STP Nuclear Operating Company

South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

November 4, 2011
NOC-AE-11002750
10 CFR 54
STI: 33013593
File: G25

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2746

South Texas Project
Units 1 and 2
Docket Nos. STN 50-498, STN 50-499
Supplement to the South Texas Project
License Renewal Application (TAC NOS. ME4936 and ME4937)

References:
1. Letter from G. T. Powell, STP Nuclear Operating Company, to NRC Document Control Desk, "License Renewal Application," dated October 25, 2010 (NOC-AE-10002607) (ML103010257)
2. Letter from G. T. Powell, STP Nuclear Operating Company, to NRC Document Control Desk, "Response to Request for Additional Information for the South Texas Project License Renewal Application (TAC Nos. ME4936 and ME4937)," dated September 15, 2011 (NOC-AE-11002730) (ML11266A019)
3. Letter from G. T. Powell, STP Nuclear Operating Company, to NRC Document Control Desk, "Response to Requests for Additional Information for the South Texas Project License Renewal Application (TAC Nos. ME4936 and ME4937)," dated September 15, 2011 (NOC-AE-11002731) (ML11266A020)

By Reference 1, STP Nuclear Operating Company (STPNOC) submitted a License Renewal Application (LRA) for South Texas Project (STP) Units 1 and 2. This letter supplements responses to requests for additional information regarding the LRA provided in References 2 and 3. The supplemental responses are in the form of revisions to the LRA and are provided in Enclosures 1 and 2.

Revised regulatory commitments to Table A4-1 of the LRA are provided in Enclosure 2. There are no other regulatory commitments in this letter.

Should you have any questions regarding this letter, please contact either Arden Aldridge, STP License Renewal Project Lead, at (361) 972-8243 or Ken Taplett, STP License Renewal Project regulatory point-of-contact, at (361) 972-8416.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 11/4/2011
Date

D. W. Rencurrel
Senior Vice President,
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KJT

Enclosures:
1. Changes to the STPNOC LRA
2. Revised Regulatory Commitments

A147
NRR

cc:

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Enclosure 1

Changes to the STPNOC LRA

Changes to the STPNOC LRA

References: 1. Letter from G. T. Powell, STP Nuclear Operating Company, to NRC Document Control Desk, "Response to Request for Additional Information for the South Texas Project License Renewal Application (TAC Nos. ME4936 and ME4937)," dated September 15, 2011 (NOC-AE-11002730) (ML11266A019)

2. Letter from G. T. Powell, STP Nuclear Operating Company, to NRC Document Control Desk, "Response to Requests for Additional Information for the South Texas Project License Renewal Application (TAC Nos. ME4936 and ME4937)," dated September 15, 2011 (NOC-AE-11002731) (ML11266A020)

The following table lists the affected STPNOC LRA Sections and Tables and the reason for each change. The LRA changes following the table are formatted in a "line-out" (i.e. text being deleted from the LRA) and "line-in" (i.e., text being added to the LRA) structure.

Referenced Letter	RAI Number	Affected Section of LRA	Reason for Change
1	B2.1.17-5	3.3.2.1.7	Components will be considered gray cast iron. For components changed to gray cast iron, aging management of these components is assigned to B2.1.17, Selective Leaching of Materials program. Affected LRA Sections 3.3.2.1.7, 3.3.2.1.9, 3.3.2.1.17, 3.3.2.1.19, 3.3.2.1.20, 3.3.2.1.22, 3.3.2.1.24, 3.3.2.1.25, 3.3.2.1.27 and LRA Tables 3.3.2-7, 3.3.2-9, 3.3.2-17, 3.3.2-19, 3.3.2-20, 3.3.2-22, 3.3.2-24, 3.3.2-25, 3.3.2-27.
1	B2.1.17-5	3.3.2.1.9	Same as above
1	B2.1.17-5	3.3.2.1.17	Same as above
1	B2.1.20-5	3.3.2.1.17	Revised to manage hardening and loss of strength of the caulking around the FWST tank bottom. Added concrete environment.
1	B2.1.17-5	3.3.2.1.19	Components will be considered gray cast iron. For components changed to gray cast iron, aging management of these components is assigned to B2.1.17, Selective Leaching of Materials program. Affected LRA Sections 3.3.2.1.7, 3.3.2.1.9, 3.3.2.1.17, 3.3.2.1.19, 3.3.2.1.20, 3.3.2.1.22, 3.3.2.1.24, 3.3.2.1.25, 3.3.2.1.27 and LRA Tables 3.3.2-7, 3.3.2-9, 3.3.2-17, 3.3.2-19, 3.3.2-20, 3.3.2-22, 3.3.2-24, 3.3.2-25, 3.3.2-27.
1	B2.1.17-5	3.3.2.1.20	Same as above
1	B2.1.17-5	3.3.2.1.22	Same as above

Referenced Letter	RAI Number	Affected Section of LRA	Reason for Change
1	B2.1.17-5	3.3.2.1.24	Same as above
1	B2.1.17-5	3.3.2.1.25	Same as above
1	B2.1.17-5	3.3.2.1.27	Same as above
1	B2.1.18-1	3.3.2.1.27	LRA Table 3.3.2-27 will be revised to remove these buried components. Revision also requires Section 3.3.2.1.27 to be revised to remove "buried" as an environment.
1	B2.1.20-5	3.4.2.1.6	Added concrete as an environment to manage loss of material from tank bottoms founded on concrete.
2	B2.1.3-3	Table 2.3.1-1	LRA Table 2.3.1-1 revises component type of "RV Closure Head Bolts" to "RV Closure Head Bolting Assemblies.
1	B2.1.20-5	Table 2.3.3-17	Added caulking and sealant as component types that perform an intended function for management of loss of material from tank bottoms founded on concrete.
1	B2.1.20-5	Table 3.0-1	Added concrete as a mechanical environment to be evaluated for aging effects
2	B2.1.3-3	Table 3.1.2-1	LRA Table 3.1.2-1 revises "RV Closure Head Bolts" to "RV Closure Head Bolting Assemblies.
1	B2.1.17-5	Table 3.3.2-7	Components will be considered gray cast iron. For components that are changed to gray cast iron, aging management of these components was assigned to B2.1.17, Selective Leaching of Materials program. Affected LRA Sections 3.3.2.1.7, 3.3.2.1.9, 3.3.2.1.17, 3.3.2.1.19, 3.3.2.1.20, 3.3.2.1.22, 3.3.2.1.24, 3.3.2.1.25, 3.3.2.1.27 and LRA Tables 3.3.2-7, 3.3.2-9, 3.3.2-17, 3.3.2-19, 3.3.2-20, 3.3.2-22, 3.3.2-24, 3.3.2-25, 3.3.2-27.
1	B2.1.17-5	Table 3.3.2-9	Same as above.
1	B2.1.20-2	Table 3.3.2-11	LRA Tables 3.3.2-11 and 3.3.2-12 will be revised to specify AMP B2.1.22 for management of the internal surfaces of the supply HVAC tornado dampers for the Fuel Handling and Mechanical Auxiliary Buildings.
1	B2.1.20-2	Table 3.3.2-12	Same as above
1	B2.1.17-5	Table 3.3.2-17	Components will be considered gray cast iron. For components that are changed to gray cast iron, aging management of these components was assigned to B2.1.17, Selective Leaching of Materials program. Affected LRA Sections 3.3.2.1.7, 3.3.2.1.9, 3.3.2.1.17, 3.3.2.1.19, 3.3.2.1.20, 3.3.2.1.22, 3.3.2.1.24, 3.3.2.1.25, 3.3.2.1.27 and LRA Tables 3.3.2-7, 3.3.2-9, 3.3.2-17, 3.3.2-19, 3.3.2-20, 3.3.2-22, 3.3.2-24, 3.3.2-25, 3.3.2-27.
1	B2.1.20-5	Table	LRA Table 3.3.2-17 will be revised to credit LRA

Referenced Letter	RAI Number	Affected Section of LRA	Reason for Change
		3.3.2-17	Basis Document XI.M36 (B2.1.20) to manage hardening and loss of strength of the caulking around the FWST tank bottom
1	B2.1.17-5	Table 3.3.2-19	Components will be considered gray cast iron. For components that are changed to gray cast iron, aging management of these components was assigned to B2.1.17, Selective Leaching of Materials program. Affected LRA Sections 3.3.2.1.7, 3.3.2.1.9, 3.3.2.1.17, 3.3.2.1.19, 3.3.2.1.20, 3.3.2.1.22, 3.3.2.1.24, 3.3.2.1.25, 3.3.2.1.27 and LRA Tables 3.3.2-7, 3.3.2-9, 3.3.2-17, 3.3.2-19, 3.3.2-20, 3.3.2-22, 3.3.2-24, 3.3.2-25, 3.3.2-27.
1	B2.1.17-5	Table 3.3.2-20	Same as above
1	B2.1.17-5	Table 3.3.2-22	Same as above
1	B2.1.17-5	Table 3.3.2-24	Same as above
1	B2.1.17-5	Table 3.3.2-25	Same as above
1	B2.1.17-5	Table 3.3.2-27	Same as above
1	B2.1.18-1	Table 3.3.2-27	LRA Table 3.3.2-27 revised to remove these buried components due to previous submitted scope change.
1	B2.1.20-5	Table 3.4.2-6	LRA Tables 3.3.2-17 and 3.4.2-6 revised to credit LRA Basis Document XI.M38 (B2.1.20) to manage loss of material from tank bottoms founded on concrete. (See Note 1)
2	B3.1-3	Table 4.3-2	The scope, corrective actions, and enhancements to address Leak-Before-Break and ASME Section XI fatigue crack growth analyses are revised to AMP B3.1. The Program Limiting Value for the High Head Safety Injection transient is revised.
1	B2.1.7-1	A.1.7	LRA Appendix B2.1.7 revised to delete the exception to Scope of Program (Element 1) and state that the Bolting Integrity program conforms to the guidance contained in EPRI TR-104213. LRA Appendix A is revised to be consistent with the AMP.
1	B2.1.9-1	A1.9	LRA Appendices A1.9 and B2.1.9 revised to delete cracking as an aging effect in the Open Cycle Cooling Water program.
1	B2.1.13-1	A1.13	LRA Appendix A1.13 revised to replace sprinklers prior to 50 years in service or will field service test a representative sample of the sprinklers and test them every 10 years thereafter during the period of extended operation to ensure signs of degradation, such as corrosion, are detected in a timely manner.

Referenced Letter	RAI Number	Affected Section of LRA	Reason for Change
1	B2.1.16-2	A1.16	LRA Appendix A1.16 revised as indicated in the response to the RAI to include one-time inspection component sample size, examination techniques, follow-up examinations, and program restrictions.
1	B2.1.17-3	A1.17	LRA Appendices A1.17 and B2.1.17 revised to remove use of flow testing for management of selective leaching in fire protection gray cast iron valves and to add that inspection of a sample set will be used for management of selective leaching in fire protection gray cast iron valves.
1	B2.1.17-4	A1.17	LRA Appendices A1.17 and B2.1.17 revised to state that the selective leaching program will be implemented in the five-year period prior to the period of extended operation.
2	B2.1.19-1	A1.19	LRA Appendices A1.19 and B2.1.19 revised to include numbers of different joints in sample determination.
1	B2.1.20-1	A1.20	LRA Appendices A1.20, A1.22, B2.1.20, B2.1.22 revised to include physical manipulation of elastomers.
1	B2.1.20-3	A1.20	LRA Appendices A1.20 and B2.1.20 revised to require manipulation of at least 10 percent of the available surface area of elastomeric or polymeric materials to confirm the absence of hardening or loss of strength.
1	B2.1.20-1	A1.22	LRA Appendices A1.20, A1.22, B2.1.20, B2.1.22 revised to include physical manipulation of elastomers.
1	B2.1.20-5	A1.22	LRA Appendices A1.22 and B2.1.22 revised to volumetrically inspect the AFST and FWST tank bottoms from the inside of the tank within 5 years prior to entering the period of extended operation and whenever the tanks are drained.
1	B2.1.22-1	A1.22	LRA Appendices A1.22 and B2.1.22 revised to remove reference to external surfaces of elastomers.
1	B2.1.22-3	A1.22	LRA Appendices A1.22 and B2.1.22 revised to include the requirement to manipulate at least 10 percent of available surface area for in-scope elastomers.
1	B2.1.22-4	A1.22	LRA Appendices A1.22 and B.2.1.22 revised to state that volumetric examination may be substituted for internal visual inspections in cases where internal surfaces are not available for visual inspection.
2	B3.1-3	A2.1	Changes are required to AMP B3.1 scope, corrective actions, and enhancements to address LBB and ASME Section XI fatigue crack growth analyses. Section A2.1 revised to be consistent with AMP change.
2	B2.1.3-1	A4-1	LRA Table A4-1 revised to include Commitment 38

Referenced Letter	RAI Number	Affected Section of LRA	Reason for Change
			for procedure enhancement to preclude the use of replacement closure stud assemblies fabricated from material with a measured yield strength greater than or equal to 150 ksi
2	B2.1.3-1	B2.1.3	LRA Appendix B2.1.3 revised to preclude the use of replacement closure stud assemblies fabricated from material with a measured yield strength greater than or equal to 150 ksi.
1	B2.1.7-1	B2.1.7	LRA Appendix B2.1.7 revised to delete the exception to Scope of Program (Element 1) and state that the Bolting Integrity program conforms to the guidance contained in EPRI TR-104213. Procedures will be enhanced to conform to the guidance contained in EPRI TR-104213. One minor editorial change made to the exception to Element 3.
1	B2.1.9-1	B2.1.9	LRA Appendices A1.9 and B2.1.9 revised to delete cracking as an aging effect in the Open Cycle Cooling Water program.
1	B2.1.10-1	B2.1.10	LRA Appendix B2.1.1 0 revised to require that representative samples of each combination of material and water treatment program be visually inspected at least every ten years or opportunistically when consistent with sample requirements.
1	B2.1.16-2	B2.1.16	LRA Appendix A1.16 revised as follows to include one-time inspection component sample size, examination techniques, follow-up examinations, and program restrictions.
1	B2.1.17-2	B2.1.17	LRA Appendix B2.1.17 revised to state that sample selection criteria will focus on bounding or lead components most susceptible to aging due to time in service, severity of operating conditions, and lowest design margin.
1	B2.1.17-3	B2.1.17	LRA Appendices A1.17 and B2.1.17 revised to remove use of flow testing for management of selective leaching in fire protection gray cast iron valves and to add that inspection of a sample set will be used for management of selective leaching in fire protection gray cast iron valves.
1	B2.1.17-4	B2.1.17	LRA Appendices A1.17 and B2.1.17 revised to state that the selective leaching program will be implemented in the five-year period prior to the period of extended operation.
2	B2.1.19-1	B2.1.19	LRA Appendices A1.19 and B2.1.19 revised to include numbers of different joints in sample determination.
1	B2.1.20-3	B2.1.20	LRA Appendices A1.20 and B2.1.20 revised to require manipulation of at least 10 percent of the available surface area of elastomeric or polymeric materials to

Referenced Letter	RAI Number	Affected Section of LRA	Reason for Change
			confirm the absence of hardening or loss of strength.
1	B2.1.20-1	B2.1.20	LRA Appendices A1.20, A1.22, B2.1.20, B2.1.22 revised to include physical manipulation of elastomers.
1	B2.1.20-1	B2.1.22	LRA Appendices A1.20, A1.22, B2.1.20, B2.1.22 revised to include physical manipulation of elastomers.
1	B2.1.22-1	B2.1.22	LRA Appendix A1.22 and B2.1.22 revised to remove reference to external surfaces of elastomers.
1	B2.1.22-3	B2.1.22	LRA Appendices A1.22 and B2.1.22 revised to include the requirement to manipulate at least 10 percent of available surface area for in-scope elastomers.
1	B2.1.22-4	B2.1.22	LRA Appendices A1.22 and B.2.1.22 revised to state that volumetric examination may be substituted for internal visual inspections in cases where internal surfaces are not available for visual inspection.
1	B2.1.20-5	B2.1.22	LRA Appendices A1.22 and B2.1.22 revised to volumetrically inspect the AFST and FWST tank bottoms from the inside of the tank within 5 years prior to entering the period of extended operation and whenever the tanks are drained.
2	B3.1-1	B3.1	LRA Appendix B3.1 revised to clarify the corrective actions to be invoked if a component cycle counting action limit is reached and the corrective actions to be invoked if a CUF or CUF_{en} action limit is reached.
2	B3.1-3	B3.1	LRA Appendix B3.1 revised to identify the increase in the scope of the program to ensure the fatigue crack growth analyses, which support the leak-before-break (LBB) analyses, remain valid by counting the transients used in the analyses.
2	B3.1-4	B3.1	LRA Appendix B3.1, the Section on Enhancements for *Corrective Actions (Element 7)* regarding when the CUF action limit is reached revised to clarify corrective actions if CUF limit is reached

Note 1: An editorial error was noted in the response to RAI B2.1.20-5 in Reference 1. The last sentence in the STPNOC response under item 4 is revised to read:

> LRA Tables 3.3.2-17 will be revised to credit LRA Basis Document XI.M36 (B2.1.20) to manage hardening and loss of strength of the caulking around the FWST tank bottom, LRA Appendix A1.20, B2.1.~~22~~ 20 and LRA Basis Document AMP XI.M36 (B2.1.20), External Surfaces Monitoring program will be revised to include visual inspection during periodic plant walkdowns to monitor for degradation of protective paints, coatings, caulking, or sealants.

3.3.2.1.7 Compressed Air System

Materials

The materials of construction for the compressed air system component types are:

- Carbon Steel
- Carbon Steel (Galvanized)
- Cast Iron (Gray Cast Iron)
- Copper Alloy
- Copper Alloy (> 15 percent Zinc)
- Stainless Steel
- Stainless Steel Cast Austenitic

3.3.2.1.9 Chilled Water HVAC System

Materials

The materials of construction for the chilled water HVAC system component types are:

- Carbon Steel
- Carbon Steel (Galvanized)
- Cast Iron (Gray Cast Iron)
- Copper Alloy
- Copper Alloy (> 15 percent Zinc)
- Glass
- Stainless Steel
- Titanium

3.3.2.1.17 Fire Protection System

Materials

The materials of construction for the fire protection system component types are:

- Aluminum
- Carbon Steel
- Carbon Steel (Galvanized)
- ~~Cast Iron~~
- Cast Iron (Gray Cast Iron)
- Copper Alloy
- Ductile Iron
- Elastomer
- Stainless Steel

Environment

The fire protection system component types are exposed to the following environments:

- Atmosphere/ Weather
- Buried
- Closed-Cycle Cooling Water
- Concrete
- Diesel Exhaust
- Dry Gas
- Encased in Concrete
- Fuel Oil
- Plant Indoor Air
- Raw Water
- Ventilation Atmosphere

Aging Effects Requiring Management

The following fire protection system aging effects require management:

- Cracking
- Hardening and loss of material
- Loss of material

- Loss of preload
- Reduction of heat transfer

3.3.2.1.19 Chemical and Volume Control System

Materials

The materials of construction for the chemical and volume control system component types are:

- Aluminum
- Carbon Steel
- Cast Iron (Gray Cast Iron)
- Copper Alloy
- Insulation Calcium Silicate
- Insulation Fiberglass
- Nickel Alloys
- Stainless Steel
- Stainless Steel Cast Austenitic
- Thermoplastics

Environment

The chemical and volume control system component types are exposed to the following environments:

- Borated Water Leakage
- Closed-Cycle Cooling Water
- Demineralized Water
- Dry Gas
- Lubricating Oil
- Plant Indoor Air
- Reactor Coolant
- Secondary Water
- Steam
- Treated Borated Water
- Zinc Acetate

Aging Effects Requiring Management

The following chemical and volume control system aging effects require management:

- Cracking
- Loss of material
- Loss of preload
- Reduction of heat transfer
- Wall thinning

Aging Management Programs

The following aging management programs manage the aging effects for the chemical and volume control system component types:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)
- Bolting Integrity (B2.1.7)
- Closed-Cycle Cooling Water System (B2.1.10)
- External Surfaces Monitoring Program (B2.1.20)
- Flow-Accelerated Corrosion (B2.1.6)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)
- Lubricating Oil Analysis (B2.1.23)
- One-Time Inspection (B2.1.16)
- One-Time Inspection of ASME Code Class 1 Small-Bore Piping (B2.1.19)
- Selective Leaching of Materials (B2.1.17)
- Water Chemistry (B2.1.2)

3.3.2.1.20 Standby Diesel Generator and Auxiliaries System

Materials

The materials of construction for the standby diesel generator and auxiliaries system component types are:

- Aluminum
- Carbon Steel
- Cast Iron (Gray Cast Iron)
- Copper Alloy
- Glass
- Stainless Steel
- Titanium

Environment

The standby diesel generator and auxiliaries system component types are exposed to the following environments:

- Closed-Cycle Cooling Water
- Diesel Exhaust
- Dry Gas
- Fuel Oil
- Lubricating Oil
- Plant Indoor Air
- Raw Water

Aging Effects Requiring Management

The following standby diesel generator and auxiliaries system aging effects require management:

- Cracking
- Loss of material
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for the standby diesel generator and auxiliaries system component types:

- Bolting Integrity (B2.1.7)
- Closed-Cycle Cooling Water System (B2.1.10)
- External Surfaces Monitoring Program (B2.1.20)
- Fuel Oil Chemistry (B2.1.14)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)
- Lubricating Oil Analysis (B2.1.23)
- One-Time Inspection (B2.1.16)
- Open-Cycle Cooling Water System (B2.1.9)
- Selective Leaching of Materials (B2.1.17)

3.3.2.1.22 Liquid Waste Processing System

Materials

The materials of construction for the liquid waste processing system component types are:

- Carbon Steel
- Cast Iron (Gray Cast Iron)
- Copper Alloy
- Glass
- Stainless Steel
- Stainless Steel Cast Austenitic

Environment

The liquid waste processing system component types are exposed to the following environments:

- Borated Water Leakage
- Closed-Cycle Cooling Water
- Demineralized Water
- Dry Gas
- Plant Indoor Air
- Raw Water
- Secondary Water
- Sodium Hydroxide
- Steam
- Treated Borated Water

Aging Effects Requiring Management

The following liquid waste processing system aging effects require management:

- Cracking
- Loss of material
- Loss of preload
- Wall thinning

Aging Management Programs

The following aging management programs manage the aging effects for the liquid waste processing system component types:

- Bolting Integrity (B2.1.7)
- Boric Acid Corrosion (B2.1.4)
- Closed-Cycle Cooling Water System (B2.1.10)
- External Surfaces Monitoring Program (B2.1.20)
- Flow-Accelerated Corrosion (B2.1.6)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)
- One-Time Inspection (B2.1.16)
- Selective Leaching of Materials (B2.1.17)
- Water Chemistry (B2.1.2)

3.3.2.1.24 Nonradioactive Waste Plumbing Drains and Sump System

Materials

The materials of construction for the nonradioactive waste plumbing drains and sump system component types are:

- Carbon Steel
- Carbon Steel (Galvanized)
- ~~Cast Iron~~
- Cast Iron (Gray Cast Iron)
- Copper Alloy
- Ductile Iron
- Polyvinyl Chloride (PVC)
- Stainless Steel

3.3.2.1.25 Oily Waste System

Materials

The materials of construction for the oily waste system component types are:

- Carbon Steel
- Carbon Steel (Galvanized)
- Cast Iron (Gray Cast Iron)
- Copper Alloy
- Ductile Iron
- Stainless Steel

Environment

The oily waste system component types are exposed to the following environments:

- Buried
- Encased in Concrete
- Plant Indoor Air
- Raw Water

Aging Effects Requiring Management

The following oily waste system aging effect requires management:

- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the oily waste system component types:

- Bolting Integrity (B2.1.7)
- Buried Piping and Tanks Inspection (B2.1.18)
- External Surfaces Monitoring Program (B2.1.20)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)
- Selective Leaching of Materials (B2.1.17)

3.3.2.1.27 Miscellaneous Systems In-Scope ONLY based on Criterion 10 CFR 54.4(a)(2)

Materials

The materials of construction for the miscellaneous systems in scope ONLY based on Criterion 10 CFR 54.4(a)(2) component types are:

- Aluminum
- Carbon Steel
- Cast Iron (Gray Cast Iron)
- Copper Alloy
- Copper Alloy (Aluminum > 8 percent)
- Copper Alloy (Zinc > 15 percent)
- Ductile Iron
- Glass
- Nickel-Alloys
- Polyvinyl Chloride (PVC)
- Stainless Steel
- Stainless Steel Cast Austenitic

Environment

The miscellaneous systems in scope ONLY based on Criterion 10 CFR 54.4(a)(2) component types are exposed to the following environments:

- Atmosphere/ Weather
- Borated Water Leakage
- ~~Buried~~
- Closed-Cycle Cooling Water
- Demineralized Water
- Dry Gas
- Plant Indoor Air
- Potable Water
- Raw Water
- Secondary Water
- Sodium Hydroxide
- Treated Borated Water

Aging Effects Requiring Management

The following miscellaneous systems in-scope ONLY based on Criterion 10 CFR 54.4(a)(2) aging effects require management:

- Cracking
- Loss of material
- Loss of preload
- Wall thinning

Aging Management Programs

The following aging management programs manage the aging effects for the miscellaneous systems in scope ONLY based on Criterion 10 CFR 54.4(a)(2) component types:

- Bolting Integrity (B2.1.7)
- ~~Buried Piping and Tanks Inspection (B2.1.18)~~
- Closed-Cycle Cooling Water System (B2.1.10)
- External Surfaces Monitoring Program (B2.1.20)
- Flow-Accelerated Corrosion (B2.1.6)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)
- One-Time Inspection (B2.1.16)
- Open-Cycle Cooling Water System (B2.1.9)
- Selective Leaching of Aluminum Bronze (B2.1.37)
- Selective Leaching of Materials (B2.1.17)
- Water Chemistry (B2.1.2)

3.4.2.1.6 Auxiliary Feedwater System

Environment

The auxiliary feedwater system components are exposed to the following environments:

- Atmosphere/ Weather
- Buried
- Concrete
- Dry Gas
- Encased in Concrete
- Lubricating Oil
- Plant Indoor Air
- Secondary Water
- Steam

Table 2.3.1-1 Reactor Vessel and Internals (Continued)

Component Type	Intended Function
RV Closure Head	Pressure Boundary
RV Closure Head Boltsing Assemblies	Pressure Boundary
RV Core Support Lugs	Structural Support

Table 2.3.3-17 Fire Protection System

Component Type	Intended Function
Caulking and Sealant	Pressure Boundary
Closure Bolting	Pressure Boundary Structural Integrity (attached)

Table 3.0-1 Mechanical Environments (Continued)

Mechanical Environments		
Evaluated Environment	**NUREG-1801 Environment**	**Description**
Closed Cycle Cooling Water	Closed Cycle Cooling Water	Water for component cooling that is treated and monitored for quality under the Closed-Cycle Cooling Water System program.
	Closed Cycle Cooling Water >60° C (140° F)	
	Treated Water	
Concrete	Concrete	Components, such as tanks, located directly on concrete, with inaccessible external surfaces, require inspection for loss of material due to corrosion.
Demineralized Water	Treated Water	Demineralized water or chemically purified water which is the source for water in all clean systems such as the primary or secondary coolant systems. Demineralized water is monitored for quality under the Water Chemistry program and depending on the system; demineralized water may require additional processing.

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
RV Closure Head	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Loss of material	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2-25	3.1.1.63	A
RV Closure Head Boltsing Assemblies	PB	High Strength Low Alloy Steel (Bolting)	Borated Water Leakage (Ext)	Cracking	Reactor Head Closure Studs (B2.1.3)	IV.A2-2	3.1.1.71	B
RV Closure Head Boltsing Assemblies	PB	High Strength Low Alloy Steel (Bolting)	Borated Water Leakage (Ext)	Loss of material	Reactor Head Closure Studs (B2.1.3)	IV.A2-3	3.1.1.71	B
RV Closure Head Boltsing Assemblies	PB	High Strength Low Alloy Steel (Bolting)	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.A2-13	3.1.1.58	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
RV Core Support Lugs	SS	Nickel Alloys	Reactor Coolant (Ext)	Cracking	Nickel-Alloy Aging Management (B2.1.37), ASME Section XI Inservice Inspection Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components, Water Chemistry (B2.1.2), and Comply with applicable NRC Orders and provide a commitment in the FSAR supplement to implement applicable (1) Bulletins and Generic Letters and (2) staff-accepted industry guidelines.	IV.A2-12	3.1.1.31	E, 1

Table 3.3.2-7 Auxiliary Systems – Summary of Aging Management Evaluation – Compressed Air System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Compressor	PB	Carbon Steel	Plant Indoor Air (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.D-2	3.3.1.53	E, 2
Compressor	LBS	Cast Iron <u>(Gray Cast Iron)</u>	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.C2-13	3.3.1.14	B
Compressor	LBS	Cast Iron <u>(Gray Cast Iron)</u>	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Filter	FIL, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Valve	PB, SIA	Carbon Steel	Plant Indoor Air (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.D-2	3.3.1.53	E, 2
Valve	PB	Cast Iron <u>(Gray Cast Iron)</u>	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Valve	PB	Cast Iron <u>(Gray Cast Iron)</u>	Plant Indoor Air (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-23	3.3.1.71	B

Valve	PB, SIA	Copper Alloy	Plant Indoor Air (Ext)	None	None	VIII.I-2	3.4.1.41	A

Table 3.3.2-9 Auxiliary Systems – Summary of Aging Management Evaluation – Chilled Water HVAC System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	VII.I-5	3.3.1.45	B
Compressor	PB	Cast Iron (Gray Cast Iron)	Dry Gas (Int)	None	None	VII.J-23	3.3.1.97	A
Compressor	PB	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Eductor	PB	Copper Alloy (> 15% Zinc)	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.C2-5	3.3.1.26	B
Pump	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Pump	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII. ~~C2-14~~ F2-18	3.3.1.47	B
Pump	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.F2-16	3.3.1.85	B
Pump	PB	Cast Iron (Gray Cast Iron)	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.C2-13	3.3.1.14	B

Pump	LBS, PB	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Separator	PB	Stainless Steel	Dry Gas (Ext)	None	None	VII.J-19	3.3.1.97	A

Table 3.3.2-11 Auxiliary Systems – Summary of Aging Management Evaluation – Fuel Handling Building HVAC System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-7	3.3.1.55	B
Damper	PB	Carbon Steel	Atmosphere/ Weather (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)~~External Surfaces Monitoring Program (B2.1.20)~~	VIII.B1-6 ~~VII.I-9~~	3.4.1.30 ~~3.3.1.58~~	D ~~B~~
Damper	PB	Carbon Steel	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	A

Table 3.3.2-12 Auxiliary Systems – Summary of Aging Management Evaluation – Mechanical Auxiliary Building HVAC System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	VII.I-5	3.3.1.45	B
Damper	PB	Carbon Steel	Atmosphere/ Weather (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)~~External Surfaces Monitoring Program (B2.1.20)~~	VIII.B1-6 ~~VII.I-9~~	3.4.1.30 ~~3.3.1.58~~	D ~~B~~
Damper	PB	Carbon Steel	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	A

Table 3.3.2-17 Auxiliary Systems – Summary of Aging Management Evaluation – Fire Protection System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Caulking and Sealant	PB	Elastomer	Atmosphere/ Weather (Ext)	Hardening and loss of strength	External Surfaces Monitoring Program (B2.1.20)	None	None	G, 4
Closure Bolting	PB	Carbon Steel	Atmosphere Weather (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	None	None	H, 1
Piping	LBS, PB, SIA	Carbon Steel (Galvanized)	Raw Water (Int)	Loss of material	Fire Water System; (B2.1.13)	VII.G-24	3.3.1.68	B
Piping	PB	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Piping	PB	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Fire Water System (B2.1.13)	VII.G-24	3.3.1.68	B
Piping	PB	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Selective Leaching of Materials (B2.1.18)	VII.G-14	3.3.1.85	B
Piping	PB	Ductile Iron	Buried (Ext)	Loss of material	Buried Piping and Tanks Inspection (B2.1.18)	VII.G-25	3.3.1.19	B
Piping	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Pump	PB	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Pump	PB	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Fire Water System (B2.1.13)	VII.G-24	3.3.1.68	B

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Pump	PB	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.G-14	3.3.1.85	B
Solenoid Valve	PB	Copper Alloy	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	None	None	G
Strainer	PB	Carbon Steel (Galvanized)	Plant Indoor Air (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-23	3.3.1.71	B
Strainer	PB, SIA	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Strainer	PB, SIA	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Fire Water System (B2.1.13)	VII.G-24	3.3.1.68	B
Strainer	PB, SIA	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.G-14	3.3.1.85	B
Strainer Element	FIL	Copper Alloy	Raw Water (Ext)	Loss of material	Fire Water System (B2.1.13)	VII.G-12	3.3.1.70	B
Tank	PB	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-9	3.3.1.58	B
Tank	PB	Carbon Steel	Concrete (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	None	None	G, 3

Tank	PB	Carbon Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.14) and One-Time Inspection (B2.1.16)	VII.H2-24	3.3.1.20	B

Plant Specific Notes:

1 Loss of preload is conservatively considered to be applicable for all closure bolting.

2 The Fire Protection program (B2.1.12) is used to manage aging of the external surfaces of halon piping.

3 A visual inspection of the external surface of the bottom of tanks sitting directly on soil or concrete cannot be performed. A volumetric examination from the inside of the bottom of the tank is performed in lieu of an external inspection.

4 The External Surfaces Monitoring Program (B2.1.20) is used to manage the hardening and loss of strength of the caulking found between the firewater storage tank (FWST) bottom to concrete foundation interface to prevent water entry under the tank bottom.

Table 3.3.2-19 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Valve	LBS,SIA	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.C2-8	3.3.1.85	B
Valve	LBS, SIA	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-14	3.3.1.~~47~~53	B
Valve	LBS, SIA	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Valve	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J-16	3.3.1.99	A

Table 3.3.2-20 Auxiliary Systems – Summary of Aging Management Evaluation – Standby Diesel Generator and Auxiliaries

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Accumulator	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	C
Blower	HT, PB	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.H2-23	3.3.1.47	D
Blower	HT, PB	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.C2-8	3.3.1.85	D
Blower	PB	Cast Iron (Gray Cast Iron)	Diesel Exhaust (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.H2-2	3.3.1.18	E
Blower	HT, PB	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Blower	PB	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.H2-21	3.3.1.71	~~D~~ B
Closure Bolting	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	VII.I-4	3.3.1.43	B

Table 3.3.2-20 Auxiliary Systems – Summary of Aging Management Evaluation – Standby Diesel Generator and Auxiliaries

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Orifice	PB, SIA, TH	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Orifice	SIA	Cast Iron (Gray Cast Iron)	Dry Gas (Int)	None	None	VII.J-23	3.3.1.97	A
Orifice	SIA	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Orifice	LBS, SIA	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-10	3.3.1.50	B
Pump	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Pump	PB	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.H2-23	3.3.1.47	B
Pump	PB	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.C2-8	3.3.1.85	B
Pump	PB	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Sight Gauge	PB	Cast Iron (Gray Cast Iron)	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.H2-20	3.3.1.14	B

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Sight Gauge	PB	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Sight Gauge	PB	Glass	Lubricating Oil (Int)	None	None	VII.J-10	3.3.1.93	A

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Strainer	FIL, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Strainer	LBS, SIA	Cast Iron (Gray Cast Iron)	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.H2-20	3.3.1.14	B
Strainer	LBS, SIA	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Strainer	FIL	Stainless Steel	Lubricating Oil (Ext)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.H2-17	3.3.1.33	B

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve	PB	Carbon Steel	Plant Indoor Air (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.H2-21	3.3.1.71	B
Valve	PB	Cast Iron (Gray Cast Iron)	Dry Gas (Int)	None	None	VII.J-23	3.3.1.97	A
Valve	PB	Cast Iron (Gray Cast Iron)	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.H2-20	3.3.1.14	B
Valve	PB	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B

Valve	PB, SIA	Copper Alloy	Dry Gas (Int)	None	None	VII.J-4	3.3.1.97	A

Table 3.3.2-22 Auxiliary Systems – Summary of Aging Management Evaluation – Liquid Waste Processing System

Pump	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Pump	LBS	Cast Iron (Gray Cast Iron)	Demineralized Water (Int)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.E1-14	3.3.1.85	B
Pump	LBS	Cast Iron (Gray Cast Iron)	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.E-34	3.4.1.04	A
Pump	LBS	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Pump	LBS, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A

Table 3.3.2-24 Auxiliary Systems – Summary of Aging Management Evaluation – Nonradioactive Waste Plumbing and Sumps System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	LBS, PB	Carbon Steel (Galvanized)	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-19	3.3.1.76	E, 2
Piping	PB	Cast Iron (Gray Cast Iron)	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	A
Piping	LBS, PB	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Piping	PB	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-23	3.3.1.71	B
Piping	LBS	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-19	3.3.1.76	E, 2
Piping	LBS	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of Material	Selective Leaching of Materials (B2.1.17)	VII.C1-11	3.3.1.85	B
Piping	LBS	Polyvinyl Chloride (PVC)	Plant Indoor Air (Ext)	None	None	None	None	F

Valve	LBS	Carbon Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-19	3.3.1.76	E, 2
Valve	PB	Cast Iron (Gray Cast Iron)	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-9	3.3.1.58	B
Valve	PB	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Valve	PB	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-23	3.3.1.71	B
Valve	LBS	Copper Alloy	Plant Indoor Air (Ext)	None	None	VIII.I-2	3.4.1.41	A

Table 3.3.2-25 Auxiliary Systems – Summary of Aging Management Evaluation – Oily Waste System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Carbon Steel (Galvanized)	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-19	3.3.1.76	E, 2
Piping	PB	Cast Iron (Gray Cast Iron)	Buried (Ext)	Loss of material	Buried Piping and Tanks Inspection (B2.1.18)	VII.C1-18	3.3.1.19	B
Piping	PB	Cast Iron (Gray Cast Iron)	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	A
Piping	PB	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-19	3.3.1.76	E, 2
Piping	PB	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.C1-11	3.3.1.85	B
Piping	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Piping	PB	Stainless Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-15	3.3.1.79	E, 2
Pump	PB	Cast Iron (Gray Cast Iron)	Raw Water (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.C1-19	3.3.1.76	E, 3

Pump	PB	Cast Iron (Gray Cast Iron)	Raw Water (Ext)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.C1-11	3.3.1.85	B

Table 3.3.2-25 Auxiliary Systems – Summary of Aging Management Evaluation – Oily Waste System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Pump	PB	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-19	3.3.1.76	E, 2
Pump	PB	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.C1-11	3.3.1.85	B
Valve	PB	Copper Alloy	Plant Indoor Air (Ext)	None	None	VIII.I-2	3.4.1.41	A

Table 3.3.2-27 Auxiliary Systems – Summary of Aging Management Evaluation – Miscellaneous Systems in scope ONLY for Criterion 10 CFR 54.4(a)(2)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	SIA	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-8	3.4.1.28	D
~~Piping~~	~~SIA~~	~~Carbon Steel~~	~~Buried (Ext)~~	~~Loss of material~~	~~Buried Piping and Tanks Inspection (B2.1.18)~~	~~VII.H1-9~~	~~3.3.1.19~~	~~B~~
Piping	SIA	Carbon Steel	Dry Gas (Int)	None	None	VII.J-23	3.3.1.97	A
Valve	SIA	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-8	3.4.1.28	D
~~Valve~~	~~SIA~~	~~Carbon Steel~~	~~Buried (Ext)~~	~~Loss of material~~	~~Buried Piping and Tanks Inspection (B2.1.18)~~	~~VII.H1-9~~	~~3.3.1.19~~	~~B~~
Valve	LBS, SIA	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-14	3.3.1.47	B

Table 3.3.2-27 Auxiliary Systems – Summary of Aging Management Evaluation – Miscellaneous Systems in scope ONLY for Criterion 10 CFR 54.4(a)(2)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve	LBS	Carbon Steel	Secondary Water (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.6)	VIII.E-35	3.4.1.29	B
Valve	LBS	Cast Iron <u>(Gray Cast Iron)</u>	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Valve	LBS	Cast Iron <u>(Gray Cast Iron)</u>	Potable Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	None	None	G
<u>Valve</u>	<u>LBS</u>	<u>Cast Iron (Gray Cast Iron)</u>	<u>Potable Water (Int)</u>	<u>Loss of material</u>	<u>Selective Leaching of Materials (B2.1.17)</u>	<u>None</u>	<u>None</u>	<u>G</u>
Valve	LBS	Copper Alloy	Plant Indoor Air (Ext)	None	None	VIII.I-2	3.4.1.41	A

Table 3.4.2-6 Steam and Power Conversion System – Summary of Aging Management Evaluation – Auxiliary Feedwater System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tank	PB	Stainless Steel	Atmosphere/ Weather (Ext)	None	None	None	None	G
Tank	PB	Stainless Steel	Concrete (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	None	None	G, 4
Tank	PB	Stainless Steel	Dry Gas (Int)	None	None	VIII.I-12	3.4.1.44	A

Plant Specific Notes:

1 Loss of preload is conservatively considered to be applicable for all closure bolting.

2 The Water Chemistry program (B2.1.2) and the One-Time Inspection program (B2.1.16) manage loss of material due to pitting and crevice corrosion and cracking due to stress corrosion cracking. The One-Time Inspection program (B2.1.16) includes selected components at susceptible locations.

3 These items are assigned the environment of Atmosphere/ Weather (Internal). The items are vented or open to the outside atmosphere so the distinction between internal and external is not relevant for aging purposes. These stainless steel components are located outside with an uncontrolled external air environment and are not exposed to aggressive chemical species. The STP plant outdoor environment is not subject to industry air pollution or saline environment. Alternate wetting and drying has shown a tendency to "wash" the surface material rather than concentrate contaminants. Stainless steel does not experience any appreciable aging effects in this environment.

4 A visual inspection of the external surface of the bottom of tanks sitting directly on soil or concrete cannot be performed. A volumetric examination from the inside of the bottom of the tank is performed in lieu of an external inspection.

Table 4.3-2 STP Units 1 and 2 Transient Cycle Count 60-year Projections

Transient Description	**UFSAR Design Cycles**	**Program Limiting Value**	**Baseline Events Up to Year End 2008**		**Projected Events for 60-Years**	
			Unit 1 (1988-2008)	**Unit 2 (1989-2008)**	**Unit 1**	**Unit 2**
37. Actuation of RCS Cold Over-pressurization Mitigation System (COMS)	10	10	3	1	4	2
38. Normal Charging Letdown Shutoff and Letdown Trip	NS	60	7	18	16	54
39. Letdown Trip with Prompt Return to Service	NS	200	3	3	10	10
40. Letdown Trip with Delayed Return to Service	NS	20	3	0	9	1
41. Charging Trip with Prompt Return to Service	NS	20	10	0	15	1
42. Charging Trip With Delayed Return to Service	NS	20	0	0	1	1
Test Conditions						
43. Primary Side Hydrostatic Test	10	1	1	1	1	1
44. Secondary Side Hydrostatic Test (each generator)	10	10	1	1	1	1
Auxiliary Conditions - Accumulator Safety Injections						
45. Inadvertent RCS Depressurization with H HSI	NS	20	0	0	1	1
46. Inadvertent Accumulator Blowdown	NS	4	0	0	1	1
47. RHR Operation	NS	200	44	27	89	76
48. High Head Safety Injection	NS	~~54~~48	1	0	3	1

A1.7 BOLTING INTEGRITY

The Bolting Integrity program manages cracking, loss of material, and loss of preload for pressure retaining bolting and ASME component support bolting. The program includes preload control, selection of bolting material, use of lubricants/sealants consistent with EPRI NP-5067, *Good Bolting Practices*, and performance of periodic inspections for indication of aging effects. The program also includes inservice inspection requirements established in accordance with ASME Section XI, Subsections IWB, IWC, IWD, and IWF for ASME Class bolting.

STP good bolting practices are established in accordance with plant procedures. These procedures include requirements for proper disassembling, inspecting, and assembling of connections with threaded fasteners. In addition to the inspection activities noted above, the Bolting Integrity program includes activities for preload control, material selection and control, and use of lubricants/sealants. The general practices that are established in this program are consistent with EPRI TR-104213, *Bolted Joint Maintenance and Applications Guide*, EPRI NP-5769, *Degradation and Failure of Bolting in Nuclear Power Plants*, Volume 1 and 2, and the recommendations delineated in NUREG-1339.

A1.9 OPEN-CYCLE COOLING WATER SYSTEM

The Open-Cycle Cooling Water System program manages ~~cracking,~~ loss of material, and reduction of heat transfer for components within the scope of license renewal and exposed to the raw water of the essential cooling water system. Included are components of the essential cooling water system that are within the scope of license renewal, the component cooling water heat exchangers and the other safety related heat exchangers cooled by the essential cooling water system. The program includes chemical treatment and control of biofouling, periodic inspections, flushes and physical and chemical cleaning, and heat exchanger performance testing/ inspections to ensure that the effects of aging will be managed during the period of extended operation. The program is consistent with STP commitments as established in responses to NRC Generic Letter 89-13, *Service Water System Problems Affecting Safety-Related Components.*

A1.13 FIRE WATER SYSTEM

The Fire Water System program manages loss of material for water-based fire protection systems consisting of piping, fittings, valves, sprinklers, nozzles, hydrants, hose stations, standpipes and water storage tanks. Periodic hydrant inspections, fire main flushing, sprinkler inspections, and flow tests in accordance with National Fire Protection Association (NFPA) codes and standards ensure that the water-based fire protection systems are capable of performing their intended function. The fire water system pressure is continuously monitored such that loss of system pressure is immediately detected and corrective actions are initiated.

The Fire Water System program conducts an air or water flow test through each open head spray/sprinkler nozzle to verify the flow is unobstructed. The program will replace sprinklers prior to 50 years in service or will field service test a representative sample of the sprinklers and test them every 10 years thereafter during the period of extended operation to ensure signs of degradation, such as corrosion, are detected in a timely manner. Non-intrusive volumetric examinations will be performed on representative samples of fire water piping to detect any loss of material due to corrosion, to ensure that aging effects are managed, wall thickness is within acceptable limits and degradation will be detected before the loss of intended function. Otherwise, internal inspections are used to evaluate wall thickness to identify evidence of loss of material.

A1.16 ONE-TIME INSPECTION

The One-Time Inspection program conducts one-time inspections of plant system piping and components to verify the effectiveness of the Water Chemistry program (A1.2), Fuel Oil Chemistry program (A1.14), and Lubricating Oil Analysis program (A1.23). The aging effects to be evaluated by the One-Time Inspection program are loss of material, cracking, and reduction of heat transfer. The One-Time Inspection program determines non-destructive examination (NDE) sample sizes based on the ~~number~~ population of components in a group sharing the same material, environment and aging effects. For each population, a representative sample size of 20 percent of the population is selected up to a maximum of 25 components. The components making up the sample are those determined to be most susceptible to degradation based on a review of environment, condition and operating experience. The program will focus on bounding or lead components most susceptible to aging due to time in service and severity of operating conditions. Inspections will be performed using a variety of NDE methods, including visual, volumetric, and surface techniques by qualified inspectors. The program will not be used for component inspections with known age-related degradation mechanisms, or when the environment in the period of extended operation is not equivalent to that in the prior 40 years. ~~Inspections performed by other activities may be used if they satisfy the requirements of the OTI program.~~ The One-Time Inspection program specifies corrective actions if aging effects are found. The corrective action program may specify follow-up inspections for confirmation of aging effects at the same or different locations. If aging effects are detected, a plant-specific program will be developed for the material, environmental, and aging combination that produced the aging effects.

This new program will be implemented and completed within the 10 year period prior to the period of extended operation. Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.

A1.17 SELECTIVE LEACHING OF MATERIALS

The Selective Leaching of Materials program manages loss of material due to selective leaching for copper alloys with greater than 15 percent zinc and gray cast iron components exposed to treated water, raw water, and groundwater (buried) within the scope of license renewal.

The Selective Leaching of Materials program will be implemented during the ~~10~~ five years prior to the period of extended operation. The procedure will include a one-time inspection of a sample of components made from gray cast iron and copper alloys with greater than 15 percent zinc. This procedure will provide for visual and mechanical inspections for each system/material/environment combination, with exception of buried fire water piping. A~~a~~n engineering evaluation is performed if graphitization of gray cast iron or dezincification of copper alloy with greater than 15 percent zinc components is detected.

~~Flow testing of the fire mains, consistent with NFPA 25, is credited for management of selective leaching of the buried cast iron valves in the fire protection system.~~

A1.19 ONE-TIME INSPECTION OF ASME CODE CLASS 1 SMALL-BORE PIPING

The One-Time Inspection of ASME Code Class 1 Small-Bore Piping program manages cracking of ASME Code Class 1 piping less than or equal to four inches nominal pipe size (NPS 4). This program is implemented as part of the fourth interval of the STP Inservice Inspection (ISI) program.

For ASME Code Class 1 small-bore piping, the ISI program requires volumetric examinations on selected butt weld locations to detect cracking. Weld locations are selected based on the guidelines provided In EPRI TR-112657, *Revised Risk-Informed Inservice Inspection Evaluation Procedure*. Volumetric examinations of butt welds are conducted in accordance with ASME Section XI with acceptance criteria from Paragraph IWB-3000 and IWB-2430. Unit 1 has 182 Class 1 small-bore butt welds and 49 Class 1 small-bore socket welds. The inspection sample for the Unit 1 Class 1 small-bore butt welds is 19 and the inspection sample for the Unit 1 Class 1 small-bore socket welds is 5, which is 10 percent of each population. In Unit 2, there are 190 Class 1 small-bore butt welds and 59 Class 1 small-bore socket welds. The inspection sample size for the Unit 2 Class 1 small-bore butt welds is 19 and the inspection sample size for Unit 2 Class 1 small-bore socket welds is 6, which is 10 percent for each population. ~~If no socket welds are in the sample population, then at least ten percent of the socket welds in each unit will be selected, up to a maximum of 25.~~

Socket welds that fall within the weld examination sample will be examined following ASME Section XI Code requirements. If a qualified volumetric examination procedure for socket welds endorsed by the industry and the NRC is available and incorporated into the ASME Section XI Code at the time of STP small-bore socket weld inspections, then this will be used for the volumetric examinations. If no volumetric examination procedure for ASME Code Class 1 small bore socket welds has been endorsed by the industry and the NRC and incorporated into ASME Section XI at the time STP performs inspections of small-bore piping, a plant procedure for volumetric examination of ASME Code Class 1 small-bore piping with socket welds will be used.

The One-Time Inspection of ASME Code Class 1 Small-Bore Piping program is a new program and inspections will be completed and evaluated within six years prior to the period of extended operation.

A1.20 EXTERNAL SURFACES MONITORING PROGRAM

The External Surfaces Monitoring program manages loss of material for external surfaces of steel, stainless steel, aluminum, copper alloy components and elastomers, including protective paints, coatings, caulking, and sealants. The program also manages hardening and loss of strength for elastomers. The program includes those systems and components within the scope of license renewal that require external surface monitoring. Visual inspections of external surfaces conducted during engineering walkdowns will be used to identify aging effects and leakage. When appropriate for the component configuration and material, physical manipulation of at least 10 percent of the available surface area ~~may~~ will be used to augment visual inspection to confirm the absence of elastomer hardening and loss of strength.

Loss of material for external surfaces is managed by the Boric Acid Corrosion program (A1.4) for components in a system with treated borated water or reactor coolant environment on which boric acid corrosion may occur, Buried Piping and Tanks Inspection program (A1.8) for buried components, and Structures Monitoring Program (A1.32) for civil structures, and other structural items which support and contain mechanical and electrical components.

The External Surfaces Monitoring program is a new program that will be implemented prior to the period of extended operation. Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.

A1.22 INSPECTION OF INTERNAL SURFACES IN MISCELLANEOUS PIPING AND DUCTING COMPONENTS

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program manages cracking, loss of material, and hardening and loss of strength of the internal surfaces of piping, piping components, ducting, tanks and other components that are not inspected by other aging management programs.

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is a new program that uses the work control process for preventive maintenance and surveillance to conduct and document inspections. The program performs visual inspections to detect aging effects that could result in a loss of component intended function. Visual inspections of internal surfaces of plant components are performed by qualified personnel during the conduct of periodic maintenance, predictive maintenance, surveillance testing, and corrective maintenance. Supplemental inspections not performed concurrently with planned work activities will be performed. The locations and intervals for these supplemental inspections are based on assessments of the likelihood of significant degradation and on current industry and plant-specific operating experience.

Additionally, visual inspections ~~may~~ will be augmented by physical manipulation of at least 10 percent of available surface area of elastomers within the scope of the program, when appropriate for the component configuration and material, to detect hardening and loss of strength of ~~both~~ internal ~~and external~~ surfaces of elastomers~~,~~. In cases where internal surfaces are not available for visual inspection, an internal visual inspection may be substituted with a volumetric examination. The program includes volumetric examination of the tank bottoms of the auxiliary feedwater storage tanks and the firewater storage tanks from inside the tanks to confirm the absence of loss of material due to corrosion. The program also includes ~~and by~~ volumetric evaluation to detect stress corrosion cracking of the internal surfaces of stainless steel components exposed to diesel exhaust.

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program will be implemented prior to the period of extended operation. Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.

A2 SUMMARY DESCRIPTIONS OF TIME-LIMITED AGING ANALYSIS AGING MANAGEMENT PROGRAMS

A2.1 METAL FATIGUE OF REACTOR COOLANT PRESSURE BOUNDARY

The Metal Fatigue of Reactor Coolant Pressure Boundary program manages fatigue cracking caused by anticipated cyclic strains in metal components of the reactor coolant pressure boundary. The program ensures that actual plant experience remains bounded by the transients assumed in the design calculations and fatigue crack growth analyses, or that appropriate corrective actions maintain the design and licensing basis by other acceptable means. The program tracks the number of transient cycles and cumulative fatigue usage at monitored locations. If a cycle count or cumulative usage factor value increases to a program action limit, corrective actions will be initiated to evaluate the design limits and determine appropriate specific corrective actions. Action limits permit completion of corrective actions before the design basis number of events is exceeded.

B2.1.3 Reactor Head Closure Studs

Program Description

The Reactor Head Closure Studs program manages cracking and loss of material by conducting ASME Section XI inspections of reactor vessel flange stud hole threads, reactor head closure studs, nuts, washers, and bushings. The program includes periodic visual, surface, and volumetric examinations of reactor vessel flange stud hole threads, reactor head closure studs, nuts, washers, and bushings and performs visual inspections of the reactor vessel flange closure during primary system leakage tests. The STP program implements ASME Section XI code, Subsection IWB, 2004 Edition. Reactor vessel flange stud hole threads, reactor head closure studs, nuts, washers, and bushings are identified in ASME Section XI Tables IWB-2500-1 and are within the scope of license renewal. The program implements recommendations in NUREG-1339 and NRC Regulatory Guide 1.65, *Material and Inspection for Reactor Vessel Closure Studs,* to address reactor head stud bolting degradation except for yield strength of existing bolting materials. STP uses lubricants on reactor head closure stud threads after reactor head closure stud, nut, and washer cleaning and examinations are complete. The lubricants are compatible with the stud material and operating environment and do not include MoS_2 which is a potential contributor to stress corrosion cracking.

In conformance with 10 CFR 50.55a(g)(4)(ii), the STP ISI Program is updated during each successive 120-month inspection interval to comply with the requirements of the latest edition of the Code specified twelve months before the start of the inspection interval. STP will use the ASME Code Edition consistent with the provisions of 10 CFR 50.55a during the period of extended operation.

Potential cracking and loss of material conditions in reactor vessel flange stud hole threads, reactor head closure studs, nuts, washers, and bushings are detected through visual, surface, or volumetric examinations in accordance with ASME Section XI requirements in STP procedures every ten years. These inspections are conducted during refueling outages. Reactor vessel studs are removed from the reactor vessel flange each refueling outage. Studs, nuts, washers, and bushings are stored in protective racks after removal. Reactor vessel flange holes are plugged with water tight plugs during cavity flooding. These methods assure the holes, studs, nuts, washers, and bushings are protected from borated water during cavity flooding. Reactor vessel flange leakage is detected prior to reactor startup during reactor coolant system pressure testing each refueling outage. The STP program has proven to be effective in preventing and detecting potential aging effects of reactor vessel flange stud hole threads, closure studs, nuts, washers, and bushings.

NUREG-1801 Consistency

The Reactor Head Closure Studs program is an existing program that is consistent, with exception to NUREG-1801, Section XI.M3, Reactor Head Closure Studs.

Exceptions to NUREG-1801

Program Elements Affected:

Scope of Program (Element 1)

Regulatory Guide 1.65 states that the ultimate tensile strength of stud bolting material should not exceed 170 ksi. One closure head insert has a tensile strength of 174.5 ksi. STP credits inservice inspections that are within the scope of this AMP, which are implemented in accordance with the STP Inservice Inspection Program, Examination Category B-G-1 requirements, as the basis for managing cracking in these components. This is in accordance with the "parameters monitored or inspected" and "detection of aging effects" program elements in NUREG 1801, Section XI.M3. In addition, the studs, nuts and washers are coated with a lubricant which is compatible with the stud materials, and the studs, nuts, and washers are protected from exposure to boric acid by removing them and plugging the reactor vessel flange holes during cavity flooding. Replacement reactor head closure bolting obtained in the future (not currently installed or on site as spare parts) will be fabricated from material with an actual measured yield strength less than 150 ksi.

Corrective Actions (Element 7)

NUREG-1801, Section XI.M3 specifies the use of Regulatory Guide 1.65 requirements for closure stud and nut material. STP uses SA-540, Grade B-24 (as modified by Code Case 1605) stud material. The use of this material has been found acceptable to the NRC for this application within the limitations discussed in Regulatory Guide 1.85, *Materials Code Case Acceptability.*

Enhancements

Scope of Program (Element 1)~~**None**~~

Procedures will be enhanced to preclude future use of replacement closure stud assemblies fabricated from material with an actual measured yield strength greater than or equal to 150 ksi. The use of currently installed components and any spare components currently on site is allowed.

Operating Experience

Review of plant-specific operating experience has not revealed any program adequacy issues with the Reactor Head Closure Studs program for reactor vessel closure studs, nuts, washers, bushings, and flange thread holes. No cases of cracking due to SCC or IGSCC have been identified with STP reactor vessel studs, nuts, washers, bushings, and flange stud holes.

Review of the Refueling Outage Inservice Inspection Summary Reports for Interval 2 indicates there were no repair/replacement items identified with reactor vessel closure studs, nuts, washers, bushings, or flange thread holes. None of the repair/replacement items indicate any implementation issues with the STP ASME Section XI Program for reactor closure studs, nuts, washers, bushings, or flange thread holes.

The ISI Program at STP is updated to account for industry operating experience. ASME Section XI is also revised every three years and addenda issued in the interim, which allows the code to be updated to reflect operating experience. The requirement to update the ISI Program to reference more recent editions of ASME Section XI at the end of each inspection interval ensures the ISI Program reflects enhancements due to operating experience that have been incorporated into ASME Section XI.

Conclusion

The continued implementation of the Reactor Head Closure Studs program provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.7 Bolting Integrity

Program Description

The Bolting Integrity program manages cracking, loss of material, and loss of preload for pressure retaining bolting and ASME component support bolting. The program includes preload control, selection of bolting material, use of lubricants/sealants consistent with EPRI NP-5067, *Good Bolting Practices,* and performance of periodic inspections for indication of aging effects. The program also includes inservice inspection requirements established in accordance with ASME Section XI, Subsections IWB, IWC, IWD, and IWF for ASME Class bolting.

STP good bolting practices are established in accordance with plant procedures. These procedures include requirements for proper disassembling, inspecting, and assembling of connections with threaded fasteners. In addition to the inspection activities noted above, the Bolting Integrity program includes activities for preload control, material selection and control, and use of lubricants/sealants. The general practices that are established in this program are consistent with EPRI TR-104213, *Bolted Joint Maintenance and Applications Guide,* EPRI NP-5769, *Degradation and Failure of Bolting in Nuclear Power Plants*, Volumes 1 and 2, and the recommendations delineated in NUREG-1339.

~~Following the review of the recommendations provided in NRC Generic Letter 91-17, NUREG-1339 and the EPRI reports, NP-5769 and NP-5067, STP had identified and implemented the action items related to bolting degradation or failure. The guidance provided in EPRI NP-5067 and NUREG-1339, together with other industrial experience regarding bolting issues, was consolidated in EPRI TR-104213, *Bolted Joint Maintenance and Applications Guide.* Although the procedures for ensuring bolting integrity do not directly reference EPRI TR-104213, they do reference EPRI NP-5769, EPRI-5067 and NUREG-1339. Implementation of the recommendations in EPRI NP-5067, EPRI NP-5769 and NUREG-1339 is considered to be consistent with the recommendations in EPRI TR-104213.~~

The following STP aging management programs supplement the Bolting Integrity program with management of loss of preload, cracking, and loss of material:

(a) ASME Section XI Inservice Inspection, Subsections IWB, IWC and IWD (B2.1.1) provides the requirements for inservice inspection of ASME Class 1, 2, and 3 safety-related pressure retaining bolting.

(b) ASME Section XI, Subsection IWF (B2.1.29) provides the requirements for inservice inspection of safety-related component support bolting.

(c) External Surfaces Monitoring Program (B2.1.20) provides the requirements for inspection of pressure boundary closure bolting within the scope of license renewal.

(d) Structures Monitoring Program (B2.1.32) provides the requirements for inspection of structural bolting.

NUREG-1801 Consistency

The Bolting Integrity program is an existing program, that following enhancement, will be consistent, with exception to NUREG-1801, Section XI.M18, Bolting Integrity.

Exceptions to NUREG-1801

Program Elements Affected:

~~*Scope of Program (Element 1)*~~

~~NUREG-1801 references EPRI TR-104213 as the industry's technical basis for the program associated with nonsafety-related bolting. The bolted joint procedure for ensuring bolting integrity identifies preload requirements and general practices for in scope bolting but does not directly reference EPRI TR-104213 as an applicable source document for these recommendations. However, this procedure does reference and incorporate the good bolting practices identified in EPRI NP-5067, ERPI 5769 and NUREG-1339. EPRI NP-5769 is very closely related with EPRI TR-104213. Implementation of the recommendations in EPRI NP-5067 and EPRI NP-5769 and NUREG-1339 is considered to be consistent with the recommendations in EPRI TR-104213 to meet NUREG-1801 requirements.~~

Parameters Monitored or Inspected (Element 3)

NUREG-1801 states that bolting for safety-related pressure retaining components is inspected for loss of preload/loss of prestress. Loss of preload is not a parameter of inspection for the STP Bolting Integrity program. At~~T~~ STP, the application of good bolting techniques provided in plant procedures and vendor instructions during assembly of bolted joints minimizes the possibility for a loss of preload/loss of prestress. The discussion of bolt preload in EPRI NP-5769, Vol. 2, Section 10, indicates that job inspection torque is non-conservative since for a given fastener tension more torque is required to restart the installed bolts. The techniques for measuring the amount of bolt tension in an assembled joint are both difficult and unreliable. Inspection of preload is usually unnecessary if the installation method has been carefully followed. Torque values are provided in plant procedure if not provided by the vendor instructions, design documents or specifications. These torque values are based on the industrial experience that includes the consideration of the expected relaxation of the fasteners over the life of the joint and gasket stress in the application of pressure closure bolting. Additionally, visual inspections for leakage would detect a loss of preload/loss of prestress in the connection prior to a loss of intended function.

Monitoring and Trending (Element 5)

NUREG-1801, Section XI.M18 specifies that if bolting connections for pressure retaining components (not covered by ASME Section XI) are reported to be leaking, then they may be inspected daily. If the leak rate does not increase, the inspection frequency may be decreased to biweekly or weekly. STP procedures require the inspection frequency be adjusted as necessary based on the trending of inspection results to ensure there is not a loss of intended function between inspection intervals. For pressure retaining components reported to be leaking, STP procedures initiate the site corrective action process. Consideration is also given to adequate frequency of subsequent inspections to ensure the inspection interval is adequate to detect further aging degradation so that a loss of intended function is avoided.

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program element:

Scope (Element 1)

Procedures will be enhanced to conform to the guidance contained in EPRI TR-104213.

Corrective Actions (Element 7)

Procedures will be enhanced to evaluate loss of preload of the joint connection, including bolt stress, gasket stress, flange alignment, and operating condition to determine the corrective actions consistent with EPRI TR-104213.

Operating Experience

Both the industry and NRC have revealed a number of instances of bolting concerns from material control and certification (e.g. NRC Bulletin 87-02) to bolting practices, use of lubrication and injection sealants and its effect on SCC (e.g., NRC Bulletin 82-02, and INPO SOER 84-05). The Bolting Integrity program incorporates the applicable industry experience on bolting issues into the program. Actions taken include confirmatory testing/analysis or inspections. Also included are the addition of procedures of inspection, material procurement and verification processes. NRC Information Notices, Bulletins, Circulars, and Generic Letters listed in Section 3 of NUREG-1339 were evaluated for applicability to the STP Bolting Integrity program to ensure conformance with the recommendations of NUREG-1339.

There is no reported case of cracking of bolting due to stress corrosion cracking.

A review of operating experience contained in STP condition reports (CRs) were evaluated for aging effects associated with the Bolting Integrity program. Of these CRs only 19 were determined to have applicable aging effects associated with the Bolting Integrity program. The following is a summary of the aging effects reported in these CRs.

Condensation has been observed to cause surface corrosion of bolting associated with chilled water bolted connections. The instances were evaluated and it was determined that the corrosion was limited to the surface and did not affect the integrity of the bolted joint. To prevent this corrosion from reoccurring the bolting was either painted to prevent water droplets coming in direct contact with carbon steel bolting or insulation was installed to prevent the cool surface temperatures from creating the condensation.

Leakage from fittings and pump mechanical seals has also caused corrosion of bolting when the leaking system fluid came in contact with bolting. The bolting was evaluated for each joint and replaced where required.

Boric acid accumulations have been observed on bolting. After the boric acid accumulations were removed the bolting was evaluated. The bolting was determined to be acceptable as found or replaced if the bolting material was degraded by boric acid corrosion.

Incorrect materials have been found in bolting connections during system walkdowns and inspections. The bolting was replaced with the correct material.

Conclusion

The continued implementation of the Bolting Integrity program provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.9 Open-Cycle Cooling Water System

Program Description

The Open-Cycle Cooling Water (OCCW) System program manages ~~cracking,~~ loss of material, and reduction of heat transfer for components in scope of license renewal and exposed to the raw water of the essential cooling water (ECW) and essential cooling water screen wash system. The program includes surveillance techniques and control techniques to manage aging effects caused by biofouling, corrosion, erosion, protective coating failures and silting in components of the ECW system, and structures and components serviced by the ECW system, that are in scope of license renewal. The program also includes periodic inspections to monitor aging effects on the OCCW structures, systems and components, component cooling water heat exchanger performance testing, and inspections of the other safety related heat exchangers cooled by the ECW System, to ensure that the effects of aging on OCCW components are adequately managed for the period of extended operation. Components within the scope of the OCCW System program are: 1) components of the ECW system that are in scope of license renewal and 2) the safety-related heat exchangers cooled by the ECW system: component cooling water heat exchangers, diesel generator jacket water heat exchangers, diesel generator lube oil coolers, diesel generator intercoolers, essential chiller condensers, and component cooling water pump supplementary coolers. The program is consistent with STPNOC commitments established in responses to NRC Generic Letter 89-13, *Service Water System Problems Affecting Safety-Related Components.*

The surveillance techniques utilized in the Open-Cycle Cooling Water System program include visual inspection with thermal and hydraulic performance monitoring of heat exchangers. The control techniques utilized in the Open-Cycle Cooling Water System program include (1) water chemistry controls to mitigate the potential for the development of aggressive cooling water conditions, (2) flushes and (3) physical and/or chemical cleaning of heat exchangers and of the ECW pump suction bay to remove fouling and to reduce the potential sources of fouling.

Additional measures used to manage loss of material due to selective leaching for aluminum bronze components in the ECW system are detailed in the plant-specific aging management program Selective Leaching of Aluminum Bronze (B2.1.37).

NUREG-1801 Consistency

The Open-Cycle Cooling Water System program is an existing program that, following enhancement, will be consistent with exception to NUREG-1801, Section XI.M20, Open-Cycle Cooling Water System.

Exceptions to NUREG-1801

<u>Program Elements Affected:</u>

Preventive Actions (Element 2), Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4)

NUREG-1801, Section XI.M20, Elements 2, 3 and 4, provide for a program of flushing and inspection to confirm that fouling and degradation of surfaces is not occurring. An exception is taken to flushing the ECW train cross-tie dead legs and inspecting the interior of these lines.

Instead, the external surfaces of the cross-tie lines are included in the six month dealloying visual external inspection walkdowns. The cross-tie valves and piping are also included in the essential cooling water system inservice pressure test, which includes VT-2 inspections of these components. Measures used to manage loss of material due to selective leaching are detailed in the Selective Leaching of Aluminum Bronze program (B2.1.37). These inspections and tests provide confidence in the ability to detect leakage in the piping and valves. The cross-tie lines do not have an intended function and are not required for any accident scenario within the design basis of the plant. The cross-tie valves are maintained locked closed.

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

Parameters Monitored or Inspected (Element 3) and Detection of Aging Effects (Element 4)

Procedures will be enhanced to include visual inspection of the strainer inlet area and the interior surfaces of the adjacent upstream and downstream piping. Material wastage, dimensional change, discoloration, and discontinuities in surface texture will be identified. These inspections will provide visual evidence of loss of material and fouling in the ECW system and serve as an indicator of the condition of the interior of ECW system piping components otherwise inaccessible for visual inspection. Procedures will also be enhanced to include the acceptance criteria for this visual inspection.

Operating Experience

Industry operating experience evaluations, Maintenance Rule Periodic Assessments, and OCCW component performance testing results have shown that the effects of aging are being adequately managed.

A review of the STP plant specific operating experience indicates that macrofouling, general corrosion, erosion corrosion, and through-wall de-alloying have been observed in aluminum bronze components. STP has analyzed the effects of the through-wall de-alloying and found that the degradation is slow so that rapid or catastrophic failure is not a consideration, and determined that the leakage can be detected before the flaw reaches a limiting size that would affect the intended functions of the essential cooling water and essential cooling water screen wash system. A long range improvement plan and engineering evaluation were developed to deal with the de-alloying of aluminum bronze components. Based on these analyses, the approach has been to evaluate components, and schedule replacement by the corrective action program. Components with indications of through-wall de-alloying, greater than one inch, will be replaced by the end of the next refueling outage. A monitoring and inspection program provides confidence in the ability to detect the leakage.

NRC Generic Letter 89-13 was based on industry operating experience and forms the basis for the STP OCCW System program.

Conclusion

The continued implementation of the Open-Cycle Cooling Water System program will provide reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.10 Closed-Cycle Cooling Water System

Program Description

The Closed-Cycle Cooling Water (CCCW) System program manages loss of material, cracking, and reduction of heat transfer for components within the scope of license renewal in the CCCW systems. The program provides for preventive measures to minimize corrosion including maintenance of corrosion inhibitor and biocide concentrations, and periodic system and component testing and inspection. Preventive measures include the monitoring and control of corrosion inhibitors and other chemical parameters, such as pH, in accordance with the guidelines of EPRI TR-107396, Revision 1. Periodic inspection and testing to confirm function and monitor corrosion is performed in accordance with EPRI TR-107396, Revision 1, and industry and plant operating experience.

The CCCW systems within the scope of license renewal scope are:

- Component cooling water (CCW),
- ESF diesel generator closed cooling water (a subsystem of the standby diesel generator and auxiliaries system),
- BOP DG closed cooling water (a subsystem of the nonsafety-related diesel generator and auxiliary fuel oil system),
- Fire pump diesel closed cooling water (a subsystem of the fire protection system), and
- Chilled water HVAC system consists of subsystems essential chilled water system, reactor containment building (RCB) chilled water system, mechanical auxiliary building (MAB) chilled water system and the technical support center (TSC) chilled water system

These systems meet the definition of a CCCW system in NUREG-1801, Section XI.M21. Also in scope are portions of additional systems (heat exchangers or coolers) that are serviced by these systems.

The CCCW System program is based on the EPRI closed-cooling water chemistry guidelines. Currently, the STP CCCW System program uses *Closed Cooling Water Chemistry Guideline: Revision 1 to TR-107396, Closed Cooling Water Chemistry Guideline* (TR-1007820). The STP CCCW System program is updated as revisions to the EPRI guideline are released.

The program maintains water chemistry within the parameter limits specified in plant procedures and consistent (with exceptions) with those in EPRI TR-107396, Revision 1, in order to minimize corrosion and microbiological growth. STP employs two types of nitrite-based corrosion inhibitor treatment programs, tolyltriazole (TTA) as a copper corrosion inhibitor, and glutaraldehyde as a biocide. STP also utilizes glycol-based corrosion inhibitors.

The CCCW System program includes non-chemistry monitoring of components consistent with EPRI TR-107396, Revision 1, Section 8.4 (Non-Chemistry Monitoring). Periodic performance testing of the CCW heat exchangers is part of the STP Open-Cycle Cooling Water System program. Diesel engine performance parameters are monitored through periodic surveillance tests. The CCW pumps are periodically tested to verify pump performance. The extent and schedule of testing and inspections of the CCCW systems assures detection of loss of material, cracking, and reduction of heat transfer prior to the loss of intended function of the system or component. In addition, representative samples of each combination of material and water treatment program are visually inspected at least every ten years and opportunistically.~~In addition, visual inspections of selected components are used as an indicator of the condition of internal surfaces exposed to the CCW System.~~ These tests and inspections together with periodic sampling and control of water chemistry are adequate to ensure component intended functions are maintained.

NUREG-1801 Consistency

The Closed-Cycle Cooling Water System program is an existing program that, following enhancement, will be consistent, with exception to NUREG-1801 Section XI.M21, Closed-Cycle Cooling Water System.

Exceptions to NUREG-1801

Program Elements Affected:

Preventive Actions (Element 2), Parameters Monitored or Inspected (Element 3), and Acceptance Criteria (Element 6)

EPRI TR-107396, Revision 1, Table 5-1, establishes chloride and fluoride as control parameters which should be monitored monthly. STP does not monitor or analyze chloride and fluoride as control parameters in the HVAC chilled water systems. At STP chloride and fluoride are monitored as diagnostic parameters in the HVAC chilled water systems with an Alert Value of 5 ppm for both chloride and fluoride which is more restrictive than the EPRI control parameter normal operating range of less than or equal to 10 ppm for both chloride and fluoride. Chemistry control of chloride and fluoride in the HVAC chilled water systems is therefore consistent, but not identical, with the EPRI recommended approach. At STP, if the system contains no stainless steel or temperatures are less than 150 F, then chlorides and fluorides are diagnostic parameters due to general corrosion concerns. The makeup water to the HVAC chilled water systems is demineralized and there are no known pathways for chloride or fluoride to enter the HVAC chilled water systems cooling water.

Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4), and Monitoring and Trending (Element 5)

NUREG-1801 states that the Closed-Cycle Cooling Water System program should conduct performance/functional testing. At STP, performance/functional testing is not performed on the heat exchangers served by the in-scope CCCW Systems. EPRI TR-107396, Revision1, does not include performance monitoring and functional testing of heat exchangers or other components. The Closed-Cycle Cooling Water System program utilizes corrosion monitoring which includes component inspections to monitor program effectiveness in managing component degradation that could impact a passive function. Chemical analysis of iron and copper in the bulk water is performed to monitor the buildup of dissolved corrosion products. Higher than expected concentration levels of total iron and copper indicate possible corrosion within the CCCW systems. Measurement of accumulated corrosion products such as iron and copper provides an indirect indication of system corrosion.

Reductions in heat transfer are managed through a combination of chemistry controls and inspection activities. Chemistry controls are generally adequate to prevent buildup of significant fouling on heat exchanger surfaces.

Preventive Actions (Element 2), Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4), Monitoring and Trending (Element 5), and Acceptance Criteria (Element 6)

The program described in NUREG-1801, Section XI.M21, is based on the 1997 version of the EPRI Closed Cooling Water Chemistry Guideline, TR-107396, Revision 0. The STP program currently uses the 2004 version of the EPRI Closed Cooling Water Chemistry Guideline, Revision 1. This exception is acceptable because the EPRI Closed Cooling Water Chemistry Guideline is a consensus document that is updated based on new operating experience, research data, and expert opinion. Incorporation of later versions of the guidance document ensures that the program addresses new information.

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4), Monitoring and Trending (Element 5), and Acceptance Criteria (Element 6)~~, and Corrective Actions (Element 7)~~

Procedures will be enhanced to include visual inspection of representative samples of each combination of material and water treatment program at least every ten years and opportunistically.~~the interior of the piping that is attached to the excess letdown heat exchanger CCW return second check valves. This periodic internal inspection will detect loss of material and fouling and serve as a leading indicator of the condition of the interior of piping components otherwise inaccessible for visual inspection.~~ The procedures will also be enhanced to include acceptance criteria.

Operating Experience

The Closed-Cycle Cooling Water System program is based on the guidance contained in EPRI TR-107396, Revision 1, which itself is based on industry-wide operating experience. The guideline is periodically updated and approved by the industry. STP operating experience is evaluated and corrective actions are implemented for chemical concentrations, monitoring and testing to ensure adherence to EPRI TR-107396, Revision 1. Industry operating experience and independent audits provide additional input to ensure that program operability is maintained at an optimum level.

Based on a review of STP operating experience, there is no history of chemistry related corrosion or fouling issues for the component cooling water system, ESF DG jacket water system, essential chilled water, RCB chilled water, MAB chilled water and BTRS chilled water systems. Past inspections of component cooling water system and ESF DG jacket water piping have indicated a clean and tight adherent passive oxide layer.

In 1999, Sure-Cool residue buildup was observed on the outside of a carbon steel flange in the component cooling water system return piping from the spent fuel pool heat exchanger.

Investigation revealed a through-wall crack in the weld neck flange about 1.1-in. from the flange to pipe weld. The flange was weld repaired. The crack showed no signs of loss of material, verified by ultrasonic test.

In 2003, a leak occurred in a coil to header joint of a reactor containment fan cooler. Initial observations of the leak detected no indications of corrosion. The attempt to repair the leak, by brazing, melted the coil tubing. The damage prohibited further examination and determination of the actual cause of the leak. An evaluation of the event determined the cause of the leak was not attributed to an aging effect.

The BOP diesel jacket water system radiator has been replaced due to corrosion. The FPD jacket water system cores have been changed due to corrosion prior to using the current corrosion inhibitor.

MIC (Microbiologically-Influenced Corrosion) has not been observed in the in-scope CCCW systems.

Based on a review of 10 years of STP operating experience, any chemistry parameters outside of established limits have been identified and the appropriate actions taken. Corrective actions have included increasing sampling frequencies, chemical addition, feed and bleeds, system cleaning and fixing leaks.

B2.1.16 One-Time Inspection

Program Description

The One-Time Inspection program manages loss of material, cracking, and reduction of heat transfer. The One-Time Inspection program conducts one-time inspections of plant system piping and components to verify the effectiveness of the Water Chemistry program (B2.1.2), Fuel Oil Chemistry program (B2.1.14), and Lubricating Oil Analysis program (B2.1.23).

The One-Time Inspection program will be implemented by STP prior to the period of extended operation. Plant system piping and components identified in the one-time inspection procedure will be subject to one-time inspections on a sampling basis, using qualified inspection personnel, following established ASME Code Section V Non-Destructive Examination techniques appropriate to each inspection. The One-Time Inspection program determines non-destructive examination (NDE) sample sizes are based on the number population of components in a group sharing the same material, environment, and aging effects. For each population, a representative sample size of 20 percent of the population is selected up to a maximum of 25 components. The components making up the sample are those determined to be most susceptible to degradation based on a review of environment conditions and operating experience. The program will focus on bounding or lead components most susceptible to aging due to time in service and severity of operating conditions. Inspections will be performed using a variety of NDE methods, including visual, volumetric, and surface techniques by other activities mayqualified inspectors. The program will not be used if they satisfy for component inspections with known age-related degradation mechanisms, or when the requirements of environment in the OTI program period of extended operation is not equivalent to that in the prior 40 years. The One-Time Inspection program specifies corrective actions and increased sampling of piping/components if aging effects are found during. The corrective action program may specify follow-up inspections for confirmation of aging effects at the same or different locations. If aging effects are detected, a plant-specific program will be developed for the material/, environmental, and aging combination inspections that produced the aging effects.

The one-time inspections will be performed no earlier than 10 years prior to the period of extended operation. All one-time inspections will be completed prior to the period of extended operation. Completion of the One-Time Inspection program in this time period will assure that potential aging effects will be manifested based on at least 30 years of STP operation. Major elements of the STP One-Time Inspection program will include:

a) Identifying piping and component populations subject to one-time inspections based on common materials and environments,

b) Determining the sample size of components to inspect for each material-environment group,

c) Selecting piping and components within the material-environment groups for inspection based on criteria provided in the one-time inspection procedure,

d) Conducting one-time inspections of the selected components within the sample using ASME Code Section V Non-Destructive Examination techniques and acceptance criteria consistent with the design codes/standards or ASME Section XI as applicable to the component,

e) Evaluating inspection results and initiating corrective action for any aging effects found.

NUREG-1801 Consistency

The One-Time Inspection program is a new program that, when implemented, will be consistent with NUREG-1801, Section XI.M32, One-Time Inspection.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

During the 10 year period prior to the period of extended operation, one-time inspections will be accomplished at STP using ASME Code Section V Non-Destructive Examination techniques to identify possible aging effects. ASME code techniques in the ASME Section XI ISI Program have proven to be effective in detecting aging effects prior to loss of intended function. Review of STP plant-specific operating experience associated with the ISI Program has not revealed any ISI Program adequacy issues with the STP ASME Section XI ISI Program. The same Non-Destructive Examination techniques used in the ASME Section XI ISI Program will be used in the One-Time Inspection program. Using ASME Code Section V Non-Destructive Examination techniques will be effective in identifying aging effects, if present.

As additional industry and plant-specific applicable operating experience becomes available, it will be evaluated and incorporated into the program through the STP condition reporting and operating experience programs.

Conclusion

The implementation of the One-Time Inspection program will provide reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.17 Selective Leaching of Materials

Program Description

The Selective Leaching of Materials program manages the loss of material due to selective leaching for copper alloys with greater than 15 percent zinc and gray cast iron components exposed to treated water, raw water, and groundwater (buried) within the scope of license renewal.

The Selective Leaching of Materials program is a new program which includes a one-time inspection of a sample of components made from gray cast iron and copper alloys with greater than 15 percent zinc. Sample selection criteria will focus on bounding or lead components most susceptible to aging due to time in service, severity of operating conditions, and lowest design margin. The program procedure provides for visual and mechanical inspections for each system/material/environment combination and for follow-up engineering evaluation in the event that graphitization of gray cast iron or dezincification of copper alloys with greater than 15 percent zinc components is detected. Sample sizes for selective leaching are based on 20 percent of the material/environment group population to a maximum of 25 components. The plant-specific Selective Leaching of Aluminum Bronze program (B2.1.37) covers aluminum bronze components. Inspection of buried components subject to selective leaching is covered in Buried Piping and Tanks Inspection (B2.1.18).

~~Flow testing of the fire mains, consistent with NFPA 25, is credited for management of selective leaching of the buried cast iron valves in the fire protection system. This is consistent with the strategy in the Buried Piping and Tanks Inspection program (B2.1.18) for managing loss of material in buried fire protection piping.~~

The Selective Leaching of Materials program will be implemented during the ~~10~~ five years prior to the period of extended operation.

NUREG-1801 Consistency

The Selective Leaching of Materials program is a new program that, when implemented, will be consistent, with exception to NUREG-1801, Section XI.M33, Selective Leaching of Materials.

Exceptions to NUREG-1801

Program Elements Affected:

Scope of Program (Element 1)

NUREG-1801, Section XI.M33 states that the Selective Leaching of Materials program should include bronze or aluminum bronze components that may be exposed to a raw water, treated water, or groundwater environment. Aluminum bronze is not managed by the Selective Leaching of Materials program. STP currently has a plant specific Selective Leaching of Aluminum Bronze program (B2.1.37), which covers these aluminum bronze components.

Scope of Program (Element 1), Parameters Monitored or Inspected (Element 3), and Detection of Aging Effects (Element 4)

NUREG-1801, Section XI.M33 recommends hardness testing of sample components in addition to visual inspections. However, a qualitative determination of selective leaching is used in lieu of Brinell hardness testing for components within the scope of the STP Selective Leaching of Materials program. The exception involves the use of examinations, other than Brinell hardness testing, identified in NUREG-1801 to identify the presence of selective leaching of materials. The exception is justified; because (1) hardness testing may not be feasible for most components due to form and configuration and (2) other mechanical means (e.g., scraping, or chipping) provide an equally valid means of identification.

Additionally, hardness testing only provides definitive results if baseline values are available for comparison purposes. Specific material contents for copper alloys may not be known and gray cast irons may not have published hardness numbers. Without specific numbers for comparison, hardness testing would yield unusable results. In lieu of hardness testing, visual and mechanical inspections will be performed on a sampling of components constructed of copper alloys with greater than 15 percent zinc and gray cast iron from various station system environments. Follow-up examinations or evaluations are performed on component material samples where indications of dezincification, de-alloying, or graphitization are visually detected and additional analysis, as part of the engineering evaluation, is required. The engineering evaluation may require confirmation with a metallurgical evaluation (which may include a microstructure examination).

NUREG 1801, Section XI.M33 requires visual inspection and hardness measurement of materials susceptible to selective leaching. ~~However, Flow testing of the fire mains, consistent with NFPA 25, is credited for management of selective leaching of the buried cast iron valves in the fire protection system.~~This is consistent with the strategy in the Buried Piping and Tanks Inspection program (B2.1.18) for managing loss of material in buried fire protection piping.

Enhancements

None

Operating Experience

To date, there have been no reported cases of loss of material attributable to graphitization or dezincification.

Through-wall cracks have been identified in essential cooling water system piping initiated by pre-existing weld defects and propagated by a de-alloying phenomenon. The flaws evaluated appeared in welds with backing rings. STP has analyzed the effects of the cracking and found that the degradation is slow so that rapid or catastrophic failure is not a consideration and determined that the leakage can be detected before the flaw reaches a limiting size that would affect the intended function of the essential cooling water system. A monitoring and inspection program provides confidence in the ability to detect the leakage. In order to identify and evaluate future leaks, the accessible large bore piping welds with backing rings are visually inspected every six months for evidence of leakage. A walk down of the yard above buried essential cooling water system pipe is performed every six months for evidence of soil changes that may indicate pressure boundary leakage. The most susceptible components are cast aluminum bronze fittings (flanges and tees) with backing ring welds. A special VT-2 visual examination of the system is performed every six months to identify new de-alloying locations. An operability review and an NRC relief request are performed for all through-wall leaks in piping larger than one-inch in diameter. The long-term strategy for essential cooling water system piping de-alloying is to replace fittings when through-wall de-alloying is discovered. This strategy is acceptable based on the very slow degradation mechanism coupled with the preservation of structural integrity and is consistent with the EPRI Service Water Piping Guideline. These ongoing activities are detailed in the Selective Leaching of Aluminum Bronze program (B2.1.37) and are examples of where selective leaching was detected and plant procedures and inspection activities were implemented to ensure that the intended functions of the essential cooling water system are maintained.

As additional industry and plant-specific applicable operating experience becomes available, it will be evaluated and incorporated into the program through the STP condition reporting and operating experience programs.

Conclusion

The implementation of the Selective Leaching of Materials program will provide reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.19 One-Time Inspection of ASME Code Class 1 Small-Bore Piping

Program Description

The One-Time Inspection of ASME Code Class 1 Small-Bore Piping program manages cracking of ASME Code Class 1 piping less than or equal to four inches nominal pipe size (NPS 4). This piping is ASME examination category B-J. This program is implemented as part of the fourth interval of the ISI Program.

For ASME Code Class 1 small-bore piping, the ISI Program requires volumetric examinations (by ultrasonic testing) on selected butt weld locations to detect cracking. Weld locations are selected based on the guidelines provided in EPRI TR-112657, *Revised Risk-Informed Inservice Inspection Evaluation Procedure*. Ultrasonic examinations are conducted in accordance with ASME Section XI with acceptance criteria from paragraph IWB-3000 and IWB-2430 for butt welds. Unit 1 has 182 Class 1 small-bore butt welds and 49 Class 1 small-bore socket welds. The inspection sample for the Unit 1 Class 1 small-bore butt welds is 19 and the inspection sample for the Unit 1 Class 1 small-bore socket welds is 5, which is 10 percent of each population. In Unit 2, there are 190 Class 1 small-bore butt welds and 59 Class 1 small-bore socket welds. The inspection sample size for the Unit 2 Class 1 small-bore butt welds is 19 and the inspection sample size for Unit 2 Class 1 small-bore socket welds is 6, which is 10 percent for each population.~~If no socket welds are in the sample population, then at least 10 percent of the socket welds in each unit will be selected, up to a maximum of 25.~~

Socket welds that fall within the weld examination sample will be examined following ASME Section XI Code requirements. If a qualified volumetric examination procedure for socket welds endorsed by the industry and the NRC is available and incorporated into the ASME Section XI Code at the time of STP small-bore socket weld inspections, then this will be used for the volumetric examinations. If no volumetric examination procedure for ASME Code Class 1 small-bore socket welds has been endorsed by the industry and the NRC and incorporated into ASME Section XI at the time STP performs inspections of small-bore piping, a plant procedure for volumetric examination of ASME Code Class 1 small-bore piping with socket welds will be used.

The One-Time Inspection of ASME Code Class 1 Small-Bore Piping program inspections will be completed and evaluated within six years prior to the period of extended operation.

In conformance with 10 CFR 50.55a(g)(4)(ii), the STP ISI Program is updated during each successive 120-month inspection interval to comply with the requirements of the latest edition of the ASME Code specified 12 months before the start of the inspection interval. STP will use the ASME Code Edition consistent with the provisions of 10 CFR 50.55a during the 10 year period prior to the period of extended operation (fourth interval) and during the period of extended operation.

NUREG-1801 Consistency

The One-Time Inspection of ASME Code Class 1 Small-Bore Piping program is a new program that, when implemented, will be consistent, with exception to NUREG-1801, Section XI.M35, One-Time Inspection of ASME Code Class 1 Small-Bore Piping.

Exceptions to NUREG-1801

Program Elements Affected

Scope of Program (Element 1)

The STP risk-informed process examination requirements are performed consistent with EPRI TR-112657, *Revised Risk-Informed Inservice Inspection Evaluation Procedure*, Revision B-A, instead of EPRI Report 1000701, *Interim Thermal Fatigue Management Guidance (MRP-24).* Guidelines for identifying piping susceptible to potential effects of thermal stratification or turbulent penetration that are provided in EPRI Report 1000701 are also provided in EPRI TR-112657. The recommended inspection volumes for welds in EPRI Report 1000701 are identical to those for inspection of thermal fatigue in RI-ISI Programs; thus, the STP risk-informed process examination requirements meet the recommendations of NUREG-1801.

Enhancements

None

Operating Experience

In order to estimate the extent of cracking in Class 1 piping socket welds, NEI conducted a review of LERs. Of 141 LERs reviewed, 48 were determined to be associated with failures of Class 1 socket welds. For the 46 LERs where a cause was identified, 42 of the failures were due to either vibration-induced high cycle fatigue or improper installation and are not age-related. Of the four remaining failures, one was due to randomly applied loads during maintenance and not age-related, and three were related to aging: two due to insulation contamination on the outside surface, and one associated with IGSCC, although there were other contributing factors not associated with aging (poor weld fit up, weld repair, nearby missing support, etc.).

The NEI review indicates that there have been a relatively small number of Class 1 socket weld failures of which only three were related to aging.

A review of plant-specific operating experience indicates that no cracking has been observed for ASME Code Class 1 small-bore pipe welds less than or equal to NPS 4.

Based on a review of operating experience, cracking of ASME Code Class 1 small-bore pipe welds less than or equal to NPS 4 has not been observed. This provides confidence that the One-Time Inspection of ASME Code Class 1 Small-Bore Piping program is adequate to manage cracking in ASME Code Class 1 small-bore piping.

As additional industry and plant-specific applicable operating experience becomes available, it will be evaluated and incorporated into the program through the STP condition reporting and operating experience programs.

Conclusion

The implementation of the One-Time Inspection of ASME Code Class 1 Small-Bore Piping program will provide reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.20 External Surfaces Monitoring Program

Program Description

The External Surfaces Monitoring Program manages loss of material for external surfaces of steel, stainless steel, aluminum, copper alloy components and elastomers, and hardening and loss of strength for elastomers. The program is a ~~visual~~ monitoring program that includes those systems and components within the scope of license renewal. Visual inspections are used to identify aging effects and leakage ~~for~~ of steel, stainless steel, aluminum, ~~and~~ copper alloy components, and ~~hardening and loss of strength for~~ elastomers. When appropriate for the component configuration and material, physical manipulation of at least 10 percent of the available surface area of elastomers is used to augment visual inspections to confirm the absence of hardening or loss of strength. Personnel performing external surfaces monitoring inspections will be qualified in accordance with site controlled procedures and processes.

The External Surfaces Monitoring Program will be implemented by a new procedure. System inspections and walkdowns will be required and will consist of periodic visual inspections for indications of loss of material, leakage, elastomer hardening and loss of strength~~.~~, and aging effects of protective paints, coatings, caulking, and sealants.

The following aging management programs are used to manage aging for external surfaces that are not within the scope of the External Surfaces Monitoring Program.

1) Boric Acid Corrosion program (B2.1.4) for components in a system with treated borated water or reactor coolant environment in which boric acid corrosion may occur.

2) Buried Piping and Tanks Inspection program (B2.1.18) for buried components.

3) Structures Monitoring Program (B2.1.32) for civil structures, and other structural items which support and contain mechanical and electrical components.

The External Surfaces Monitoring Program is a new program that will be implemented prior to the period of extended operation. Within the ten year period prior to the period of extended operation, and continuing into the period of extended operation, periodic inspections will be performed.

NUREG-1801 Consistency

The External Surfaces Monitoring program is a new program that, when implemented, will be consistent, with exception to NUREG-1801, Section XI.M36, External Surfaces Monitoring.

Exceptions to NUREG-1801

Program Elements Affected:

Scope of Program (Element 1) and Detection of Aging Effects (Element 4)

NUREG-1801, Section XI.M36 requires the program to visually inspect the external surface of in-scope components and monitor external surfaces of steel components in systems within the scope of license renewal and subject to AMR for loss of material and leakage. The External

Surfaces Monitoring Program has expanded the materials inspected to include stainless steel, aluminum, copper alloy, and elastomer external surfaces within the scope of license renewal. The use of visual inspection to detect loss of material and leakage of stainless steel, aluminum, copper alloy and elastomer external surfaces is an effective method for these materials.

NUREG-1801, Section XI.M36 requires the program to manage loss of material and leakage. The External Surfaces Monitoring Program also includes, among the aging effects to be managed, elastomer hardening and loss of strength. This aging effect is managed by physical manipulation of elastomer components to detect hardening and loss of strength.

NUREG-1801, Section XI.M36 requires a program of visual inspection to detect loss of material and leakage. The External Surfaces Monitoring Program primarily uses visual inspection to detect loss of material and leakage and is augmented by physical manipulation of at least 10 percent of the available surface area of elastomers when appropriate to the component material and design. Manipulation of elastomers is an effective method to augment the visual inspection of elastomers in detecting the aging effect of hardening and loss of strength.

Enhancements

None

Operating Experience

The External Surfaces Monitoring Program is a new program. Routine system walkdowns are performed as part of the systems engineering program. The STP condition reporting program is used in conjunction with the system walkdowns to identify and resolve issues to plant equipment. Industry operating experience that forms the basis for this program is included in the operating experience element of the corresponding NUREG-1801 aging management program. A review of plant condition reporting documents, as well as other STP current licensing basis documents, since 1998, was performed to ensure that there is no unique, plant-specific operating experience in addition to that in NUREG-1801. The review identified no unique operating experience. The condition reporting program was proven to be effective in maintaining the material condition of plant systems.

As additional industry and plant-specific applicable operating experience becomes available, it will be evaluated and incorporated into the program through the STP condition reporting and operating experience programs.

Conclusion

The implementation of the External Surfaces Monitoring program will provide reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.22 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components

Program Description

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program manages cracking, loss of material, and hardening and loss of strength of the internal surfaces of piping, piping components, ducting, tanks and other components that are not inspected by other aging management programs.

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is a new program that uses the work control process for preventive maintenance and surveillance to conduct and document inspections. The program performs visual inspections to detect aging effects that could result in a loss of component intended function. Visual inspections of internal surfaces of plant components are performed by qualified personnel during periodic maintenance, predictive maintenance, surveillance testing and corrective maintenance. Supplemental inspections, not performed concurrently with planned work activities will be performed. The locations and intervals for these supplemental inspections are based on assessments of the likelihood of significant degradation and on current industry and plant-specific operating experience.

Additionally, visual inspections ~~may~~ will be augmented by physical manipulation of at least 10 percent of available surface area of elastomers within the scope of the program, when appropriate for the component configuration and material, to detect hardening and loss of strength of ~~both~~ internal ~~and external~~ surfaces of elastomers. In cases where internal surfaces are not available for visual inspection, an internal visual inspection may be substituted with a volumetric examination. The program includes volumetric examination of the tank bottoms of the auxiliary feedwater storage tanks and the firewater storage tanks from inside the tanks, to confirm the absence of loss of material due to corrosion. The program also includes volumetric evaluation (ultrasonic examination) to detect stress corrosion cracking of the internal surfaces of stainless steel components exposed to diesel exhaust.

This program will be initiated prior to entering the period of extended operation and provides for periodic inspection of a selected set of sample components within the scope of this program. The internal surfaces inspections are normally performed through scheduled preventive maintenance and surveillance inspections such that work opportunities are sufficient to detect aging and provide reasonable assurance that intended functions are maintained. Supplemental inspections not performed concurrently with planned work activities will be performed. The locations and intervals for these supplemental inspections will be based on assessments of the likelihood of significant degradation and on current industry and plant-specific operating experience.

NUREG-1801 Consistency

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is a new program that, when implemented, will be consistent with exception to NUREG-1801, Section XI.M38, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components.

Exceptions to NUREG-1801

Program Elements Affected:

Scope of Program (Element 1), Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4), and Monitoring and Trending (Element 5)

NUREG-1801 Section XI.M38 provides for a program of visual inspections of the internal surfaces of miscellaneous steel piping and ducting components to ensure that existing environmental conditions are not causing material degradation that could result in a loss of component intended functions. The exceptions to NUREG-1801 Section XI.M38 are an increase to the scope of the materials inspected to include stainless steel, aluminum, copper alloy, stainless steel-cast austenitic, nickel alloys, glass and elastomers, in addition to steel, and an increase to the scope of aging effects to include hardening and loss of strength for elastomers. Additionally, visual inspections ~~may~~ will be augmented (1) by physical manipulation of at least 10 percent of available surface area of elastomers within the scope of the program to detect hardening and loss of strength of elastomers when appropriate for the component configuration and material, (2) volumetric examinations of the tank bottoms of the auxiliary feedwater storage tanks and the firewater storage tanks from inside the tanks, to confirm the absence of loss of material due to corrosion, and (3~~2~~) ~~by~~ volumetric evaluation to detect stress corrosion cracking of the internal surfaces of stainless steel components exposed to diesel exhaust.

Enhancements

None

Operating Experience

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is a new program; therefore, plant-specific operating experience to verify the effectiveness of the program is not available. However, visual inspections were conducted during periodic maintenance, predictive maintenance, surveillance testing and corrective maintenance. These records provided evidence of STP using maintenance opportunities to conduct internal inspections during normal plant activities. Industry operating experience that forms the basis for this program is included in the operating experience element of the corresponding NUREG-1801 aging management program. A review of plant condition reporting documents, as well as other STP current licensing basis documents, since 1998, was performed to ensure that there is no unique, plant-specific experience in addition to that in NUREG-1801. The review identified no unique operating experience.

Many of the plant condition reporting documents discussed above concerned corrosion found in HVAC systems. The corrective actions for these conditions generally included removal of the corrosion and painting to prevent recurrence.

As additional industry and plant-specific applicable operating experience becomes available, it will be evaluated and incorporated into the program through the STP condition reporting and operating experience programs.

Conclusion

The implementation of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program will provide reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B3 TLAA SUPPORT ACTIVITIES

B3.1 METAL FATIGUE OF REACTOR COOLANT PRESSURE BOUNDARY

Program Description

The Metal Fatigue of Reactor Coolant Pressure Boundary program manages fatigue cracking caused by anticipated cyclic strains in metal components of the RCPB. The program ensures that actual plant experience remains bounded by the transients assumed in the design calculations, or that appropriate corrective actions maintain the design and licensing basis by other acceptable means.

The Metal Fatigue of Reactor Coolant Pressure Boundary program consists of cycle counting activities. The program will be enhanced to monitor and trend fatigue usage at selected locations in the reactor coolant pressure boundary. The program will be enhanced to include additional transients and locations identified by the evaluation of ASME Section III fatigue analyses, locations necessary to ensure accurate calculations of fatigue, and the NUREG/CR-6260 locations for a newer-vintage Westinghouse Plant. The supporting environmental life correction factor calculations were performed with NUREG/CR-6583 for carbon and low alloy steels and with NUREG/CR-5704 for austenitic stainless steels.

The Metal Fatigue of Reactor Coolant Pressure Boundary program tracks the occurrences of selected transients and will be enhanced to monitor the cumulative usage factors (CUFs) at selected locations using one of the following methods:

1) The Cycle Counting (CC) method does not periodically calculate CUF; however, transient event cycles affecting the location (e.g. plant heatup and plant cooldown) are counted to ensure that the numbers of transient events assumed by the design calculations are not exceeded.

2) The Cycle Based Fatigue (CBF) management method utilizes the CC results and stress intensity ranges generated with the ASME III methods that use six stress-tensors to perform periodic CUF calculations, consistent with NRC Regulatory Issue Summary 2008-30, *Fatigue Analysis of Nuclear Power Plant Components* for a selected location. The fatigue accumulation is tracked to determine approach to the ASME allowable fatigue limit of 1.0.

The Metal Fatigue of Reactor Coolant Pressure Boundary program continuously monitors plant data, and maintains a record of the data collected. The collected data are analyzed to identify operational transients and events, calculate usage factors for selected monitored locations, and compare the calculated usage factors to allowable limits. Periodic review of the calculations ensures that usage factors will not exceed the allowable value of 1.0 without an appropriate evaluation and any further necessary actions. If a cycle count or CUF value increases to a program action limit, corrective actions will be initiated to evaluate the design limits and determine appropriate specific corrective actions. Action limits permit completion of corrective actions before an assumed number of events in a fatigue analysis is exceeded.

NUREG-1801 Consistency

The Metal Fatigue of Reactor Coolant Pressure Boundary program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section X.M1, Metal Fatigue of Reactor Coolant Pressure Boundary.

Exceptions to NUREG-1801

None

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

Scope of Program (Element 1) and Monitoring and Trending (Element 5)

Procedures will be enhanced to include locations identified by the evaluation of ASME Section III fatigue analyses, locations necessary to ensure accurate calculations of fatigue, and the NUREG/CR-6260 locations for a newer-vintage Westinghouse Plant.

Scope of the Program (Element 1), and Parameters Monitored or Inspected (Element 3)

Procedures will be enhanced to include additional transients that contribute significantly to fatigue usage identified by the evaluation of ASME Section III fatigue analyses.

Scope of the Program (Element 1)

Procedures will be enhanced to ensure the fatigue crack growth analyses, which support the leak-before-break analyses and ASME Section XI evaluations, remain valid by counting the transients used in the analyses.

Detection of Aging Effects (Element 4)

The procedures will be enhanced to 1) include additional transients necessary to ensure accurate calculations of fatigue, 2) fatigue usage monitoring at specified locations, and 3) specify the frequency and process of periodic reviews of the results of the monitored cycle count and CUF data at least once per fuel cycle. This review will compare the results against the corrective action limits to determine any approach to action limits and any necessary revisions to the fatigue analyses will be included in the corrective actions.

Preventive Actions (Element 2) and Acceptance Criteria (Element 6)

The procedures will be enhanced to include additional cycle count and fatigue usage action limits, which will invoke appropriate corrective actions if a component approaches a cycle count action limit or a fatigue usage action limit. Action limits permit completion of corrective actions before the design limits are exceeded. The acceptance criteria associated with the NUREG/CR-6260 sample locations for a newer vintage Westinghouse plant will account for environmental effects on fatigue.

Cycle Count Action Limits:

Cycle count action limits are selected to initiate corrective action when the cycle count for any of the critical thermal or pressure transients is projected to reach the design limit within the next three fuel cycles.

CUF Action Limits:

CUF action limits require corrective action when the calculated CUF for any monitored location is projected to reach 1.0 within the next three fuel cycles.

Corrective Actions (Element 7)

Procedures will be enhanced to include appropriate corrective actions to be invoked if a component approaches a cycle count or CUF action limit.

If a cycle count action limit is reached, acceptable corrective actions include:

1) Review of fatigue usage calculations:

    a) To identify the components and analyses affected by the transient in question.

    b) To determine whether the transient in question contributes significantly to CUF.

    c) To ensure that the analytical bases of the high energy line break (HELB) locations are maintained.

2) Evaluation of remaining margins on CUF.

3) Review the fatigue crack growth and stability analyses which support the leak before break exemptions and relief from the ASME Section XI flaw removal or inspection requirements to ensure that the analytical bases remain valid. Re-analysis of a fatigue crack growth analysis must be consistent with or reconciled to the originally submitted analysis and receive the same level of regulatory review as the original analysis.

4) Redefinition of the specified number of cycles (e.g., by reducing specified numbers of cycles for other transients and using the margin to increase the allowed number of cycles for the transient that is approaching its specified number of cycles).

5) Redefinition of the transient to remove conservatism in the pressure and temperature ranges.

~~Since the counting action limits are based on a somewhat arbitrary cycle count that does not accurately indicate approach to the CUF = 1.0 fatigue limit, t~~

These preliminary actions are designed to determine how close the approach is to the 1.0 limit, and from those determinations, set new action limits. If the CUF has approached 1.0 then further actions described below for cumulative fatigue usage action limits may be invoked.

If a CUF action limit is reached acceptable corrective actions include:

~~1) Determine whether the scope of the management program must be enlarged to include additional affected reactor coolant pressure boundary locations. This determination will ensure that other locations do not approach design limits without an appropriate action.~~

~~2) Enhance fatigue managing to confirm continued conformance to the code limit.~~

~~3~~1) Repair the component.

~~4~~2) Replace the component. If a limiting component is replaced, assess the effect on locations monitored by the program. If a limiting component is replaced, resetting its cumulative fatigue usage factor to zero, a component which was previously bounded by the replaced component will become the limiting component and may need to be monitored.

~~5~~3) Perform a more rigorous analysis of the component to demonstrate that the design code limit will not be exceeded.

~~6) Modify plant operating practices to reduce the fatigue usage accumulation rate.~~

~~7) Perform a flaw tolerance evaluation and impose component specific inspections, under ASME Section XI Appendices A or C (or their successors), and obtain required approvals by the NRC.~~

Operating Experience

The STP industry operating experience program reviews industry experience, including experience that may affect fatigue management, to ensure that applicable experience is evaluated and incorporated in plant analyses and procedures. Any necessary evaluations are conducted under the plant corrective action program.

The Metal Fatigue of Reactor Coolant Pressure Boundary program was implemented in response to industry experience that indicated that the design basis set of transients used for fatigue analyses of the reactor coolant pressure boundary did not include some significant transients, and therefore might not be limiting for components affected by them. Examples:

Thermal stratification of pressurizer surge line piping:

In response to NRC Bulletin 88-11, Westinghouse performed a plant-specific evaluation of STP pressurizer surge lines. The surge line stratification analysis was based on STP design transients. It was concluded that thermal stratification does not affect the integrity of the pressurizer surge lines. STP responses to NRC Bulletin 88-1 1 describe the inspections, analyses, and procedural revisions made to ensure that thermal stratification does not affect the integrity of the pressurizer surge lines. In addition, the responses noted that fatigue analyses were updated to ensure compliance with applicable codes and license commitments.

Thermal fatigue cracking in normally-isolated piping:

In 1988, as identified in NRC Bulletin 88-08, there were several instances of thermal fatigue cracking in normally stagnant lines attached to reactor coolant system (RCS) piping. This issue was addressed by utilities by conducting evaluations and monitoring to ensure that further leakage would not occur. STP performed a complete analysis of systems connected to the RCS. The review concluded that the potential for the described thermal conditions existed only in the normal charging, alternate charging, and auxiliary spray lines. However, these systems are separated and only hot water can leak through the charging and auxiliary spray lines, reducing the potential for thermal cycling.

Conclusion

The continued implementation of the Metal Fatigue of Reactor Coolant Pressure Boundary program provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

Enclosure 2

Revised Regulatory Commitments

A4 License Renewal Commitments

Table A4-1 identifies proposed actions committed to by STPNOC for STP Units 1 and 2 in its License Renewal Application. These and other actions are proposed regulatory commitments. This list will be revised, as necessary, in subsequent amendments to reflect changes resulting from NRC questions and STPNOC responses. STPNOC will utilize the STP commitment tracking system to track regulatory commitments. The Condition Report (CR) number in the Implementation Schedule column of the table is for STPNOC tracking purposes and is not part of the amended LRA.

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
3	Enhance the Bolting Integrity program procedures to: • conform to the guidance contained in EPRI TR-104213 • evaluate loss of preload of the joint connection, including bolt stress, gasket stress, flange alignment, and operating condition to determine the corrective actions consistent with EPRI TR-104213.	B2.1.7	Prior to the period of extended operation 10-23255-1
5	Enhance the Closed-Cycle Cooling Water System program procedures to: • include visual inspection of ~~the interior of the piping that is attached to the excess letdown heat exchanger CCW return second check valves. This periodic internal inspection will detect loss of material and fouling and serve as a leading indicator of the condition of the interior of piping components otherwise inaccessible for visual inspection.~~representative samples of each combination of material and water treatment program at least every ten years and opportunistically, and • include acceptance criteria.	B2.1.10	Prior to the period of extended operation 10-23257-1
38	Enhance the Reactor Head Closure Studs program procedures to: preclude future use of replacement closure stud assemblies fabricated from material with an actual measure yield strength greater than or equal to 150 ksi. The use of currently installed components and any spare components currently on site is allowed.	B2.1.3	Prior to the period of extended operation 11-22923-1