.3.19-1	Changed 3.3.2.64 to 3.3.2.75 for pipes & fittings	3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
105	2.3.3.19-1	Changed 3.3.2.64 to 3.3.2.75 for valve bodies	3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
106	2.3.3.20-1	Changed 3.3.2.64 to 3.3.2.75 for bolting	3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
107	2.3.3.20-1	Changed 3.3.2.64 to 3.3.2.75 for filters/strainers	3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
108	2.3.3.20-1	Changed 3.3.2.64 to 3.3.2.75 for pipes & fittings	3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
109	2.3.3.20-1	*Added 3.3.2.75 for pressure vessel*	*Response to RAI 2.3.3.20-1 and POI-3(c)*	YES	
110	2.3.3.20-1	Changed 3.3.2.64 to 3.3.2.75 for pump casings	3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	
111	2.3.3.20-1	Added new component "transmitter/element"	This component type was inadvertently omitted from the April 2002 submittal. The reason for only one AMR Link is because the AMR Item includes both internal and external environment for aluminum in ambient air.	YES	
112	2.3.3.20-1	Changed 3.3.2.64 to 3.3.2.75 for valve bodies	3.3.2.64 to 3.3.2.75 - Duplicate Clarification	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
113	2.3.4.1-1	Deleted 3.4.1.05 from bolting	The AERM identified in AMR Item 3.4.1.05 is included in AMR Item 3.4.1.08 and this bolting is included in the Bolting Integrity Program; therefore, credit did not have to be taken for the General Corrosion of External Surfaces Program that applies to AMR Item 3.4.1.05.	YES	
114	2.3.4.2-1	Deleted 3.4.1.13 from pump casings	This link was removed because there are no borated water systems in the space where the AFW pumps are located.	YES	
115	2.3.4.2-1	Added new component "transmitter/element"	This was added for the thermowell on the Emergency Feedwater Storage Tank. It is a SS thermowell; therefore the link provided to AMR Item 3.4.1.02 is in error. AMR Item 3.4.2.09 is the correct link and should be the only link.	YES	
116	2.3.4.2-1	Deleted 3.4.1.13 from turbine casing	This link was removed because there are no borated water systems in the space where the AFW pumps are located.	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
117	2.3.4.2-1	Added 3.4.2.04 to valve bodies	Selective leaching of these two copper alloy valves (the steam driven AFW pump lube oil cooler outlet line check valve and the steam driven AFW pump gland relief valve) was inadvertently overlooked in the LRA submittal. This AMR Item was added to address selective leaching of these valves. It is performed in conjunction with AMR Item 3.4.2.03, which provides for a One-Time Inspection.	YES	
118	2.3.4.3-1	Changed 3.4.3.02 to 3.4.3.03	AMR Item 3.4.3.02 applies to an environment of deoxygenated treated water and was inadvertently linked to the steam supply strainer for the steam-driven AFW pump. AMR Item 3.4.3.03 addresses the correct material and environment for the steam supply strainer.	YES	
119	2.3.4.3-1	*Added the Intended Function of Flow Restriction to "Pipes & Fittings"*	*Response to RAI 2.3.1.2-3*	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
120	2.4.1-1	Added 3.5.1.08. Deleted 3.5.1.16 *and 3.5.1.23 from "Interior containment concrete in ambient air"*	AMR Item 3.5.1.08, which applies to the Containment foundation, was inadvertently omitted from the original LRA submittal. It applies to settling which is not a plausible AERM at FCS due to the foundation being supported by steel pipe piles driven to bedrock; however, the foundation is still included in the Structures Monitoring Program. AMR Item 3.5.1.16 is redundant to AMR Items 3.5.1.08, 3.5.1.09, and 3.5.1.10 relative to Containment concrete and provision of aging management via the Structures Monitoring Program. *Response to RAI 3.5.1-2*	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
121	2.4.1-1	Added 3.5.1.08. Deleted 3.5.1.23 from "Containment grout in ambient air"	AMR Item 3.5.1.08, which applies to the Containment foundation, was inadvertently omitted from the April 2002 LRA submittal. It applies to settling which is not a plausible AERM at FCS due to the foundation being supported by steel pipe piles driven to bedrock; however, the foundation is still included in the Structures Monitoring Program. AMR Item 3.5.1.23 was removed because it is a duplication of AMR item 3.5.1.10 for structures other than containment.	YES	
122	2.4.1-1	Added 3.5.1.02 to "Containment mechanical and electrical penetrations"	AMR Item 3.5.1.02 was inadvertently omitted from the April 2002 submittal. It applies to the penetrations having SS bellows.	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
123	2.4.1-1	Deleted 3.5.1.01 from "Containment mechanical penetrations with bellows"	AMR Item 3.5.1.01 does not apply to FCS because plant operating experience shows that Fatigue has never occurred in these components.	**NO, needs further clarification**	**At FCS, the stainless steel bellows are not part of the containment pressure boundary associated with the penetration. For each penetration, on the containment side of the penetration, the penetration sleeve is welded directly to the pipe and to a containment liner plate. For the penetrations that have bellows, the bellows are located on the outside of containment and are installed for the sole purpose of providing a pressure boundary for penetration leakage testing. The FCS containment penetration bellows are not, therefore, subject to fatigue. See Appendix C of this letter for a drawing of a typical FCS mechanical penetration. All mechanical penetrations having bellows are constructed in the same manner.**
124	2.4.1-1	~~Deleted 3.5.1.11 from "Containment prestressing/post-tensioning tendons~~		N/A	This change has been retracted and will not be made.

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
125	2.4.1-1	Added 3.5.1.02 to "Fuel transfer penetration"	AMR Item 3.5.1.02 was inadvertently omitted from the April 2002 submittal. It applies to the penetrations having SS bellows.	YES	
126	2.4.1-1	Added 3.5.1.10. Deleted 3.5.1.23 from "RV missile shields"	AMR Item 3.5.1.10 was added since it addresses the one AERM, reduction of strength and modulus due to elevated temperature, not addressed by AMR Item 3.5.1.16. AMR Item 3.5.1.23 was removed because it is a duplication of AMR item 3.5.1.10 for structures other than containment.	YES	
127	2.4.1-1	Added 3.5.1.25 and 3.5.1.27 to "Trisodium phosphate baskets"	AMR Items 3.5.1.25 and 3.5.1.27 were added to apply to the basket support structure, which is CS. The baskets themselves are SS and are addressed by the other table entry.	YES	
128	2.4.2.1-1	Deleted 3.5.1.23 from Aux bldg interior concrete in ambient air	AMR Item 3.5.1.23 was removed because plant operating experience has shown that the elevated temperatures do not apply to the Aux. Building.	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
129	2.4.2.1-1	Added 3.5.1.16 to aux bldg grout in ambient air	AMR Item 3.5.1.16 conservatively added for this component. Even though 3.5.1.25 addressed grout degradation, Item 3.5.1.16 specifically applies to the concrete.	YES	
130	2.4.2.1-1	Added 3.5.2.07 to aux bldg structural steel	AMR Item 3.5.2.07 was added to specifically address the floodgates in the Aux. Building that are managed for aging by the PS/PM Program.	YES	
131	2.4.2.1-1	Deleted 3.5.1.23 from DG missile shield enclosure concrete in ambient air	AMR Item 3.5.1.23 was removed because plant operating experience has shown that the elevated temperatures do not apply to the Aux. Building and this component specifically.	YES	
132	2.4.2.1-1	New component "Stainless steel pipe penetrations - SIRWT	This component was added to specifically address the SS Safety Injection piping penetrations of the CS SIRWT Liner. It was added here since the SIRWT is part of the Aux. Building Structure.	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
133	2.4.2.3-1	Added 3.5.3.01 to Cast iron stuffing box floor penetration	AMR Item 3.5.3.01 was added for this cast iron component to specifically address the possibility of selective leaching since the mechanism was not included with Item 3.5.2.09.	YES	
134	2.4.2.3-1	*Deleted 3.5.2.32 from Concrete exposed to raw water*	*Response to RAI 3.5.1-17*	YES	
135	2.4.2.3-1	*Changed 3.3.1.16 to 3.5.2.25 for SS strainer backwash piping floor penetration*	*Response to RAI 3.5-2*	**NO, needs further clarification**	***Per the referenced RAI response, the link to AMR Item 3.3.1.16 was made in error. Since this piping floor penetration sleeve is considered to be part of the structure, a link to a structural AMR Item was substituted for the Auxiliary Systems link and the link was made based on the normal environment for the component. The penetration sleeve is normally exposed to air with the occasional possibility of being exposed to raw water if the river reaches abnormally high levels.***

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
136	2.4.2.5-1	Added new component "crane expansion anchors	This item was added to specifically address the expansion anchors for all of the cranes and fuel handling devices included in this Commodity group. It was initially inadvertently overlooked.	YES	
137	2.4.2.6-1	Changed 3.5.2.29 to 3.5.1.28 for Component support high-strength steel threaded fasteners in ambient air	This change was made to correct a typo in the April 2002 submittal since AMR Item 3.5.2.29 was not used in the application.	YES	
138	2.4.2.7-1	~~Added "to non-CQE" to intended function of manhole MH-5 cover and flange.~~		N/A	This change has been retracted and will not be made.
139	2.5.2-1	*Added new component "instrumentation cable pigtails"*	*Response to POI-12*	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
140	3.1-1	Link 3.1.1.02 - Revised Item 2 in Discussion column.	This was revised to address the fact that the ISI Program only inspects SG shell welds and does not inspect the shell for loss of material. The SG Program inspects the shell for loss of material.	**Added since the meeting based on meeting discussion**	**Item 2 in the Discussion column of AMR Item 3.1.1.02 was revised to read as follows: "At FCS, the Inservice Inspection Program (B.1.6) only inspects applicable steam generator shell welds. Loss of material is managed by the Chemistry Program (B.1.2) and the Steam Generator Program (B.2.9). The Steam Generator Program includes methods to detect the general, crevice, and pitting corrosion discussed in NUREG-1801, Volume 2, IV.D1.1-c. These programs are described in Appendix B of this application."** **Also, see Item #147.**
141	3.1-1	*Link 3.1.1.15 - Discussion column changed B1.7 to B.2.9*	*Response to RAI 3.1.1-1*	YES	
142	3.1-1	~~Link 3.1.1.32 - remove water chemistry as an AMP~~		N/A	This change has been retracted and will not be made.
143	3.1-2	*Link 3.1.2.02 - Add OTI*	*Response to RAI 3.1.2-5*	YES	
144	3.1-2	*Link 3.1.2.04 - Add OTI*	*Response to RAI 3.1.2-1*	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
145	3.1-2	Link 3.1.2.06 - Added blowdown nozzles and deleted the ISI program	As a result of AMP review and development post-submittal, it was determined that for the components covered by this AMR Item, the ISI Program did not apply. The components are included in the SG Program. The SG blowdown nozzles were added as a component type to this Item and were included in the SG Program when it was determined that they, too, were not addressed by the ISI Program.	**NO, needs further clarification**	**Refer to POI 7.d.4. That POI refers to the response to RAI B.2.9-2, which describes how the results of the inspection of the carbon steel feedwater ring for loss of material due to general, pitting, and crevice corrosion provide bounding results for the steam generator nozzles. Not specifically mentioned in that discussion are the carbon steel steam generator blowdown nozzles. The aging management of these nozzles for the cited mechanisms is also bounded by the feedwater ring inspection for the same reasons.**
146	3.1-2	*Link 3.1.2.07 - Removed it from the application*	*Response to RAI B.2.9-2*	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
147	3.1-2	Link 3.1.2.14 - ~~Added steam generator shell,~~ deleted pitting corrosion, added crevice corrosion, and deleted ISI	~~The SG shell was added as a component to this item and was included in the SG Program when it was determined that it was not addressed by the ISI Program.~~ The change in the 1st bullet in the "AERMs" column was to correct a typo since pitting is addressed in the 2nd bullet. As a result of AMP review and development post-submittal, it was determined that for the components covered by this AMR Item, the ISI Program did not apply.	**YES, with additional clarification**	**The addition of the steam generator shell was retracted and will not be made. Instead, based on discussions during the public meeting, a change was made to AMR Item 3.1.1.02, which is addressed in item #140 in this table.**
148	3.1-2	Added new AMR Item 3.1.2.17	This was added as a result of the clarification provided for the Table 2.3.1.2-1 discussion for the RCP seal water cooler tubes earlier in this table. Component Type: RCP seal water cooler tubes Material: Stainless Steel Environment: Corrosion-Inhibited Treated Water AERMs: Cracking Program/Activity: One Time Inspection Program (B.3.5)	**Added since the meeting for clarification of entry #10 in this table**	**See the discussion earlier in this table (item #10) for Table 2.3.1.2-1 relative to the RCP seal water cooler tubes.**

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
149	3.1-3	Link 3.1.3.05 - Deleted thermal shield positioning pin and bolt	These components were inadvertently included with the April 2002 submittal. This item is meant to address the thermal shield only.	YES	
150	3.1-3	~~Link 3.1.3.11 - Deleted pressurizer shell~~		N/A	This change has been retracted and will not be made.
151	3.2-1	Link 3.2.1.04 - Deleted "not" from discussion column	Response to RAI 3.2.1-1	YES	
152	3.2-1	Link 3.2.1.09 - Added program and AERM information in discussion column	This information was added to 1) clarify that the Closed Cycle Cooling Water System Program as defined in the GALL Report consists of the Cooling Water Corrosion Program and the Water Chemistry Program at FCS and 2) indicate that for CCW at FCS, galvanic corrosion, where applicable, and MIC also apply. Relative to the additional mechanisms, they are similar LOM mechanisms, that have been identified as being plausible at FCS, that will be managed in the same manner as general, pitting, and crevice corrosion by the credited program activities.	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
153	3.2-2	Link 3.2.2.04 - Deleted component surface information	This change was made so that the AMR item could also be made to apply to internal SS surfaces in air as well. The AMR results are the same.	YES	
154	3.3-1	*Link 3.3.1.02 - Added PS/PMP*	*Response to RAI 3.3.1-1*	YES	
155	3.3-1	Link 3.3.1.05 - Added Cooling Water Corrosion Program	This AMR Item corresponds to GALL Report Volume I, Table 3, row 1 on page 20 of Volume 1. It is seen that there are many applicable GALL Item numbers in Volume 2 and that the AMP is plant specific. It was determined post-submittal that some of the plant activities credited for aging management of components were actually associated with the Cooling Water Corrosion Program instead of the PS/PM Program so the addition of that program was made.	**NO, needs further clarification**	**In the FCS LRA, Appendix B, Section B.2.2, a 4th bullet has been added following the 1st paragraph of that section. It reads as follows: "Some inspection activities included in this program perform external inspections of carbon steel components for degradation. For the applicable components, these activities are credited for external aging management of the components." See attached revision to Section B.2.2 in Appendix D of this letter. This change does not affect the LRA Appendix A USAR Supplement discussion for the program.**

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
156	3.3-1	Link 3.3.1.08 - Deleted OTI and PS/PMP and added ISI	This AMR Item corresponds to GALL Report Volume I, Table 3, row 5 on page 20 of Volume 1. It calls for AMPs of Water Chemistry and a plant specific program. It was determined post-submittal that the OTI and PSPM Programs were not needed since the AMP inspection functions are performed under the ISI Program for the covered components (Letdown and Regenerative HXs) at FCS.	YES	
157	3.3-1	Link 3.3.1.14 - added cast iron and clarifying info crediting the chemistry program	This AMR Item corresponds to GALL Report Volume I, Table 3, last row on page 21 of Volume 1. The addition of cast iron for this AMR Item is consistent with GALL Item Number VII.C2.3-a for the CCW pumps. The program information added just provides clarification again that the Closed Cycle Cooling Water System Program as defined by the GALL report consists of both The Chemistry Program and the Closed Cycle Cooling Water Program at FCS.	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
158	3.3-1	*Link 3.3.1.20 - added potable water*	*Response to RAI 2.3.3.14-2*	YES	
159	3.3-1	Link 3.3.1.24 - Deleted comment on cast iron and raw water	This full deletion should not have been made. The deletion should have only included the words "and bronze." This AMR Item is only credited for the cast iron CCW pumps.	YES	
160	3.3-2	Link 3.3.2.01 - added internal surfaces of aluminum components	This change was made so that the AMR Item could be used for aluminum with internal air environments as well since the AMR results are the same.	YES	
161	3.3-2	*Link 3.3.2.03 - Added aging management info about valve bodies*	*Response to RAI 2.3.3.14-2*	YES	
162	3.3-2	Link 3.3.2.10 - Deleted external surface language	This change was made so that the AMR Item could be used for brass/bronze with internal air environments as well since the AMR results are the same.	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
163	3.3-2	Link 3.3.2.16 - Add pitting/crevice corrosion, delete cooling water corrosion AMP, and add PS/PMP	It was determined post-LRA submittal that for the charging pump lube oil cooler tubes, the only component to which this AMR Item applies, pitting and crevice corrosion were possible and that the credited aging management activity was associated with the PSPM Program instead of the Cooling Water Corrosion Program.	YES	
164	3.3-2	*Link 3.3.2.17 - Add pipes and fittings*	*Response to RAI 3.2-1*	YES	
165	3.3-2	*Link 3.3.2.18 - Add pipes and fittings*	*Response to RAI 3.2-1*	YES	
166	3.3-2	Link 3.3.2.21 - Add tanks and coated carbon steel	Response to RAI 3.3.2-7 This AMR Item was utilized for the Diesel Fire Pump Fuel Oil Tank, FO-27, which is coated; however, from an AERM determination standpoint, the coating is not credited.	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
167	3.3-2	*Link 3.3.2.23 - Add bus duct*	*This component was added post-submittal for the SBO analysis changes that were documented in the response to RAI 2.5-1. It applies to the 22kv Bus Duct.* The added SBO work scope was actually in progress before the RAI was sent to OPPD so this change was originally identified as a change by OPPD; however, as stated above, the change was provided to the NRC in response to the above RAI.	YES	
168	3.3-2	Link 3.3.2.26- Delete carbon steel	This AMR Item only applies to cast iron components in a concrete environment in the Liquid Waste Disposal System; therefore, the identification of carbon steel as an applicable material was removed.	YES	
169	3.3-2	*Link 3.3.2.27 - Add pipes and fittings and pump casings, cast iron, and FPP*	*Response to RAI 2.3.3.14-2*	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
170	3.3-2	Link 3.3.2.30 - Added heat exchanger channel and channel head, *bronze, and oxygenated treated water <200F*	This AMR Item applies to the Control Room A/C Unit condenser channel heads and header so these components were added for selective leaching aging management. It is performed in conjunction with AMR Item 3.3.2.29. *Response to RAI 2.3.3.14-2*	YES	
171	3.3-2	Link 3.3.2.37 - Add valve bodies	This AMR Item was credited for Diesel Starting air copper and copper alloy valve bodies in the April 2002 LRA submittal but the component type was not included in the Component Type description at the time so it was added.	YES	
172	3.3-2	Link 3.3.2.38 - Add liquid	This clarification was added to indicate that this AMR Item also applies to the components in the liquid portion of the refrigeration cycle.	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
173	3.3-2	Link 3.3.2.45 - Add copper alloy	This clarification was added to show that this AMR Item applied to copper alloy tubing not identified as containing zinc as well. There is no difference in the AMR results for the slightly different materials in the fuel oil environment	YES	
174	3.3-2	*Link 3.3.2.47 - Add below grade and FPP*	*Response to RAI 2.3.3.14-2*	YES	
175	3.3-2	Link 3.3.2.50 – Added Tank	This AMR Item was credited for aging management of the Boric Acid Storage Tanks (in CVCS, Table 2.3.3.1-1) in the April 2002 LRA submittal; however, "tanks" were not identified in the Component Type column.	YES	
176	3.3-2	Link 3.3.2.56 - Delete OTI	Since elements of the credited Cooling Water Corrosion Program verify the adequacy of the Chemistry Program, for the Primary Sampling cooler tubes that link to this AMR Item, crediting the One Time Inspection Program was determined to be unnecessary.	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
177	3.3-2	Link 3.3.2.64 - Removed this link	This item was identical to AMR Item 3.3.2.75 so this item was eliminated and all links to it were changed to 3.3.2.75.	YES	
178	3.3-2	Link 3.3.2.70 - Add pipes and fittings	After the April 2002 LRA submittal, it was determined that the hydrogen lines connecting the valves, for which a hydrogen environment was identified, had not been included in the LRA so they were added and the Component Type "Pipes & Fittings" was added to this AMR Item.	YES	
179	3.3-2	*Link 3.3.2.73 - Add tanks and OTI. Deleted general corrosion and FPP*	*Response to RAIs 2.3.1.2-3*	YES	
180	3.3-2	*Link 3.3.2.74 - Add RCP pump cover, RCP seal water cooler tubes.* Removed "tubes" from heat exchanger.	*Response to RAI 3.1-1* This AMR Item applied to applicable HX subcomponents other than the tubes alone so the differentiation for tubes only was removed.	YES	
181	3.3-2	*Link 3.3.2.76 - Add valve bodies and pipes and fittings*	*Responses to RAI 3.3.2-7 and POI-1(a)*	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
182	3.3-2	*Link 3.3.2.77 - Removed this link*	*Response to RAI 3.3.2-1*	YES	
183	3.3-2	*Link 3.3.2.78 - Added this link*	*Response to RAI 2.3.3.8-1*	YES	
184	3.3-2	Link 3.3.2.84 – Added Brass	Even though brass is a copper alloy, this clarification identified the type of copper alloy. There is no effect on the applicable AMR results.	YES	
185	3.3-2	*Link 3.3.2.85 - Added filter/strainers*	*Response to RAI 3.3.2-7*	YES	
186	3.3-2	Link 3.3.2.89 - Added pipes and fittings	This change is not required since there are no Section 2 tables that utilize this AMR link for pipes and fittings.	YES	
187	3.3-2	~~Link 3.3.2.91 – Added heat exchangers and copper alloy~~		N/A	This change has been retracted and will not be made.
188	3.3-2	*Link 3.3.2.93 - Added pump casings and ductile iron*	*Responses to RAI 2.3.3.14-2*	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
189	3.3-2	*Link 3.3.2.95 - Added valve bodies, stainless steel, deoxygenated treated water <200°F, cracking and loss of material due to pitting and crevice corrosion, and FPP*	*Response to RAI 2.3.3.14-2* [Refer to discussion above for Table 2.3.3.15-1 relative to Item 3.3.2.95]	YES	
190	3.3-2	Link 3.3.2.96 - Add valves	The component Type Valves in the Liquid Waste Disposal System had a link to this AMR Item in the April 2002 LRA submittal; however, the Component Type "Valve" was not included in this AMR Item.	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
191	3.3-3	Link 3.3.3.01 - Add flow element/orifice, transmitter/element, *and V.A.1-a, V.A.3-a, and V.A.4-a, and change 3.3.1.10 to 3.2.1.10*	These Component Types were added to this AMR Item to address the inlet flow element to the boric acid blending tee, the Ion Exchanger loop letdown flow element, and charging pump discharge header flow element when it replaced AMR Item 3.3.1.08 for these components. AMR Item 3.3.1.08 addressed HXs only so AMR Item 3.3.3.01 became a better match with the addition of these component types *Response to RAIs 3.3-1 and 3.3.2-1*	YES	
192	3.3-3	*Link 3.3.3.03 - Added* valve bodies *and OTI*	This AMR Item was included for CVCS valve bodies in the April 2002 LRA submittal; however, the Component Type "valve bodies" was not included in the AMR Item so it was added. *Response to RAI 3.3.3-2*	YES	
193	3.3-3	*Link 3.3.3.04 - Deleted Link*	*Response to RAI 3.3.3-3*	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
194	3.3-3	Link 3.3.3.05 - Added heat exchangers	This AMR Item was included for Diesel Lube Oil and Fuel Oil heat exchangers in the April 2002 LRA submittal; however, the Component Type "heat exchangers" was not included in the AMR Item so it was added.	YES	
195	3.3-3	Link 3.3.3.06 - Deleted tanks	This AMR Item was deleted from 3.3.3.06 because the Type 1 table item to which it is linked, 3.3.1.07, specifically addresses tanks and was also included in the Table 2.3.3.5-1, Aux. Boiler Fuel Oil and Fire Protection Fuel Oil, row for Tanks. The link to 3.3.3.06 was removed from Table 2.3.3.5-1, as addressed above, so the Component Type "Tanks" is not needed.	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
196	3.3-3	Link 3.3.3.07 - Added filters/strainers and ductile iron	Filters/strainers were added as a Component Type in this AMR Item after it was determined that Item 3.3.3.07 was a better fit for the cast iron Raw Water filters/strainers than the original link of 3.3.1.05. Ductile iron was added as a material due to ductile iron valves present in CVCS.	YES	
197	3.3-3	Link 3.3.3.08 – *Deleted sleeves.* Added indicator/recorder and stainless steel	*Response to RAI 3.3.3-4* The stainless steel indicators/recorders in the CCW System had a link to this AMR Item in the April 2002 submittal; however, the component type and material for these were not identified in the AMR Item. This change adds these component types and material.	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
198	3.3-3	Link 3.3.3.09 - Added filter/strainers, fan housings, pumps, transmitter/element, ductile iron, and *boric acid corrosion*	This AMR Item was a link for filter housings in the Containment Ventilation System in the April 2002 LRA submittal; however, the component type was not included in the Item. This change adds it. This AMR Item was added post-LRA submittal as a link for fan housings and for filters/strainer housings in the Aux. Building HVAC Table 2.3.3.11-1. Flow element housings were added as a new Component Type to the Aux. Building HVAC Table 2.3.3.11-1 post-LRA submittal. That new component type included a link to this AMR Item. This AMR Item was a link for pump casings in the CCW system in the April 2002 LRA submittal; however, the Component Type was not included in the Item. This change adds it. This AMR Item was added as a link for the ductile iron valve bodies in CVCS as a more appropriate link for aging management than AMR Item 3.3.1.13; therefore, ductile iron was added as a material for Item 3.3.3.09. *Response to RAI 3.3.3-1*	**YES, with additional clarification**	**For all filters/strainers, fans & blowers, and transmitter/elements within scope of license renewal at FCS, the applicable part of the component evaluated and subject to aging management is the component housing (pressure boundary function). The same is true for pumps. The component evaluated and managed for aging is each pump casing. Refer to the responses to FCS RAIs 2.3.3.10-2, 2.3.3.10-3, and 2.3.3.16-3.**

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
199	3.3-3	Link 3.3.3.10 - Delete fire blocking and "made of same material." Added heat exchangers	Deleted "fire blocking" to just "Dampers" to allow encompassing of all dampers, not just fire dampers. Added heat exchangers since these component types were inadvertently omitted from this AMR Item in the April 2002 submittal. The referenced GALL Item Number (equivalent to AMR Item 3.3.1.05) does not contain cast iron; therefore, the "Justification for applying NUREG-1801 Aging Management Review Results" column for Item 3.3.3.10 was revised to read as follows: "This material is subject to the same environment and aging effect, and managed by the same aging management program as the components evaluated in NUREG-1801, Volume 2, VII.F2.1-a."	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
200	3.3-3	*Link 3.3.3.11 - Add flow element/orifice, FP sprinkler/spray nozzle, pipes and fittings, pump casings, switch/bistable housing, brass, bronze, copper alloy, and FPP. Deleted "for externally exposed components*	*Response to RAI 2.3.3.14-2*	YES	
201	3.3-3	Link 3.3.3.13 - Added chemistry AMP	The Chemistry Program is required as a mitigative program in conjunction with the Cooling Water Corrosion Program to adequately manage this AERM. It was inadvertently omitted from the April 2002 submittal.	YES	
202	3.4-1	*Link 3.4.1.02 - Added stainless steel*	*Response to RAI 3.3.3-6*	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
203	3.4-1	Link 3.4.1.10 - Added clarifying language regarding chemistry and cooling water corrosion AMPs and additional LOM mechanisms.	Both the Chemistry Program (B.1.2) and the Cooling Water Corrosion Program (B.2.2) manage the aging of the "Closed-cycle cooling water system" at FCS. Relative to the additional mechanisms, they are similar LOM mechanisms, that have been identified as being plausible at FCS, that will be managed in the same manner as general, pitting, and crevice corrosion by the credited program activities..	YES	
204	3.4-1	~~Link 3.4.1.12 - Added "(see subsection 3.4.2.2.5.2)" to Further Evaluation Required column.~~		N/A	This was a cut and paste error in Attachment A of the March 14, 2003 POI response submittal and did not represent an actual change to LRA Table 3.4-1. As such, the indicated wording has been retracted.
205	3.4-2	Link 3.4.2.03 - Added water chemistry AMP	Water Chemistry is the mitigative program and OTI is the inspection program for aging management of these components.	YES	
206	3.4-2	Link 3.4.2.04 - Added OTI	The Selective Leaching Program utilizes the OTI for aging management of these components.	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
207	3.4-3	Link 3.4.3.01 - Added stainless steel. Changed from B.2.8 to B.2.7	Adding stainless steel makes this AMR Item consistent with GALL AMR Item 3.4.1.04. Corrected program reference to B.2.8 which was entered in error.	YES	
208	3.4-3	Link 3.4.3.03 - Added low-alloy steel	This material is also found in this system/environment. The AERMs are the same and are managed by the same AMPs.	YES	
209	3.4-3	Link 3.4.3.04 - Added low-alloy steel	This material is also found in this system/environment. The AERMs are the same and are managed by the same AMPs.	YES	
210	3.5-1	*Link 3.5.1.23 - Revised link from 3.5.1.22 to 3.5.1.23*	*Response to RAI 3.5.1-5*	YES	
211	3.5-1	*Link 3.5.1.24 - Revised link from 3.5.1.23 to 3.5.1.24*	*Response to RAI 3.5.1-5*	YES	
212	3.5-2	Link 3.5.2.28 - Added cracking	Cracking was inadvertently omitted from the April 2002 submittal. Cracking is another plausible AERM for this material/environment and is managed by the same AMPs.	YES	

Open Item 3.0-1
Summary of Revisions to FCS LRA Tables

#	TABLE	CHANGE	REASON FOR CHANGE	CHANGE ACCEPTED AT 5/28-29/03 MEETING?	CLARIFICATIONS
213	3.5-2	Link 3.5.2.32 - Removed link	Deleted AERM of Cracking and SCC for stainless steel bolting in ambient air since they are not plausible.	YES	

Italicized text represents changes based on responses to NRC RAIs or POIs.
Normal text represents changes based on OPPD reviews of LR system Engineering Analyses.
Bolded text represents additional information requested by the NRC reviewers during discussions at the public meeting.

LIC-03-0089

Appendix B

Corrected Table 2.2-1

TABLE 2.2-1 Plant Level Scoping Results	
SSC	**Within Scope of License Renewal?**
120 VAC (2.5.10)	yes
120/208 Miscellaneous Power Lighting	no
125 VDC (2.5.9)	yes
161 KV Substation Equipment (2.5.21)	~~no~~ yes[1]
22 KV	no
277/480 Miscellaneous Power Lighting *	no
345 KV Substation Equipment (2.5.21)	~~no~~ yes[1]
4.16 KV (2.5.6)	yes
480 Bus (2.5.7)	yes
480 Motor Control Centers (2.5.8)	yes
Acetylene Gas *	no
Administration Building *	no
Argon Gas *	no
Auxiliary Boiler *	no
Auxiliary Boiler Fuel Oil (2.3.3.5)	yes
Auxiliary Building (2.4.2.1)	yes
Auxiliary Building Auxiliary Steam	no
Auxiliary Building Fire Barriers	no
Auxiliary Building HVAC (2.3.3.11)	yes
Auxiliary Feedwater (2.3.4.2)	yes
NSR Auxiliary Feedwater Pump Fuel Oil *	no

[1] **System Is Included with Substation Equipment – SBO Restoration – RAI 2.5-1**

TABLE 2.2-1 Plant Level Scoping Results	
SSC	**Within Scope of License Renewal?**
Auxiliary Instrument Panel (2.5.15)	yes
Auxiliary Steam	~~*no*~~ *Yes*[2]
Blowpipe System *	Yes[1]
Building Piles (2.4.2.4)	yes
Bus Bars (2.5.20)	yes
Cables and Connectors (2.5.1)	yes
Carbon Dioxide Gas *	no
Chem/RP Building HVAC	no
Chemical and Volume Control (2.3.3.1)	yes
Secondary Side Chemical Feed	~~*no*~~ *Yes*[2]
Chemistry and Radiation Protection Building	no
Circulating Water	no
Communications (2.5.18)	yes
Component Cooling 2.3.3.16)	yes
Component Supports (2.4.2.6)	yes
Compressed Air	yes[1]
Condensate	~~*no*~~ *Yes*[2]
Condensate Storage Tank Foundation *	no
Condenser Evacuation	no
Containment (2.4.1)	yes
Containment Electrical Penetrations (2.5.2)	yes
Containment Heating, Ventilation, and Air Conditioning (2.3.3.10)	yes
Containment Penetration, and System Interface comonents for Non-CQE Systems (2.3.2.2) *	yes

[2] *POI-01(a) – Required for 54.4(a)(2)*

TABLE 2.2-1 Plant Level Scoping Results	
SSC	**Within Scope of License Renewal?**
Control Board (2.5.16)	yes
Control Room Heating, Ventilation, and Air Conditioning (2.3.3.12)	yes
Demineralized Water *	yes[1]
Demineralized Water Sampling *	no
Diverse Scram System (2.5.17)	yes
Duct Banks (2.4.2.7)	yes
Electrical Equipment (2.5.14) *	yes
Emergency Diesel Generator Fuel Oil (2.3.3.3)	yes
Emergency Diesel Generator Lube Oil and Fuel Oil (2.3.3.4)	yes
Emergency Diesel Jacket Water (2.3.3.6)	yes
Emergency Lighting (2.5.19)	yes
Engineered Safeguards (2.5.3)	yes
Feedwater (2.3.4.1)	yes
Feedwater (Cross-Referenceection)	yes
Fire Protection (2.3.3.14)	yes
Fire Protection - Security Building *	no
Fire Protection – Warehouse *	no
Fire Protection Fuel Oil (2.3.3.5)	yes
Fuel Handling Equipment and Heavy Load Cranes (2.4.2.5)	yes
Gaseous Waste Disposal (2.3.3.18)	yes
Gasoline Storage Tank	no
Generator Seal Oil *	no
Hazardous Waste Storage Building	no
Heater Vents and Drains *	no
Hydrogen Gas	no

TABLE 2.2-1 Plant Level Scoping Results	
SSC	**Within Scope of License Renewal?**
Instrument Air (2.3.3.8)	yes
Intake and Turbine Building Sump Pump	no
Intake Structure (2.4.2.3)	yes
Intake Structure HVAC *	no
Liquid Waste Disposal (2.3.3.17)	yes
Main Steam and Turbine Steam Extraction (2.3.4.3)	yes
Maintenance Shop *	no
Meteorological Monitoring *	no
New Warehouse *	no
Nitrogen Gas (2.3.3.9)	yes
Nitrous Oxide Gas *	no
Non-CQE Auxiliary Feedwater Pump Fuel Oil *	no
Nuclear Instrumentation (2.5.4)	yes
Oxygen Gas *	no
Plant Computer and Emergency Response Facility Computer (2.5.11)	yes
Plant Security *	no
Portal Monitor Gas *	no
Post Accident Sampling	no
Potable Water	~~*no*~~ *Yes*[2]
Primary Sampling (2.3.3.19)	yes
Propane Gas *	no
Qualified Safety Parameter Display (2.5.12)	yes
Rad Waste Building	no
Rad Waste Building HVAC	no
Radiation Monitoring - Mechanical (2.3.3.20) Electrical (2.5.13)	yes

TABLE 2.2-1 Plant Level Scoping Results	
SSC	**Within Scope of License Renewal?**
Raw Water (2.3.3.15)	yes
Reactor Coolant (2.3.1.2)	yes
Reactor Protection System (2.5.5)	yes
Reactor Regulating System	no
Reactor Vessel (2.3.1.3)	yes
Reactor Vessel Internals (2.3.1.1)	yes
Safety Injection (HPSI, LPSI, Containment Spray) (2.3.2.1)	yes
Sampling Platform *	no
Sanitary and Storm Drains *	no
Seal Water	no
Secondary Sampling	no
Secondary Side Chemical Feed	no
Security Building *	no
Security Building HVAC *	no
Security Diesel *	no
Security Diesel Fuel Oil *	no
Service Air	no
Solid Waste Disposal	no
Spent Fuel Pool Cooling (2.3.3.2)	yes
Starting Air (2.3.3.7)	yes
Steam Generator ~~Feedwater~~ Blowdown	~~no~~ yes[1] [3]
Substation *	no
Substation Equipment – SBO Restoration (2.5.21)	~~no~~ yes[4]

[3] POI-01(d)
[4] RAI 2.5-1/POI-06(a)

TABLE 2.2-1 Plant Level Scoping Results	
SSC	**Within Scope of License Renewal?**
Technical Support Center	no
Technical Support Center HVAC	no
Toxic Gas Monitoring (2.3.3.12)	yes
Transformer Yard	no
Turbine Generator Electro Hydraulic Control *	no
Turbine Generator and Accessories	no
Turbine Generator Lubricating Oil	no
Turbine Building and Service Building (2.4.2.2)	yes
Turbine Building HVAC	no
Turbine Plant Cooling	~~no~~ yes[5]
Turbine Supervisory *	no
Vacuum Priming *	no
Vacuum Service (Laboratories) *	no
Ventilating Air (2.3.3.13)	yes
Vents and Drains	no
Vibration Monitoring	no
Warehouse HVAC	no

[1] The intended function(s) for these systems was limited to containment isolation and/or pressure boundary between CQE and Non- CQE systems. The number of components with intended functions in each of these system is very small, so to make the process of evaluation and review more efficient the components which have intended functions were were transferred to one commodity group for evaluation. That group is titled "Containment Penetration, and System Interface Components for Non-CQE Related Systems." (2.3.2.2)

[5] POI-01(a)

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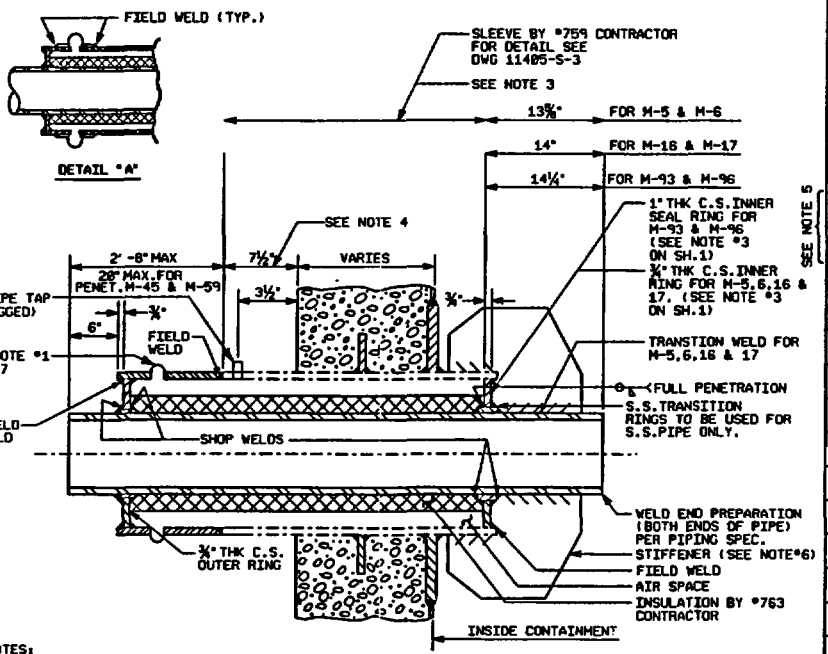
Appendix C

Typical Containment Penetration Drawing
(Referenced in Item 123 of Appendix A)



NOTES:

1. EXPANSION JOINT ASSEMBLY SHOP FABRICATED AS ONE PIECE. WELDING ENDS TO BE IDENTICAL IN MATERIAL, O.D. AND WALL THK. TO SLEEVE. (SEE DWG. "11405-S-3)
2. SEE NOTES No. 1.2.3 & 4 ON SHEET 1
3. 6'-7½" LONG FOR PENETRATION M-93 & M-96
   6'-6⅜" LONG FOR PENETRATION M-16 & M-17
   6'-10" LONG FOR PENETRATION M-5 & M-6 .
4. 6½" LONG FOR PENETRATION M-5,6,16 & 17
5. ENDS OF PIPE TO BE MACHINED TO MATCH CLASS 1100 PIPING.
6. SEE 11405-M-70 SH.6 FOR PENETRATION COOLING FINS AND STIFFERNERS.
7. EXPANSION JOINT MODIFICATIONS TO M-93 AND M-96 ARE SHOWN AT DETAIL "A" ON THIS DRAWING. ORIGINAL S.S. ELEMENT REMOVED. THE REPLACEMENT ASSEMBLY FABRICATED IN TWO HALVES. ASSEMBLIES TO BE WELDED TO OUTSIDE OF EXISTING WELD ENDS. REFER TO OPPD DWG D-4405 AND TEMPFLEX DWG 051188 FOR DETAILS.

PIPING PENETRATION LIST

PEN No.	SERVICE DESCRIPTION	PIPE			SLEEVE	
		SIZE	CLASS	TEMP. DEG.F.	SIZE	SCH.
M-5	H.P.S.I.	4"	2500R	212	12"	80
M-6	H.P.S.I.	4"	1503R	212	12"	80
M-16	SHUTDOWN COOLING	12"	2501R	300	24"	80
M-17	L.P.S.I.	12"	601R	212	24"	80
M-93	FEEDWATER	16"	1600	438	30"	1" THK
M-96	FEEDWATER	16"	1600	438	30"	1" THK

FORT CALHOUN STATION

CONTAINMENT PIPE PENETRATIONS

DWG. 11405-M-78 SH. 3

REV. NO. 13187

FILE 16239

REV 7

USAR FIGURE No. 5.4-3

DATE | TASK/MR #

LIC-03-0089
Appendix D

Revised License Renewal Application Section B.2.2
Cooling Water Corrosion Program
(Referenced in Item 155 of Appendix A)

B.2.2 COOLING WATER CORROSION PROGRAM

The FCS Cooling Water Corrosion Program is consistent with XI.M20, "*Open-Cycle Cooling Water System*," and XI.21, "*Closed-Cycle Cooling Water System*," as identified in NUREG-1801, with the exception of the enhancements specified in the following table and with the following clarifications:

- XI.M20 - Program Description, 3. Parameters Monitored/Inspected, 4. Detection of Aging Effects, 5. Monitoring and Trending, and 6. Acceptance Criteria

  External coatings are addressed by the FCS General Corrosion of External Surfaces Program.

- XI.M21 - Program Description, 2. Preventative Actions, 5. Monitoring and Trending, 6. Acceptance Criteria, and 7. Corrective Action

  The Chemistry-related portions of the program are addressed in the FCS Chemistry Program.

- The scope of the FCS Cooling Water Corrosion Program includes those plant specific components identified in Tables 3.2.2, 3.3.2, and 3.3.3 of this application for which the Cooling Water Corrosion Program is identified as an aging management program.

- Some inspection activities included in this program perform external inspections of carbon steel components for degradation. For the applicable components, these activities are credited for external aging management of the components.

The FCS Cooling Water Corrosion Program will also include the following exceptions to NUREG-1801:

- XI.M21 - 3. Parameters Monitored/Inspected, 4. Detection of Aging Effects, and 5. Monitoring and Trending

  The license renewal commitment for these programs relates only to the maintenance of the pressure boundary and not the maintenance of fluid flow. Fluid flow is considered an active function. Performance testing and other active system function testing is not performed on an 18 month or 5 year frequency in accordance with EPRI TR-107396, Closed Cooling Water Chemistry Guideline, because this EPRI document does not address this criteria or specify that testing frequency. Non-destructive testing and heat transfer performance to identify pressure boundary integrity are performed per EPRI TR-107396.

The following enhancements will be made to the Cooling Water Corrosion Program prior to the period of extended operation.

NUREG-1801 Program	Criteria	Enhancement
XI.M20, Open-Cycle Cooling Water System	1. Scope of Program 4. Detection of Aging Effects 5. Monitoring and Trending	Inspections to various raw water components will be added based on FCS' Cooling Water Corrosion Program susceptibility evaluation. These inspection activities will be commensurate with the GALL Program.
XI.M21, Closed-Cycles Cooling Water System	3. Parameters Monitored/ Inspected 4. Detection of Aging Effects	Inspections to various cooling water components will be added based on FCS' Cooling Water Corrosion Program susceptibility evaluation. These inspection activities will be commensurate with the GALL Program.

Operating Experience:

Review of FCS operating experience has identified some component part replacements (and repairs) due to corrosion and cracking in the Component Cooling Water and Raw Water Systems. Appropriate long term corrective actions were implemented based on these experiences. These included material changes, additional preventive maintenance, and increased sample evaluation.

Conclusion:

The FCS Cooling Water Corrosion Program provides reasonable assurance that the aging effects will be managed such that the components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.