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 Pilgrim Nuclear Power Station (PNPS) 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 which 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 PNPS 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, the above format is generally followed, with additional discussion of each of the ten elements.

B.0.3 PNPS CORRECTIVE ACTIONS, CONFIRMATION PROCESS AND ADMINISTRATIVE CONTROLS

Three attributes common to all aging management programs are corrective actions, confirmation process and administrative controls. Discussion of these attributes 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

PNPS 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.

Confirmation Process

PNPS 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. The Entergy Quality Assurance Program applies to PNPS 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 PNPS 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 PNPS confirmation process is consistent with NUREG-1801.

Administrative Controls

PNPS 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. The Entergy Quality Assurance Program applies to PNPS 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 PNPS 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.

B.0.5 AGING MANAGEMENT PROGRAMS

The following aging management programs are described in the sections listed of 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 PNPS programs is shown in Table B-2, with plant-specific programs listed near the end.

Table B-1
Aging Management Programs

1)	Boraflex Monitoring Program	B.1.1	existing
2)	Buried Piping and Tanks Inspection Program	B.1.2	new
3)	BWR CRD Return Line Nozzle Program	B.1.3	existing
4)	BWR Feedwater Nozzle Program	B.1.4	existing
5)	BWR Penetrations Program	B.1.5	existing
6)	BWR Stress Corrosion Cracking Program	B.1.6	existing
7)	BWR Vessel ID Attachment Welds Program	B.1.7	existing

Table B-1
Aging Management Programs (Continued)

8)	BWR Vessel Internals Program	B.1.8	existing
9)	Containment Leak Rate Program	B.1.9	existing
10)	Diesel Fuel Monitoring Program	B.1.10	existing
11)	Environmental Qualification (EQ) of Electric Components Program	B.1.11	existing
12)	Fatigue Monitoring Program	B.1.12	existing
13)	Fire Protection – Fire Protection Program	B.1.13.1	existing
14)	Fire Protection - Fire Water System Program	B.1.13.2	existing
15)	Flow-Accelerated Corrosion Program	B.1.14	existing
16)	Heat Exchanger Monitoring Program	B.1.15	new
17)	Inservice Inspection - Containment Inservice Inspection (CII) Program	B.1.16.1	existing
18)	Inservice Inspection - Inservice Inspection (ISI) Program	B.1.16.2	existing
19)	Instrument Air Quality Program	B.1.17	existing
20)	Metal-Enclosed Bus Inspection Program	B.1.18	new
21)	Non-EQ Inaccessible Medium-Voltage Cable Program	B.1.19	new
22)	Non-EQ Instrumentation Circuits Test Review Program	B.1.20	new
23)	Non-EQ Insulated Cables and Connections Program	B.1.21	new
24)	Oil Analysis Program	B.1.22	existing
25)	One-Time Inspection Program	B.1.23	new
26)	Periodic Surveillance and Preventive Maintenance Program	B.1.24	existing

Table B-1
Aging Management Programs (Continued)

27)	Reactor Head Closure Studs Program	B.1.25	existing
28)	Reactor Vessel Surveillance Program	B.1.26	existing
29)	Selective Leaching Program	B.1.27	new
30)	Service Water Integrity Program	B.1.28	existing
31)	Structures Monitoring - Masonry Wall Program	B.1.29.1	existing
32)	Structures Monitoring – Structures Monitoring Program	B.1.29.2	existing
33)	Structures Monitoring – Water Control Structures Monitoring Program	B.1.29.3	existing
34)	System Walkdown Program	B.1.30	existing
35)	Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program	B.1.31	new
36)	Water Chemistry Control - Auxiliary Systems Program	B.1.32.1	existing
37)	Water Chemistry Control – BWR Program	B.1.32.2	existing
38)	Water Chemistry Control - Closed Cooling Water Program	B.1.32.3	existing

B.0.6 CORRELATION WITH NUREG-1801 AGING MANAGEMENT PROGRAMS

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

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

NUREG-1801 Number	NUREG-1801 Program	PNPS Program
X.E1	Environmental Qualification (EQ) of Electric Components	Environmental Qualification (EQ) of Electric Components Program [B.1.11]
X.M1	Metal Fatigue of Reactor Coolant Pressure Boundary	Fatigue Monitoring Program [B.1.12]
X.S1	Concrete Containment Tendon Prestress	Not applicable
XI.M1	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	See plant-specific Inservice Inspection - Inservice Inspection (ISI) Program [B.1.16.2]
XI.M2	Water Chemistry	Water Chemistry Control - BWR Program [B.1.32.2]
XI.M3	Reactor Head Closure Studs	Reactor Head Closure Studs Program [B.1.25]
XI.M4	BWR Vessel ID Attachment Welds	BWR Vessel ID Attachment Welds Program [B.1.7]
XI.M5	BWR Feedwater Nozzle	BWR Feedwater Nozzle Program [B.1.4]
XI.M6	BWR Control Rod Drive Return Line Nozzle	BWR CRD Return Line Nozzle Program [B.1.3]
XI.M7	BWR Stress Corrosion Cracking	BWR Stress Corrosion Cracking Program [B.1.6]
XI.M8	BWR Penetrations	BWR Penetrations Program [B.1.5]
XI.M9	BWR Vessel Internals	BWR Vessel Internals Program [B.1.8]

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

NUREG-1801 Number	NUREG-1801 Program	PNPS Program
XI.M10	Boric Acid Corrosion	Not applicable
XI.M11	Nickel-Alloy Nozzles and Penetrations	Not applicable
XI.M11A	Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors	Not applicable
XI.M12	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	Not applicable
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) Program [B.1.31]
XI.M14	Loose Part Monitoring	Not applicable
XI.M15	Neutron Noise Monitoring	Not applicable
XI.M16	PWR Vessel Internals	Not applicable
XI.M17	Flow-Accelerated Corrosion	Flow-Accelerated Corrosion Program [B.1.14]
XI.M18	Bolting Integrity	Not applicable
XI.M19	Steam Generator Tube Integrity	Not applicable
XI.M20	Open-Cycle Cooling Water System	Service Water Integrity Program [B.1.28]
XI.M21	Closed-Cycle Cooling Water System	Water Chemistry Control - Closed Cooling Water Program [B.1.32.3]
XI.M22	Boraflex Monitoring	Boraflex Monitoring Program [B.1.1]

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

NUREG-1801 Number	NUREG-1801 Program	PNPS Program
XI.M23	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	Not applicable
XI.M24	Compressed Air Monitoring	Not applicable
XI.M25	BWR Reactor Water Cleanup System	Not applicable
XI.M26	Fire Protection	Fire Protection Program [B.1.13.1]
XI.M27	Fire Water System	Fire Water System Program [B.1.13.2]
XI.M28	Buried Piping and Tanks Surveillance	Not applicable
XI.M29	Aboveground Steel Tanks	Not applicable
XI.M30	Fuel Oil Chemistry	Diesel Fuel Monitoring Program [B.1.10]
XI.M31	Reactor Vessel Surveillance	Reactor Vessel Surveillance Program [B.1.26]
XI.M32	One-Time Inspection	One-Time Inspection Program [B.1.23]
XI.M33	Selective Leaching of Materials	Selective Leaching Program [B.1.27]
XI.M34	Buried Piping and Tanks Inspection	Buried Piping and Tanks Inspection Program [B.1.2]
XI.M35	One-time Inspection of ASME Code Class 1 Small-Bore Piping	One-Time Inspection Program [B.1.23]
XI.M36	External Surfaces Monitoring	System Walkdown Program [B.1.30]
XI.M37	Flux Thimble Tube Inspection	Not applicable

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

NUREG-1801 Number	NUREG-1801 Program	PNPS Program
XI.M38	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	Not applicable
XI.M39	Lubricating Oil Analysis	Oil Analysis Program [B.1.22]
XI.E1	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Non-EQ Insulated Cables and Connections Program [B.1.21]
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 Program [B.1.20]
XI.E3	Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Non-EQ Inaccessible Medium-Voltage Cable Program [B.1.19]
XI.E4	Metal Enclosed Bus	Metal-Enclosed Bus Inspection Program [B.1.18]
XI.E5	Fuse Holders	Not applicable
XI.E6	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Not applicable
XI.S1	ASME Section XI, Subsection IWE	See plant-specific Inservice Inspection - Containment Inservice Inspection (CII) Program [B.1.16.1]
XI.S2	ASME Section XI, Subsection IWL	Not applicable

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

NUREG-1801 Number	NUREG-1801 Program	PNPS Program
XI.S3	ASME Section XI, Subsection IWF	See plant-specific Inservice Inspection - Inservice Inspection (ISI) Program [B.1.16.2]
XI.S4	10 CFR 50, Appendix J	Containment Leak Rate Program [B.1.9]
XI.S5	Masonry Wall Program	Structures Monitoring - Masonry Wall Program [B.1.29.1]
XI.S6	Structures Monitoring Program	Structures Monitoring - Structures Monitoring Program [B.1.29.2]
XI.S7	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	Structures Monitoring – Water Control Structures Monitoring Program [B.1.29.3]
XI.S8	Protective Coating Monitoring and Maintenance Program	Not applicable
Plant-Specific Programs		
NA	Plant-specific program	Heat Exchanger Monitoring Program [B.1.15]
NA	Plant-specific program	Inservice Inspection - Containment Inservice Inspection (CII) Program [B.1.16.1]
NA	Plant-specific program	Inservice Inspection - Inservice Inspection (ISI) Program [B.1.16.2]
NA	Plant-specific program	Instrument Air Quality Program [B.1.17]
NA	Plant-specific program	Periodic Surveillance and Preventive Maintenance Program [B.1.24]
NA	Plant-specific program	Water Chemistry Control - Auxiliary Systems Program [B.1.32.1]

PNPS programs have been compared to the NUREG-1801 programs with the results being shown in Table B-3 as

- programs consistent with NUREG-1801;
- programs with enhancements;
- programs with exception to NUREG-1801;
- not comparable to NUREG-1801 (plant-specific)

Table B-3
PNPS Program Consistency with NUREG-1801

Program Name	Plant Specific	NUREG-1801 Comparison		
		Programs Consistent with NUREG-1801	Programs with Enhancements	Programs with Exceptions to NUREG-1801
Boraflex Monitoring Program		X		
Buried Piping and Tanks Inspection Program				X
BWR CRD Return Line Nozzle Program				X
BWR Feedwater Nozzle Program				X
BWR Penetrations Program				X
BWR Stress Corrosion Cracking Program			X	X
BWR Vessel ID Attachment Welds Program				X
BWR Vessel Internals Program			X	X
Containment Leak Rate Program		X		
Diesel Fuel Monitoring Program			X	X
Environmental Qualification (EQ) of Electric Components Program		X		

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

Program Name	Plant Specific	NUREG-1801 Comparison		
		Programs Consistent with NUREG-1801	Programs with Enhancements	Programs with Exceptions to NUREG-1801
Fatigue Monitoring Program				X
Fire Protection - Fire Protection Program			X	X
Fire Protection - Fire Water System Program			X	X
Flow-Accelerated Corrosion Program		X		
Heat Exchanger Monitoring Program	X			
Inservice Inspection - Containment Inservice Inspection (CII) Program	X			
Inservice Inspection - Inservice Inspection (ISI) Program	X			
Instrument Air Quality Program	X			
Metal-Enclosed Bus Inspection Program				X
Non-EQ Inaccessible Medium-Voltage Cable Program		X		
Non-EQ Instrumentation Circuits Test Review Program		X		
Non-EQ Insulated Cables and Connections Program		X		
Oil Analysis Program			X	X
One-Time Inspection Program		X		

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

Program Name	Plant Specific	NUREG-1801 Comparison		
		Programs Consistent with NUREG-1801	Programs with Enhancements	Programs with Exceptions to NUREG-1801
Periodic Surveillance and Preventive Maintenance Program	X			
Reactor Head Closure Studs Program				X
Reactor Vessel Surveillance Program		X	X	
Selective Leaching Program		X		
Service Water Integrity Program				X
Structures Monitoring - Masonry Wall Program		X		
Structures Monitoring - Structures Monitoring Program		X	X	
Structures Monitoring - Water Control Structures Monitoring Program		X	X	
System Walkdown Program		X		
Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program		X		
Water Chemistry Control – Auxiliary Systems Program	X			
Water Chemistry Control – BWR Program		X		

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

Program Name	Plant Specific	NUREG-1801 Comparison		
		Programs Consistent with NUREG-1801	Programs with Enhancements	Programs with Exceptions to NUREG-1801
Water Chemistry Control – Closed Cooling Water Program				X

B.1 AGING MANAGEMENT PROGRAMS AND ACTIVITIES

B.1.1 BORAFLEX MONITORING

Program Description

The Boraflex Monitoring Program at PNPS is comparable to the program described in NUREG-1801, Section XI.M22, Boraflex Monitoring.

The Boraflex Monitoring Program assures that degradation of the Boraflex panels in the spent fuel racks does not compromise the criticality analysis in support of the design of the spent fuel storage racks. The program relies on periodic inspection of the Boraflex, monitoring of silica levels in the spent fuel pool water, and analysis of criticality to assure that the required 5% subcriticality margin is maintained.

NUREG-1801 Consistency

The Boraflex Monitoring Program at PNPS is consistent with the program described in NUREG-1801, Section XI.M22, Boraflex Monitoring.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

Blackness testing was performed on Boraflex panels in the spent fuel storage racks during 1996 and 1998 to provide a baseline for development of the monitoring program and assure that the required 5% subcriticality margin is maintained. Results of the 1996 testing showed shrinkage and gapping in the Boraflex, but did not indicate erosion of the Boraflex was occurring. Analysis of the criticality design of the fuel pool based on the observed gap sizes and locations showed a very minor and negligible effect of the gaps on rack reactivity. Therefore, the pool subcriticality margin was greater than 5%. Results of the 1998 testing showed about a 20% increase in average gap size, but overall shrinkage (gaps and end shortening) of the material was much less on a percentage change basis. There were no very large gaps, and the report concluded that the Boraflex poison material in the spent fuel storage racks continues to perform its intended function.

The Boraflex Monitoring Program at PNPS has been instituted recently. Therefore, there is no additional plant-specific operating experience.

Conclusion

The Boraflex Monitoring Program provides reasonable 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 for the period of extended operation.

B.1.2 BURIED PIPING AND TANKS INSPECTION

Program Description

The Buried Piping and Tanks Inspection Program at PNPS is comparable to the program described in NUREG-1801, Section XI.M34, Buried Piping and Tanks Inspection.

This program includes (a) preventive measures to mitigate corrosion and (b) inspections to manage the effects of corrosion on the pressure-retaining capability of buried carbon steel, stainless steel, and titanium components. Preventive measures are in accordance with standard industry practice for maintaining external coatings and wrappings. Buried components are inspected when excavated during maintenance.

A focused inspection will be performed within the first 10 years of the period of extended operation, unless an opportunistic inspection (or an inspection via a method that allows assessment of pipe condition without excavation) occurs within this ten-year period.

NUREG-1801 Consistency

The Buried Piping and Tanks Inspection Program at PNPS will be consistent with program attributes described in NUREG-1801, Section XI.M34, Buried Piping and Tanks Inspection, with one exception.

Exceptions to NUREG-1801

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

Attributes Affected	Exception
4. Detection of Aging Effects	Inspections via methods that allow assessment of pipe condition without excavation may be substituted for inspections requiring excavation solely for the purpose of inspection.[1]

Exception Note

1. Methods such as phased array UT technology provide indication of wall thickness for buried piping without excavation. Use of such methods to identify the effects of aging is preferable to excavation for visual inspection, which could result in damage to coating or wrappings.

Enhancements

None

Operating Experience

The Buried Piping and Tanks Inspection Program at PNPS is a new program for which there is no operating experience.

Conclusion

Implementation of the Buried Piping and Tanks Inspection Program will provide reasonable 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 for the period of extended operation.

B.1.3 BWR CRD RETURN LINE NOZZLE

Program Description

The BWR Control Rod Drive (CRD) Return Line Nozzle Program at PNPS is comparable to the program described in NUREG-1801, Section XI.M6, BWR Control Rod Drive Return Line Nozzle.

Under this program, PNPS has cut and capped the CRD return line nozzle to mitigate cracking, and continues Inservice Inspection (ISI) examinations to monitor the effects of crack initiation and growth on the intended function of the control rod drive return line nozzle and cap.

In 2003, a structural weld overlay was installed over a crack in the CRD return line nozzle-to-cap weld. The Inconel 52 weld metal used in the overlay is highly resistant to stress corrosion cracking.

NUREG-1801 Consistency

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

Exceptions to NUREG-1801

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

Attributes Affected	Exceptions
3. Parameters Monitored/ Inspected	PNPS examines ½ inch of the volume next to the widest part of the N10 nozzle-to-vessel weld, rather than half of the vessel wall thickness.[1]
4. Detection of Aging Effects 5. Monitoring and Trending	The extent and schedule of inspection, as delineated in NUREG 0619, are not followed. Specifically, liquid penetrant testing (PT) of CRDRL nozzle blend radius and bore regions is not performed.[2]
6. Acceptance Criteria	PNPS repaired the CRDRL nozzle by weld overlay rather than removing the crack by grinding and examines the overlay using UT in lieu of RT.[3]

Exception Notes

1. Extending the examination volume into the base metal as required by ASME Section XI, 1998 Edition, 2000 Addenda, Figure IWB-2500-7(b) prolongs the examination time significantly and results in no net increase in safety. The extra volume is base metal region which is not prone to in-service cracking and has been extensively examined before the vessel was put into service and during the first, second and third interval examinations.

2. The weld overlay installed over a crack in the CRD return line nozzle-to-cap weld covers the nozzle, the nozzle-to-cap weld, and part of the cap. The Inconel 52 weld overlay, which is highly resistant to stress corrosion cracking, is ultrasonically inspected in accordance with GL 88-01 and BWRVIP-75. The weld overlay provides reasonable assurance of structural and pressure boundary integrity of the RPV capped N10 nozzle and, thus, provides an acceptable level of quality and safety. Since the nozzle and original nozzle-to-cap weld are covered by the overlay, and the overlay is examined, examination of the nozzle and original nozzle-to-cap weld is not required.

3. In its letter of February 25, 2005, the NRC concluded that the proposed alternative provides reasonable assurance of structural and pressure boundary integrity of the RPV capped N10 nozzle and, thus, provides an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the NRC staff authorized the use of ASME Code Case N-504-2, as modified, and the use of UT in lieu of RT, to perform a weld overlay repair of the CRD return line nozzle-to-cap weld (N10).

Enhancements

None

Operating Experience

On October 1, 2003, a reactor coolant pressure boundary leak from the N10 nozzle-to-cap weld area was identified during a planned visual inspection of the drywell. Through-wall leakage from the N10 nozzle-to-cap butt weld was caused by an incipient crack or crevice condition remaining in the weld after repair welding performed as part of the nozzle-to-cap fabrication welding in 1977. Subsequent crack propagation continued through-wall by an interdendritic stress corrosion cracking mechanism due to high residual weld stresses in the Inconel 82/182 weld metal as a result of the repair. A structural weld overlay was installed with Inconel 52 weld metal, which is highly resistant to stress corrosion cracking. The weld overlay process also imparts a compressive residual stress due to the welding process, which prevents further crack growth.

The N10 nozzle-to-cap weld received all code-required preservice NDE examinations and was pressure tested prior to returning to service. Ultrasonic examinations have the capability to detect incipient cracking including hard-to-detect flaws related to stress corrosion cracking mechanisms and flaws that occur entirely within the weld metal. Thus, the examinations would have detected weld cracking. Since the weld overlay is highly resistant to cracking, and will

continue to be examined as required, the BWR CRD Return Line Nozzle Program remains effective for managing the effect of cracking on the intended function of the CRD return line nozzle.

Conclusion

The BWR CRD Return Line Nozzle Program has been effective at managing aging effects. The BWR CRD Return Line Nozzle Program provides reasonable 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 for the period of extended operation.

B.1.4 BWR FEEDWATER NOZZLE

Program Description

The BWR Feedwater Nozzle Program at PNPS is comparable to the program described in NUREG-1801, Section XI.M5, BWR Feedwater Nozzle.

Under this program, PNPS has removed feedwater blend radii flaws, removed feedwater nozzle cladding, and installed a triple-sleeve-double-piston sparger to mitigate cracking. This program continues 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 to monitor the effects of cracking on the intended function of the feedwater nozzles.

NUREG-1801 Consistency

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

Exceptions to NUREG-1801

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

Attributes Affected	Exceptions
2. Preventive Actions	A low-flow controller was not installed and the reactor water cleanup system was not rerouted.[1]
3. Parameters/Monitored Inspected	PNPS reduced the examination volume next to the widest part of the feedwater nozzle-to-vessel welds from half of the vessel wall thickness to 1/2".[2]

Exception Notes

1. In its safety evaluation of BWR feedwater and CRD return line modifications at PNPS, NRC noted that the intent of the requirements of NUREG-0619 and NEDE-21821-A had been satisfied with the PNPS modifications. Since the stainless steel cladding has been removed and the improved spargers have been installed, an adequate margin of safety against feedwater nozzle crack growth exists. Therefore, NRC concluded that, with continued inspections to monitor for crack initiation and growth, PNPS can operate without rerouting the RWCU and without installing a low-flow controller for the feedwater system. Since inspections to monitor for crack initiation and growth will continue, this conclusion remains valid for the period of extended operation.

2. Extending the examination volume into the base metal as required by ASME Section XI, 1998 Edition, 2000 Addenda, Figure IWB-2500-7(b) prolongs the examination time significantly and results in no net increase in safety. The extra volume is base metal region which is not prone to in-service cracking and has been extensively examined before the vessel was put into service and during the first, second and third interval examinations.

Enhancements

None

Operating Experience

In October, 1989 it was discovered that feedwater nozzles were not being examined with scans designed for the bore. Procedures were revised and subsequent examinations were performed in accordance with NUREG-0619. Since feedwater nozzle bores have subsequently been examined without recordable indications, and will continue to be examined as required, this programmatic error did not impact the ability of the BWR Feedwater Nozzle Program to manage the effect of cracking on the intended function of the feedwater nozzles.

Ultrasonic testing of the feedwater nozzles during RFO14 (April, 2003) resulted in no recordable indications. Absence of recordable indications on the feedwater nozzles provides evidence that the program is effective for managing cracking of the nozzles.

Conclusion

The BWR Feedwater Nozzle Program has been effective at managing aging effects. The BWR Feedwater Nozzle Program provides reasonable 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 for the period of extended operation.

B.1.5 BWR PENETRATIONS

Program Description

The BWR Penetrations Program at PNPS is comparable to the program described in NUREG-1801, Section XI.M8, BWR Penetrations.

The program 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 and BWRVIP-49 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 at PNPS is consistent with the program described in NUREG-1801, Section XI.M8, BWR Penetrations, with exceptions.

Exceptions to NUREG-1801

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

Attributes Affected	Exceptions
1. Scope of Program 3. Parameters Monitored/Inspected 4. Detection of Aging Effects	Surface examinations are not performed on instrument penetration nozzle welds. In accordance with ASME Section XI, Code Case N-578 for elements classified as low risk, inspections to monitor the effects of cracking on the intended function of instrument penetration nozzles (N15A/B and N16A/B) include enhanced visual (VT-2 with insulation removed) examinations during system pressure testing. Also, a UT exam of the N16B safe end-to-reducer weld is performed once every 10 years. However, ASME Section XI, Table IWB-2500-1 and BWRVIP-49 (by reference) also recommend surface examinations.[1]

3. Parameters Monitored/ Inspected	Table IWB-2500-1 from the 1998 edition with 2000 addenda of ASME Section XI is used, while NUREG-1801 specifies the 2001 edition with 2002 and 2003 addenda.[2]

Exception Notes

1. PNPS has implemented risk informed ISI (RI-ISI) in accordance with ASME Section XI, Code Case N-578. The overall risk to the plant is reduced when RI-ISI is applied because the process concentrates on examining welds that have the greatest risk in terms of consequences of failure and potential degradation. In addition, RI-ISI examinations are focused on those examination volumes where flaws are most likely to be located. As such, RI-ISI does a better job in capturing risk than existing ASME Section XI requirements, which are based on design stresses and random selection. Also, PNPS replaced the original IGSCC-susceptible 304 stainless steel safe end extensions for the N15 and N16 nozzles with more IGSCC-resistant Inconel material.

2. Since ASME Section XI through the 2003 Addenda has been accept by reference in 10 CFR 50.55a paragraph (b) (2) without modification or limitation on use of Table IWB-2500-1 from the 1998 edition with 2000 addenda for BWR components, use of this version is appropriate to assure that components crediting this program can perform their intended function consistent with the current licensing basis during the period of extended operation.

Enhancements

None

Operating Experience

In January 2005 three 2½" piping butt welds in SLC system piping adjacent to nozzle N14 were found to be unidentified on inspection drawings and not included in ISI weld population totals. Two of the welds (RPV-N14-T1 and RPV-N14-T2) are shop welds in a vendor supplied tee. The third weld (RPV-14-2) is the connection field weld between the tee and the SLC nozzle (N14) safe end extension piece. This weld was included in surface examinations of the N14 nozzle safe end weld and safe end extension piece performed in RFO11. Corrective actions included adding the welds to ISI weld population totals and performing a nozzle surface examination of weld RPV-N14-2 during RFO15. Since RPV-N14-2 has been examined without recordable indications, and will continue to be examined as required, this programmatic error did not impact the ability of the BWR Penetrations Program to manage the effect of cracking on the intended function of the SLC nozzle.

Inservice examination of the SLC nozzle, (including weld RPV-N14-2 as discussed above), during RFO15 (April, 2005) resulted in no recordable indications. Absence of recordable

indications on the SLC nozzle and adjacent welds provides evidence that the program is effective for managing cracking of the nozzle.

Liquid penetrant examination of instrument penetration nozzle N15A in 1990 resulted in no recordable indications. Absence of recordable indications on the instrument nozzles provides evidence that the program is effective for managing cracking of the instrument penetration nozzles.

Inservice examination of instrument penetration nozzles during RFO15 (April, 2005) resulted in no recordable indications. Absence of recordable indications on the instrument nozzles provides evidence that the program is effective for managing cracking of the nozzles.

Conclusion

The BWR Penetrations Program has been effective at managing aging effects. The BWR Penetrations Program provides reasonable 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 for the period of extended operation.

B.1.6 BWR STRESS CORROSION CRACKING

Program Description

The BWR Stress Corrosion Cracking Program at PNPS is comparable to the program described in NUREG-1801, Section XI.M7, BWR Stress Corrosion Cracking.

The program 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 or CASS.

NUREG-1801 Consistency

The BWR Stress Corrosion Cracking Program at PNPS is consistent with the program described in NUREG-1801, Section XI.M7, BWR Stress Corrosion Cracking, with an exception and an enhancement.

Exceptions to NUREG-1801

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

Attributes Affected	Exception
6. Acceptance Criteria	The 1998 edition with 2000 addenda of ASME Section XI, Subsection IWB-3600 is used for flaw evaluation, while NUREG-1801 specifies the 1986 edition of ASME Section XI, Subsection IWB-3600 for flaw evaluation.[1]

Exception Note

1. Since ASME Section XI through the 2003 Addenda has been accept by NRC in 10 CFR 50.55a paragraph (b) (2) without modification or limitation on use of subsection IWB-3600 from the 1998 edition with 2000 addenda, use of this version for flaw evaluation is appropriate to assure that components crediting this program can perform their intended function consistent with the current licensing basis during the period of extended operation.

Enhancements

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

Attributes Affected	Enhancement
5. Monitoring and Trending	The implementing procedure for ASME Section XI inservice inspection and testing will be enhanced to specify that the guidelines in Generic Letter 88-01 or approved BWRVIP-75 shall be considered in determining sample expansion if indications are found in Generic Letter 88-01 welds.

Operating Experience

Ultrasonic examinations of GL 88-01 nozzle safe end welds and austenitic stainless steel reactor coolant piping with 4" and greater nominal diameter and operating temperature greater than 200°F during RFO14 (April, 2003) resulted in no recordable indications. Absence of recordable indications on the nozzles and piping provides evidence that the program is effective for managing cracking of austenitic stainless steel components.

Ultrasonic examinations of nozzle safe end welds and austenitic stainless steel reactor coolant piping with 4" and greater nominal diameter and operating temperature greater than 200°F during RFO15 (April 2005) resulted in no recordable indications. Absence of recordable indications on the nozzles and piping provides evidence that the program is effective for managing cracking of the nozzles and piping.

Conclusion

The BWR Stress Corrosion Cracking Program has been effective at managing aging effects. The BWR Stress Corrosion Cracking Program provides reasonable 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 for the period of extended operation.

B.1.7 BWR VESSEL ID ATTACHMENT WELDS

Program Description

The BWR Vessel ID Attachment Welds Program at PNPS is comparable to the program described in NUREG-1801, Section XI.M4, BWR Vessel ID Attachment Welds.

The program includes (a) inspection and flaw evaluation in accordance with the guidelines of staff-approved boiling water reactor vessel and internals project (BWRVIP) BWRVIP-48 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 at PNPS is consistent with the program described in NUREG-1801, Section XI.M4, BWR Vessel ID Attachment Welds with one exception.

Exceptions to NUREG-1801

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

Attributes Affected	Exception
3. Parameters Monitored/ Inspected	Table IWB-2500-1 from the 1998 edition with 2000 addenda of ASME Section XI is used, while NUREG-1801 specifies the 2001 edition with 2002 and 2003 addenda.[1]

Exception Note

1. Since ASME Section XI through the 2003 Addenda has been accept by reference in 10 CFR 50.55a paragraph (b) (2) without modification or limitation on use of Table IWB-2500-1 from the 1998 edition with 2000 addenda for BWR components, use of this version is appropriate to assure that components crediting this program can perform their intended function consistent with the current licensing basis during the period of extended operation.

Enhancements

None

Operating Experience

Visual and enhanced visual examinations of vessel attachment welds (feedwater bracket attachment and jet pump riser braces) during RFO14 (April, 2003) resulted in no recordable indications. Previous visual and enhanced visual examinations of vessel attachment welds resulted in no recordable indications. Absence of recordable indications on the vessel attachment welds provides evidence that the program is effective for managing cracking of the welds.

Visual and enhanced visual examinations of vessel attachment welds (core spray piping bracket, guide rod bracket attachment, steam dryer support brackets, steam dryer hold-down brackets, and surveillance specimen holder brackets) during RFO15 (April, 2005) resulted in no recordable indications. Absence of recordable indications on the vessel attachment welds provides evidence that the program is effective for managing cracking of the welds.

Conclusion

The BWR Vessel ID Attachment Welds Program has been effective at managing aging effects. The BWR Vessel ID Attachment Welds Program provides reasonable 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 for the period of extended operation.

B.1.8 BWR VESSEL INTERNALS

Program Description

The BWR Vessel Internals Program at PNPS is comparable to the program described in NUREG-1801, Section XI.M9, BWR Vessel Internals.

The program 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 internals components.

NUREG-1801 Consistency

The BWR Vessel Internals Program at PNPS is consistent with the program described in NUREG-1801, Section XI.M9, BWR Vessel Internals, with exceptions and an enhancement.

Exceptions to NUREG-1801

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

Attributes Affected	Exceptions
1. Scope of Program 4. Detection of Aging Effects	**Low-pressure Coolant Injection (LPCI) Coupling** BWRVIP-42 guidelines are not applicable to PNPS.[1]
1. Scope of Program 4. Detection of Aging Effects	**Top Guide** Inspection of the four top guide hold-down assemblies and four top guide aligner assemblies is not performed at PNPS.[2] The top guide rim weld does not exist at PNPS and is therefore exempt.
1. Scope of Program 4. Detection of Aging Effects	**Core Spray** PNPS defers inspection of three inaccessible welds inside each of the two core spray nozzles until a delivery system for ultrasonic testing of the hidden welds is developed. Thus, PNPS does not meet the BWRVIP-18 requirement to perform an ultrasonic inspection of a full target weld set every other refueling outage.[3]

1. Scope of Program 4. Detection of Aging Effects	**Jet Pump Assembly** PNPS defers inspection of jet pump inaccessible welds until a delivery system for ultrasonic testing of the hidden welds is developed. Thus, PNPS does not meet the BWRVIP-41 requirement to perform a modified VT-1 of 100% of these welds over two 6-year inspection cycles and 25% per inspection cycle thereafter.[4]
3. Parameters Monitored/ Inspected	Table IWB-2500-1 from the 1998 edition with 2000 addenda of ASME Section XI is used, while NUREG-1801 specifies the 2001 edition with 2002 and 2003 addenda.[5]

Exception Notes

1. BWRVIP-42 provides guidelines for inspection and evaluation of the low-pressure coolant injection (LPCI) coupling. PNPS has no LPCI coupling.

2. PNPS has a plant-specific analysis to account for plant-specific dynamic loading of the top guide hold-down and aligner assemblies, which concludes that less than 20% of the weld area on the top guide hold-down and aligner assemblies is needed to resist load. Therefore, in accordance with Table 3-2 of BWRVIP-26, inspection of the four top guide hold-down assemblies and four top guide aligner assemblies is not performed at PNPS.

3. Inspection of similar creviced and uncreviced welds; including junction box-to-pipe welds, upper elbow welds, junction box cover plate weld, P1 weld, and downcomer sleeve welds; showed no indication of cracking. Therefore, deferral of inspection of the inaccessible welds is justified.

4. The hidden jet pump welds are far enough into the nozzle that failure at these welds would not result in the thermal sleeve disengaging from the nozzle before the riser contacted the shroud. If the jet pump thermal sleeve severed, the riser brace would maintain the geometry of the jet pump well past the time that leakage would be detected through operational parameters and the plant could be safely shut down. In addition, PNPS instituted hydrogen water chemistry in 1991 to mitigate cracking in the reactor internals, and to address crack growth in the jet pump thermal sleeve welds in particular. Therefore, deferral of inspection of the inaccessible welds is justified.

5. Since ASME Section XI through the 2003 Addenda has been accept by reference in 10 CFR 50.55a paragraph (b) (2) without modification or limitation on use of Table IWB-2500-1 from the 1998 edition with 2000 addenda for BWR components, use of this version is appropriate to assure that components crediting this program can perform their intended function consistent with the current licensing basis during the period of extended operation.

Enhancements

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

Attributes Affected	Enhancement
1. Scope of Program	The PNPS top guide fluence is projected to exceed the threshold for IASCC ($5x10^{20}$ n/cm^2) prior to the period of extended operation. Therefore, ten (10) percent of the top guide locations will be inspected using enhanced visual inspection technique, EVT-1, within the first 12 years of the period of extended operation, with one-half of the inspections (50 percent of locations) to be completed within the first 6 years of the period of extended operation. Locations selected for examination will be areas that have exceeded the neutron fluence threshold.

Operating Experience

Visual and enhanced visual examinations of vessel internals (shroud support plate gusset welds, core spray piping, jet pump riser braces, jet pump diffusers, CRD guide tube handle attachment, steam dryer, and feedwater spargers) during RFO14 (April, 2003) resulted in no new recordable indications. Previous visual and enhanced visual examinations of vessel internals revealed indications on core spray piping welds, and steam dryer leveling screw tack welds. Absence of new recordable indications on the vessel internals provides evidence that the program is effective for managing cracking of the welds.

Visual and enhanced visual examinations of vessel internals (core spray piping welds, core spray spargers, integrally welded core support structures, jet pump restrainer wedges, shroud vertical welds, shroud top guide ring, shroud support, steam dryer, steam dryer level screw tack weld cracks, steam separator/shroud head, and top guide grid beams) during RFO15 (April, 2005) resulted in no new recordable indications. Absence of new recordable indications on the vessel internals provides evidence that the program is effective for managing cracking of the welds.

The core shroud provides 2/3-core coverage in case of a LOCA. Because IGSCC cracking of sensitized shroud welds was an industry issue, PNPS implemented a preemptive shroud hold-down modification during RFO10 in 1995.

Conclusion

The BWR Vessel Internals Program has been effective at managing aging effects. The BWR Vessel Internals Program provides reasonable 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 for the period of extended operation.

B.1.9 CONTAINMENT LEAK RATE

Program Description

The Containment Leak Rate Program at PNPS is comparable to the program described in NUREG-1801, Section XI.S4, 10 CFR 50, Appendix J.

As described in 10 CFR Part 50, Appendix J, containment leak rate tests are required to assure that (a) leakage through primary reactor containment and systems and components penetrating primary 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 primary containment.

NUREG-1801 Consistency

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

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

During the most recent integrated leakage testing of primary containment, as-found and as-left test data met all applicable test acceptance criteria, indicating that the program is effective at managing the effects of loss of material and cracking on primary containment components.

QA audits in 2000 and 2005 revealed no issues or findings that could impact effectiveness of the program.

Conclusion

The Containment Leak Rate Program has been effective at managing aging effects. The Containment Leak Rate Program provides reasonable 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 for the period of extended operation.

B.1.10 DIESEL FUEL MONITORING

Program Description

The Diesel Fuel Monitoring Program at PNPS is comparable to the program described in NUREG-1801, Section XI.M30, Fuel Oil Chemistry Program.

The program entails sampling to ensure that adequate diesel fuel quality is maintained to prevent plugging of filters, fouling of injectors, and corrosion of fuel systems. Exposure to fuel oil contaminants such as water and microbiological organisms is minimized by periodic draining and cleaning of tanks and by verifying the quality of new oil before its introduction into the storage tanks. Sampling and analysis activities are in accordance with technical specifications on fuel oil purity and the guidelines of ASTM Standards D4057-81 and D975-81 (or later revisions of these standards).

NUREG-1801 Consistency

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

Exceptions to NUREG-1801

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

Attributes Affected	Exceptions
1. Scope of Program 6. Acceptance Criteria	The guidelines of ASTM Standard D6217 are not used along with those of D2276 for determination of particulates.[1]
2. Preventive Actions	No additives are used beyond what the refiner adds during production.[2]
2. Preventive Actions	The security diesel generator fuel storage tank is not periodically cleaned and inspected because the internals are inaccessible.[3]
3. Parameters Monitored/ Inspected 6. Acceptance Criteria	Determination of particulates maybe according to ASTM Standard D2276, rather than modified ASTM D2276 Method A.[4]

Exception Notes

1. PNPS technical specifications specify use of ASTM D975-81, which recommends use of ASTM D2276. Therefore, the guidelines of D2276 are appropriate for determination of particulates.

2. PNPS does not add biocides, stabilizers, or corrosion inhibitors to the diesel fuel. Plant-specific operating experience has not indicated significant problems related to MIC. Since water contamination in the diesel fuel storage tanks is minimized, the potential for MIC is limited.

3. The security diesel fuel storage tank does not have manways or other means of access to the internals.

4. Determination of particulates maybe according to ASTM Standard D2276 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.

Enhancements

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

Attributes Affected	Enhancements
1. Scope of Program	The Diesel Fuel Monitoring Program will be enhanced to include periodic sampling of the security diesel generator fuel storage tank, near the bottom, to determine water content.
4. Detection of Aging Effects	The Diesel Fuel Monitoring Program will be enhanced to include periodic ultrasonic measurement of the bottom surface of the security diesel generator fuel storage tank to ensure that significant degradation is not occurring.
6. Acceptance Criteria	UT measurements of tank bottom surfaces will have acceptance criterion $\geq$ 60% T_{nom}.

Operating Experience

In 2001, two diesel fuel oil deliveries were rejected; one because the oil viscosity was too low and one because the oil had detectable visible particulate contamination. Rejection of inferior fuel shipments maintains diesel fuel quality to prevent loss of material and cracking of fuel system components.

Monthly sampling of the B EDG fuel oil tank and the B SBO fuel oil tank in August, 2003 indicated a small amount of water was in the tanks. Gaskets were replaced although the indication of water was determined to be a false positive. The tanks were confirmed to be water-free during subsequent testing. Sampling of the B EDG fuel oil tank in January 2005 indicated a small amount of water was in the tank. However, subsequent testing confirmed the tank to be water-free. Other fuel oil sampling results from 2000 through August 2005 reveal that fuel oil quality is being maintained in compliance with acceptance criteria. A 1998 visual and ultrasonic inspection of A and B diesel fuel oil storage tank internals revealed no degradation. A 2002 visual inspection of A and B SBO fuel oil storage tank internals revealed no degradation. Continuous confirmation of diesel fuel quality, timely corrective actions, and absence of degradation in the fuel oil storage tanks provide evidence that the program is effective in managing loss of material and cracking of fuel system components.

Conclusion

The Diesel Fuel Monitoring Program has been effective at managing aging effects. The Diesel Fuel Monitoring Program provides reasonable assurance that effects of aging will be managed such that applicable components will continue to perform their intended function consistent with the current licensing basis for the period of extended operation.

B.1.11 ENVIRONMENTAL QUALIFICATION OF ELECTRIC COMPONENTS

Program Description

The Environmental Qualification (EQ) of Electric Components Program at PNPS is comparable to the program described in NUREG-1801, Section X.E1, Environmental Qualification (EQ) of Electric Components.

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 post-LOCA 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 PNPS 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 not qualified for the current license term are refurbished, replaced, or their qualification is extended prior to reaching the aging limits established in the evaluation. Aging evaluations for EQ components are considered time-limited aging analyses (TLAAs) for license renewal.

NUREG-1801 Consistency

The Environmental Qualification (EQ) of Electric Components Program at PNPS 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 overall effectiveness of the Environmental Qualification (EQ) of Electric Components Program is demonstrated by the excellent operating experience for systems, structures, and components in the program. The program has been subject to periodic internal and external assessments that have resulted in program improvement.

Conclusion

The Environmental Qualification (EQ) of Electric Components Program has been effective at managing aging effects. The Environmental Qualification (EQ) of Electric Components Program provides reasonable assurance that effects of aging will be managed such that applicable components will continue to perform their intended function consistent with the current licensing basis for the period of extended operation.

B.1.12 FATIGUE MONITORING

Program Description

The Fatigue Monitoring Program at PNPS is comparable to the program described in NUREG-1801, Section X.M1, Metal Fatigue of Reactor Coolant Pressure Boundary.

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

NUREG-1801 Consistency

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

Exceptions to NUREG-1801

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

Attributes Affected	Exceptions
2. Preventive Actions	The Fatigue Monitoring Program only involves tracking the number of transient cycles and does not include assessment of the impact of the reactor water environment on critical components.[1]
4. Detection of Aging Effects	The PNPS program does not provide for periodic update of the fatigue usage calculations.[2]

Exception Notes

1. The effect of the reactor water environment on fatigue is addressed as described in Section 4.3.3.

2. Updates of fatigue usage calculations are not necessary unless the number of accumulated fatigue cycles approaches the number of assumed design cycles. The PNPS program provides for periodic assessment of the number of accumulated cycles. If a design cycle assumption is approached, corrective action is taken which may include update of the fatigue usage calculation.

Enhancements

None

Operating Experience

Industry experience has been factored into the PNPS fatigue monitoring program through incorporation of Regulatory Guides and BWRVIP documents. The locations at which CUFs are calculated include those identified in NUREG/CR-6260.

Industry experience has identified thermal stresses that were not considered in the original design of PNPS. These thermal stresses have been evaluated. PNPS will continue to evaluate future industry experience on fatigue of Class 1 components.

For recent reactor shutdowns and startups, cycle limitations did not trend toward exceeding the allowable number of cycles. This demonstrates that the program continues to monitor plant transients and track the accumulation of these transients.

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 temperature and pressure changes.

The Fatigue Monitoring Program provides reasonable assurance that effects of aging will be managed such that applicable components will continue to perform their intended function consistent with the current licensing basis for the period of extended operation.

B.1.13 FIRE PROTECTION

The fire protection programs for PNPS include the Fire Protection Program and the Fire Water System Program. These two programs are comparable to NUREG-1801, Section XI.M26, Fire Protection and NUREG-1801, Section XI.M27, Fire Water System, respectively.

The Fire Protection programs are discussed in more detail in the following subsections

- Fire Protection
- Fire Water System

B.1.13.1 FIRE PROTECTION

Program Description

The Fire Protection Program at PNPS is comparable to the program described in NUREG-1801, Section XI.M26, Fire Protection.

The fire protection program 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 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 be periodically tested to ensure that the fuel supply line can perform its intended function. The program also includes periodic inspection and testing of the Halon fire suppression system.

Corrective actions, confirmation process, and administrative controls in accordance with the requirements of 10 CFR 50 Appendix B are applied to the Fire Protection Program.

NUREG-1801 Consistency

The Fire Protection Program at PNPS is consistent with the program described in NUREG-1801, Section XI.M26, Fire Protection, with exceptions and enhancements.

Exceptions to NUREG-1801

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

Attributes Affected	Exceptions
1. Scope of Program	This program is not necessary to manage aging effects for carbon dioxide fire protection system components.[1]

4. Detection of Aging Effects	The NUREG-1801 program states that approximately 10% of each type of penetration seal should be visually inspected at least once every refueling outage. The PNPS program specifies inspection of approximately 20% of the seals each operating cycle, with all accessible fire barrier penetration seals being inspected at least once every five operating cycles.[2]

Exception Notes

1. The carbon dioxide fire suppression system is not subject to aging management review.

2. Since aging effects are typically manifested over several years, this variation in inspection frequency is insignificant.

Enhancements

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

Attributes Affected	Enhancements
3. Parameters Monitored/ Inspected 6. Acceptance Criteria	Procedures will be enhanced to state that the diesel engine sub-systems (including the fuel supply line) shall be observed while the pump is running. Acceptance criteria will be enhanced to verify that the diesel engine did not exhibit signs of degradation while it was running; such as fuel oil, lube oil, coolant, or exhaust gas leakage.
3. Parameters Monitored/ Inspected 6. Acceptance Criteria	The procedure for Halon system functional testing, will be enhanced to state that the Halon 1301 flex hoses shall be replaced if leakage occurs during the system functional test.

Operating Experience

Inspections of fire stops, fire barrier penetration seals, fire barrier walls, ceilings, and floors from 1998 through 2004, revealed signs of degradation such as cracks, gaps, voids, holes or missing material. Identification of degradation and corrective action prior to loss of intended function

provide evidence that the program is effective for managing aging effects for fire barrier components.

Visual inspections and functional tests of fire doors, from 1998 through 2004, detected degradation of fire doors, such as corrosion, wear and missing parts. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing loss of material for fire doors.

Observation of the diesel-driven fire pump during a performance test in 2000 revealed leakage from the cooling system. The cause was determined to be corrosion of the heat exchanger shell, which was repaired. Observation of the diesel-driven fire pump during performance tests in 2001 revealed degradation of several components in the engine oil and coolant systems. The pump also failed a flow test. Therefore, the entire assembly (engine, controller, and pump) was replaced in 2002. Identification of degradation and corrective action provide evidence that the program is effective for managing aging of diesel-driven fire pump subsystem components.

Recent (2002 and 2003) visual inspections of cable spreading room Halon cylinders, associated hoses, valves and piping, detected no evidence of damage or corrosion. Absence of cracks or corrosion provides evidence that the program is effective for managing aging effects for cable spreading room Halon system components.

On July 31, 2003, NRC completed a triennial fire protection team inspection to assess whether PNPS has implemented an adequate fire protection program and that post-fire safe shutdown capabilities have been established and are being properly maintained at PNPS. Results confirmed that PNPS was maintaining the fire protection systems in accordance with their fire protection program and that PNPS was identifying program deficiencies and implementing appropriate corrective actions. The team also evaluated the material condition of fire walls, fire doors, fire dampers and fire barrier penetration seals and concluded that PNPS was maintaining passive features in a state of readiness.

A QA audit in May 2004 and an NRC inspection in June 2005 revealed no issues or findings that could impact effectiveness of the program to manage aging effects for fire protection components.

Conclusion

The Fire Protection Program has been effective at managing aging effects. The Fire Protection Program provides reasonable 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 for the period of extended operation.

B.1.13.2 FIRE WATER SYSTEM

Program Description

The Fire Water System Program at PNPS is comparable to the program described in NUREG-1801, Section XI.M27, Fire Water System.

This aging management program 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. 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, a sample of sprinkler heads will be inspected using the guidance of NFPA 25 (2002 Edition) Section 5.3.1.1.1. NFPA 25 states that, “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.” NFPA 25 also contains guidance to perform this sampling every 10 years after initial field service testing.

NUREG-1801 Consistency

The Fire Water System Program at PNPS is consistent with the program described in NUREG-1801, Section XI.M27, Fire Water System, with an exception and enhancements.

Exceptions to NUREG-1801

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

Attributes Affected	Exception
4. Detection of Aging Effects	NUREG-1801 specifies annual fire hydrant hose hydrostatic tests. Under the PNPS program, hydrostatic test of hoses occurs once per 3 years. NUREG-1801 specifies annual gasket inspections. Under the PNPS program, visual inspection, re-racking and replacement of gaskets in couplings occurs at least once per operating cycle. NUREG-1801 specifies annual fire hydrant flow tests. Under the PNPS program, verification of operability and no flow blockage occurs at least once every 2 fuel cycles.[1]

Exception Note

1. Since aging effects are typically manifested over several years, differences in inspection and testing frequencies are insignificant.

Enhancements

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

Attributes Affected	Enhancements
3. Parameters Monitored/ Inspected 6. Acceptance Criteria	Procedures will be enhanced to include inspection of hose reels for corrosion. Acceptance criteria will be enhanced to verify no significant corrosion.
4. Detection of Aging Effects	A sample of sprinkler heads will be inspected using guidance of NFPA 25 (2002 Edition) Section 5.3.1.1.1. NFPA 25 also contains guidance to repeat this sampling every 10 years after initial field service testing.

Attributes Affected	Enhancements
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.

Operating Experience

A fire hose station inspection in 1999 identified a degraded hose station. The hose reel was replaced. Hydrostatic testing and visual inspections of fire hose station equipment in 2004 and 2005 revealed no loss of material. Absence of significant corrosion provides evidence that the program is effective for managing loss of material for fire water system components.

Inspection of fire water storage tank, T-107A, in 2001 revealed minimal localized leakage, probably due to loss of material on the tank bottom. The leakage is being monitored and repair is scheduled. Also, inspection of fire water storage tank, T-107B, in 2003 revealed that microbiologically influenced corrosion (MIC) is occurring at spots (<1/16" in diameter) on internal surfaces. Similar corrosion was seen prior to tank recoating in 1993. Results of the next inspection (2008) will be compared with 2003 results to determine the need for repair of the tank. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing loss of material for fire water system components.

Full flow tests of fire main segments and hydrant inspections from 2001 through 2004 found no evidence of obstruction or loss of material. Spray and sprinkler system functional tests, and visual inspections of piping and nozzles, in 2003 found no evidence of blockage or loss of material. Confirmation of absence of degradation provides evidence that the program is effective for managing loss of material for fire water system components.

In 2001, an underground fire main broke due to fabrication and installation anomalies. A 16' section of the pipe was replaced. Inspection of internal and external surfaces of the removed pipe section revealed only one small spot of corrosion on the external surface where the coating was cracked. Confirmation of absence of degradation provides evidence that the program is effective for managing loss of material for fire water system components.

On July 31, 2003, NRC completed a triennial fire protection team inspection to assess whether PNPS has implemented an adequate fire protection program and that post-fire safe shutdown capabilities have been established and are being properly maintained at PNPS. Results confirmed that PNPS was maintaining the fire protection systems in accordance with their fire protection program and that PNPS was identifying program deficiencies and implementing appropriate corrective actions. The team also evaluated the material condition of selected wet pipe sprinkler systems, standpipe systems, and hose reels and concluded that PNPS was maintaining passive features in a state of readiness.

A QA audit in May 2004 revealed no issues or findings that could impact effectiveness of the program to manage loss of material for fire water system components.

Conclusion

The Fire Water System Program has been effective at managing aging effects. The Fire Water System Program provides reasonable assurance that effects of aging will be managed such that applicable components will continue to perform their intended function consistent with the current licensing basis for the period of extended operation.

B.1.14 FLOW-ACCELERATED CORROSION

Program Description

The Flow-Accelerated Corrosion (FAC) Program at PNPS is comparable to the program described in NUREG-1801, Section XI.M17, Flow-Accelerated Corrosion.

This program applies to safety-related and nonsafety-related carbon steel components in systems containing high-energy fluids carrying two-phase or single-phase high-energy fluid $\geq$ 2% of plant operating time.

The program, based on EPRI Report NSAC-202L-R2 recommendations 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 repair or replace components as necessary.

NUREG-1801 Consistency

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

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

Sixty-five FAC UT examinations were performed on-line (between RFO13 and RFO14) and during RFO14 (April, 2003). The examinations included components in the condensate, extraction steam, feedwater, heater vents and drains, main steam, reactor core isolation cooling, and reactor water cleanup systems. Five of the examinations detected decreased wall thickness. Two of the components were accepted after re-evaluation and the other three components were replaced. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing loss of material in carbon steel components.

Ninety-seven FAC UT examinations were performed on-line (between RFO14 and RFO15) and during RFO15 (April, 2005). The examinations included components in the condensate, extraction steam, feedwater, heater vents and drains, main steam, reactor core isolation cooling,

and reactor water cleanup systems. Three of the examinations detected decreased wall thickness. Two of the components were accepted after re-evaluation and the other component was repaired. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing loss of material in carbon steel components.

During RFO15 (April, 2005), five piping upgrades to FAC resistant material (ASTM A335 GR P11) were performed.

The FAC program document was developed with input from each of the Entergy Nuclear Northeast (ENN) FAC engineers as a standardized ENN procedure. Therefore, it includes improvements based on industry and other ENN plant OE. For example, skid mounted piping is now included in the enhanced system susceptibility evaluation.

During RFO15, several FAC points were added to inspections, or re-inspected, in response to industry OE and the MIHAMA Japan failure.

A self-assessment in January 2005 revealed no issues or findings that could impact effectiveness of the program to manage FAC in carbon steel components in systems containing high-energy fluids $\geq$ 2% of plant operating time.

Conclusion

The FAC Program has been effective at managing aging effects. The FAC Program provides reasonable 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 for the period of extended operation.

B.1.15 HEAT EXCHANGER MONITORING

Program Description

There is no corresponding NUREG-1801 program.

The Heat Exchanger Monitoring Program will inspect heat exchangers for degradation. If degradation is found, then an evaluation will be performed to evaluate its effects on the heat exchanger's design functions including its ability to withstand a seismic event.

Representative tubes within the sample population of heat exchangers will be eddy current tested at a frequency determined by internal and external operating experience to ensure that effects of aging are identified prior to loss of intended function. Along with each eddy current test, visual inspections will be performed on accessible heat exchanger heads, covers and tube sheets to monitor surface condition for indications of loss of material. The sample population of heat exchangers includes the RHR heat exchangers, core spray pump motor thrust bearing lube oil coolers, HPCI gland seal condenser, HPCI turbine lube oil cooler, RCIC lube oil cooler, recirculation pump motor generator set fluid coupling oil and bearing coolers, CRD pump oil coolers, recirculation pump motor lube oil coolers, clean up recirculation pump lube oil coolers and stuffing box cooler, and EDG lube oil coolers.

The program will be initiated prior to the period of extended operation.

Evaluation

1. Scope of Program

The Heat Exchanger Monitoring Program will manage aging effects on selected heat exchangers in various systems as identified in aging management reviews.

2. Preventive Actions

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

3. Parameters Monitored/Inspected

Where practical, eddy current inspections of shell-and-tube heat exchanger tubes will be performed to determine tube wall thickness. Visual inspections will be performed on heat exchanger heads, covers and tube sheets where accessible to monitor surface condition for indications of loss of material.

4. Detection of Aging Effects

Loss of material is the aging effect managed by this program. Representative tubes within the sample population of heat exchangers will be eddy current tested at a frequency determined by internal and external operating experience to ensure that effects of aging are identified prior to loss of intended function. Visual inspections of accessible heat exchangers will be performed on the same frequency as eddy current inspections.

An appropriate sample population of heat exchangers will be determined based on operating experience prior to inspections. Inspection can reveal loss of material that could result in degradation of the heat exchangers. Fouling is not addressed by this program.

5. Monitoring and Trending

Results will be evaluated against established acceptance criteria and an assessment will be made regarding the applicable degradation mechanism, degradation rate and allowable degradation level. This information will be used to develop future inspection scope and to modify inspection frequency, if appropriate. Wall thickness will be trended and projected to the next inspection. Corrective actions will be taken if projections indicate that the acceptance criteria may not be met at the next inspection.

6. Acceptance Criteria

The minimum acceptable tube wall thickness for each heat exchanger to be eddy current inspected will be established based upon a component-specific engineering evaluation. Wall thickness will be acceptable if greater than the minimum wall thickness for the component.

The acceptance criterion for visual inspections of heat exchanger heads, covers and tubesheets will be no evidence of degradation that could lead to loss of function. If degradation that could lead to loss of intended function is detected, a condition report will be written and the issue resolved in accordance with the site corrective action program.

7. Corrective Actions

This program will be administered under the site QA program which meets requirements of 10 CFR Part 50, Appendix B.

8. Confirmation Process

This attribute is discussed in Section B.0.3.

9. Administrative Controls

This attribute is discussed in Section B.0.3.

10. Operating Experience

The Heat Exchanger Monitoring Program at PNPS is a new program for which there is no operating experience.

Conclusion

The Heat Exchanger Monitoring Program will be effective for managing aging effects since it will incorporate proven monitoring techniques and conservative acceptance criteria. The Heat Exchanger Monitoring Program will provide reasonable 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 for the period of extended operation.

B.1.16 INSERVICE INSPECTION

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, IWD, and IWF 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.

Inservice inspection of supports for ASME piping and components is addressed in Section XI, Subsection IWF. ASME Code Section XI, Subsection IWF constitutes an existing mandated program applicable to managing aging of ASME Class 1, 2, 3, and MC supports for license renewal.

Additionally, 10 CFR 50.55a imposes inservice inspection requirements of ASME Code Section XI for class MC and class CC containment structures. Subsection IWE contains inspection requirements for class MC metal containments and class CC concrete containments. The scope of IWE includes steel liners for concrete containment and their integral attachments; containment hatches and airlocks; moisture barriers; and pressure-retaining bolting.

The program uses nondestructive examination (NDE) techniques to detect and characterize flaws. Three different types of examinations are volumetric, surface, and visual. Volumetric examinations are the most extensive, using methods such as radiographic, ultrasonic or eddy current examinations to locate surface and subsurface flaws. Surface examinations, such as magnetic particle or dye penetrant testing, are used to locate surface flaws.

Three levels of visual examinations are specified. VT-1 visual examination is conducted to assess condition of the surface of the part being examined, looking for cracks and symptoms of wear, corrosion, erosion or physical damage. It can be done with either direct visual observation or with remote examination using various optical/video devices. The VT-2 examination is conducted specifically to locate evidence of leakage from pressure retaining components (period pressure tests). While the system is under pressure for a leakage test, visual examinations are conducted to detect direct or indirect indication of leakage. The VT-3 examination is conducted to determine the general mechanical and structural condition of components and supports and to detect discontinuities and imperfections. For containment inservice inspection, general visual and detailed visual examinations are used in addition to VT examinations as allowed by 10 CFR 50.55a to include applicable relief requests.

The inservice inspection programs are discussed in more detail in the following subsections

- Containment Inservice Inspection (CII)
- Inservice Inspection (ISI)

B.1.16.1 CONTAINMENT INSERVICE INSPECTION (CII)

Program Description

The Containment Inservice Inspection (CII) Program is a plant-specific program encompassing the requirements for the inspection of Class MC pressure-retaining components (Primary Containment) and their integral attachments in accordance with the requirements of 10 CFR 50.55a(b)(2) and the 1998 Edition of ASME Section XI with 2000 Addenda, Inspection Program B.

Evaluation

1. Scope of Program

The CII Program, under ASME Section XI Subsection IWE, manages loss of material for the primary containment and its integral attachments. The primary containment is a General Electric Mark I pressure suppression containment system. The system consists of a drywell (housing the reactor vessel and reactor coolant recirculation loops), a pressure suppression chamber (housing a water pool), and the connecting vent system between the drywell and the water pool, isolation valves, and containment cooling systems. The code of construction for the containment structure is the ASME Section III, 1965 Edition and the latest addenda as of June 9, 1969, including Code Cases 1330-1 and 1177-5.

2. Preventive Actions

The CII Program is a monitoring program that does not include preventive actions.

3. Parameters Monitored/Inspected

The primary containment and its attachments are inspected for evidence of cracks, wear, and corrosion.

4. Detection of Aging Effects

The CII Program manages loss of material for the primary containment and its integral attachments.

The primary inspection method for the primary containment and its integral attachments is visual examination. Visual examinations are performed either directly or remotely with sufficient illumination and resolution suitable for the local environment to assess general conditions that may affect either the containment structural integrity or leak tightness of the pressure retaining component. The program includes augmented ultrasonic exams to measure wall thickness of the containment structure.

For steel, the CII Program manages loss of material and cracking for ASME Code Class MC pressure-retaining steel components and their integral attachments. This aging effect is managed by visual inspections required by ASME Section XI, Subsection IWE.

5. Monitoring and Trending

Results are compared, as appropriate, to baseline data and other previous test results. If indications are accepted for continued use by analytical evaluation, the areas containing such flaws are monitored during successive inspection periods.

6. Acceptance Criteria

Results are compared, as appropriate, to baseline data, other previous test results, and acceptance criteria of the ASME Section XI, Subsection IWE for evaluation of any evidence of degradation.

7. Corrective Actions

Subsection IWE states that components whose examination results indicate flaws or areas of degradation that do not meet the acceptance standards are acceptable if an engineering evaluation indicates that the flaw or area of degradation is nonstructural in nature or has no effect on the structural integrity of the containment. Except as permitted by 10 CFR 50.55a(b)(ix)(D), components that do not meet the acceptance standards are subject to additional examination requirements, and the components are repaired or replaced to the extent necessary to meet the acceptance standards.

8. Confirmation Process

This attribute is discussed in Section B.0.3.

9. Administrative Controls

This attribute is discussed in Section B.0.3.

10. Operating Experience

In 1999, the below-water regions of all 16 torus bays as well as the drywell to torus vent areas with water accumulation were inspected. Results revealed areas of defects such as depleted zinc, localized pitting corrosion, and minor surface rusting. Degraded areas were re-coated to prevent further corrosion and re-examined. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing aging effects.

An IWE visual exam in 1999 detected loose torus anchor bolt extensions and baseplate corrosion exceeding acceptance criteria. Bolt extensions were tightened. Corrosion was accepted by evaluation. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing aging effects.

During RFO14 (April, 2003) ultrasonic thickness examination of the torus shell, several measurements were below the nominal wall thickness of 0.629". Since the measurements were all greater than the minimum allowable thickness of 0.563", no further action was taken. CII examinations will continue to monitor thickness of the torus shell. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing aging effects.

Results of the CII general visual walkdown of primary containment during RFO14 (April, 2003) were compared with those from the previous inspection. The only new indication was in the CRD penetration area, where there is some surface corrosion but it is not significant and is structurally acceptable. No significant corrosion was found in other areas. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing aging effects.

CII inspections during RFO15 (April 2005) did not reveal evidence of loss of material. Absence of degradation provides evidence that the program is effective for managing aging effects.

Oyster Creek experienced drywell corrosion due to salt water intrusion. To ensure the same problem did not exist at PNPS, augmented IWE UT inspections were performed.

A QA audit and an NRC inspection in spring 2005 revealed no issues or findings that could impact effectiveness of the program.

Conclusion

The CII Program has been effective at managing aging effects. The CII Program provides reasonable 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 for the period of extended operation.

B.1.16.2 INSERVICE INSPECTION

Program Description

The PNPS Inservice Inspection (ISI) Program is a plant-specific program encompassing ASME Section XI, Subsections IWA, IWB, IWC, IWD and IWF requirements.

The ISI Program is based on ASME Inspection Program B (IWA-2432), 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 July 1, 2005 PNPS entered the fourth ISI interval. The ASME code edition and addenda used for the fourth interval is the 1998 Edition with 2000 Addenda. The current program ensures that the structural integrity of Class 1, 2, and 3 systems and associated supports is maintained at the level required by 10 CFR 50.55a.

Evaluation

1. Scope of Program

The ISI Program manages cracking, loss of material, and reduction of fracture toughness of reactor coolant system piping, components, and supports. The program implements applicable requirements of ASME Section XI, Subsections IWA, IWB, IWC, IWD and IWF, and other requirements specified in 10 CFR 50.55a with approved NRC alternatives and relief requests. Every 10 years the ISI Program is updated to the latest ASME Section XI code edition and addendum approved by the NRC in 10 CFR 50.55a.

ASME Section XI inspection requirements for Reactor Vessel Internals (Subsection IWB, Categories B-N-1 and B-N-2) are not in the ISI Program, but are included in the BWR Vessel Internals Program.

2. Preventive Actions

The ISI Program is a condition monitoring program that does not include preventive actions.

3. Parameters Monitored/Inspected

The program uses nondestructive examination (NDE) techniques to detect and characterize flaws. Volumetric examinations such as radiographic, ultrasonic or eddy current examinations are used to locate surface and subsurface flaws. Surface examinations, such as magnetic particle or dye penetrant testing, are used to locate surface flaws.

Three levels of visual examinations are specified. VT-1 visual examination is conducted to assess the condition of the surface of the part being examined, looking for cracks and symptoms of wear, corrosion, erosion or physical damage. It can be done with either direct visual observation or with remote examination using various optical and video devices. VT-2 visual examination is conducted specifically to locate evidence of leakage from pressure retaining components (period pressure tests). While the system is under pressure for a leakage test, visual examinations are conducted to detect direct or indirect indication of leakage. VT-3 visual examination is conducted to determine general mechanical and structural condition of components and supports and to detect discontinuities and imperfections.

4. Detection of Aging Effects

The ISI Program manages cracking and loss of material, as applicable, for carbon steel, low alloy steel and stainless steel/nickel based alloy subcomponents of the reactor pressure vessel using NDE techniques specified in ASME Section XI, Subsections IWB, IWC, and IWD examination categories.

The ISI Program manages cracking, loss of material, and reduction of fracture toughness, as applicable, of reactor coolant system components using NDE techniques specified in ASME Section XI, Subsections IWB, IWC and IWD examination categories.

The ISI Program manages loss of material for ASME Class MC and Class 1, 2, and 3 piping and component supports and their anchorages by visual examination of components using NDE techniques specified in ASME Section XI, Subsection IWF examination categories.

No aging effects requiring management are identified for lubrite sliding supports. However, the ISI Program will confirm the absence of aging effects for the period of extended operation.

5. Monitoring and Trending

Results are compared, as appropriate, to baseline data and other previous test results. If indications are accepted for continued use by analytical evaluation, the areas containing such flaws are monitored during successive inspection periods.

ISI results are recorded every operating cycle and provided to the NRC after each refueling outage via Owner’s Activity Reports prepared by the ISI Program Coordinator. These detailed reports include scope of inspection and significant inspection results.

6. Acceptance Criteria

A preservice, or baseline, inspection of program components was performed prior to startup to assure freedom from defects greater than code-allowable. This baseline data also provides a basis for evaluating subsequent inservice inspection results. Since plant startup, additional inspection criteria for Class 2 and 3 components have been imposed by 10 CFR 50.55a for which baseline and inservice data has also been obtained. Results of inservice inspections are compared, as appropriate, to baseline data, other previous test results, and acceptance criteria of the ASME Section XI, 1998 Edition, 2000 Addenda, for evaluation of any evidence of degradation.

7. Corrective Actions

If a flaw is discovered during an ISI examination, an evaluation is conducted in accordance with articles IWA-3000 and IWB-3000, IWC-3000, IWD-3000 or IWF-3000 as appropriate. If flaws exceed acceptance standards, such flaws are removed, repaired, or the component is replaced prior to its return to service. For Class 1, 2, and 3, repair and replacement is in conformance with IWA-4000. Acceptance of flaws which exceed acceptance criteria may be accomplished through analytical evaluation without repair, removal or replacement of the flawed component if the evaluation meets the criteria specified in the applicable article of the code.

8. Confirmation Process

This attribute is discussed in Section B.0.3.

9. Administrative Controls

This attribute is discussed in Section B.0.3.

10. Operating Experience

Intergranular stress corrosion cracking was discovered during RFO06 in the thermal sleeve at nine of the ten recirculation supply nozzles. GE has performed an evaluation to demonstrate no further crack growth with hydrogen water chemistry protection.

A scheduled ISI surface examination in 1997 detected an indication adjacent to a welded pipe support lug. The lug was removed and the indication was repaired by welding. A scheduled ISI visual examination in 1999 detected a snubber with restricted movement and cold piston setting out of tolerance. The restriction was re-worked and the cold piston setting was accepted by evaluation. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing aging effects.

142 scheduled ISI (ASME Section XI Subsections IWB, IWC, IWD, and IWF) examinations were performed on-line (between RFO13 and RFO14) and during RFO14 (April 2003). Results show that one spring hanger support in the residual heat removal system required rework because ISI visual inspection determined that bolting was loose. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing aging effects.

194 scheduled ISI (ASME Section XI Subsections IWB, IWC, IWD, and IWF) examinations were performed on-line (between RFO14 and RFO15) and during RFO15 (April 2005). Results show that cracked welds on four steam dryer tie-bars were repaired, loose bolting on a hanger was reworked, a UT exam indication on a standby liquid control system weld was repaired, and a number of RPV safe-end welds were accepted by evaluation because they had wall thickness less than the screening criteria, but not less than design minimums. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing aging effects.

A QA audit and an NRC inspection in spring 2005 revealed no issues or findings that could impact effectiveness of the program.

Conclusion

The ISI Program has been effective at managing aging effects. The ISI Program provides reasonable 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 for the period of extended operation.

B.1.17 INSTRUMENT AIR QUALITY

Program Description

The Instrument Air Quality Program is a plant-specific program which ensures that instrument air supplied to components is maintained free of water and significant contaminants, thereby preserving an environment that is not conducive to loss of material. Dewpoint, particulate contamination, and hydrocarbon concentration are periodically checked to verify the instrument air quality is maintained.

Evaluation

1. Scope of Program

This program applies to components within the scope of license renewal and subject to aging management review that are supplied with instrument air, for which pressure boundary integrity is required for the component to perform its intended function.

2. Preventive Actions

System air quality is monitored and maintained within specified limits to ensure that instrument air supplied to components is maintained free of water and significant contaminants, thereby preventing loss of material.

3. Parameters Monitored/Inspected

Dewpoint, particulate contamination, and hydrocarbon concentration (oil mist) are periodically checked to verify instrument air quality is maintained.

4. Detection of Aging Effects

Dewpoint, particulate contamination and hydrocarbon concentration are periodically checked to verify instrument air quality is maintained, thereby preventing loss of material. At least once per 18 months, dew point, particulate contamination, and hydrocarbon concentration are monitored at several locations in the instrument air system.

5. Monitoring and Trending

Results of sample analyses are maintained in the chemistry log. A condition report is issued if data indicates deteriorating instrument air quality.

6. Acceptance Criteria

- dew point $\leq$ -20°F
- oil mist and particulate < 1.2 mg/m^3

7. Corrective Actions

Corrective actions are carried out in accordance with the PNPS 10 CFR Part 50, Appendix B, Corrective Action Program.

8. Confirmation Process

This attribute is discussed in Section B.0.3.

9. Administrative Controls

This attribute is discussed in Section B.0.3.

10. Operating Experience

In 1999, an instrument air dryer dewpoint reading was greater than the acceptance criterion of $\leq$ -20°F. A faulty solenoid valve was replaced and dewpoint was confirmed $\leq$ -20°F. Monitoring of instrument air quality and subsequent corrective actions provide evidence that the program is effective in managing loss of material and cracking of instrument air system components.

For a period of time (October 2001 through March 2005), dew point, particulate contamination, and hydrocarbon concentration (oil mist) were not sampled in the instrument air system. Procedures were corrected in March 2005 to require dew point, particulate contamination, and hydrocarbon concentration (oil mist) sampling at several locations in the instrument air system. Sample results for the service air system, which supplies the instrument air system, show that dewpoint, oil mist and particulates were within acceptance criteria. Instrument air header moisture checks during the same period found little or no moisture. Therefore, instrument air quality is assumed to have been maintained and will be maintained from now on by sampling in accordance with the Instrument Air Quality Program. Continuous confirmation of instrument air quality and subsequent corrective actions provide evidence that the program is effective in managing loss of material and cracking of instrument air system components.

Enhancements

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

Attributes Affected	Enhancement
1. Scope of Program	The Instrument Air Quality Program will be enhanced to include a sample point in the standby gas treatment and torus vacuum breaker instrument air subsystem in addition to the instrument air header sample points.

Conclusion

The Instrument Air Quality Program has been effective at managing aging effects. The Instrument Air Quality Program provides reasonable assurance that effects of aging will be managed such that applicable components will continue to perform their intended function consistent with the current licensing basis for the period of extended operation.

B.1.18 METAL-ENCLOSED BUS INSPECTION

Program Description

The Metal-Enclosed Bus Inspection Program at PNPS will be comparable to the program described in NUREG-1801, Section XI.E4, Metal-Enclosed Bus.

The program will manage the effects of aging on non-segregated phase bus which connects the 4.16 kV switchgear (A3 through A6) through visual inspection of enclosure assemblies and interior portions of the bus. This inspection will also verify the absence of water or debris.

The program will be initiated prior to the period of extended operation.

NUREG-1801 Consistency

The program attributes of the Metal-Enclosed Bus Inspection Program at PNPS will be consistent with the program attributes described in NUREG-1801, Section XI.E4, Metal-Enclosed Bus, with exceptions.

Exceptions to NUREG-1801

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

Attributes Affected	Exception
3. Parameters Monitored/ Inspected 4. Detection of Aging Effects	MEB enclosure assemblies will be inspected in addition to internal surfaces.[1]
4. Detection of Aging Effects	MEB bolted connections will be visually inspected every 10 years, rather than every five years as stated in NUREG-1801.[2]

Exception Notes

1. Inspection of MEB enclosure assemblies under the Metal-Enclosed Bus Inspection Program assures that effects of aging will be identified prior to loss of intended function.

2. As stated in NUREG-1801 for the other inspections in this program, a 10 year inspection interval will provide two data points during a 20-year period, which can be used to characterize the degradation rate. This is an adequate period to preclude failures of the MEBs since experience has shown that aging degradation is a slow process.

Enhancements

None

Operating Experience

The Metal-Enclosed Bus Inspection Program at PNPS is a new program for which there is no operating experience.

Conclusion

The Metal-Enclosed Bus Inspection Program will be effective for managing aging effects since it will incorporate appropriate monitoring techniques. The Metal-Enclosed Bus Inspection Program will provide reasonable assurance that the effects of aging will be managed such that the applicable components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation

B.1.19 NON-EQ INACCESSIBLE MEDIUM-VOLTAGE CABLE

Program Description

The Non-EQ Inaccessible Medium-Voltage Cable Program at PNPS will be comparable to the program described in NUREG-1801, Section XI.E3, Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements.

In this program, periodic actions will be taken to prevent cables from being exposed to significant moisture, such as inspecting for water collection in cable manholes and conduit, and draining water, as needed. In scope medium-voltage cables 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. The specific type of test performed will be determined prior to the initial test.

The program will be initiated prior to the period of extended operation.

NUREG-1801 Consistency

The program attributes of the Non-EQ Inaccessible Medium-Voltage Cable Program at PNPS will be consistent with the program attributes described in 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 at PNPS is a new program for which there is no operating experience.

Conclusion

The Non-EQ Inaccessible Medium-Voltage Cable Program will be effective for managing aging effects since it will incorporate appropriate monitoring techniques. The Non-EQ Inaccessible Medium-Voltage Cable Program will provide reasonable assurance that the effects of aging will be managed such that the applicable components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.1.20 NON-EQ INSTRUMENTATION CIRCUITS TEST REVIEW

Program Description

The Non-EQ Instrumentation Circuits Test Review Program at PNPS will be comparable to the 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.

The Non-EQ Instrumentation Circuits Test Review Program will provide reasonable assurance that the intended functions of instrument cables exposed to adverse localized equipment 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 environment for the cable. This program will consider the technical information and guidance provided in NUREG/CR-5643, IEEE Std. P1205, SAND96-0344, and EPRI TR-109619.

The program will be initiated prior to the period of extended operation.

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 at PNPS is a new program for which there is no operating experience. Industry and plant-specific operating experience will be considered in the development of this program, and future operating experience will be appropriately incorporated into the program.

Conclusion

The Non-EQ Instrumentation Circuits Test Review Program will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. Implementation of the Non-EQ Instrumentation Circuits Test Review Program will provide reasonable assurance that the effects of aging will be managed so that the components within the scope of this program will perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.1.21 NON-EQ INSULATED CABLES AND CONNECTIONS

Program Description

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

The Non-EQ Insulated Cables and Connections Program will provide reasonable assurance that 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 technical basis for sampling will be determined using EPRI document TR-109619, “Guideline for the Management of Adverse Localized Equipment Environments.”

The program will be initiated prior to the period of extended operation.

NUREG-1801 Consistency

The Non-EQ Insulated Cables and Connections Program at PNPS 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 at PNPS is a new program for which there is no operating experience.

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 will provide reasonable 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 for the period of extended operation.

B.1.22 OIL ANALYSIS

Program Description

The Oil Analysis Program at PNPS is comparable to the program described in NUREG-1801, Section XI.M39, Lubricating Oil Analysis.

The Oil Analysis Program 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.

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

NUREG-1801 Consistency

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

Exceptions to NUREG-1801

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

Attributes Affected	Exception
3. Parameters Monitored/ Inspected	Flash point is not determined for sampled oil.[1]

Exception Note

1. Analyses of filter residue or particle count, viscosity, total acid/base (neutralization number), water content, and metals content provide sufficient information to verify the oil is suitable for continued use.

Enhancements

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

Attributes Affected	Enhancements
1. Scope of Program	The Oil Analysis Program will be enhanced to periodically change CRD pump lubricating oil. A particle count and check for water will be performed on the drained oil to detect evidence of abnormal wear rates, contamination by moisture, or excessive corrosion.
3. Parameters Monitored/ Inspected	Procedures for security diesel and reactor water cleanup pump oil changes will be enhanced to obtain oil samples from the drained oil. Procedures for lubricating oil analysis will be enhanced to specify that a particle count and check for water are performed on oil samples from the fire water pump diesel, security diesel, and reactor water cleanup pumps.

Operating Experience

Lube oil analysis for residual heat removal pump B in July, 2003 showed viscosity slightly outside of the acceptable range. No other problems were noted with the oil. Retest confirmed viscosity condition. Oil was changed at next system window. Continuous confirmation of oil quality and timely corrective actions provide evidence that the program is effective in managing aging effects for lube oil components.

Lube oil testing of the A diesel generator in December, 2004 and of the B diesel generator in January, 2005 indicated a step change in the wear particle count. The increase in iron and aluminum was very minor and levels remained well below those at which corrective action is necessary. The analysis laboratory indicated that the increases may be the result of new analysis equipment that has a higher resolution. Quarterly trending will continue for wear products and appropriate action will be taken if required. Continuous confirmation of oil quality and timely corrective actions provide evidence that the program is effective in managing aging effects for lube oil components.

Conclusion

The Oil Analysis Program has been effective at managing aging effects. The Oil Analysis Program provides reasonable assurance that effects of aging will be managed such that applicable components will continue to perform their intended function consistent with the current licensing basis for the period of extended operation.

B.1.23 ONE-TIME INSPECTION

Program Description

The One-Time Inspection Program at PNPS is a new program that will be implemented prior to the period of extended operation. The program will be comparable to the program described in NUREG-1801, Section XI.M32, One-Time Inspection. The one-time inspection activity for small bore piping in the reactor coolant system and associated systems that form the reactor coolant pressure boundary, will also be comparable to the program described in NUREG-1801, Section XI.M35, One-Time Inspection of ASME Code Class I Small-Bore Piping. The PNPS program will be consistent with the program elements described in NUREG-1801.

The program will include one activity to verify effectiveness of an aging management program and activities to confirm the absence of aging effects as described below.

Water chemistry control programs	One-time inspection activity will verify the effectiveness of the water chemistry control aging management programs by confirming that unacceptable cracking, loss of material, and fouling is not occurring.
Internal surfaces of buried carbon steel pipe on the standby gas treatment system discharge to the stack	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 compressed air and emergency diesel generator system components containing untreated air	One-time inspection activity will confirm that cracking (EDG system) and loss of material (compressed air and EDG systems) are not occurring or are so insignificant that an aging management program is not warranted.
Internal surfaces of stainless steel radioactive waste and sanitary soiled waste and vent system components containing untreated 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.
Small bore piping in the reactor coolant system and associated systems that form the reactor coolant pressure boundary	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.

RV flange leakoff line	One-time inspection activity will confirm that cracking is not occurring or is so insignificant that an aging management program is not warranted.
Main steam flow restrictors (CASS)	One-time inspection activity will confirm that loss of material, cracking, and reduction of fracture toughness are not occurring or are so insignificant that an aging management program is not warranted.

The elements of the 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.

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

The inspection will be performed within the 10 years prior to the period of extended operation.

NUREG-1801 Consistency

The One-Time Inspection Program will be consistent with the program described in NUREG-1801, Section XI.M32, One-Time Inspection. The one-time inspection activity for small bore piping in the reactor coolant system and associated systems that form the reactor coolant pressure boundary, will also be consistent with the program described in NUREG-1801, Section XI.M35, One-Time Inspection of ASME Code Class I Small-Bore Piping.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The One-Time Inspection Program is a new program for which there is no operating experience. Industry and plant-specific operating experience will be considered in development of this program, as appropriate.

Conclusion

Verification of the effectiveness of the Water Chemistry Control programs and confirmation of the absence of aging effects on specific standby gas treatment, compressed air, emergency diesel generator, radioactive waste, sanitary soiled waste and vent, and reactor coolant system components will be undertaken in the One-Time Inspection Program to ensure component intended functions can be maintained in accordance with the current licensing basis (CLB) during the period of extended operation.

B.1.24 PERIODIC SURVEILLANCE AND PREVENTIVE MAINTENANCE

Program Description

There is no corresponding NUREG-1801 program.

The PNPS Periodic Surveillance and Preventive Maintenance Program includes periodic inspections and tests that manage aging effects not managed by other aging management programs. The preventive maintenance and surveillance testing activities are generally implemented through repetitive tasks or routine monitoring of plant operations. 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 the reactor building crane, rails, and girders and refueling platform carbon steel components.
process facilities	Visually inspect the main stack components to manage loss of material for carbon steel and cracking, spalling, or loss of material for concrete.
standby liquid control system	Use UT or other NDE techniques to verify remaining wall thickness to manage loss of material from internal surfaces of the carbon steel discharge accumulators.
automatic depressurization system	Use visual or other NDE techniques to inspect torus to manage loss of material for carbon steel piping in the waterline region of the torus.
high pressure coolant injection system	Use visual or other NDE techniques to inspect a representative sample of the internals of gland seal condenser blower (P-223) and suction piping to manage loss of material.
reactor core isolation cooling system	Use visual or other NDE techniques to inspect a representative sample of RCIC steam supply and exhaust piping downstream of the strainers and steam traps to manage loss of material.

standby gas treatment system	Perform a visual inspection of accessible expansion joints for cracks. Also perform manual flexing (manipulation) of the expansion joints to determine if they have become brittle. These inspections will verify the absence of significant change in material properties. Use visual or other NDE techniques to inspect internal surfaces of the valve bodies and piping in the demister drains to manage loss of material. Use visual or other NDE techniques to inspect a representative sample of the internal and external surfaces of the drain lines from each reactor building auxiliary bay passing into the water trough in the torus room to manage loss of material.
reactor building closed cooling water system	Use visual or other NDE techniques to inspect clean-up recirc pump P-204B stuffing box cooler to manage loss of material due to wear. Use visual or other NDE techniques to inspect a representative sample of the in-scope RBCCW copper alloy cooling coils to manage loss of material.
emergency diesel generator system	Use visual or other NDE techniques to inspect a representative sample of EDG intake air, air start, and exhaust components to manage loss of material and fouling. Visually inspect A/B EDG jacket water radiators to manage loss of material and fouling. Perform EDG surveillance test (loaded) to manage fouling for heat exchanger tubes.

station blackout diesel generator system	Use visual or other NDE techniques to inspect a representative sample of station blackout diesel intake air, air start, and exhaust components to manage loss of material, cracking, and fouling. Visually inspect station blackout jacket water radiator to manage loss of material and fouling. Perform station blackout diesel surveillance test to manage fouling for heat exchanger tubes.
heating, ventilation, and air conditioning systems	Use visual or other NDE techniques to inspect the air side of the copper alloy tubes of heat exchangers VAC-201A/B, VAC-202A/B, and VAC-204A/B/C/D to manage loss of material and fouling. Visually inspect and manually flex VSF-103A/B, VAC-202A/B, VAC-204A/B/C/D, and EDG engine-driven fan duct flexible connections to manage cracking and change in material properties.
security diesel	Perform security diesel generator surveillance test (loaded) to manage fouling for heat exchanger tubes. Use visual or other NDE techniques to inspect a representative sample of security diesel oil cooler, aftercooler, and radiator tubes to manage loss of material. Use visual or other NDE techniques to inspect a representative sample of security diesel intake air and exhaust components to manage cracking and loss of material on internal surfaces.
condensate storage system	Use visual or other NDE techniques to inspect a representative sample of the internal and external surfaces of the condensate storage tanks to manage loss of material.

nonsafety-related systems affecting safety-related systems	Use visual or other NDE techniques to inspect a representative sample of circulating water, potable & sanitary water, radioactive waste, sanitary soiled waste & vent, plumbing and drains and screen wash system components to manage internal loss of material. Visually inspect and manually flex a representative sample of the flex/expansion joints in the circulating water, HVAC/chilled water, and radioactive waste systems to manage cracking and change in material properties.

Evaluation

1. Scope of Program

The PNPS 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 intervals are established such that they provide timely detection of degradation. Inspection 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 ten 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

The PNPS Corrective Action Program, quality assurance procedures, site review and approval process, and administrative controls are implemented in accordance with requirements of 10 CFR Part 50, Appendix B.

8. Confirmation Process

This attribute is discussed in Section B.0.3.

9. Administrative Controls

This attribute is discussed in Section B.0.3.

10. Operating Experience

Inspection of the reactor building crane in 2000 and of the refueling platform in March, 2003 found no significant corrosion or wear. Absence of significant corrosion and wear provides evidence that the program is effective for managing loss of material for the reactor building crane, rails, and girders and refueling platform carbon steel components.

Visual inspection of the main stack and guy wires in June, 2004 revealed no significant corrosion of steel structures and components. Similarly, inspection of the

concrete anchor blocks revealed no cracking, spalling, or other loss of material. Absence of steel corrosion and concrete cracking, spalling, and loss of material provides evidence that the program is effective for managing aging effects for components of the main stack.

In 1999, visual inspection of the drywell spray header revealed no significant corrosion. Absence of significant corrosion provides evidence that the program is effective for managing loss of material for the drywell spray header.

In 1999, the below-water regions of all 16 torus bays as well as the drywell to torus vent areas with water accumulation were inspected. The condition of other submerged structures and components was also reported. Results revealed no significant corrosion on submerged structures and components within the torus. Absence of significant corrosion provides evidence that the program is effective for managing loss of material for carbon steel SRV tailpipes in the waterline region of the torus.

During visual inspection of standby gas treatment system exhaust fans in 2000 and 2001, the expansion joints which connect the fans to ductwork were disconnected from the fans to facilitate fan inspection. Inspection of the expansion joints after this evolution revealed no cracking. Absence of cracking provides evidence that the program is effective for managing cracking and change in material properties for the expansion joints.

No significant corrosion or wear was found on the reactor recirculation system MG sets area cooling coils during an inspection in 2000. Absence of significant corrosion or wear provides evidence that the program is effective for managing loss of material for RBCCW copper alloy cooling coils.

During a 2002 run of the A EDG, soot buildup was noticed on the turbo charger. Although no obvious leakage was noted, soot buildup may indicate existence of a small exhaust leak. Thermography was performed during the next diesel run to determine if and where leakage was occurring, but no leakage was found. Identification of possible degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing loss of material for EDG exhaust components.

Inspections of EDG air intake and jacket water radiator components in 1999 and 2004 revealed no significant corrosion, wear, or fouling. Also, no significant corrosion was found on air start components or exhaust components during the inspections. Absence of aging effects provides evidence that the program is effective for managing aging effects for EDG components.

EDG surveillance tests were performed in April 2005. Results for both generators show that air manifold temperature did not fluctuate significantly during the loaded run, providing evidence that the program is effective for managing fouling of EDG intake air cooler tubes.

Inspections of station blackout (SBO) diesel jacket water radiator components in 2001 revealed no significant corrosion, wear, or fouling. Also, no significant corrosion was found on air start components or exhaust components during the inspections. Minor corrosion on inside surface of the air intake silencer housing was determined to not affect the ability of the silencer to perform its intended function. Absence of significant aging effects provides evidence that the program is effective for managing aging effects for SBO diesel components.

SBO diesel generator surveillance tests were performed in May 2005. Results show that air manifold temperature did not fluctuate significantly during the loaded run, providing evidence that the program is effective for managing fouling of SBO diesel intake air cooler tubes.

Visual inspection of the control room emergency air supply system blowers in 1999 revealed no cracking of the flexible connectors on these components. Absence of cracking provides evidence that the program is effective for managing cracking for flexible connectors.

A thorough inspection of the security diesel intake air components, exhaust components, and the jacket water radiator in 1998 revealed no significant corrosion, cracking, wear, or fouling. Absence of aging effects provides evidence that the program is effective for managing aging effects for security diesel system components.

Security diesel generator surveillance tests were performed in 2002, 2003, and 2004. Results show that air manifold temperature did not fluctuate significantly during the loaded run, providing evidence that the program is effective for managing fouling of security diesel intake air cooler tubes.

An inspection of the ‘A’ condensate storage tank in April, 2003 noted paint flaking off the interior of the tank, corrosion nodules on the sidewall and floor, and a 2”-3” diameter by ½” deep depression in the tank floor. The ‘B’ condensate storage tank was also inspected and no corrosion or coating degradation was observed. A long-term corrective action was initiated to assess the interior condition of the tank, review the existing coating system, select an appropriate recoating system, and repair and recoat the ‘A’ condensate storage tank. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing loss of material for the condensate storage tanks.

Enhancements

Prior to the period of extended operation, program activity implementing documents will be enhanced as necessary to assure that the effects of aging will be managed 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 Periodic Surveillance and Preventive Maintenance Program has been effective at managing aging effects. The Periodic Surveillance and Preventive Maintenance Program provides reasonable 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 for the period of extended operation.

B.1.25 REACTOR HEAD CLOSURE STUDS

Program Description

The Reactor Head Closure Studs Program at PNPS is comparable to the program described in NUREG-1801, Section XI.M3, Reactor Head Closure Studs.

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

Attributes Affected	Exception
4. Detection of Aging Effects	When reactor head closure studs are removed for examination, either a surface or volumetric examination is allowed.[1]

Exception Note

1. Cracking initiates on the outside surfaces of bolts and studs. Therefore, a qualified surface examination meeting the acceptance standards of ASME Section XI, Subsection IWB-3515 provides at least the sensitivity for flaw detection that an end shot ultrasonic examination provides on bolts or studs. Thus, when reactor head closure studs are removed for examination, either a surface or volumetric examination is allowed.

Enhancements

None

Operating Experience

Volumetric examination of 18 reactor head closure studs and visual examination of 18 nuts and 18 washers during RFO15 (April, 2005) resulted in no new recordable indications. Absence of

new recordable indications provides evidence that the program is effective for managing loss of material and cracking of the reactor head closure studs, nuts, washers, and bushings.

Conclusion

The Reactor Head Closure Studs Program has been effective at managing aging effects. The Reactor Head Closure Studs Program provides reasonable 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 for the period of extended operation.

B.1.26 REACTOR VESSEL SURVEILLANCE

Program Description

The Reactor Vessel Surveillance Program complies with the guidelines for an acceptable Integrated Surveillance Program as described in NUREG-1801, Section XI.M31, Reactor Vessel Surveillance. This program manages reduction in fracture toughness of reactor vessel beltline materials to assure that the pressure boundary function of the reactor pressure vessel is maintained for the period of extended operation.

PNPS is a participant in the Boiling Water Reactor Vessel and Internals Project (BWRVIP) Integrated Surveillance Program (ISP) as approved by License Amendment 209. This 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 PNPS, 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, PNPS 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, their withdrawal schedule, and contingencies to ensure that the requirements of 10 CFR 50 Appendix H are met for the period of extended operation.

NUREG-1801 Consistency

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

Exceptions to NUREG-1801

None

Enhancements

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

Attributes Affected	Enhancement
5. Monitoring and Trending Actions 6. Acceptance Criteria 7. Corrective Actions	The Reactor Vessel Surveillance Program will be enhanced to proceduralize the data analysis, acceptance criteria, and corrective actions described in this program description.

Operating Experience

PNPS is a participant in the Boiling Water Reactor Vessel and Internals Project (BWRVIP) Integrated Surveillance Program (ISP) as approved by Amendment 209 to the operating License. The fact that PNPS participates in the BWRVIP ISP ensures that future operating experience from all participating BWRs will be factored into this program.

Conclusion

The Reactor Vessel Surveillance Program provides reasonable assurance that aging effects will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.1.27 SELECTIVE LEACHING

Program Description

The Selective Leaching Program at PNPS will be comparable to the program described in NUREG-1801, Section XI.M33 Selective Leaching of Materials.

The Selective Leaching Program will ensure the integrity of components made of cast iron, bronze, brass, and other alloys exposed to raw water, treated water, or groundwater that may lead to selective leaching. The program will include a one-time visual inspection and hardness measurement 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 for the period of extended operation.

The program will be initiated prior to the period of extended operation.

NUREG-1801 Consistency

The Selective Leaching Program at PNPS 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 for which there is no operating experience.

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 will provide reasonable 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 for the period of extended operation.

B.1.28 SERVICE WATER INTEGRITY

Program Description

The Service Water Integrity Program at PNPS is comparable to the program described in NUREG-1801, Section XI.M20, Open-Cycle Cooling Water System.

This program relies on implementation of the recommendations of GL 89-13 to ensure that the effects of aging on the salt service water (SSW) system are managed for the period of extended operation. The program includes surveillance and control techniques to manage aging effects caused by biofouling, corrosion, erosion, protective coating failures, and silting in the SSW system or structures and components serviced by the SSW system.

NUREG-1801 Consistency

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

Exceptions to NUREG-1801

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

Attributes Affected	Exceptions
2. Preventive Actions	NUREG-1801 states that system components are lined or coated. Components are lined or coated only where necessary to protect the underlying metal surfaces.[1]
5. Monitoring and Trending	NUREG-1801 states that testing and inspections are performed annually and during refueling outages. The PNPS program requires tests and inspections each refueling outage.[2]

Exception Notes

1. NUREG-1801 states that system components are constructed of appropriate materials and lined or coated to protect the underlying metal surfaces from being exposed to aggressive cooling water environments. Not all PNPS system components are lined or coated. Components are lined or coated only where necessary to protect the underlying metal surfaces.

2. NUREG-1801 program entails testing and inspections performed annually and during refueling outages. The PNPS program requires tests and inspections each refueling outage, but not annually. Since aging effects are typically manifested over several years, the difference in inspection and testing frequency is insignificant.

Enhancements

None

Operating Experience

Results of heat transfer capability testing of the reactor building closed cooling water (RBCCW) heat exchangers from 2001 through 2004 show that the heat exchangers are capable of removing the required amount of heat. Confirmation of adequate thermal performance provides evidence that the program is effective for managing fouling of SSW cooled heat exchangers.

Results of SSW visual inspections, eddy current testing, ultrasonic testing, and radiography testing from 1998 through 2004 revealed areas of erosion and areas of corrosion on internal and external surfaces. SSW butterfly valves, pump discharge check valves, air removal valves, and pipe spools have been replaced with components made of corrosion resistant materials. Also, RBCCW heat exchanger channel assemblies have been replaced and tubes have been sleeved to address erosion and corrosion. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing loss of material for SSW system components.

Visual inspections of SSW piping revealed degradation of the lining in original SSW carbon steel rubber lined piping. Pipe lining is intended to protect pipe internal surfaces from erosion and corrosion. Therefore, SSW piping has been replaced with carbon steel pipe with cured-in-place rubber lining, relined with a ceramic epoxy compound, or replaced with titanium pipe. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing loss of material for SSW system components.

Conclusion

The Service Water Integrity Program has been effective at managing aging effects. The Service Water Integrity Program provides reasonable assurance that effects of aging will be managed such that applicable components will continue to perform their intended function consistent with the current licensing basis for the period of extended operation.

B.1.29 STRUCTURES MONITORING

The Structures Monitoring programs are discussed in more detail in the following subsections

- Masonry Wall
- Structures Monitoring
- Water Control Structures Monitoring

B.1.29.1 MASONRY WALL

Program Description

The Masonry Wall Program at PNPS is comparable to the program described in NUREG-1801, Section XI.S5, Masonry Wall Program.

The objective of the Masonry Wall Program is to manage 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 all masonry walls identified as performing intended functions in accordance with 10 CFR 54.4. Included components are the 10 CFR 50.48-required masonry walls, radiation shielding masonry walls, masonry walls with the potential to affect safety-related components, and the torus compartment water trough.

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

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

Examinations of masonry walls within the scope of license renewal in 2002 did not find evidence of cracking. A review of condition reports from 1998 through 2004 did not reveal any instances of cracked masonry walls. Absence of cracking provides evidence that the program is effective for managing cracking of masonry walls.

Conclusion

The Masonry Wall Program has been effective at managing aging effects. The Masonry Wall Program provides reasonable 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 for the period of extended operation.

B.1.29.2 STRUCTURES MONITORING

Program Description

The Structures Monitoring Program at PNPS is comparable to the program described in NUREG-1801, Section XI.S6, Structures Monitoring Program.

Structures monitoring in accordance with 10 CFR 50.65 (Maintenance Rule) is addressed in Regulatory Guide 1.160 and NUMARC 93-01. These two documents provide guidance for development of licensee-specific programs to monitor the condition of structures and structural components within the scope of the Maintenance Rule, such that there is no loss of structure or structural component 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 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 initiated prior to the period of extended operation.

Attributes Affected	Enhancements
1. Scope of Program	The Structures Monitoring Program procedure will be enhanced to clarify that the discharge structure, security diesel generator building, trenches, valve pits, manholes, duct banks, underground fuel oil tank foundations, manway seals and gaskets, hatch seals and gaskets, underwater concrete in the intake structure, and crane rails and girders are included in the program.
4. Detection of Aging Effects	Guidance for performing structural examinations of elastomers (seals, gaskets, seismic joint filler, and roof elastomers) to identify cracking and change in material properties will be added to the Structures Monitoring Program procedure.

Operating Experience

Inspections of structural steel, concrete exposed to fluid, and structural elastomers from 1998 through 2004 revealed signs of degradation such as cracks, gaps, corrosion (rust), and flaking coatings. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing aging effects for structural components.

Structural inspection of pipe supports and cable trays in November 2004 revealed numerous minor signs of degradation which were repaired. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing aging effects for structural components.

A self-assessment in July 2005 revealed no issues or findings that could impact effectiveness of the program.

Conclusion

The Structures Monitoring Program has been effective at managing aging effects. The Structures Monitoring Program provides reasonable 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 for the period of extended operation.

B.1.29.3 WATER CONTROL STRUCTURES MONITORING

Program Description

The Water Control Structures Monitoring Program at PNPS is comparable to the program described in NUREG-1801, Section XI.S7, RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants.

The program includes visual inspections to manage loss of material and loss of form for water-control structures (breakwaters, jetties, and revetments). The water-control structures are of rubble mound construction with the outer layer protected by heavy capstone. Parameters monitored include settlement (vertical displacement) and rock displacement. These parameters are consistent with those described in RG 1.127.

NUREG-1801 Consistency

The Water Control Structures Monitoring Program is consistent with the program described in NUREG-1801, Section XI.S7, RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants.

Exceptions to NUREG-1801

None

Enhancements

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

Attributes Affected	Enhancement
1. Scope of Program	Program scope will be enhanced to include the east breakwater, jetties, and onshore revetments in addition to the main breakwater.

Operating Experience

Preliminary results of the 2004 inspection of the main breakwater indicated one area of the breakwater had rock displacement resulting in the complete dislodging of the rocks on the shore side of the main breakwater. Since the discontinuity extended beyond the façade but did not involve the full height or width of the water-control structure, an evaluation was performed to determine if repair was required to restore the designed stability of the structure. Results of the evaluation show that the designed stability of the structure was not impacted, however a work request was issued to repair the structure due to the possibility of future storms extending the damaged areas and restriction to personnel from easily walking on the structure. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing loss of material and loss of form for water-control structures.

Conclusion

The Water Control Structures Monitoring Program has been effective at managing aging effects. The Water Control Structures Monitoring Program provides reasonable 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 for the period of extended operation.

B.1.30 SYSTEM WALKDOWN

Program Description

The System Walkdown Program at PNPS is comparable to the program described in NUREG-1801, Section XI.M36, External Surfaces Monitoring.

This program entails inspections of 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.

NUREG-1801 Consistency

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

Exceptions to NUREG-1801

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

Enhancements

None

Operating Experience

System walkdowns between 1998 and 2004 identified evidence of aging effects, including corrosion and leakage. Examples include fire water storage tank and diesel fire pump fuel oil day tank leakage, through-wall leakage on SSW piping, signs of corrosion in fan room and auxiliary bays, and through-wall leakage on a drain line to the aux bay sump. 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 passive components.

Conclusion

The System Walkdown Program has been effective at managing aging effects. The System Walkdown Program provides reasonable 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 for the period of extended operation.

B.1.31 THERMAL AGING AND NEUTRON IRRADIATION EMBRITTLEMENT OF CAST AUSTENITIC STAINLESS STEEL (CASS)

Program Description

The Thermal Aging and Neutron Irradiation Embrittlement of CASS Program at PNPS will be comparable to the program described in NUREG-1801, Section XI.M13, Thermal Aging and Neutron Irradiation Embrittlement of CASS.

The purpose of the Thermal Aging and Neutron Irradiation Embrittlement of CASS Program is to assure that 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.

EPRI, the BWR Owners Group and other industry groups are focused on reactor vessel internals to ensure a better understanding of aging effects. Future Boiling Water Reactor Vessel Internals Project (BWRVIP) reports, EPRI reports, and other industry operating experience will provide additional bases for evaluations and inspections under this program. This program will supplement reactor vessel internals inspections required by the BWR Vessel Internals Program to assure that aging effects do not result in loss of the intended functions of reactor vessel internals during the period of extended operation.

The program will be initiated 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

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.

Enhancements

None

Operating Experience

The Thermal Aging and Neutron Irradiation Embrittlement of CASS Program is a new program for which there is no operating experience.

Conclusion

The Thermal Aging and Neutron Irradiation Embrittlement of CASS Program will use existing techniques with demonstrated capability and a proven industry record to provide reasonable 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 for the period of extended operation.

B.1.32 WATER CHEMISTRY CONTROL

The PNPS chemistry program is the personnel, programs, policies and procedures designed to control site water chemistry to maximize plant availability, extend operating lifetime, and minimize radiation levels. Based on applicable EPRI Guidelines, the program controls contaminants at lowest practical levels and provides corrosion protection for major systems and components.

The following subsections address individual PNPS water chemistry control programs in more detail.

- Water Chemistry Control – Auxiliary Systems
- Water Chemistry Control – BWR
- Water Chemistry Control – Closed Cooling Water

B.1.32.1 WATER CHEMISTRY CONTROL – AUXILIARY SYSTEMS

Program Description

There is no corresponding NUREG-1801 program.

The purpose of the Water Chemistry Control – Auxiliary Systems Program is to manage loss of material for components exposed to treated water.

Program activities include sampling and analysis of the stator cooling water system to minimize component exposure to aggressive environments.

Evaluation

1. Scope of Program

Program activities include sampling and analysis of the stator cooling water system to minimize component exposure to aggressive environments.

City water is taken from the Town of Plymouth water main and distributed throughout the potable and sanitary water system at town water pressure. City water is monitored and treated by the Town of Plymouth to meet the regulations of the Commonwealth of Massachusetts.

2. Preventive Actions

The program includes monitoring and control of stator cooling water to minimize exposure to aggressive environments.

City water used in the potable and sanitary water system is monitored and treated by the town of Plymouth to meet the regulations of the Commonwealth of Massachusetts.

3. Parameters Monitored/Inspected

In accordance with industry recommendations, stator cooling water parameters monitored are conductivity, corrosion products, and dissolved oxygen.

City water used in the potable and sanitary water system is monitored and treated by the town of Plymouth to meet the regulations of the Commonwealth of Massachusetts.

4. Detection of Aging Effects

The program manages loss of material for stator cooling water system and potable and sanitary water system components.

The One-Time Inspection Program 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.

6. Acceptance Criteria

In accordance with industry recommendations, acceptance criteria for the stator cooling water system are as follows.

- conductivity < 0.3 S/cm
- dissolved oxygen > 2.0 ppm / < 8.0ppm
- corrosion products no detectable activity

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 Corrective Action Program.

8. Confirmation Process

This attribute is discussed in Section B.0.3.

9. Administrative Controls

This attribute is discussed in Section B.0.3.

10. Operating Experience

In spring 2001, a small leak of hydrogen into the stator coolant that caused displacement of oxygen was identified and repaired. Continuous confirmation of stator cooling water quality and timely corrective actions provides evidence that the program is effective in managing loss of material for stator cooling water system components.

Stator cooling water sample results between October 2001 and January 2002 revealed oxygen concentrations below the acceptance criterion of 2 ppm. Feed and bleed operations were used to introduce atmospheric oxygen into the cooling water to correct the oxygen level. Oxygen levels did not go below 0.76 ppm and copper concentrations remained normal with no adverse trend. Continuous confirmation of stator cooling water quality and timely corrective actions provides evidence that the program is effective in managing loss of material for stator cooling water system components.

Stator cooling water sample results for the period 1/1/2004 through 9/7/2005 revealed only two instances of a parameter outside the acceptance criteria. On 7/1/04, measured dissolved oxygen was 1.84 ppm. The acceptance criterion for dissolved oxygen is > 2.0ppm and < 8.0ppm. Subsequent readings were within the acceptance criterion and corrective action was not required. On 4/7/05, measured dissolved oxygen was 0.90 ppm. In this instance it was determined that the oxygen probe had failed. Grab sample analysis resulted in a dissolved oxygen reading within acceptance criteria. Continuous confirmation of stator cooling water quality provides evidence that the program is effective in managing loss of material for stator cooling water system components.

QA audits in 2000, 2002, and 2004 revealed no issues or findings that could impact effectiveness of the program.

Conclusion

The Water Chemistry Control – Auxiliary Systems Program has been effective at managing loss of material for components exposed to treated water. The Water Chemistry Control – Auxiliary Systems Program provides reasonable 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 for the period of extended operation.

B.1.32.2 WATER CHEMISTRY CONTROL – BWR

Program Description

The Water Chemistry Control – BWR Program at PNPS is comparable to the program described in NUREG-1801, Section XI.M2, Water Chemistry.

The objective of this program is to manage 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, condensate storage tanks, 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 RCS that could cause loss of material and cracking. Additionally, PNPS has instituted hydrogen water chemistry (HWC) to limit the potential for IGSCC through the reduction of dissolved oxygen in the treated water.

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 1998 through 2004, 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. Continuous confirmation of water quality and corrective action prior to reaching control limits provide evidence that the program is effective in managing aging effects for applicable components.

During the period from 1998 through 2004, several condition reports were initiated due to parameters monitored by the Water Chemistry Control – BWR Program outside of administrative limits, but still within EPRI acceptance criteria. Corrective actions were taken within the Corrective Action Program to preclude violating EPRI acceptance criteria. Continuous confirmation of water quality and corrective action prior to reaching control limits provide evidence that the program is effective in managing aging effects for applicable components.

During the period from 1998 through 2004, the following two incidents were found in which parameters monitored by the Water Chemistry Control – BWR Program were outside of EPRI acceptance criteria.

- Following a downpower on March 29, 2002, dissolved oxygen measurement from the B high pressure feedwater (HPFW) train was ~28 ppb, below the minimum required reading of 30 ppb (EPRI action level 1). Dissolved oxygen measured from the A HPFW train and condensate demineralizer effluent (CDE) were acceptable (~ 70 to 80 ppb). Root cause was B HPFW sample line contamination, not actual low oxygen in the feedwater. The B HPFW sample line was replaced.

- On October 28, 2002, HPFW and CDE dissolved oxygen levels spiked to 400 to 500 ppb for about 15 minutes before returning to normal. EPRI action level 1 for HPFW dissolved oxygen is 200 ppb. Root cause was determined to be inadequate filling of the D demineralizer prior to its return to service. The procedure states, "It is EXTREMELY important that all air is vented from a Cond Demin before it is placed in service to prevent air injection into the Feedwater System." Procedural steps were emphasized that will insure proper venting and mitigate elevated oxygen levels in the feedwater system.

Continuous confirmation of water quality and timely corrective action provide evidence that the program is effective in managing aging effects for applicable components.

QA audits in 2000 and 2002 revealed no issues or findings that could impact effectiveness of the program.

A QA audit in 2004 revealed that reactor coolant sodium and lithium analyses were not being performed weekly during the first half of 2004. Corrective action was taken to replace the analysis instrument and ensure required analyses are performed. Confirmation of water quality

and timely corrective actions provide evidence that the program is effective in managing aging effects for applicable components.

A corporate assessment in 2003 identified areas for improvement in administrative controls, but revealed no issues or findings that could impact effectiveness of the program.

Conclusion

The Water Chemistry Control – BWR Program has been effective at managing aging effects. The Water Chemistry Control – BWR Program at PNPS provides reasonable 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 for the period of extended operation.

B.1.32.3 WATER CHEMISTRY CONTROL – CLOSED COOLING WATER

Program Description

The Water Chemistry Control – Closed Cooling Water Program at PNPS is comparable to the program described in NUREG-1801, Section XI.M21, Closed-Cycle Cooling Water System.

This program includes preventive measures that manage loss of material, cracking, and fouling for components in closed cooling water systems (reactor building closed cooling water, turbine building closed cooling water, emergency diesel generator cooling water, station blackout diesel cooling water, security diesel generator cooling water, and plant heating). These chemistry activities provide for monitoring and controlling closed cooling water chemistry using PNPS procedures and processes based on EPRI guidance for closed cooling water chemistry.

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.

Attributes Affected	Exception
4. Detection of Aging Effects	The PNPS 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 and as such would be included as part of Maintenance Rule (10 CFR 50.65). Passive intended functions of pumps, heat exchangers and other components will be adequately managed by the closed cooling water chemistry program through monitoring and control of water chemistry parameters.

Enhancements

None

Operating Experience

During the period from 1998 through 2004, several condition reports were initiated due to adverse trends in parameters (nitrite and tolytriazole) monitored by the Water Chemistry Control – Closed Cooling Water Program. Corrective actions were taken within the Corrective Action Program to preclude reaching unacceptable values. No increases, long or short term, were observed in iron or copper levels. Continuous confirmation of water quality and corrective action prior to reaching control limits provide evidence that the program is effective in managing aging effects for applicable components.

During the period from 1998 through 2004, two condition reports were initiated due to parameters monitored by the Water Chemistry Control – Closed Cooling Water Program outside of administrative limits, but still within EPRI acceptance criteria. Corrective actions were taken within the Corrective Action Program to preclude violating EPRI acceptance criteria. Continuous confirmation of water quality and corrective action prior to reaching control limits provide evidence that the program is effective in managing aging effects for applicable components.

During the period from 1998 through 2004, a few incidents were found in which station heating system parameters monitored by the Water Chemistry Control – Closed Cooling Water Program were outside of EPRI action level 1 acceptance criteria. Monitoring frequency was increased and the parameter was returned to within the prescribed normal operating range as soon as possible (well within the 90 days permitted by action level 1). Continuous confirmation of water quality and timely corrective action provide evidence that the program is effective in managing aging effects for applicable components.

QA audits in 2000 and 2002 revealed no issues or findings that could impact effectiveness of the program.

A self-assessment in October 2003 noted that chemistry specifications and methods of control are not clearly established for nonsafety-related diesel jacket coolant systems. This assessment and a QA audit in early 2004 revealed that corrective actions for condition reports addressing closed cooling water (CCW) analyses had not been completed in a timely manner. Specifically, condition reports initiated in early 2003 identified that for RBCCW, TBCCW and plant heating, some chemical analyses are not being performed in the frequencies defined in procedures due to faulty analysis equipment. In June 2004 corrective actions had not been completed. Corrective actions were taken by the end of 2004 to reinstate all analyses and confirm water quality for the RBCCW, TBCCW, and plant heating systems. Completion of corrective actions and confirmation of water quality provide evidence that the program is effective in managing aging effects for applicable components.

When the revised EPRI CCW Guidelines were first implemented (January 2005), new jacket coolant chemistry parameters did not meet recommendations for the EDG, SBO, and security diesels. The parameters that did not meet recommendations are indicators that the glycol and corrosion inhibitor products in the jacket cooling water systems are degrading and becoming less effective. Evaluation determined that there were no immediate concerns of corrosion or cooling ability breakdown for the diesels as other parameter routinely analyzed are in specification and had no adverse trend to indicate an immediate need for action. Work requests were issued to change the SBO and security diesel cooling water during the next maintenance window. Evaluation determined that EDG jacket coolant change-out was not warranted. Continuous confirmation of water quality and timely corrective action provide evidence that the program is effective in managing aging effects for applicable components.

A self-assessment of the Water Chemistry Control – Closed Cooling Water Program was performed in August 2005 to assess how well the program is implementing the revised EPRI CCW guidelines. The assessment concluded that open issues remain regarding the tolytriazole achievable limit for the security diesel and reserve alkalinity achievable limit for the EDGs and SBO diesel. Resolution of these open issues is scheduled to assure that the program is effective in managing aging effects for applicable 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 provides reasonable 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 for the period of extended operation.

B.2 REFERENCES

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

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