VIII Steam and Power Conversion System
A. Steam Turbine System

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
A.1-a A.1.1 A.1.2	Piping and fittings HP turbine to MSR MSR to LP turbine	Carbon steel	Steam	Wall thinning/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
S-15	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Steam	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
A.1-b A.1.1 A.1.2	Piping and fittings HP turbine to MSR MSR to LP turbine	Carbon steel	Steam	Loss of material/ General, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) or PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-04	General piping and components	Carbon steel	Steam	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-06	General piping and components	Carbon steel	Steam	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

VIII Steam and Power Conversion System
A. Steam Turbine System

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
A.2-a A.2.1	Valves (stop, control or governor, intermediate stop and control or combined intermediate, bypass or steam dumps, atmospheric dumps, main steam safety, or safety/relief) Body and bonnet	Carbon steel	Steam	Wall thinning (body only)/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion" (body only)	No
S-15	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Steam	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
A.2-b A.2.1	Valves (stop, control or governor, intermediate stop and control or combined intermediate, bypass or steam dumps, atmospheric dumps, main steam safety, or safety/relief) Body and bonnet	Carbon steel	Steam	Loss of material/ General, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) or PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-04	General piping and components	Carbon steel	Steam	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

VIII Steam and Power Conversion System
A. Steam Turbine System

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-06	General piping and components	Carbon steel	Steam	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

VIII Steam Power Conversion System
B1. Main Steam System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
B1.1-a B1.1.1 B1.1.2	Piping and fittings Steam lines from steam generator to isolation valves (Group B or C) Steam lines from isolation valves to main turbine (Group D)	Carbon steel	Up to 300°C (572°F) steam	Loss of material/ Pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134	No
S-07	General piping and components	Carbon steel	Steam	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134	No
B1.1-b B1.1.1	Piping and fittings Steam lines from steam generator to isolation valves (Group B or C)	Carbon steel	Up to 300°C (572°F) steam	Cumulative fatigue damage/ Fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, "Metal Fatigue" for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA
S-08	General piping and components	Carbon steel	Steam	Cumulative fatigue damage	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, "Metal Fatigue" for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA

VIII Steam Power Conversion System
B1. Main Steam System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
B1.1-c B1.1.1 B1.1.2 B1.1.3 B1.1.4 B1.1.5 B1.1.6	Piping and fittings Steam lines from steam generator to isolation valves (Group B or C) Steam lines from isolation valves to main turbine (Group D) Lines to FW and AFW pump turbines Lines to MSR Turbine bypass Steam drains	Carbon steel	Up to 300°C (572°F) steam	Wall thinning/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
S-15	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Steam	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
B1.2-a B1.2.1	Valves (check, control, hand, motor operated, safety, and containment isolation valves) Body and bonnet	Carbon steel	Up to 300°C (572°F) steam	Loss of material/ Pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134	No
S-07	General piping and components	Carbon steel	Steam	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134	No
B1.2-b B1.2.1	Valves (check, control, hand, motor operated, safety, and containment isolation valves) Body and bonnet	Carbon steel	Up to 300°C (572°F) steam	Wall thinning (body only)/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion" (body only)	No
S-15	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Steam	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No

VIII Steam Power Conversion System
B2. Main Steam System (BWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
B2.1-a B2.1.1 B2.1.2	Piping and fittings Steam lines to main turbine (Group B) Steam lines to main turbine (Group D)	Carbon steel	288°C (550°F) steam	Loss of material/ Pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515)	No
S-05	General piping and components	Carbon steel	Steam	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515)	No
B2.1-b B2.1.1 B2.1.2 B2.1.3 B2.1.4 B2.1.5 B2.1.6 B2.1.7	Piping and fittings Steam lines to main turbine (Group B) Steam lines to main turbine (Group D) Lines to FW pump turbines Turbine bypass Steam drains Steam line to HPCI turbine Steam line to RCIC turbine	Carbon steel	288°C (550°F) steam	Wall thinning/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
S-15	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Steam	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
B2.1-c B2.1.1 B2.1.2 B2.1.3 B2.1.4 B2.1.5 B2.1.6 B2.1.7	Piping and fittings Steam lines to main turbine (Group B) Steam lines to main turbine (Group D) Lines to FW pump turbines Turbine bypass Steam drains Steam line to HPCI turbine Steam line to RCIC turbine	Carbon steel	288°C (550°F) steam	Cumulative fatigue damage/ Fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, "Metal Fatigue," for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA

VIII Steam Power Conversion System
B2. Main Steam System (BWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-08	General piping and components	Carbon steel	Steam	Cumulative fatigue damage	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, "Metal Fatigue" for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA
B2.2-a B2.2.1	Valves (check, control, hand, motor operated, safety valves) Body and bonnet	Carbon steel	288°C (550°F) steam	Wall thinning (body only)/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion" (body only)	No
S-15	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Steam	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
B2.2-b B2.2.1	Valves (check, control, hand, motor operated, safety valves) Body and bonnet	Carbon steel	288°C (550°F) steam	Loss of material/ Pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515)	No
S-05	General piping and components	Carbon steel	Steam	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515)	No

VIII Steam Power Conversion System
C. Extraction Stream System

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
C.1-a C.1.1 C.1.2	Piping and fittings Lines to feedwater heaters Steam drains	Carbon steel	Up to 300°C (572°F) steam	Wall thinning/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
S-15	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Steam	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
C.1-b C.1.1 C.1.2	Piping and fittings Lines to feedwater heaters Steam drains	Carbon steel	Up to 300°C (572°F) steam	Loss of material/ General, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) or PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-04	General piping and components	Carbon steel	Steam	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-06	General piping and components	Carbon steel	Steam	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

C.2-a C.2.1	Valves Body and bonnet	Carbon steel	Up to 300°C (572°F) steam	Wall thinning (body only)/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion" (body only)	No
S-15	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Steam	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
C.2-b C.2.1	Valves Body and bonnet	Carbon steel	Up to 300°C (572°F) steam	Loss of material/ General, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) or PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-04	General piping and components	Carbon steel	Steam	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-06	General piping and components	Carbon steel	Steam	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

VIII Steam and Power Conversion System
D1. Feedwater System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
D1.1-a D1.1.1	Main feedwater line Piping and fittings (Group B, C, or D)	Carbon steel	Treated water	Wall thinning/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
S-16	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Treated water	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
D1.1-b D1.1.1	Main feedwater line Piping and fittings (Group B or C from steam generator to isolation valves)	Carbon steel	Treated water	Cumulative fatigue damage/ Fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, "Metal Fatigue" for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA
S-11	General piping and components	Carbon steel	Treated water	Cumulative fatigue damage	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, "Metal Fatigue" for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA
D1.1-c D1.1.1	Main feedwater line Piping and fittings (Group B, C, or D)	Carbon steel	Treated water	Loss of material/ General, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

VIII Steam and Power Conversion System
D1. Feedwater System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-10	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
D1.2-a D1.2.1	Valves (control, check, hand, safety, and containment isolation valves) Body and bonnet	Carbon steel	Treated water	Wall thinning (body only)/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion" (body only)	No
S-16	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Treated water	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
D1.2-b D1.2.1	Valves (control, check, and hand, safety, and containment isolation valves) Body and bonnet	Carbon steel	Treated water	Loss of material/ General, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-10	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

VIII Steam and Power Conversion System
D1. Feedwater System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
D1.3-a D1.3.1 D1.3.2	Feedwater pump (steam turbine and motor driven) Casing Suction and discharge lines	Carbon steel	Treated water	Loss of material/ General, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-10	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
D1.3-b D1.3.2	Feedwater pump (steam turbine and motor driven) Suction and discharge lines	Carbon steel	Treated water	Wall thinning/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
S-16	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Treated water	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No

VIII Steam and Power Conversion System
D2. Feedwater System (BWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
D2.1-a D2.1.1	Main feedwater line Piping and fittings (Group B or D)	Carbon steel	Treated water	Wall thinning/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
S-16	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Treated water	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
D2.1-b D2.1.1	Main feedwater line Piping and fittings (Group B or D)	Carbon steel	Treated water	Loss of material/ General, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-09	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
D2.1-c D2.1.1	Main feedwater line Piping and fittings (Group B or D)	Carbon steel	Treated water	Cumulative fatigue damage/ Fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, "Metal Fatigue" for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA

VIII Steam and Power Conversion System
D2. Feedwater System (BWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-11	General piping and components	Carbon steel	Treated water	Cumulative fatigue damage	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, "Metal Fatigue" for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA
D2.2-a D2.2.1	Valves (control, check, and hand valves) Body and bonnet	Carbon steel	Treated water	Wall thinning (body only)/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion" (body only)	No
S-16	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Treated water	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
D2.2-b D2.2.1	Valves (control, check, and hand valves) Body and bonnet	Carbon steel	Treated water	Loss of material/ General, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-09	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
D2.3-a D2.3.2	Feedwater pump (steam turbine and motor driven) Suction and discharge lines	Carbon steel	Treated water	Wall thinning/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No

VIII Steam and Power Conversion System
D2. Feedwater System (BWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-16	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Treated water	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
D2.3-b D2.3.1 D2.3.2	Feedwater pump (steam turbine and motor driven) Casing Suction and discharge lines	Carbon steel	Treated water	Loss of material/ General, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-09	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

VIII Steam and Power Conversion System
E. Condensate System

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
E.1-a E.1.1	Condensate lines Piping and fittings	Carbon steel	Treated water (BWRs: reactor coolant; PWRs: secondary side water)	Wall thinning/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
S-16	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Treated water	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
E.1-b E.1.1	Condensate lines Piping and fittings	Carbon steel	Treated water (BWRs: reactor coolant; PWRs: secondary side water)	Loss of material/ General, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) or PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-09	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

VIII Steam and Power Conversion System
E. Condensate System

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-10	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
E.2-a E.2.1	Valves Body and bonnet	Carbon steel	Treated water	Wall thinning (body only)/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion" (body only)	No
S-16	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Treated water	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
E.2-b E.2.1	Valves Body and bonnet	Carbon steel	Treated water	Loss of material/ General, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) or PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-09	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

VIII Steam and Power Conversion System
E. Condensate System

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-10	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
E.3-a E.3.1	Condensate pumps (main and booster pumps) Casing	Carbon steel	Treated water	Loss of material/ General, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) or PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-09	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

VIII Steam and Power Conversion System
E. Condensate System

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-10	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
E.4-a E.4.1 E.4.2 E.4.3 E.4.4	Condensate coolers/ condensers (serviced by open-cycle cooling water) Tubes Tubesheet Channel head Shell	Tubes: stainless steel; tubesheet: carbon steel; channel head: carbon steel; shell: carbon steel	Treated water side (condensate side)	Loss of material/ General (carbon steel only), pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) or PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-18	Heat exchanger shell side components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

VIII Steam and Power Conversion System
E. Condensate System

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-19	Heat exchanger shell side components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-21	Heat exchanger shell side components	Stainless steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-22	Heat exchanger shell side components	Stainless steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
E.4-b E.4.1 E.4.2 E.4.3 E.4.4	Condensate coolers/ condensers (serviced by open-cycle cooling water) Tubes Tubesheet Channel head Shell	Tubes: stainless steel; tubesheet: carbon steel; channel head: carbon steel; shell: carbon steel	Open-cycle cooling water (raw water) side	Loss of material/ General (carbon steel only), pitting, crevice, and microbiologically influenced corrosion, and biofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No

VIII Steam and Power Conversion System
E. Condensate System

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-24	Heat exchanger tube side components	Carbon steel	Raw water	Loss of material and macrofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
S-26	Heat exchanger tube side components	Stainless steel	Raw water	Loss of material and macrofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
E.4-c E.4.1	Condensate coolers/ condensers (serviced by open-cycle cooling water) Tubes	Tubes: stainless steel	Open-cycle cooling water (raw water) side	Buildup of deposit/ Biofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
S-28	Heat exchanger tubes	Stainless steel	Raw water	Reduction of heat transfer	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
E.4-d E.4.1 E.4.2 E.4.3 E.4.4	Condensate coolers/ condensers (serviced by closed-cycle cooling water) Tubes Tubesheet Channel head Shell	Tubes: stainless steel; tubesheet: carbon steel; channel head: carbon steel; shell: carbon steel	Treated water side (on other side of condensate)	Loss of material/ General (carbon steel only), pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) or PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-18	Heat exchanger shell side components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

Comment: This environment implies the closed cycle cooling side but the program relates to the condensate side. Have assumed the condensate side is what applies.

VIII Steam and Power Conversion System
E. Condensate System

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-19	Heat exchanger shell side components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-21	Heat exchanger shell side components	Stainless steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-22	Heat exchanger shell side components	Stainless steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
E.4-e E.4.1 E.4.2 E.4.3 E.4.4	Condensate coolers/ condensers (serviced by closed-cycle cooling water) Tubes Tubesheet Channel head Shell	Tubes: stainless steel; tubesheet: carbon steel; channel head: carbon steel; shell: carbon steel	Closed-cycle cooling water side	Loss of material/ General (carbon steel only), pitting, and crevice corrosion	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No

VIII Steam and Power Conversion System
E. Condensate System

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-23	Heat exchanger tube side components	Carbon steel	Closed cycle cooling water	Loss of material	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No
S-25	Heat exchanger tube side components	Stainless steel	Closed cycle cooling water	Loss of material	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No
E.5-a E.5.1	Condensate storage Tank	Carbon steel	<90°C (<194°F) treated water	Loss of material/ General, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) or PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-09	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-10	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

VIII Steam and Power Conversion System
E. Condensate System

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
E.5-b E.5.1	Condensate storage Tank	Stainless steel	<90°C (<194°F) treated water	Loss of material/ Pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) or PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-13	General piping and components	Stainless steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-14	General piping and components	Stainless steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
E.5-c E.5.1	Condensate storage Tank (aboveground, external surface)	Carbon steel	Sun, weather, humidity, and moisture	Loss of material/ General corrosion	Chapter XI.M29, "Aboveground Carbon Steel Tanks"	No
S-31	Tank	Carbon steel	Air – outdoor (Ext)	Loss of material	Chapter XI.M29, "Aboveground Carbon Steel Tanks"	No

VIII Steam and Power Conversion System
E. Condensate System

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
E.5-d E.5.1	Condensate storage Tank (buried, external surface)	Carbon steel	Soil and ground water	Loss of material/ General, pitting, crevice, and microbiologically influenced corrosion	Chapter XI.M28, "Buried Piping and Tanks Surveillance," or Chapter XI.M34, "Buried Piping and Tanks Inspection"	No Yes, detection of aging effects and operating experience are to be further evaluated
S-01	Buried piping and components	Carbon steel (with or without coating or wrapping)	Soil	Loss of material	Chapter XI.M28, "Buried Piping and Tanks Surveillance," or Chapter XI.M34, "Buried Piping and Tanks Inspection"	No Yes, detection of aging effects and operating experience are to be further evaluated
E.6-a E.6.1 E.6.2 E.6.3	Condensate cleanup system Piping and fittings Demineralizer Strainer	Carbon steel	Treated water	Loss of material/ General, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) or PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

VIII Steam and Power Conversion System
E. Condensate System

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-09	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-10	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

VIII Steam and Power Conversion System
F. Steam Generator Blowdown System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
F.1-a F.1.1 F.1.2	Blowdown lines Piping and fittings (Group B) Piping and fittings (Group D)	Carbon steel	Secondary side treated water	Wall thinning/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
S-16	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Treated water	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
F.1-b F.1.1 F.1.2	Blowdown lines Piping and fittings (Group B) Piping and fittings (Group D)	Carbon steel	Secondary side treated water	Loss of material/ General, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-10	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
F.2-a F.2.1	Valves (including containment isolation valves) Body and bonnet	Carbon steel	Secondary side treated water	Wall thinning (body only)/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion" (body only)	No
S-16	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Treated water	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No

VIII Steam and Power Conversion System
F. Steam Generator Blowdown System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
F.2-b F.2.1	Valves (including containment isolation valves) Body and bonnet	Carbon steel	Secondary side treated water	Loss of material/ General, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-10	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
F.3-a F.3.1	Blowdown pump Casing	Carbon steel	Secondary side treated water	Loss of material/ General, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

VIII Steam and Power Conversion System
F. Steam Generator Blowdown System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-10	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
F.4-a F.4.1 F.4.2 F.4.3 F.4.4	Blowdown heat exchanger (serviced by open-cycle cooling water) Tubes Tubesheet Channel head and access cover Shell and access cover	Tubes: stainless steel; tubesheet: carbon steel; channel head: carbon steel	Secondary side treated water	Loss of material/ General (carbon steel only), pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-19	Heat exchanger shell side components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

VIII Steam and Power Conversion System
F. Steam Generator Blowdown System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-22	Heat exchanger shell side components	Stainless steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
F.4-b F.4.1 F.4.2 F.4.3 F.4.4	Blowdown heat exchanger (serviced by open-cycle cooling water) Tubes Tubesheet Channel head and access cover Shell and access cover	Tubes: stainless steel; tubesheet: carbon steel; channel head: carbon steel	Open-cycle cooling water (raw water) side	Loss of material/ General (carbon steel only), pitting, crevice, and microbiologically influenced corrosion, and biofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
S-24	Heat exchanger tube side components	Carbon steel	Raw water	Loss of material and macrofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
S-26	Heat exchanger tube side components	Stainless steel	Raw water	Loss of material and macrofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
F.4-c F.4.1	Blowdown heat exchanger (serviced by open cycle cooling water) Tubes	Tubes: stainless steel	Open-cycle cooling water (raw water) side	Buildup of deposit/ Biofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
S-28	Heat exchanger tubes	Stainless steel	Raw water	Reduction of heat transfer	Chapter XI.M20, "Open-Cycle Cooling Water System"	No

VIII Steam and Power Conversion System
F. Steam Generator Blowdown System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
F.4-d F.4.1 F.4.2 F.4.3 F.4.4	Blowdown heat exchanger (serviced by closed-cycle cooling water) Tubes Tubesheet Channel head and access cover Shell and access cover	Tubes: stainless steel; tubesheet: carbon steel; channel head: carbon steel	Treated water side (other side of steam generator blowdonwn)	Loss of material/ General (carbon steel only), pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-19	Heat exchanger shell side components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-22	Heat exchanger shell side components	Stainless steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

VIII Steam and Power Conversion System
F. Steam Generator Blowdown System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
F.4-e F.4.1 F.4.2 F.4.3 F.4.4	Blowdown heat exchanger (serviced by closed-cycle cooling water) Tubes Tubesheet Channel head and access cover Shell and access cover	Tubes: stainless steel; tubesheet: carbon steel; channel head: carbon steel	Closed-cycle cooling water side	Loss of material/ General (carbon steel only), pitting, and crevice corrosion	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No
S-23	Heat exchanger tube side components	Carbon steel	Closed cycle cooling water	Loss of material	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No
S-25	Heat exchanger tube side components	Stainless steel	Closed cycle cooling water	Loss of material	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No

VIII Steam and Power Conversion System
G. Auxiliary Feedwater System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
G.1-a G.1.1	Auxiliary feedwater piping Piping and fittings (aboveground) for Westinghouse steam generators with preheaters	Carbon steel	Treated water >90°C (>194°F)	Wall thinning/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
S-16	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Treated water	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
G.1-b G.1.1	Auxiliary feedwater piping Piping and fittings (aboveground)	Carbon steel	Treated water >90°C (>194°F)	Cumulative fatigue damage/ Fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, "Metal Fatigue" for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA
S-11	General piping and components	Carbon steel	Treated water	Cumulative fatigue damage	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, "Metal Fatigue" for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA
G.1-c G.1.1 G.1.2	Auxiliary feedwater piping Piping and fittings (aboveground) Piping and fittings (buried)	Carbon steel	Treated water	Loss of material/ General, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

VIII Steam and Power Conversion System
G. Auxiliary Feedwater System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-10	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
G.1-d G.1.1 G.1.2	Auxiliary feedwater piping Piping and fittings (aboveground) Piping and fittings (buried)	Carbon steel	Untreated water from backup water supply	Loss of material/ General, pitting, crevice, and microbiologically influenced corrosion, and biofouling	A plant-specific aging management program is to be evaluated.	Yes, plant specific
S-12	General piping and components	Carbon steel	Untreated water	Loss of material and macrofouling	A plant-specific aging management program is to be evaluated.	Yes, plant specific
G.1-e G.1.2	Auxiliary feedwater piping Piping and fittings (buried) external surface	Carbon steel	Soil and groundwater	Loss of material/ General, pitting, crevice, and microbiologically influenced corrosion	Chapter XI.M28, "Buried Piping and Tanks Surveillance," or Chapter XI.M34, "Buried Piping and Tanks Inspection"	No Yes, detection of aging effects and operating experience are to be further evaluated

VIII Steam and Power Conversion System
G. Auxiliary Feedwater System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-01	Buried piping and components	Carbon steel (with or without coating or wrapping)	Soil	Loss of material	Chapter XI.M28, "Buried Piping and Tanks Surveillance," or Chapter XI.M34, "Buried Piping and Tanks Inspection"	No Yes, detection of aging effects and operating experience are to be further evaluated
G.2-a G.2.1 G.2.2	AFW pumps (steam turbine and motor driven) Casing Suction and discharge lines	Carbon steel	Treated water <90°C (<194°F)	Loss of material/ General, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-10	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

VIII Steam and Power Conversion System
G. Auxiliary Feedwater System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
G.3-a G.3.1	Valves (control, check, hand, and containment isolation valves) Body and bonnet	Carbon steel	Treated water <90°C (<194°F)	Loss of material/ General, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-10	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
G.4-a G.4.1	Condensate storage (emergency) Tank	Carbon steel	Treated water <90°C (<194°F)	Loss of material/ General, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-10	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

VIII Steam and Power Conversion System
G. Auxiliary Feedwater System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
G.4-b G.4.1	Condensate storage (emergency) Tank	Stainless steel	Treated water <90°C (<194°F)	Loss of material/ Pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-14	General piping and components	Stainless steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
G.4-c G.4.1	Condensate storage (emergency) Tank (aboveground, external surface)	Carbon steel	Sun, weather, humidity, and moisture	Loss of material/ General corrosion	Chapter XI.M29, "Aboveground Carbon Steel Tanks"	No
S-31	Tank	Carbon steel	Air – outdoor (Ext)	Loss of material	Chapter XI.M29, "Aboveground Carbon Steel Tanks"	No
G.4-d G.4.1	Condensate storage (emergency) Tank (buried, external surface)	Carbon steel	Soil and groundwater	Loss of material/ General, pitting, crevice, and microbiologically influenced corrosion	Chapter XI.M28, "Buried Piping and Tanks Surveillance," or Chapter XI.M34, "Buried Piping and Tanks Inspection"	No Yes, detection of aging effects and operating experience are to be further evaluated

VIII Steam and Power Conversion System
G. Auxiliary Feedwater System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-01	Buried piping and components	Carbon steel (with or without coating or wrapping)	Soil	Loss of material	Chapter XI.M28, "Buried Piping and Tanks Surveillance," or Chapter XI.M34, "Buried Piping and Tanks Inspection"	No Yes, detection of aging effects and operating experience are to be further evaluated
G.5-a G.5.1 G.5.2 G.5.3	Bearing oil coolers (for steam turbine pump) serviced by open-cycle cooling water Shell Tubes Tubesheet	Stainless steel, carbon steel	Open-cycle cooling water (raw water)	Loss of material/ General (carbon steel only), pitting, crevice, and microbiologically influenced corrosion, and biofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
S-24	Heat exchanger tube side components	Carbon steel	Raw water	Loss of material and macrofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
S-26	Heat exchanger tube side components	Stainless steel	Raw water	Loss of material and macrofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
G.5-b G.5.2	Bearing oil coolers (for steam turbine pump) serviced by open-cycle cooling water Tubes	Stainless steel, carbon steel	Open-cycle cooling water (raw water)	Buildup of deposit/ Biofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
S-27	Heat exchanger tubes	Carbon steel	Raw water	Reduction of heat transfer	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
S-28	Heat exchanger tubes	Stainless steel	Raw water	Reduction of heat transfer	Chapter XI.M20, "Open-Cycle Cooling Water System"	No

VIII Steam and Power Conversion System
G. Auxiliary Feedwater System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
G.5-c G.5.1 G.5.2 G.5.3	Bearing oil coolers (for steam turbine pump) serviced by closed-cycle cooling water Shell Tubes Tubesheet	Stainless steel, carbon steel	Closed-cycle cooling water (treated water)	Loss of material/ General (carbon steel only), pitting, and crevice corrosion	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No
S-23	Heat exchanger tube side components	Carbon steel	Closed cycle cooling water	Loss of material	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No
S-25	Heat exchanger tube side components	Stainless steel	Closed cycle cooling water	Loss of material	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No
G.5-d G.5.1 G.5.2 G.5.3	Bearing oil coolers (for steam turbine pump) Shell Tubes Tubesheet	Stainless steel, carbon steel	Lubricating oil (possibly contaminated with water)	Loss of material/ General (carbon steel only), pitting, crevice, and microbiologically influenced corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
S-17	Heat exchanger shell side components	Carbon steel	Lubricating oil	Loss of material	A plant-specific aging management program is to be evaluated.	Yes, plant specific
S-20	Heat exchanger shell side components	Stainless steel	Lubricating oil	Loss of material	A plant-specific aging management program is to be evaluated.	Yes, plant specific

VIII Steam and Power Conversion System
H. Carbon Steel Components

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
H.1-a H.1.1	Carbon steel components (PWRs) External Surfaces	Carbon steel, low-alloy steel	Air, leaking and dripping chemically treated borated water up to 340°C (644°F)	Loss of material/ Boric acid corrosion of external surfaces	Chapter XI.M10, "Boric Acid Corrosion"	No
S-30	Piping and components external surfaces and bolting	Carbon steel	Air with boric acid leakage	Loss of material/ Boric acid corrosion	Chapter XI.M10, "Boric Acid Corrosion"	No
H.1-b H.1.1	Carbon steel components (PWRs and BWRs) External surfaces	Carbon steel, low-alloy steel	Air, moisture, and humidity <100°C (212°F)	Loss of material/ General corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
S-29	Piping and components external surfaces and bolting	Carbon steel	Air – indoor uncontrolled (Ext)	Loss of material	A plant-specific aging management program is to be evaluated.	Yes, plant specific
H.2-a H.2.1	Closure bolting In high-pressure or high-temperature systems	Carbon steel, low-alloy steel	Air, moisture, humidity, and leaking fluid	Loss of material/ General corrosion	Chapter XI.M18, "Bolting Integrity"	No
S-02	Closure bolting In high-pressure or high-temperature systems	Carbon steel	Air with steam or water leakage	Loss of material	Chapter XI.M18, "Bolting Integrity"	No
H.2-b H.2.1	Closure bolting In high-pressure or high-temperature systems	Carbon steel, low-alloy steel	Air, moisture, humidity, and leaking fluid	Crack initiation and growth/ Cyclic loading, stress corrosion cracking	Chapter XI.M18, "Bolting Integrity"	No
S-03.	Closure bolting In high-pressure or high-temperature systems	Carbon steel	Air with steam or water leakage	Cracking	Chapter XI.M18, "Bolting Integrity"	No

General Material Types

Material	Description
Aluminum	Pure aluminum
Aluminum alloys	Alloys of aluminum
Carbon steel	For a given environment, carbon steel, alloy steel, and cast iron exhibit the same aging effects, even though the rates of aging may vary. Consequently, these metal types may be considered the same for aging management reviews. Gray cast iron is also susceptible to selective leaching and high strength low alloy steel is also susceptible to stress corrosion cracking. Therefore, when these aging effects are being considered, these materials are specifically mentioned; otherwise they are considered part of the general category of carbon steel. (References 5, 6)
Cast austenitic stainless steel	Cast stainless steels containing ferrite in an austenitic matrix
Copper alloy < 15 % Zn	Copper, copper nickel, brass, bronze <15% Zn, Aluminum bronze < 8% Al – These materials are resistant to stress corrosion cracking, selective leaching and pitting and crevice corrosion. (References 5, 6) May be identified simply as copper alloy when these aging mechanisms are not at issue.
Copper alloy >15% Zn	Copper, brass and other alloys >15% Zn, Aluminum bronze > 8% Al – These materials are susceptible to stress corrosion cracking, selective leaching (except for inhibited brass) and pitting and crevice corrosion. (References 5, 6) May be identified simply as copper alloy when these aging mechanisms are not at issue.
Elastomers	Elastomers include rubber, EPT, EPDM, PTFE, ETFE, viton, vitril, neoprene, silicone elastomer, etc.
Galvanized steel	Zinc coated carbon steel
Glass	All glass materials
Soils	Earthen structures
Nickel-alloy	Nickel based iron alloys such as Alloy 600, Alloy 690, Inconel
Reinforced concrete	Concrete with embedded steel reinforcement

Attachment 4 Steam and Power Conversion Systems

Stainless steel	Wrought or forged austenitic stainless steel

Environment Categories

Environment[1]	Description
Air – indoor controlled (Int/Ext)	Indoor air in a humidity controlled (e.g., air conditioned) environment.
Air – indoor uncontrolled (Int/Ext)	Indoor air on systems with temperatures higher than the dew point – Condensation can occur but only rarely – equipment surfaces are normally dry.
Air – indoor uncontrolled > 95°F (Int/Ext)	Indoor air above thermal stress threshold for elastomers
Air with boric acid leakage	Air and untreated borated water leakage on indoor or outdoor systems with temperatures above or below the dew point
Air with reactor coolant leakage	Air and reactor coolant or steam leakage on high temperature systems
Air with steam or water leakage	Air and untreated steam or water leakage on indoor or outdoor systems with temperatures above or below the dew point
Air – outdoor (Int/Ext)	Exposed to air and local weather conditions including salt spray where applicable
Air and steam	Exposed normally to air and periodically to steam
Condensation (Int/Ext)	Air and condensation on surfaces of indoor systems with temperatures below the dew point – for exterior surfaces and interior surfaces in communication ambient indoor air, condensation is considered untreated water due to potential for surface contamination.
Condensation with boric acid leakage	Air and condensation with the potential for boric acid leakage on surfaces of indoor systems with temperatures below the dew point – condensation is considered untreated water due to potential for surface contamination

[1] For environments listed with (Int/Ext), the component information description should identify whether the surface is internal or external. This information is important because it indicates the applicability of direct visual observation of the surface for aging management. For the remaining environments, this distinction need not be made since the environment must be internal to some barrier that precludes direct observation of the surface.

Attachment 4 **Steam and Power Conversion Systems**

Closed cycle cooling water	Treated water subject to the closed cycle cooling water chemistry program
Concrete	Components embedded in concrete
Dried Air	Air that has been treated to reduce the dew point well below the system operating temperature
Exhaust gases	Gas present in a diesel engine exhaust
Gas	Inert gases such as carbon dioxide, freon, halon, nitrogen
Fuel oil	Fuel oil used for combustion engines
Lubricating oil	Lubricating oil for plant equipment with possible water contamination
Neutron flux	Reactor core environment for ferritic materials that will result in a neutron fluence exceeding 10^{17} n/cm^2 (E >1 MeV) at the end of the license renewal term.
Raw water	Raw untreated fresh or salt water
Reactor coolant	Water in the reactor coolant system and connected systems at or near full operating temperature – includes steam for BWRs
Reactor coolant > 482°F	Water in the reactor coolant system and connected systems above thermal embrittlement threshold for CASS
Sand and concrete	Sand/concrete base for tanks
Soil	External environment for components buried in the soil, including groundwater in the soil
Secondary feedwater/steam	PWR feedwater or steam at or near full operating temperature subject to the secondary water chemistry program
Steam	Steam, subject to BWR water chemistry program or PWR secondary plant water chemistry program
Treated borated water	Treated water with boric acid

Attachment 4 Steam and Power Conversion Systems

Treated borated water >140°F	Treated water with boric acid above SCC threshold for stainless steel
Treated borated water >482°F	Treated water with boric acid above thermal embrittlement threshold for CASS
Treated water	Treated or demineralized water – This environment is used where the context of the MEAP combination makes the type of treated water apparent; e.g., if the program is for PWR secondary water chemistry, the treated water is from the PWR secondary system.
Treated water >140°F	Treated water above SCC threshold for stainless steel
Treated water >482°F	Treated water above thermal embrittlement threshold for CASS
Untreated water	Water that may contain contaminants including oil and boric acid depending on the location – includes originally treated water that is not monitored by a chemistry program

Attachment 4 **Steam and Power Conversion Systems**

Temperature Thresholds

Temperature	Threshold	Basis
95°F	Thermal stresses for elastomers	In general, if the ambient temperature is less than about 95°F, then thermal aging may be considered not significant for rubber, butyl rubber, neoprene, nitrile rubber, silicone elastomer, fluoroelastomer, EPR, and EPDM (Reference 8).
140°F	SCC for stainless steel	In general, SCC very rarely occurs in austenitic stainless steels below 140°F (Reference 1, 2). Although SCC has been observed in stagnant, oxygenated borated water systems at lower temperatures than this 140°F threshold, all of these instances have identified a significant presence of contaminants (halogens, specifically chlorides) in the failed components. With a harsh enough environment (significant contamination), SCC can occur in austenitic stainless steel at ambient temperature. However, these conditions are considered event driven, resulting from a breakdown of chemistry controls. Further discussion of this threshold is provided in Reference 7.
482°F	Thermal embrittlement for CASS	CASS materials subjected to sustained temperatures below 250°C (482°F) will not result in a reduction of room temperature Charpy impact energy below 50 ft-lb for exposure times of approximately 300,000 hours (for CASS with ferrite content of 40%) and approximately 2,500,000 hours for CASS with ferrite content of 14%) [Figure 1; Reference 4]. For a maximum exposure time of approximately 420,000 hours (48 EFPY), a screening temperature of 482°F is conservatively chosen because (1) the majority of nuclear grade materials are expected to contain a ferrite content well below 40%, and (2) the 50 ft-lb limit is very conservative when applied to cast austenitic materials. It is typically applied to ferritic materials (e.g., 10 CFR 50 Appendix G). For CASS components in the reactor coolant pressure boundary, this threshold is supported by NUREG-1801 XI.M12, with the exception of niobium-containing steels which require evaluation on a case-by-case basis.

New Aging Effect Terms

Change in material properties	This effect covers all degradation of a material's properties considered important for its intended function
Reduction of heat transfer	Reduction of heat transfer from fouling by the buildup (from whatever source) on the heat transfer surface.
Macrofouling	Biofouling listed in NUREG-1801 as aging mechanism is assumed to be the plugging of components due to biological growth or material. Although plugging of a component affects only flow, an active intended function outside the purview of license renewal, the term macrofouling is used to address fouling that causes plugging as opposed to fouling that causes loss of heat transfer, and includes plugging from any source, including biological.

References

1. D. Peckner and I. M. Bernstein, Eds., Handbook of Stainless Steels, McGraw-Hill, New York, 1977.
2. Metals Handbook, Ninth Edition, Volume 13, Corrosion, American Society of Metals, Copyright 1987.
3. Not Used
4. R. Nickell, M. A. Rinckel, “Evaluation of Thermal Aging Embrittlement for Cast Austenitic Stainless Steel Components,” TR-106092, Research Project 2643-33, Final Report, March 1996.
5. Metals Handbook, Desk Edition, American Society for Metals, Materials Park, OH, 1985.
6. M. G. Fontana, Corrosion Engineering, Third Edition, Copyright 1986, McGraw Hill.
7. License Renewal Application for St. Lucie Units 1 and 2, November 30, 2001, Appendix C.
8. Aging Management Guideline for Commercial Nuclear Power Plants – Electrical and Mechanical Penetrations, EPRI, Palo Alto, CA: 2002. 1003456

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-04	General piping and components	Carbon steel	Steam	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-06	General piping and components	Carbon steel	Steam	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-15	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Steam	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No

VIII Steam Power Conversion System
B1. Main Steam System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-07	General piping and components	Carbon steel	Steam	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134	No
S-08	General piping and components	Carbon steel	Steam	Cumulative fatigue damage	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, "Metal Fatigue" for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA
S-15	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Steam	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No

VIII Steam Power Conversion System
B2. Main Steam System (BWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-05	General piping and components	Carbon steel	Steam	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515)	No
S-08	General piping and components	Carbon steel	Steam	Cumulative fatigue damage	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, "Metal Fatigue" for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA
S-15	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Steam	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No

VIII Steam Power Conversion System
C. Extraction Stream System

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-04	General piping and components	Carbon steel	Steam	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-06	General piping and components	Carbon steel	Steam	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-15	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Steam	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No

VIII Steam and Power Conversion System
D1. Feedwater System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-10	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-11	General piping and components	Carbon steel	Treated water	Cumulative fatigue damage	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, "Metal Fatigue" for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA
S-16	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Treated water	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No

VIII Steam and Power Conversion System
D2. Feedwater System (BWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-09	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-11	General piping and components	Carbon steel	Treated water	Cumulative fatigue damage	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, "Metal Fatigue" for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA
S-16	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Treated water	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No

VIII Steam and Power Conversion System
E. Condensate System

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-01	Buried piping and components	Carbon steel (with or without coating or wrapping)	Soil	Loss of material	Chapter XI.M28, "Buried Piping and Tanks Surveillance," or Chapter XI.M34, "Buried Piping and Tanks Inspection"	No Yes, detection of aging effects and operating experience are to be further evaluated
S-09	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-10	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

VIII Steam and Power Conversion System
E. Condensate System

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-13	General piping and components	Stainless steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-14	General piping and components	Stainless steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-16	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Treated water	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
S-18	Heat exchanger shell side components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

VIII Steam and Power Conversion System
E. Condensate System

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-19	Heat exchanger shell side components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-21	Heat exchanger shell side components	Stainless steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-22	Heat exchanger shell side components	Stainless steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-23	Heat exchanger tube side components	Carbon steel	Closed cycle cooling water	Loss of material	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No
S-24	Heat exchanger tube side components	Carbon steel	Raw water	Loss of material and macrofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
S-25	Heat exchanger tube side components	Stainless steel	Closed cycle cooling water	Loss of material	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No
S-26	Heat exchanger tube side components	Stainless steel	Raw water	Loss of material and macrofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No

VIII Steam and Power Conversion System
E. Condensate System

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-28	Heat exchanger tubes	Stainless steel	Raw water	Reduction of heat transfer	Chapter XI.M20, “Open-Cycle Cooling Water System”	No
S-31	Tank	Carbon steel	Air – outdoor (Ext)	Loss of material	Chapter XI.M29, “Aboveground Carbon Steel Tanks”	No

VIII Steam and Power Conversion System
F. Steam Generator Blowdown System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-10	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-16	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Treated water	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
S-19	Heat exchanger shell side components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-22	Heat exchanger shell side components	Stainless steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-23	Heat exchanger tube side components	Carbon steel	Closed cycle cooling water	Loss of material	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No

VIII Steam and Power Conversion System
F. Steam Generator Blowdown System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-24	Heat exchanger tube side components	Carbon steel	Raw water	Loss of material and macrofouling	Chapter XI.M20, “Open-Cycle Cooling Water System”	No
S-25	Heat exchanger tube side components	Stainless steel	Closed cycle cooling water	Loss of material	Chapter XI.M21, “Closed-Cycle Cooling Water System”	No
S-26	Heat exchanger tube side components	Stainless steel	Raw water	Loss of material and macrofouling	Chapter XI.M20, “Open-Cycle Cooling Water System”	No
S-28	Heat exchanger tubes	Stainless steel	Raw water	Reduction of heat transfer	Chapter XI.M20, “Open-Cycle Cooling Water System”	No

VIII Steam and Power Conversion System
G. Auxiliary Feedwater System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-01	Buried piping and components	Carbon steel (with or without coating or wrapping)	Soil	Loss of material	Chapter XI.M28, "Buried Piping and Tanks Surveillance," or Chapter XI.M34, "Buried Piping and Tanks Inspection"	No Yes, detection of aging effects and operating experience are to be further evaluated
S-10	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-11	General piping and components	Carbon steel	Treated water	Cumulative fatigue damage	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, "Metal Fatigue" for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA
S-12	General piping and components	Carbon steel	Untreated water	Loss of material and macrofouling	A plant-specific aging management program is to be evaluated.	Yes, plant specific

VIII Steam and Power Conversion System
G. Auxiliary Feedwater System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-14	General piping and components	Stainless steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-16	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Treated water	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
S-17	Heat exchanger shell side components	Carbon steel	Lubricating oil	Loss of material	A plant-specific aging management program is to be evaluated.	Yes, plant specific
S-20	Heat exchanger shell side components	Stainless steel	Lubricating oil	Loss of material	A plant-specific aging management program is to be evaluated.	Yes, plant specific
S-23	Heat exchanger tube side components	Carbon steel	Closed cycle cooling water	Loss of material	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No
S-24	Heat exchanger tube side components	Carbon steel	Raw water	Loss of material and macrofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
S-25	Heat exchanger tube side components	Stainless steel	Closed cycle cooling water	Loss of material	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No
S-26	Heat exchanger tube side components	Stainless steel	Raw water	Loss of material and macrofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
S-27	Heat exchanger tubes	Carbon steel	Raw water	Reduction of heat transfer	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
S-28	Heat exchanger tubes	Stainless steel	Raw water	Reduction of heat transfer	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
S-31	Tank	Carbon steel	Air – outdoor (Ext)	Loss of material	Chapter XI.M29, "Aboveground Carbon Steel Tanks"	No

VIII Steam and Power Conversion System
H. Carbon Steel Components

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-02	Closure bolting In high-pressure or high-temperature systems	Carbon steel	Air with steam or water leakage	Loss of material	Chapter XI.M18, "Bolting Integrity"	No
S-03	Closure bolting In high-pressure or high-temperature systems	Carbon steel	Air with steam or water leakage	Cracking	Chapter XI.M18, "Bolting Integrity"	No
S-29	Piping and components external surfaces and bolting	Carbon steel	Air – indoor uncontrolled (Ext)	Loss of material	A plant-specific aging management program is to be evaluated.	Yes, plant specific
S-30	Piping and components external surfaces and bolting	Carbon steel	Air with boric acid leakage	Loss of material/ Boric acid corrosion	Chapter XI.M10, "Boric Acid Corrosion"	No

VIII Steam and Power Conversion System
Additional MEAP Combinations Not Currently Addressed by NUREG-1801

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
	General piping and components	Carbon steel	Air – indoor controlled (Ext)	None	None	
	General piping and components	Carbon steel	Concrete	None	None	
	General piping and components	Carbon steel	Lubricating oil (no water pooling)	None	None	
	General piping and components	Carbon steel	Gas	None	None	
	General piping and components	Copper alloy	Gas	None	None	
	General piping and components	Copper-alloy	Air – indoor uncontrolled (Ext)	None	None	
	General piping and components	Copper-alloy	Lubricating oil (no water pooling)	None	None	
	General piping and components	Copper-alloy <15 % Zn	Closed cycle cooling water	Loss of material	Chapter XI.M21, “Closed-Cycle Cooling Water System”	No
	General piping and components	Glass	Air – indoor uncontrolled (Ext)	None	None	
	General piping and components	Glass	Lubricating oil	None	None	
	General piping and components	Nickel-alloy	Air – indoor uncontrolled (Ext)	None	None	
	General piping and components	Stainless steel	Air – indoor uncontrolled (Ext)	None	None	
	General piping and components	Stainless steel	Concrete	None	None	
	General piping and components	Stainless steel	Lubricating oil (no water pooling)	None	None	
	General piping and components	Stainless steel	Gas	None	None	

Line	Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-01	E.5-d G.1-e G.4-d	Buried piping and components	Carbon steel (with or without coating or wrapping)	Soil	Loss of material	Chapter XI.M28, "Buried Piping and Tanks Surveillance," or Chapter XI.M34, "Buried Piping and Tanks Inspection"	No Yes, detection of aging effects and operating experience are to be further evaluated
S-02	H.2-a	Closure bolting In high-pressure or high-temperature systems	Carbon steel	Air with steam or water leakage	Loss of material	Chapter XI.M18, "Bolting Integrity"	No
S-03	H.2-b	Closure bolting In high-pressure or high-temperature systems	Carbon steel	Air with steam or water leakage	Cracking	Chapter XI.M18, "Bolting Integrity"	No
S-04	A.1-b A.2-b C.1-b C.2-b	General piping and components	Carbon steel	Steam	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-05	B2.1-a B2.2-b	General piping and components	Carbon steel	Steam	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515)	No
S-06	A.1-b A.2-b C.1-b C.2-b	General piping and components	Carbon steel	Steam	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-07	B1.1-a B1.2-a	General piping and components	Carbon steel	Steam	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134	No

Line	Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-08	B1.1-b B2.1-c	General piping and components	Carbon steel	Steam	Cumulative fatigue damage	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, “Metal Fatigue” for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA
S-09	D2.1-b D2.2-b D2.3-b E.1-b E.2-b E.3-a E.5-a E.6-a	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, “Water Chemistry,” for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, “One-Time Inspection,” for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-10	D1.1-c D1.2-b D1.3-a E.1-b E.2-b E.3-a E.5-a E.6-a F.1-b F.2-b F.3-a G.1-c G.2-a G.3-a G.4-a	General piping and components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, “Water Chemistry,” for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, “One-Time Inspection,” for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-11	D1.1-b D2.1-c G.1-b	General piping and components	Carbon steel	Treated water	Cumulative fatigue damage	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, “Metal Fatigue” for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA

Line	Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-12	G.1-d	General piping and components	Carbon steel	Untreated water	Loss of material and macrofouling	A plant-specific aging management program is to be evaluated.	Yes, plant specific
S-13	E.5-b	General piping and components	Stainless steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-14	E.5-b G.4-b	General piping and components	Stainless steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-15	A.1-a A.2-a B1.1-c B1.2-b B2.1-b B2.2-a C.1-a C.2-a	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Steam	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
S-16	D1.1-a D1.2-a D1.3-b D2.1-a D2.2-a D2.3-a E.1-a E.2-a F.1-a F.2-a G.1-a	General piping and components susceptible to flow-accelerated corrosion	Carbon steel	Treated water	Loss of material/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No

Line	Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-17	G.5-d	Heat exchanger shell side components	Carbon steel	Lubricating oil	Loss of material	A plant-specific aging management program is to be evaluated.	Yes, plant specific
S-18	E.4-a E.4-d	Heat exchanger shell side components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-19	E.4-a E.4-d F.4-a F.4-d	Heat exchanger shell side components	Carbon steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-20	G.5-d	Heat exchanger shell side components	Stainless steel	Lubricating oil	Loss of material	A plant-specific aging management program is to be evaluated.	Yes, plant specific
S-21	E.4-a E.4-d	Heat exchanger shell side components	Stainless steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-22	E.4-a E.4-d F.4-a F.4-d	Heat exchanger shell side components	Stainless steel	Treated water	Loss of material	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-23	E.4-e F.4-e G.5-c	Heat exchanger tube side components	Carbon steel	Closed cycle cooling water	Loss of material	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No

Line	Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-24	E.4-b F.4-b G.5-a	Heat exchanger tube side components	Carbon steel	Raw water	Loss of material and macrofouling	Chapter XI.M20, “Open-Cycle Cooling Water System”	No
S-25	E.4-e F.4-e G.5-c	Heat exchanger tube side components	Stainless steel	Closed cycle cooling water	Loss of material	Chapter XI.M21, “Closed-Cycle Cooling Water System”	No
S-26	E.4-b F.4-b G.5-a	Heat exchanger tube side components	Stainless steel	Raw water	Loss of material and macrofouling	Chapter XI.M20, “Open-Cycle Cooling Water System”	No
S-27	G.5-b	Heat exchanger tubes	Carbon steel	Raw water	Reduction of heat transfer	Chapter XI.M20, “Open-Cycle Cooling Water System”	No
S-28	E.4-c F.4-c G.5-b	Heat exchanger tubes	Stainless steel	Raw water	Reduction of heat transfer	Chapter XI.M20, “Open-Cycle Cooling Water System”	No
S-29	H.1-b	Piping and components external surfaces and bolting	Carbon steel	Air – indoor uncontrolled (Ext)	Loss of material	A plant-specific aging management program is to be evaluated.	Yes, plant specific
S-30	H.1-a	Piping and components external surfaces and bolting	Carbon steel	Air with boric acid leakage	Loss of material/ Boric acid corrosion	Chapter XI.M10, “Boric Acid Corrosion”	No
S-31	E.5-c G.4-c	Tank	Carbon steel	Air – outdoor (Ext)	Loss of material	Chapter XI.M29, “Aboveground Carbon Steel Tanks”	No

Attachment 4 Steam and Power Conversion Systems