APPENDIX B

AGING MANAGEMENT PROGRAMS AND ACTIVITIES

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B.0 INTRODUCTION

B.0.1 OVERVIEW

The aging management review results for the integrated plant assessment of Cooper Nuclear Station (CNS) are presented in Sections 3.1 through 3.6 of this application. The programs credited in the integrated plant assessment for managing aging effects are described in this appendix.

Each aging management program described in this appendix has ten elements in accordance with the guidance in NUREG-1800 (Reference B.2-1) Appendix A.1, "Aging Management Review – Generic," Table A.1-1, "Elements of an Aging Management Program for License Renewal." For aging management programs that are comparable to the programs described in Sections X and XI of NUREG-1801 (Reference B.2-2), *Generic Aging Lessons Learned (GALL) Report*, the ten elements have been compared to the elements of the NUREG-1801 program. For plant-specific programs that do not correlate with NUREG-1801, the ten elements are addressed in the program description.

B.0.2 FORMAT OF PRESENTATION

For those aging management programs that are comparable to the programs described in Sections X and XI of NUREG-1801, the program discussion is presented in the following format.

- **Program Description**: abstract of the overall program.
- **NUREG-1801 Consistency**: summary of the degree of consistency between the CNS program and the corresponding NUREG-1801 program, when applicable (i.e., degree of similarity, etc.).
- **Exceptions to NUREG-1801**: exceptions to the NUREG-1801 program, including a justification for the exceptions (when applicable).
- **Enhancements**: future program enhancements with a proposed schedule for their completion (when applicable), including additional program features to manage aging effects not addressed by the NUREG-1801 program.
- **Operating Experience**: discussion of operating experience information specific to the program.
- **Conclusion**: statement of reasonable assurance that the program is effective, or will be effective, once implemented with necessary enhancements.

For plant-specific programs, a complete discussion of the ten elements of NUREG-1800 Table A.1-1 is provided.

B.0.3 CORRECTIVE ACTIONS, CONFIRMATION PROCESS AND ADMINISTRATIVE CONTROLS

Three elements common to all aging management programs are corrective actions, confirmation process and administrative controls. Discussion of these elements is presented below. Corrective actions have program-specific details which are included in the descriptions of the individual programs in this report, but further discussion of the confirmation process and administrative controls is not necessary and is not included in the descriptions of the individual programs.

Corrective Actions

CNS quality assurance (QA) procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B. Conditions adverse to quality, such as failures, malfunctions, deviations, defective material and equipment, and nonconformances, are promptly identified and corrected. In the case of significant conditions adverse to quality, measures are implemented to ensure that the cause of the nonconformance is determined and that corrective action is taken to preclude recurrence. In addition, the root cause of the significant condition adverse to quality and the corrective action implemented are documented and reported to appropriate levels of management. The corrective action controls of the CNS (10 CFR Part 50, Appendix B) Quality Assurance Program are applicable to all aging management programs and activities during the period of extended operation.

Confirmation Process

CNS QA procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B. The CNS Quality Assurance Program applies to CNS safety-related structures and components. Corrective actions and administrative (document) control for both safety-related and nonsafety-related structures and components are accomplished per the existing CNS Corrective Action Program and Document Control Program. The confirmation process is part of the Corrective Action Program and includes

- reviews to assure that proposed actions are adequate,
- tracking and reporting of open corrective actions, and
- review of corrective action effectiveness.

Any follow-up inspection required by the confirmation process is documented in accordance with the Corrective Action Program. The Corrective Action Program constitutes the confirmation process for aging management programs and activities. The CNS confirmation process is consistent with NUREG-1801.

Administrative Controls

CNS QA procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B. The CNS Quality Assurance Program applies to CNS safety-related structures and components. Administrative (document) control for both safety-related and nonsafety-related structures and components is accomplished per the existing document control program. The CNS administrative controls are consistent with NUREG-1801.

B.0.4 OPERATING EXPERIENCE

Operating experience for the programs and activities credited with managing the effects of aging was reviewed. The operating experience review included a review of corrective actions resulting in program enhancements. For inspection programs, reports of recent inspections, examinations, or tests were reviewed to determine if aging effects have been identified on applicable components. For monitoring programs, reports of sample results were reviewed to determine if parameters are being maintained as required by the program. Also, program owners contributed evidence of program success or weakness and identified applicable self-assessments, QA audits, peer evaluations, and NRC reviews.

Site procedures for evaluating operating experience require reviews of site and relevant industry OE as the site continues operation through the license renewal period.

B.0.5 AGING MANAGEMENT PROGRAMS

Table B-1 lists the aging management programs described in this appendix. Programs are identified as either existing or new. The programs are either comparable to programs described in NUREG-1801 or are plant-specific. The correlation between NUREG-1801 programs and CNS programs is shown in Table B-2.

Table B-1
Aging Management Programs

Program	Section	New or Existing
Aboveground Steel Tanks	B.1.1	new
Bolting Integrity	B.1.2	existing
Buried Piping and Tanks Inspection	B.1.3	new
BWR CRD Return Line Nozzle	B.1.4	existing
BWR Feedwater Nozzle	B.1.5	existing
BWR Penetrations	B.1.6	existing
BWR Stress Corrosion Cracking	B.1.7	existing
BWR Vessel ID Attachment Welds	B.1.8	existing
BWR Vessel Internals	B.1.9	existing
Containment Inservice Inspection	B.1.10	existing
Containment Leak Rate	B.1.11	existing
Diesel Fuel Monitoring	B.1.12	existing
Environmental Qualification (EQ) of Electric Components	B.1.13	existing
External Surfaces Monitoring	B.1.14	existing
Fatigue Monitoring	B.1.15	existing
Fire Protection	B.1.16	existing
Fire Water System	B.1.17	existing
Flow-Accelerated Corrosion	B.1.18	existing
Inservice Inspection–ISI	B.1.19	existing
Inservice Inspection–IWF	B.1.20	existing
Masonry Wall	B.1.21	existing
Metal-Enclosed Bus Inspection Program	B.1.22	new

Table B-1
Aging Management Programs (Continued)

Program	Section	New or Existing
Neutron Absorber Monitoring	B.1.23	existing
Non-EQ Bolted Cable Connections	B.1.24	new
Non-EQ Inaccessible Medium-Voltage Cable	B.1.25	new
Non-EQ Instrumentation Circuits Test Review	B.1.26	new
Non-EQ Insulated Cables and Connections	B.1.27	new
Oil Analysis	B.1.28	existing
One-Time Inspection	B.1.29	new
One-Time Inspection – Small-Bore Piping	B.1.30	new
Periodic Surveillance and Preventive Maintenance	B.1.31	existing
Reactor Head Closure Studs	B.1.32	existing
Reactor Vessel Surveillance	B.1.33	existing
Selective Leaching	B.1.34	new
Service Water Integrity	B.1.35	existing
Structures Monitoring	B.1.36	existing
Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)	B.1.37	new
Water Chemistry Control – Auxiliary Systems	B.1.38	existing
Water Chemistry Control – BWR	B.1.39	existing
Water Chemistry Control – Closed Cooling Water	B.1.40	existing

B.0.6 CORRELATION WITH NUREG-1801 AGING MANAGEMENT PROGRAMS

The correlation between NUREG-1801 programs and CNS programs is shown below. For the CNS programs, links to appropriate sections of this appendix are provided.

Table B-2
CNS AMP Correlation with NUREG-1801 Programs

NUREG-1801 Number	NUREG-1801 Program	CNS Program
X.E1	Environmental Qualification (EQ) of Electric Components	Environmental Qualification (EQ) of Electric Components [B.1.13]
X.M1	Metal Fatigue of Reactor Coolant Pressure Boundary	Fatigue Monitoring [B.1.15]
X.S1	Concrete Containment Tendon Prestress	CNS does not have pre-stressed tendons in the containment structures. The NUREG-1801 program does not apply.
XI.M1	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	Inservice Inspection – ISI [B.1.19]
XI.M2	Water Chemistry	Water Chemistry Control – BWR [B.1.39]
XI.M3	Reactor Head Closure Studs	Reactor Head Closure Studs [B.1.32]
XI.M4	BWR Vessel ID Attachment Welds	BWR Vessel ID Attachment Welds [B.1.8]
XI.M5	BWR Feedwater Nozzle	BWR Feedwater Nozzle [B.1.5]
XI.M6	BWR Control Rod Drive Return Line Nozzle	BWR CRD Return Line Nozzle [B.1.4]
XI.M7	BWR Stress Corrosion Cracking	BWR Stress Corrosion Cracking [B.1.7]
XI.M8	BWR Penetrations	BWR Penetrations [B.1.6]
XI.M9	BWR Vessel Internals	BWR Vessel Internals [B.1.9]
XI.M10	Boric Acid Corrosion	CNS is a BWR. The NUREG-1801 program does not apply.

Table B-2
CNS AMP Correlation with NUREG-1801 Programs (Continued)

NUREG-1801 Number	NUREG-1801 Program	CNS Program
XI.M11	Nickel-Alloy Nozzles and Penetrations	CNS is a BWR. The NUREG-1801 program does not apply.
XI.M11A	Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors	CNS is a BWR. The NUREG-1801 program does not apply.
XI.M12	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	Not credited for aging management. Refer to the Thermal Aging and Neutron Irradiation Embrittlement of CASS Program. [B.1.37]
XI.M13	Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)	Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) [B.1.37]
XI.M14	Loose Part Monitoring	Not credited for aging management.
XI.M15	Neutron Noise Monitoring	Not credited for aging management.
XI.M16	PWR Vessel Internals	CNS is a BWR. The NUREG-1801 program does not apply.
XI.M17	Flow-Accelerated Corrosion	Flow-Accelerated Corrosion Program [B.1.18]
XI.M18	Bolting Integrity	Bolting Integrity [B.1.2]
XI.M19	Steam Generator Tube Integrity	CNS is a BWR. The NUREG-1801 program does not apply.
XI.M20	Open-Cycle Cooling Water System	Service Water Integrity [B.1.35]
XI.M21	Closed-Cycle Cooling Water System	Water Chemistry Control – Closed Cooling Water [B.1.40]

Table B-2
CNS AMP Correlation with NUREG-1801 Programs (Continued)

NUREG-1801 Number	NUREG-1801 Program	CNS Program
XI.M22	Boraflex Monitoring	Spent fuel racks at CNS use "Boral" and "Metamic" as the neutron absorbers (rather than Boraflex). The NUREG-1801 program does not apply.
XI.M23	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	Not credited for aging management. The Structures Monitoring Program [B.1.36] and the Periodic Surveillance and Preventive Maintenance Program [B.1.31] manage the effects of aging for crane components.
XI.M24	Compressed Air Monitoring	Not credited for aging management. Programs identified in Section 3.3.2.1.10 manage the effects of aging for compressed air system components.
XI.M25	BWR Reactor Water Cleanup System	Not credited for aging management. Refer to relevant discussion in Table 3.3.1, Item 3.3.1-37.
XI.M26	Fire Protection	Fire Protection [B.1.16]
XI.M27	Fire Water System	Fire Water System [B.1.17]
XI.M28	Buried Piping and Tanks Surveillance	Not credited for aging management. The Buried Piping and Tanks Inspection Program [B.1.3] manages the effects of aging on buried piping and tanks.
XI.M29	Aboveground Steel Tanks	Aboveground Steel Tanks [B.1.1]
XI.M30	Fuel Oil Chemistry	Diesel Fuel Monitoring [B.1.12]
XI.M31	Reactor Vessel Surveillance	Reactor Vessel Surveillance [B.1.33]
XI.M32	One-Time Inspection	One-Time Inspection [B.1.29]
XI.M33	Selective Leaching of Materials	Selective Leaching [B.1.34]

Table B-2
CNS AMP Correlation with NUREG-1801 Programs (Continued)

NUREG-1801 Number	NUREG-1801 Program	CNS Program
XI.M34	Buried Piping and Tanks Inspection	Buried Piping and Tanks Inspection Program [B.1.3]
XI.M35	One-time Inspection of ASME Code Class 1 Small-Bore Piping	One-Time Inspection – Small-Bore Piping [B.1.30]
XI.M36	External Surfaces Monitoring	External Surfaces Monitoring [B.1.14]
XI.M37	Flux Thimble Tube Inspection	CNS is a BWR. The NUREG-1801 program does not apply.
XI.M38	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	Not credited for aging management. The External Surfaces Monitoring Program [B.1.14] or the Periodic Surveillance and Preventive Maintenance Program [B.1.31] manage the effects of aging on internal surfaces of piping and ducting components.
XI.M39	Lubricating Oil Analysis	Oil Analysis [B.1.28]
XI.E1	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Non-EQ Insulated Cables and Connections [B.1.27]
XI.E2	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	Non-EQ Instrumentation Circuits Test Review [B.1.26]
XI.E3	Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Non-EQ Inaccessible Medium-Voltage Cable [B.1.25]
XI.E4	Metal Enclosed Bus	Metal-Enclosed Bus Inspection [B.1.22]

Table B-2
CNS AMP Correlation with NUREG-1801 Programs (Continued)

NUREG-1801 Number	NUREG-1801 Program	CNS Program
XI.E5	Fuse Holders	Not credited for aging management. Refer to relevant discussion in Table 3.6.1, Item 3.6.1-6.
XI.E6	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	See Non-EQ Bolted Cable Connections [B.1.24] for an alternative.
XI.S1	ASME Section XI, Subsection IWE	Containment Inservice Inspection [B.1.10]
XI.S2	ASME Section XI, Subsection IWL	CNS does not have a concrete containment. The NUREG-1801 program does not apply.
XI.S3	ASME Section XI, Subsection IWF	Inservice Inspection – IWF [B.1.20]
XI.S4	10 CFR 50, Appendix J	Containment Leak Rate [B.1.11]
XI.S5	Masonry Wall Program	Masonry Wall Program [B.1.21]
XI.S6	Structures Monitoring Program	Structures Monitoring [B.1.36]
XI.S7	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	Not credited for aging management. The Structures Monitoring Program [B.1.36] manages the effects of aging on water control structures.
XI.S8	Protective Coating Monitoring and Maintenance Program	Not credited for aging management. The Containment Inservice Inspection Program [B.1.10] manages the effects of aging on the drywell shell.
Plant-Specific Programs		
NA	Plant-specific program	Neutron Absorber Monitoring [B.1.23]
NA	Plant-specific program	Non-EQ Bolted Cable Connections [B.1.24]

Table B-2
CNS AMP Correlation with NUREG-1801 Programs (Continued)

NUREG-1801 Number	NUREG-1801 Program	CNS Program
NA	Plant-specific program	Periodic Surveillance and Preventive Maintenance [B.1.31]
NA	Plant-specific program	Water Chemistry Control – Auxiliary Systems [B.1.38]

Table B-3 indicates the consistency of CNS programs with NUREG-1801 programs.

Table B-3
CNS Program Consistency with NUREG-1801

Program Name	Plant Specific	NUREG-1801 Comparison		
		Consistent with NUREG-1801	Programs with Enhancements	Programs with Exceptions to NUREG-1801
Aboveground Steel Tanks		X		
Bolting Integrity		X	X	
Buried Piping and Tanks Inspection		X		
BWR CRD Return Line Nozzle		X		
BWR Feedwater Nozzle				X
BWR Penetrations		X		
BWR Stress Corrosion Cracking				X
BWR Vessel ID Attachment Welds		X		
BWR Vessel Internals		X	X	

Table B-3
CNS Program Consistency with NUREG-1801 (Continued)

Program Name	Plant Specific	NUREG-1801 Comparison		
		Consistent with NUREG-1801	Programs with Enhancements	Programs with Exceptions to NUREG-1801
Containment Inservice Inspection		X	X	
Containment Leak Rate				X
Diesel Fuel Monitoring			X	X
Environmental Qualification (EQ) of Electric Components		X		
External Surfaces Monitoring		X	X	
Fatigue Monitoring		X	X	
Fire Protection			X	X
Fire Water System			X	X
Flow-Accelerated Corrosion			X	X
Inservice Inspection – ISI				X
Inservice Inspection – IWF			X	X
Masonry Wall		X	X	
Metal-Enclosed Bus Inspection				X
Neutron Absorber Monitoring	X			
Non-EQ Bolted Cable Connections	X			
Non-EQ Inaccessible Medium-Voltage Cable		X		
Non-EQ Instrumentation Circuits Test Review		X		

Table B-3
CNS Program Consistency with NUREG-1801 (Continued)

Program Name	Plant Specific	NUREG-1801 Comparison		
		Consistent with NUREG-1801	Programs with Enhancements	Programs with Exceptions to NUREG-1801
Non-EQ Insulated Cables and Connections		X		
Oil Analysis		X	X	
One-Time Inspection		X		
One-Time Inspection – Small-Bore Piping		X		
Periodic Surveillance and Preventive Maintenance	X			
Reactor Head Closure Studs				X
Reactor Vessel Surveillance		X	X	
Selective Leaching		X		
Service Water Integrity		X		
Structures Monitoring		X	X	
Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)		X		
Water Chemistry Control – Auxiliary Systems	X			
Water Chemistry Control – BWR		X		
Water Chemistry Control – Closed Cooling Water				X

B.1 AGING MANAGEMENT PROGRAMS AND ACTIVITIES

B.1.1 ABOVEGROUND STEEL TANKS

Program Description

The Aboveground Steel Tanks Program is a new program that will manage loss of material from external surfaces of outdoor, aboveground carbon steel tanks by periodic visual inspection of external surfaces and thickness measurement of locations that are inaccessible for external visual inspection.

NUREG-1801 Consistency

The Aboveground Steel Tanks Program will be consistent with the program described in NUREG-1801, Section XI.M29, Aboveground Steel Tanks.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Aboveground Steel Tanks Program is a new program. Industry operating experience will be considered when implementing this program. Plant operating experience for this program will be gained as it is implemented during the period of extended operations, and will be factored into the program via the confirmation and corrective action elements of the CNS 10 CFR 50 Appendix B quality assurance program.

The CNS program is based on the program description in NUREG-1801, which in turn is based on industry operating experience that demonstrates that this program is effective for managing the aging effects described herein. As such, operating experience assures that implementation of the Aboveground Steel Tanks Program will manage the effects of aging such that applicable components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

Conclusion

The Aboveground Steel Tanks Program will be effective for managing aging effects since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. The Aboveground Steel Tanks Program provides assurance that effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.2 BOLTING INTEGRITY

Program Description

The Bolting Integrity Program is an existing program that relies on recommendations for a comprehensive bolting integrity program, as delineated in NUREG-1339, industry recommendations, and Electric Power Research Institute (EPRI) NP-5769, with the exceptions noted in NUREG-1339 for safety-related bolting. The program relies on industry recommendations for comprehensive bolting maintenance, as delineated in EPRI TR-104213 for pressure retaining bolting and structural bolting.

The program applies to bolting and torquing practices of safety- and nonsafety-related bolting for pressure retaining components, NSSS component supports, and structural joints. The program addresses all bolting regardless of size except reactor head closure studs, which are addressed by the Reactor Head Closure Studs Program [B.1.32]. The program includes periodic inspection of closure bolting for signs of leakage that may be due to crack initiation, loss of preload, or loss of material due to corrosion. The program also includes preventive measures to preclude or minimize loss of preload and cracking.

NUREG-1801 Consistency

The Bolting Integrity Program, with enhancements, is consistent with the program described in NUREG-1801, Section XI.M18, Bolting Integrity.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Elements Affected	Enhancement
1. Scope of Program	The Bolting Integrity Program will be enhanced to include guidance from EPRI NP-5769 and EPRI TR-104213 for material selection and testing, bolting preload control, ISI, plant operation and maintenance, and evaluation of the structural integrity of bolted joints.

Elements Affected	Enhancement
2. Preventive Actions	The Bolting Integrity Program will be enhanced to clarify that actual yield strength is used in selecting materials for low susceptibility to SCC, to clarify the prohibition on use of lubricants containing MoS_2 for bolting at CNS, and to specify that proper gasket compression will be visually verified following assembly.
7. Corrective Actions	The Bolting Integrity Program will be enhanced to include guidance from EPRI NP-5769 and EPRI TR-104213 for replacement of non-Class 1 bolting and disposition of degraded structural bolting.

Operating Experience

Corroded bolting and fasteners were identified in 2005 in the auxiliary steam and service water systems and in 2006 in the radwaste (Z sump for plant drains) system. Bolting was replaced on the valve in the auxiliary steam system. Corrosion on bolting in the service water system was removed and the bolting was painted with corrosion preventive material. The corrosion on the fasteners in the Z sump was evaluated as superficial and did not compromise structural integrity.

In 2003 and 2005, VT-1 inspections were completed of the drywell head fasteners. In 2003 numerous recordable conditions such as arc strikes, necking, washer gouging, galling on bolt shafts and “machining” chatter on threads were noted. Evaluation of these conditions indicated that only the bolts subject to arc strike, necking and “machining” chatter required replacement. Gouged washers and galled bolts were determined acceptable “as-is.” Inspections of drywell head fasteners in 2005 indicated only a gouged washer that required replacement.

In 2003 steam leakage from a flanged connection was noted during in-service leak testing. This leakage was corrected by additional torquing on the flange in accordance with plant procedures.

In 2002 personnel identified an apparent increase in steam leakage from the moisture separator manways. Evaluation determined that bolt lubricant had been applied to newly specified gaskets with non-asbestos materials as well as to the bolting. The gasket vendor indicated that the bolt lubricant had a deleterious effect on the new gaskets. Gaskets that were subject to this condition were replaced and maintenance procedures were revised to assure the bolt lubricant was not used on the gaskets.

The Bolting Integrity Program has been effective in identification of conditions and program deficiencies. Appropriate corrective actions have been implemented to correct program deficiencies and to ensure future integrity of the bolted connections. This provides assurance that the program will remain effective for managing loss of material. The history of identification of degradation and initiation of corrective action prior to loss of intended function provide assurance that the program is effective for managing aging effects for passive components.

Conclusion

The Bolting Integrity Program has been effective at managing aging effects. The Bolting Integrity Program assures the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.3 BURIED PIPING AND TANKS INSPECTION

Program Description

The Buried Piping and Tanks Inspection Program is a new program that will include (a) preventive measures to mitigate corrosion and (b) inspections to manage the effects of corrosion on the pressure-retaining capability of buried carbon steel, gray cast iron, and stainless steel components. Preventive measures will be in accordance with standard industry practice for maintaining external coatings and wrappings. Buried components will be inspected when excavated during maintenance. If trending within the Corrective Action Program identifies susceptible locations, the areas with a history of corrosion problems are evaluated for the need for additional inspection, alternate coating, or replacement.

Prior to entering the period of extended operation, plant operating experience will be reviewed to verify that an inspection occurred within the past ten years. If an inspection did not occur, a focused inspection will be performed prior to the period of extended operation. A focused inspection will be performed within the first ten years of the period of extended operation, unless an opportunistic inspection occurs within this ten-year period. A “focused inspection” is defined as an inspection performed in areas with a history of corrosion problems and in areas with the highest likelihood of corrosion problems.

This program will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The Buried Piping and Tanks Inspection Program will be consistent with the program described in NUREG-1801, Section XI.M34, Buried Piping and Tanks Inspection.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Buried Piping and Tanks Inspection Program is a new program. Industry operating experience will be considered when implementing this program. Plant operating experience for this program will be gained as it is implemented during the period of extended operations, and will be factored into the program via the confirmation and corrective action elements of the CNS 10 CFR 50 Appendix B quality assurance program.

The CNS program is based on the program description in NUREG-1801, which in turn is based on industry operating experience that demonstrates that this program is effective for managing the aging effects described herein. As such, operating experience assures that implementation of the Buried Piping and Tanks Inspection Program will manage the effects of aging such that applicable components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

Conclusion

The Buried Piping and Tanks Inspection Program will be effective for managing aging effects since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. The Buried Piping and Tanks Inspection Program provides assurance that effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.4 BWR CRD RETURN LINE NOZZLE

Program Description

The BWR Control Rod Drive (CRD) Return Line Nozzle Program is an existing program.

Under this program, CNS has cut and capped the CRD return line nozzle to mitigate fatigue cracking and continues Inservice Inspection (ISI) examinations using ASME Section XI to monitor the effects of crack initiation and growth on the intended function of the control rod drive return line nozzle. ISI examinations include ultrasonic inspection of the nozzle inside radius section and nozzle-to-vessel weld. CNS also conducts UT examinations of the CRD return line nozzle-to-cap weld in accordance with the guidelines of staff-approved boiling water reactor vessel and internals project (BWRVIP) document BWRVIP-75-A as part of the BWR Stress Corrosion Cracking Program [B.1.7].

NUREG-1801 Consistency

The BWR CRD Return Line Nozzle Program is consistent with the program described in NUREG-1801, Section XI.M6, BWR Control Rod Drive Return Line Nozzle.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

During RE22 in 2005 the control rod drive return line nozzle inner radius weld and the nozzle-to-shell weld were ultrasonically examined and found acceptable. Absence of aging effects indicates that the preventive actions of the program have been effective.

The CRD Return Line Nozzle Program detects aging effects using nondestructive examination visual, surface and volumetric techniques to detect and characterize flaws. These techniques are widely used and have been demonstrated effective at detecting aging effects during inspections performed to meet ASME Section XI Code requirements. In addition, BWRVIP-75-A is based on industry-wide experience at BWR plants. The application of these proven methods provides assurance that the effects of aging will be managed such that the CRD return line nozzle components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

Conclusion

The BWR CRD Return Line Nozzle Program has been effective at managing aging effects. The BWR CRD Return Line Nozzle Program assures the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.5 BWR FEEDWATER NOZZLE

Program Description

The BWR Feedwater Nozzle Program is an existing program.

Under this program, CNS has removed feedwater nozzle cladding and installed a double piston ring, triple thermal sleeve sparger to mitigate cracking. This program implements enhanced inservice inspection (ISI) of the feedwater nozzles in accordance with the requirements of ASME Section XI, Subsection IWB and the recommendation of General Electric (GE) NE 523-A71-0594-A to detect cracking.

NUREG-1801 Consistency

The BWR Feedwater Nozzle Program is consistent with the program described in NUREG-1801, Section XI.M5, BWR Feedwater Nozzle, with one exception.

Exceptions to NUREG-1801

The BWR Feedwater Nozzle Program is consistent with the program described in NUREG-1801, Section XI.M5, BWR Feedwater Nozzle, with the following exception.

Elements Affected	Exceptions
2. Preventive Actions	NUREG-1801 recommends performing low-flow modifications of the feedwater control system and rerouting of the reactor water cleanup (RWCU) system as recommended in NUREG-0619. CNS has not performed these modifications and rerouting.[1]

Exception Note

1. These modifications were recommended in NUREG-0619 to decrease the magnitude and frequency of temperature fluctuations and thus prevent crack initiation and limit crack growth, thereby permitting an extension of the time between required inspections. At that time, CNS accepted the NUREG-0619 inspection intervals, without extension, since the existing feedwater flow control system was found to provide satisfactory low-flow control and rerouting of the RWCU system was not necessary due to the low ratio of RWCU flow to feedwater flow. Thus, the low-flow and RWCU modifications were not necessary. Subsequently, GE-NE-523-A71-0594-A was approved in which the use of modern UT techniques coupled with plant-specific fracture mechanics assessments that utilize actual plant thermal cycle duty negated the need for NUREG-0619 penetrant test examinations and permitted reduction of the NUREG-0619 UT exam frequency. The CNS feedwater nozzle fracture mechanics analysis (without low-flow and RWCU modifications) supports an examination schedule of one examination each inspection

interval consistent with ASME Section XI. Since inspections to monitor for crack initiation and growth will continue per ASME Section XI, the low-flow and RWCU modifications are not necessary to assure that the feedwater nozzles can perform their intended function consistent with the current licensing basis through the period of extended operation.

Enhancements

None

Operating Experience

Reactor pressure vessel inner radius section ultrasonic examinations were performed for nozzles N4A, N4B, N4C and N4D in 2005 during RE22. No indications that required evaluation were recorded during these examinations. Absence of aging effects indicates that the preventive actions of the program have been effective.

The BWR Feedwater Nozzle Program detects aging effects using nondestructive examination (NDE) visual, surface and volumetric techniques to detect and characterize flaws. These techniques are widely used and have been demonstrated effective at detecting aging effects during inspections performed to meet ASME Section XI Code requirements. The application of these proven methods provides assurance that the effects of aging will be managed such that the BWR feedwater nozzle components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

Conclusion

The BWR Feedwater Nozzle Program has been effective at managing aging effects. The BWR Feedwater Nozzle Program assures the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.6 BWR PENETRATIONS

Program Description

The BWR Penetrations Program is an existing program that includes (a) inspection and flaw evaluation in conformance with the guidelines of staff-approved boiling water reactor vessel and internals project (BWRVIP) documents BWRVIP-27-A and BWRVIP-49-A and (b) monitoring and control of reactor coolant water chemistry in accordance with the guidelines of BWRVIP-130 to ensure the long-term integrity of vessel penetrations and nozzles.

NUREG-1801 Consistency

The BWR Penetrations Program is consistent with the program described in NUREG-1801, Section XI.M8, BWR Penetrations.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The nozzle-to-safe-end welds of instrument nozzle 16B1 and SLC nozzle N10 were ultrasonically examined and found acceptable in 2005 during RE22. Each of the instrument penetration nozzles (N11A/B, N12A/B, and N16A/B) were inspected and found acceptable during pressure testing in RE21 in 2003 and RE23 in 2005. Absence of aging effects indicates that the preventive actions of the program have been effective.

The BWR Penetrations Program detects aging effects using nondestructive examination visual, surface and volumetric techniques to detect and characterize flaws. These techniques are widely used and have been demonstrated effective at detecting aging effects during inspections performed to meet ASME Section XI Code requirements. In addition, the BWRVIP programs are based on industry-wide experience at BWR plants. The application of these proven methods provides assurance that the effects of aging will be managed such that the BWR Penetrations Program components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

Conclusion

The BWR Penetrations Program has been effective at managing aging effects. The BWR Penetrations Program assures the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.7 BWR STRESS CORROSION CRACKING

Program Description

The BWR Stress Corrosion Cracking Program is an existing program that includes (a) preventive measures to mitigate intergranular stress corrosion cracking (IGSCC), and (b) inspection and flaw evaluation to monitor IGSCC and its effects on reactor coolant pressure boundary components made of stainless steel, CASS, or nickel alloy. CNS has taken actions to prevent IGSCC and will continue to use materials resistant to IGSCC for component replacements and repairs following the recommendations delineated in NUREG-0313, Generic Letter 88-01, Generic Letter 88-01 Supplement 1, and the staff-approved BWRVIP-75-A report. Inspection of piping identified in NRC Generic Letter 88-01 to detect and size cracks is performed in accordance with the staff positions on schedule, method, personnel qualification and sample expansion included in the generic letter and the staff-approved BWRVIP-75-A report.

NUREG-1801 Consistency

The BWR Stress Corrosion Cracking Program is consistent with the program described in NUREG-1801, Section XI.M7, BWR Stress Corrosion Cracking, with one exception.

Exceptions to NUREG-1801

The BWR Stress Corrosion Cracking Program is consistent with the program described in NUREG-1801, Section XI.M7, BWR Stress Corrosion Cracking with the following exception.

Elements Affected	Exception
4. Detection of Aging Effects 5. Monitoring and Trending	NUREG-1801 recommends the use of GL 88-01 to determine the scope of welds selected for examination. CNS also bases this scope on risk informed methodology approved by NRC.[1]

Exception Notes

1. Significant industry attention has been devoted to the application of risk-informed selection criteria in order to determine the scope of inservice inspection programs at nuclear power plants. CNS applied the methodology documented in the NRC-approved EPRI Topical Report TR-112657 in the development of the CNS Risk-Informed Inservice Inspection (RI-ISI) Program. Although the use of this methodology for the selection and subsequent examination of Class 1 piping welds creates a different inspection schedule for GL 88-01 Category A welds than that delineated in NRC GL 88-01 or BWRVIP-75-A, it provides an acceptable level of quality and safety. This alternative to the ASME code has been approved in accordance with the provisions of 10 CFR 50.55a(a)(3) for the 4th interval. To continue the alternative in subsequent intervals during the period of extended operation, approval must be obtained in accordance with 10 CFR 50.55a.

Enhancements

None

Operating Experience

In 2000 during RE19, safe end nozzles and piping components were ultrasonically examined and found acceptable. Examinations during RE19 in 2000 and RE22 in 2005 for a nozzle cap had recordable indications, which were caused by ID geometry and determined to be acceptable. Absence of aging effects indicates that the preventive actions of the program have been effective.

The BWR Stress Corrosion Cracking Program detects aging effects using nondestructive examination (NDE) visual, surface and volumetric techniques to detect and characterize flaws. These techniques are widely used and have been demonstrated effective at detecting aging effects during inspections performed to meet ASME Section XI Code requirements. In addition, BWRVIP-75-A is based on industry-wide experience at BWR plants. The application of these proven methods provides assurance that the effects of aging will be managed such that the BWR Stress Corrosion Cracking Program components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

Conclusion

The BWR Stress Corrosion Cracking Program has been effective at managing aging effects. The BWR Stress Corrosion Cracking Program assures the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.8 BWR VESSEL ID ATTACHMENT WELDS

Program Description

The BWR Vessel ID Attachment Welds Program is an existing program that includes (a) inspection and flaw evaluation in accordance with the guidelines of staff-approved boiling water reactor vessel and internals project (BWRVIP) BWRVIP-48-A and (b) monitoring and control of reactor coolant water chemistry in accordance with the guidelines of BWRVIP-130 (EPRI Report 1008192) to ensure the long-term integrity and safe operation of reactor vessel inside diameter (ID) attachment welds and support pads.

NUREG-1801 Consistency

The BWR Vessel ID Attachment Welds Program is consistent with the program described in NUREG-1801, Section XI.M4, BWR Vessel ID Attachment Welds.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

In 2000 during RE19 and 2003 during RE21, a combination of components including guide rod brackets, feedwater sparger brackets, and core spray sparger brackets was examined with no recordable indications for the guide rod and feedwater sparger brackets. Indications found in 2000 during RE19 on the core spray sparger brackets were determined to be acceptable.

In 2003 during RE21, jet pump riser brace attachment pad welds and steam dryer support brackets were examined with no indications.

In 2005 during RE22, holddown brackets for the surveillance specimens and steam dryer were examined with no indications. The jet pump riser brace attachment was also examined with no indications. Absence of aging effects indicates that the preventive actions of the program have been effective.

The BWR Vessel ID Attachment Welds Program detects aging effects using nondestructive examination (NDE) visual, surface and volumetric techniques to detect and characterize flaws. These techniques are widely used and have been demonstrated effective at detecting aging effects during inspections performed to meet ASME Section XI Code requirements. In addition, BWRVIP-48 is based on industry-wide experience at BWR plants. The application of these proven methods provides assurance that the effects of aging will be managed such that the BWR Vessel ID Attachment Welds Program components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

Conclusion

The BWR Vessel ID Attachment Welds Program has been effective at managing aging effects. The BWR Vessel ID Attachment Welds Program assures the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.9 BWR VESSEL INTERNALS

Program Description

The BWR Vessel Internals Program is an existing program that includes (a) inspection, flaw evaluation, and repair in conformance with the applicable, staff-approved BWR reactor vessel and internals project (BWRVIP) documents and (b) monitoring and control of reactor coolant water chemistry in accordance with the guidelines of BWRVIP-130 to ensure the long-term integrity of vessel internal components. In addition, the BWR Vessel Internals Program includes inspection of the steam dryer in accordance with BWRVIP-139 guidance.

NUREG-1801 Consistency

The BWR Vessel Internals Program, with enhancements, is consistent with the program described in NUREG-1801, Section XI.M9, BWR Vessel Internals.

Exceptions to NUREG-1801

None

Enhancements

The following enhancement will be implemented prior to the period of extended operation.

Elements Affected	Enhancements
1. Scope of Program	In addition to the scope of program described in NUREG-1801, CNS scope of program will include actions to replace the plugs in the core plate bypass holes based on their qualified life.

Operating Experience

In 2000 during RE19, the core spray sparger and brackets were inspected. Five indications were dispositioned as acceptable. In 2001 additional welds were examined with no indications. In 2003 welds were examined, including some of the same welds examined in 2001 and found no indications. In 2006 welds were examined with no indications observed.

In 2000 during RE19, a combination of vessel internal components was examined with no recordable indications with the exception of the core spray piping. Indications in the core spray piping were reexamined as they have been since 1995 during each pursuant outage. These indications have been evaluated as acceptable in each case. Indications were found in the core spray "B" loop piping in RE20. The weld was re-examined in RE21, and no new indications were found. The weld was re-examined in RE23 and evaluated as acceptable.

Two indications were found in 2006 on the top guide pin keeper. These indications were evaluated as acceptable.

In 2006 during RE23, top guide aligner pins, steam dryer lifting lugs, core shroud welds, and core spray welds were examined. These examinations showed indications that were evaluated as acceptable. Absence of aging effects indicates that the preventive actions of the program have been effective.

In 2006, a QA surveillance reviewed condition reports initiated during the past two years related to vessel internals inspections. This review identified improvements in the BWRVIP program such as better handling of deviation dispositions for deferred inspections and more timely completion of inspections. CNS inspection commitments were found to be up-to-date and in compliance with BWRVIP requirements. No conditions adverse to quality were identified during this surveillance.

The BWR Vessel Internals Program detects aging effects using nondestructive examination (NDE) visual, surface and volumetric techniques to detect and characterize flaws. These techniques are widely used and have been demonstrated effective at detecting aging effects during inspections performed to meet ASME Section XI Code requirements. In addition, the various BWRVIPs applied in this program are based on industry-wide experience at BWR plants. The application of these proven methods provides assurance that the effects of aging will be managed such that the BWR Internals Program components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

Conclusion

The BWR Vessel Internals Program has been effective at managing aging effects. The BWR Vessel Internals Program assures the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.10 CONTAINMENT INSERVICE INSPECTION

Program Description

The Containment Inservice Inspection Program is an existing program that manages loss of material and cracking for the primary containment and its integral attachments. The program uses the ASME Boiler and Pressure Vessel Code, Section XI, 2001 Edition, through the 2003 Addenda.

Visual inspections for IWE monitor loss of material of the steel containment shells and their integral attachments; containment hatches and airlocks; moisture barriers; and pressure-retaining bolting by inspecting surfaces for evidence of flaking, blistering, peeling, discoloration, and other signs of distress.

NUREG-1801 Consistency

The Containment Inservice Inspection Program, with enhancements, is consistent with the program described in NUREG-1801, Section XI.S1, ASME Section XI, Subsection IWE.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Elements Affected	Enhancements
4. Detection of Aging Effects	For surface areas requiring augmented examination, guidance will be provided in CNS CII Program to require accessible areas to be examined using a visual examination method and surface areas not accessible on the side requiring augmented examination to be examined using an ultrasonic thickness measurement method in accordance with IWE-2500(b).

Elements Affected	Enhancements
6. Acceptance Criteria	For volumetric inspections, guidance will be provided in the CNS CII Program to document material loss in a local area exceeding 10% of the nominal containment wall thickness or material loss in a local area projected to exceed 10% of the nominal containment wall thickness before the next examination in accordance with IWE-3511.3 for volumetric inspections.

Operating Experience

In 2005 inspection of the torus found pitting that was screened for further review. CNS engineering's review indicated that the pitting did not exceed code allowables. The area containing the pitting was recoated.

Results of the Containment Inservice Inspection Program general visual walkdown of primary containment during RE19 in 2000 recorded crack-like indications on gusset plates, arc strikes on the drywell upper bulb, and holes due to burn through from attachment welds. These indications were evaluated as acceptable or repaired with further reexamination.

Results of the Containment Inservice Inspection Program general visual walkdown of primary containment during the mid-cycle outage of 2001 recorded numerous examples of tiger striping, pinpoint rusting, random pitting, uniform corrosion, discoloration, small areas of mechanical damage, general corrosion, and areas of uniform corrosion. The conditions noted were evaluated when they exceeded given screening criteria for evaluation. Upon evaluation, conditions that exceeded the screening criteria for recoat were recoated. None of the conditions exceeded code allowables. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing aging effects.

A self-assessment of the program in 2005 confirmed that the program met regulatory requirements and industry standards. The results of this assessment were used to develop the program changes in preparation for the next 10-year interval. Identification of areas for improvement, and subsequent corrective actions, assures that the program will remain effective for managing aging effects of components.

The Containment Inservice Inspection Program detects aging effects using nondestructive examination visual surface techniques to detect and characterize flaws. Also, the Containment Inservice Inspection Program makes provision to use volumetric examination techniques to detect and characterize flaws. These techniques are widely used and have been demonstrated effective at detecting aging effects during inspections performed to meet ASME Section XI Code requirements. Identification of program deficiencies, and subsequent corrective actions, provide assurance that the program will remain effective for managing loss of material of components. The application of these proven methods provides assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

Conclusion

The Containment Inservice Inspection Program has been effective at managing aging effects. The Containment Inservice Inspection Program assures the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.11 CONTAINMENT LEAK RATE

Program Description

The Containment Leak Rate Program is an existing program. As described in 10 CFR Part 50, Appendix J, containment leak rate tests are required to assure that (a) leakage through reactor containment and systems and components penetrating containment shall not exceed allowable values specified in technical specifications or associated bases and (b) periodic surveillance of reactor containment penetrations and isolation valves is performed so that proper maintenance and repairs are made during the service life of containment, and systems and components penetrating containment. The program utilizes 10 CFR 50 Appendix J, Option B, and the guidance in NRC Regulatory Guide 1.163 and NEI 94-01.

NUREG-1801 Consistency

The Containment Leak Rate Program is consistent with the program described in NUREG-1801, Section XI.S4, 10 CFR Part 50, Appendix J, with exceptions.

Exceptions to NUREG-1801

The Containment Leak Rate Program is consistent with the program described in NUREG-1801, Section XI.S4, 10 CFR Part 50, Appendix J with the following exceptions.

Elements Affected	Exception
5. Monitoring and Trending	NUREG-1801 recommends testing in accordance with 10 CFR Part 50, Appendix J, paragraph III.C.1, which requires Type C tests to be performed by local pressurization and applied in the same direction as that when the valve would be required to perform its safety function. CNS performs reverse direction local leak rate testing of four containment isolation valves.[1]
5. Monitoring and Trending	NUREG-1801 recommends testing in accordance with 10 CFR Part 50, Appendix J, paragraphs III.B.2 and III.C.2, which require testing on containment isolation valves (Type C test) and containment penetrations (Type B test), respectively, at peak calculated containment pressure. CNS performs MSIV testing at 29 psig and expansion bellows testing at 5 psig.[2]

Elements Affected	Exception
6. Acceptance Criteria	NUREG-1801 recommends testing in accordance with 10 CFR Part 50, Appendix J, sections III.A and III.B, which require tests to measure an overall containment integrated leak rate and to measure local leakage rates at pressure retaining boundaries and isolation valves, respectively. CNS excludes the main steam isolation valve leakage contributions from the overall integrated leakage rate Type A test measurement and from the sum of the leakage rates from Type B and Type C tests.[3]

Exception Notes

1. CNS has been granted an exemption from 10 CFR Part 50, Appendix J to allow reverse direction local leak rate (Type C) testing of four containment isolation valves since the disk seat is conservatively tested by reverse-direction testing and the leak-tightness of the bonnet and packing boundaries is reasonably assured by other means including the Type A integrated leak rate testing.
2. CNS has been granted an exemption from 10 CFR Part 50, Appendix J to allow MSIV testing at 29 psig and expansion bellows testing at 5 psig between the plies. Since the test procedure results in reverse loading of the inboard MSIV and a greater measured leak rate, testing at 29 psig results in a conservative determination of leak rate through the valves. Since the design of the expansion bellows does not permit local testing at a higher pressure, the bellows are a static system with no moving parts or active components, and the bellows are tested as part of the integrated leak rate test, local testing at 5 psig is acceptable.
3. NRC approved Amendment 226 to Facility Operating License DPR-46 allowing this exemption from the requirements of Sections III.A and III.B of 10 CFR 50 Appendix J, Option B because a separate radiological consequence term has been provided for these pathways. The revised design basis radiological consequences analyses address leakage through these pathways as individual factors, exclusive of the primary containment leakage.

Enhancements

None

Operating Experience

During the local leak rate testing of primary containment in 2003 and 2005, test data met applicable test acceptance criteria and confirmed the structural integrity of the containment. The local leak rate testing in 2006 met test acceptance criteria with the exception of an electrical penetration that did not meet administrative limits. This penetration was repaired and retested as acceptable. This indicates that the program is effective at identifying and managing the effects of loss of material and cracking on primary containment components. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing aging effects for components.

A QA audit in 2005 and a self-assessment in 2003 revealed no issues or findings that called into question the effectiveness of the program. Reviews against established program standards provide assurance that the program will remain effective for managing loss of material of components.

Conclusion

The Containment Leak Rate Program has been effective at managing aging effects. The Containment Leak Rate Program assures the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.12 DIESEL FUEL MONITORING

Program Description

The Diesel Fuel Monitoring Program is an existing program that entails sampling to ensure that adequate diesel fuel quality is maintained to prevent loss of material in fuel systems. Exposure to fuel oil contaminants such as water and microbiological organisms is minimized by periodic sampling and analysis, draining and cleaning of tanks, and verifying the quality of new fuel oil before its introduction into the storage tanks.

Sampling and analysis activities are in accordance with technical specifications for fuel oil purity and the guidelines of ASTM Standards ASTM D4057 and D975.

The One-Time Inspection Program [B.1.29] describes inspections planned to verify that the Diesel Fuel Monitoring Program has been effective at managing aging effects.

NUREG-1801 Consistency

The Diesel Fuel Monitoring Program, with enhancements, is consistent with the program described in NUREG-1801, Section XI.M30, Fuel Oil Chemistry Program, with exceptions.

Exceptions to NUREG-1801

The Diesel Fuel Monitoring Program is consistent with the program described in NUREG-1801, Section XI.M30, Fuel Oil Chemistry Program, with the following exceptions.

Elements Affected	Exceptions
1. Scope of Program	NUREG-1801 recommends use of ASTM Standards D2276 and D6217. Particulate testing is performed using the guidelines of ASTM Standard D2276. [1]
1. Scope of Program 3. Parameters Monitored or Inspected 6. Acceptance Criteria	NUREG-1801 recommends use of ASTM Standards D1796 and D2709. Only ASTM Standard D1796 is used for testing water and sediment.[2]
3. Parameters Monitored or Inspected 6. Acceptance Criteria	NUREG-1801 recommends use of modified ASTM Standard D2276 Method A. Determination of particulates is according to non-modified ASTM Standard D2276 Method A.[3]

Exception Notes

1. Particulate testing is performed using standard D2276. The guidelines of D2276 are appropriate for determination of particulates and the plant technical specifications specify this standard.
2. The guidelines of ASTM Standard D1796 are used rather than those of ASTM Standard D2709 (water and sediment by centrifuge for lower viscosities). The two standards are applicable to oils of different viscosities. Standard D1796 is applicable to the fuel oil used at CNS.
3. Determination of particulates is according to non-modified ASTM Standard D2276 Method A which conducts particulate analysis using a 0.8 micron filter, rather than the 3.0 micron filter specified in NUREG-1801. Use of a filter with a smaller pore size results in a larger sample of particulates since smaller particles are retained. Thus, use of a 0.8 micron filter is more conservative than use of the 3.0 micron filter specified in NUREG-1801. Furthermore, ASTM D6217 applies to middle distillate fuel using a smaller volume of sample passing over the 0.8 micron filter. Since ASTM D2276 determines particulates with a larger volume passing through the filter for a longer time than the D6217 method, use of D2276 only is more conservative.

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Elements Affected	Enhancements
1. Scope of Program 3. Parameters Monitored or Inspected 6. Acceptance Criteria	The Diesel Fuel Monitoring Program will be revised to use ASTM Standard D4057 for sampling of the diesel fire pump fuel oil storage tank.
2. Preventive Actions	The Diesel Fuel Monitoring Program will be enhanced to include periodic visual inspections and cleaning of the diesel fuel oil day tanks, the diesel fuel oil storage tanks, and the diesel fire pump fuel oil storage tank.
4. Detection of Aging Effects	The Diesel Fuel Monitoring Program will be enhanced to include periodic multilevel sampling of the diesel fuel oil day tanks and the diesel fire pump fuel oil storage tank and to include periodic visual inspections as well as ultrasonic bottom surface thickness measurement of the diesel fuel oil day tanks, the diesel fuel oil storage tanks, and the diesel fire pump fuel oil storage tank.

Elements Affected	Enhancements
6. Acceptance Criteria	The Diesel Fuel Monitoring Program will be enhanced to provide the acceptance criterion of ≤ 10 mg/l for the determination of particulates in the diesel fire pump fuel oil storage tank.
6. Acceptance Criteria	The Diesel Fuel Monitoring Program will be enhanced to specify acceptance criterion for UT thickness measurements of the bottom surfaces of the diesel fuel oil day tanks, the diesel fuel oil storage tanks, and the diesel fire pump fuel oil storage tank.

Operating Experience

In 2005, sampling of diesel oil storage tank B indicated excessive water in the tank. Further evaluation resulted in sample point changes, addition of dewatering drains, and procedural changes to assure proper sampling and drainage for an interim tanker maintained on site and incoming diesel fuel tanker shipments, as well as the other fuel storage tanks on site. Diesel oil storage tank B was dewatered to within acceptance criteria.

In 2005 and 2006 water was detected in samples from the diesel oil storage tank B. Further testing was done and evaluation of the results indicated that water content was within acceptance criteria. Procedures were revised to clarify testing methods.

Several incoming tankers of diesel fuel oil were rejected after testing indicated that they did not meet acceptance criteria in the period 2002 through 2005. These tankers were deferred for further testing, properly filtered prior to offload to meet acceptance criteria or returned to the origination point. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing aging effects for carbon steel components.

In 2003, industry operating experience indicated evidence of corrosion in diesel fuel storage tanks and was reviewed for applicability at CNS. Corrosion was found at CNS during cleaning activities. Evaluation of the corrosion confirmed that minimum wall thickness was maintained. Corrective actions included the addition of a corrosion inhibitor lining.

Identification of program deficiencies and subsequent corrective actions provide assurance that the program will remain effective for managing loss of material of components.

Conclusion

The Diesel Fuel Monitoring Program has been effective at managing aging effects. The Diesel Fuel Monitoring Program assures the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.13 ENVIRONMENTAL QUALIFICATION (EQ) OF ELECTRIC COMPONENTS

Program Description

The Environmental Qualification (EQ) of Electric Components Program is an existing program. The Nuclear Regulatory Commission (NRC) has established nuclear station environmental qualification (EQ) requirements in 10 CFR Part 50, Appendix A, Criterion 4, and 10 CFR 50.49. 10 CFR 50.49 specifically requires that an EQ program be established to demonstrate that certain electrical components located in harsh plant environments (that is, those areas of the plant that could be subject to the harsh environmental effects of a loss of coolant accident [LOCA], high energy line breaks [HELBs] or high radiation) are qualified to perform their safety function in those harsh environments. 10 CFR 50.49 requires that the effects of significant aging mechanisms be addressed as part of environmental qualification.

The CNS EQ program manages the effects of thermal, radiation, and cyclic aging through the use of aging evaluations based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49, EQ components are refurbished, replaced, or their qualification is extended prior to reaching the aging limits established in the evaluation. Some aging evaluations for EQ components are time-limited aging analyses (TLAAs) for license renewal.

EQ Component Reanalysis Attributes

The reanalysis of an aging evaluation is normally performed to extend the qualification by reducing excess conservatism incorporated in the prior evaluation. Reanalysis of an aging evaluation to extend the qualification of a component is performed on a routine basis pursuant to 10 CFR 50.49(e) as part of an EQ program. While a component life limiting condition may be due to thermal, radiation, or cyclical aging, the vast majority of component aging limits are based on thermal conditions. Conservatism may exist in aging evaluation parameters, such as the assumed ambient temperature of the component, an unrealistically low activation energy, or in the application of a component (de-energized versus energized). The reanalysis of an aging evaluation is documented according to the station's quality assurance program requirements that require the verification of assumptions and conclusions. As already noted, important attributes of a reanalysis include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, and corrective actions (if acceptance criteria are not met). These attributes are discussed below.

Analytical Methods: The analytical models used in the reanalysis of an aging evaluation are the same as those applied during the prior evaluation. The Arrhenius methodology is an acceptable thermal model for performing a thermal aging evaluation. The analytical method used for a radiation aging evaluation is to demonstrate qualification for the total integrated dose (that is, normal radiation dose for the projected installed life plus accident radiation dose). For license renewal, one acceptable method of establishing the 60-year normal radiation dose is to multiply the 40-year normal radiation dose by 1.5 (that is, 60 years/40 years). The result is added to the

accident radiation dose to obtain the total integrated dose for the component. For cyclical aging, a similar approach may be used. Other models may be justified on a case-by-case basis.

Data Collection and Reduction Methods: Reducing excess conservatism in the component service conditions (for example, temperature, radiation, cycles) used in the prior aging evaluation is the chief method used for a reanalysis. Temperature data used in an aging evaluation is to be conservative and based on plant design temperatures or on actual plant temperature data. When used, plant temperature data can be obtained in several ways, including monitors used for Technical Specification compliance, other installed monitors, measurements made by plant operators during rounds, and temperature sensors on large motors (while the motor is not running). A representative number of temperature measurements are conservatively evaluated to establish the temperatures used in an aging evaluation. Plant temperature data may be used in an aging evaluation in different ways, such as (a) directly applying the plant temperature data in the evaluation, or (b) using the plant temperature data to demonstrate conservatism when using plant design temperatures for an evaluation. Any changes to material activation energy values as part of a reanalysis are to be justified on a plant-specific basis. Similar methods of reducing excess conservatism in the component service conditions used in prior aging evaluations can be used for radiation and cyclical aging.

Underlying Assumptions: EQ component aging evaluations contain sufficient conservatism to account for most environmental changes occurring due to plant modifications and events. When unexpected adverse conditions are identified during operational or maintenance activities that affect the normal operating environment of a qualified component, the affected EQ component is evaluated and appropriate corrective actions are taken that may include changes to the qualification bases and conclusions.

Acceptance Criteria and Corrective Actions: The reanalysis of an aging evaluation could extend the qualification of the component. If the qualification cannot be extended by reanalysis, the component is to be refurbished, replaced, or requalified prior to exceeding the period for which the current qualification remains valid. A reanalysis is to be performed in a timely manner (that is, sufficient time is available to refurbish, replace, or requalify the component if the reanalysis is unsuccessful).

NUREG-1801 Consistency

The Environmental Qualification (EQ) of Electric Components Program is consistent with the program described in NUREG-1801, Section X.E1, Environmental Qualification (EQ) of Electric Components.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Environmental Qualification (EQ) Program at CNS is routinely audited to ensure that program elements are carried out properly. A 2004 QA audit provided a wide view of program-related operating experience, with a focus on certain program elements.

Scope and Preventive Actions: Translation of design criteria into working documents was found to be performed satisfactorily. This included establishment of design basis accident (DBA) margins, calculations of station environmental qualification parameters, use of equipment qualification data packages (EQDPs) to establish qualified life for components, use of maintenance tasks to ensure that components are maintained within their qualified life. Modification activities involving EQ components were found to be satisfactorily conducted in accordance with station processes and procedures.

Acceptance Criteria: No exceptions or deviations from approved codes and standards were observed during a review of EQ design and licensing documents. This provides assurance that acceptance criteria from appropriate standards are specified and included in design documents.

Corrective Actions: Corrective actions taken to prevent recurrence of significant conditions were found to be effective, based on a review of significant condition reports (SCRs) related to the EQ Program.

Providing the proper requirements for the environmental qualification of electrical equipment important to safety, along with the identification of qualified life and specific maintenance/ installation requirements, ensures that the program will remain effective for managing aging effects.

Conclusion

The Environmental Qualification (EQ) of Electric Components Program has been effective at managing aging effects by maintaining equipment within its qualification basis. The Environmental Qualification (EQ) of Electric Components Program assures the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.14 EXTERNAL SURFACES MONITORING

Program Description

The External Surfaces Monitoring Program is an existing program that inspects external surfaces of components subject to aging management review. The program is also credited with managing loss of material from internal surfaces for situations in which internal and external material and environment combinations are the same such that external surface condition is representative of internal surface condition. This program does not manage aging effects on structures.

Surfaces that are inaccessible during plant operations are inspected during refueling outages. Surfaces that are insulated are inspected when the external surface is exposed (i.e., during maintenance). Surfaces are inspected at frequencies to assure the effects of aging are managed such that applicable components will perform their intended function during the period of extended operation.

NUREG-1801 Consistency

The External Surfaces Monitoring Program, with enhancement, is consistent with the program described in NUREG-1801, Section XI.M36, External Surfaces Monitoring.

Exceptions to NUREG-1801

None

Enhancements

The following enhancement will be implemented prior to the period of extended operation.

Elements Affected	Enhancement
1. Scope of Program	External Surfaces Monitoring Program guidance documents will be enhanced to clarify that periodic inspections of systems in scope and subject to aging management review for license renewal in accordance with 10 CFR 54.4 (a)(1) and (a)(3) will be performed. Inspections shall include areas surrounding the subject systems to identify hazards to those systems. Inspections of nearby systems that could impact the subject systems will include SSCs that are in scope and subject to aging management review for license renewal in accordance with 10 CFR 54.4 (a)(2).

Operating Experience

System walkdowns in 2002, 2003, 2004, and 2005 identified evidence of aging effects, such as external valve leakage and leakage at heat exchanger flanges and general corrosion on pipe fittings and flanges. The conditions were low in significance, involving no loss of intended function. Corrective actions were accomplished in accordance with the Corrective Action Program. These examples of the identification of degradation and initiation of corrective action prior to loss of intended function provide evidence that the program is effective for managing aging effects for passive components.

System walkdowns in 2007 for the condensate filter demineralizer, high pressure coolant injection (HPCI), main steam, reactor core isolation cooling, residual heat removal, and service water systems indicated no evidence of corrosion or leakage except for one inspection on the HPCI system, which showed leakage on the turbine casing.

Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing aging effects for passive components.

Conclusion

The External Surfaces Monitoring Program has been effective at managing aging effects. The External Surfaces Monitoring Program assures the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.15 FATIGUE MONITORING

Program Description

The Fatigue Monitoring Program is an existing program that tracks the number of critical thermal and pressure transients for selected reactor coolant system components, in order not to exceed design limits on fatigue usage. The program ensures the validity of analyses that explicitly assumed a fixed number of thermal and pressure transients by assuring that the actual effective number of transients does not exceed the assumed limit.

This program also addresses the effects of the coolant environment on component fatigue life by assessing the impact of the reactor coolant environment on a sample of critical components for the plant.

NUREG-1801 Consistency

The Fatigue Monitoring Program, with enhancements, is consistent with the program described in NUREG-1801, Section X.M1, Metal Fatigue of Reactor Coolant Pressure Boundary.

Exceptions to NUREG-1801

None

Enhancement

The following enhancements will be implemented at least two years prior to entering the period of extended operation.

Elements Affected	Enhancement
2. Preventive Actions 4. Detection of Aging Effects 6. Acceptance Criteria 7. Corrective Actions	Consideration of the effect of the reactor water environment will be accomplished through implementation of one or more of the following options for the feedwater nozzles, core spray nozzles and RHR pipe transition. (1) Update the fatigue usage calculations using refined fatigue analyses to determine valid CUFs less than 1.0 when accounting for the effects of reactor water environment. This includes applying the appropriate F_{en} factors to valid CUFs determined using an NRC-approved version of the ASME code or NRC-approved alternative (e.g., NRC-approved code case). (2) Repair or replace the affected locations before exceeding a CUF of 1.0.

Elements Affected	Enhancement
3. Parameters Monitored or Inspected	The CNS Fatigue Monitoring Program will be enhanced to require the recording of each transient associated with the actuation of a safety/relief valve (SRV).

Operating Experience

Transient data collected and trended from 2000 through 2005 at CNS confirmed that the number of cycles was not trending toward exceeding the allowable number of cycles. The program continues to monitor plant transients to assure fatigue usage factors are not exceeded.

Operating experience shows that the Fatigue Monitoring Program has been effective in managing aging effects.

Conclusion

The Fatigue Monitoring Program has been demonstrated to maintain the validity of the fatigue design basis for reactor coolant system components designed to withstand the effects of cyclic loads due to reactor system transients.

The Fatigue Monitoring Program assures the fatigue design basis is maintained such that applicable components will continue to perform their intended function consistent with the current licensing basis through the period of extended operation.

B.1.16 FIRE PROTECTION

Program Description

The Fire Protection Program is an existing program that includes a fire barrier inspection and a diesel-driven fire pump inspection. The fire barrier inspection requires periodic visual inspection of fire barrier penetration seals, fire dampers, fire stops, fire wraps, fire barrier walls, ceilings, and floors, and periodic visual inspection and functional tests of fire rated doors to ensure that their operability is maintained. The diesel-driven fire pump inspection requires that the pump and its driver be periodically tested and inspected to ensure that diesel engine fuel supply lines can perform their intended functions.

The Fire Protection Program also includes periodic inspection and testing of the CO_2 and Halon fire suppression systems.

NUREG-1801 Consistency

The Fire Protection Program, with enhancements, is consistent with the program described in NUREG-1801, Section XI.M26, Fire Protection, with an exception.

Exceptions to NUREG-1801

The Fire Protection Program is consistent with the program described in NUREG-1801, Section XI.M26, Fire Protection, with the following exception.

Elements Affected	Exceptions
3. Parameters Monitored or Inspected 4. Detection of Aging Effects	The NUREG-1801 program recommends that functional testing and inspection of the Halon and CO_2 fire suppression systems occur at least once every six months. However, while CNS performs visual inspections at least once every six months, functional testing is performed on an 18-month basis as listed in the current licensing basis for CNS.[1]
Exception Notes	

1. The NRC Staff, as documented in the SER for Oyster Creek, has accepted the position that, in the absence of aging-related events adversely affecting system operation and provided that visual inspections of component external surfaces are performed every six months, the periodicity specified in the current licensing basis for functional testing of the CO_2 system is sufficient to ensure system availability and operability. This frequency is sufficient based on station operating experience.

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Elements Affected	Enhancements
3. Parameters Monitored or Inspected 4. Detection of Aging Effects 5. Monitoring and Trending 6. Acceptance Criteria	The Fire Protection Program will be enhanced to explicitly state that the diesel fire pump engine sub-systems (including the fuel supply line) shall be observed while the engine is running. Acceptance criteria will be revised to verify that the diesel engine does not exhibit signs of degradation while running, such as excessive fuel oil, lube oil, coolant, or exhaust gas leakage.
3. Parameters Monitored or Inspected 4. Detection of Aging Effects 5. Monitoring and Trending 6. Acceptance Criteria	The Fire Protection Program will be enhanced to specify that diesel fire pump engine carbon steel exhaust components are inspected for evidence of corrosion or cracking at least once every five years.
3. Parameters Monitored or Inspected 4. Detection of Aging Effects 5. Monitoring and Trending	The Fire Protection Program will be enhanced to require visual inspections of fire damper framing to check for signs of degradation.
3. Parameters Monitored or Inspected 4. Detection of Aging Effects 5. Monitoring and Trending	The Fire Protection Program will be enhanced to require visual inspections of the Halon and CO_2 fire suppression systems at least once every six months to check for signs of degradation in a manner suitable for trending.
3. Parameters Monitored or Inspected 6. Acceptance Criteria	The Fire Protection Program will be enhanced to include inspection of cardox hose reels for corrosion. Acceptance criteria will be enhanced to verify no unacceptable corrosion.
4. Detection of Aging Effects	The Fire Protection Program will be enhanced to require visual inspections of concrete flood curbs, manways, hatches, and hatch covers on an 18-month basis to check for signs of degradation.

Operating Experience

In 2002, 2004 and 2005, inspections of fire barriers and fire walls found certain fire seals unsatisfactory. These included degraded grout and foam seals that had voids and a cracked boot seal. Other similar discrepancies were found during plant tours and walkdowns during normal plant operations or QA audits and were corrected with the site Corrective Action Program.

In 2003 and 2006 fire door inspections found gaps in doors that exceeded specifications. Gaps were evaluated after further inspection and found to meet requirements, required procedural clarification of specifications, or were restored to specifications. Corrective actions were accomplished in accordance with the site Corrective Action Program.

In 2002 and 2004 during 30 day inspections of fire doors, discrepancies were noted. In 2002 a fire door was found with excessive gaps. In 2004 a door was found with a tear in the outer skin. Doors were restored to specifications according to the site Corrective Action Program.

Annual fire pump flow testing was completed in 2005 for fire pump D and 2006 for fire pumps D and E. The testing results were satisfactory in both years but prompted enhancements in operating procedures and component settings. In 2005, the operating procedure for D pump was enhanced to clarify the operation of the pump as a result of the testing. In 2006, fire pump D required adjustment of the time delay for restart. The testing of fire pump E in 2006 was satisfactory with no discrepancies noted. Corrective actions were accomplished in accordance with the site Corrective Action Program.

Results of past inspections of the external surfaces of the CO_2 and Halon fire protection systems have indicated no loss of intended function due to general corrosion.

QA audits of the Fire Protection Program were conducted in 2004, 2005, 2006 and 2007. Although these audits covered the overall program, specific walkdowns and inspections of fire barriers conducted in numerous areas of the plant revealed no significant issues.

In 2006 the NRC completed three quarterly integrated inspection reports concerning selected areas of plant operation, including fire protection. Walkdowns of numerous areas of the plant to assess the material condition of passive fire protection features were completed with no significant findings or issues noted. These walkdowns confirm that the program is effective for managing aging effects for passive components.

An NRC Notice of Violation in the Fire Protection area was issued in June 2008. The violation involved inadequacy of an emergency operating procedure a situation unrelated to the effects of aging.

Identification of program deficiencies, and subsequent corrective actions, provide assurance that the program will remain effective for managing loss of material of components.

Conclusion

The Fire Protection Program has been effective at managing aging effects. The Fire Protection Program assures the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.17 FIRE WATER SYSTEM

Program Description

The Fire Water System Program is an existing program that applies to water-based fire protection systems that consist of sprinklers, nozzles, fittings, valves, hydrants, hose stations, standpipes, and aboveground and underground piping and components that are tested in accordance with applicable National Fire Protection Association (NFPA) codes and standards. Such testing assures functionality of systems. To determine if significant corrosion has occurred in water-based fire protection systems, periodic flushing, system performance testing and inspections are conducted. Also, many of these systems are normally maintained at required operating pressure and monitored such that leakage resulting in loss of system pressure is immediately detected and corrective actions initiated.

In addition, wall thickness evaluations of fire protection piping are periodically performed on system components using non-intrusive techniques (e.g., volumetric testing) to identify evidence of loss of material due to corrosion.

A sample of sprinkler heads will be tested or replaced using the guidance of NFPA-25 (2002 edition), Section 5.3.1.1.1. NFPA-25 states, "Where sprinklers have been in place for 50 years, they shall be replaced or representative samples from one or more sample areas shall be submitted to a recognized testing laboratory for field service testing." This sampling will be repeated every 10 years after initial field service testing per the guidance of NFPA-25.

NUREG-1801 Consistency

The Fire Water System Program, with enhancements, is consistent with the program described in NUREG-1801, Section XI.M27, Fire Water System, with exceptions.

Exceptions to NUREG-1801

The Fire Water System Program is consistent with the program described in NUREG-1801, Section XI.M27, Fire Water System, with the following exceptions.

Elements Affected	Exceptions
4. Detection of Aging Effects	NUREG-1801 recommends annual fire hydrant hose hydrostatic tests. However, the hoses are not subject to aging management since they are periodically inspected, hydrotested, and replaced.[1]

Elements Affected	Exceptions
4. Detection of Aging Effects	NUREG-1801 recommends annual gasket inspections. However, gaskets are not subject to aging management review since they are periodically inspected and replaced.[2]
Exception Notes	

1. Fire hoses are replaced based on periodic performance or condition monitoring and are excluded from aging management review per Table 2.1-3 of NUREG-1800 Rev. 1.
2. Gaskets are replaced based on performance or condition monitoring and are excluded from aging management review per Table 2.1-3 of NUREG-1800 Rev. 1.

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Elements Affected	Enhancements
3. Parameters Monitored or Inspected 6. Acceptance Criteria	The Fire Water System Program will be enhanced to include inspection of hose reels for corrosion. Acceptance criteria will be enhanced to verify no unacceptable corrosion.
3. Parameters Monitored or Inspected 6. Acceptance Criteria	The Fire Water System Program will be enhanced to include visual inspection of spray and sprinkler system internals for evidence of corrosion. Acceptance criteria will be enhanced to verify no unacceptable corrosion.
3. Parameters Monitored or Inspected 4. Detection of Aging Effects	Wall thickness evaluations of fire protection piping will be performed on system components using non-intrusive techniques (e.g., volumetric testing) to identify evidence of loss of material due to corrosion. These inspections will be performed before the end of the current operating term and at intervals thereafter during the period of extended operation. Results of the initial evaluations will be used to determine the appropriate inspection interval to ensure aging effects are identified prior to loss of intended function.

Elements Affected	Enhancements
4. Detection of Aging Effects	A sample of sprinkler heads required for 10 CFR 50.48 will be tested or replaced using guidance of NFPA-25 (2002 edition), Section 5.3.1.1.1, before the end of the 50-year sprinkler head service life and at 10-year intervals thereafter during the extended period of operation.

Operating Experience

System flow verification tests were performed in 2003 and 2004 with no discrepancies noted.

Yard hydrant flow checks were performed in 2003, 2004 and 2006 with no discrepancies noted. The hydrant flow checks done in 2005 noted a valve that was stuck closed. This valve was repaired and returned to service. In 2002, evidence of MIC was found in the Fire Water System during inspections. Corrective actions were accomplished in accordance with the site Corrective Action Program. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing aging effects.

QA audits in 2004, 2005, 2006 and 2007 indicated that the program was effectively maintained and implemented. Reviews against established program standards provide assurance that the program will remain effective for managing loss of material of components.

Conclusion

The Fire Water System Program has been effective at managing aging effects. The Fire Water System Program assures the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.18 FLOW-ACCELERATED CORROSION

Program Description

The Flow-Accelerated Corrosion (FAC) Program is an existing program that applies to safety-related and nonsafety-related carbon steel components and gray cast iron in systems containing high-energy fluids carrying two-phase or single-phase high-energy fluid greater than or equal to two percent of plant operating time per the criteria given in EPRI NSAC-202L.

The program, based on EPRI recommendations in NSAC-202L for an effective flow-accelerated corrosion program, predicts, detects, and monitors FAC in plant piping and other pressure retaining components. This program includes (a) an evaluation to determine critical locations, (b) initial operational inspections to determine the extent of thinning at these locations, and (c) follow-up inspections to confirm predictions or to repair or replace components as necessary. The aging effect of loss of material managed by the Flow Accelerated Corrosion Program is equivalent to the aging effect of wall thinning as defined in NUREG-1801 Volume 2 Table IX.E.

NUREG-1801 Consistency

The FAC Program, with enhancement, is consistent with the program described in NUREG-1801, Section XI.M17, Flow-Accelerated Corrosion, with an exception.

Exceptions to NUREG-1801

The FAC Program is consistent with the program described in NUREG-1801, Section XI.M17, Flow-Accelerated Corrosion, with the following exception.

Elements Affected	Exception
4. Detection of Aging Effects	NUREG-1801 recommends using both ultrasonic (UT) and radiographic testing to detect wall thinning. CNS uses UT only.[1]

Exception Note

1. This is sufficient because, as stated in NSAC-202L Revision 2, the UT method provides more complete data for measuring the remaining wall thickness.

Enhancements

The following enhancement will be implemented prior to the period of extended operation.

Elements Affected	Enhancement
1. Scope of Program	The System Susceptibility Analysis for the Flow-Accelerated Corrosion Program will be updated to reflect the lessons learned and new technology that became available after the publication of NSAC-202L Revision 1.

Operating Experience

From 2002 through 2006, FAC ultrasonic examinations of carbon steel components in systems containing steam and treated water revealed wall thinning due to corrosion, erosion, and FAC. The evaluation of each indication determined an additional period until minimum wall thickness would be exceeded or justified continued operation until the next available time for repair. Corrective actions were accomplished in accordance with the site Corrective Action Program. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing aging effects for carbon steel components.

Enhancements to the FAC program were incorporated via self-assessments done in 2002 and 2003. A self-assessment done in 2006 concluded that the FAC program meets the recommendations of NSAC-202L, with areas for improvement tracked in the Corrective Action Program. These assessments confirmed that the program met or exceeded industry standards and was well implemented according to procedures.

Identification of program deficiencies, and subsequent corrective actions, provide assurance that the program will remain effective for managing loss of material of components.

Conclusion

The Flow-Accelerated Corrosion Program has been effective at managing aging effects. The Flow-Accelerated Corrosion Program assures the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.19 INSERVICE INSPECTION – ISI

Program Description

The Inservice Inspection – ISI Program is an existing program that encompasses ASME Section XI Subsection IWB, IWC, and IWD requirements.

This program manages loss of material, cracking, and reduction of fracture toughness to assure that the pressure boundary functions of the reactor pressure vessel and reactor coolant system pressure boundary are maintained through the period of extended operation.

Regulation 10 CFR 50.55a, imposes inservice inspection (ISI) requirements of ASME Code, Section XI, for Class 1, 2, and 3 pressure-retaining components, their integral attachments, and supports in light-water cooled power plants. Inspection, repair, and replacement of these components are covered in Subsections IWB, IWC, and IWD respectively. The program includes periodic visual, surface, and volumetric examination and leakage tests of Class 1, 2, and 3 pressure-retaining components, their integral attachments and supports.

The ISI Program is based on ASME Inspection Program B, which has 10-year inspection intervals. Every 10 years the program is updated to the latest ASME Section XI code edition and addendum approved by the NRC in 10 CFR 50.55a. On March 1, 2006, CNS entered the fourth ISI interval. The ASME code edition and addenda used for the fourth interval is the 2001 Edition, 2003 Addenda.

NUREG-1801 Consistency

The Inservice Inspection – ISI Program is consistent with the program described in NUREG-1801, Section XI.M1, ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD, with exceptions.

Exceptions to NUREG-1801

The Inservice Inspection – ISI Program consistent with the program described in NUREG-1801, Section XI.M1, ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD, with the following exceptions.

Elements Affected	Exceptions
3. Parameters Monitored or Inspected 4. Detection of Aging Effects	NUREG-1801 recommends the use of ASME Section XI Table IWB-2500-1 to determine the method of examination of category B-F and B-J welds. CNS uses examination category R-A in accordance with risk informed methodology approved by NRC for examination of Table IWB-2500-1 category B-F and B-J welds.[1]

Elements Affected	Exceptions
4. Detection of Aging Effects	NUREG-1801 recommends the use of ASME Section XI, Subsection IWA-2000 to set distance and lighting requirements for VT-2 inspections for leak detection performed during system pressure tests. CNS uses an alternate approach.[2]
4. Detection of Aging Effects	NUREG-1801 recommends the use of the reactor coolant system boundary, with all valves in the normal position required for normal reactor operation startup, as the pressure-retaining boundary during the system leakage test per ASME Section XI IWB-5222. CNS reactor coolant system leakage test boundaries are refined as follows. • The outboard MSIVs, the main steam line drain valves, the HPCI and RCIC steam supply valves, and three of the feedwater check valves are closed during the system leakage test, but are included in the VT-2 visual examination. • In addition, reactor coolant pressure boundary vent, drain, and branch (VTDB) connections 1-inch NPS and smaller are visually examined for leakage with the inboard isolation valve in the normally closed position during the system leakage test conducted at or near the end of each inspection interval.[3]
4. Detection of Aging Effects	NUREG-1801 recommends using the system pressure test requirements of IWB-5210(b) and IWB-5221(a). In lieu of this, CNS performs a VT-2 visual examination on the reactor pressure vessel (RPV) head flange leak detection line either when the reactor cavity is flooded or when it is pressurized to 100 psig.[4]

Exception Notes

1. Significant industry attention has been devoted to the application of risk-informed selection criteria in order to determine the scope of inservice inspection programs at nuclear power plants. CNS applied the methodology documented in the NRC-approved EPRI Topical Report TR-112657 in the development of the CNS Risk-Informed Inservice Inspection (RI-ISI) Program. The use of this methodology for the selection and subsequent examination of Class 1 piping welds provides an acceptable level of quality and safety. This alternative to the ASME code has been approved in accordance with the provisions of 10 CFR 50.55a(a)(3) for the 4th interval (TAC No. MD0283 dated 10/23/2006). To continue the alternative in subsequent intervals during the period of extended operation, approval must be obtained in accordance with 10 CFR 50.55a.
2. To prevent the extra scaffolding and radiation exposure needed to meet the distance and lighting requirements of IWA-2210, CNS conducts VT-2 examinations to detect evidence of leakage from pressure retaining components without a distance limitation and prescribes examinations in accordance with IWA-5000. IWA-5000 allows examination of floor areas or equipment surfaces underneath an inaccessible component for evidence of leakage. The NRC Staff has determined that the minimum illumination level and maximum direct examination distance need not be specified in order to perform effective VT-2 examinations. A VT-2 examination is conducted to detect evidence of leakage, and such leakage can be detected effectively beyond the code-specified minimum distance. Leakage can also be detected well under the code-specified minimum illumination level. Even if the general illumination level in the general building area of interest is below the minimum specified illumination level, supplemental spot lighting, if necessary, can be utilized.
   This alternative to the ASME code has been approved in accordance with the provisions of 10 CFR 50.55a(a)(3) for the 4th interval (TAC No. MD0323 dated 8/23/2006). To continue the alternative in subsequent intervals during the period of extended operation, approval must be obtained in accordance with 10 CFR 50.55a.
3. Performing the pressure test with the normal reactor coolant system boundary would result in a hardship without a compensating increase in quality and safety due to excessive radiation exposure and personnel safety concerns (temperature levels in the drywell). These alternate provisions provide reasonable assurance of the continued operational readiness of mechanical connections, extending to the Class 1 boundary. This alternative to the ASME code has been approved in accordance with the provisions of 10 CFR 50.55a(a)(3) for the 4th interval (TAC No. MD0284 dated 10/2/2006 and TAC No. MD0515 dated 10/2/2006). To continue the alternative in subsequent intervals during the period of extended operation, approval must be obtained in accordance with 10 CFR 50.55a.

4. Performing such a test per the system pressure test requirements of IWB-5210(b) and IWB-5221(a) is impractical because of the possibility of damage to the RPV head flange O-ring seals. These alternate provisions provide reasonable assurance of the structural integrity of the subject line. This alternative to the ASME code has been approved in accordance with the provisions of 10 CFR 50.55a(a)(3) for the 4th interval (TAC No. MD0285 dated 10/2/2006). To continue the alternative in subsequent intervals during the period of extended operation, approval must be obtained in accordance with 10 CFR 50.55a.

Enhancements

None

Operating Experience

Results of ISI examinations during RE20 in 2001 revealed acceptable indications in the core spray piping and the core spray piping collar supports. Results of ISI examinations during RE22 in 2005 revealed acceptable indications and flaws that required repair and reexamination. Successive examinations are required in the next period. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing aging effects.

A self-assessment in 2005 confirmed that the program met regulatory requirements and industry standards. The results of this assessment were used to develop the program changes in preparation for the next 10 year interval.

The ISI Program detects aging effects via visual, surface and ultrasonic inspection. Identification of program deficiencies, and subsequent corrective actions, provide assurance that the program will remain effective for managing loss of material of components. Ultrasonic inspection methods are subject to the performance demonstration requirements of ASME Section XI, Appendix VIII. In addition, the ISI programs are based on industry wide experience.

Conclusion

The Inservice Inspection – ISI Program has been effective at managing aging effects. The Inservice Inspection – ISI Program assures the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.20 INSERVICE INSPECTION – IWF

Program Description

The Inservice Inspection – IWF Program is an existing program that manages loss of material for ASME Class 1, 2, 3 and MC piping and component supports, bolting, and base plates. The program uses the ASME Boiler and Pressure Vessel Code, Section XI, 2001 Edition, 2003 Addenda.

The program includes visual inspections of surfaces to manage loss of material. Evidence of corrosion, deformation, misalignment, improper clearances, improper spring settings, damage to close tolerance machined or sliding surfaces, and missing, detached, or loosened support items that may compromise support function or load capacity are detected through visual inspection.

NUREG-1801 Consistency

The Inservice Inspection – IWF Program, with enhancements, is consistent with the program described in NUREG-1801, Section XI.S3, ASME Section XI, Subsection IWF with an exception.

Exceptions to NUREG-1801

The Inservice Inspection - IWF Program is consistent with the program described in NUREG-1801, Section XI.S3, ASME Section XI, Subsection IWF with the following exception.

Elements Affected	Exception
4. Detection of Aging Effects	NUREG-1801 recommends a VT-3 visual examination as specified in Table IWF-2500-1. Lighting and distance requirements for VT-3 visual examinations are specified in Table IWA-2210-1. The maximum direct examination distance requirement is not always followed for the VT-3 examination.[1]

Exception Note

1. A VT-3 examination is performed to determine the general mechanical and structural condition of components and their supports, such as physical displacement, general deformation, corrosion, and missing or loose parts. Experience has shown that such conditions and degradation can be detected effectively at distances greater than the Code-required maximum distance criteria. This alternative to the ASME code has been approved in accordance with the provisions of 10 CFR 50.55a(a)(3) for the 4th interval (TAC No. MD0323 dated 8/23/2006). To continue the alternative in subsequent intervals during the period of extended operation, approval must be obtained in accordance with 10 CFR 50.55a.

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Elements Affected	Enhancements
1. Scope of Program 4. Detection of Aging Effects	The ISI-IWF Program will be enhanced to include Class MC piping and component supports.
6. Acceptance Criteria	The ISI-IWF Program will be enhanced to clarify that the successive inspection requirements of IWF-2420 and the additional examination requirements of IWF-2430 are applied.

Operating Experience

Results of ISI examinations during RE19 in 2000 revealed indications that required repair and reexamination. Successive reexaminations were required in the next inspection period for some conditions. Results of ISI examinations during RE20 in 2001 revealed a missing jam nut, stiffener plates not shown on support drawings on a sway strut, and a missing scale was found on a variable spring hanger. In addition, there were three recordable indications shown for other structural members. Each of these recordable indications was evaluated as acceptable. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing aging effects.

In 2006 visual inspections found corroded bolting in the Z sump. Corrective actions were accomplished with engineering review in accordance with the site Corrective Action Program.

The Inservice Inspection – IWF Program detects aging effects using visual techniques to detect and characterize flaws. These techniques are widely used and have been demonstrated effective at detecting aging effects during inspections performed to meet ASME Section XI Code requirements.

Conclusion

The Inservice Inspection – IWF Program has been effective at managing aging effects. The Inservice Inspection – IWF Program assures the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.21 MASONRY WALL

Program Description

The Masonry Wall Program is an existing program that manages aging effects so that the evaluation basis established for each masonry wall within the scope of license renewal remains valid through the period of extended operation.

The program includes visual inspection of all masonry walls identified as performing intended functions in accordance with 10 CFR 54.4. Included components are 10 CFR 50.48-required masonry walls, radiation shielding masonry walls, and masonry walls with the potential to affect safety-related components. Structural steel components of masonry walls are managed by the Structures Monitoring Program [B.1.36].

Masonry walls are visually examined at a frequency selected to ensure there is no loss of intended function between inspections.

NUREG-1801 Consistency

The Masonry Wall Program, with enhancements, is consistent with the program described in NUREG-1801, Section XI.S5, Masonry Wall Program.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Elements Affected	Enhancements
1. Scope of Program	The Masonry Wall Program will be enhanced to clarify that the control house–161 kv switchyard is included in the program.
7. Corrective Actions	The Masonry Wall Program will be enhanced to clarify that structures with conditions classified as "acceptable with deficiencies" or "unacceptable" shall be entered into the Corrective Action Program.

Operating Experience

In 1996, 2002, and 2007, CNS conducted inspections of masonry walls. Masonry Wall Inspection Checklists in 1996 and 2002 documented cracks in the Machine Shop masonry walls. These cracks were evaluated and determined to be acceptable. Identification of deficiencies, and subsequent corrective actions, provide assurance that the program will remain effective for managing aging effects of components.

Conclusion

The Masonry Wall Program has been effective at managing aging effects. The Masonry Wall Program assures the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.22 METAL-ENCLOSED BUS INSPECTION

Program Description

The Metal Enclosed Bus Inspection Program is a new program that inspects the following non-segregated phase bus.

- non-segregated bus between the emergency station service transformer and 4.16 kV switchgear buses (1F and 1G)
- non-segregated bus between the start-up station service transformer X winding and 4.16 kV switchgear buses (1A and 1B)

Inspections of the metal enclosed bus (MEB) will include the bus and bus connections, the bus enclosure assemblies, and the bus insulation and insulators. A sample of the accessible bolted connections will be inspected for loose connections. The bus enclosure assemblies will be inspected for loss of material and elastomer degradation. This program will be used instead of the Structures Monitoring Program for external surfaces of the bus enclosure assemblies. The bus insulation or insulators will be inspected for degradation leading to reduced insulation resistance (IR). These inspections will include visual inspections, as well as quantitative measurements, such as thermography or connection resistance measurements, as required.

This program will be implemented prior to the period of extended operation. This new program will be implemented consistent with the corresponding program described in NUREG-1801 Section XI.E4, Metal Enclosed Bus.

NUREG-1801 Consistency

The Metal-Enclosed Bus Inspection Program will be consistent with the program described in NUREG-1801, Section XI.E4, Metal-Enclosed Bus, with an exception.

Exceptions to NUREG-1801

The Metal-Enclosed Bus (MEB) Inspection Program will be consistent with the program described in NUREG-1801, Section XI.E4, Metal-Enclosed Bus Aging Management Program, with the following exception.

Elements Affected	Exception
3. Parameters Monitored or Inspected 4. Detection of Aging Effects	NUREG-1801 specifies the Metal Enclosed Bus Inspection Program for inspection of the internal portion of the MEBs, and specifies the Structures Monitoring Program for inspection of the external portion of the MEBs. The CNS Metal Enclosed Bus Inspection Program specifies visual inspection of the external surfaces of the MEB enclosure assemblies in addition to internal portions.[1]

Exception Note

1. Inspection of the external portion of MEB enclosure assemblies under the Metal Enclosed Bus Inspection Program instead of the Structures Monitoring program assures that effects of aging will be identified prior to loss of intended function. Visual inspections have been proven effective in detecting indications of loss of material.

Enhancements

None

Operating Experience

The Metal-Enclosed Bus Inspection Program is a new program. Industry operating experience will be considered when implementing this program. Plant operating experience for this program will be gained as it is implemented during the period of extended operations, and will be factored into the program via the confirmation and corrective action elements of the CNS 10 CFR 50 Appendix B quality assurance program.

The CNS program is based on the program description in NUREG-1801, which in turn is based on industry operating experience that demonstrates that this program is effective for managing the aging effects described herein. As such, operating experience assures that implementation of the Metal-Enclosed Bus Inspection Program will manage the effects of aging such that applicable components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

Conclusion

The Metal-Enclosed Bus Inspection Program will be effective for managing aging effects since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. The Metal-Enclosed Bus Inspection Program provides assurance that effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.23 NEUTRON ABSORBER MONITORING

Program Description

There is no corresponding NUREG-1801 program.

The Neutron Absorber Monitoring Program is an existing program that manages loss of material of Boral neutron absorption panels in the spent fuel racks. The program relies on representative coupon samples mounted in surveillance assemblies located in the spent fuel pool to monitor performance of the absorber material without disrupting the integrity of the storage system.

Surveillance assemblies are removed from the spent fuel pool on a prescribed schedule and physical and chemical properties are measured. From this data, the stability and integrity of Boral in the storage cells are assessed.

Evaluation

1. Scope of Program

The Neutron Absorber Monitoring Program includes all Boral in the CNS spent fuel pool.

2. Preventive Actions

This is an inspection program and no actions are taken as part of this program to prevent or mitigate aging degradation.

3. Parameters Monitored or Inspected

The program monitors changes that can lead to loss of material of Boral material.

4. Detection of Aging Effects

The program monitors representative coupon samples located in the spent fuel pool to determine the condition of the absorber material without disrupting the integrity of the storage system. Visual inspections are used to determine and assess the extent of loss of material in the Boral before there is a loss of intended function. Results from CNS Boral coupons, inspected in 1982 and 1992, were evaluated and found that the reduction of neutron-absorbing capacity (change in material properties) is insignificant. Therefore, CNS no longer evaluates Boral coupons for change of material properties.

This program manages loss of material of the Boral neutron absorber.

5. Monitoring and Trending

Visual inspections determine the extent of loss of material. These inspections are reported in a manner which allows trending of results.

6. Acceptance Criteria

Control coupons are inspected concurrently with the coupons removed from the surveillance assembly. Comparison to these control coupons provides the acceptance criteria against which the need for corrective action is evaluated.

7. Corrective Actions

When adverse trends are identified, engineering will determine the appropriate course of action and document it through the CNS Corrective Action Program. Timely corrective action is assured through this 10 CFR 50 Appendix B program.

8. Confirmation Process

This element is discussed in Section B.0.3.

9. Administrative Controls

This element is discussed in Section B.0.3.

10. Operating Experience

Results of an inspection of coupon samples in 2002 showed no significant degradation of Boral material. Overall the results indicate the boral coupon samples are not degrading within the spent fuel storage pool (SFSP).

Since the coupons have been consistent in weight, dimension and characteristics for about 20 years the inspection interval was evaluated and extended from 4 years to 8 years in 2006. The next scheduled inspection of the Boral coupons is in 2010.

Enhancements

None

Conclusion

The Neutron Absorber Monitoring Program has been effective at managing aging effects. The Neutron Absorber Monitoring Program assures the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.24 NON-EQ BOLTED CABLE CONNECTIONS

Program Description

There is no corresponding NUREG-1801 program.

The Non-EQ Bolted Cable Connections Program is a new one-time inspection program. Cable connections are used to connect cable conductors to other cables or electrical devices. Connections associated with cables within the scope of license renewal are considered for this program. The most common types of connections used in nuclear power plants are splices (butt or bolted), crimp-type ring lugs, connectors, and terminal blocks. Most connections involve insulating material and metallic parts. This aging management program (AMP) focuses on the metallic parts of the electrical cable connections. This program provides a one-time inspection, on a sampling basis, to confirm the absence of age-related degradation of bolted cable connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation. This program does not apply to the high voltage (> 35 kV) switchyard connections.

The Metal Enclosed Bus Inspection Program manages aging effects from thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation on the metallic parts of MEB connections. Therefore, MEB connections are not included in this program.

Electrical cable connections exposed to appreciable ohmic or ambient heating during operation may experience loosening caused by repeated cycling of connected loads or cycling of the ambient temperature environment. Bolted connectors, splices, and terminal blocks may loosen if subjected to significant thermally induced cyclic stress.

The design of these connections will account for the stresses associated with ohmic heating, thermal cycling, and dissimilar metal connections. Therefore, these stressors/mechanisms should not be a significant issue. However, confirmation of the lack of these effects is warranted.

This program provides for one-time inspections on a sample of connections that will be completed prior to the period of extended operation. The factors considered for sample selection will be application (medium and low voltage, defined as < 35 kV), circuit loading (high loading), and location (high temperature, high humidity, vibration, etc.). The technical basis for the sample selections will be documented. If an unacceptable condition or situation is identified in the selected sample, the Corrective Action Program will be used to evaluate the condition and determine appropriate corrective action.

This program will ensure that electrical cable connections will perform their intended function through the period of extended operation and will be implemented prior to the period of extended operation.

Evaluation

1. Scope of Program

Cable connections external to terminations at active or passive devices associated with non-EQ cables in scope of license renewal are part of this program. This program does not include the high voltage (> 35 kV) switchyard connections. In-scope connections are evaluated for applicability of this program. The criteria for including connections in the program are that the connection is a bolted connection that is not covered under the EQ program or an existing preventive maintenance program.

2. Preventive Actions

This one-time inspection program is a condition monitoring program; therefore, no actions will be taken as part of this program to prevent or mitigate aging degradation.

3. Parameters Monitored or Inspected

This program will focus on the metallic parts of the cable connections. The one-time inspection verifies that loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation is not an aging effect that requires a periodic aging management program.

4. Detection of Aging Effects

A representative sample of electrical connections within the scope of license renewal, and subject to aging management review will be inspected or tested at least once prior to the period of extended operation to verify there are no aging effects requiring management during the period of extended operation. The factors considered for sample selection will be application (medium and low voltage), circuit loading (high loading), and location (high temperature, high humidity, vibration, etc.). The technical basis for the sample selected will be documented. Inspection methods may include thermography, contact resistance testing, or other appropriate methods based on plant configuration and industry guidance. The one-time inspection provides additional confirmation to support industry and CNS operating experience that shows that electrical connections have not experienced a high degree of failures and that existing installation and maintenance practices are effective.

5. Monitoring and Trending

Trending actions will not be included as part of this program because this is a one-time inspection.

6. Acceptance Criteria

The acceptance criteria for each inspection or test will be defined by the specific type of inspection or test performed for the specific type of cable connections. Acceptance criteria will ensure that the intended functions of the cable connections can be maintained consistent with the current licensing basis.

7. Corrective Actions

If the inspection or test acceptance criteria are not met, the requirements of 10 CFR Part 50, Appendix B, will be used to address corrective actions. The Corrective Action Program will be used to perform an evaluation that will consider extent of condition, the indications of aging effects, and possible changes to the one-time inspection program such as frequency and sample size.

8. Confirmation Process

This element is discussed in Section B.0.3.

9. Administrative Controls

This element is discussed in Section B.0.3.

10. Operating Experience

Industry operating experience has shown that loosening of connections and corrosion of connections could be a problem without proper installation and maintenance activities. Industry and CNS operating experience supports performing this one-time inspection program in lieu of a periodic testing program. This one-time inspection program will verify that the installation and maintenance activities are effective.

The Non-EQ Bolted Cable Connection Program is a new program. Industry and plant-specific operating experience will be considered when implementing this program. Plant operating experience for this program will be gained as it is implemented during the period of extended operations and will be factored into the program via the confirmation and corrective action elements of the CNS 10 CFR 50 Appendix B quality assurance program.

Conclusion

The Non-EQ Bolted Cable Connections Program will be effective for managing aging effects since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. The Non-EQ Bolted Cable Connections Program provides assurance that effects of aging will be managed such that applicable cable connections will continue to perform their intended function consistent with the current licensing basis through the period of extended operation.

B.1.25 NON-EQ INACCESSIBLE MEDIUM-VOLTAGE CABLE

Program Description

The Non-EQ Inaccessible Medium-Voltage Cable Program is a new program that inspects the following underground medium-voltage cables.

- inaccessible medium-voltage cables between the station service water pumps (SWP-1A, 1B, 1C, and 1D) and the 4.16 kV safety switchgear
- inaccessible medium-voltage cables between 12.5 kV overhead loop and the fire pump motor (FP-MOT-E)
- inaccessible medium-voltage cables between the standby diesel (DG1 and DG2) to the 4.16 kV safety busses (1F and 1G)
- inaccessible medium-voltage cables between the 4.16 kV non-safety buses (1A and 1B) and the 161 kV control house power transformers (located in the 345 kV switchyard)

The Non-EQ Inaccessible Medium-Voltage Cable Program entails periodic inspections for water collection in cable manholes and periodic testing of cables. In-scope medium-voltage cables (cables with operating voltage from 2 kV to 35 kV) exposed to significant moisture and voltage will be tested at least once every ten years to provide an indication of the condition of the conductor insulation. Significant moisture is defined as periodic exposures to moisture that last more than a few days (e.g., cable in standing water). Periodic exposures to moisture that lasts less than a few days (i.e., normal rain and drain) are not significant. Significant voltage exposure is defined as being subjected to system voltage for more than twenty-five percent of the time.

The program includes inspections for water accumulation in manholes at least once every two years.

This program will be implemented prior to the period of extended operation. This new program will be implemented consistent with the corresponding program described in NUREG-1801 Section XI.E3, Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements.

NUREG-1801 Consistency

The program will be consistent with NUREG-1801, Section XI.E3, Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Non-EQ Inaccessible Medium-Voltage Cable Program is a new program. Industry operating experience will be considered when implementing this program. Plant operating experience for this program will be gained as it is implemented during the period of extended operations, and will be factored into the program via the confirmation and corrective action elements of the CNS 10 CFR 50 Appendix B quality assurance program.

The CNS program is based on the program description in NUREG-1801, which in turn is based on industry operating experience that demonstrates that this program is effective for managing the aging effects described herein. As such, operating experience assures that implementation of the Non-EQ Inaccessible Medium-Voltage Cable Program will manage the effects of aging such that applicable components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

A search of CNS operating experience with manholes containing in-scope medium-voltage cables identified one event. The event, which occurred in 2003, was for a high-level alarm in the control room due to failure of a manhole sump pump to auto-start. Due to the automatic sump pumps and associated high-level alarms in the manholes, a frequency of at least once every two years for manhole inspections is adequate for the Non-EQ Inaccessible Medium-Voltage Cable Program.

Conclusion

The Non-EQ Inaccessible Medium-Voltage Cable Program will be effective for managing aging effects since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. The Non-EQ Inaccessible Medium-Voltage Cable Program provides assurance that effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.26 NON-EQ INSTRUMENTATION CIRCUITS TEST REVIEW

Program Description

The Non-EQ Instrumentation Circuits Test Review Program is a new program that inspects the applicable cables in the following systems or sub-systems.

- neutron monitoring system intermediate range monitors
- neutron monitoring system local power range monitors
- neutron monitoring system average power range monitors
- reactor building ventilation exhaust radiation monitors
- main steam line radiation monitors

The Non-EQ Instrumentation Circuits Test Review Program assures the intended functions of sensitive, high-voltage, low-signal cables exposed to adverse localized equipment environments caused by heat, radiation and moisture (i.e., neutron flux monitoring instrumentation, reactor building ventilation exhaust radiation monitoring, and main steam line radiation monitoring) can be maintained consistent with the current licensing basis through the period of extended operation. Most sensitive instrumentation circuit cables and connections are included in the instrumentation loop calibration at the normal calibration frequency, which provides sufficient indication of the need for corrective actions based on acceptance criteria related to instrumentation loop performance. The review of calibration results will be performed once every ten years, with the first review occurring before the period of extended operation.

For sensitive instrumentation circuit cables that are disconnected during instrument calibrations, testing using a proven method for detecting deterioration for the insulation system (such as insulation resistance tests or time domain reflectometry) will occur at least once every ten years, with the first test occurring before the period of extended operation. This program will consider the technical information and guidance provided by the industry.

The program will be implemented prior to the period of extended operation. This new program will be implemented consistent with the corresponding program described in NUREG-1801 Section XI.E2, Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits.

NUREG-1801 Consistency

The program will be consistent with NUREG-1801, Section XI.E2, Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Non-EQ Instrumentation Circuits Test Review Program is a new program. Industry operating experience will be considered when implementing this program. Plant operating experience for this program will be gained as it is implemented during the period of extended operations, and will be factored into the program via the confirmation and corrective action elements of the CNS 10 CFR 50 Appendix B quality assurance program.

The CNS program is based on the program description in NUREG-1801, which in turn is based on industry operating experience that demonstrates that this program is effective for managing the aging effects described herein. As such, operating experience assures that implementation of the Non-EQ Instrumentation Circuits Test Review Program will manage the effects of aging such that applicable components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

Conclusion

The Non-EQ Instrumentation Circuits Test Review Program will be effective for managing aging effects since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. The Non-EQ Instrumentation Circuits Test Review Program provides assurance that effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.27 NON-EQ INSULATED CABLES AND CONNECTIONS

Program Description

The Non-EQ Insulated Cables and Connections Program is a new program that assures the intended functions of insulated cables and connections exposed to adverse localized environments caused by heat, radiation and moisture can be maintained consistent with the current licensing basis through the period of extended operation. An adverse localized environment is significantly more severe than the specified service condition for the insulated cable or connection.

A representative sample of accessible insulated cables and connections within the scope of license renewal will be visually inspected for cable and connection jacket surface anomalies such as embrittlement, discoloration, cracking or surface contamination. The program sample consists of all accessible cables and connections in localized adverse environments.

This program will be implemented prior to the period of extended operation. This new program will be implemented consistent with the corresponding program described in NUREG-1801 Section XI.E1, Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements.

NUREG-1801 Consistency

The Non-EQ Insulated Cables and Connections Program will be consistent with the program described in NUREG-1801, Section XI.E1, Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Non-EQ Insulated Cables and Connections Program is a new program. Industry operating experience will be considered when implementing this program. Plant operating experience for this program will be gained as it is implemented during the period of extended operations, and will be factored into the program via the confirmation and corrective action elements of the CNS 10 CFR 50 Appendix B quality assurance program.

The CNS program is based on the program description in NUREG-1801, which in turn is based on industry operating experience that demonstrates that this program is effective for managing the aging effects described herein. As such, operating experience assures that implementation of the Non-EQ Insulated Cables and Connections Program will manage the effects of aging such that applicable components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

Conclusion

The Non-EQ Insulated Cables and Connections Program will be effective for managing aging effects since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. The Non-EQ Insulated Cables and Connections Program provides assurance that effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.28 OIL ANALYSIS

Program Description

The Oil Analysis Program is an existing program that maintains oil systems free of contaminants (primarily water and particulates) thereby preserving an environment that is not conducive to loss of material, cracking, or fouling. Activities include sampling and analysis of lubricating oil for detrimental contaminants, water, and particulates.

Sampling frequencies are based on vendor recommendations, accessibility during plant operation, equipment importance to plant operation, and previous test results.

The One-Time Inspection Program [B.1.29] utilizes inspections or non-destructive evaluations of representative samples to verify that the Oil Analysis Program has been effective at managing aging effects.

NUREG-1801 Consistency

The Oil Analysis Program, with enhancements, is consistent with the program described in NUREG-1801, Section XI.M39, Lubricating Oil Analysis.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Elements Affected	Enhancements
3. Parameters Monitored or Inspected	The Oil Analysis Program will be enhanced to include viscosity, neutralization number, and flash point determination of oil samples from components that do not have regular oil changes, along with analytical ferrography and elemental analysis for the identification of wear particles.
3. Parameters Monitored or Inspected	The Oil Analysis Program will be enhanced to include screening for particulate and water content for oil replaced periodically.

Elements Affected	Enhancements
6. Acceptance Criteria	The Oil Analysis Program will be enhanced to formalize preliminary oil screening for water and particulates and laboratory analyses, including defined acceptance criteria for all components included in the scope of the program. The program will specify corrective actions in the event acceptance criteria are not met.

Operating Experience

The CNS quarterly oil reports provide a periodic summary of the results of oil analysis. The results for the period 2006 and 2007 indicate that lube oil for the RCIC, HPCI and DG systems were within the specifications required for this period. The RCIC system particulate count indicated an adverse trend but did not exceed minimum limits for this period. The HPCI system water content indicated an adverse trend but did not exceed minimum limits for this period. The DG system particulate and lead content indicated an adverse trend but did not exceed minimum limits for this period. In 2004 and 2005 oil samples from the service air compressor indicated excessive water content. Corrective actions included replacement and cleanup of components in addition to an oil changeout of the reservoir. Retest indicated that the water content was only a trace and within acceptable levels. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing aging effects for carbon steel components.

Water content continued to be monitored in the 2nd quarter of 2007 with the HPCI system trending plan. This trending plan monitors water levels in the oil, considering concerns from a system drain and refill in 2005. The HPCI lube oil sump samples detected a decreasing amount of water from June to September 2006. This trace amount was evaluated and shown to be well below any specified limitations. No corrective maintenance was required at that time. Continuous confirmation of oil quality provides evidence that the program is effective in managing aging effects for lube oil components.

In 2007 service water outboard bearing oil samples appeared to be dark and contained debris. Oil analysis of the service water pump outboard bearing indicated no water content but that iron and copper content had risen. The frequency of analysis was increased from 6 months to monthly for improved trending of iron and copper content. Identification of program deficiencies and subsequent corrective actions provide assurance that the program will remain effective for managing loss of material of components.

In 2006, contaminant levels were high out of specification on the main turbine lube oil system. Further review indicated that water in-leakage was occurring from a gland steam seal valve packing leak to the bearing pedestal oil seals. The packing leaks were corrected returning water levels to acceptable. Use of warning level indicators to direct corrective actions prior to equipment degradation provides evidence that the program is effective in managing aging effects.

An EPRI Predictive Maintenance Program Assessment was done in 2004. The oil analysis program was one of several programs reviewed. As a result of this assessment the procedures for this program were revised and updated to include expectations for trending, initiation of condition reports for anomalies, and periodic report generation. Also as a result of this assessment, sample ports were installed on equipment, a minilab was set up on site to expedite results, program owner responsibilities were better defined, and improved training was provided to ensure backup capabilities for program application. Identification of program deficiencies and subsequent corrective actions provide assurance that the program will remain effective for managing loss of material of components.

Conclusion

The Oil Analysis Program has been effective at managing aging effects. The Oil Analysis Program assures the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.29 ONE-TIME INSPECTION

Program Description

The One-Time Inspection Program is a new program that will include measures to verify effectiveness of an aging management program (AMP) and confirm the insignificance of an aging effect. For structures and components that rely on an AMP, this program will verify effectiveness of the AMP by confirming that unacceptable degradation is not occurring and the intended function of a component will be maintained during the period of extended operation. One-time inspections may be needed to address concerns for potentially long incubation periods for certain aging effects on structures and components. There are cases where either (a) an aging effect is not expected to occur but there is insufficient data to completely rule it out, or (b) an aging effect is expected to progress very slowly. For these cases, there will be confirmation that either (a) the aging effect is indeed not occurring, or (b) the aging effect is occurring very slowly as not to affect the component or structure intended function. A one-time inspection of the subject component or structure is appropriate for this verification. The inspections will be nondestructive examinations (including visual, ultrasonic, or surface techniques). The inspection will be performed within the ten years prior to the period of extended operation.

The program will include activities to verify effectiveness of aging management programs and activities to confirm the insignificance of aging effects as described below.

Diesel fuel monitoring program	One-time inspection activity will verify the effectiveness of the diesel fuel monitoring aging management programs by confirming that unacceptable loss of material is not occurring.
Oil analysis program	One-time inspection activity will verify the effectiveness of the oil analysis aging management programs by confirming that unacceptable cracking, loss of material, and fouling is not occurring.
Water chemistry control programs	One-time inspection activity will verify the effectiveness of the three water chemistry control aging management programs by confirming that unacceptable cracking, loss of material, and fouling is not occurring.
Main steam line flow elements (CASS) Reactor recirculation flow elements (CASS)	One-time inspection activity will confirm that cracking and reduction of fracture toughness are not occurring or are so insignificant that an aging management program is not warranted.

Internal surfaces of stainless steel components in the standby gas treatment system containing raw water (drain water)	One-time inspection activity will confirm that loss of material is not occurring or is so insignificant that an aging management program is not warranted.
Internal surfaces of stainless steel tubing in the circulating water system containing raw water (river water)	One-time inspection activity will confirm that loss of material is not occurring or is so insignificant that an aging management program is not warranted.
Internal surfaces of stainless steel tubing and components in the off gas system containing raw water (drain water)	One-time inspection activity will confirm that loss of material is not occurring or is so insignificant that an aging management program is not warranted.
Internal surfaces of stainless steel components in the radwaste system containing raw water (drain water)	One-time inspection activity will confirm that loss of material is not occurring or is so insignificant that an aging management program is not warranted.
Internal surfaces of stainless steel tubing and components in the service air system exposed to condensation	One-time inspection activity will confirm that loss of material is not occurring or is so insignificant that an aging management program is not warranted.

The elements of the One-Time Inspection Program include (a) determination of the sample size based on an assessment of materials of fabrication, environment, plausible aging effects, and operating experience; (b) identification of the inspection locations in the system or component based on the aging effect; (c) determination of the examination technique, including acceptance criteria that would be effective in managing the aging effect for which the component is examined; and (d) evaluation of the need for follow-up examinations to monitor the progression of any aging degradation.

A representative sample will be selected from each unique material and environment combination covered under each of the activities. Each sample size will be based on Chapter 4 of EPRI document 107514, Age Related Degradation Inspection Method and Demonstration, which outlines a method to determine the number of inspections required for 90% confidence that 90% of the population does not experience degradation (90/90). Components with the same material-environment combinations at other facilities may be included in the sample.

The program provides for increasing inspection sample size and locations in the event that aging effects are detected. Unacceptable inspection findings are evaluated in accordance with the corrective action process to determine the need for subsequent (including periodic) inspections and for monitoring and trending the results.

For specific system components where significant aging effects are not expected, one-time inspection activities are used to confirm that loss of material, cracking, and reduction of fracture toughness, as applicable, are not occurring or are so insignificant that an aging management program is not warranted. When evidence of an aging effect is revealed by a one-time inspection, routine evaluation of the inspection results will identify appropriate corrective actions.

NUREG-1801 Consistency

The One-Time Inspection Program will be consistent with the program described in NUREG-1801, Section XI.M32, One-Time Inspection.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The One-Time Inspection Program is a new program. Industry operating experience will be considered when implementing this program. Plant operating experience for this program will be gained as it is implemented during the period of extended operations, and will be factored into the program via the confirmation and corrective action elements of the CNS 10 CFR 50 Appendix B quality assurance program.

The CNS program is based on the program description in NUREG-1801, which in turn is based on industry operating experience that demonstrates that this program is effective for managing the aging effects described herein. As such, operating experience assures that implementation of the One-Time Inspection Program will manage the effects of aging such that applicable components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

Conclusion

The One-Time Inspection Program will be effective for managing aging effects since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. The One-Time Inspection Program provides assurance that the Water Chemistry Control, Diesel Fuel Monitoring, and Oil Analysis programs will be effective in managing the effects of aging to ensure component intended functions can be maintained in accordance with the current licensing basis (CLB) through the period of extended operation. In addition, the One-Time Inspection Program will confirm the insignificance of aging effects on specific system components where significant aging effects are not expected.

B.1.30 ONE-TIME INSPECTION – SMALL-BORE PIPING

Program Description

The One-Time Inspection – Small-Bore Piping Program is a new program applicable to small-bore American Society of Mechanical Engineers (ASME) Code Class 1 piping less than 4 inches nominal pipe size (NPS 4"), which includes pipe, fittings, and branch connections. The ASME Code does not require volumetric examination of Class 1 small-bore piping. The CNS One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program will manage cracking through the use of volumetric examinations.

The program will include a sample selected based on susceptibility, inspectability, dose considerations, operating experience, and limiting locations of the total population of ASME Code Class 1 small-bore piping locations.

When evidence of an aging effect is revealed by a one-time inspection, evaluation of the inspection results will identify appropriate corrective actions.

The NUREG-1801 Program Description for Program XI.M35 describes the program to include piping "less than or equal to NPS 4" with a reference to ASME Section XI, Table IWB-2500-1, Examination Category BJ. However, volumetric examinations are already required for piping equal to NPS 4" according to ASME Code. These examinations are included in B.1.19 Inservice Inspection. Consistent with the Code, GALL Item IV.C2-1 applies the One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program (XI.M35) only to Class 1 piping less than NPS 4". Based on this, CNS concludes that it is not the intent of GALL for Program XI.M35 to include NPS 4" pipe. Therefore, the CNS One-Time Inspection – Small-Bore Piping Program includes only small-bore Class 1 piping < NPS 4", which is considered consistent with GALL.

The inspection will be performed within the ten years prior to the period of extended operation.

NUREG-1801 Consistency

The One-Time Inspection – Small-Bore Piping Program will be consistent with the program described in NUREG-1801, Section XI.M35, One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The One-Time Inspection – Small-Bore Piping Program is a new program. Industry operating experience will be considered when implementing this program. Plant operating experience for this program will be gained as it is implemented during the period of extended operations, and will be factored into the program via the confirmation and corrective action elements of the CNS 10 CFR 50 Appendix B quality assurance program.

The CNS program is based on the program description in NUREG-1801, which in turn is based on industry operating experience that demonstrates that this program is effective for managing the aging effects described herein. As such, operating experience assures that implementation of the One-Time Inspection – Small-Bore Piping Program will manage the effects of aging such that applicable components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

Conclusion

The One-Time Inspection –Small-Bore Piping Program will be effective for managing aging effects since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. The One-Time Inspection – Small-Bore Piping Program provides assurance that effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.31 PERIODIC SURVEILLANCE AND PREVENTIVE MAINTENANCE

Program Description

There is no corresponding NUREG-1801 program.

The Periodic Surveillance and Preventive Maintenance Program is an existing program that includes periodic inspections and tests that manage aging effects not managed by other aging management programs. In addition to specific activities in the plant's preventive maintenance program and surveillance program, the Periodic Surveillance and Preventive Maintenance Program includes enhancements to add new activities. The preventive maintenance and surveillance testing activities are generally implemented through repetitive tasks or routine monitoring of plant operations. The program is credited with managing loss of material from external surfaces for situations in which external and internal material and environment combinations are the same such that internal surface condition is representative of external surface condition.

In cases where a representative sample is inspected by this program, a representative sample will be selected from each unique material and environment combination covered under each of the program activities. Each sample size will be based on Chapter 4 of EPRI document 107514, Age-Related Degradation Inspection Method and Demonstration, which outlines a method to determine the number of inspections required for 90% confidence that 90% of the population does not experience degradation (90/90). Components with the same material-environment combinations at other facilities may be included in the sample.

The program provides for increasing inspection sample size and locations in the event that aging effects are detected. Unacceptable inspection findings are evaluated in accordance with the corrective action process to determine the need for subsequent (including periodic) inspections and for monitoring and trending the results.

Credit for program activities has been taken in the aging management review of the following systems and structures.

Reactor building	Perform visual or other non-destructive examination to manage loss of material for carbon steel components of the reactor building monorails, railroad airlock doors, reactor building crane, rails and girders, and refueling bridge equipment assembly.
Reactor building	Perform visual inspection and manually flex a representative sample of the elastomer seals for railroad airlock doors to manage cracking and change in material properties.
Standby liquid control (SLC) system	Perform visual inspection of the internal surfaces of the SLC system accumulator shells to manage loss of material.

High pressure core injection (HPCI) system	Perform visual or other non-destructive examination of the external surfaces of the copper alloy turbine lube oil heat exchanger tubes to manage wear.
Automatic depressurization system (ADS)	Perform visual or other non-destructive examination of carbon steel ADS components in waterline region of the suppression chamber to manage loss of material of main steam relief tailpipes and T-quenchers
Reactor core isolation cooling (RCIC) system	Perform visual inspection of a representative sample of vacuum pump discharge piping, piping elements, and components to manage loss of material and cracking. Perform visual or other non-destructive examination of the external surfaces of the copper alloy turbine lube oil heat exchanger tubes to manage wear.
Standby gas treatment (SGT) system	Perform visual inspection of a representative sample of SGT system carbon steel components exposed to raw water (drain water) to manage loss of material. Perform visual inspection of a representative sample of SGT system copper alloy components exposed to raw water (drain water) to manage loss of material. Perform internal and external visual inspection and manually flex the fan inlet flexible connections to verify the absence of cracks and significant change in material properties.
Plant drains system	Perform internal visual inspection of a representative sample of carbon steel, stainless steel, copper alloy, and gray cast iron plant drain components exposed to raw water (drain water) to manage loss of material. Perform visual inspection of the inside and outside surfaces of a representative sample of gray cast iron and aluminum pump casings exposed to raw water (drain water) to manage loss of material. Perform visual inspection of the outside surface of gasoline-powered gray cast iron pump casings exposed to air – indoor to manage loss of material.
Diesel generator (DG) system	Perform internal visual inspection of a representative sample of DG exhaust gas components to manage loss of material. Perform intercooler operability testing to manage fouling for stainless steel tubes and aluminum fins. Perform visual inspection of a representative sample of DG service air component internal surfaces to manage loss of material.

Heating, ventilation, and air conditioning (HVAC) systems	Visually inspect both internally and externally and flex to the extent possible a representative sample of flexible duct connections composed of elastomer. Visually inspect both internally and externally the portable blower fan housings that are in storage that may be used for ventilation for loss of material. Visually inspect the HVAC flexible trunks that are in storage that may be used for ventilation for cracking and change in material properties. Perform visual or other non-destructive examination to inspect a representative sample of fan coil unit tubes, fins and drip pan to manage loss of material and fouling.
Primary containment (PC) system	Visually inspect the internal surface of a representative sample of carbon steel equipment and floor drain components exposed to raw water (drain water) to manage loss of material.
Nonsafety-related systems affecting safety-related systems	Visually inspect the internal surfaces of a representative sample of carbon steel, copper alloy, and gray cast iron piping, piping elements, and components in the circulating water system exposed to raw water (river water) to manage loss of material. Visually inspect the internal surfaces of a representative sample of carbon steel, copper alloy and gray cast iron piping, piping elements, and components in the nonradioactive floor drain system exposed to raw water (drain water) to manage loss of material. Visually inspect the internal surfaces of a representative sample of carbon steel piping, piping elements, and components in the heating and ventilation (HV) system exposed to raw water (drain water) to manage loss of material. Visually inspect the internal surfaces of a representative sample of carbon steel piping, piping elements, and components in the off gas (OG) system exposed to raw water (drain water) to manage loss of material. Visually inspect the internal surfaces of a representative sample of copper alloy piping, piping elements, and components in the potable water (PW) system exposed to treated water (potable water) to manage loss of material. Visually inspect the internal surfaces of a representative sample of carbon steel and copper alloy piping, piping elements, and components in the radwaste (RW) system exposed to raw water (liquid radwaste) to manage loss of material.

(continued)	Visually inspect the internal surfaces of a representative sample of piping, piping elements, and components in the diesel generator starting air (DGSA) and service air (SA) systems exposed to condensation to manage loss of material.
Instrument air system	Visually inspect the service air primary containment penetration X-21 carbon steel component internal surfaces to manage loss of material.
Nitrogen system	Visually inspect inside surface of carbon steel tank exposed to raw water. Visually inspect the external surface of copper alloy vaporizer coil exposed to raw water inside the nitrogen vaporizer tank to manage loss of material and fouling.

Evaluation

1. Scope of Program

The Periodic Surveillance and Preventive Maintenance Program, with regard to license renewal, includes those tasks credited with managing aging effects identified in aging management reviews.

2. Preventive Actions

Inspection and testing activities used to identify component aging effects do not prevent aging effects. However, activities are intended to prevent failures of components that might be caused by aging effects.

3. Parameters Monitored/Inspected

This program provides instructions for monitoring structures, systems, and components to detect degradation. Inspection and testing activities monitor various parameters including system flow, system pressure, surface condition, loss of material, presence of corrosion products, and signs of cracking.

4. Detection of Aging Effects

Preventive maintenance activities and periodic surveillances provide for periodic component inspections and testing to detect aging effects. Inspection and test intervals are established such that they provide timely detection of degradation. Inspection and test intervals are dependent on component material and environment and take into consideration industry and plant-specific operating experience and manufacturers' recommendations. Each inspection or test occurs at least once every five years.

The extent and schedule of inspections and testing assure detection of component degradation prior to loss of intended functions. Established techniques such as visual inspections are used.

5. Monitoring and Trending

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

6. Acceptance Criteria

Periodic Surveillance and Preventive Maintenance Program acceptance criteria are defined in specific inspection and testing procedures. The procedures confirm component integrity by verifying the absence of aging effects or by comparing applicable parameters to limits based on applicable intended functions established by plant design basis.

7. Corrective Actions

Corrective actions for this program are implemented in accordance with requirements of 10 CFR Part 50, Appendix B.

8. Confirmation Process

This element is discussed in Section B.0.3.

9. Administrative Controls

This element is discussed in Section B.0.3.

10. Operating Experience

Typical inspection results of this program include the following.

Results of inspections of the reactor building crane in 2005 revealed a broken trolley rail hold-down lug bolt. A work order was issued to replace the lug bolt. Identification of degradation and corrective action provide evidence that the program is effective for managing aging effects of material on the turbine building crane, crane rails, and girders.

Inspection of railroad airlock doors elastomer gaskets in 2004 indicated that the elastomers in this airlock were worn. A condition report was issued and the elastomer gaskets were replaced. There was no indication of degradation in the structural members of the airlock doors. Identification of degradation and prompt corrective action provide evidence that the program is effective for managing aging effects for the door seals.

Inspection of railroad airlock doors structural members and elastomer gaskets in 2005 and 2006 revealed that they were in good condition with no signs of corrosion or deterioration of the elastomers. This provides evidence that the program is effective for managing loss of material and cracking and change in material properties in elastomers on the airlock.

Results of inspections of the turbine building crane in 2004 and 2006 did not reveal significant corrosion or wear. This provides evidence that the program is effective for managing loss of material on the turbine building crane, crane rails, and girders.

During 2004, preventive maintenance on the SLC tank drain valve revealed no corrosion or leakage on the external surfaces of the valve. This provides evidence that the program is effective for managing aging effects for the SLC valves.

Preventive maintenance on the standby gas treatment fans in 2006 revealed no corrosion that required any corrective action. This provides evidence that the program is effective for managing aging effects for the standby gas treatment fans.

In 1999 and 2000, the drywell equipment sump drains were disassembled and reassembled with no indication of aging such as erosion or corrosion. This provides evidence that the program is effective for managing aging effects for the sump drains.

Preventive maintenance on jacket water heat exchangers in 2001 revealed pitting on tubes. After evaluation, thirteen tubes were plugged. Also in 2001, pitting on tubes in the lube oil heat exchangers required plugging of five tubes. Identification of degradation and prompt corrective action provide evidence that the program is effective for managing loss of material on the diesel generator heat exchangers. In 2005 degradation due to corrosion was found on the internal surfaces of the exhaust stack. In 2007 corrosion was found on the intercooler waterboxes. No loss of intended function was indicated. These components are being repaired or replaced according to the site Corrective Action Program.

Preventive maintenance on the high pressure core injection room fan in 2005 revealed the flexible rubber connector between the fan and the duct was not secure although no air leakage was found. A condition report was written and the connection was repaired. No other aging effects were observed in the ductwork, vents, fan housing or coil casing. Identification of degradation and prompt corrective action

provides assurance that the program is effective for managing loss of material in the HVAC system.

In 2003 and 2005, the suppression chamber exhaust inboard valves were disassembled and reassembled for butterfly valve seal replacement with no indication of aging such as erosion or corrosion. In 2006 and 2007, drain traps in the instrument air system were disassembled, cleaned and examined with no indication of aging such as erosion or corrosion. In 2004 and 2006, air dryer exhaust valves in the instrument air system were disassembled and examined with no indication of aging such as erosion or corrosion. This provides evidence that the program is effective for managing aging effects for the exhaust valves.

Preventive maintenance in 2007 measured the wall thickness of the service air receiver tank using UT procedures to establish a baseline reference for future preventive maintenance. The test results revealed that the tank walls were of acceptable thickness. Preventive maintenance test results confirming the absence of significant wall loss provides evidence that the program is effective for managing loss of material on the instrument air System.

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Elements Affected	Enhancements
1. Scope of Program 3. Parameters Monitored or Inspected 4. Detection of Aging Effects 6. Acceptance Criteria	The Periodic Surveillance and Preventive Maintenance Program will be enhanced to include all activities described in the table provided in the program description.
4. Detection of Aging Effects	For each activity that refers to a representative sample, a representative sample will be selected for each unique material and environment combination. The sample size will be determined in accordance with Chapter 4 of EPRI 107514, Age-Related Degradation Inspection Method and Demonstration, which outlines a method to determine the number of inspections required for 90% confidence that 90% of the population does not experience degradation (90/90).

Conclusion

The Periodic Surveillance and Preventive Maintenance Program has been effective at managing aging effects. The Periodic Surveillance and Preventive Maintenance Program assures the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.32 REACTOR HEAD CLOSURE STUDS

Program Description

The Reactor Head Closure Studs Program is an existing program that includes inservice inspection (ISI) in conformance with the requirements of ASME Section XI, Subsection IWB, and preventive measures (e.g., rust inhibitors, stable lubricants, appropriate materials) to mitigate cracking and loss of material of reactor head closure studs, nuts, washers, and bushings.

NUREG-1801 Consistency

The Reactor Head Closure Studs Program is consistent with the program described in NUREG-1801, Section XI.M3, Reactor Head Closure Studs, with one exception.

Exceptions to NUREG-1801

The Reactor Head Closure Studs Program is consistent with the program described in NUREG-1801, Section XI.M3, Reactor Head Closure Studs, with the following exception.

Elements Affected	Exception
4. Detection of Aging Effects	NUREG-1801 recommends the use of ASME Section XI, Subsection IWA-2000 to set distance and lighting requirements for VT-2 inspections for leak detection performed during system pressure tests. CNS uses an alternate approach.[1]

Exception Note

1. To prevent the extra scaffolding and radiation exposure needed to meet the distance and lighting requirements of IWA-2210, CNS conducts VT-2 examinations to detect evidence of leakage from pressure retaining components without a distance limitation and prescribes examinations in accordance with IWA-5000. IWA-5000 allows examination of floor areas or equipment surfaces underneath an inaccessible component for evidence of leakage. The NRC Staff has determined that the minimum illumination level and maximum direct examination distance need not be specified in order to perform effective VT-2 examinations. A VT-2 examination is conducted to detect evidence of leakage, and such leakage can be detected effectively beyond the code-specified minimum distance. Leakage can also be detected well under the code-specified minimum illumination level. Even if the general illumination level in the general building area of interest is below the minimum specified illumination level, supplemental spot lighting, if necessary, can be utilized. This alternative to the ASME code has been approved in accordance with the provisions of 10 CFR 50.55a(a)(3) for the 4th interval. To continue the alternative in subsequent intervals during the period of extended operation, approval must be obtained in accordance with 10 CFR 50.55a.

Enhancements

None

Operating Experience

Surface examination of RPV studs and nuts in 2001 during RE20 identified a recordable indication for RPV nuts, two non-recordable indications for RPV studs and a non-recordable for RPV washers. The recordable indication was evaluated as satisfactory. These examinations were done in the previous 10-year interval. Examination of the studs during the current 10-year interval is scheduled for fall of 2009 during RE25. In addition the studs, nuts and washers are examined for cleanliness and damage during each installation of the RPV head. Continuing examination of the studs and nuts and the evaluation of the results provide evidence that the program is effective in managing and detecting cracking and loss of material in the bolting.

The Reactor Head Closure Studs Program detects aging effects using nondestructive examination (NDE) visual, surface and volumetric techniques to detect and characterize flaws. These techniques are widely used and have been demonstrated effective at detecting aging effects during inspections performed to meet ASME Section XI Code requirements. The application of these proven methods provides assurance that the effects of aging will be managed such that the Reactor Head Closure Studs Program components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

Conclusion

The Reactor Head Closure Studs Program has been effective at managing aging effects. The Reactor Head Closure Studs Program assures the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.33 REACTOR VESSEL SURVEILLANCE

Program Description

The Reactor Vessel Surveillance Program is an existing program that manages reduction in fracture toughness of reactor vessel beltline materials to assure that the pressure boundary function of the reactor pressure vessel is maintained through the period of extended operation.

CNS has received NRC approval to use the BWR vessel and internals project (BWRVIP) Integrated Surveillance Program (ISP). The Reactor Vessel Surveillance Program monitors changes in the fracture toughness properties of ferritic materials in the reactor pressure vessel (RPV) beltline region. As BWRVIP-ISP capsule test reports become available for RPV materials representative of CNS, the actual shift in the reference temperature for nil-ductility transition of the vessel material may be updated. In accordance with 10 CFR 50 Appendices G and H, CNS reviews relevant test reports to assure compliance with fracture toughness requirements and P-T limits.

BWRVIP-116, "BWR Vessel and Internals Project Integrated Surveillance Program (ISP) Implementation for License Renewal," describes the design and implementation of the ISP during the period of extended operation. BWRVIP-116 identifies additional capsules of the Supplemental Surveillance Program (SSP), their withdrawal schedule, and contingencies to ensure that the requirements of 10 CFR 50 Appendix H are met through the period of extended operation.

NUREG-1801 Consistency

The Reactor Vessel Surveillance Program, with enhancements, is consistent with the program described in NUREG-1801, Section XI.M31, Reactor Vessel Surveillance.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Elements Affected	Enhancements
5. Monitoring and Trending	If the CNS standby capsule is removed from the reactor vessel without the intent to test it, the capsule will be stored in a manner which maintains it in a condition which would permit its future use, including during the period of extended operation, if necessary.
5. Monitoring and Trending	The CNS Reactor Vessel Surveillance Program will be enhanced to ensure that the additional requirements that are specified in the final NRC safety evaluation for BWRVIP-116 will be addressed before the period of extended operation.

Operating Experience

In 2002 CNS committed to follow the requirements of the BWRVIP Integrated Surveillance Program, BWRVIP-86-A. CNS withdrew surveillance capsules for testing in 2003 and updated the fluence calculation. This resulted in a change in the P-T curves which required a Technical Specification change in 2005.

Conclusion

The Reactor Vessel Surveillance Program has been effective at managing aging effects. The Reactor Vessel Surveillance Program assures the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.34 SELECTIVE LEACHING

Program Description

The Selective Leaching Program is a new program that will ensure the integrity of components made of cast iron, bronze, brass, and other alloys exposed to condensation, raw water, steam, treated water, and soil (groundwater) that may lead to selective leaching. The program will include a one-time visual inspection, hardness measurement (where feasible based on form and configuration), or other industry accepted mechanical inspection techniques of selected components that may be susceptible to selective leaching to determine whether loss of material due to selective leaching is occurring, and whether the process will affect the ability of the components to perform their intended function through the period of extended operation. The selected set or representative sample size will be based on Chapter 4 of EPRI document 107514, Age-Related Degradation Inspection Method and Demonstration, which outlines a method to determine the number of inspections required for 90% confidence that 90% of the population does not experience degradation (90/90). Each group of components with the same material-environment combination is considered a separate population.

This program will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The Selective Leaching Program will be consistent with the program described in NUREG-1801, Section XI.M33 Selective Leaching of Materials.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Selective Leaching Program is a new program. Industry operating experience will be considered when implementing this program. Plant operating experience for this program will be gained as it is implemented during the period of extended operations, and will be factored into the program via the confirmation and corrective action elements of the CNS 10 CFR 50 Appendix B quality assurance program.

The CNS program is based on the program description in NUREG-1801, which in turn is based on industry operating experience that demonstrates that this program is effective for managing the aging effects described herein. As such, operating experience assures that implementation of the Selective Leaching Program will manage the effects of aging such that applicable components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

Conclusion

The Selective Leaching Program will be effective for managing aging effects since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. The Selective Leaching Program provides assurance that effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.35 SERVICE WATER INTEGRITY

Program Description

The Service Water Integrity Program is an existing program that relies on implementation of the recommendations of GL 89-13 to ensure that the effects of aging on the service water (SW) system will be managed through the period of extended operation. The program includes component inspections for cracking, erosion, corrosion, wear, and blockage and performance monitoring to verify the heat transfer capability of the safety-related heat exchangers cooled by SW. Periodic cleaning and flushing of redundant or infrequently used loops are the methods used to control or prevent fouling within the heat exchangers and loss of material in SW components.

NUREG-1801 Consistency

The Service Water Integrity Program is consistent with the program described in NUREG-1801, Section XI.M20, Open-Cycle Cooling Water System.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

In 2004 and 2005 the reactor equipment cooling system heat exchanger internals were visually examined for corrosion in the water boxes and fouling of the tubes with no aging effects noted. Similar examinations were performed in 2007 to the diesel generator jacket water heat exchangers with no aging effects noted. In 2007, the reactor equipment cooling system heat exchangers were performance tested and shown to have a fouling factor less than the maximum allowable for these heat exchangers. Absence of aging effects provides evidence that the program is effective for managing aging effects.

In 2007, the diesel generator lube oil heat exchangers required that five tubes be plugged due to wall thinning determined by eddy current test. Plugging of these five tubes did not exceed the total tube plugging margin allowed for these lube oil heat exchangers. In 2005 pinhole leaks were found in the backwash piping of the Zurn strainer piping in the SW system. A corrective action plan was placed in effect to periodically replace the piping. In 2002, 2003 and 2007 erosion was found in valve bodies and piping. These components were repaired or replaced according to the site Corrective Action Program. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing aging effects for carbon steel components.

In 2007 cleaning and inspections were performed in the SW bays and the reactor equipment cooling system heat exchangers. SW bays were cleaned and procedures were revised to more effectively monitor this area of the intake structure. Heat exchanger fouling was determined to be within acceptance criteria. NRC biennial heat sink performance inspections were performed in 2004 and 2006. This inspection verified that heat exchanger problems were properly documented, dispositioned, and corrected. In 2006 an industry OE bulletin SER 7-06 was reviewed to address 14 "lessons learned" issues from industry experience related to service water integrity. The service water integrity program was shown to be effectively addressing the issues except for inspection of underground piping and cathodic protection. The Corrective Action Program is being used to enhance the program in these areas. Self assessments have concluded that this program is well documented, captured in controlled procedures, consistent with applicable industry standards, and is implemented with effective interfaces. Identification of program deficiencies, and subsequent corrective actions, provide assurance that the program will remain effective for managing loss of material of components.

Conclusion

The Service Water Integrity Program has been effective at managing aging effects. The Service Water Integrity Program assures the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.36 STRUCTURES MONITORING

Program Description

The Structures Monitoring Program is an existing program that performs inspections in accordance with 10 CFR 50.65 (Maintenance Rule) as addressed in Regulatory Guide 1.160 and NUMARC 93-01. Periodic inspections are used to monitor the condition of structures and structural commodities to ensure there is no loss of intended function.

Since protective coatings are not relied upon to manage the effects of aging for structures included in the Structures Monitoring Program, the program does not address protective coating monitoring and maintenance.

NUREG-1801 Consistency

The Structures Monitoring Program, with enhancements, is consistent with the program described in NUREG-1801, Section XI.S6, Structures Monitoring Program.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Elements Affected	Enhancements
1. Scope of Program	The Structures Monitoring Program will be enhanced to clarify that the following structures are included in the program. • biological shield wall • control room ceiling support system • crane rails and girders • CRD shootout steel • diesel fuel tank hatch cover • diesel fuel tank retaining wall and slab • drywell fill slab • drywell shell protection panels and jet deflectors • drywell stabilizer supports • foundations (buildings) • guide wall • manholes and duct banks

Elements Affected	Enhancements
1. Scope of Program (continued)	• monorails • new fuel storage vault • office building (or administration building) • oil tank bunker crushed rock fill • pump baffle plates • reactor building loop seal drain caps • reactor building railroad airlock doors • reactor building sump structure • reactor cavity floor and walls • reactor cavity liner • reactor pedestal • sacrificial shield wall (steel portion) • sacrificial shield wall lateral supports • service water pipe slab • shield plugs • spent fuel pool floor and walls • steam tunnel • sumps and sump liners • transformer yard and switchyard support structures and foundations • transmission towers (galvanized), wooden utility towers, wooden utility poles, and foundations • traveling screen casing and associated framing
1. Scope of Program	The Structures Monitoring Program will be enhanced to clarify that in addition to structural steel and concrete, the following commodities are inspected for each structure as applicable. • anchor bolts • anchorage/embedments • base plates • battery racks • beams, columns, floor slabs, and walls (below grade) • blowout panels (including east end of steam tunnel) • cable trays and supports • component and piping supports • conduits and conduit supports

Elements Affected	Enhancements
1. Scope of Program (continued)	• electrical and instrument panels and enclosures • equipment pads and foundations • exterior walls • flood curbs • flood, pressure and specialty doors • flood retention materials (spare parts) • HVAC duct supports • instrument line supports • instrument racks, frames, and tubing trays • manways, hatches, manhole covers, and hatch covers • missile shields • penetration sealant (flood, radiation) • penetration sleeves and sealant (mechanical/electrical not penetrating PC boundary) • pipe whip restraints • seals and gaskets (doors, manways and hatches) • stairs and handrails, platforms, grating, decking, and ladders • support pedestals • vents and louvers
1. Scope of Program 4. Detection of Aging Effects	Guidance will be added to the Structures Monitoring Program to inspect inaccessible concrete areas that are submerged or below grade which may become exposed due to excavation, construction or other activities. CNS will also inspect inaccessible concrete areas when observed conditions in accessible areas exposed to the same environment indicate that significant concrete degradation is occurring.
4. Detection of Aging Effects	The Structures Monitoring Program will be enhanced for inspection of elastomers (seals, gaskets, and roof elastomers) to identify cracking and change in material properties.

Elements Affected	Enhancements
4. Detection of Aging Effects	Guidance to perform an engineering evaluation of groundwater samples to assess aggressiveness of groundwater to concrete on a periodic basis (at least once every five years) will be added to the Structures Monitoring Program. CNS will obtain samples from a well that is representative of the groundwater surrounding below-grade site structures. Samples will be monitored for sulfates, pH and chlorides.
4. Detection of Aging Effects	Guidance for performing visual structural examinations of wood to identify loss of material and change in material properties will be added to the Structures Monitoring Program.
4. Detection of Aging Effects	Guidance for performing visual structural monitoring of the oil tank bunker crushed rock fill to identify loss of form will be added to the Structures Monitoring Program.
7. Corrective Actions	The Structures Monitoring Program will be enhanced to clarify that structures with conditions classified as “acceptable with deficiencies” or “unacceptable” shall be entered into the Corrective Action Program.

Operating Experience

From 2002 through 2007, inspections of buildings, concrete, and structural steel components revealed cracks, spalling, missing grout, minor corrosion (rust), scaling, insulation tears, and minor siding damage. Also, during this period, inspections of roofs indicated tears, missing drain grating, and degraded sealant. An evaluation of these findings concluded the condition did not compromise structural integrity. Identification of degradation and corrective action prior to loss of intended function provide evidence that the loss program is effective for managing aging effects for structural components.

A Maintenance Rule Periodic Assessment covering the period from September 2005 to February 2007 stated there is no known adverse trend in structure performance and concluded the structure inspection program is adequate and effective.

Conclusion

The Structures Monitoring Program has been effective at managing aging effects. The Structures Monitoring Program assures the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.37 THERMAL AGING AND NEUTRON IRRADIATION EMBRITTLEMENT OF CAST AUSTENITIC STAINLESS STEEL (CASS)

Program Description

The Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program is a new program that will assure reduction of fracture toughness due to thermal aging and reduction of fracture toughness due to radiation embrittlement will not result in loss of intended function. This program will evaluate CASS components in the reactor vessel internals and require non-destructive examinations as appropriate.

This program will supplement reactor vessel internals inspections required by the BWR Vessel Internals Program [B.1.9] and the Inservice Inspection – ISI Program [B.1.19] to manage the effects of loss of fracture toughness due to thermal aging and neutron embrittlement of CASS components.

For pump casings and valve bodies, based on the assessment documented in the letter dated May 19, 2000, from Christopher Grimes, NRC, to Douglas Walters, Nuclear Energy Institute (NEI), screening for susceptibility to thermal aging is not required. The existing ASME Section XI inspection requirements, including the alternative requirements of ASME Code Case N-481 for pump casings, are adequate for all pump casings and valve bodies.

This aging management program includes

(a) identification of susceptible components determined to be limiting from the standpoint of thermal aging susceptibility (i.e., ferrite and molybdenum contents, casting process, and operating temperature) and/or neutron irradiation embrittlement (neutron fluence), and

(b) for each "potentially susceptible" component, aging management is accomplished through either a supplemental examination of the affected component during the period of extended operation, or a component-specific evaluation to determine its susceptibility to reduction of fracture toughness.

This program will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The Thermal Aging and Neutron Irradiation Embrittlement of CASS Program will be consistent with the program described in NUREG-1801, Section XI.M13, Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Thermal Aging and Neutron Irradiation Embrittlement of CASS Program is a new program. Industry operating experience will be considered when implementing this program. Plant operating experience for this program will be gained as it is implemented during the period of extended operations, and will be factored into the program via the confirmation and corrective action elements of the CNS 10 CFR 50 Appendix B quality assurance program.

The CNS program is based on the program description in NUREG-1801, which in turn is based on industry operating experience that demonstrates that this program is effective for managing the aging effects described herein. As such, operating experience assures that implementation of the Thermal Aging and Neutron Irradiation Embrittlement of CASS Program will manage the effects of aging such that applicable components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

Conclusion

The Thermal Aging and Neutron Irradiation Embrittlement of CASS Program will be effective for managing aging effects since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. The Thermal Aging and Neutron Irradiation Embrittlement of CASS Program provides assurance that effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.38 WATER CHEMISTRY CONTROL – AUXILIARY SYSTEMS

Program Description

There is no corresponding NUREG-1801 program.

The Water Chemistry Control – Auxiliary Systems Program is an existing program that manages loss of material and cracking for components exposed to treated water and steam.

Program activities include sampling and analysis of water in auxiliary condensate drain system components, auxiliary steam system components, and heating and ventilation system components to minimize component exposure to aggressive environments.

The One-Time Inspection Program [B.1.29] utilizes inspections or non-destructive evaluations of representative samples to verify that the Water Chemistry Control – Auxiliary Systems Program has been effective at managing aging effects.

Evaluation

1. Scope of Program

Program activities include sampling and analysis of water in auxiliary condensate drain system components, auxiliary steam system components, and heating and ventilation system components to minimize component exposure to aggressive environments.

2. Preventive Actions

This program includes monitoring and control of water in auxiliary condensate drain system components, auxiliary steam system components, and heating and ventilation system components to minimize exposure to aggressive environments, thereby mitigating the effects of aging.

3. Parameters Monitored/Inspected

In accordance with industry recommendations, auxiliary condensate drain system and auxiliary steam system water parameters monitored are pH, conductivity, phosphate, sulfite, and iron.

In accordance with industry recommendations, heating and ventilation systems parameter monitored is sodium nitrite ($NaNO_2$).

4. Detection of Aging Effects

This program manages loss of material and cracking for auxiliary condensate drain system components, loss of material and cracking for auxiliary steam system components, and loss of material for heating and ventilation system components.

The One-Time Inspection Program [B.1.29] for water chemistry describes inspections planned to verify the effectiveness of water chemistry control programs to ensure that significant degradation is not occurring and component intended function is maintained during the period of extended operation.

5. Monitoring and Trending

Values from analyses are archived for long-term trending and review. Trending is not required to predict the extent of degradation since maintaining parameters within acceptance criteria prevents degradation. Operating experience indicates effectiveness in preventing aging effects if parameters are maintained within limits.

6. Acceptance Criteria

In accordance with industry recommendations, acceptance criteria for the auxiliary condensate drain system and auxiliary steam system water are as follows.

pH	> 9.0, $\leq$ 11.4
conductivity	< 2100 µmho/cm
phosphate	> 50 ppm
sulfite	> 3 ppm
iron	< 2 ppm

In accordance with industry recommendations, acceptance criteria for the heating and ventilation system are as follows.

sodium nitrite ($NaNO_2$)> 750 ppm

7. Corrective Actions

If acceptance criteria are not met, chemistry parameters are adjusted as appropriate. Additional sampling and verification is performed if necessary. Corrective actions for unacceptable inspection results are identified and implemented in accordance with the CNS 10 CFR Part 50 Appendix B Corrective Action Program.

8. Confirmation Process

This element is discussed in Section B.0.3.

9. Administrative Controls

This element is discussed in Section B.0.3.

10. Operating Experience

From 2003 through 2008, samples were routinely taken from the auxiliary condensate and steam system (heating boilers) and the heating and ventilation system (admin chillers) for analysis. The results for the condensate and steam system indicated no variance from limits in PH or conductivity with occasional variance in iron, phosphate and sulfite. Also, the results for the admin chiller system indicated no variance from limits in conductivity with occasional variance in sodium nitrites. On these occasions of variance, corrective action was taken to bring the variance back into compliance. The routine confirmation of water quality and use of appropriate timely corrective action provide evidence that the program is effective in managing loss of material for applicable components.

In 2006, a self-assessment was performed to address chemistry monitoring, control and evaluation. This assessment prompted training for the process for chemical labeling and permits to assure adequate implementation. It also prompted a review and update of personnel roles and responsibilities, more effective use of the Corrective Action Program and increased attention to reviewing and documenting instrument trends and bias as required by procedure. This self assessment included actions and recommendations which were resolved to upgrade the program to confirm its effectiveness. Identification of program deficiencies, and subsequent corrective actions, provide assurance that the program will remain effective for managing loss of material of components.

Enhancements

None

Conclusion

The Water Chemistry Control – Auxiliary Systems Program has been effective at managing aging effects. The Water Chemistry Control – Auxiliary Systems Program assures the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.39 WATER CHEMISTRY CONTROL – BWR

Program Description

The Water Chemistry Control – BWR Program is an existing program that manages aging effects caused by corrosion and cracking mechanisms. The program relies on monitoring and control of water chemistry based on EPRI Report 1008192 (BWRVIP-130). BWRVIP-130 has three sets of guidelines: one for primary water, one for condensate and feedwater, and one for control rod drive (CRD) mechanism cooling water. EPRI guidelines in BWRVIP-130 also include recommendations for controlling water chemistry in the torus/pressure suppression chamber, condensate storage tank, demineralized water storage tanks, and spent fuel pool.

The Water Chemistry Control – BWR Program optimizes the primary water chemistry to minimize the potential for loss of material and cracking. This is accomplished by limiting the levels of contaminants in the reactor coolant system that could cause loss of material and cracking. Additionally, CNS has instituted hydrogen water chemistry and noble metal chemical addition to limit the potential for IGSCC through the reduction of dissolved oxygen in the treated water.

The One-Time Inspection Program [B.1.29] utilizes inspections or non-destructive evaluations of representative samples to verify that the Water Chemistry Control – BWR Program has been effective at managing aging effects.

NUREG-1801 Consistency

The Water Chemistry Control – BWR Program is consistent with the program described in NUREG-1801, Section XI.M2, Water Chemistry.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

During the period from 2002 through 2006, several condition reports were initiated due to adverse trends in parameters monitored by the Water Chemistry Control – BWR Program. Corrective actions were taken within the Corrective Action Program to preclude reaching unacceptable values for the parameters monitored. The routine confirmation of water quality and use of appropriate timely corrective action provide evidence that the program is effective in managing loss of material for applicable components.

In 2002 and 2003, reactor water sulfates were briefly above the chemistry warning limit. These levels are less severe than the EPRI action levels, yet exceeding these levels indicated a potential problem that should be investigated. Parameters were returned to within the prescribed normal operating range in the required time and further corrective action was taken as necessary. The routine confirmation of water quality and use of appropriate timely corrective action provide evidence that the program is effective in managing loss of material for applicable components.

During the period from 2003 through 2005, incidents occurred in which parameters monitored by the Water Chemistry Control – BWR Program exceeded EPRI action level 1 acceptance criteria. This action level is the least of three levels requiring further action. Parameters were returned to the prescribed normal operating range in the required time and further corrective action was taken as necessary. The routine confirmation of water quality and use of appropriate timely corrective action provide evidence that the program is effective in managing loss of material for applicable components.

In 2004 and 2006, elevated reactor water parameters resulted in the Chemistry Performance Index (CPI) reaching greater than 1. This index is an industry standard for prompting action at the least levels of concern. The CPI reached greater than 1 due to different combinations of elevated levels of sulfates and chlorides. Corrective actions were taken to address the excessive CPI. The routine confirmation of water quality and use of appropriate timely corrective action provide evidence that the program is effective in managing loss of material for applicable components.

In 2007, sampling indicated demineralized water system conductivity levels that exceeded action level 1 criteria. Investigation determined the increased conductivity was due to chloride bearing HHC (halogenated hydrocarbons) getting through the reverse osmosis and Electrol Deionization (EDI) phases of the GE/IONICS process stream. An activated charcoal bed was added downstream of the EDI phase of the system. Further testing verified that this modification returned the conductivity to acceptable levels. The routine confirmation of water quality and use of appropriate corrective action provides evidence that the program is effective in managing loss of material for applicable components.

In 2007, conductivity levels that exceeded action level 1 criteria were indicated in the demineralized water storage tank (DWST). Further evaluation indicated that the increase in the DWST total organic carbon and associated minor increase in DWST conductivity was the result of volatile organic compounds introduced during the construction activities associated in the area. When the work activities decreased, the conductivity levels decreased to below the action level 1 criteria. The routine confirmation of water quality and evaluation of results to confirm sources of contamination provides evidence that the program is effective in managing loss of material for applicable components.

In 2005, construction activity dust and debris entering the demineralized water storage tank vent were determined to be the cause of conductivity levels exceeding action level 1 in the tank. An action plan to provide special monitoring along with temporary procedure changes for the system water processing, assured acceptable water quality for the demin water tank. The routine confirmation of water quality and use of appropriate corrective action provides evidence that the program is effective in managing loss of material for applicable components.

SOER 03-02, Managing Core Design Changes was issued to address unsuccessful industry efforts to obtain defect free fuel performance. This SOER required an evaluation of the effects of chemistry changes on core and fuel performance, and the effects of core and fuel design changes on coolant chemistry. This evaluation required a review of chemistry related issues and how these issues are addressed in the Water Chemistry Control – BWR Program. The results of this review and the required responses upgraded and confirmed the effectiveness of the program. Identification of program deficiencies, and subsequent corrective actions, provide assurance that the program will remain effective for managing loss of material of components.

In 2004 a self assessment was performed to address system corrosion control and data tracking. This assessment reviewed organizational and communication issues such as informing other plant departments of data trending issues. It confirmed improvements in diminishing sulfate chemistry. It also observed continued general compliance with EPRI guidelines for corrosion data in condensate and feedwater chemistry. Actions were assigned to resolve issues concerning communication of trending with other plant groups and an improved lab QA/QC procedure. This self assessment included actions and recommendations which were resolved to upgrade the program to enhance its effectiveness. Identification of program deficiencies, and subsequent corrective actions, provide assurance that the program will remain effective for managing loss of material of components.

In 2005, a self-assessment was performed to compare the effectiveness of the CNS chemistry program alignment to Entergy chemistry practices. This assessment confirmed the adequacy of qualification and training of CNS chemists. Areas for improvement included the lowering of the threshold for condition report development and setting up communications programs to better use Entergy fleet data for comparison purposes. This self assessment included actions and recommendations which were resolved to upgrade the program by reviewing the adequacy of staffing and providing improved scheduling techniques for chemistry activities. Identification of program deficiencies, and subsequent corrective actions, provide assurance that the program will remain effective for managing loss of material of components.

Conclusion

The Water Chemistry Control – BWR Program has been effective at managing aging effects. The Water Chemistry Control – BWR Program assures the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.40 WATER CHEMISTRY CONTROL – CLOSED COOLING WATER

Program Description

The Water Chemistry Control – Closed Cooling Water Program is an existing program that includes preventive measures that manage loss of material, cracking, and fouling for components in closed cooling water systems: diesel generator jacket water (DGJW) system, reactor equipment cooling (REC) system, and turbine equipment cooling (TEC) system. These chemistry activities provide for monitoring and controlling closed cooling water chemistry using CNS procedures and processes based on EPRI guidance for closed cooling water chemistry issued as EPRI TR-1007820, “Closed Cycle Cooling Water Chemistry,” Revision 1, dated April 2004. This guideline supersedes EPRI TR-107396, “Closed Cycle Cooling Water Chemistry Guideline,” Revision 0, issued November 1997, referenced in NUREG-1801. Differences in Revision 0 and Revision 1 are described below.

The purpose of Revision 0 was to assist plants in developing water treatment strategies to protect carbon-steel and copper-containing systems from corrosion. This revision does not provide precise direction, but instead provides broad direction for plants to develop their own closed cooling water chemistry control programs by utilizing the guidance in the report to tailor specific station programs. Revision 0 does not provide tables for "Control Parameters" and "Diagnostic Parameters" with respective sampling frequency and expected values. However, parameters that should be monitored are identified as "Control Parameters" or "Diagnostic Parameters." In general, Revision 0 allows plants a great deal of flexibility in developing their closed cooling water chemistry programs.

Revision 1 is significantly more directive and incorporates action levels with established thresholds for specific actions required. This revision specifically establishes recommended monitoring frequencies and clearly identifies expected parameter values. Revision 0 identifies total organic carbon, dissolved oxygen, total alkalinity, calcium/magnesium, and refrigerants as diagnostic, but these are not described in Revision 1. None of these parameters (or monitoring of them) is considered to have any effect on the long-term health of closed cycle cooling water systems.

Both the EPRI closed cycle cooling water guidelines make a clear distinction between "control parameters" and "diagnostic parameters." Adherence to control parameters is expected, whereas diagnostic parameters are suggested, but can be plant specific. Deviations from EPRI recommended diagnostic parameters are not considered exceptions to NUREG-1801.

Future revisions of the EPRI closed cycle cooling water guidelines will be adopted as required, commensurate with industry standards.

The One-Time Inspection Program [B.1.29] utilizes inspections or non-destructive evaluations of representative samples to verify that the Water Chemistry Control – Closed Cooling Water Program has been effective at managing aging effects.

NUREG-1801 Consistency

The Water Chemistry Control – Closed Cooling Water Program is consistent with the program described in NUREG-1801, Section XI.M21, Closed-Cycle Cooling Water System, with one exception.

Exceptions to NUREG-1801

The Water Chemistry Control – Closed Cooling Water Program is consistent with the program described in NUREG-1801, Section XI.M21, Closed-Cycle Cooling Water System, with the following exception.

Elements Affected	Exception
3. Parameters Monitored or Inspected 4. Detection of Aging Effects 5. Monitoring and Trending 6. Acceptance Criteria	NUREG-1801 recommends the use of EPRI report TR-107396 for performance and functional testing guidance. The CNS Water Chemistry Control – Closed Cooling Water Program does not include performance and functional testing.[1]

Exception Note

1. While NUREG-1801, Section XI.M21, Closed-Cycle Cooling Water System endorses EPRI report TR-107396 for performance and functional testing guidance, EPRI report TR-107396 does not recommend that equipment performance and functional testing be part of a water chemistry control program. This appears appropriate since monitoring pump performance parameters is of little value in managing effects of aging on long-lived, passive CCW system components. Rather, EPRI report TR-107396 states in section 5.7 (Section 8.4 in EPRI report 1007820) that performance monitoring is typically part of an engineering program, which would not be part of water chemistry. In most cases, functional and performance testing verifies that component active functions can be accomplished. Passive intended functions of pumps, heat exchangers and other components will be adequately managed by the closed cooling water chemistry and one-time inspection programs through monitoring and control of water chemistry parameters and verification of the absence of aging effects.

Enhancements

None

Operating Experience

In 2002, during routine analysis of the DG-2 jacket cooling water, a high iron concentration level was observed. There was visible iron precipitated in the bottle after preservative was added. Another sample was taken of the DG-2 jacket cooling water and the re-sampled analysis did not confirm the initial results. Further review confirmed that increased flushing prior to sampling was required to assure an acceptable sample. The evidence points to an unrepresentative sample and not a degraded condition. Procedures were revised to double the flush volume to assure a representative sample. Evaluation of sampling practices, and subsequent corrective actions, provides assurance that the program will remain effective in managing loss of material for applicable components.

In 2004, a self assessment was performed to address system corrosion control and data tracking. This assessment reviewed organizational and communication issues such as informing other plant departments of data trending issues and REC and TEC long term trending data (issues of high dissolved oxygen). Recommendations for data tracking and retrieval were evaluated for procedure enhancement. This self assessment included actions and recommendations which were resolved to upgrade the program to enhance its effectiveness. Identification of program deficiencies, and subsequent corrective actions, provide assurance that the program will remain effective for managing loss of material of components.

Conclusion

The Water Chemistry Control – Closed Cooling Water Program has been effective at managing aging effects. The Water Chemistry Control – Closed Cooling Water Program assures the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.2 REFERENCES

B.2-1 U.S. Nuclear Regulatory Commission, NUREG-1800, *Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants*, Revision 1, September 2005.

B.2-2 U.S. Nuclear Regulatory Commission, NUREG-1801, *Generic Aging Lessons Learned (GALL) Report*, Revision 1, September 2005.