3.0 AGING MANAGEMENT REVIEW

For those structures and components identified as subject to an aging management review, 10 CFR 54.21(a)(3) requires demonstration that the effects of aging will be adequately managed so that their intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation. This section describes the results of the aging management reviews of the components and structures identified in Section 2, *Scoping and Screening Methodology for Identifying Structures and Components Subject to Aging Management Review, and Implementation Results*.

The aging management reviews were conducted by:

1. Identifying the materials and environments of these structures and components;

2. Determining the applicable aging effect(s) requiring management; and

3. Assigning the appropriate aging management program to those components and structures with materials and environments that were determined to be subject to an aging effect requiring management.

The result of each mechanical and structural aging management review is documented as a unique set of component(s) or subcomponent(s), made of a material, exposed to an environment, with an Aging Effect Requiring Management (AERM), managed by an Aging Management Program (AMP). This unique set of

- component(s) or subcomponent(s)
- material
- environment
- AERM
- AMP

is defined as a FCS Aging Management Group (AMG). The aging management review results for systems, structures, or component groupings are made up of several AMGs.

Four types of aging management review results are discussed in this section of the application. The first of these are the FCS AMGs that credit AMPs evaluated in NUREG-1801. To identify those FCS AMGs that credit AMPs evaluated in NUREG-1801, each FCS AMG was compared to the NUREG-1801, Volume 2 aging management review results using the process documented below. FCS aging management review results were classified as being consistent with NUREG-1801 if the comparison between each FCS AMG and a single row from the tables in NUREG-1801, Volume 2 met the following criteria.

1. The FCS AMG component, material, environment and AERM are determined to be the same, using engineering judgment, as the component, material, environment and AERM documented in NUREG-1801, Volume 2.

2. The FCS AMP is determined to be the same, using engineering judgment, as the AMP documented in NUREG-1801, Volume 2; or NUREG-1801, Volume 2 specifies a plant specific AMP.

FCS AMG aging management review results were classified as consistent with NUREG-1801 with deviation if the comparison between the FCS AMG and a single row from the tables in NUREG-1801, Volume 2 met criterion 1 above, and the FCS AMP deviates from one or more of the acceptance criteria for the AMP documented in Chapters 10 and 11 of NUREG-1801, Volume 2.

The Aging Management Review results for FCS AMGs that credit AMPs evaluated in NUREG-1801 are reported in Tables 3.x.1 of sections 3.1 through 3.6. The process used to develop these tables is described below.

The component, aging effect/mechanism, aging management programs and further evaluation recommended columns from Table 3.x.1 of NUREG-1800 were copied from NUREG-1800 for those rows applicable to a PWR.

A discussion column was added to the four columns. Where applicable, the following information was entered in the discussion column:

- A statement that the FCS AMGs are consistent with NUREG-1801, that the FCS AMGs are consistent with NUREG-1801 with deviation(s), or that the components, materials and environments identified in NUREG-1801 are not applicable to FCS
- Identification of the FCS AMP when NUREG-1801 specifies a plant specific program; the applicable Appendix B section is also identified
- A discussion of the materials and environments included in the FCS AMGs that are consistent with the materials and environments reported in NUREG-1801
- If necessary, a description of component(s) in the FCS AMGs that is not included in NUREG-1801
- If necessary, a description of material(s) in the FCS AMGs that is not included in NUREG-1801

In Table 3.6-1, discussions of a FCS specific AMP and modification are included for electrical cables and connectors not subject to 10 CFR 50.49 EQ requirements.

The second type of aging management review result discussed in Sections 3.1, 3.2, 3.3, 3.4, and 3.5 of the application are the FCS AMGs that do not credit AMPs evaluated in NUREG-1801. These aging management review results are reported in Tables 3.x.2 of Sections 3.1, 3.2, 3.3, 3.4, and 3.5. The entries in Tables 3.x.2 were developed by identifying components with the same material, environment, AERM and AMP, and entering these results as a single row in the table. The AERM column of Tables 3.x.2 includes a discussion of the applicable aging mechanisms for the AERM. The applicable Appendix B section is also identified for each AMP.

The third type of Aging Management Review results discussed in Sections 3.1, 3.2, 3.3, 3.4, and 3.5 of the application are the FCS AMGs with components or materials not evaluated in NUREG-1801 that rely on aging management programs in NUREG-1801 for FCS License Renewal and the justification for the use of these programs. These aging management review results are reported in Tables 3.x.3 of Sections 3.1, 3.2, 3.3, 3.4, and 3.5.

The fourth type of Aging Management Review results discussed in this section of the application includes the components replaced on the basis of performance or condition. The performance or condition monitoring programs to ensure functionality during the period of extended operation are discussed in Section 3.3 of this application.

3.1 AGING MANAGEMENT OF REACTOR COOLANT SYSTEMS

The FCS reactor coolant systems evaluated in this section of the application consist of the Reactor Coolant System, the Reactor Vessel and the Reactor Vessel Internals and associated components.

The Reactor Coolant System consists of two heat transfer loops connected in parallel to the reactor vessel. Each loop contains one steam generator, two reactor coolant pumps, connecting piping and instrumentation. A pressurizer is connected to one of the reactor vessel outlet (hot leg) pipes by a surge line. All components of the Reactor Coolant System are located within the Containment Building.

The Reactor Vessel is a 140-inch beltline inner diameter two-loop vessel. This configuration has four coolant inlet nozzles and two coolant outlet nozzles. The vessel includes a removable head with multiple penetrations (control element drive mechanisms, in-core instrumentation nozzles, and the reactor vessel vent line). The vessel includes two leakage detection lines. The vessel is an all welded, manganese molybdenum-nickel steel plate and forging construction. The interior surfaces of the vessel in contact with reactor coolant are clad with austenitic stainless steel.

The Reactor Vessel Internals are designed to support and align the fuel assemblies, control element assemblies (CEAs), and in-core instrumentation (ICI) assemblies, and to guide reactor coolant through the reactor vessel. The components of the Reactor Vessel Internals consist of the upper guide structure, core support barrel, thermal shield, core shroud, CEA shroud assemblies, ICI assemblies, lower support structure, and flow skirt.

Operating Experience:

Site: A review of plant specific operating experience was conducted, including the review of Condition Reports and discussions with appropriate site personnel to identify AERM. These reviews concluded that the AERM identified by the FCS specific operating experience were consistent with those identified in NUREG-1801.

Industry: A review of industry-wide operating experience was conducted to identify aging effects requiring management. This included a review of operating experience issued during 2001. This review concluded that the AERM identified by industry operating experience were consistent with those identified in NUREG-1801.

On-Going: The on-going review of plant specific and industry-wide operating experience is conducted in accordance with the FCS Operating Experience Program.

3.1.1 AGING MANAGEMENT PROGRAMS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR LICENSE RENEWAL

Table 3.1-1 shows the aging management programs evaluated in NUREG-1801 that are relied on for license renewal of the reactor coolant systems at FCS. Note that this table only includes those components, materials and environments that are applicable to a PWR. Information on FCS specific components and materials, not listed in NUREG-1801 but included in the component group of this application, is included in the discussion column.

TABLE 3.1-1
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1.01	Reactor coolant pressure boundary components	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801 except as noted in item 4 below. 2. The metal fatigue time limited aging analyses are discussed in Section 4.3. 3. Consistent with NUREG-1801, this group includes the low alloy steel and carbon steel with stainless steel cladding, stainless steel, CASS, and nickel alloy in borated treated water; and low alloy steel in deoxygenated water and steam at FCS. 4. Cumulative fatigue damage is not an aging effect requiring management for control element assembly shroud bolts and core support barrel snubber assembly socket head cap screws. These components are preloaded to prevent fatigue cycles.

TABLE 3.1-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1.02	Steam generator shell assembly	Loss of material due to pitting and crevice corrosion	Inservice inspection; water chemistry	Yes, detection of aging effects is to be further evaluated	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. This aging effect is managed by the Inservice Inspection Program (B.1.6), the Chemistry Program (B.1.2) and the Steam Generator Program (B.2.9). The Steam Generator Program includes methods to detect 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. 3. Consistent with NUREG-1801, this group includes carbon steel in deoxygenated treated water at FCS.
3.1.1.03	Pressure vessel ferritic materials that have a neutron fluence greater than 10^{17} n/cm^2 (E>1 MeV)	Loss of fracture toughness due to neutron irradiation embrittlement	TLAA, evaluated in accordance with Appendix G of 10 CFR 50 and RG 1.99	Yes, TLAA	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. The reactor vessel neutron embrittlement time limited aging analyses are discussed in Section 4.2. 3. Consistent with NUREG-1801, this group includes low alloy steel with stainless steel cladding in borated treated water.

TABLE 3.1-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1.04	Reactor vessel beltline shell and welds	Loss of fracture toughness due to neutron irradiation embrittlement	Reactor vessel surveillance	Yes, plant specific	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. The Reactor Vessel Integrity Program (B.1.7) manages this aging effect. This program is described in Appendix B of this application. 3. Consistent with NUREG-1801, this group includes low alloy steel with stainless steel cladding in borated treated water.
3.1.1.05	Westinghouse and B&W baffle/former bolts	Loss of fracture toughness due to neutron irradiation embrittlement and void swelling	Plant specific	Yes, plant specific	This item is not applicable since FCS is a Combustion Engineering designed and manufactured reactor.

TABLE 3.1-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1.06	Small-bore reactor coolant system and connected systems piping	Crack initiation and growth due to SCC, intergranular SCC, and thermal and mechanical loading	Inservice inspection; water chemistry; one-time inspection	Yes, parameters monitored/ inspected and detection of aging effects are to be further evaluated	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. This aging effect is managed by the Inservice Inspection Program (B.1.6), the Chemistry Program (B.1.2) and the One-Time Inspection Program (B.3.5). These programs are described in Appendix B of this application. The One-Time Inspection Program verifies that service-induced weld cracking is not occurring in the small-bore piping less than NPS 4, including pipe, fittings, and branch connections. 3. Consistent with NUREG-1801, this group includes stainless steel in borated treated water at FCS.
3.1.1.07	Vessel shell	Crack growth due to cyclic loading	TLAA	Yes, TLAA	Underclad crack growth due to cyclic loading was not identified as a TLAA for FCS.

TABLE 3.1-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1.08	Reactor internals	Changes in dimension due to void swelling	Plant specific	Yes, plant specific	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801 with the exception noted in item 4 below. 2. This aging effect is managed by the Reactor Vessel Internals Inspection Program (B2.8). FCS will continue to participate in industry programs to investigate aging effects and determine appropriate aging management programs. This program is described in Appendix B of this application. 3. Consistent with NUREG-1801, this group includes stainless steel in borated treated water at FCS. 4. Changes in dimension due to void swelling are not an aging effect requiring management for some reactor internals components because the intended function of the component is not affected. As noted in the Safety Evaluation Report Related to the License Renewal of Arkansas Nuclear One, Unit 1, the specific impacts of concern for void swelling are constriction of flow paths, interference with control rod insertion and excessive baffle bolt loading.

TABLE 3.1-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
					This is consistent with NUREG-1705, Safety Evaluation Report Related to the License Renewal of Calvert Cliffs Nuclear Power Plant, Units 1 and 2 (Final Report), and NUREG-1723, Safety Evaluation Report Related to the License Renewal of Oconee Nuclear Station, Units 1, 2 and 3. Swelling of certain components does not impact the noted concerns. These components are the core support barrel alignment key, core support barrel fasteners, core support barrel locking collar, core support barrel spacer, core support barrel upper flange, upper guide structure alignment lug (NUREG-1801 FAP guide lug), upper guide structure fasteners, upper guide structure guide pins, hold down ring, upper guide structure locking strip, upper guide structure plate (a support for an instrument tube), upper guide structure shim ring, upper guide structure tab, thermal shield positioning pins and screws, thermal shield pins, thermal shield shim, lower internals anchor block,

TABLE 3.1-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
					lower internals fasteners, lower vessel internals dowel pins, core shroud fasteners, control element assembly shroud nuts and bolts, in-core instrumentation guide tubes (above instrumentation support plate), in-core instrumentation guide tube fasteners, incore instrumentation support plate and gussets.
3.1.1.09	PWR core support pads, instrument tubes (bottom head penetrations), pressurizer spray heads, and nozzles for the steam generator instruments and drains	Crack initiation and growth due to SCC and/or primary water stress corrosion cracking (PWSCC)	Plant specific	Yes, plant specific	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. This aging effect is managed by the Alloy 600 Program (B.3.1). This program is described in Appendix B of this application. 3. Consistent with NUREG-1801, this group includes Alloy 600 in borated treated water at FCS. The vessel flange leak detection line at FCS is made of Alloy 600.

TABLE 3.1-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1.10	Cast austenitic stainless steel (CASS) reactor coolant system piping	Crack initiation and growth due to SCC	Plant specific	Yes, plant specific	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. This aging effect is managed by the Chemistry Program (B.1.2), the Inservice Inspection Program (B.1.6) and the Thermal Embrittlement of Cast Austenitic Stainless Steel Program (B.3.7). These programs are described in Appendix B of this application. 3. Consistent with NUREG-1801, this group includes cast austenitic stainless steel (CASS) reactor coolant system piping.
3.1.1.11	Pressurizer instrumentation penetrations and heater sheaths and sleeves made of Ni-alloys	Crack initiation and growth due to PWSCC	Inservice inspection; water chemistry	Yes, AMP for PWSCC of Inconel 182 welds is to be evaluated	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. This aging effect is managed by the Alloy 600 Program (B.3.1), Chemistry Program (B.1.2) and Inservice Inspection Program (B.1.6) These programs are described in Appendix B of this application. The Alloy 600 Program manages the AERM of PWSCC in Inconel 182 welds. 3. Consistent with NUREG-1801, this group includes Alloy 600 and nickel alloys in borated treated water at FCS.

TABLE 3.1-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1.12	Westinghouse and B&W baffle former bolts	Crack initiation and growth due to SCC and IASCC	Plant specific	Yes, plant specific	This item is not applicable since FCS is a Combustion Engineering designed and manufactured reactor.
3.1.1.13	Westinghouse and B&W baffle former bolts	Loss of preload due to stress relaxation	Plant specific	Yes, plant specific	This item is not applicable since FCS is a Combustion Engineering designed and manufactured reactor.
3.1.1.14	Steam generator feedwater impingement plate and support	Loss of section thickness due to erosion	Plant specific	Yes, plant specific	The components identified in NUREG-1801, Volume 2, IV.D1.1-e are not applicable to FCS.

TABLE 3.1-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1.15	(Alloy 600) Steam generator tubes, repair sleeves, and plugs	Crack initiation and growth due to PWSCC, outside diameter stress corrosion cracking (ODSCC), and/or intergranular attack (IGA) or loss of material due to wastage and pitting corrosion, and fretting and wear; or deformation due to corrosion at tube support plate intersections	Steam generator tubing integrity; water chemistry	Yes, effectiveness of a proposed AMP is to be evaluated	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. This aging effect is managed by the Steam Generator Program (B1.7) and Chemistry Program (B.1.2). These programs are described in Appendix B of this application. The FCS Technical Specifications have already incorporated the NRC-approved basis for steam generator degradation management. 3. Consistent with NUREG-1801, this group includes Alloy 600 in borated treated and deoxygenated treated water. 4. Combustion Engineering (Westinghouse) mechanical and welded steam generator tube plugs are installed at FCS. 5. NUREG-1801 IV.D 1.2-f is not pertinent to FCS, as phosphate chemistry has never been used. Regarding NUREG-1801 IV.D 1.2-g, FCS did not require analysis in accordance with NRC Bulletin 88-02.

TABLE 3.1-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1.16	Tube support lattice bars made of carbon steel	Loss of section thickness due to FAC	Plant specific	Yes, plant specific	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. The inspection of the tube support lattice bars for loss of thickness is included in the Steam Generator Program (B.2.9) described in Appendix B of this application. 3. Consistent with NUREG-1801, this group includes carbon steel in deoxygenated water.
3.1.1.17	Carbon steel tube support plate	Ligament cracking due to corrosion	Plant specific	Yes, effectiveness of a proposed AMP is to be evaluated	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. This aging effect is managed by the Steam Generator Program (B.2.9) and Chemistry Program (B.1.2). These programs are described in Appendix B of this application. The FCS Technical Specifications have already incorporated NRC-approved guidance for steam generator degradation management. 3. Consistent with NUREG-1801, this group includes carbon steel in deoxygenated water.

TABLE 3.1-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1.18	Steam generator feedwater inlet ring and supports	Loss of material due to flow-corrosion	Combustion Engineering (CE) steam generator feedwater ring inspection	Yes, plant specific	As stated in NUREG-1801, Volume 2, VI.D1.3-a, this effect is only applicable to certain CE System 80 steam generators. Because of differences in design between the FCS steam generators and the System 80 steam generators, this effect is not applicable to FCS.
3.1.1.19	Reactor vessel closure studs and stud assembly	Crack initiation and growth due to SCC and/or IGSCC	Reactor head closure studs	No	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes low alloy steel in air possibly exposed to borated treated water. 3. The Reactor Head Closure Studs Program is incorporated into the Bolting Integrity Program at FCS.
3.1.1.20	CASS pump casing and valve body	Loss of fracture toughness due to thermal aging embrittlement	Inservice inspection	No	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes CASS in borated treated water.
3.1.1.21	CASS piping	Loss of fracture toughness due to thermal aging embrittlement	Thermal aging embrittlement of CASS	No	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes CASS in borated treated water.

TABLE 3.1-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1.22	BWR piping and fittings; steam generator components	Wall thinning due to flow-accelerated corrosion	Flow-accelerated corrosion	No	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes carbon steel in deoxygenated treated water.
3.1.1.23	Reactor coolant pressure boundary (RCPB) valve closure bolting, manway and holding bolting, and closure bolting in high pressure and high temperature systems	Loss of material due to wear; loss of preload due to stress relaxation; crack initiation and growth due to cyclic loading and/ or SCC	Bolting integrity	No	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes stainless steel, low alloy steel and carbon steel in air possibly exposed to borated treated water.
3.1.1.24	CRD nozzle	Crack initiation and growth due to PWSCC	Ni-alloy nozzles and penetrations; water chemistry	No	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes Alloy 600 in borated treated water.

TABLE 3.1-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1.25	Reactor vessel nozzles safe ends and CRD housing; reactor coolant system components (except CASS and bolting) *Note: NUREG-1801, Volume 2, items IV.C2.3-b and IV.C2.4-b that include CASS are included in this group.*	Crack initiation and growth due to cyclic loading, and/or SCC, and PWSCC	Inservice inspection; water chemistry	No	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes stainless steel, austenitic stainless steel, Alloy 600 and carbon or low alloy steel clad with stainless steel in borated treated water.
3.1.1.26	Reactor vessel internals CASS components	Loss of fracture toughness due to thermal aging, neutron irradiation embrittlement, and void swelling	Thermal aging and neutron irradiation embrittlement	No	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes CASS in borated treated water.

TABLE 3.1-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1.27	External surfaces of carbon steel components in reactor coolant system pressure boundary	Loss of material due to boric acid corrosion	Boric acid corrosion	No	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes carbon steel in air possibly exposed to borated treated water.
3.1.1.28	Steam generator secondary manways and handholds (CS)	Loss of material due to erosion	Inservice inspection	No	This item is not applicable since FCS is a Combustion Engineering designed and manufactured reactor.
3.1.1.29	Reactor internals, reactor vessel closure studs, and core support pads	Loss of material due to wear	Inservice inspection	No	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes low alloy steel and stainless steel in borated treated water.
3.1.1.30	Pressurizer integral support	Crack initiation and growth due to cyclic loading	Inservice inspection	No	The component identified in NUREG-1801 is not applicable to FCS.
3.1.1.31	Upper and lower internals assembly (Westinghouse)	Loss of preload due to stress relaxation	Inservice inspection; loose part and/or neutron noise monitoring	No	These items are not applicable since FCS is a Combustion Engineering designed and manufactured reactor.

TABLE 3.1-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1.32	Reactor vessel internals in fuel zone region (except Westinghouse and Babcock & Wilcox [B&W] baffle bolts)	Loss of fracture toughness due to neutron irradiation embrittlement, and void swelling	PWR vessel internals; water chemistry	No	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes stainless steel and nickel alloys in borated treated water at FCS.
3.1.1.33	Steam generator upper and lower heads; tubesheets; primary nozzles and safe ends	Crack initiation and growth due to SCC, PWSCC. IASCC	Inservice inspection; water chemistry	No	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes stainless steel in borated treated water.
3.1.1.34	Vessel internals (except Westinghouse and B&W baffle former bolts)	Crack initiation and growth due to SCC and IASCC	PWR vessel internals; water chemistry	No	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes stainless steel, nickel alloys and CASS in borated treated water.
3.1.1.35	Reactor internals (B&W screws and bolts)	Loss of preload due to stress relaxation	Inservice inspection; loose part monitoring	No	These items are not applicable since FCS is a Combustion Engineering designed and manufactured reactor.

TABLE 3.1-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1.36	Reactor vessel closure studs and stud assembly	Loss of material due to wear	Reactor head closure studs	No	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes high strength steel in air possibly exposed to borated treated water at FCS. 3. The Reactor Head Closure Studs Program is incorporated into the Bolting Integrity Program (B.1.1) at FCS.
3.1.1.37	Reactor internals (Westinghouse upper and lower internal assemblies; CE bolts and tie rods)	Loss of preload due to stress relaxation	Inservice inspection; loose part monitoring	No	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801 with the deviation that FCS does not credit the Loose Parts Monitoring Program as discussed in NUREG-1801, Volume 2, IV.B3.2-g and IV.B3.4-h. 2. The Reactor Vessel Internals Inspection Program (B.2.8) manages this aging effect. This program is described in Appendix B of this application. 3. Consistent with NUREG-1801, this group includes nickel alloy and stainless steel in borated treated water.

3.1.2 COMPONENTS OR AGING EFFECTS THAT ARE NOT ADDRESSED IN NUREG-1801

Table 3.1-2 contains the reactor coolant systems aging management review results that are not addressed in NUREG-1801. This table includes the component types, materials, environments, aging effects requiring management and the programs and activities for managing aging. Table 3.1-3 contains components and materials in reactor coolant systems not evaluated in NUREG-1801 that rely on aging management programs in NUREG-1801 for FCS License Renewal and the justification for the use of these programs.

TABLE 3.1-2
FCS REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM COMPONENT TYPES SUBJECT TO AGING MANAGEMENT NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.1.2.01	External surfaces of stainless steel components in reactor coolant system pressure boundary	Stainless Steel	Ambient Air	None	Not Applicable
3.1.2.02	Pressurizer heater sleeves, steam generator - tubes, ICI nozzles, nozzle safe ends, CEDM and incore instrument housings, reactor head vent pipe, pressurizer bottom head plate cladding, steam generator primary head cladding and shock suppressors & supports, nozzle welds, thermal sleeves	Nickel Based Alloy including Alloy 600	Borated Treated Water	Loss of Material Crevice corrosion in the presence of sufficient levels of oxygen, halogens, sulfates, or copper	Chemistry Program (B.1.2)
3.1.2.03	External surfaces of nickel based alloy components in reactor coolant system pressure boundary	Nickel Based Alloy including Alloy 600	Ambient Air	None	Not Applicable
3.1.2.04	Steam generator lower head and manway cladding and primary side tube sheet	Nickel Based Alloy	Borated Treated Water	Cracking	Chemistry Program (B.1.2)

TABLE 3.1-2 (CONTINUED)
FCS REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM COMPONENT TYPES SUBJECT TO AGING MANAGEMENT NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.1.2.05	Reactor coolant pump thermal barrier	Cast Austenitic Stainless Steel (CASS)	Corrosion-Inhibited Treated Water	Cracking	Chemistry Program (B.1.2)
3.1.2.06	Secondary side of the tubesheet, steam generator feedwater, steam and instrument nozzles, and feedwater nozzle safe ends	Low-Alloy Steel	Deoxygenated Treated Water	Loss of Material • General and crevice corrosion due to the exposure of low-alloy steel to dissolved oxygen • Pitting corrosion due to the exposure of low-alloy steel to halogens and sulfates	Chemistry Program (B.1.2), Steam Generator Program (B.2.9) and Inservice Inspection Program (B.1.6))
3.1.2.07	Steam generator tube plugs	Nickel Based Alloy	Deoxygenated Treated Water	Loss of Material Crevice and pitting corrosion due to the exposure of nickel-based alloys to halogens and sulfates	Chemistry Program (B.1.2) and Steam Generator Program (B.2.9)

TABLE 3.1-2 (CONTINUED)
FCS REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM COMPONENT TYPES SUBJECT TO AGING MANAGEMENT NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.1.2.08	Reactor vessel internals - flow skirt	Alloy 600	Borated Treated Water	Changes in Dimensions Void swelling as a result of helium bubble nucleation and growth from nuclear transmutation reactions of nickel or boron in the austenitic stainless steel or nickel-based alloy material.	Reactor Vessel Internals Inspection Program (B.2.8)
3.1.2.09	Reactor vessel internals - flow skirt	Alloy 600	Borated Treated Water	Cracking · Primary Water Stress Corrosion Cracking · irradiation-assisted stress corrosion cracking in the presence of oxygen concentrations > 5 ppb, halogen concentrations > 150 ppb, and fluence levels > 5 E20 n/cm2	Alloy 600 Program (B.3.1)

TABLE 3.1-2 (CONTINUED)
FCS REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM COMPONENT TYPES SUBJECT TO AGING MANAGEMENT NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.1.2.10	Reactor vessel internals - flow skirt	Alloy 600	Borated Treated Water	Fatigue Due to repeated stress/strain cycles caused by fluctuating loads and temperatures	Fatigue Monitoring Program (B.2.4)
3.1.2.11	Reactor vessel internals - flow skirt	Alloy 600	Borated Treated Water	Reduction of Fracture Toughness Due to changes in the properties of the stainless steel and nickel-base alloys used in reactor internals	Reactor Vessel Internals Inspection Program (B.2.8)
3.1.2.12	Steam generator secondary manway steel bolts	Carbon Steel	Ambient Air	Loss of preload Due to stress relaxation in high temperature environments	Bolting Integrity Program (B.1.1)
3.1.2.13	Pressurizer manway cover plate, SG feedwater and steam nozzle safe ends	Carbon Steel	Ambient Air	Loss of Material Due to the exposure to leaking boric acid	Boric Acid Corrosion Prevention Program (B.2.1)

TABLE 3.1-2 (CONTINUED)
FCS REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM COMPONENT TYPES SUBJECT TO AGING MANAGEMENT NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.1.2.14	Steam generator steam nozzle safe end, steam generator feed ring	Carbon Steel	Deoxygenated Treated Water	Loss of Material • General and pitting corrosion due to the exposure to dissolved oxygen • pitting corrosion due to the exposure to halogens and sulfates	Chemistry Program (B.1.2), Steam Generator Program (B.2.9) and Inservice Inspection Program (B.1.6)
3.1.2.15	Pressurizer base	Low-Alloy Steel	Ambient Air	Loss of Material Due to the exposure to leaking boric acid	Boric Acid Corrosion Prevention Program (B.2.1)
3.1.2.16	Pressurier relief valve and Instrument nozzle nozzle inserts	Nickel Based Alloy	Borated Treated Water	Cracking Stress corrosion cracking due to potential exposure to halogens or sulfates.	Chemistry Program (B.1.2) and Inservice Inspection Program (B.1.6)

TABLE 3.1-3
COMPONENTS IN REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM NOT EVALUATED IN NUREG-1801 THAT RELY ON AGING MANAGEMENT PROGRAMS IN NUREG-1801 FOR FCS LICENSE RENEWAL

Row Number	FCS Components	FCS Material	FCS Environment	FCS AERMs	FCS Program Activity	Applicable NUREG-1801 Aging Management Review Results Row Number	Justification for applying NUREG-1801 Aging Management Review Results
3.1.3.01	Thermal Shield and Thermal Shield Positioning Pin & Bolt	Stainless Steel	High Temp/ Neutron Fluence/ Borated Treated Water	Cracking	Chemistry Program (B.1.2)	3.1.1.34	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management program as the components evaluated in NUREG-1801, Volume 2, IV.B3.4-a and IV.B3.4-e
3.1.3.02	Thermal Shield and Thermal Shield Positioning Pin & Bolt	Stainless Steel	High Temp/ Neutron Fluence/ Borated Treated Water	Cracking	Reactor Vessel Internals Inspection Program (B.2.8)	3.1.1.34	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management program as the components evaluated in NUREG-1801, Volume 2, IV.B3.4-a and IV.B3.4-e

TABLE 3.1-3 (CONTINUED)
COMPONENTS IN REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM NOT EVALUATED IN NUREG-1801 THAT RELY ON AGING MANAGEMENT PROGRAMS IN NUREG-1801 FOR FCS LICENSE RENEWAL

Row Number	FCS Components	FCS Material	FCS Environment	FCS AERMs	FCS Program Activity	Applicable NUREG-1801 Aging Management Review Results Row Number	Justification for applying NUREG-1801 Aging Management Review Results
3.1.3.03	Bolt - Thermal Shield	Stainless Steel	High Temp/ Neutron Fluence/ Borated Treated Water	Loss of preload	Inservice Inspection Program (B.1.6)	3.1.1.37	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management program as the components evaluated in NUREG-1801, Volume 2, IV.B3.4-h
3.1.3.04	Thermal Shield and Thermal Shield Positioning Pin & Bolt	Stainless Steel	High Temp/ Neutron Fluence/ Borated Treated Water	Reduction of Fracture Toughness	Reactor Vessel Integrity Program (B.1.7)	3.1.1.32	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management program as the components evaluated in NUREG-1801, Volume 2, IV.B3.4-c and IV.B3.4-g

TABLE 3.1-3 (CONTINUED)
COMPONENTS IN REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM NOT EVALUATED IN NUREG-1801 THAT RELY ON AGING MANAGEMENT PROGRAMS IN NUREG-1801 FOR FCS LICENSE RENEWAL

Row Number	FCS Components	FCS Material	FCS Environment	FCS AERMs	FCS Program Activity	Applicable NUREG-1801 Aging Management Review Results Row Number	Justification for applying NUREG-1801 Aging Management Review Results
3.1.3.05	Thermal Shield and Thermal Shield Positioning Pin & Bolt	Stainless Steel	High Temp/ Neutron Fluence/ Borated Treated Water	Changes in Dimensions	Reactor Vessel Internals Inspection Program (B.2.8)	3.1.1.08	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management program as the components evaluated in NUREG-1801, Volume 2, IV.B3.4-b
3.1.3.06	Reactor coolant valves including PORV, drain valves, head and pressurizer vent valves, instrument isolation valves etc.; Reactor vessel cladding	Stainless Steel	Borated treated water	Cracking	Chemistry (B.1.2) and Inservice Inspection Programs (B.1.6)	3.1.1.25	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management programs as the components evaluated in NUREG-1801, Volume 2, IV.C2.2-f and IV.A2.4-b
3.1.3.07	Not used in application						

TABLE 3.1-3 (CONTINUED)
COMPONENTS IN REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM NOT EVALUATED IN NUREG-1801 THAT RELY ON AGING MANAGEMENT PROGRAMS IN NUREG-1801 FOR FCS LICENSE RENEWAL

Row Number	FCS Components	FCS Material	FCS Environment	FCS AERMs	FCS Program Activity	Applicable NUREG-1801 Aging Management Review Results Row Number	Justification for applying NUREG-1801 Aging Management Review Results
3.1.3.08	Feedwater nozzle safe end	Low-Alloy Steel	Containment Air	Loss of Material	Boric Acid Corrosion Prevention Program (B.2.1)	3.1.1.27	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management programs as the components evaluated in NUREG-1801, Volume 2, IV.D1.1-g
3.1.3.09	Reactor coolant pump driver mounts	Carbon Steel	Containment Air	Loss of Material	Boric Acid Corrosion Prevention Program (B.2.1)	3.1.1.27	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management programs as the components evaluated in NUREG-1801,Volume 2, IV.C2.3-f

TABLE 3.1-3 (CONTINUED)
COMPONENTS IN REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM NOT EVALUATED IN NUREG-1801 THAT RELY ON AGING MANAGEMENT PROGRAMS IN NUREG-1801 FOR FCS LICENSE RENEWAL

Row Number	FCS Components	FCS Material	FCS Environment	FCS AERMs	FCS Program Activity	Applicable NUREG-1801 Aging Management Review Results Row Number	Justification for applying NUREG-1801 Aging Management Review Results
3.1.3.10	Pressurizer relief valve external portion of body	Carbon Steel	Containment Air	Loss of Material	Boric Acid Corrosion Prevention Program (B.2.1)	3.1.1.27	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management programs as the components evaluated in NUREG-1801, Volume 2, IV.C2.4-f
3.1.3.11	Reactor vessel nozzles and safe ends, pressurizer shell	Low-Alloy Steel	Containment Air	Loss of Material	Boric Acid Corrosion Prevention Program (B.2.1)	3.1.1.27	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management programs as the components evaluated in NUREG-1801, Volume 2, IV.A2.1-a

TABLE 3.1-3 (CONTINUED)
COMPONENTS IN REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM NOT EVALUATED IN NUREG-1801 THAT RELY ON AGING MANAGEMENT PROGRAMS IN NUREG-1801 FOR FCS LICENSE RENEWAL

Row Number	FCS Components	FCS Material	FCS Environment	FCS AERMs	FCS Program Activity	Applicable NUREG-1801 Aging Management Review Results Row Number	Justification for applying NUREG-1801 Aging Management Review Results
3.1.3.12	Steam generator feedwater and steam nozzles	Low-Alloy Steel	Deoxygenated Treated Water	Loss of Material	Flow-Accelerated Corrosion Program (B.1.5)	3.1.1.22	The material is subject to the same environment and aging effect, and managed by the same aging management program as evaluated in Table 3.1-1, Item 3.1.1.22. The aging effect is independent of component type.
3.1.3.13	ICI Nozzles, RV Vent Nozzle	Alloy 600	Borated Treated Water	Cracking	Chemistry Program (B.1.2) Alloy 600 Program (B.3.1)	3.1.1.24	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management programs as the components evaluated in NUREG-1801, Volume 2, IV.A2.2-a and IV.A2.7-b

TABLE 3.1-3 (CONTINUED)
COMPONENTS IN REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM NOT EVALUATED IN NUREG-1801 THAT RELY ON AGING MANAGEMENT PROGRAMS IN NUREG-1801 FOR FCS LICENSE RENEWAL

Row Number	FCS Components	FCS Material	FCS Environment	FCS AERMs	FCS Program Activity	Applicable NUREG-1801 Aging Management Review Results Row Number	Justification for applying NUREG-1801 Aging Management Review Results
3.1.3.14	Thermal Shield	Stainless Steel	High Temp/ Neutron Fluence/ Borated Treated Water	Fatigue	TLAA	3.1.1.01	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management programs as the components evaluated in NUREG-1801, Volume 2, IV.B3.4-d

3.2 AGING MANAGEMENT OF ENGINEERED SAFETY FEATURES SYSTEMS

The Engineered Safety Features Systems are composed of the Safety Injection and Containment Spray System and the Mechanical Containment Penetrations Commodity Group at FCS.

The Safety Injection (SI) System injects borated water into the Reactor Coolant System to provide emergency core cooling. The major components of the SI system are the three high pressure safety injection (HPSI) pumps, two low pressure safety injection (LPSI) pumps, four safety-injection tanks, four safety-injection leakage coolers, eight HPSI control valves, four LPSI control valves and other various valves, instrumentation, and piping.

During normal plant operation the SI system is maintained in a standby mode with all of its components lined up for emergency injection. A safety injection actuation signal (SIAS) automatically starts the HPSI and LPSI pumps and automatically opens the high pressure and low pressure injection valves. During the injection mode of operation, the HPSI and LPSI pumps take suction from the Safety Injection and Refueling Water Tank (SIRWT) and inject borated water into the Reactor Coolant System (RCS) via the safety injection nozzles located on the RCS cold legs. The four safety injection tanks constitute a passive injection system.

The Containment Spray (CS) System consists of three spray pumps, two heat exchangers (shutdown cooling heat exchangers) and all necessary piping, valves, instruments, and accessories. The pumps discharge the borated water through the two heat exchangers, during recirculation, to a dual set of spray headers and spray nozzles in the containment. These spray headers are supported from the containment roof.

The Containment Penetrations and System Interface Components for Non-CQE Systems Commodity Group consists of isolation valves, piping, and mechanical penetrations into containment for the following mechanical systems: Compressed Air (CA-PA), Demineralized Water (DW), Blowpipe and Feedwater Blowdown (FW-BD). The safety related heat exchangers in the Demineralized Water System are included. The mechanical portions of all electrical penetrations (i.e., canister and header plate) are also included.

Operating Experience:

Site: A review of plant specific operating experience was conducted, including the review of Condition Reports and discussions with appropriate site personnel to identify AERM. These reviews concluded that the AERM identified by the FCS specific operating experience were consistent with those identified in NUREG-1801.

Industry: A review of industry-wide operating experience was conducted to identify aging effects requiring management. This included a review of operating experience issued during 2001. This review concluded that the AERM identified by industry operating experience were consistent with those identified in NUREG-1801.

On-Going: The on-going review of plant specific and industry-wide operating experience is conducted in accordance with the FCS Operating Experience Program.

3.2.1 AGING MANAGEMENT PROGRAMS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR LICENSE RENEWAL

Table 3.2-1 shows the aging management programs evaluated in NUREG-1801 that are relied on for license renewal of the Engineered Safeguards Features Systems at FCS. Note that this table only includes those components, materials and environments that are applicable to a PWR. Information on FCS specific components and materials, not listed in NUREG-1801 but included in the component group of this application, is included in the discussion column.

TABLE 3.2-1
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR ENGINEERED SAFETY FEATURES EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1.01	Piping, fittings, and valves in emergency core cooling system	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. The metal fatigue time limited aging analyses are discussed in Section 4.3.
3.2.1.02	Components in containment spray (PWR only), standby gas treatment (BWR only), containment isolation, and emergency core cooling systems	Loss of material due to general corrosion	Plant specific	Yes, plant specific	The applicable FCS components, materials and environments identified in NUREG-1801 are discussed in row number 3.2.1.06 of this table.

TABLE 3.2-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR ENGINEERED SAFETY FEATURES EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1.03	Components in containment spray (PWR only), standby gas treatment (BWR only), containment isolation, and emergency core cooling systems	Loss of material due to pitting and crevice corrosion	Plant specific	Yes, plant specific	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. The Chemistry Program (B.1.2) supplemented by the One Time Inspection Program (B.3.5) to verify the effectiveness of the Chemistry Program's management of the aging effects of these components. These programs are described in Appendix B of this application. 3. Consistent with NUREG-1801, this group only includes stainless steel in oxygenated treated water for components in containment isolation at FCS.
3.2.1.04	Containment isolation valves and associated piping	Loss of material due to microbiologically influenced corrosion	Plant specific	Yes, plant specific	No FCS containment isolation valves and associated piping in systems that are not addressed in this or other sections of this application were determined to be subject to the aging effect of loss of material due to microbiologically influenced corrosion
3.2.1.05	High pressure safety injection (charging) pump miniflow orifice	Loss of material due to erosion	Plant specific	Yes, plant specific	The component identified in NUREG-1801 is not applicable to FCS.

TABLE 3.2-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR ENGINEERED SAFETY FEATURES EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1.06	External surface of carbon steel components *This row is only found in Table 2 of NUREG-1801, Volume1. It is not found in Table 3.2-1 of NUREG-1800.*	Loss of material due to general corrosion	Plant specific	Yes, plant specific	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. The General Corrosion of External Surfaces Program (B.3.3) manages the aging effects of these components. This program is described in Appendix B of this application. 3. Consistent with NUREG-1801, this group includes carbon steel components in ambient air at FCS.
3.2.1.07	Piping and fittings of CASS in emergency core cooling system	Loss of fracture toughness due to thermal aging embrittlement	Thermal aging embrittlement of CASS	No	The material identified in NUREG-1801 is not applicable to FCS. CASS piping and fittings are not used in the ESF systems at FCS.
3.2.1.08	Components serviced by open-cycle cooling system	Local loss of material due to corrosion and/or buildup of deposits due to biofouling	Open-cycle cooling water system	No	The FCS ESF components are not serviced by open-cycle cooling system.

TABLE 3.2-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR ENGINEERED SAFETY FEATURES EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1.09	Components serviced by closed-cycle cooling system	Loss of material due to general, pitting, and crevice corrosion	Closed-cycle cooling water system	No	1. The aging management results are consistent with the results documented in NUREG-1801. 2. Consistent with NUREG-1801, this group includes stainless steel, carbon steel and cast iron in corrosion-inhibited treated water at FCS.
3.2.1.10	Pumps, valves, piping, and fittings in containment spray and emergency core cooling systems	Crack initiation and growth due to SCC	Water chemistry	No	1. The aging management results are consistent with the results documented in NUREG-1801. 2. Consistent with NUREG-1801, this group includes stainless steel and stainless steel clad carbon steel in chemically treated borated water at FCS.
3.2.1.11	Carbon steel components	Loss of material due to boric acid corrosion	Boric acid corrosion	No	1. The aging management results are consistent with the results documented in NUREG-1801. 2. Consistent with NUREG-1801, this group includes carbon and low alloy steel at FCS.

TABLE 3.2-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR ENGINEERED SAFETY FEATURES EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1.12	Closure bolting in high pressure or high temperature systems	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	Bolting integrity	No	1. The aging management results are consistent with the results documented in NUREG-1801. 2. Consistent with NUREG-1801, this group includes carbon and low alloy steel in ambient air at FCS.

3.2.2 COMPONENTS OR AGING EFFECTS THAT ARE NOT ADDRESSED IN NUREG-1801

Table 3.2-2 contains Engineered Safety Features Systems aging management review results that are not addressed in NUREG-1801. This table includes the component types, materials, environments, and aging effects requiring management, and the programs and activities for managing aging. Table 3.2-3 contains components in Engineered Safety Features not evaluated in NUREG-1801 that rely on aging management programs in NUREG-1801 for FCS License Renewal and the justification for the use of these programs.

TABLE 3.2-2
FCS ENGINEERED SAFETY FEATURES COMPONENT TYPES SUBJECT TO AGING MANAGEMENT REVIEW NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.2.2.01	Heat Exchanger - Tubes	Alloy 600	Chemically Treated Borated Water	Loss of Material Crevice corrosion in the presence of sufficient levels of oxygen, halogens, sulfates, or copper	Chemistry Program (B.1.2)
3.2.2.02	Heat Exchanger - Tubes	Alloy 600	Chemically Treated Borated Water	Cracking Stress Corrosion Cracking due to exposure to halogens or sulfates	Chemistry Program (B.1.2)
3.2.2.03	Heat Exchanger - Tubes	Alloy 600	Corrosion-Inhibited Treated Water	Loss of Material • Crevice and pitting corrosion in the presence of sufficient levels of oxygen, halogens, or sulfates • MIC due to exposure to microbiological activity	Chemistry Program (B.1.2) and Cooling Water Corrosion Program (B.2.2)
3.2.2.04	External surface of stainless steel components	Stainless Steel	Ambient Air	None	Not Applicable

TABLE 3.2-2 (CONTINUED)
FCS ENGINEERED SAFETY FEATURES COMPONENT TYPES SUBJECT TO AGING MANAGEMENT REVIEW NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.2.2.05	Filter/Strainers	Galvanized Steel	Containment Air	Loss of Material • Crevice corrosion where crevices exist that allow a corrosive environment to develop • General corrosion where both oxygen and moisture are present	Period Surviellance and Preventive Maintenance Program
3.2.2.06	Heat Exchanger - Shell	Cast Iron	Corrosion-Inhibited Treated Water	Loss of Material Selective leaching due to the exposure of cast iron to dissolved oxygen	Selectrive Leaching Program
3.2.2.07	Valve, Pipes & Fittings	Carbon Steel	Dry Air/Gas	None	Not Applicable

TABLE 3.2-3
COMPONENTS IN ENGINEERED SAFETY FEATURES NOT EVALUATED IN NUREG-1801 THAT RELY ON AGING MANAGEMENT PROGRAMS IN NUREG-1801 FOR FCS LICENSE RENEWAL

Row Number	FCS Components	FCS Material	FCS Environment	FCS AERMs	FCS Program Activity	Applicable NUREG-1801 Aging Management Review Results Row Number	Justification for applying NUREG-1801 Aging Management Review Results
3.2.3.01	Safety injection tanks, flow element and orifice bodies, orifice plate, tubing and heat exchangers	Stainless steel	Chemically Treated Borated Water	Crack initiation and growth / Stress corrosion cracking	Chemistry Program (B.1.2)	3.2.1.10	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management program as the components evaluated in NUREG-1801, Volume 2, V.D1.1-a
3.2.3.02	Leakage accumulators	Carbon steel with stainless steel cladding	Chemically Treated Borated Water	Crack initiation and growth / Stress corrosion cracking	Chemistry Program (B.1.2)	3.2.1.10	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management program as the components evaluated in NUREG-1801, Volume 2, V.D1.7-b

3.3 AGING MANAGEMENT OF AUXILIARY SYSTEMS

The Auxiliary Systems consist of the following systems and components:

- Spent Fuel Pool Cooling System
- Fuel Handling and Heavy Load Cranes (including New and Spent Fuel Storage Racks)
- Raw Water System (Open Cycle Cooling Water System in NUREG-1801)
- Component Cooling Water System (Closed Cycle Cooling Water System in NUREG-1801)
- Chemical and Volume Control System
- Instrument Air System
- Nitrogen Gas System
- Control Room HVAC and Toxic Gas Monitoring System
- Auxiliary Building HVAC System
- Containment HVAC System
- Ventilating Air System (includes Diesel Generator rooms)
- Fire Protection System including the Fire Protection Fuel Oil System
- Diesel Generator Fuel Oil System and Auxiliary Boiler Fuel Oil System
- Diesel Generator System including the Diesel Jacket Water System, the Diesel Generator Lube Oil System, and the Diesel Generators Starting Air System
- Primary Sampling System
- Liquid Waste Disposal System
- Gaseous Waste Disposal System
- Radiation Monitoring-Mechanical Components

The Spent Fuel Pool Cooling System consists of a stainless steel lined storage pool, two storage pool circulation pumps, a storage pool heat exchanger, a demineralizer and filter, two fuel transfer canal drain pumps, piping, and manual valves. The pool concrete and liner are evaluated with the Auxiliary Building.

The Fuel Handling and Heavy Load Cranes System consists of the refueling machine, tilting machines in the Auxiliary Building and in Containment, fuel transfer conveyor, fuel transfer carrier box, fuel transfer tube, new and spent fuel handling tools, new and spent fuel storage racks, thirty-six (36) cranes of varying types (i.e., polar crane, overhead crane, hoist with monorail, and jib crane) and three (3) elevators.

The Raw Water (RW) system is an open-cycle cooling water system which uses screened water from the Missouri River. The system includes four parallel vertical mixed-flow pumps installed in the Intake Structure pump house. The pumps discharge into an interconnected header which splits into two parallel supply headers. The two supply headers run underground from the Intake Structure to the Auxiliary Building, where they join in an interconnected inlet header to the four Component Cooling Water (CCW) heat exchangers. Downstream of the CCW heat exchangers, the Raw Water discharge header runs through the Turbine Building and discharges to the river.

The Component Cooling Water System is a closed loop system used to transfer heat from various components carrying radioactive or potentially radioactive fluids to the raw water. This system consists of three motor driven circulating pumps, four heat exchangers, a surge tank, valves, and piping. The water in the system is demineralized and deaerated and an inhibitor is added for protection against corrosion.

The Chemical and Volume Control System includes one regenerative heat exchanger, one letdown heat exchanger, five ion exchangers, one volume control tank, three positive-displacement charging pumps, one boric acid batching tank, two boric acid storage tanks, two centrifugal boric acid transfer pumps, and one chemical addition tank.

The Instrument Air System provides oil-free, filtered, and dried air for pneumatic controls, instrumentation, and the actuation of valves, dampers and similar devices. Instrument Air is distributed to the various pneumatic components it serves through a network of supply headers and distribution risers. The Instrument Air System also feeds the suction of the compressors for the Diesel Starting Air system. Backup accumulators containing instrument air or nitrogen are provided on selected pneumatic devices to ensure their operability if instrument air pressure drops.

The Nitrogen Gas System provides compressed nitrogen gas to the Safety Injection Tanks and provides a gas blanket to various vessels and contained areas of the plant.

The Control Room HVAC and Toxic Gas Monitoring System consists of two air conditioning units; two outside air filter units, each with its own supply fan; an outside air intake plenum; and distribution ductwork.

The Auxiliary Building HVAC System is a once-through, non-recirculating type using supply and exhaust fans. Portions of the Auxiliary Building HVAC System may be utilized to purge hydrogen from the containment.

The Containment HVAC System provides ventilation and cooling of the containment. Containment HVAC consists of four separate sub-systems. These sub-systems provide containment air re-circulation, cooling, nuclear detector well cooling, containment purge, and hydrogen purge.

The Ventilating Air System passive equipment is contained within the Emergency Diesel Generator rooms.

The Fire Protection System water supply system has two vertical turbine type fire pumps. One fire pump is driven by an electric motor and the other fire pump is driven by a diesel engine. Both pumps deliver screened and strained Missouri River water to the underground water distribution system, which in turn supply the automatic water fire suppression systems, interior hose stations and fire hydrants in the yard. An independent underground looped yard main system capable of delivering sprinkler flow plus adequate hose flow to support manual fire fighting for a single fire is provided for the Fire Protection System.

Four safety related plant areas are provided with automatic halon 1301 extinguishing systems. These areas include the Cable Spreading Room, both Switchgear Rooms and the Control Room cabinets. The plant is divided into unique fire areas as required by Appendix A to NRC Branch Technical Position APCSB 9.5-1, and 10CFR 50, Appendix R. Walls enclosing separate fire areas utilize fire resistive construction. Openings in plant fire barriers are protected by rated fire doors, fire dampers, and fire barrier penetration seals. Portable fire extinguishers are identified in the Fire Hazards Analysis as being provided throughout the station, generally in accordance with NFPA 10. Fire extinguishers, fire hoses, and air packs are not subject to an aging management review because they are replaced based on condition in accordance with applicable NFPA standards and plant procedures for fire protection equipment. This position is consistent with the NRC Staff's guidance on consumables, which has been incorporated into NEI 95-10 Revision 2.

RCP lube oil collection neoprene hoses will be replaced on condition in accordance with the Period Surveillance and Preventive Maintenance Program. These hoses provide a gravity drain of RCP lube oil from the collection pans to the lube oil collection tanks. The hoses are not pressurized and do not normally contain fluid.

The Fire Protection Fuel Oil System supplies the sole source of fuel oil to the diesel engine fire pump. The unit is located at the north end of the Intake Structure. A 10-gallon fuel oil day tank for the diesel engine is located adjacent to the engine. Fuel is transferred from the 550-gallon diesel fire pump fuel oil tank to the day tank.

The Diesel Generator Fuel Oil System provides fuel to the emergency diesel generators in the proper amount to maintain engine speed and load. An 18,000 gallon underground storage tank serves both engines. Two transfer pumps for each diesel transfer fuel from the underground storage tank to the wall-mounted auxiliary tank. Fuel gravity drains from the wall mounted tank to the engine base tank. One engine-driven fuel oil pump and one motor driven fuel oil pump delivers fuel to the engine fuel injectors. Warehoused components include a portable hand pump, a rubber hose and hose couplings. These components will be replaced on performance or condition in accordance with the Periodic Surveillance and Preventive Maintenance Program. These components contribute to the first intended function listed above, involving the transfer of diesel fuel from the auxiliary boiler fuel oil storage tank to the diesel engine fuel oil storage tank. The components are normally not pressurized and normally do not contain fluid. The Auxiliary Boiler Fuel Oil System consists of a fuel oil transfer pump, piping, filters, instrumentation and warehoused equipment for delivery of fuel oil from the auxiliary boiler fuel oil storage tank to the diesel engine fuel oil storage tank.

The Diesel Generator System includes emergency diesel generators designed to furnish reliable in-plant ac power when power is not available from the 345 or 161-kV systems. Each emergency diesel generator is provided with an exhaust silencer and auxiliaries. Each emergency diesel generator interfaces with an integral cooling system, two air starting systems, a lubricating system, two fuel systems between the engine mounted fuel oil tanks and the engine fuel lines. Both emergency diesel generators are supplied fuel from a common, underground fuel oil storage tank by redundant transfer pumps. Immersion heaters are provided to maintain engine jacket water and lubricating oil temperatures at desirable temperatures for quick, reliable starting. The emergency diesel generators are located in separate rooms of the Auxiliary Building.

The Diesel Jacket Water System provides cooling to the engine. Each engine has its own self contained radiator type cooling system. Two different coolant mixtures are used in the diesels. For DG-1 a glycol based coolant mixture is used during the winter months with the coolant mixture being changed out to a nitrite based coolant mixture during the summer to ensure the rating of the generator. DG-2 uses a glycol based coolant mixture year round. The Diesel Generator Lube Oil System lubricates the diesel engine components and filters the engine lube oil. The Diesel Generators Starting Air System provides stored pressurized air for starting the emergency diesel generators. Each tank has the capacity for five starts of the diesel (combining for a total of ten emergency starts).

The Primary Sampling system includes the primary sampling panel, the CVCS panel, the steam generator blowdown analyzer rack, the instrument panel, steam generator blowdown sample chiller, and the manual sampling sink and hood.

The Liquid Waste Disposal system is used to collect, store, prepare for disposal, and dispose of liquid radioactive wastes. Radioactive liquid wastes are generated as a result of plant operation, repair, and maintenance activities.

The Gaseous Waste Disposal System includes the containment isolation valves that close on a Containment Isolation Actuation Signal (CIAS) and the piping between the containment penetrations and the containment isolation valves. Also included are the waste gas compressor seal water heat exchangers that receive cooling water from the Component Cooling Water System.

The Radiation Monitoring-Mechanical Components System consists of the mechanical portions of the radiation monitors and their supporting components.

Operating Experience:

Site: A review of plant specific operating experience was conducted, including the review of Condition Reports and discussions with appropriate site personnel to identify AERM. These reviews concluded that the AERM identified by the FCS specific operating experience were consistent with those identified in NUREG-1801.

Industry: A review of industry-wide operating experience was conducted to identify aging effects requiring management. This included a review of operating experience issued during 2001. This review concluded that the AERM identified by industry operating experience were consistent with those identified in NUREG-1801.

On-Going: The on-going review of plant specific and industry-wide operating experience is conducted in accordance with the FCS Operating Experience Program.

3.3.1 AGING MANAGEMENT PROGRAMS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR LICENSE RENEWAL

Table 3.3-1 shows the aging management programs evaluated in NUREG-1801 that are relied on for license renewal of the Auxiliary Systems at FCS. Note that this table only includes those components, materials and environments that are applicable to a PWR. Information on FCS-specific components and materials, not listed in NUREG-1801 but included in the component group of this application, is included in the discussion column.

TABLE 3.3-1
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR AUXILIARY SYSTEMS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1.01	Components in spent fuel pool cooling and cleanup	Loss of material due to general, pitting, and crevice corrosion	Water chemistry and one-time inspection	Yes, detection of aging effects is to be further evaluated	The material identified in NUREG-1801 is not applicable to FCS. These components are addressed in Section 3.3.2 of this application.
3.3.1.02	Linings in spent fuel pool cooling and cleanup system; seals and collars in ventilation systems	Hardening, cracking and loss of strength due to elastomer degradation; loss of material due to wear	Plant specific	Yes, plant specific	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. The General Corrosion of External Surfaces Program (B.3.3) manages this aging effect. This program is described in Appendix B of this application. 3. Consistent with NUREG-1801, this group only includes elastomer seals in the ventilation systems exposed to ambient air at FCS.
3.3.1.03	Components in load handling, chemical and volume control system (PWR), and reactor water cleanup and shutdown cooling systems (older BWR)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801 for the chemical and volume control and primary sampling systems. 2. The metal fatigue time limited aging analyses are discussed in Section 4.3.1 of this application.

TABLE 3.3-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR AUXILIARY SYSTEMS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1.04	Heat exchangers in reactor water cleanup system (BWR); high pressure pumps in chemical and volume control system (PWR)	Crack initiation and growth due to SCC or cracking	Plant specific	Yes, plant specific	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. The Chemistry (B.1.2) and One-Time Inspection Programs (B.3.5) manage this aging effect. One-Time Inspection will be conducted prior to the period of extended operation to confirm the effectiveness of the Chemistry Program. This program is described in Appendix B of this application. 3. Consistent with NUREG-1801, this group includes stainless steel in chemically treated borated water at FCS.

TABLE 3.3-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR AUXILIARY SYSTEMS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1.05	Components in ventilation systems, diesel fuel oil system, and emergency diesel generator systems; external surfaces of carbon steel components	Loss of material due to general, pitting, and crevice corrosion, and MIC	Plant specific	Yes, plant specific	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. The Periodic Surveillance and Preventive Maintenance (B.2.7), General Corrosion of External Surfaces (B.3.3), and Fire Protection Programs (B.2.5) manage this aging effect. These programs are described in Appendix B of this application. The FCS Fire Protection Program provides guidance for detecting loss of material due to general, pitting, crevice, and microbiologically influenced corrosion (MIC). 3. Consistent with NUREG-1801, this group includes carbon steel, galvanized steel, and copper in air, and carbon steel in diesel engine exhaust gases at FCS.

TABLE 3.3-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR AUXILIARY SYSTEMS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1.06	Components in reactor coolant pump oil collect system of fire protection	Loss of material due to galvanic, general, pitting, and crevice corrosion	One-time inspection	Yes, detection of aging effects is to be further evaluated	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. The One-Time Inspection Program (B.3.5) manages this aging effect. These inspections will be conducted prior to the period of extended operation. This program is described in Appendix B of this application. 3. Consistent with NUREG-1801, this group includes copper in lubricating oil at FCS.

TABLE 3.3-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR AUXILIARY SYSTEMS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1.07	Diesel fuel oil tanks in diesel fuel oil system and emergency diesel generator system	Loss of material due to general, pitting, and crevice corrosion, MIC, and biofouling	Fuel oil chemistry and one-time inspection	Yes, detection of aging effects is to be further evaluated	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. The Diesel Fuel Monitoring and Storage Program (B.2.3) manages this aging effect. This program is described in Appendix B of this application. Diesel Fuel Monitoring and Storage Program includes the Fuel Oil Chemistry Program at FCS. The Diesel Fuel Monitoring and Storage Program includes measures to verify the effectiveness of the fuel oil chemistry control. These inspections will be conducted prior to the period of extended operation to confirm the effectiveness of the oil chemistry control. 3, Consistent with NUREG-1801, this group includes carbon steel in fuel oil at FCS.

TABLE 3.3-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR AUXILIARY SYSTEMS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1.08	Heat exchangers in chemical and volume control system	Crack initiation and growth due to SCC and cyclic loading	Water chemistry and a plant-specific verification program	Yes, plant specific	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. The Chemistry Program (B.1.2) verified by the One-Time Inspection Program (B.3.5), Cooling Water Corrosion Program (B.2.2) and Periodic Surveillance and Preventive Maintenance Program (B.2.7) manage this aging effect. Inspections will be conducted prior to the period of extended operation to confirm the effectiveness the Chemistry Program. These programs are described in Appendix B of this application. 3. Consistent with NUREG-1801, this group includes stainless steel in chemically treated borated and corrosion inhibited treated water at FCS.

TABLE 3.3-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR AUXILIARY SYSTEMS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1.09	Neutron absorbing sheets in spent fuel storage racks	Reduction of neutron absorbing capacity and loss of material due to general corrosion (Boral, boron steel)	Plant specific	Yes, plant specific	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. The Periodic Surveillance and Preventive Maintenance Program (B.2.7) manages this aging effect. This program is described in Appendix B of this application. The surveillance test evaluates the neutron absorbing samples for dimensional change, weight change, neutron attenuation change and specific gravity change. 3. Consistent with NUREG-1801, this group includes Boral encapsulated in stainless steel in chemically treated borated water at FCS.
3.3.1.10	New fuel rack assembly	Loss of material due to general, pitting, and crevice corrosion	Structures monitoring	No	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes carbon steel in ambient air at FCS.
3.3.1.11	Spent fuel storage racks and valves in spent fuel pool cooling and cleanup	Crack initiation and growth due to stress corrosion cracking	Water chemistry	No	1. The aging management results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes stainless steel in borated treated water at FCS.

TABLE 3.3-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR AUXILIARY SYSTEMS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1.12	Neutron absorbing sheets in spent fuel storage racks	Reduction of neutron absorbing capacity due to Boraflex degradation	Boraflex monitoring	No	The material identified in NUREG-1801 is not applicable to FCS.
3.3.1.13	Closure bolting and external surfaces of carbon steel and low-alloy steel components	Loss of material due to boric acid corrosion	Boric acid corrosion	No	1. The aging management results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes carbon and low alloy steel in air exposed to leaking and dripping borated treated water at FCS.
3.3.1.14	Components in or serviced by closed-cycle cooling water system	Loss of material due to general, pitting, and crevice corrosion, and MIC	Closed-cycle cooling water system	No	1. The aging management results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes carbon steel and stainless steel in chemically treated corrosion inhibited water at FCS.
3.3.1.15	Cranes including bridge and trolleys and rail system in load handling system	Loss of material due to general corrosion and wear	Overhead heavy load and light load handling systems	No	1. The aging management results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes carbon steel in ambient air at FCS.

TABLE 3.3-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR AUXILIARY SYSTEMS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1.16	Components in or serviced by open-cycle cooling water systems	Loss of material due to general, pitting, crevice, and galvanic corrosion, MIC, and biofouling; buildup of deposits due to biofouling	Open-cycle cooling water system	No	1. The aging management results are consistent with the results documented in NUREG-1801. 2. Consistent with NUREG-1801, this group includes carbon steel, bronze, cast iron and stainless steel in raw water at FCS.
3.3.1.17	Buried piping and fittings	Loss of material due to general, pitting, and crevice corrosion, and MIC	Buried piping and tanks surveillance or Buried piping and tanks inspection	No Yes, detection of aging effects and operating experience are to be further evaluated	1. The aging management results are consistent with the results documented in NUREG-1801. 2. The aging effects are managed by the Buried Surfaces External Corrosion Program (B.3.2) and the Fire Protection Program (B.2.4) described in Appendix B of this application. The aging management activities of the Fire Protection Program are the same as those of the Buried Surfaces External Corrosion Program. 3. Consistent with NUREG-1801, this group includes carbon steel in soil at FCS.
3.3.1.18	Components in compressed air system	Loss of material due to general and pitting corrosion	Compressed air monitoring	No	The environment identified in NUREG-1801 is not applicable to FCS. Components in the instrument air system at FCS are exposed to dry air.

TABLE 3.3-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR AUXILIARY SYSTEMS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1.19	Components (doors and barrier penetration seals) and concrete structures in fire protection	Loss of material due to wear; hardening and shrinkage due to weathering	Fire protection	No	1. The aging management results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes carbon steel and sealant in ambient air at FCS.
3.3.1.20	Components in water-based fire protection	Loss of material due to general, pitting, crevice, and galvanic corrosion, MIC, and biofouling	Fire water system	No	1. The aging management results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes carbon steel, cast iron, stainless steel, and bronze in raw water at FCS.
3.3.1.21	Components in diesel fire system	Loss of material due to galvanic, general, pitting, and crevice corrosion	Fire protection and fuel oil chemistry	No	1. The aging management results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes carbon steel in fuel oil at FCS.
3.3.1.22	Tanks in diesel fuel oil system	Loss of material due to general, pitting, and crevice corrosion	Above ground carbon steel tanks	No	The components identified in NUREG-1801 are not applicable to FCS.

TABLE 3.3-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR AUXILIARY SYSTEMS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1.23	Closure bolting	Loss of material due to general corrosion; crack initiation and growth due to cyclic loading and SCC	Bolting integrity	No	1. The aging management results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes carbon steel and low alloy steel in ambient air at FCS.
3.3.1.24	Components (aluminum bronze, brass, cast iron, cast steel) in open-cycle and closed-cycle cooling water systems, and ultimate heat sink	Loss of material due to selective leaching	Selective leaching of materials	No	1. The aging management results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes cast iron and bronze in raw water and soil at FCS.
3.3.1.25	Fire barriers, walls, ceilings and floors in fire protection	Concrete cracking and spalling due to freeze-thaw, aggressive chemical attack, and reaction with aggregates; loss of material due to corrosion of embedded steel	Fire protection and structures monitoring	No	1. The aging management results are consistent with the results documented in NUREG-1801. 2. Consistent with NUREG-1801, this group includes concrete in ambient air at FCS.

3.3.2 COMPONENTS OR AGING EFFECTS THAT ARE NOT ADDRESSED IN NUREG-1801

Table 3.3-2 contains Auxiliary Systems aging management review results that are not addressed in NUREG-1801. This table includes the component types, materials, environments, and aging effects requiring management, and the programs and activities for managing aging. Table 3.3-3 contains components in Auxiliary Systems not evaluated in NUREG-1801 that rely on aging management programs in NUREG-1801 for FCS License Renewal and the justification for the use of these programs.

TABLE 3.3-2
FCS AUXILIARY SYSTEMS COMPONENT TYPES SUBJECT TO AGING MANAGEMENT NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.3.2.01	External surfaces of aluminum components	Aluminum	Ambient Air	None	Not Applicable
3.3.2.02	Filter/Strainer housing, valve bodies	Aluminum	Fuel Oil	Loss of Material • MIC due to the potential for microorganism introduction and moisture contamination during bulk fuel oil supply and delivery • Pitting/Crevice/General Corrosion due to potential for water contamination and water pooling in a fuel oil system	Diesel Fuel Monitoring and Storage Program (B.2.3)
3.3.2.03	Not used in application				
3.3.2.04	Filter/Strainer housing, Valve Operators, Valve bodies	Aluminum	Instrument Air	None	Not Applicable
3.3.2.05	Valve bodies	Aluminum	Gas - Nitrogen	None	Not Applicable
3.3.2.06	Switch/Bistable housing	Aluminum	Raw Water	Loss of Material Crevice and pitting corrosion and MIC due to stagnant conditions	Fire Protection Program (B.2.5)

TABLE 3.3-2 (CONTINUED)
FCS AUXILIARY SYSTEMS COMPONENT TYPES SUBJECT TO AGING MANAGEMENT NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.3.2.07	New and spent fuel handling tools	Aluminum	Occasionally exposed to Treated Water -Borated	Cracking Stress corrosion cracking (SCC) due to the exposure of aluminum to halogens and stress	Chemistry Program (B.1.2)
3.3.2.08	New and spent fuel handling tools	Aluminum	Occasionally exposed to Treated Water -Borated	Loss of Material • Pitting corrosion due to the exposure of aluminum to halogens and sulfates • Galvanic corrosion due to aluminum in contact with stainless steel and exposed to halogens • Exfoliation due to the exposure of aluminum to halogens	Chemistry Program (B.1.2)
3.3.2.09	Subcomponent - new fuel storage rack - boral sheets	Boral	Ambient Air	None	Not Applicable
3.3.2.10	External surfaces of brass or bronze components	Brass or Bronze	Ambient Air	None	Not Applicable

TABLE 3.3-2 (CONTINUED)
FCS AUXILIARY SYSTEMS COMPONENT TYPES SUBJECT TO AGING MANAGEMENT NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.3.2.11	Valve bodies, filters/strainer housing, pump casings	Brass or Bronze	Fuel Oil	Loss of Material • MIC due to the potential for microorganism introduction and moisture contamination during bulk fuel oil supply and delivery • Pitting/Crevice/General Corrosion due to potential for water contamination and water pooling in a fuel oil system	Diesel Fuel Monitoring and Storage Program (B.2.3)
3.3.2.12	Valve bodies	Brass	Gas - Halon	None	Not Applicable
3.3.2.13	Valve bodies	Brass or Bronze	Gas - Instrument Air	None	Not Applicable
3.3.2.14	Valve bodies	Brass or Bronze	Gas - Nitrogen	None	Not Applicable
3.3.2.15	Valve bodies	Brass	Gas - Refrigerant (Liquid)	None	Not Applicable
3.3.2.16	Heat exchanger	Brass or Bronze	Lubricating Oil	Loss of Material General corrosion due to the possibility for water contamination and water pooling	Cooling Water Corrosion Program (B.2.2)

TABLE 3.3-2 (CONTINUED)
FCS AUXILIARY SYSTEMS COMPONENT TYPES SUBJECT TO AGING MANAGEMENT NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.3.2.17	Heat exchanger	Brass	Corrosion-Inhibited Treated Water	Cracking Due to SCC because of the ammonium compounds present in the water due to the nitrite corrosion inhibitor	Cooling Water Corrosion Program (B.2.2) and Chemistry Program (B.1.2)
3.3.2.18	Heat exchanger	Brass, Copper Alloy	Corrosion-Inhibited Treated Water	Loss of Material • Crevice and pitting corrosion due to potential stagnant or low flow conditions • Galvanic corrosion due to the high conductivity of the process fluid and the presence of dissimilar metals in contact • MIC due to the exposure of copper alloy to microbiological activity	Cooling Water Corrosion Program (B.2.2) and Chemistry Program (B.1.2)
3.3.2.19	Switch/Bistable housing	Brass	Raw Water	Loss of Material • Crevice and pitting corrosion and MIC due to stagnant conditions • Galvanic corrosion due to the conductivity of the process fluid and the presence of dissimilar metals in contact	Fire Protection Program (B.2.5)

TABLE 3.3-2 (CONTINUED)
FCS AUXILIARY SYSTEMS COMPONENT TYPES SUBJECT TO AGING MANAGEMENT NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.3.2.20	Valve bodies	Cadmium Plated Steel	Gas - Instrument Air	None	Not Applicable
3.3.2.21	Pipes & fittings	Carbon Steel	Above ground, buried in gravel and protected from the elements	Loss of Material External surface corrosion due to the potential for the existence of sufficient oxygen, moisture levels, and/or soil contaminants	Diesel Fuel Monitoring and Storage Program (B.2.3)
3.3.2.22	Pipes & fittings	Carbon Steel	Concrete	None	Not Applicable
3.3.2.23	Filter/Strainer housing, heat exchangers, lubricator motors, pipes & fittings, tanks, valve bodies, accumulators, valve operators	Carbon Steel	Gas - Instrument Air	None	Not Applicable
3.3.2.24	Pipes and fittings	Carbon Steel	Gas - Hydrogen	None	Not Applicable
3.3.2.25	Valve bodies, accumulators, pipes & fittings	Carbon Steel	Gas - Nitrogen	None	Not Applicable
3.3.2.26	Pipes & fittings, valves	Carbon Steel or Cast Iron	Concrete	None	Not Applicable

TABLE 3.3-2 (CONTINUED)
FCS AUXILIARY SYSTEMS COMPONENT TYPES SUBJECT TO AGING MANAGEMENT NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.3.2.27	Heat exchanger - shell	Carbon Steel	Oxygenated Treated Water <200 deg F	Loss of Material • General and crevice corrosion due to dissolved oxygen • Pitting corrosion due to halogens • Galvanic corrosion due to the conductivity of the process fluid and the presence of dissimilar metals in contact	Chemistry Program (B.1.2) and Cooling Water Corrosion Program (B.2.2)
3.3.2.28	Valve bodies	Cast Iron	Gas - Refrigerant (Liquid)	None	Not Applicable
3.3.2.29	Pump casings, valve bodies, pipes & fittings, heat exchanger - channel/channel head	Cast Iron	Corrosion-Inhibited Treated Water	Loss of Material • General and crevice corrosion due to the exposure of cast iron to dissolved oxygen • Pitting corrosion due to exposure to halogens	Chemistry Program (B.1.2) and Cooling Water Corrosion Program (B.2.2)
3.3.2.30	Pump casings, valve bodies, pipes & fittings	Cast Iron	Corrosion-Inhibited Treated Water	Loss of Material Selective leaching due to the exposure of cast iron to dissolved oxygen	Selective Leaching Program (B.3.6)

TABLE 3.3-2 (CONTINUED)
FCS AUXILIARY SYSTEMS COMPONENT TYPES SUBJECT TO AGING MANAGEMENT NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.3.2.31	Valve bodies, pipes & fittings	Cast Iron	Buried in Ground	Loss of Material • General corrosion due to exposure to dissolved oxygen • Selective leaching due to the exposure of cast iron to dissolved oxygen	The Fire Protection Program (B.2.5) governs implementing procedures that provide reasonable assurance the Fire Protection System pressure-retaining components will be adequately managed by specific performance and/or condition monitoring activities in accordance with Current Licensing Basis requirements.
3.3.2.32	Tanks, pipes & fittings, filter/strainers, valves	Coated Carbon Steel, Cast Iron, Stainless Steel, Galvanized Steel	Fuel Oil	Loss of Material • MIC due to the potential for microorganism introduction and moisture contamination during bulk fuel oil supply and delivery • Pitting/Crevice/General Corrosion due to potential for water contamination and water pooling in a fuel oil system	Diesel Fuel Monitoring and Storage Program (B.2.3)

TABLE 3.3-2 (CONTINUED)
FCS AUXILIARY SYSTEMS COMPONENT TYPES SUBJECT TO AGING MANAGEMENT NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.3.2.33	Pressure vessels	Coated Carbon Steel	Gas - Halon (Liquid)	None	Not Applicable
3.3.2.34	Pipes & fittings	Concrete	Buried in Ground	None	Not Applicable
3.3.2.35	Pipes & fittings	Concrete	Raw Water	None	Not Applicable
3.3.2.36	Safety Injection Refueling Water Tank (SIRWT)	Concrete with coated carbon steel liner	Treated Water - Borated	Loss of Material Due to exposure of the material to moisture, contaminants, dissolved oxygen, and boric acid (i.e., general corrosion, crevice corrosion, pitting corrosion, boric acid corrosion and galvanic corrosion)	Structures Monitoring Program (B.2.10)
3.3.2.37	Pipes & fittings, tubing	Copper, Copper Alloy, Copper-Zinc Alloy	Gas - Instrument Air	None	Not Applicable
3.3.2.38	Valve bodies, pipes & fittings, heat exchanger tubes	Copper, Copper Alloy	Gas - Refrigerant	None	Not Applicable

TABLE 3.3-2 (CONTINUED)
FCS AUXILIARY SYSTEMS COMPONENT TYPES SUBJECT TO AGING MANAGEMENT NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.3.2.39	Heat exchangers, valves	Brass, Copper, Copper Alloy	Corrosion-Inhibited Treated Water	Loss of Material • Crevice and pitting corrosion due to potential stagnant or low flow conditions • Galvanic corrosion due to the high conductivity of the process fluid and the presence of dissimilar metals in contact • MIC due to the exposure of copper alloy to microbiological activity	Cooling Water Corrosion Program (B.2.2) and Chemistry Program (B.1.2)
3.3.2.40	External surfaces of brass, bronze, copper, copper alloy or copper-zinc alloy components	Brass, Bronze, Copper, Copper Alloy, Copper-Zinc Alloy	Ambient Air	None	Not Applicable
3.3.2.41	Heat exchangers, valves	Copper Alloy	Corrosion-Inhibited Treated Water	Cracking Due to SCC because of the ammonium compounds present in the water due to the nitrite corrosion inhibitor	Cooling Water Corrosion Program (B.2.2) and Chemistry Program (B.1.2)

TABLE 3.3-2 (CONTINUED)
FCS AUXILIARY SYSTEMS COMPONENT TYPES SUBJECT TO AGING MANAGEMENT NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.3.2.42	Tubing	Copper-Zinc Alloy	Buried in Ground	Loss of Material General and pitting corrosion due to the potential for the existence of sufficient oxygen, moisture levels, and/or soil contaminants	Buried Surfaces External Corrosion Program (B.3.2)
3.3.2.43	Tubing	Copper-Zinc Alloy	Buried in Ground	Loss of Material Due to dezincification	Selective Leaching Program (B.3.6)
3.3.2.44	Tubing	Copper-Zinc Alloy	Above ground, buried in gravel and protected from the elements	Loss of Material General and pitting corrosion due to the potential for the existence of sufficient oxygen, moisture levels, and/or soil contaminants	Diesel Fuel Monitoring and Storage Program (B.2.3)
3.3.2.45	Tubing	Copper-Zinc Alloy	Fuel Oil	Loss of Material • MIC due to the potential for microorganism introduction and moisture contamination during bulk fuel oil supply and delivery • Pitting/Crevice/General Corrosion due to potential for water contamination and water pooling in a fuel oil system	Diesel Fuel Monitoring and Storage Program (B.2.3)

TABLE 3.3-2 (CONTINUED)
FCS AUXILIARY SYSTEMS COMPONENT TYPES SUBJECT TO AGING MANAGEMENT NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.3.2.46	Pipes & fittings	Galvanized Steel	Gas - Diesel Exhaust	Cracking Due to embrittlement at elevated temperatures. Loss of Material • Crevice corrosion due to the presence of an aggressive chemical species and moisture • Pitting corrosion due to halides, chlorides or hypochlorites	Periodic Surveillance and Preventive Maintenance Program (B.2.7)
3.3.2.47	Pipes & fittings	Galvanized Steel	Above ground, buried in gravel and protected from the elements	Loss of Material General and pitting corrosion due to the potential for the existence of sufficient oxygen, moisture levels, and/or soil contaminants	Diesel Fuel Monitoring and Storage Program (B.2.3)
3.3.2.48	External surfaces of galvanized steel components	Galvanized Steel	Ambient Air	Loss of Material • Crevice corrosion due to crevices existing that allow a corrosive environment to develop • General corrosion due to presence of both oxygen and moisture	General Corrosion of External Surfaces Program (B.3.3)

TABLE 3.3-2 (CONTINUED)
FCS AUXILIARY SYSTEMS COMPONENT TYPES SUBJECT TO AGING MANAGEMENT NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.3.2.49	Sight glass	Glass	Fuel Oil, Lubricating Oil, Corrosion-Inhibited Treated Water, Air	None	Not Applicable
3.3.2.50	Flow element/orifice body, pipes & fittings, pump casings, valve bodies	Heat-Traced Stainless Steel	Plant Indoor Air	Cracking Due to possible leachables in heat-tracing adhesive (cement) combined with component temperatures exceeding 160 deg F due to the heat tracing	One Time Inspection Program (B.3.5)
3.3.2.51	Fire barriers	Mineral Fiber	Ambient Air	Separation Due to vibration, movement, and shrinkage	Fire Protection Program (B.2.5)
3.3.2.52	Fire barriers	Mineral Fiber Board	Ambient Air	Cracking Due to vibration and movement	Fire Protection Program (B.2.5)
3.3.2.53	Fire barriers	Mineral Fiber Board	Ambient Air	Loss of Material Due to abrasion	Fire Protection Program (B.2.5)
3.3.2.54	Fire barriers	Mineral Fiber Board	Ambient Air	Separation Due to vibration, movement, and shrinkage	Fire Protection Program (B.2.5)

TABLE 3.3-2 (CONTINUED)
FCS AUXILIARY SYSTEMS COMPONENT TYPES SUBJECT TO AGING MANAGEMENT NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.3.2.55	Heat exchanger - tubes, heat exchanger - shell	Nickel-Base Alloy	Deoxygenated Treated Water (>200 deg F)	Cracking Stress Corrosion Cracking due to exposure to halogens or sulfates	Chemistry Program (B.1.2) and Cooling Water Corrosion Program (B.2.2)
3.3.2.56	Heat exchanger - tubes, heat exchanger - shell	Nickel-Base Alloy	Deoxygenated Treated Water (>200 deg F)	Loss of Material • Crevice corrosion due to potential exposure to dissolved oxygen • MIC due to the potential for microbiological activity • Pitting corrosion due to potential exposure to halogens and sulfates	Chemistry Program (B.1.2), Cooling Water Corrosion Program (B.2.2) and One Time Inspection Program (B.3.5)
3.3.2.57	Heat exchanger - tubes, heat exchanger - shell	Copper Alloy, Nickel-Base Alloy	Corrosion-Inhibited Treated Water	Loss of Material Crevice and pitting corrosion due to the exposure of nickel-based alloys to halogens and sulfates	Chemistry Program (B.1.2) and Cooling Water Corrosion Program (B.2.2)
3.3.2.58	Heat exchanger - shell	Nickel-Base Alloy	Plant Indoor Air	None	Not Applicable
3.3.2.59	Fire barriers	Pyrocrete	Ambient Air	Cracking Due to vibration, movement, and shrinkage	Fire Protection Program (B.2.5)

TABLE 3.3-2 (CONTINUED)
FCS AUXILIARY SYSTEMS COMPONENT TYPES SUBJECT TO AGING MANAGEMENT NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.3.2.60	Fire barriers	Pyrocrete	Ambient Air	Loss of Material • Due to vibration that may cause delamination • Due to movement that may cause separation	Fire Protection Program (B.2.5)
3.3.2.61	Fire barriers	Pyrocrete	Ambient Air	Separation • Due to contact with pipe surfaces • Due to hydration	Fire Protection Program (B.2.5)
3.3.2.62	Indicator/Recorder body	Polysulfone	Plant Indoor Air	None	Not Applicable
3.3.2.63	Indicator/Recorder body	Polysulfone	Raw Water	None	Not Applicable
3.3.2.64	External surfaces of stainless steel components	Stainless Steel	Ambient Air	None	Not Applicable
3.3.2.65	Pipes & fittings	Stainless Steel	Concrete	None	Not Applicable
3.3.2.66	Pipes & fittings, valve bodies	Stainless Steel	Deoxygenated Treated Water (>200 deg F)	Cracking Due to exposure of stainless steel to halogens and sulfates	Chemistry Program (B.1.2) and One Time Inspection Program (B.3.5)

TABLE 3.3-2 (CONTINUED)
FCS AUXILIARY SYSTEMS COMPONENT TYPES SUBJECT TO AGING MANAGEMENT NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.3.2.67	Pipes & fittings, valve bodies	Stainless Steel	Deoxygenated Treated Water (>200 deg F)	Loss of Material • Crevice corrosion due exposure of stainless steel to dissolved oxygen • Pitting corrosion due to the exposure of stainless steel to halogens and sulfates	Chemistry Program (B.1.2) and One Time Inspection Program (B.3.5)
3.3.2.68	Filter/Strainer housing, valve bodies, tubing	Stainless Steel	Fuel Oil	Loss of Material • MIC due to the potential for microorganism introduction and moisture contamination during bulk fuel oil supply and delivery • Pitting/Crevice/General Corrosion due to potential for water contamination and water pooling in a fuel oil system	Diesel Fuel Monitoring and Storage Program (B.2.3)

TABLE 3.3-2 (CONTINUED)
FCS AUXILIARY SYSTEMS COMPONENT TYPES SUBJECT TO AGING MANAGEMENT NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.3.2.69	Pipes & fittings	Stainless Steel	Gas - Diesel Exhaust	Cracking Due to moisture-containing contaminants concentrate, resulting in an environment conducive to SCC/IGA. Loss of Material • Crevice corrosion due to the presence of an aggressive chemical species and moisture • Pitting corrosion due to halides, chlorides or hypochlorites	Periodic Surveillance and Preventive Maintenance Program (B.2.7)
3.3.2.70	Valve bodies	Stainless Steel	Gas - Hydrogen	None	Not Applicable
3.3.2.71	Pipes & fittings, valve bodies, tubing	Stainless Steel	Gas - Instrument Air	None	Not Applicable
3.3.2.72	Pipes & fittings, valve bodies, tubing	Stainless Steel	Gas - Nitrogen	None	Not Applicable
3.3.2.73	Pipes & fittings, valve bodies, piping spray shield	Stainless Steel	Lubricating Oil	Loss of Material General corrosion due to the possibility for water contamination and water pooling	Fire Protection Program (B.2.5)

TABLE 3.3-2 (CONTINUED)
FCS AUXILIARY SYSTEMS COMPONENT TYPES SUBJECT TO AGING MANAGEMENT NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.3.2.74	Flow element/orifice body; indicator/recorder housing, orifice plate, pipes & fittings, valve bodies, heat exchanger - tubes	Stainless Steel	Corrosion-Inhibited Treated Water	Cracking Due to exposure to halogens and sulfates	Chemistry Program (B.1.2) and Cooling Water Corrosion Program (B.2.2)
3.3.2.75	External surfaces of stainless steel componenets	Stainless Steel	Ambient Air	None	Not Applicable
3.3.2.76	Heat exchanger - tubes	Stainless Steel	Oxygenated Treated Water <200 deg F	Loss of Material • Crevice corrosion due to an oxygenated treated water environment • Pitting corrosion due to exposure to halogens and sulfates	Chemistry Program (B.1.2) and Cooling Water Corrosion Program (B.2.2)
3.3.2.77	Filter strainer housing	Stainless Steel	Raw Water	Loss of Material • Crevice corrosion due to the presence of dis-solved oxygen and impurities • MIC due to exposure to microbiological activity • Pitting corrosion due to exposure to halide ions	Periodic Surveillance and Preventive Maintenance Program (B.2.7)
3.3.2.78	Not used in application				
3.3.2.79	Glass in metal fire penetration barriers	Glass	Ambient Air	None	Not Applicable

TABLE 3.3-2 (CONTINUED)
FCS AUXILIARY SYSTEMS COMPONENT TYPES SUBJECT TO AGING MANAGEMENT NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.3.2.80	Calcium silicate board	Calcium Silicate	Ambient Air	None	Not Applicable
3.3.2.81	Fuel transfer carrier box, fuel transfer conveyor, UGS lift rig, reactor head lift rig, fuel handling tools, fuel transfer tilting machine, spent fuel storage racks	Stainless Steel	Ambient Air and Borated Water	Loss of Material • Crevice corrosion due to the exposure to dis-solved oxygen. • Pitting corrosion due to the exposure to halo-gens and sulfates.	Chemistry Program (B.1.2)
3.3.2.82	Valve bonnets protected by rubber diaphragm	Ductile Iron	Possibly exposed to borated water	Loss of material due to boric acid corrosion	Periodic Surveillance and Preventive Maintenance Program (B.2.7)
3.3.2.83	Pipes & fittings	Galvanized Steel	Ambient Air	Loss of material • General corrosion due to exposure to oxygen and moisture • Crevice corrosion due to exposure to moisture	Periodic Surveillance and Preventive Maintenance Program (B.2.7)
3.3.2.84	Heat exchanger tubes, valve bodies	Copper Alloy	Corrosion-Inhibited Treated Water	Loss of material Due to selective leaching	Selective Leaching Program (B.3.6)
3.3.2.85	Heat exchanger tubes, valves	Copper Alloy, Brass, Bronze	Lubricating Oil	Loss of Material Pitting, general and crevice corrosion due to potential for water contamination	Periodic Surveillance and Preventive Maintenance Program (B.2.7)

TABLE 3.3-2 (CONTINUED)
FCS AUXILIARY SYSTEMS COMPONENT TYPES SUBJECT TO AGING MANAGEMENT NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.3.2.86	Pipes & fittings, tanks	Coated Carbon Steel	Buried in Ground	Loss of Material External surface corrosion due to the potential for the existence of sufficient oxygen, moisture levels, and/or soil contaminants.	Buried Surfaces External Corrosion Program (B.3.2)
3.3.2.87	Pump Casing	Cast Iron	Fuel Oil	Loss of Material • MIC due to the potential for microorganism introduction and moisture contamination during bulk fuel oil supply and delivery • Pitting, general and crevice corrosion due to potential for water contamination	Diesel Fuel Monitoring and Storage Program (B.2.7)
3.3.2.88	Pump Casing	Cast Iron	Lubricating Oil	Loss of Material Pitting, general and crevice corrosion due to potential for water contamination	Periodic Surveillance and Preventive Maintenance Program (B.2.7)
3.3.2.89	Heat exchangers - shell and tube sheet, tanks, valves	Carbon Steel, Cadmium Plated Steel	Lubricating Oil	Loss of Material General corrosion due to the possibility for water contamination and water pooling.	Periodic Surveillance and Preventive Maintenance Program (B.2.7)

TABLE 3.3-2 (CONTINUED)
FCS AUXILIARY SYSTEMS COMPONENT TYPES SUBJECT TO AGING MANAGEMENT NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.3.2.90	Blower and fan housing	Cast Iron	Containment Air	Loss of Material due to general corrosion where both oxygen and moisture are present	Periodic Surveillance and Preventive Maintenance Program (B.2.7)
3.3.2.91	Piping and fittings	Copper	Ambient Air	Loss of Material due to wear	Periodic Surveillance and Preventive Maintenance Program (B.2.7)
3.3.2.92	Bolting	Zinc Plated Steel	Buried in Ground	Loss of Material External surface corrosion due to the potential for the existence of sufficient oxygen, moisture levels, and/or soil contaminants	Fire Protection Program (B.2.5)
3.3.2.93	Filter/Strainers, valves	Cast Iron	Ambient Air	Loss of Material due to general corrosion where both oxygen and moisture are present	Fire Protection Program (B.2.5)
3.3.2.94	Piping and fittings	Galvanized Steel	Raw Water	Loss of Material due to general, crevice, pitting and galvanic corrosion and MIC.	Fire Protection Program (B.2.5)
3.3.2.95	Traveling Screen Frame	Carbon Steel	Raw Water	Loss of Material due to general, crevice, pitting and galvanic corrosion and MIC.	Periodic Surveillance and Preventive Maintenance Program (B.2.7)

TABLE 3.3-2 (CONTINUED)
FCS AUXILIARY SYSTEMS COMPONENT TYPES SUBJECT TO AGING MANAGEMENT NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.3.2.96	Piping and fittings	Stainless Steel	Borated Treated Water	Cracking Stress corrosion cracking	Periodic Surveillance and Preventive Maintenance Program (B.2.7)

TABLE 3.3-3
COMPONENTS IN AUXILIARY SYSTEMS NOT EVALUATED IN NUREG-1801 THAT RELY ON AGING MANAGEMENT PROGRAMS IN NUREG-1801 FOR FCS LICENSE RENEWAL

Row Number	FCS Components	FCS Material	FCS Environment	FCS AERMs	FCS Program Activity	Applicable NUREG-1801 Aging Management Review Results Row Number	Justification for applying NUREG-1801 Aging Management Review Results
3.3.3.01	Pipes, fittings, valve bodies, filter casings, pump casings, ion exchangers and heat exchangers	Stainless Steel	Borated Treated Water	Cracking Stress corrosion cracking	Chemistry Program (B.1.2)	3.3.1.10	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management program as the components evaluated in NUREG-1801, Volume 2, V.D1.1-a.
3.3.3.02	Fuel transfer carrier box, fuel transfer conveyor, UGS lift rig, reactor head lift rig, fuel handling tools, fuel transfer tilting machine	Stainless Steel	Ambient Air and Borated Treated Water	Cracking Stress corrosion cracking	Chemistry Program (B.1.2)	3.3.1.12	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management program as the components evaluated in NUREG-1801, Volume 2, VII.A2.1-c.

TABLE 3.3-3 (CONTINUED)
COMPONENTS IN AUXILIARY SYSTEMS NOT EVALUATED IN NUREG-1801 THAT RELY ON AGING MANAGEMENT PROGRAMS IN NUREG-1801 FOR FCS LICENSE RENEWAL

Row Number	FCS Components	FCS Material	FCS Environment	FCS AERMs	FCS Program Activity	Applicable NUREG-1801 Aging Management Review Results Row Number	Justification for applying NUREG-1801 Aging Management Review Results
3.3.3.03	Pipes, fittings	Stainless Steel	Deoxygenated Treated Water (<200F)	Loss of Material	Chemistry Program (B.1.2)	3.4-1.02	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management program as the components evaluated in NUREG-1801, Volume 2, VIII.G.4-b.
3.3.3.04	Pipes, fittings, valve bodies	Stainless Steel	Borated Treated Water	Cracking Stress corrosion cracking	Chemistry Program (B.1.2)	3.3.1.08	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management program as the components evaluated in NUREG-1801, Volume 2, VII.E1.7-c.

TABLE 3.3-3 (CONTINUED)
COMPONENTS IN AUXILIARY SYSTEMS NOT EVALUATED IN NUREG-1801 THAT RELY ON AGING MANAGEMENT PROGRAMS IN NUREG-1801 FOR FCS LICENSE RENEWAL

Row Number	FCS Components	FCS Material	FCS Environment	FCS AERMs	FCS Program Activity	Applicable NUREG-1801 Aging Management Review Results Row Number	Justification for applying NUREG-1801 Aging Management Review Results
3.3.3.05	Filter/Strainer bodies, flow element/orifice, pipes & fittings, braided flexible hose	Carbon Steel	Lubricating Oil	Loss of Material	Periodic Surveillance and Preventive Maintenance Program (B.2.7)	3.4-1.04	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management program as the components evaluated in NUREG-1801, Volume 2, VIII.G.5-d.
3.3.3.06	Filter/Strainer bodies, pipes & fittings, valves, pumps, tanks	Carbon Steel	Fuel Oil	Loss of Material	Diesel Fuel Monitoring and Storage Program (B.2.3)	3.3.1.07	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management program as the components evaluated in NUREG-1801, Volume 2, VII.H1.4-a.

TABLE 3.3-3 (CONTINUED)
COMPONENTS IN AUXILIARY SYSTEMS NOT EVALUATED IN NUREG-1801 THAT RELY ON AGING MANAGEMENT PROGRAMS IN NUREG-1801 FOR FCS LICENSE RENEWAL

Row Number	FCS Components	FCS Material	FCS Environment	FCS AERMs	FCS Program Activity	Applicable NUREG-1801 Aging Management Review Results Row Number	Justification for applying NUREG-1801 Aging Management Review Results
3.3.3.07	Valve bodies, piping & fittings, fan housings, bolts, duct, pumps	Cast Iron, cadmium plated steel, galvanized steel	Ambient Air	Loss of Material	General Corrosion of Ext. Surfaces Program (B.3.3)	3.3.1.05	The material is subject to the same environment and aging effect, and managed by the same aging management program as evaluated in Table 3.3-1, Item 3.3.1.05. The aging effect is independent of component type.
3.3.3.08	Electric heater sleeves, tanks, heat exchanger, orifice,	Carbon Steel	Corrosion-Inhibited Treated Water	Loss of Material	Chemistry Program (B.1.2) and Cooling Water Corrosion Program (B.2.2)	3.3.1.14	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management program as the components evaluated in NUREG-1801, Volume 2, VII.H2.1-a and VII.C2.5-a.

TABLE 3.3-3 (CONTINUED)
COMPONENTS IN AUXILIARY SYSTEMS NOT EVALUATED IN NUREG-1801 THAT RELY ON AGING MANAGEMENT PROGRAMS IN NUREG-1801 FOR FCS LICENSE RENEWAL

Row Number	FCS Components	FCS Material	FCS Environment	FCS AERMs	FCS Program Activity	Applicable NUREG-1801 Aging Management Review Results Row Number	Justification for applying NUREG-1801 Aging Management Review Results
3.3.3.09	Valve bodies, piping & fittings, duct, damper, bolts, heat exchangers	Cast Iron, cadmium plated steel, galvanized steel, copper alloy	Ambient Air	Loss of Material	Boric Acid Corrosion (BAC) Prevention Program (B.2.1)	3.3.1.13	The material is subject to the same environment and aging effect, and managed by the same aging management program as evaluated in Table 3.3-1, Item 3.3.1.13. The aging effect is independent of component type.
3.3.3.10	Fire blocking damper, duct, valve bodies, fan housings	Galvanized steel, cast iron	Ambient Air	Loss of Material	Periodic Surveillance and Preventive Maintenance Program (B.2.7)	3.3.1.05	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management program as the components evaluated in NUREG-1801, Volume 2, VII.F2.1-a.

TABLE 3.3-3 (CONTINUED)
COMPONENTS IN AUXILIARY SYSTEMS NOT EVALUATED IN NUREG-1801 THAT RELY ON AGING MANAGEMENT PROGRAMS IN NUREG-1801 FOR FCS LICENSE RENEWAL

Row Number	FCS Components	FCS Material	FCS Environment	FCS AERMs	FCS Program Activity	Applicable NUREG-1801 Aging Management Review Results Row Number	Justification for applying NUREG-1801 Aging Management Review Results
3.3.3.11	Filter/Strainer, valve, heat exchanger	Cast iron	Raw Water	Loss of Material	Cooling Water Corrosion Program (B.2.2) and Selective Leaching Program (B.3.6) or Periodic Surveillance and Preventive Maintenance Program (B.2.7) for externally exposed components	3.3.1.16 3.3.1.24	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management program as the components evaluated in NUREG-1801, Volume 2, VII.C1.5-a.

TABLE 3.3-3 (CONTINUED)
COMPONENTS IN AUXILIARY SYSTEMS NOT EVALUATED IN NUREG-1801 THAT RELY ON AGING MANAGEMENT PROGRAMS IN NUREG-1801 FOR FCS LICENSE RENEWAL

Row Number	FCS Components	FCS Material	FCS Environment	FCS AERMs	FCS Program Activity	Applicable NUREG-1801 Aging Management Review Results Row Number	Justification for applying NUREG-1801 Aging Management Review Results
3.3.3.12	Heat exchanger, Pumps, Indicator / Recorder	Stainless Steel	Raw Water	Loss of Material Biofouling	Cooling Water Corrosion Program (B.2.2)	3.3.1.16	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management program as the components evaluated in NUREG-1801, Volume 2, VII.C1.4-a.
3.3.3.13	Heat exchanger	Stainless Steel	Corrosion-Inhibited Treated Water	Cracking	Cooling Water Corrosion Program (B.2.2)	3.3.1.08	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management program as the components evaluated in NUREG-1801, Volume 2, VII.E1.8-b.

TABLE 3.3-3 (CONTINUED)
COMPONENTS IN AUXILIARY SYSTEMS NOT EVALUATED IN NUREG-1801 THAT RELY ON AGING MANAGEMENT PROGRAMS IN NUREG-1801 FOR FCS LICENSE RENEWAL

Row Number	FCS Components	FCS Material	FCS Environment	FCS AERMs	FCS Program Activity	Applicable NUREG-1801 Aging Management Review Results Row Number	Justification for applying NUREG-1801 Aging Management Review Results
3.3.3.14	Traveling Screen Frame	Carbon Steel	Raw Water	Loss of Material	Cooling Water Corrosion Program (B.2.2)	3.3.1.16	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management program as the components evaluated in NUREG-1801, Volume 2, VII.C1.1-a.
3.3.3.15	Pipes & fittings, Indicator / Recorder, Heat Exchanger	Stainless Steel	Corrosion-Inhibited Treated Water	Loss of Material	Chemistry Program (B.1.2) and Cooling Water Corrosion Program (B.2.2)	3.3.1.14	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management program as the components evaluated in NUREG-1801, Volume 2, VII.C2.2-a.

3.4 AGING MANAGEMENT OF STEAM AND POWER CONVERSION SYSTEMS

The Steam and Power Conversion Systems consist of the Main Steam System, the Main and Auxiliary Feedwater Systems, Steam Generator Blowdown System and associated components at FCS.

The Main Steam System consists of piping from each steam generator that penetrates the containment wall to the main steam isolation valves that are located in each pipe just outside containment. Also included in the Main Steam System boundary is the piping to the turbine-driven auxiliary feedwater pump and the associated drains and vents.

The Feedwater System consists of a supply line to each steam generator. A feedwater isolation valve in each steam generator supply line is located just outside the containment penetration.

The Auxiliary Feedwater (AFW) System supplies feedwater to the steam generators whenever the reactor coolant system temperature is above 300 deg F and the main feedwater system is not in operation. The AFW System contains the emergency feedwater storage tank (EFWST), two pumps, plus related piping, valves, and instrumentation. One pump is electric motor driven, and the other is steam turbine driven. The AFW System can supply the steam generators through two different flow paths. One flow path is through an interconnection with the main feedwater piping upstream of the feedwater regulating valves, after which the water enters the each steam generator through the normal feed ring. This flow path is typically used during normal plant heatup and cooldown evolutions. The other flow path connects to the AFW nozzles on the steam generators. Either AFW pump can pump water from the EFWST to the steam generators.

Operating Experience:

Site: A review of plant specific operating experience was conducted, including the review of Condition Reports and discussions with appropriate site personnel to identify AERM. These reviews concluded that the AERM identified by the FCS specific operating experience were consistent with those identified in NUREG-1801.

Industry: A review of industry-wide operating experience was conducted to identify aging effects requiring management. This included a review of operating experience issued during 2001. This review concluded that the AERM identified by industry operating experience were consistent with those identified in NUREG-1801.

On-Going: The on-going review of plant specific and industry-wide operating experience is conducted in accordance with the FCS Operating Experience Program.

3.4.1 AGING MANAGEMENT PROGRAMS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR LICENSE RENEWAL

Table 3.4-1 shows the aging management programs evaluated in NUREG-1801 that are relied on for license renewal of the Steam and Power Conversion Systems at FCS. Note that this table only includes those components, materials and environments that are applicable to a PWR. Information on FCS specific components and materials, not listed in NUREG-1801 but included in the group described in a particular line of the table, is included in the discussion column.

TABLE 3.4-1
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR STEAM AND POWER CONVERSION SYSTEMS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component Group	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1.01	Piping and fittings in main feedwater line, steam line and AFW piping (PWR only)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	1. The TLAA is applicable to Class II and III piping at FCS. See Section 4.3.4 for the TLAA discussion of Class II and III Piping. 2. Consistent with NUREG-1801, this group includes piping, fittings, and valve bodies at FCS.
3.4.1.02	Piping and fittings, valve bodies and bonnets, pump casings, tanks, tubes, tubesheets, channel head, and shell (except main steam system)	Loss of material due to general (carbon steel only), pitting, and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be further evaluated	1. The Chemistry Program (B.1.2), supplemented by the One-Time Inspection Program (B.3.5) manages the aging effects of these components. The programs are described in Appendix B of this application. NUREG-1801 indicates that the verification of the effectiveness of the water chemistry program should be conducted with an inspection of stagnant flow locations within the systems. These inspections will be conducted in accordance with the One-Time Inspection Program. 2. Consistent with NUREG-1801, this group includes carbon steel in treated water at FCS.

TABLE 3.4-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR STEAM AND POWER CONVERSION SYSTEMS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component Group	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1.03	Auxiliary feedwater (AFW) piping	Loss of material due to general, pitting, and crevice corrosion, MIC, and biofouling	Plant specific	Yes, plant specific	The environment identified in NUREG-1801 is not applicable to FCS. The AFW piping at FCS is not exposed to untreated water from a backup water supply
3.4.1.04	Oil coolers in AFW system (lubricating oil side possibly contaminated with water)	Loss of material due to general (carbon steel only), pitting, and crevice corrosion, and MIC	Plant specific	Yes, plant specific	1. The Periodic Surveillance and Preventive Maintenance Program (B.2.7) manages this aging effect by ensuring water is not present in lubricating oil and that the oil is changed on a refueling frequency. This program is described in Appendix B of this application. 2. Consistent with NUREG-1801, this group includes carbon steel and stainless steel in lubricating oil possibly contaminated with water at FCS
3.4.1.05	External surface of carbon steel components	Loss of material due to general corrosion	Plant specific	Yes, plant specific	1. The General Corrosion of External Surfaces Program (B.3.3) manages this aging effect. This program is described in Appendix B of this application. 2. Consistent with NUREG-1801, this group includes carbon and low alloy steel in ambient air at FCS.

TABLE 3.4-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR STEAM AND POWER CONVERSION SYSTEMS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component Group	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1.06	Carbon steel piping and valve bodies	Wall thinning due to flow-accelerated corrosion	Flow Accelerated Corrosion	No	1. The aging management results are consistent with the results reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes carbon steel in treated water and saturated steam at FCS.
3.4.1.07	Carbon steel piping and valve bodies in main steam system	Loss of material due to pitting and crevice corrosion	Water Chemistry	No	1. The aging management results are consistent with the results documented in NUREG-1801. 2. Consistent with NUREG-1801, this group includes carbon steel in saturated steam at FCS.
3.4.1.08	Closure bolting in high-pressure or high-temperature systems	Loss of material due to general corrosion; crack initiation and growth due to cyclic loading and/or SCC.	Bolting Integrity	No	1. The aging management results are consistent with the results documented in NUREG-1801. 2. Consistent with NUREG-1801, this group includes carbon and low alloy steel bolting in ambient air in high pressure or high temperature systems at FCS.

TABLE 3.4-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR STEAM AND POWER CONVERSION SYSTEMS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component Group	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1.09	Heat exchangers and coolers/condensers serviced by open-cycle cooling water	Loss of material due to general (carbon steel only), pitting, and crevice corrosion, MIC, and biofouling; buildup of deposits due to biofouling	Open-cycle Cooling Water System	No	The combinations of materials and environment identified in NUREG-1801 are not applicable to FCS. The applicable heat exchangers are not serviced by open-cycle cooling water
3.4.1.10	Heat exchangers and coolers/condensers serviced by closed-cycle cooling water	Loss of material due to general (carbon steel only), pitting, and crevice corrosion	Closed-cycle Cooling Water System	No	1. The aging management results are consistent with the results documented in NUREG-1801. 2. Consistent with NUREG-1801, this group includes stainless steel components in corrosion inhibited treated water at FCS.
3.4.1.11	External surface of above ground condensate storage tank	Loss of material due to general (carbon steel only), pitting, and crevice corrosion	Above Ground Carbon Steel Tanks	No	The component identified in NUREG-1801 is not applicable to FCS.

TABLE 3.4-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR STEAM AND POWER CONVERSION SYSTEMS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component Group	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1.12	External surfaces of buried condensate storage tank and AFW piping	Loss of material due to general, pitting, and crevice corrosion and MIC	Buried piping and tanks surveillance or Buried piping and tanks inspection	No Yes, detection of aging effects and operating experience are to be further evaluated	The component identified in NUREG-1801 is not applicable to FCS.
3.4.1.13	External surface of carbon steel components	Loss of material due to boric acid corrosion	Boric acid corrosion	No	1. The aging management results are consistent with the results documented in NUREG-1801. 2. Consistent with NUREG-1801, this group includes carbon and low alloy steel components in ambient air and leaking and dripping, chemically treated, borated water at FCS.

3.4.2 COMPONENTS OR AGING EFFECTS THAT ARE NOT ADDRESSED IN NUREG-1801

Table 3.4-2 contains Steam and Power Conversion Systems aging management review results that are not addressed in NUREG-1801. This table includes the component types, materials, environments, aging effects requiring management, and the programs and activities for managing aging. Table 3.4-3 contains components in Steam and Power Conversion Systems not evaluated in NUREG-1801 that rely on aging management programs in NUREG-1801 for FCS License Renewal and the justification for the use of these programs.

TABLE 3.4-2
FCS STEAM AND POWER CONVERSION SYSTEMS COMPONENT TYPES SUBJECT TO AGING MANAGEMENT REVIEW NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.4.2.01	Pumps	Aluminum	Lubricating Oil	Loss of Material General corrosion due to the possibility for water contamination and water pooling	Periodic Surveillance and Preventive Maintenance Program (B.2.7)
3.4.2.02	Pumps	Aluminum	Plant Indoor Air	None	Not Applicable
3.4.2.03	Heat exchanger (channel, channel head, tubes) and valves	Copper Alloy	Deoxygenated Treated Water	Loss of Material • Crevice and pitting corrosion due to potential stagnant or low flow conditions • Wear due to flow induced vibration	One Time Inspection Program (B.3.5)
3.4.2.04	Heat exchanger (channel, channel head, tubes) and valves	Copper Alloy	Deoxygenated Treated Water	Loss of Material Selective leaching	Selective Leaching Program (B.3.5)
3.4.2.05	Filters/Strainers, heat exchanger (shell and tubes), indicator/ recorder body, pipes, fittings and valves	Copper Alloy	Lubricating Oil	Loss of Material General corrosion due to the possibility for water contamination and water pooling	Periodic Surveillance and Preventive Maintenance Program (B.2.7)
3.4.2.06	External surface of copper alloy components	Copper Alloy	Ambient Air	None	Not Applicable

TABLE 3.4-2 (CONTINUED)
FCS STEAM AND POWER CONVERSION SYSTEMS COMPONENT TYPES SUBJECT TO AGING MANAGEMENT REVIEW NOT EVALUATED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.4.2.07	Indicator/Recorder (sightglass)	Glass	Deoxygenated Treated Water Lubricating Oil Ambient Air	None	Not Applicable
3.4.2.08	External surface of stainless steel components	Stainless Steel	Ambient Air	None	Not Applicable
3.4.2.09	Pipes, fittings, valves, filter/strainer, flow element/orifice, transmitter element, pump casing	Stainless Steel	Oxygenated or Deoxygenated Treated Water	Cracking Due to exposure of stainless steel to halogens and sulfates	Water Chemistry (B.1.2) and One-Time Inspection (B.3.5)
3.4.2.10	Pipes, fittings, and valves	Stainless Steel	Deoxygenated Treated Water or Saturated Steam	Cracking Due to exposure of stainless steel to halogens and sulfates	Water Chemistry (B.1.2) and One-Time Inspection (B.3.5)
3.4.2.11	Pipes, fittings, and valves	Stainless Steel	Deoxygenated Treated Water or Saturated Steam	Loss of Material • Crevice corrosion due exposure of stainless steel to dissolved oxygen • Pitting corrosion due to the exposure of stainless steel to halogens and sulfates	Water Chemistry (B.1.2) and One-Time Inspection (B.3.5)

TABLE 3.4-3
COMPONENTS NOT EVALUATED IN NUREG-1801 THAT RELY ON AGING MANAGEMENT PROGRAMS FOR STEAM AND POWER CONVERSION SYSTEMS IN NUREG-1801 FOR FCS LICENSE RENEWAL

Row Number	FCS Components	FCS Material	FCS Environment	FCS AERMs	FCS Program Activity	Applicable NUREG-1801 Aging Management Review Results Row Number	Justification for applying NUREG-1801 Aging Management Review Results
3.4.3.01	Filter/Strainer, pumps	Carbon Steel	Lubricating Oil	Loss of Material	Periodic Surveillance and Preventive Maintenance Program (B.2.8)	3.4.1.04	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management program as the components evaluated in NUREG-1801, Volume 2, VIII.G.5-d.
3.4.3.02	Filter/Strainer, flow element/ orifice housing, pipes & fittings	Stainless Steel	Deoxygenated Treated Water	Loss of Material	Chemistry Program (B.1.2), supplemented by the One-Time Inspection Program (B.3.5)	3.4.1.02	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management program as the components evaluated in NUREG-1801, Volume 2, VIII.G.4-b.

TABLE 3.4-3 (CONTINUED)
COMPONENTS NOT EVALUATED IN NUREG-1801 THAT RELY ON AGING MANAGEMENT PROGRAMS FOR STEAM AND POWER CONVERSION SYSTEMS IN NUREG-1801 FOR FCS LICENSE RENEWAL

Row Number	FCS Components	FCS Material	FCS Environment	FCS AERMs	FCS Program Activity	Applicable NUREG-1801 Aging Management Review Results Row Number	Justification for applying NUREG-1801 Aging Management Review Results
3.4.3.03	Turbine casing, filter/strainer, pipes & fittings, valve bodies	Carbon Steel	Saturated Steam	Loss of Material	Chemistry Program (B.1.2)	3.4.1.07	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management program as the components evaluated in NUREG-1801, Volume 2, VIII.B1.2-a and VIII.B1.1-a.
3.4.3.04	Filter/strainer, pipes & fittings, valve bodies	Carbon Steel	Saturated Steam	Loss of Material	Flow Accelerated Corrosion (FAC) Program (B.1.5)	3.4.1.06	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management program as the components evaluated in NUREG-1801, Volume 2, VIII.B1.1-c.

TABLE 3.4-3 (CONTINUED)
COMPONENTS NOT EVALUATED IN NUREG-1801 THAT RELY ON AGING MANAGEMENT PROGRAMS FOR STEAM AND POWER CONVERSION SYSTEMS IN NUREG-1801 FOR FCS LICENSE RENEWAL

Row Number	FCS Components	FCS Material	FCS Environment	FCS AERMs	FCS Program Activity	Applicable NUREG-1801 Aging Management Review Results Row Number	Justification for applying NUREG-1801 Aging Management Review Results
3.4.3.05	Valves	Low-Alloy Steel	Deoxygenated Treated Water	Loss of Material	Chemistry Program (B.1.2) supplemented by the One-Time Inspection Program (B.3.5)	3.4.1.02	The material is subject to the same environment and aging effect, and managed by the same aging management program as evaluated in Table 3.4-1, Item 3.4.1.02. The aging effect is independent of component type.

3.5 AGING MANAGEMENT OF CONTAINMENT, STRUCTURES AND COMPONENT SUPPORTS

The Containment, Structures and Component Supports are comprised of the Containment, Auxiliary Building, Turbine and Service Building, Intake Structure, Building Piles and associated component supports at FCS.

The Containment structure is a partially prestressed, reinforced concrete Class I structure composed of cylindrical walls, domed roof and a bottom mat. The mat is common to both the Containment structure and the Auxiliary Building and is supported on steel piles driven to bedrock. The mat incorporates a depressed center portion for the reactor vessel. The Containment has a 1/4-inch internal carbon steel liner. The unbonded tendons are in conduits filled with waterproof grease. The tendon anchors are accessible for inspection, testing, and re-tensioning via the tendon access gallery located directly beneath the cylinder walls and at the dome roof.

The Auxiliary Building is a multi-floored, reinforced concrete, Class I structure. From the bottom of the foundation mat to the roof, the structure is of box-type construction with internal bracing provided by vertical concrete walls and horizontal floor slabs. The spent fuel pool is contained within the Auxiliary Building and consists of a stainless steel lined concrete structure. The control room is located within the Auxiliary Building. The Auxiliary Building masonry walls in the area of safety-related equipment have been reinforced to provide protection for Class I equipment and components located nearby.

The Turbine and Service Building is a multi-floored Class II structure. From the basement floor to the operating floor, the structure is a box-type, reinforced concrete structure with internal bracing provided by concrete walls, floor slabs and structural steel. The mat foundation is supported on steel piles driven to bedrock. From the operating floor to the roof, the structure is braced steel frame clad with aggregate resin panels. The multi-layered built-up roof is supported by metal decking spanning between open web steel joists. The turbine generator is located on the operating floor. It is supported by a mass concrete structure referred to as the turbine pedestal.

The Intake Structure is a multi-floored Class I structure. From the bottom of the foundation mat to seven feet above the operating floor, the structure is a box-type reinforced concrete structure with internal bracing provided by concrete walls and floor slabs. The mat foundation is supported on steel pipe piles driven to bedrock. Above the reinforced concrete structure to the roof the structure is a braced steel frame clad with aggregate resin panels. The multi-layered built-up roof is supported by metal decking spanning between open web steel joists. The diesel-driven fire pump fuel tank enclosure is included in the Intake Structure.

The Building Piles commodity group consists of four types of piles: Class A steel pipe piles, Class B steel pipe piles, concrete caissons, and steel H-piles. Class A piles are 20-inch OD open-end pipe piles with 1.031-inch thick walls driven to bedrock. The piles are filled with sand to the point four feet below the top of the pile. The remaining top four feet is filled with concrete. Class A piles are capped with a 2-inch thick steel plate end closure. Class B piles are 12.75-inch OD closed-end pipe piles with 0.25-inch thick walls and filled with concrete. Class B piles are capped with a 1.25-inch steel plate end closure. Concrete caissons are 3-foot diameter reinforced concrete cylinders that extend 10 feet into bedrock. Steel H-piles are used in the foundations of the diesel engine fuel oil storage tank.

Duct banks are comprised of conduits encased in concrete and are located below grade. Duct banks are used to route electrical power cables between buildings. Electrical manholes are reinforced concrete box-type structures which allow for inspection and routing of the cables. Duct banks and electrical manholes contain both CQE and Non-CQE cables. Only the duct banks and electrical manholes of Class I design that contain safety-related cables are within the scope of license renewal.

Operating Experience:

Site: A review of plant specific operating experience was conducted, including the review of Condition Reports and discussions with appropriate site personnel to identify AERM. These reviews concluded that the AERM identified by the FCS specific operating experience were consistent with those identified in NUREG-1801.

Industry: A review of industry-wide operating experience was conducted to identify aging effects requiring management. This included a review of operating experience issued during 2001. This review concluded that the AERM identified by industry operating experience were consistent with those identified in NUREG-1801.

On-Going: The on-going review of plant specific and industry-wide operating experience is conducted in accordance with the FCS Operating Experience Program.

3.5.1 AGING MANAGEMENT PROGRAMS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR LICENSE RENEWAL

Table 3.5-1 shows the aging management programs evaluated in NUREG-1801 that are relied on for license renewal of Structures, and Component Supports at FCS. Note that this table only includes those components, materials and environments that are applicable to a PWR. Information on FCS specific components and materials, not listed in NUREG-1801 but included in the component group of this application, is included in the discussion column.

TABLE 3.5-1
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR STRUCTURES AND COMPONENT SUPPORTS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
	Common Components to all Types of PWR and BWR Containments				
3.5.1.01	Penetration sleeves, penetration bellows, and dissimilar metal welds	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	1. The metal fatigue time limited aging analyses are discussed in Section 4.6 of this application. 2. Consistent with NUREG-1801, this group includes penetration sleeves, penetration bellows, and dissimilar metal welds at FCS.
3.5.1.02	Penetration sleeves, bellows, and dissimilar metal welds.	Cracking due to cyclic loading, or crack initiation and growth due to SCC	Containment ISI and Containment leak rate test	Yes, detection of aging effects is to be evaluated	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801 with the exception of item 4 below. 2. The Containment Inservice Inspection Program (B.1.3) and the Containment Leak Rate Program (B.1.4) manage these aging effects. These programs are described in Appendix B of this application. 3. Consistent with NUREG-1801, this group includes stainless steel in ambient air at FCS. 4. 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, Stress Corrosion Cracking is not an aging effect requiring management.

TABLE 3.5-1 (Continued)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR STRUCTURES AND COMPONENT SUPPORTS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1.03	Penetration sleeves, penetration bellows, and dissimilar metal welds	Loss of material due to corrosion	Containment ISI and Containment leak rate test	No	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes carbon steel in ambient air at FCS.
3.5.1.04	Personnel airlock and equipment hatch	Loss of material due to corrosion	Containment ISI and Containment leak rate test	No	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-180, this group includes carbon steel in ambient air at FCS.
3.5.1.05	Personnel airlock and equipment hatch	Loss of leak tightness in closed position due to mechanical wear of locks, hinges and closure mechanism	Containment leak rate test and Plant Technical Specifications	No	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes carbon steel in ambient air at FCS.
3.5.1.06	Seals, gaskets, and moisture barriers	Loss of sealant and leakage through containment due to deterioration of joint seals, gaskets, and moisture barriers	Containment ISI and Containment leak rate test	No	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. The equipment hatch gasket, made of neoprene, is the only component included in this component group at FCS.

TABLE 3.5-1 (Continued)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR STRUCTURES AND COMPONENT SUPPORTS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
	PWR Concrete (Reinforced and Prestressed) and Steel Containment				
3.5.1.07	Concrete elements: foundation, walls, dome.	Aging of accessible and inaccessible concrete areas due to leaching of calcium hydroxide, aggressive chemical attack, and corrosion of embedded steel	Containment ISI	Yes, if aging mechanism is significant for inaccessible areas	1. The FCS aging management review results are consistent with those reviewed and approved in NUREG-1801. 2. The Containment Inservice Inspection Program (B.1.3) manages the aging effects for these components. This program is described in Appendix B of this application. 3. Leaching of calcium hydroxide from reinforced concrete becomes significant only if the concrete is exposed to flowing water. The reinforced concrete at FCS is not exposed to flowing water. Cracking is controlled through proper arrangement and distribution of reinforcing bars. The concrete at FCS was designed in accordance with ACI 318-63 (per USAR Section 5.3.1 and USAR Section 5.11.3.1) and has these characteristics. Therefore, a plant specific program for below-grade inaccessible areas is not required. 4. Below-grade exterior reinforced concrete at FCS is not exposed to an aggressive environment (pH less than 5.5), or to chloride or sulfate solutions beyond defined limits (greater than 500 ppm chloride, or greater than 1500 ppm sulfate). Periodic monitoring of below-grade water chemistry will be conducted during the period of extended operation to demonstrate that the below-grade environment is not aggressive. Therefore, a plant specific aging management program for below-grade inaccessible areas is not required.

TABLE 3.5-1 (Continued)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR STRUCTURES AND COMPONENT SUPPORTS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1.08	Concrete elements: foundation	Cracks, distortion, and increases in component stress level due to settlement	Structures Monitoring	No, if within the scope of the applicant's Structures Monitoring Program	1. The aging management results are consistent with those reviewed and approved in NUREG 1801. Applicable components are within the scope of the Structures Monitoring Program (B.2.10) described in Appendix B of this application. 2. The structures at FCS are supported on end-bearing steel pipe piles driven to bedrock. Settlement of the concrete subfoundation is not a plausible aging mechanism. A de-watering system is not relied upon for control of settlement at FCS.
3.5.1.09	Concrete elements: foundation	Reduction in foundation strength due to erosion of porous concrete subfoundation	Structures Monitoring	No, if within the scope of the applicant's Structures Monitoring Program	1. The aging management results are consistent with those reviewed and approved in NUREG-1801. Applicable components are within the scope of the Structures Monitoring Program (B.2.10) described in Appendix B of this application. 2. The reinforced concrete at FCS is not exposed to flowing water and a de-watering system is not relied upon for control of erosion of cement from porous concrete subfoundations.

TABLE 3.5-1 (Continued)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR STRUCTURES AND COMPONENT SUPPORTS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1.10	Concrete elements: foundation, dome, and wall	Reduction of strength and modulus due to elevated temperature	Plant specific	Yes, for any portions of concrete containment that exceed specified temperature limits	Subsection CC-3400 of ASME Section III, Division 2, specifies the concrete temperature limits for normal operation or any other long-term period. The temperatures shall not exceed 150 deg F except for local areas that are allowed to have increased temperatures not to exceed 200 deg F. Per USAR Section 2.5.2.3, the record high temperature in the vicinity of FCS was 114 deg F in July 1936. This is below the temperature limit of 150 deg F. USAR Table 9.10-1 provides maximum building/room temperatures for the Auxiliary Building, Turbine Building, Containment, Control Room, Engine Driven Auxiliary Feedwater Pump Room, Radioactive Waste Processing Building, Chemistry and Radiation Protection Building, and Office/Cafeteria Addition.

TABLE 3.5-1 (Continued)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR STRUCTURES AND COMPONENT SUPPORTS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
					The maximum indoor plant temperature in Table 9.10-1 is 120 deg F inside the main area of containment. This is below the temperature limit of 150 deg F. Per USAR Section 5.5.4, sleeve radiation fins and thermal sleeves (in conjunction with pipe insulation) are used to limit maximum temperature at the containment penetration sleeves to 150 deg F under operating conditions. The nuclear detector well cooling system cools the out-of-core neutron detectors, which are located in tubes or wells in the reactor compartment annulus between the lower portion of the reactor vessel and the biological shield, and maintains the shield concrete temperature below 150 deg F. Technical Specification Limiting Condition for Operation 2.13 requires that the annulus exit temperature from the nuclear detector cooling system shall not exceed a temperature found to correlate to 150 deg F concrete temperature. Therefore, no portions of concrete containment exceed specified temperature limits and no aging management is required.

TABLE 3.5-1 (Continued)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR STRUCTURES AND COMPONENT SUPPORTS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1.11	Prestressed containment: tendons and anchorage components	Loss of prestress due to relaxation, shrinkage, creep, and elevated temperature	TLAA evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	1. See Section 4.5 for the TLAA discussion of containment tendons. 2. Consistent with NUREG-1801, this group includes containment tendons and anchorage components at FCS.
3.5.1.12	Steel elements: liner plate, containment shell	Loss of material due to corrosion in accessible and inaccessible areas	Containment ISI and Containment leak rate test	Yes, if corrosion is significant for inaccessible areas	1. The aging management results are consistent with those reviewed and approved in NUREG-1801. 2. Corrosion for inaccessible areas (embedded containment liner) is not significant because: a. Concrete meeting the requirements of ACI 318 or 349 and the guidance of 201.2R was used for the containment concrete in contact with the embedded containment liner. b. The concrete is monitored to ensure that it is free of penetrating cracks that provide a path for water seepage to the surface of the containment shell or liner. c. The moisture barrier, at the junction where the shell or liner becomes embedded, is subject to aging management activities in accordance with IWE requirements. d. Borated water spills and water ponding on the containment concrete floor are not common and when detected are cleaned up in a timely manner.

TABLE 3.5-1 (Continued)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR STRUCTURES AND COMPONENT SUPPORTS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1.13	Steel elements: protected by coating	Loss of material due to corrosion in accessible areas only	Protective coating monitoring and maintenance	No	The combinations of components, materials and environments identified in NUREG-1801 are not applicable to FCS. Protective coatings are not relied on to manage the effects of aging at FCS. The Aging Management Review evaluated in NUREG-1801 is not relied on for FCS license renewal.
3.5.1.14	Prestressed containment: tendons and anchorage components	Loss of material due to corrosion of prestressing tendons and anchorage components	Containment ISI	No	1. The aging management results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes containment tendons and anchorage components at FCS.
3.5.1.15	Concrete elements: foundation, dome, and wall	Scaling, cracking, and spalling due to freeze-thaw; expansion and cracking due to reaction with aggregate	Containment ISI	No	1. The aging management results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes concrete exposed to ambient air and below grade concrete at FCS.

TABLE 3.5-1 (Continued)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR STRUCTURES AND COMPONENT SUPPORTS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
	Class I Structures				
3.5.1.16	All Groups except Group 6: accessible interior/ exterior concrete & steel components	All types of aging effects	Structures Monitoring	No, if within the scope of the applicant's Structures Monitoring Program	1. The aging management results are consistent with those reviewed and approved in NUREG 1801. Applicable components are within the scope of the Structures Monitoring Program (B.2.10) described in Appendix B of this Application 2. As described in NUREG-1557, freeze/thaw does not cause loss of material from reinforced concrete in foundations, and in above and below grade exterior concrete, for plants located in a geographic region of negligible weathering conditions (weathering index <100 day-inch/yr). Loss of material from such concrete is not significant at plants located in areas in which weathering conditions are severe (weathering index >500 day-inch/yr) or moderate (100-500 day-inch/yr), provided that the concrete mix design meets the air content (entrained air 3-6%) and water-to-cement ratio (0.35-0.45) specified in ACI 318-63 or ACI 349-85. The weathering index for FCS is >500 day-inch/yr. The concrete mix design specified a water-to-cement ratio of 0.38 and air entrainment of 4.75% + 0.75% for Class A concrete for FCS. It specified a water-to-cement ratio of 0.44 and air entrainment of 5.00% + 1.00% for Class B concrete. Therefore, the conditions of NUREG-1801, Volume 2, Chapter III are satisfied.

TABLE 3.5-1 (Continued)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR STRUCTURES AND COMPONENT SUPPORTS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
					3. Leaching of calcium hydroxide from reinforced concrete becomes significant only if the concrete is exposed to flowing water. Leaching is not significant if the concrete is constructed to ensure that it is dense, well-cured, has low permeability, and that cracking is well controlled. Cracking is controlled through proper arrangement and distribution of reinforcing bars. The concrete at FCS was designed in accordance with ACI 318-63 (per USAR Section 5.3.1 and USAR Section 5.11.3.1) and has these characteristics. Therefore, the conditions of NUREG-1801, Volume 2, Chapter III are satisfied. 4. Investigations, tests, and petrographic examinations of aggregates performed in accordance with ASTM C295-54 or ASTM C227-50 demonstrated that the aggregates used in the construction of FCS do not react within reinforced concrete. Concrete for FCS was constructed in accordance with ACI 201.2R-77. C. Therefore, the conditions of NUREG-1801, Volume 2, Chapter III are satisfied.

TABLE 3.5-1 (Continued)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR STRUCTURES AND COMPONENT SUPPORTS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
					5. 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 that have a low water-to-cement ratio, adequate air entrainment, and have been 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. The concrete at FCS is not exposed to aggressive river water or groundwater. There is no heavy industry in the area whose emissions would cause degradation to concrete or steel. 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 0.38 and air entrainment of 4.75% + 0.75% for Class A concrete. It specified a water-to-cement ratio of 0.44 and air entrainment of 5.00% + 1.00% for Class B concrete.

TABLE 3.5-1 (Continued)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR STRUCTURES AND COMPONENT SUPPORTS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
					Class C concrete was only used for radiation shields; therefore, it would not be exposed to an environment that would promote corrosion of embedded steel. 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). Therefore, the conditions of NUREG-1801, Volume 2, Chapter III are satisfied and aging management is not required. Below-grade exterior reinforced concrete at FCS is not exposed to an aggressive environment (pH less than 5.5), or to chloride or sulfate solutions beyond defined limits (greater than 500 ppm chloride, or greater than 1500 ppm sulfate). Periodic monitoring of below-grade water chemistry will be conducted during the period of extended operation to demonstrate that the below-grade environment is not aggressive. Therefore, the conditions of NUREG-1801, Volume 2, Chapter III are satisfied.

TABLE 3.5-1 (Continued)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR STRUCTURES AND COMPONENT SUPPORTS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
					6. Aggressive chemical attack on reinforced concrete is not significant if the concrete is exposed to a nonaggressive environment. A non-aggressive environment, as defined by GALL, is one with a pH greater than 5.5, chlorides less than 500 ppm, or sulfates less than 1500 ppm. The concrete at FCS is not exposed to aggressive river water or groundwater. There is no heavy industry in the area whose emissions would cause degradation to concrete or steel. Therefore, the conditions of NUREG-1801, Volume 2, Chapter III are satisfied. 7. The structures at FCS are supported on end-bearing steel pipe piles driven to bedrock. Settlement of the concrete subfoundations is not plausible aging mechanism. A de-watering system is not relied upon for control of settlement at FCS. 8. The reinforced concrete at FCS is not exposed to flowing water and a de-watering system is not relied upon for control of erosion of cement from porous concrete subfoundations.

TABLE 3.5-1 (Continued)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR STRUCTURES AND COMPONENT SUPPORTS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
					9. Subsection CC-3400 of ASME Section III, Division 2, specifies the concrete temperature limits for normal operation or any other long-term period. The temperatures shall not exceed 150 deg F except for local areas that are allowed to have increased temperatures not to exceed 200 deg F. Per USAR Section 2.5.2.3, the record high temperature in the vicinity of FCS was 114 deg F in July 1936. This is below the temperature limit of 150 deg F. USAR Table 9.10-1 provides maximum building/room temperatures for the Auxiliary Building, Turbine Building, Containment, Control Room, Engine Driven Auxiliary Feedwater Pump Room, Radioactive Waste Processing Building, Chemistry and Radiation Protection Building, and Office/Cafeteria Addition. The maximum indoor plant temperature in Table 9.10-1 is 120 deg F inside the main area of Containment. This is below the temperature limit of 150 deg F. Per USAR Section 5.5.4, sleeve radiation fins and thermal sleeves (in conjunction with pipe insulation) are used to limit maximum temperature at the containment penetration sleeves to 150 deg F under operating conditions.

TABLE 3.5-1 (Continued)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR STRUCTURES AND COMPONENT SUPPORTS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
					The nuclear detector well cooling system cools the out-of-core neutron detectors, which are located in tubes or wells in the reactor compartment annulus between the lower portion of the reactor vessel and the biological shield, and maintains the shield concrete temperature below 150 deg F. Technical Specification Limiting Condition for Operation 2.13 requires that the annulus exit temperature from the nuclear detector cooling system shall not exceed a temperature found to correlate to 150 deg F concrete temperature. Therefore, no portions of concrete containment exceed specified temperature limits and no aging management is required.
3.5.1.17	Groups 1-3, 5, 7-9: inaccessible concrete components, such as exterior walls below grade and foundation	Aging of inaccessible concrete areas due to aggressive chemical attack, and corrosion of embedded steel	Plant-specific	Yes, if an aggressive below-grade environment exists	Below-grade exterior reinforced concrete at FCS is not exposed to an aggressive environment (pH less than 5.5), or to chloride or sulfate solutions beyond defined limits (greater than 500 ppm chloride, or greater than 1500 ppm sulfate). Periodic monitoring of below grade water chemistry will be conducted during the period of extended operation to demonstrate that the below-grade environment is not aggressive. Therefore, the conditions of NUREG-1801, Volume 2, Chapter III are satisfied.

TABLE 3.5-1 (Continued)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR STRUCTURES AND COMPONENT SUPPORTS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1.18	Group 6: all accessible/inaccessible concrete, steel, and earthen components	All types of aging effects, including loss of material due to abrasion, cavitation, and corrosion	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance	No	The components identified in NUREG-1801 are not applicable to FCS. The plant specific programs for Intake Structure components exposed to flowing river water are discussed in Items 3.5.2.02, 3.5.2.08 and 3.5.2.32 of Table 3.5-2.
3.5.1.19	Group 5: liners	Crack initiation and growth from SCC and loss of material due to crevice corrosion	Water Chemistry Program and Monitoring of spent fuel pool water level	No	1. The aging management results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes stainless steel in borated water at FCS. 3. In addition to monitoring of spent fuel pool level, the Periodic Surveillance and Preventive Maintenance Program (B.2.7) performs a leak rate analysis of the refueling canal liner.
3.5.1.20	Groups 1-3, 5, 6: all masonry block walls	Cracking due to restraint, shrinkage, creep, and aggressive environment	Masonry Wall	No	1. The aging management results are consistent with those reviewed and approved in NUREG-1801. The masonry wall program is included in the FCS Structures Monitoring Program (B.2.10). 2. Consistent with NUREG-1801, this group includes concrete block in ambient air at FCS.

TABLE 3.5-1 (Continued)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR STRUCTURES AND COMPONENT SUPPORTS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1.21	Groups 1-3, 5, 7-9: foundation	Cracks, distortion, and increases in component stress level due to settlement	Structures Monitoring	No, if within the scope of the applicant's Structures Monitoring Program	1. The aging management results are consistent with those reviewed and approved in NUREG-1801. Applicable components are within the scope of the Structures Monitoring Program (B.2.10) described in Appendix B of this application 2. The structures at FCS are supported on end-bearing steel pipe piles driven to bedrock. Settlement of the concrete subfoundation are not plausible aging mechanisms. A de-watering system is not relied upon for control of settlement at FCS. 3. Consistent with NUREG-1801, this group includes reinforced concrete at FCS.
3.5.1.22	Groups 1-3, 5-9: foundation	Reduction in foundation strength due to erosion of porous concrete subfoundation	Structures Monitoring	No, if within the scope of the applicant's Structures Monitoring Program	1. The aging management results are consistent with those reviewed and approved in NUREG-1801. Applicable components are within the scope of the Structures Monitoring Program (B.2.10) described in Appendix B of this application. 2. The reinforced concrete at FCS is not exposed to flowing water and a de-watering system is not relied upon for control of erosion of cement from porous concrete subfoundations. 3. Consistent with NUREG-1801, this group includes reinforced concrete at FCS.

TABLE 3.5-1 (Continued)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR STRUCTURES AND COMPONENT SUPPORTS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1.22	Groups 1-5: concrete	Reduction of strength and modulus due to elevated temperature	Plant-specific	Yes, for any portions of concrete that exceed specified temperature limits	Subsection CC-3400 of ASME Section III, Division 2, specifies the concrete temperature limits for normal operation or any other long-term period. The temperatures shall not exceed 150 deg F except for local areas that are allowed to have increased temperatures not to exceed 200 deg F. Per USAR Section 2.5.2.3, the record high temperature in the vicinity of FCS was 114 deg F in July 1936. This is below the temperature limit of 150 deg F. USAR Table 9.10-1 provides maximum building/room temperatures for the Auxiliary Building, Turbine Building, Containment, Control Room, Engine Driven Auxiliary Feedwater Pump Room, Radioactive Waste Processing Building, Chemistry and Radiation Protection Building, and Office/Cafeteria Addition. The maximum indoor plant temperature in Table 9.10-1 is 120 deg F inside the main area of Containment. This is below the temperature limit of 150 deg F. Per USAR Section 5.5.4, sleeve radiation fins and thermal sleeves (in conjunction with pipe insulation) are used to limit maximum temperature at the containment penetration sleeves to 150 deg F under operating conditions.

TABLE 3.5-1 (Continued)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR STRUCTURES AND COMPONENT SUPPORTS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
					The nuclear detector well cooling system cools the out-of-core neutron detectors, which are located in tubes or wells in the reactor compartment annulus between the lower portion of the reactor vessel and the biological shield, and maintains the shield concrete temperature below 150 deg F. Technical Specification Limiting Condition for Operation 2.13 requires that the annulus exit temperature from the nuclear detector cooling system shall not exceed a temperature found to correlate to 150 deg F concrete temperature. Therefore, no portions of concrete containment exceed specified temperature limits and no aging management is required.
3.5.1.23	Groups 7, 8: liners	Crack Initiation and growth due to SCC; Loss of material due to crevice corrosion	Plant-specific	Yes	The combinations of components, materials and environments identified in NUREG-1801 are not applicable to FCS.

TABLE 3.5-1 (Continued)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR STRUCTURES AND COMPONENT SUPPORTS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
	Component Supports				
3.5.1.25	All Groups: support members: anchor bolts, concrete surrounding anchor bolts, welds, grout pad, bolted connections, etc.	Aging of component supports	Structures Monitoring	No, if within the scope of the applicant's Structures Monitoring Program	1. The aging management results are consistent with those reviewed and approved in NUREG-1801. Applicable components are within the scope of the Structures Monitoring Program (B.2.10) described in Appendix B of this application. 2. Consistent with NUREG-1801, this group includes carbon steel, grout and epoxy grout and reinforced concrete exposed to ambient air at FCS.
3.5.1.26	Groups B1.1, B1.2, and B1.3: support members: anchor bolts, welds	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	A CLB fatigue analysis does not exist at FCS Station.
3.5.1.27	All Groups: support members: anchor bolts, welds	Loss of material due to boric acid corrosion	Boric acid corrosion	No	1. The aging management results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes carbon steel exposed to ambient air at FCS.

TABLE 3.5-1 (Continued)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR STRUCTURES AND COMPONENT SUPPORTS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1.28	Groups B1.1, B1.2, and B1.3: support members: anchor bolts, welds, spring hangers, guides, stops, and vibration isolators	Loss of material due to environmental corrosion; loss of mechanical function due to corrosion, distortion, dirt, overload, etc.	ISI	No	1. The aging management results are consistent with those reviewed and approved in NUREG-1801. 2. Consistent with NUREG-1801, this group includes carbon steel exposed to ambient air at FCS.
3.5.1.29	Group B1.1: high strength low-alloy bolts	Crack initiation and growth due to SCC	Bolting integrity	No	1. The aging management results are consistent (with deviation) with the results documented in NUREG-1801. 2. The Bolting Integrity Program (B.1.1) discussed in Appendix B of this application includes an alternative means of managing cracking due to SCC. 3. Consistent with NUREG-1801, this group includes high strength low-alloy bolts exposed to ambient air at FCS.

3.5.2 COMPONENTS OR AGING EFFECTS THAT ARE NOT ADDRESSED IN NUREG-1801

Table 3.5-2 contains Containment, Structures and Component Supports aging management review results that are not addressed in NUREG-1801. This table includes the component types, materials, environments, aging effects requiring management, and the programs and activities for managing aging. Table 3.5-3 contains components in Containment, Structures and Component Supports not evaluated in NUREG-1801 that rely on aging management programs in NUREG-1801 for FCS License Renewal and the justification for the use of these programs.

TABLE 3.5-2
AGING MANAGEMENT PROGRAMS FOR CONTAINMENT, STRUCTURES AND COMPONENTS THAT ARE NOT ADDRESSED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.5.2.01	Removable slab lifting devices	Bronze	Plant Indoor Air	None	Not Applicable
3.5.2.02	Intake Structure sluice gate operator gland, pump gland and gland bolting	Bronze, brass	Raw Water	Loss of Material • Crevice and pitting corrosion and MIC due to stagnant conditions • Galvanic corrosion due to the conductivity of the process fluid and the presence of dissimilar metals in contact	Structures Monitoring Program (B.2.10)
3.5.2.03	Class A pipe piles are partially filled with soil during placement and then are filled with sand to the point four feet below the top of the pile. The remaining four feet are then filled with concrete.	Carbon Steel	Below Grade	None	Not Applicable
3.5.2.04	Class B pipe piles Diesel engine fuel oil storage tank H-piles	Carbon Steel	Below Grade	None	Not Applicable
3.5.2.05	Class B pipe piles	Carbon Steel	Concrete	None	Not Applicable

TABLE 3.5-2 (CONTINUED)
AGING MANAGEMENT PROGRAMS FOR CONTAINMENT, STRUCTURES AND COMPONENTS THAT ARE NOT ADDRESSED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.5.2.06	Class A pipe piles are partially filled with soil during placement and then are filled with sand to the point four feet below the top of the pile. The remaining four feet are then filled with concrete.	Carbon Steel	Concrete/Sand/Soil	None	Not Applicable
3.5.2.07	Manhole flange, Flood gates	Carbon Steel	Outside Air	Loss of Material General corrosion due to the exposure of external surfaces to varying levels of humidity	Periodic Surveillance and Preventive Maintenance Program (B.2.7)

TABLE 3.5-2 (CONTINUED)
AGING MANAGEMENT PROGRAMS FOR CONTAINMENT, STRUCTURES AND COMPONENTS THAT ARE NOT ADDRESSED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.5.2.08	Intake Structure carbon steel pipe, pipe sleeve, flange and pipe casing floor penetration	Carbon Steel	Raw Water	Loss of Material • Crevice and general corrosion due to oxygenated raw water environment • Pitting corrosion due to oxygenated raw water environment and stagnant or low flow conditions • Galvanic corrosion due to the conductivity of the process fluid and dissimilar metals in contact • MIC due to exposure to microbiological activity	Periodic Surveillance and Preventive Maintenance Program (B.2.7)

TABLE 3.5-2 (CONTINUED)
AGING MANAGEMENT PROGRAMS FOR CONTAINMENT, STRUCTURES AND COMPONENTS THAT ARE NOT ADDRESSED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.5.2.09	Intake Structure cast iron stuffing box floor penetration	Cast Iron	Raw Water	Loss of Material • Crevice and general corrosion due to oxygenated raw water environment • Pitting corrosion due to oxygenated raw water environment and stagnant or low flow conditions • Galvanic corrosion due to the conductivity of the process fluid and dissimilar metals in contact • MIC due to exposure to microbiological activity	Structures Monitoring Program (B.2.10)
3.5.2.10	Concrete caissons	Concrete	Below Grade	None	Not Applicable

TABLE 3.5-2 (CONTINUED)
AGING MANAGEMENT PROGRAMS FOR CONTAINMENT, STRUCTURES AND COMPONENTS THAT ARE NOT ADDRESSED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.5.2.11	Concrete encased in Class B pipe piles is protected from aggressive environments. The concrete has a compressive strength of 4000 psi, a maximum water-to-cement ratio of 6 gallons/sack or 0.53, and the minimum cement content is 6.50 sacks/cubic yard. The aggregate used has been specified to be non-reactive when mixed with portland cement and water.	Concrete	Carbon Steel	None	Not Applicable
3.5.2.12	Pneumatic flood panel seals	EPDM Rubber	Plant Indoor Air	None	Not Applicable
3.5.2.13	Intake Structure EDPM rubber Link-Seal	EPDM Rubber	Raw Water	Change in Material Properties due to chemical exposure	Structures Monitoring Program (B.2.10)
3.5.2.14	Intake Structure raw water pump rubber foundation seal	EPDM Rubber	Raw Water	Change in Material Properties due to chemical exposure	General Corrosion of External Surfaces Program (B.3.3)
3.5.2.15	Glass in metal fire penetration barriers	Glass	Plant Indoor Air	None	Not Applicable

TABLE 3.5-2 (CONTINUED)
AGING MANAGEMENT PROGRAMS FOR CONTAINMENT, STRUCTURES AND COMPONENTS THAT ARE NOT ADDRESSED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.5.2.16	Intake Structure sand and gravel surrounding the diesel fire pump fuel storage tank	Gravel	Ambient Air Protected from Weather	None	Not Applicable
3.5.2.17	Manhole covers and flange	Gray Cast Iron	Ambient Air	Loss of Material General corrosion and selective leaching due to the exposure of external surfaces to varying levels of humidity	Periodic Surveillance and Preventive Maintenance Program (B.2.7)
3.5.2.18	Flood panel seals	Neoprene	Plant Indoor Air	Change in Material Properties Due to the prolonged exposure of neoprene to temperatures above 95 deg F	Periodic Surveillance and Preventive Maintenance Program (B.2.7)
3.5.2.19	Flood panel seals	Neoprene	Plant Indoor Air	Cracking Due to the prolonged exposure of neoprene to temperatures above 95 deg F	Periodic Surveillance and Preventive Maintenance Program (B.2.7)
3.5.2.20	Manhole foam blocks	Polyurethane foam	Ambient Air Protected from Weather	Cracking Due to vibration, movement, and shrinkage	Periodic Surveillance and Preventive Mainte-nance Program (B.2.7)

TABLE 3.5-2 (CONTINUED)
AGING MANAGEMENT PROGRAMS FOR CONTAINMENT, STRUCTURES AND COMPONENTS THAT ARE NOT ADDRESSED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.5.2.21	Manhole foam blocks	Polyurethane foam	Ambient Air Protected from Weather	Separation Due to vibration, movement, and shrinkage	Periodic Surveillance and Preventive Maintenance Program (B.2.7)
3.5.2.22	Auxiliary building pressure relief panels	PVC	Outside Air	Change in Material Properties Due to ultraviolet (UV) radiation exposure	Structures Monitoring Program (B.2.10)
3.5.2.23	Auxiliary building pressure relief panels	PVC	Outside Air	Cracking Due to ultraviolet (UV) radiation exposure	Structures Monitoring Program (B.2.10)
3.5.2.24	Intake Structure stainless steel raw water pump gland bolting	Stainless Steel	Raw Water	Loss of Material • Crevice corrosion due to the presence of dissolved oxygen and impurities • MIC due to exposure to microbiological activity • Pitting corrosion due to (1) stagnant or low-flow conditions, and (2) halide ions, chlorides, bromides or hypochlorites	General Corrosion of External Surfaces Program (B.3.3)
3.5.2.25	Structural steel	Stainless Steel	Ambient Air	None	Not Applicable
3.5.2.26	Trisodium phosphate baskets	Stainless Steel	Ambient Air	None	Not Applicable

TABLE 3.5-2 (CONTINUED)
AGING MANAGEMENT PROGRAMS FOR CONTAINMENT, STRUCTURES AND COMPONENTS THAT ARE NOT ADDRESSED IN NUREG-1801

Row Number	Component Types	Material	Environment	AERMs	Program/Activity
3.5.2.27	Boot clamps for auxiliary building boot sealed fire penetration barrier	Stainless Steel	Ambient Air	None	Not Applicable
3.5.2.28	Structural steel, fuel transfer penetration, fasteners	Stainless Steel	Borated treated water	Loss of Material • Crevice corrosion due to an oxygenated treated water environ-ment • Pitting corrosion due to exposure to halogens and sulfates.	Structures Monitoring Program (B.2.10) and Inservice Inspection Program (B.1.3)
3.5.2.29	Not used in application				
3.5.2.30	Radiant energy shield sheet metal	Carbon Steel	Ambient Air	Loss of Material General corrosion due to the exposure of external surfaces to varying levels of humidity.	Fire Protection Program (B.2.5)
3.5.2.31	Component Support Stainless Structural Steel	Stainless Steel	Borated treated water	Cracking Stress corrosion cracking	Chemistry Program (B.1.2)
3.5.2.32	Component Support Stainless Steel Threaded Fasteners	Stainless Steel	Ambient Air	Cracking Stress corrosion cracking	Bolting Integrity Program (B.1.1)
3.5.2.33	Intake Structure concreate exposed to raw water	Concrete	Raw Water	Loss of Material Abrasion	Structures Monitoring Program (B.2.10)

TABLE 3.5-3
COMPONENTS IN STRUCTURES AND COMPONENT SUPPORTS NOT EVALUATED IN NUREG-1801 THAT RELY ON AGING MANAGEMENT PROGRAMS IN NUREG-1801 FOR FCS LICENSE RENEWAL

Row Number	FCS Components	FCS Material	FCS Environment	FCS AERMs	FCS Program Activity	Applicable NUREG-1801 Aging Management Review Results Row Number	Justification for applying NUREG-1801 Aging Management Review Results
3.5.3.01	Intake Structure bronze sluice gate operator gland and gland bolting and cast iron stuffing box floor penetrations	Bronze, Cast Iron	Raw Water	Loss of Material Due to Dezincification	Selective Leaching Program (B.3.6)	3.3.1.16 3.3.1.24	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management program as the components evaluated in NUREG-1801, Volume 2, VII.C1.2-a.
3.5.3.02	Steel spring support anchorage	Carbon Steel	Indoor Ambient Air	Loss of Material General Corrosion	Structures Monitoring Program (B.2.10)	3.5.1.25	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management program as the components evaluated in NUREG-1801, Volume 2, III.B4.1-a.

TABLE 3.5-3 (CONTINUED)
COMPONENTS IN STRUCTURES AND COMPONENT SUPPORTS NOT EVALUATED IN NUREG-1801 THAT RELY ON AGING MANAGEMENT PROGRAMS IN NUREG-1801 FOR FCS LICENSE RENEWAL

Row Number	FCS Components	FCS Material	FCS Environment	FCS AERMs	FCS Program Activity	Applicable NUREG-1801 Aging Management Review Results Row Number	Justification for applying NUREG-1801 Aging Management Review Results
3.5.3.03	Reactor cavity liner, reactor cavity seal ring, fuel transfer penetration	Stainless Steel	Plant Indoor Air/ Borated Water	Loss of Material, Cracking	Water Chemistry Program (B.1.2) and monitoring of spent fuel pool water level	3.5.1.19	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management program as the components evaluated in NUREG-1801, Volume 2, III.A5.2-b.
3.5.3.04	Containment Ungrouted Masonry Block Walls in Ambient Air	Masonry	Plant Indoor Air	Cracking	Structures Monitoring Program	3.5.1.20	The FCS components are made of the same material, exposed to the same environment, subject to the same aging effects and managed by the same aging management program as the components evaluated in NUREG-1801, Volume 2, III.A3.3-a.

3.6 AGING MANAGEMENT OF ELECTRICAL AND INSTRUMENTATION AND CONTROLS

The components for FCS evaluated in this section of the application consist of the electrical cables, connectors, splices, fuse blocks, terminal blocks, electrical penetrations, and electrical bus bars subject to aging management review.

Cables and their associated connectors perform the function of providing electrical energy (either continuously or intermittently) to power various equipment and components throughout the plant. Cables and connectors associated with the 10 CFR 50.49 program (Environmental Qualification) are addressed either as short lived, periodically replaced, or long-lived Time Limited Aging Analysis (TLAA) candidates; as such, those candidates are not included in the set of cables and connectors requiring additional aging management review.

Electrical penetrations electrically connect specified sections of an electrical circuit through the containment boundary to deliver voltage, current or signal while maintaining the integrity of containment. The pigtail at each end of the penetration is connected to the field cable by industry accepted methods such as connectors, terminal blocks or splice connections. Non-EQ electrical penetrations will be assessed in a similar manner to the non-EQ cable and connectors requiring additional aging management review.

Bus bars electrically connect specified sections of an electrical circuit to deliver voltage, current or signal. The standoffs support the electrical bus bars. This assessment includes the bus bars located in the 480-volt motor control centers. No aging effects requiring management were identified for this group.

Operating Experience:

Site: A review of plant specific operating experience was conducted, including the review of Condition Reports and discussions with appropriate site personnel to identify AERM. These reviews concluded that the AERM identified by the FCS specific operating experience were consistent with those identified in NUREG-1801.

Industry: A review of industry-wide operating experience was conducted to identify aging effects requiring management. This included a review of operating experience issued during 2001. This review concluded that the AERM identified by industry operating experience were consistent with those identified in NUREG-1801.

On-Going: The on-going review of plant specific and industry-wide operating experience is conducted in accordance with the FCS Operating Experience Program.

3.6.1 AGING MANAGEMENT PROGRAMS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR LICENSE RENEWAL

Table 3.6-1 shows the aging management groups (combinations of components, materials and environments) and the aging management programs evaluated in NUREG-1801 that are relied on for license renewal of the Electrical and Instrumentation and Controls Systems at FCS. Information on FCS specific components, materials and aging effects, not listed in NUREG-1801 but included in the component group of this application, is included in the discussion column.

TABLE 3.6-1
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR ELECTRICAL AND INSTRUMENTATION AND CONTROLS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1.01	Electrical equipment subject to 10 CFR 50.49 environmental qualification (EQ) requirements	Degradation due to various aging mechanisms	Environmental qualification of electric components	Yes, TLAA	The environmental qualification time limited aging analyses are discussed in Section 4.4 of this application.
3.6.1.02	Electrical cables and connections not subject to 10 CFR 50.49 EQ requirements	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure caused by thermal/ thermoxidative degradation of organics; radiolysis and photolysis (ultraviolet [UV] sensitive materials only) of organics; radiation-induced oxidation; moisture intrusion	Aging management program for electrical cables and connections not subject to 10 CFR 50.49 EQ requirements	No	Addressed in FCS Plant Specific Non-EQ Cable Aging Management Program (B.3.4), which is described in Appendix B of this application.

TABLE 3.6-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR ELECTRICAL AND INSTRUMENTATION AND CONTROLS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1.03	Electrical cables used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements that are sensitive to reduction in conductor insulation resistance	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced IR; electrical failure caused by thermal/ thermoxidative degradation of organics; radiation-induced oxidation; moisture intrusion	Aging management program for electrical cables used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements	No	Addressed in FCS Plant Specific Non-EQ Cable Aging Management Program (B.3.4), which is described in Appendix B of this application.
3.6.1.04	Inaccessible medium-voltage (2kV to 15kV) cables (e.g., installed in conduit or direct buried) not subject to 10 CFR 50.49 EQ requirements	Formation of water trees; localized damage leading to electrical failure (breakdown of insulation) caused by moisture intrusion and water trees	Aging management program for inaccessible medium-voltage cables not subject to 10 CFR 50.49 EQ requirements	No	Modifications were made to the Duct Banks to preclude moisture intrusion; therefore, there is no aging effect requiring management.

TABLE 3.6-1 (CONTINUED)
SUMMARY OF AGING MANAGEMENT PROGRAMS FOR ELECTRICAL AND INSTRUMENTATION AND CONTROLS EVALUATED IN NUREG-1801 THAT ARE RELIED ON FOR FCS LICENSE RENEWAL

Row Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1.05	Electrical connectors not subject to 10 CFR 50.49 EQ requirements that are exposed to borated water leakage	Corrosion of connector contact surfaces caused by intrusion of borated water	Boric acid corrosion	No	1. The aging management results are consistent with the results documented in NUREG-1801. 2. Consistent with NUREG-1801, this group includes connectors exposed to borated water leakage at FCS.

3.6.2 COMPONENTS OR AGING EFFECTS THAT ARE NOT ADDRESSED IN NUREG-1801

All components subject to aging management review and aging effects for FCS Electrical and Instrumentation and Controls systems are addressed in Section 3.6.1.