APPENDIX B

AGING MANAGEMENT PROGRAMS

APPENDIX B

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APPENDIX B

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B1.0 Introduction

B1.1 Overview

License Renewal Aging Management Program (AMP) descriptions are provided in this appendix for each program credited for managing aging effects based upon the aging management review results provided in Sections 3.1 through 3.6 of this application.

Two of the programs consist of commitments that are consistent with the program descriptions provided in NUREG-1801, Sections XI.M11 and XI.M16, and the discussions in the corresponding aging management review line items of NUREG-1801 Chapter IV.

The remaining programs are described in terms of their consistency with NUREG-1801. The ten generic program elements defined in Appendix A.1, Section A.1.2.3 of NUREG-1800 have been addressed for each AMP. Each of the new or existing AMPs described in this appendix has been evaluated for consistency with the ten program-specific element discussions in the applicable program description in NUREG-1801, Chapter X or XI. This appendix summarizes the evaluation results for each program and indicates whether the program elements are consistent with, consistent with enhancements, or consistent with exceptions, to the corresponding program described in NUREG-1801.

B1.2 Method of Discussion

For those AMPs that are consistent with, consistent with enhancements, or consistent with exceptions to the programs described in Chapters X and XI of NUREG-1801, a discussion is presented in the following form:

- **Program Description:** An abstract of the overall program form and function is provided.
- **NUREG-1801 Consistency:** A NUREG-1801 consistency statement is made about the program.
- **Exceptions to NUREG-1801:** Exceptions to the NUREG-1801 program description are outlined and a justification provided. Exceptions are PINGP program element differences from NUREG-1801 specified guidance criteria.
- **Enhancements:** Enhancements to the program are identified. Enhancements are specific changes made, or to be made, to existing programs/procedures to make the program consistent with the related NUREG-1801 AMP element. An enhancement upgrades the existing site program/procedure to provide reasonable assurance that the respective aging effect(s) will be managed for the period of extended operation. Enhancements are considered NRC commitments for existing PINGP programs. For new PINGP programs, the development and implementation of each new program is considered an NRC commitment.

- **Operating Experience:** A discussion of related Operating Experience is provided for each program.
- **Conclusion:** A conclusion section is provided to confirm NMC's conclusion that, with reasonable assurance, the AMP (with enhancements, if applicable) is or will be effective.

B1.3 Quality Assurance Program and Administrative Controls

The NMC Quality Assurance Program establishes quality assurance and administrative control requirements that meet 10 CFR 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants." The NMC Quality Assurance Program implements the requirements of 10 CFR 50, Appendix B, and is consistent with the summary in Appendix A.2 of NUREG-1800. The NMC Quality Assurance Program includes the elements of corrective actions, confirmation process, and administrative controls, and is applicable to the safety related and non-safety related systems, structures, and components that are subject to aging management review.

The AMPs and activities described in Appendix A and Appendix B of the LRA rely on the Quality Assurance Program for the elements of corrective actions, confirmation process, and administrative controls. The Quality Assurance Program and associated procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of the Quality Assurance Topical Report and 10 CFR 50, Appendix B. The corrective actions and administrative controls for both safety related and non-safety related systems, structures and components are accomplished per the existing Corrective Action Program and PINGP administrative control program, and are applicable to all AMPs and activities that will be required during the period of extended operation. The confirmation process is part of the Corrective Action Program and includes reviews to assure that corrective actions are adequate, that they are adequately tracked and reported, and that corrective action effectiveness is reviewed. Follow-up actions required by the confirmation process are documented in accordance with the Corrective Action Program. The corrective actions, confirmation process, and administrative controls of the Quality Assurance Program are applicable to all AMPs and activities required during the period of extended operation.

These three elements will be applicable as follows:

Corrective Actions

PINGP has a single Corrective Action Program that is applied regardless of the safety classification of the structure or component. Corrective Action Program requirements are established in accordance with the requirements of the NMC Quality Assurance Topical Report and 10 CFR 50, Appendix B.

PINGP implements the NMC Corrective Action Program via NMC Fleet Procedures. These procedures require the initiation of an Action Request (AR) for actual or potential problems, including failures, malfunctions, discrepancies, deviations, defective material and equipment, nonconformances, and administrative control discrepancies, to ensure that conditions adverse to quality, and operability, functionality and reportability issues are promptly identified, evaluated if necessary, and corrected as appropriate.

Since the same 10 CFR 50, Appendix B Corrective Action Program is applied for nonconforming safety related and non-safety related structures and components subject to an aging management review for License Renewal, it is concluded that the PINGP Corrective Action Program is consistent with NUREG-1800 and NUREG-1801 Element 7, "Corrective Actions."

Confirmation Process

The confirmation process is part of the Corrective Action Program. The focus of the confirmation process is on the follow-up actions that must be taken to verify effective implementation of corrective actions. The measure of effectiveness is in terms of correcting the adverse condition and precluding repetition of significant conditions adverse to quality. NMC Fleet Procedures include provisions for timely evaluation of adverse conditions and implementation of any corrective actions required, including root cause determinations and prevention of recurrence where appropriate (e.g., significant conditions adverse to quality). These procedures provide for tracking, coordinating, monitoring, reviewing, verifying, validating, and approving corrective actions, to ensure effective corrective actions are taken. The Corrective Action Program is also monitored for potentially adverse trends. The existence of an adverse trend due to recurring or repetitive adverse conditions would result in the initiation of an AR. The AMPs or aging management activities required for License Renewal would also uncover any unsatisfactory condition due to ineffective corrective action.

Since the same 10 CFR 50, Appendix B corrective action and confirmation process is applied for nonconforming safety related and non-safety related structures and components subject to an aging management review for License Renewal, the PINGP Corrective Action Program is consistent with NUREG-1800 and NUREG-1801 Element 8, “Confirmation Process.”

Administrative Controls

The NMC Quality Assurance Program and associated procedures, review and approval processes, and administrative controls applicable to the AMPs and activities credited for License Renewal are implemented in accordance with the requirements of the NMC Quality Assurance Topical Report and 10 CFR 50, Appendix B. The administrative controls that

govern aging management activities at PINGP are established in accordance with the PINGP Administrative Control Program and associated NMC fleet procedures. The PINGP Administrative Control Program implements the requirements of the NMC Quality Assurance Program, NMC Quality Assurance Topical Report, and 10 CFR 50, Appendix B.

Since the Quality Assurance Program and associated procedures provide the necessary administrative controls to the aging management programs, activities, and implementing documents in accordance with 10 CFR 50, Appendix B, it is concluded that the PINGP administrative controls are consistent with NUREG-1800 and NUREG-1801 Element 9, "Administrative Controls."

B1.4 Operating Experience

Operating Experience (OE) is an important resource used to identify Aging Effects Requiring Management (AERM) and to confirm the effectiveness of AMPs. Both PINGP-specific and industry OE records were reviewed to identify information that is related to aging effects and AMPs at PINGP. The relevant OE records were further evaluated as necessary to support the aging management review process and the AMP review process. See Section 3.0.1.3 for additional discussion.

The programs identified for aging management are discussed in this appendix. Operating experience related to the program/activity, including past corrective actions resulting in program enhancements, was considered. This information provides objective evidence that the effects of aging have been and will continue to be adequately managed.

B1.5 Aging Management Programs

The AMPs credited with managing the effects of aging at PINGP are described in the following sections. These programs are also discussed and evaluated in NUREG-1801. PINGP does not employ any plant-specific AMPs. The programs are either fully consistent with or are, with some exceptions and/or enhancements, consistent with the programs discussed in NUREG-1801.

1. 10 CFR Part 50, Appendix J Program [Section B2.1.1]
2. Aboveground Steel Tanks Program [Section B2.1.2]
3. ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program [Section B2.1.3]
4. ASME Section XI, Subsection IWE Program [Section B2.1.4]
5. ASME Section XI, Subsection IWF Program [Section B2.1.5]

6. Bolting Integrity Program [Section B2.1.6]
7. Boric Acid Corrosion Program [Section B2.1.7]
8. Buried Piping and Tanks Inspection Program [Section B2.1.8]
9. Closed-Cycle Cooling Water System Program [Section B2.1.9]
10. Compressed Air Monitoring Program [Section B2.1.10]
11. Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program [Section B2.1.11]
12. Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program [Section B2.1.12]
13. Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program [Section B2.1.13]
14. External Surfaces Monitoring Program [Section B2.1.14]
15. Fire Protection Program [Section B2.1.15]
16. Fire Water System Program [Section B2.1.16]
17. Flow-Accelerated Corrosion Program [Section B2.1.17]
18. Flux Thimble Tube Inspection Program [Section B2.1.18]
19. Fuel Oil Chemistry Program [Section B2.1.19]
20. Fuse Holders Program [Section B2.1.20]
21. Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program [Section B2.1.21]
22. Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program [Section B2.1.22]
23. Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program [Section B2.1.23]
24. Lubricating Oil Analysis Program [Section B2.1.24]
25. Masonry Wall Program [Section B2.1.25]

26. Metal-Enclosed Bus Program [Section B2.1.26]
27. Nickel-Alloy Nozzles and Penetrations Program [Section B2.1.27]
28. Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program [Section B2.1.28]
29. One-Time Inspection Program [Section B2.1.29]
30. One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program [Section B2.1.30]
31. Open-Cycle Cooling Water System Program [Section B2.1.31]
32. PWR Vessel Internals Program [Section B2.1.32]
33. Reactor Head Closure Studs Program [Section B2.1.33]
34. Reactor Vessel Surveillance Program [Section B2.1.34]
35. RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program [Section B2.1.35]
36. Selective Leaching of Materials Program [Section B2.1.36]
37. Steam Generator Tube Integrity Program [Section B2.1.37]
38. Structures Monitoring Program [Section B2.1.38]
39. Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) Program [Section B2.1.39]
40. Water Chemistry Program [Section B2.1.40]

B1.6 Time-Limited Aging Analyses Aging Management Programs

The AMPs credited with managing the effects of aging associated with Time-Limited Aging Analyses are described in the following sections. These programs are also discussed and evaluated in NUREG-1801. The programs are either fully consistent with or are, with enhancements, consistent with the programs discussed in NUREG-1801.

1. Environmental Qualification (EQ) of Electrical Components Program [Section B3.1]
2. Metal Fatigue of Reactor Coolant Pressure Boundary Program [Section B3.2]

B2.0 Aging Management Programs Correlation

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

NUREG-1801 ID	NUREG-1801 Program	PINGP Program	NUREG-1801 Comparison
NUREG-1801, Chapter XI			
XI.M1	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program [Section B2.1.3]	Existing Program, Consistent with NUREG-1801
XI.M2	Water Chemistry	Water Chemistry Program [Section B2.1.40]	Existing Program, Consistent with NUREG-1801 with Exception and Enhancement
XI.M3	Reactor Head Closure Studs	Reactor Head Closure Studs Program [Section B2.1.33]	Existing Program, Consistent with NUREG-1801 with Enhancement
XI.M4	BWR Vessel ID Attachment Welds	Not applicable to PWRs.	Not Applicable
XI.M5	BWR Feedwater Nozzle	Not applicable to PWRs.	Not Applicable
XI.M6	BWR Control Rod Drive Return Line Nozzle	Not applicable to PWRs.	Not Applicable
XI.M7	BWR Stress Corrosion Cracking	Not applicable to PWRs.	Not Applicable
XI.M8	BWR Penetrations	Not applicable to PWRs.	Not Applicable
XI.M9	BWR Vessel Internals	Not applicable to PWRs.	Not Applicable
XI.M10	Boric Acid Corrosion	Boric Acid Corrosion Program [Section B2.1.7]	Existing Program, Consistent with NUREG-1801
XI.M11	Nickel-Alloy Nozzles and Penetrations	Nickel-Alloy Nozzles and Penetrations Program [Section B2.1.27]	Consistent with NUREG-1801, See Note 1

NUREG-1801 ID	NUREG-1801 Program	PINGP Program	NUREG-1801 Comparison
XI.M11A	Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors	Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program [Section B2.1.28]	Existing Program, Consistent with NUREG-1801 with Enhancement
XI.M12	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) Program [Section B2.1.39]	New Program, Consistent with NUREG-1801
XI.M13	Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)	Not credited for aging management.	Not Applicable
XI.M14	Loose Part Monitoring	Not credited for aging management.	Not Applicable
XI.M15	Neutron Noise Monitoring	Not credited for aging management.	Not Applicable
XI.M16	PWR Vessel Internals	PWR Vessel Internals Program [Section B2.1.32]	Consistent with NUREG-1801, See Note 2
XI.M17	Flow-Accelerated Corrosion	Flow-Accelerated Corrosion Program [Section B2.1.17]	Existing Program, Consistent with NUREG-1801
XI.M18	Bolting Integrity	Bolting Integrity Program [Section B2.1.6]	Existing Program, Consistent with NUREG-1801 with Exception and Enhancement
XI.M19	Steam Generator Tube Integrity	Steam Generator Tube Integrity Program [Section B2.1.37]	Existing Program, Consistent with NUREG-1801 with Exception
XI.M20	Open-Cycle Cooling Water System	Open-Cycle Cooling Water System Program [Section B2.1.31]	Existing Program, Consistent with NUREG-1801

NUREG-1801 ID	NUREG-1801 Program	PINGP Program	NUREG-1801 Comparison
XI.M21	Closed-Cycle Cooling Water System	Closed-Cycle Cooling Water System Program [Section B2.1.9]	Existing Program, Consistent with NUREG-1801 with Exception and Enhancement
XI.M22	Boraflex Monitoring	Not credited for aging management.	Not Applicable
XI.M23	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program [Section B2.1.23]	Existing Program, Consistent with NUREG-1801 with Enhancement
XI.M24	Compressed Air Monitoring	Compressed Air Monitoring Program [Section B2.1.10]	Existing Program, Consistent with NUREG-1801 with Exception and Enhancement
XI.M25	BWR Reactor Water Cleanup System	Not applicable to PWRs.	Not Applicable
XI.M26	Fire Protection	Fire Protection Program [Section B2.1.15]	Existing Program, Consistent with NUREG-1801 with Exception and Enhancement
XI.M27	Fire Water System	Fire Water System Program [Section B2.1.16]	Existing Program, Consistent with NUREG-1801 with Enhancement
XI.M28	Buried Piping and Tanks Surveillance	Not credited for aging management.	Not Applicable
XI.M29	Aboveground Steel Tanks	Aboveground Steel Tanks Program [Section B2.1.2]	New Program, Consistent with NUREG-1801
XI.M30	Fuel Oil Chemistry	Fuel Oil Chemistry Program [Section B2.1.19]	Existing Program, Consistent with NUREG-1801 with Exception and Enhancement

NUREG-1801 ID	NUREG-1801 Program	PINGP Program	NUREG-1801 Comparison
XI.M31	Reactor Vessel Surveillance	Reactor Vessel Surveillance Program [Section B2.1.34]	Existing Program, Consistent with NUREG-1801 with Enhancement
XI.M32	One-Time Inspection	One-Time Inspection Program [Section B2.1.29]	New Program, Consistent with NUREG-1801
XI.M33	Selective Leaching of Materials	Selective Leaching of Materials Program [Section B2.1.36]	New Program, Consistent with NUREG-1801 with Exception
XI.M34	Buried Piping and Tanks Inspection	Buried Piping and Tanks Inspection Program [Section B2.1.8]	New Program, Consistent with NUREG-1801
XI.M35	One-Time Inspection of ASME Code Class 1 Small-Bore Piping	One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program [Section B2.1.30]	New Program, Consistent with NUREG-1801
XI.M36	External Surfaces Monitoring	External Surfaces Monitoring Program [Section B2.1.14]	Existing Program, Consistent with NUREG-1801 with Enhancement
XI.M37	Flux Thimble Tube Inspection	Flux Thimble Tube Inspection Program [Section B2.1.18]	Existing Program, Consistent with NUREG-1801 with Enhancement
XI.M38	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program [Section B2.1.22]	New Program, Consistent with NUREG-1801
XI.M39	Lubricating Oil Analysis	Lubricating Oil Analysis Program [Section B2.1.24]	Existing Program, Consistent with NUREG-1801
XI.S1	ASME Section XI, Subsection IWE	ASME Section XI, Subsection IWE Program [Section B2.1.4]	Existing Program, Consistent with NUREG-1801
XI.S2	ASME Section XI, Subsection IWL	Not credited for aging management.	Not Applicable

NUREG-1801 ID	NUREG-1801 Program	PINGP Program	NUREG-1801 Comparison
XI.S3	ASME Section XI, Subsection IWF	ASME Section XI, Subsection IWF Program [Section B2.1.5]	Existing Program, Consistent with NUREG-1801
XI.S4	10 CFR Part 50, Appendix J	10 CFR Part 50, Appendix J Program [Section B2.1.1]	Existing Program, Consistent with NUREG-1801
XI.S5	Masonry Wall Program	Masonry Wall Program [Section B2.1.25]	Existing Program, Consistent with NUREG-1801 with Enhancement
XI.S6	Structures Monitoring Program	Structures Monitoring Program [Section B2.1.38]	Existing Program, Consistent with NUREG-1801 with Enhancement
XI.S7	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program [Section B2.1.35]	Existing Program, Consistent with NUREG-1801 with Enhancement
XI.S8	Protective Coating Monitoring and Maintenance Program	Not credited for aging management.	Not Applicable
XI.E1	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program [Section B2.1.12]	New Program, Consistent with NUREG-1801
XI.E2	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program [Section B2.1.13]	New Program, Consistent with NUREG-1801
XI.E3	Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program [Section B2.1.21]	New Program, Consistent with NUREG-1801

NUREG-1801 ID	NUREG-1801 Program	PINGP Program	NUREG-1801 Comparison
XI.E4	Metal-Enclosed Bus	Metal-Enclosed Bus Program [Section B2.1.26]	New Program, Consistent with NUREG-1801
XI.E5	Fuse Holders	Fuse Holders Program [Section B2.1.20]	New Program, Consistent with NUREG-1801
XI.E6	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program [Section B2.1.11]	New Program, Consistent with NUREG-1801 with Exception
NUREG-1801, Chapter X			
X.M1	Metal Fatigue of Reactor Coolant Pressure Boundary	Metal Fatigue of Reactor Coolant Pressure Boundary Program [Section B3.2]	Existing Program, Consistent with NUREG-1801 with Enhancement
X.S1	Concrete Containment Tendon Prestress	Not applicable to PINGP containment design.	Not Applicable
X.E1	Environmental Qualification (EQ) of Electrical Components	Environmental Qualification (EQ) of Electrical Components Program [Section B3.1]	Existing Program, Consistent with NUREG-1801

Notes:

1 A commitment is provided in Appendix A of this application [Section A2.27] to: (1) comply with applicable NRC Orders, and (2) implement applicable NRC Bulletins, Generic Letters, and staff-accepted industry guidelines.

2 A commitment is provided in Appendix A of this application [Section A2.32] to: (1) participate in the industry programs for investigating and managing aging effects on reactor internals; (2) evaluate and implement the results of the industry programs as applicable to the reactor internals; and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan for reactor internals to the NRC for review and approval.

B2.1 Aging Management Programs Details

B2.1.1 10 CFR Part 50, Appendix J Program

Program Description

The 10 CFR Part 50, Appendix J Program provides for containment system examinations and leakage testing. The program includes: scheduling of tests using risk and performance considerations, test methodology, overall containment leakage rate computations, leakage rate summations, acceptance criteria and corrective actions. Containment leak rate tests are performed to assure that leakage through the primary reactor containment, and systems and components penetrating primary containment, do not exceed allowable leakage rate values as specified in the Technical Specifications. Periodic surveillance of reactor containment penetrations and isolation valves is performed so that proper maintenance and repairs are made during the service life of the containment.

The program conforms to the requirements of 10 CFR 50, Appendix J, Option B. The program incorporates guidance provided in Regulatory Guide 1.163 as well as NEI 94-01. The containments and the individual isolation barriers are tested at intervals determined by risk and performance considerations as specified in Option B and the associated guidance documents, or as otherwise specifically approved by the NRC.

Test results are evaluated against the acceptance criteria given in Technical Specifications Section 5.5.14 and the component administrative leakage limits provided in the program documents. Corrective action is taken as necessary.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant 10 CFR Part 50, Appendix J Program is an existing program. It is consistent with the recommendations of NUREG-1801, Chapter XI, Program XI.S4, 10 CFR Part 50, Appendix J.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The 10 CFR Part 50, Appendix J Program has been effective in managing leakage through the containment pressure boundary. The 10 CFR Part 50, Appendix J Program

incorporates both industry and plant-specific operating experience to provide added assurance that aging effects related to leakage barriers of containment systems (containment shells and individual isolation barriers) are managed such that these systems will continue to perform their intended function(s) throughout the period of extended operation. As documented in the Option B performance based program, plant-specific operating experience serves as the basis for corrective action decisions as well as for the determination of leakage testing intervals.

PINGP has experienced significant leakage through air lock door operating shaft seals. The problem was resolved by replacing the seals with a type less susceptible to leakage, and performing more frequent testing. Other issues such as isolation valve seat degradation and air lock door seal damage have also been addressed through routine maintenance.

Conclusion

The 10 CFR Part 50, Appendix J Program is an existing program that has successfully managed the leak tight integrity of the containment systems, and has ensured the continuing effectiveness of the containment as a barrier against the release of radioactive material to the environment.

Implementation of the 10 CFR Part 50, Appendix J Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

B2.1.2 Aboveground Steel Tanks Program

Program Description

The Aboveground Steel Tanks Program ensures the integrity of carbon steel tanks in scope of License Renewal that rest on soil or concrete such that the bottom exterior surface is potentially susceptible to corrosion due to the ingress of water, while being inaccessible for visual inspection. The program provides for visual inspections of tank external surfaces down to their contact with the foundation, including any sealants/caulking at the foundation interfaces. It also provides for ultrasonic bottom thickness measurements from inside the tank to determine if significant thinning is occurring on the inaccessible bottom surface of the tank. External tank surfaces are coated with protective paint or coatings to prevent corrosion. This program manages the effects of both coating degradation and corrosion on the intended function(s) of the tanks.

For insulated outdoor tanks, the inspections cover the exterior surface of the insulation, and specifically looks for damage to insulation or its outer covering that could permit water ingress, and for discoloration or other evidence that the insulation has been wetted. If insulation damage or wetting is identified, insulation will be removed at the affected location to permit direct inspection of the external tank surface. In addition, sample sections of insulation near the bottom of each insulated outdoor tank (i.e., locations with the highest potential for wetted insulation) will be removed periodically to permit direct inspection of the tank exterior.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Aboveground Steel Tanks Program is a new program. It will be consistent with the recommendations of NUREG-1801, Chapter XI, Program XI.M29, Aboveground Steel Tanks.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Prairie Island Nuclear Generating Plant Aboveground Steel Tanks Program is a new program, and therefore, has no operating experience related to program implementation. At PINGP, past inspections have revealed instances of corrosion and coating degradation on the external surfaces of the outdoor condensate storage tanks. The corrosion was documented and determined to be within the design corrosion allowance of the tanks.

Conclusion

The Aboveground Steel Tanks Program is a new program that will visually inspect for corrosion of accessible external tank surfaces. Tank wall thinning due to corrosion of external surfaces that are inaccessible (e.g., bottoms of tanks that sit directly on the ground or other support structures), will be detected by ultrasonic thickness measurements from inside the tank.

Implementation of the Aboveground Steel Tanks Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

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

B2.1.3 ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program

Program Description

The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program (IWB, IWC, and IWD Program) provides for condition monitoring of ASME Class 1, 2 and 3 pressure-retaining components, their welded integral attachments, and bolting. The program is implemented in accordance with the requirements of 10 CFR 50.55a, with specified limitations, modifications and NRC-approved alternatives, and utilizes ASME Section XI, Subsections IWB, IWC, and IWD, 1998 Edition including the 1998, 1999 and 2000 Addenda, for the current inspection interval. The program includes periodic visual, surface, and/or volumetric examinations of Class 1, 2 and 3 pressure-retaining components, their welded integral attachments, and bolting. Leakage tests are periodically performed on Class 1, 2, and 3 pressure-retaining components. The program also provides component repair and replacement requirements in accordance with ASME Section XI.

Class 1 dissimilar metal welds in nozzles and Class 1 and 2 welds in piping are inspected in accordance with the NRC-approved Risk Informed Inservice Inspection Program.

The provisions of ASME Section XI are augmented by additional inspections to detect general and pitting corrosion on the shell to transition cone weld of the Westinghouse Model 51 steam generators in Unit 2. Westinghouse Model 51 steam generators have a high stress region at the shell to transition cone weld, and corrosion of the steam generator shell is known to exist. See Section 3.1.2.2.2 for additional discussion.

The IWB, IWC, and IWD Program is updated periodically as required by 10 CFR 50.55a.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program is an existing program. It is consistent with the recommendations of NUREG-1801, Chapter XI, Program XI.M1, ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

A review of operating experience for the IWB, IWC, and IWD Program identified no adverse trends or issues with program performance. Minor conditions such as gasket leakage have been identified and corrected prior to causing any significant impact to safe operation or loss of intended functions. Examples of operating experience that have resulted in program updates are as follows:

- In January 1988, PINGP Unit 2 detected a leak in the Safety Injection 22 Accumulator Tank. The leak was determined to be in a two-inch diameter nozzle for the water level sensing instrumentation line. It was determined that the failure mode was IGSCC resulting in a crack that started as a consequence of high stresses caused by the improper fit-up of the pipe to the nozzle in preparation for welding. The leak was repaired. The nozzles on both Units 1 and 2 continue to be examined on a 10-year frequency. In addition, these nozzles are inspected for leakage as a normal part of the ASME Section XI Pressure Testing Program.
- In May 2005, cracks were found in the 21 Accumulator Tank in PINGP Unit 2. The cracks were repaired. In addition, procedures were developed to perform a periodic external ultrasonic inspection (UT) and an internal visual examination (VT) and dye penetrant examination (PT) of the Safety Injection Accumulators.

The review of operating experience indicates the IWB, IWC, and IWD Program is effective in monitoring and detecting degradation and taking effective corrective actions as needed when acceptance criteria are not met.

Conclusion

The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program is an existing program which provides for condition monitoring of Class 1, 2, and 3 pressure-retaining components, their welded attachments, and bolting. The program has been effective in monitoring Class 1, 2, and 3 components and no adverse trends or significant conditions related to these components have been identified.

Implementation of the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

B2.1.4 ASME Section XI, Subsection IWE Program

Program Description

The ASME Section XI, Subsection IWE Program (IWE Program) provides for condition monitoring of Class MC pressure-retaining components and their related items, including integral attachments, seals, gaskets, moisture barriers, and pressure-retaining bolting. The program is implemented in accordance with the requirements of 10 CFR 50.55a, with specified limitations, modifications and NRC-approved alternatives, and utilizes ASME Section XI, Subsection IWE, 1992 Edition including the 1992 Addenda, for the current inspection interval.

Class MC components at PINGP include the containment vessels, personnel airlocks, equipment hatches, mechanical penetrations, and electrical penetrations.

The IWE Program monitors for aging effects by performing visual examinations (general, VT-3, VT-1) of the Class MC components and their related items. Visual (VT-1) or volumetric examinations, as applicable, are performed on components that require augmented examination. Leak testing is also periodically performed in accordance with the 10 CFR 50, Appendix J Program [Section B2.1.1], to detect leakage from the pressure-retaining Class MC components.

The IWE Program is updated periodically as required by 10 CFR 50.55a.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant ASME Section XI, Subsection IWE Program is an existing program. It is consistent with the recommendations of NUREG-1801, Chapter XI, Program XI.S1, ASME Section XI, Subsection IWE.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

A review of operating experience for the IWE Program identified no adverse trends or issues with program performance. Issues with minor coating degradation have been identified and corrected prior to causing any significant impact to safe operation or loss of

intended functions. Inservice inspections have not revealed adverse trends or significant conditions relevant to the IWE Program.

The review of operating experience indicates the IWE Program is effective in monitoring and detecting degradation, and taking effective corrective actions as needed when acceptance criteria are not met.

Conclusion

The ASME Section XI, Subsection IWE Program is an existing program which provides for the condition monitoring of Class MC pressure-retaining components and their related items, including integral attachments, seals, gaskets, moisture barriers, and pressure retaining bolting. The program has been effective in monitoring Class MC components and their related items, and no adverse trends or significant conditions related to these components and items have been identified.

Implementation of the ASME Section XI, Subsection IWE Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

B2.1.5 ASME Section XI, Subsection IWF Program

Program Description

The ASME Section XI, Subsection IWF Program (IWF Program) provides for condition monitoring of Class 1, 2 and 3 component supports. The program is implemented in accordance with the requirements of 10 CFR 50.55a, with specified limitations, modifications and NRC-approved alternatives, and utilizes ASME Section XI, Subsection IWF, 1998 Edition, including the 1998, 1999 and 2000 Addenda, for the current inspection interval.

The component supports within the program include piping supports and supports other than piping supports as required by ASME Section XI. There are no Class MC component supports installed at PINGP. The IWF Program manages aging effects by performing periodic visual (VT-3) examinations. The scope of the component support examinations for each 10-year inspection interval is based on the total support population, with the largest sample size specified for the most critical component supports (Class 1) and smaller sample sizes for the less critical component supports (Class 2 and 3).

Component support examinations that reveal flaws or relevant conditions exceeding the acceptance standards of ASME Section XI result in an expansion of the inspection

sample size in accordance with IWF-2430 to ensure that the full extent of the deficiencies are identified. Degradation that potentially compromises the support function or load capacity is evaluated. Acceptance criteria and corrective actions are in accordance with Subsection IWF. Component supports requiring corrective action are re-examined during the next inspection period in accordance with IWF-2420(b).

The IWF Program is updated periodically as required by 10 CFR 50.55a.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant ASME Section XI, Subsection IWF Program is an existing program. It is consistent with the recommendations of NUREG-1801, Chapter XI, Program XI.S3, ASME Section XI, Subsection IWF.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

A review of operating experience for the IWF Program identified no adverse trends or issues with program performance. Minor conditions, such as improper spring can settings and unacceptable arc strikes, have been identified and corrected prior to causing any significant impact to safe operation or loss of intended functions. Adequate corrective actions were taken to prevent recurrence.

The review of operating experience indicates the IWF Program is effective in monitoring and detecting degradation and taking effective corrective actions as needed when acceptance criteria are not met.

Conclusion

The ASME Section XI, Subsection IWF Program is an existing program for condition monitoring of Class 1, 2, and 3 component supports. The program has been effective in monitoring Class 1, 2 and 3 component supports and no adverse trends or significant conditions related to these items have been identified.

Implementation of the ASME Section XI, Subsection IWF Program provides reasonable assurance that aging effects will be managed such that structures, systems, and

components within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

B2.1.6 Bolting Integrity Program

Program Description

The Bolting Integrity Program manages the aging affects associated with closure bolting in mechanical components and with structural bolting in the scope of License Renewal through periodic inspection, material selection, thread lubricant control, assembly and torque requirements, and repair and replacement requirements. For ASME Class 1, 2, 3 and MC components and their associated supports, these activities are based on the applicable requirements of the ASME Section XI edition and addenda specified by 10 CFR 50.55a with prescribed limitations, modifications and NRC-approved alternatives. Aging management activities for bolting consider the guidance contained in various NRC and industry reports and standards, including NUREG-1339, "Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants," EPRI TR-111472, "Assembling Bolted Connections Using Spiral-Wound Gaskets," and EPRI NP-5769, "Degradation and Failure of Bolting in Nuclear Power Plants." Additional industry standards are also applied where appropriate, including EPRI TR-104213, "Bolted Joint Maintenance & Application Guide," and EPRI NP-5067 Volumes 1 and 2, "Good Bolting Practices."

The program includes preventive measures to preclude or minimize loss of preload, cracking and corrosion through material selection, lubricant control, and assembly and torque requirements. The program also includes periodic inspection of closure and structural bolting for indications of loss of preload (leaking or loose bolts/nuts), cracking, and loss of material due to corrosion.

Inspections of bolting within the scope of the Bolting Integrity Program are conducted under the following programs:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program,
- ASME Section XI, Subsection IWE Program,
- ASME Section XI, Subsection IWF Program,
- Buried Piping and Tanks Inspection Program,
- External Surfaces Monitoring Program,
- RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program, and
- Structures Monitoring Program.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Bolting Integrity Program is an existing program. It will be enhanced to be consistent, with exceptions, to the recommendations of NUREG-1801, Chapter XI, Program XI.M18, Bolting Integrity.

Exceptions to NUREG-1801

Program Elements Affected

- Parameters Monitored/Inspected, Detection of Aging Effects

  High strength bolting used in steam generator hold-down supports, reactor coolant pump supports, and other structural applications is periodically examined with visual techniques. Performing visual inspections of high strength bolts in lieu of a volumetric examination is an exception to the discussion provided in NUREG-1801, XI.M18. For stress corrosion cracking to occur in a susceptible high strength bolting material, a sustained high tensile stress and a corrosive environment must be present. Visual examinations of structural assemblies will detect corrosion or conditions indicative of a corrosive environment that could lead to stress corrosion cracking in potentially susceptible high strength bolting, and will cause appropriate corrective action to be taken under the Corrective Action Program when necessary. Corrective action may include volumetric examination of affected bolts, hammer testing, or other actions appropriate for the condition. Therefore, visual examination, as described, will effectively manage the aging of installed high strength bolting.

Enhancements

The following enhancements are required to satisfy NUREG-1801 aging management program recommendations. Enhancements will be implemented prior to the period of extended operation.

- Parameters Monitored/Inspected, Detection of Aging Effects

  Procedures for the conduct of inspections in the External Surfaces Monitoring Program, Structures Monitoring Program, Buried Piping and Tanks Inspection Program, and the RG 1.127 Inspection of Water-Control Structures Associated with Nuclear Power Plants Program will be enhanced to include guidance for visual inspections of installed bolting.

Operating Experience

Both the industry and NRC have identified a number of bolting concerns ranging from material control and certification to bolting practices, use of lubrication, and the impact of

aging mechanisms. The Bolting Integrity Program incorporates both plant and industry experience on bolting issues. For example, NRC Information Notices, Bulletins, Circulars, and Generic Letters listed in Section 3 of NUREG-1339 were previously evaluated and addressed at PINGP. Some of these resulted in confirmatory analysis or inspections, and others in modifications or the addition of controls to the procurement or design process. A review of plant operating experience from the site Corrective Action Program identified issues with missing or loose bolts or nuts, inadequate thread engagement, and some leaking flanges. The identified concerns were corrected or evaluated and determined to be acceptable as-is. Additional actions, such as procedural enhancements or bolt re-designs, were implemented as needed to minimize the potential for recurrence.

Early in plant life stress corrosion cracking of some steam generator support bolts was experienced at PINGP and reported to the NRC in Licensee Event Report 80-25. A number of steam generator pad hold down bolts were found to have cracks. A number of contributors caused this condition including excessive torque application, presence of some chlorine and zinc, installation alignment concerns, and sharp thread relief. New bolts which used a rolled thread were installed in many locations, alignment was corrected, bolts were cleaned with low halogen and low sulfur material, certified lubricants were used, exposed heads were seal coated with a high temperature silicone paint (to prevent moisture exposure), and lower torque values were applied. High strength bolts in NSSS supports continue to be inspected visually under the ASME Section XI, Subsection IWF Program.

Conclusion

The Bolting Integrity Program is an existing program that includes requirements for bolt material selection, control, assembly, bolt-up patterns, torquing, and use of thread lubricants consistent with industry guidance and industry and plant-specific operating experience. Several AMPs are credited by the Bolting Integrity Program to inspect mechanical closure and structural bolting within the scope of the Bolting Integrity Program. Collectively, the credited programs, as enhanced, effectively manage aging effects in mechanical closure and structural bolting in the scope of the Bolting Integrity Program.

Implementation of the enhanced Bolting Integrity Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

B2.1.7 Boric Acid Corrosion Program

Program Description

The Boric Acid Corrosion Program is a condition monitoring program developed in accordance with NRC Generic Letter 88-05, “Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants.” The program performs periodic visual examinations of the reactor coolant pressure boundary and other systems containing borated water for evidence of leakage and corrosion. Adjacent structures, components (including electrical), and supports are also examined for boric acid accumulation and corrosion. The program includes evaluations, assessments, and corrective actions for observed leakage sources and any affected structures and components.

The program also monitors and inspects piping and components containing borated water that are outside the program scope established in response to Generic Letter 88-05. The program addresses operating experience contained in recent NRC generic communications, including program experience summarized in Regulatory Issue Summary 2003-013, “NRC Review of Responses to Bulletin 2002-01, 'Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity’.”

Borated water leakage or boric acid crystals may also be discovered while performing other PINGP activities such as normal plant walkdowns, operational rounds, and maintenance. The Boric Acid Corrosion Program includes provisions for triggering evaluations and assessments when leakage is discovered while performing these activities.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Boric Acid Corrosion Program is an existing program. It is consistent with the recommendations of NUREG-1801, Chapter XI, Program XI.M10, Boric Acid Corrosion.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

A review of operating experience for the Boric Acid Corrosion Program identified no adverse trends or issues with program performance. Borated water leakage and boric acid crystal accumulations have been identified and corrected prior to causing any significant impact to safe operation or loss of intended functions. Adequate corrective actions were taken to prevent recurrence.

NRC Information Notices 86-108 [and supplements 1 through 3], 2003-02, and NRC Bulletin 2002-01 were reviewed and taken into consideration in the development of the Boric Acid Corrosion Program to ensure that even small boric acid leaks do not lead to degradation of the plant.

Conclusion

The Boric Acid Corrosion Program is an existing program which performs periodic condition monitoring of systems and components containing borated water, including adjacent structures, components and supports, and ensures that boric acid corrosion is being acceptably managed. The program has been effective in monitoring and detecting leakage and taking effective corrective actions as needed when borated water or boric acid crystals are identified.

Implementation of the Boric Acid Corrosion Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

B2.1.8 Buried Piping and Tanks Inspection Program

Program Description

The Buried Piping and Tanks Inspection Program manages loss of material on the external surfaces of carbon steel and cast iron components that are buried in soil or sand. As a preventive measure, buried pipe is coated and wrapped prior to initial installation in accordance with standard industry practices to prevent/mitigate corrosion. The program performs visual inspections following excavation of external surfaces of buried components (e.g., piping, tanks, bolting) for evidence of coating damage and degradation of the underlying carbon steel and cast iron. If no evidence of damage to the coating or wrapping is detected, then the coating or wrapping will not be removed for further inspection. The periodicity of these inspections will be based on opportunities for inspection such as scheduled maintenance work, with at least one inspection occurring within ten years prior to the period of extended operation, and one in each ten-year period

thereafter. If an opportunity for inspection does not occur within a ten-year period, then a focused inspection of a sample component will be performed prior to the end of that period.

The Buried Piping and Tanks Inspection Program assures that the effects of aging on buried piping, tanks and miscellaneous components are being effectively managed for the period of extended operation. Evidence of damage to the coating or wrapping, such as coating perforation, holidays, or other damage, will cause the protected component to be inspected for evidence of loss of material. Following the inspection of the external surface of the exposed component, the coating or wrap will be repaired to restore the preventive attributes.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Buried Piping and Tanks Inspection Program is a new program. It will be consistent with the recommendations of NUREG-1801, Chapter XI, Program XI.M34, Buried Piping and Tanks Inspection.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Buried Piping and Tanks Inspection Program is a new program, and therefore, has no operating experience related to program implementation. A review of operating experience did reveal that portions of the Cooling Water and Fire Protection Systems' buried piping were replaced in 1992 as a result of MIC indications on the internal surfaces of dead-leg portions of these systems. Although no documented observations of the condition of the external piping coatings/surfaces were found other than limited photographs, interviews have indicated that no external surface degradation or anomalies were identified.

Conclusion

The Buried Piping and Tanks Inspection Program is a new program that will perform inspections of opportunity on external surfaces of carbon steel and cast iron components that are buried in soil or sand.

Implementation of the Buried Piping and Tanks Inspection Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

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

B2.1.9 Closed-Cycle Cooling Water System Program

Program Description

The Closed-Cycle Cooling Water System Program is both a preventive and condition monitoring program that is based on Electric Power Research Institute (EPRI) Closed Cooling Water Chemistry Guideline", TR-107396, Revision 1. The program includes preventive measures to minimize corrosion, heat transfer degradation, and stress corrosion cracking (SCC); and testing and inspection to monitor the effects of corrosion, heat transfer degradation, and SCC on the intended functions of the components. The preventive measures consist of maintaining the system corrosion inhibitor concentrations within the specified limits by periodic testing. Testing is performed to verify key chemistry parameters and to measure impurities, conductivity and microbiological growth. Inspections are performed to identify corrosion, fouling and SCC that may be present. Cleaning and inspection of heat exchangers are performed periodically along with pump and heat exchanger performance/functional testing. The combination of chemistry control, testing and inspection provide reasonable assurance that the components within the scope of this program will continue to perform their intended functions.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Closed-Cycle Cooling Water System Program is an existing program. It will be enhanced to be consistent, with exceptions, to the recommendations of NUREG-1801, Chapter XI, Program XI.M21, Closed-Cycle Cooling Water System.

Exceptions to NUREG-1801

Program Elements Affected

- Preventive Actions

  PINGP implements the guidance provided in EPRI TR-107396, Revision 1 (1007820), "Closed Cooling Water Chemistry Guideline," April 2004, in lieu of the NUREG-1801 recommendation of EPRI TR-107396, Revision 0, "Closed Cooling Water Chemistry Guideline," October 1997. Revision 1 is the most recent revision of

this document and it provides more prescriptive guidance based on the latest industry operating experience. Use of the current guideline is an acceptable method to maintain the closed-cycle cooling water systems at PINGP.

- Parameters Monitored/Inspected

  Some of the pump and heat exchanger performance parameters recommended by NUREG-1801 are not used by PINGP for monitoring specific pumps or smaller converters serviced by the closed-cycle cooling water systems. Chemical controls and established performance monitoring techniques, based on plant experience, are adequate to detect changes in system performance due to corrosion or cracking.

Enhancements

The following enhancement is required to satisfy NUREG-1801 aging management program recommendations. The enhancement will be implemented prior to the period of extended operation.

- Monitoring and Trending

  The program will be enhanced to include an internal visual examination of accessible surfaces of components serviced by closed-cycle cooling water when the systems or components are opened during scheduled maintenance or surveillance activities.

Operating Experience

A review of operating experience for the Closed-Cycle Cooling Water System Program identified no adverse trends or issues with program performance. Conditions such as corrosion, fouling, and out of range chemistry parameters have been identified and corrected prior to causing any significant impact to safe operation or loss of intended functions. Adequate corrective actions were taken to prevent recurrence.

The review of operating experience indicates the Closed-Cycle Cooling Water System Program is effective in monitoring and detecting degradation and taking effective corrective actions as needed when acceptance criteria are not met.

Conclusion

The Closed-Cycle Cooling Water System Program is an existing program that is based on water chemistry control, inspections and performance/functional testing. The program has been effective in monitoring the closed-cycle cooling water systems and their components and no adverse trends or significant conditions related to these systems and components have been identified.

Implementation of the enhanced Closed-Cycle Cooling Water System Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

B2.1.10 Compressed Air Monitoring Program

Program Description

The Compressed Air Monitoring Program is a condition monitoring program that manages the effects of corrosion and the presence of unacceptable levels of contaminants for the Station and Instrument Air System. The program conducts periodic air quality sampling, inspections, component functional testing, and leakage testing. Additionally, preventive maintenance is performed at regular intervals to assure system components continue to operate reliably, thereby assuring that quality air is supplied to plant equipment.

The program implements the commitments made in response to NRC Generic Letter 88-14, “Instrument Air Supply System Problems Affecting Safety-Related Equipment,” as well as the recommendations associated with the Institute of Nuclear Power Operations Significant Operating Experience Report (INPO SOER) 88-01, “Instrument Air System Failures.” The preventive maintenance program associated with the Station and Instrument Air System is based upon manufacturer's recommendations and industry guidance. Implementation of program activities and associated corrective actions ensure that the Station and Instrument Air System is operated within specified limits.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Compressed Air Monitoring Program is an existing program. It will be enhanced to be consistent, with exceptions, to the recommendations of NUREG-1801, Chapter XI, Program XI.M24, Compressed Air Monitoring.

Exceptions to NUREG-1801

Program Elements Affected

- Preventive Actions, Detection of Aging Effects:

  The PINGP Compressed Air Monitoring Program does not explicitly incorporate the performance testing guidelines provided in EPRI NP-7079, EPRI TR-108147, and ASME OM-S/G-1998, Part 17, that are listed in NUREG-1801. The PINGP Station and Instrument Air System is an older installation which was not designed and installed with the instrumentation and features (i.e., in-line dew point indication with

alarm) necessary to conduct the specified performance testing. Instead, preventive maintenance activities are conducted on Station and Instrument Air System components, based upon manufacturer's recommendations and other EPRI guidance. These routine maintenance activities in conjunction with system inspections and system alarms provide for sufficient inspection and monitoring to ensure the timely detection of aging effects such that the Station and Instrument Air System is capable of performing its intended function.

Enhancements

The following enhancement is required to satisfy NUREG-1801 aging management program recommendations. The enhancement will be implemented prior to the period of extended operation.

- Preventive Actions, Acceptance Criteria:

  Station and Instrument Air System air quality will be monitored and maintained in accordance with the instrument air quality guidance provided in ISA S7.0.01-1996. Particulate testing will be revised to use a particle size methodology as specified in ISA S7.0.01.

Operating Experience

A review of operating experience for the Compressed Air Monitoring Program indicates that degraded conditions have been identified and corrected prior to causing any significant impact to Station and Instrument Air System operation or loss of intended functions. Concerns with compressor and dryer reliability have resulted in increased monitoring and plans for equipment replacement. While additional activities are in progress to improve system performance, the quality of the air supply to the plant continues to be maintained at satisfactory levels.

Conclusion

The Compressed Air Monitoring Program is an existing program that manages the effects of corrosion and the presence of unacceptable levels of contaminants for the Station and Instrument Air System. The program has effectively monitored the Station and Instrument Air System to ensure the effects of corrosion are managed.

Implementation of the Compressed Air Monitoring Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

B2.1.11 Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program

Program Description

The Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program conducts a one-time test of a representative sample of electrical cable connections (metallic portions) to confirm the absence of aging effects (loose connections). Cable connections terminating within an active or passive device/enclosure from external sources are within the scope of this program. Cable/wiring connections terminating within an active or passive device/enclosure from internal sources are not within the scope of this program.

The program manages the aging effects of loose connections and electrical failure from the following aging stressors: thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion and oxidation. The representative sample includes connections of various voltage applications (medium and low voltage), circuit loadings, and locations (high temperature, high humidity, vibration, etc.). The technical basis for the sample selections will be documented.

The specific type of test performed is determined prior to the initial test, and is to be a proven test for detecting loose connections, such as thermography, contact resistance testing, or other proven test. If an unacceptable condition is identified, the Corrective Action Program is used to evaluate additional requirements. This one-time program will be conducted prior to the period of extended operation.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a new program. It will be consistent, with exceptions, to the recommendations of NUREG-1801, Chapter XI, Program XI.E6, Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements. The exceptions, however, are consistent with the proposed Interim Staff Guidance LR-ISG-2007-02, noticed for public comment in the Federal Register on September 6, 2007 (FRN 72FR51256).

Exceptions to NUREG-1801

Program Elements Affected

- Scope of Program, Parameters Monitored/Inspected, Detection of Aging Effects, Monitoring and Trending

  The Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is consistent with NUREG-1801 as it is modified by the proposed LR-ISG-2007-02 published on September 6, 2007.

  NUREG-1801 describes an AMP for electrical cable connections in Chapter XI, Program XI.E6, “Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements.” A revision to this program is being developed via the Interim Staff Guidance (ISG) process. The revised program was published for public comment on September 6, 2007, in Federal Register Notice 72FR51256 “Proposed License Renewal Interim Staff Guidance LR-ISG-2007-02: Changes to Generic Aging Lesson Learned (GALL) Report Aging Management Program (AMP) XI.E6, 'Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements’ Solicitation of Public Comment.”

Enhancements

None

Operating Experience

The Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a new program, and therefore, has no operating experience related to program implementation.

A review of PINGP operating experience identified one significant connection failure that resulted in a fire. The cause of this failure was determined to be from either improper re-silvering of the bus contacts, improper connection during maintenance activities, and/or manufacturers' design flaw (tulip connection) where connection pieces may break (unnoticed) during reconnection activities. None of the failure causes were age-related, but the detrimental effects of the improper connection heightened the awareness and importance of having sound electrical connections (regardless of cause of loose connections), and resulted in an expansion of the number of electrical connections periodically inspected under the PINGP Thermography Program. The Corrective Action Program evaluation also investigated similar connections in detail, and found no similar loose connections that would lead to circuit failure or fire. A procedure change was made to include an acceptable and consistent contact re-silvering process.

Conclusion

The Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a new, one-time, sampling inspection program that will use thermography, resistance testing, or other proven test to detect loose electrical connections.

Implementation of the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program will provide reasonable assurance that aging effects will be managed such that electrical cable connections within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

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

B2.1.12 Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program

Program Description

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program manages the aging effect reduced insulation resistance on insulated electrical cables and connections (includes splices, terminations, fuse blocks, connectors, and insulation portions of electrical penetrations) installed in adverse localized environments (e.g., high temperature, radiation and/or moisture levels significantly more severe than design service conditions) to ensure cable and connection insulation integrity is maintained throughout the period of extended operation. The program includes all accessible non-EQ insulated cables and connections within the scope of License Renewal. The program conducts periodic visual inspections on a representative sample of accessible cables and connections in identified adverse localized environments, to confirm insulation integrity. Inspections are performed at least once every ten years, with the first inspection completed before the period of extended operation. If an unacceptable condition is identified on a cable or connection in the inspection sample, a determination is made as to whether the same condition is applicable to other accessible or inaccessible cables or connections. This program considers the technical information and guidance provided in NUREG/CR-5643, IEEE Std. P1205, SAND96-0344, and EPRI TR-109619.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a new

program. It will be consistent with the recommendations of NUREG-1801, Chapter XI, Program 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 Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a new program, and therefore, has no operating experience related to program implementation. However, both plant and industry operating experience will be used to provide examples of adverse localized environments to establish sample size and develop inspection locations.

At PINGP there have been instances where adverse localized environments for electrical cables and connections were suspected to have caused localized cable and connection insulation degradation. Most of the cases did not clearly define whether the degradation was conductor insulation degradation or cable jacket degradation. The noted cases of degradation resulted in the replacement or rework of the affected cable or connection jacket/insulation.

Conclusion

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a new program that conducts periodic visual inspections on a representative sample of accessible cables and connections in identified adverse localized environments, to ensure/maintain cable and connection insulation integrity.

Implementation of the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program provides reasonable assurance that aging effects will be managed such that the electrical cables and connections within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

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

B2.1.13 Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program

Program Description

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program is a condition monitoring program that manages the aging effect of reduced insulation resistance on non-EQ sensitive (high voltage, low signal) instrumentation circuit cables and connections exposed to adverse ambient or adverse localized environments to maintain electrical circuit integrity throughout the period of extended operation. An adverse localized environment is a condition of high temperature, radiation and/or moisture that is significantly more severe than the specified service environment for the cable. This program includes either periodic review of surveillance data, or testing of cables and connections, for non-EQ sensitive instrumentation circuits in scope of License Renewal, and considers the technical information and guidance provided in NUREG/CR-5643, IEEE Std. P1205, SAND96-0344, and EPRI TR-109619. The cables and connections in scope of this program are those associated with high-range-radiation and neutron flux monitoring instrumentation circuits that are sensitive to a reduction in insulation resistance.

The cables and connections (circuits) in scope of this program that have calibration or surveillance tests are subject to periodic review and evaluation to determine the existence of aging. If adverse aging effects are detected from these reviews, an aging evaluation is conducted for other cables and connections subjected to the same aging environment. Cables and connections (circuits) in scope of this program that are not covered by calibration or surveillance testing, will be subject to cable testing. The first reviews/tests will be completed before the period of extended operation, and subsequent reviews/tests will be conducted at least once every ten years thereafter.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program is a new program. It will be consistent with the recommendations of NUREG-1801, Program 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 Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program is a new program, and therefore, has no operating experience related to program implementation. NRC, industry, and plant operating experience will be used in the development of the program.

Plant-specific operating experience has revealed cases where adverse localized environments for sensitive instrumentation cables and connections were suspected to have caused adverse/erratic signals. The identified cases of degradation resulted in the replacement or rework of the affected cable/connection.

Conclusion

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program is a new program that implements periodic reviews of surveillance data or cable tests on non-EQ sensitive instrumentation circuits (electrical cables and connections) exposed to adverse ambient or adverse localized environments.

Implementation of the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program provides reasonable assurance that aging effects will be managed such that the electrical cables and connections within the scope of this program will continue to perform their intended functions during the period of extended operation.

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

B2.1.14 External Surfaces Monitoring Program

Program Description

The External Surfaces Monitoring Program is a condition monitoring program that implements inspections and walkdowns of systems and components within the scope of the program. Periodic system inspections and walkdowns are conducted to visually

inspect accessible external surfaces of piping, piping components, ducting, and other metallic and non-metallic components for aging degradation (e.g., evidence of loss of material, cracking and leakage).

The program manages aging effects by performing visual inspections of external surfaces for evidence of loss of material due to corrosion or wear; cracking or change in material properties due to ozone, ultraviolet or thermal exposure; and heat transfer degradation due to fouling. Leakage, if present, is also identified during the inspections. Additionally, the program is credited with managing aging effects of internal surfaces for situations in which the external surface is subject to the same environment or stressor as the internal surface, such that external surface condition is representative of internal surface condition.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant External Surfaces Monitoring Program is an existing program. It will be enhanced to be consistent with the recommendations of NUREG-1801, Chapter XI, Program XI.M36, External Surfaces Monitoring.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements are required to satisfy NUREG-1801 aging management program recommendations. Enhancements will be implemented prior to the period of extended operation.

- Scope of Program

  The scope of the program will be expanded as necessary to include all metallic and non-metallic components within the scope of License Renewal that require aging management in accordance with this program.

  The program will be enhanced to ensure that surfaces that are inaccessible or not readily visible during plant operations will be inspected during refueling outages.

  The program will be enhanced to ensure that surfaces that are inaccessible or not readily visible during both plant operations and refueling outages will be inspected at intervals that provide reasonable assurance that aging effects are managed such that the applicable components will perform their intended function during the period of extended operation.

Operating Experience

A review of operating experience for the External Surfaces Monitoring Program identified no adverse trends or issues with program performance. Plant equipment issues, such as corrosion and leakage, have been identified and corrected prior to causing any significant impact to safe operation or loss of intended functions. Adequate corrective actions were taken to prevent recurrence.

The review of operating experience indicates the External Surfaces Monitoring Program is effective in monitoring and detecting degradation and taking effective corrective actions as needed when acceptance criteria are not met.

Conclusion

The External Surfaces Monitoring Program is an existing program that is based on periodic system inspections and walkdowns. The program has been effective in monitoring external surfaces of components, and no adverse trends or significant conditions related to these components have been identified.

Implementation of the enhanced External Surfaces Monitoring Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

B2.1.15 Fire Protection Program

Program Description

The Fire Protection Program is a condition monitoring program which consists of fire barrier inspection activities, diesel-driven fire pump inspection activities and halon/carbon dioxide (CO_2) fire suppression system inspection activities. The fire barrier inspection activities include periodic visual inspection of fire barrier penetration seals, fire barrier walls, ceilings, and floors, and periodic inspection and functional testing of all fire-rated doors that perform a fire barrier function to ensure that their operability and intended functions are maintained. The diesel-driven fire pump inspection activities include periodic pump performance testing to ensure that the fuel supply line can perform its intended function. The halon/CO_2 fire suppression system inspection activities include both periodic inspection and functional testing of the halon/CO_2 fire suppression system to manage the aging effects and degradation that may affect the intended function and performance of the system.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Fire Protection Program is an existing program. It will be enhanced to be consistent, with exceptions, to the recommendations of NUREG-1801, Chapter XI, Program XI.M26, Fire Protection.

Exceptions to NUREG-1801

Program Elements Affected

- Parameters Monitored/Inspected

  The Relay/Cable Spreading Room and Computer Room CO_2 System is functionally tested and visually inspected every 18 months instead of every six months as recommended in NUREG-1801, XI.M26. The surveillance interval is specified in the NRC-approved fire protection program, which is an element of the plant's licensing basis, and is historically traceable to the plant Technical Specifications. Functional testing and visual inspections performed every 18 months are sufficient to identify material conditions that may affect the performance of the system.

  The halon system smoke detectors in the computer room and the Old Administration Building vault are functionally tested every 3 and 5 years respectively, instead of every six months as recommended in NUREG-1801, XI.M26. Functional testing the smoke detectors in the computer room and vault every 3 and 5 years respectively, will be sufficient to identify degradation that may affect the performance of the systems.

Enhancements

The following enhancements are required to satisfy NUREG-1801 aging management program recommendations. Enhancements will be implemented prior to the period of extended operation.

- Parameters Monitored/Inspected

  The Fire Protection Program will be enhanced to require functional testing of the halon system smoke detectors in the guardhouse every 5 years.

- Detection of Aging Effects

  The Fire Protection Program will be enhanced to require periodic visual inspection of the fire barrier walls, ceilings, and floors to be performed during walkdowns at least once every refueling cycle.

Operating Experience

A review of operating experience for the Fire Protection Program identified no adverse trends or issues with program performance. Minor concerns, such as fire doors not closing properly, have been identified and corrected prior to causing any significant impact to safe operation or loss of intended functions. A recent example of corrective actions to prevent recurrence were modifications made to fire doors to prevent the recurrence of the doors not closing properly due to inadequate clearances or improper adjustments.

The review of operating experience indicates the Fire Protection Program is effective in monitoring and detecting degradation and taking effective corrective actions as needed when acceptance criteria are not met.

Conclusion

The Fire Protection Program is an existing program that implements periodic inspections and functional testing (as applicable) for fire barriers, diesel-driven fire pumps, and the halon/carbon dioxide (CO_2) fire suppression system.

Implementation of the enhanced Fire Protection Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

B2.1.16 Fire Water System Program

Program Description

The Fire Water System Program is a condition monitoring program that conducts inspections and performance tests of water-based fire protection system components such as sprinklers, nozzles, fittings, valves, hydrants (including hose and gaskets), hose stations, standpipes, and aboveground and underground piping and components. Inspection and testing are performed in accordance with applicable National Fire Protection Association (NFPA) codes and standards, and NRC commitments. Fire protection system piping is subject to periodic flushing, flow testing and wall thickness evaluations to ensure that corrosion, MIC, and fouling are managed such that the system function is maintained. Additionally, internal portions of the fire water system are visually inspected when disassembled for maintenance. The system is normally maintained at the required operating pressure. A loss of system pressure requiring the fire pump to automatically start would be immediately detected in the control room and corrective

actions would be initiated. Prior to exceeding the 50-year service life, sprinkler heads will be replaced or be subject to representative sample testing.

Inspections will be performed before the end of the current operating term and at plant-specific intervals during the period of extended operation as determined by an engineering evaluation to ensure that degradation will be detected before the loss of intended function.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Fire Water System Program is an existing program. It will be enhanced to be consistent with the recommendations of NUREG-1801, Chapter XI, Program XI.M27, Fire Water System.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements are required to satisfy NUREG-1801 aging management program recommendations. Enhancements will be implemented prior to the period of extended operation.

- Detection of Aging effects

  The program will be enhanced to include eight additional yard fire hydrants in the scope of the annual visual inspection and flushing activities.

  Sprinkler heads that have been in place for 50 years will be replaced or a representative sample of sprinkler heads will be tested using the guidance of NFPA 25, “Inspection, Testing and Maintenance of Water-Based Fire Protection Systems” (2002 Edition, Section 5.3.1.1.1). Sample testing, if performed, will continue at a 10-year interval following the initial testing.

Operating Experience

A review of operating experience for the Fire Water System Program identified no adverse trends or issues with program performance. Issues have been identified and corrected prior to causing any significant impact to safe operation or loss of intended functions. Adequate corrective actions were taken. Examples of issues which have been identified and corrected include fire hydrant corrosion and leakage, piping below minimum required wall thickness, and low fire detector sensitivities.

The review of operating experience indicates the Fire Water System Program is effective in monitoring and detecting degradation and taking effective corrective actions as needed when acceptance criteria are not met.

Conclusion

The Fire Water System Program is an existing program that is based on periodic inspections and functional testing of sprinklers, nozzles, fittings, valves, hydrants (including hose and gaskets), hose stations, standpipes, and aboveground and underground piping and components. The program has been effective in monitoring fire water system components and no adverse trends or significant conditions related to these components have been identified.

Implementation of the enhanced Fire Water System Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

B2.1.17 Flow-Accelerated Corrosion Program

Program Description

The Flow-Accelerated Corrosion (FAC) Program is a condition monitoring program based on the Electric Power Research Institute (EPRI) guidelines in Nuclear Safety Analysis Center (NSAC)-202L-R2 for carbon steel and bronze components containing high-energy single phase or two phase fluids. The program manages loss of material due to flow-accelerated corrosion in piping and components by (a) conducting an analysis to determine critical locations, (b) performing baseline inspections to determine the extent of thinning at these locations, and (c) performing follow-up inspections to confirm the predictions of the rate of thinning, or repairing or replacing components as necessary. This program complies with PINGP's response to NRC Generic Letter 89-08.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Flow-Accelerated Corrosion Program is an existing program. It is consistent with the recommendations of NUREG-1801, Chapter XI, Program XI.M17, Flow-Accelerated Corrosion.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

A review of operating experience for the FAC Program identified no adverse trends or issues with program performance. Wall thinning has been identified, and the associated components replaced, prior to causing any significant impact to safe operation or loss of intended functions. The review of operating experience indicates the FAC Program is effective in monitoring and detecting degradation and taking effective corrective actions as needed when acceptance criteria are not met.

Conclusion

The Flow-Accelerated Corrosion Program is an existing program for carbon steel and bronze components containing high-energy single phase or two phase fluids. The program has been effective in predicting, detecting, and monitoring components for FAC; and no adverse trends or significant conditions related to these components have been identified.

Implementation of the Flow-Accelerated Corrosion Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

B2.1.18 Flux Thimble Tube Inspection Program

Program Description

The Flux Thimble Tube Inspection Program is a condition monitoring program that manages loss of material due to wear for in-core instrument thimble tubes. The program requires periodic eddy current testing of thimble tubes for thinning of the flux thimble tube wall due to flow-induced fretting. The program also provides for evaluation and trending of inspection results and appropriate corrective actions. This program implements the PINGP commitments made in response to NRC Bulletin 88-09, “Thimble Tube Thinning in Westinghouse Reactors.”

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Flux Thimble Tube Inspection Program is an existing program. It will be enhanced to be consistent with the recommendations of NUREG-1801, Chapter XI, Program XI.M37, Flux Thimble Tube Inspection.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements are required to satisfy NUREG-1801 aging management program recommendations. Enhancements will be implemented prior to the period of extended operation.

- Monitoring and Trending

  The program will require that the interval between inspections be established such that no flux thimble tube is predicted to incur wear that exceeds the established acceptance criteria before the next inspection.

  The program will also require that re-baselining of the examination frequency be justified using plant-specific wear rate data unless prior plant-specific NRC acceptance for the re-baselining was received. If design changes are made to use more wear-resistant thimble tube materials, sufficient inspections will be conducted at an adequate inspection frequency for the new materials.

- Corrective Actions

  The program will require that flux thimble tubes that cannot be inspected must be removed from service.

Operating Experience

A review of operating experience for the Flux Thimble Tube Inspection Program identified no adverse trends or issues with program performance. No thimble tubes have had a through-wall leak at PINGP. PINGP has capped one thimble tube in Unit 2. In 2002 a thimble tube in Unit 1 exhibited a significant increase in new wear and was capped to reduce the risk of leaking; however, the wear rate later stabilized and the thimble tube was subsequently uncapped. Thimble tubes have been replaced in both Units 1 and 2; however the reason was due to difficulty in the movement of the incore instrumentation detectors and was not age-related.

The Flux Thimble Tube Inspection Program effectively monitors the condition of the pressure retaining components within the License Renewal boundary and ensures aging effects are acceptably managed.

Conclusion

The Flux Thimble Tube Inspection Program is an existing program which manages loss of material due to wear for the flux thimble tubes. The program has been effective in monitoring for unacceptable degradation and ensuring that aging effects are managed.

Implementation of the Flux Thimble Tube Inspection Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

B2.1.19 Fuel Oil Chemistry Program

Program Description

The Fuel Oil Chemistry Program manages the aging effects of loss of material and cracking on internal surfaces of the diesel fuel oil system piping, piping components and tanks by minimizing the potential for a corrosive environment, and by verifying that the actions taken to mitigate corrosion are effective. The program includes: (1) periodic sampling and testing of stored fuel oil and testing of new fuel oil in accordance with plant Technical Specifications and selected industry standards (e.g., ASTM D 975, D 1796, D 4057, and D 6217) to confirm water, sediment and contaminants remain below limits of concern for corrosion to occur; (2) periodic testing of fuel oil storage tanks for the presence of water; (3) periodic integrity testing of underground storage tanks and external visual inspections of aboveground storage tanks to confirm leakage is not occurring; and, (4) one-time inspections of selected tank bottom and piping locations, using ultrasonic testing, to be performed prior to the period of extended operation. These activities verify the absence of unacceptable aging effects and assure the continued effectiveness of fuel oil chemistry control activities to ensure that significant degradation is not occurring and the component intended functions will be maintained during the period of extended operation.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Fuel Oil Chemistry Program is an existing program. It will be enhanced to be consistent, with exceptions, to the recommendations of NUREG-1801, Chapter XI, Program XI.M30, Fuel Oil Chemistry.

Exceptions to NUREG-1801

Program Elements Affected

- Preventive Actions

Periodic fuel oil sampling from the day tanks and clean fuel oil leakage collection tanks of the diesel generators, and the day tanks of the diesel cooling water pumps and the diesel fire pump, is not performed. The very high turnover rate for the fuel in the day tanks, and the close control of the fuel oil quality in the storage tanks that comprise the sources for the day and leakage collection tanks, make periodic sampling unnecessary. The leakage collection tanks are very small and their interiors are not reasonably accessible. Tank internal inspections and wall thickness measurements that have been completed have shown no degradation.

Periodic draining and cleaning of the storage, day, and leakage collection tanks are not performed. The very high turnover rate for the fuel in the day tanks, and the close control of the fuel oil quality in the storage tanks that comprise the sources for the day and leakage collection tanks, make periodic draining and cleaning unnecessary. The leakage collection tanks are very small and their interiors are not reasonably accessible. Tank internal inspections and wall thickness measurements that have been completed have shown no degradation. Draining and cleaning of the tanks would be performed only if determined necessary based on negative trends indicated by the results of the fuel oil analyses, results of periodic testing for the presence of water, and plant or industry operating experience.

Biocides, stabilizers, or corrosion inhibitors are not added to the fuel oil. Operating experience has not indicated a need for such fuel oil additives. Fuel oil samples have not shown cloudiness, sludge, or other conditions that would indicate significant biological activity or fuel degradation, and the tank inspections that have been performed have not shown any significant internal corrosion activity. Internal coatings are also not used nor credited for preventing internal tank corrosion. The combination of fuel oil quality standards, fuel oil quality sampling trends which routinely show fuel oil to meet the acceptance criteria of ASTM D 975-77, the high rate of fuel oil turnover and replenishment in the tanks, and plant operating experience have shown that the additional preventive actions of coatings or fuel oil additives are not required.

- Monitoring and Trending

  Particulate contamination testing of fuel oil will be performed annually and not quarterly. Annual testing is sufficiently frequent to verify that particulates are not forming. The absence of previous particulate contamination during routine historical sampling and analysis, and the practice of quarantining new fuel deliveries in isolated tanks until sampling and analysis are complete, provide robust safeguards to prevent particulate contamination in storage tanks.

Enhancements

The following enhancements are required to satisfy NUREG-1801 aging management program recommendations. Enhancements will be implemented prior to the period of extended operation.

- Monitoring and Trending

  Particulate contamination testing of fuel oil in the eleven fuel oil storage tanks in scope of License Renewal will be performed, in accordance with ASTM D 6217, on an annual basis.

- Detection of Aging Effects

  One-time ultrasonic thickness measurements will be performed at selected tank bottom and piping locations prior to the period of extended operation.

Operating Experience

The Fuel Oil Chemistry Program has been effective in monitoring and controlling diesel fuel oil chemistry to mitigate aging effects. Based on a review of the site Corrective Action Program, the plant has taken timely and effective corrective action to address diesel fuel oil quality concerns and diesel fuel oil system performance issues when requirements were not met. Fuel oil quality parameters, including water and sediment percentage, are routinely within acceptance limits at the various monitored locations and no adverse trends have been identified. Some examples were noted where fuel oil shipments did not meet quality standards and the fuel oil was not placed in service. Periodic external visual walkdown inspections of the aboveground and vaulted tanks, and pressure integrity testing results for the underground storage tanks, have not identified any signs of leakage that would indicate a concern with tank wall integrity. The internal visual inspections of storage tank surfaces that have been performed identified no significant corrosion, pitting, or areas requiring repair due to aging effects or unacceptable fuel oil chemistry control. Ultrasonic testing of one tank was performed in 1995 and no wall thinning due to corrosion was detected. Therefore, consistent with NUREG-1801, no instances of fuel oil system component failures to perform License Renewal intended functions attributed to contamination have been identified.

Conclusion

The Fuel Oil Chemistry Program is an existing program that implements Technical Specifications requirements; ASTM standards; vendor and plant requirements for fuel oil chemistry; and piping, piping component and tank inspections. The program has been effective in controlling fuel oil chemistry, preventing the use of fuel oil not meeting

specifications, minimizing the potential for corrosion, and periodically demonstrating storage tank integrity.

Implementation of the enhanced Fuel Oil Chemistry Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

B2.1.20 Fuse Holders Program

Program Description

The Fuse Holders Program is a condition monitoring program that implements periodic visual inspections and tests on fuse holders in scope of License Renewal, located in passive enclosures and assemblies, and exposed to environments that potentially could lead to electrical circuit failures if left unmanaged. The AMP for fuse holders (metallic clamps) manages the effects of aging from adverse localized environments caused from the following aging stressors, as applicable: fatigue, mechanical stress, vibration, chemical contamination, and corrosion.

The identified fuse holders are reviewed, inspected and/or tested to determine if they are exposed to adverse localized environments that could adversely affect the electrical circuit (metallic connection with the fuse) if left unmanaged during the period of extended operation. A localized environment is adverse if it promotes loose connections from clip relaxation/fatigue (ohmic heating, thermal cycling or electrical transients, mechanical fatigue caused by frequent removal/replacement of the fuse, or vibration), or if it exposes the fuse holder to adverse levels of chemical contamination or moisture that would promote corrosion and oxidation of the metallic fuse clips.

Fuse holders determined to be operating in an adverse localized environment will be visually inspected and tested at least once every 10 years. The first visual inspections and tests will be completed before the period of extended operation. The specific type of test to be performed will be determined prior to the initial test, and is to be a proven test for detecting deterioration of metallic clamps of the fuse holders, such as thermography, contact resistance testing, or other appropriate testing.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Fuse Holders Program is a new program. It will be consistent with the recommendations of NUREG-1801, Chapter XI, Program XI.E5, Fuse Holders.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Fuse Holders Program is a new program, and, therefore, has no operating experience related to program implementation. A review of plant-specific operating experience was conducted, and no fuse connection failures from potential age-related causes were identified. The plant operating experience review did identify fuse enclosure issues involving water intrusion from event driven causes (e.g., water leaked into conduit and emptied into enclosure). These moisture intrusion events for enclosures exposed to this adverse localized environment could promote a corrosive environment for the metallic contact surfaces, leading to increased contact resistance and circuit failure if left unmanaged.

Inspections and testing (thermography) were performed on fuse holders in scope of License Renewal in terminal boxes and junction boxes located outside Containment. This initial inspection and testing revealed that some enclosures had significant signs of oxidation that could adversely affect the fuse holders if not repaired or reworked. The conditions were entered into the Corrective Action Program for disposition. For adverse aging environments, this program will ensure the integrity of fuse holders in scope of License Renewal and located in passive enclosures during the period of extended operation.

Conclusion

The Fuse Holders Program is a new program that implements periodic inspections and tests on fuse holders in scope of License Renewal, located in passive enclosures and assemblies, and exposed to adverse localized environments that potentially could challenge the electrical circuit integrity.

Implementation of the Fuse Holders Program provides reasonable assurance that aging effects will be managed such that electrical commodities within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

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

B2.1.21 Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program

Program Description

The Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program performs periodic tests to provide an indication of the condition of the conductor insulation for medium voltage cables in scope of License Renewal exposed to adverse localized environments (i.e., periods of high moisture greater than a few days at a time) and subjected to voltage stress (energized greater than 25 percent of the time). PINGP has taken the position that underground cables (direct buried or in underground ducts) not designed for wet environments may have been exposed to high moisture conditions for greater than a few days at a time, and once exposed to periods of high moisture, the cable insulation may retain moisture regardless of moisture changes in underground ducts or earth. Therefore, insulation testing for the cables meeting these conditions will be performed at least once every 10 years. The first tests for License Renewal are to be completed before the period of extended operation.

In addition, periodic inspections of the underground medium voltage cable manhole for the accumulation of water (and draining if necessary) will be conducted to minimize prolonged moisture conditions that promote the growth of water trees. The inspection frequency will be based on actual plant experience with water accumulation in the manhole. However, the inspection frequency will be at least once every two years. The first inspection for License Renewal will be completed before the period of extended operation.

This program considers the technical guidance provided in NUREG/CR-5643, IEEE Std. P1205, SAND96-0344, and EPRI TR-109619.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a new program. It will be consistent with the recommendations of NUREG-1801, Chapter XI, Program 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 Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a new program, and therefore, has no operating experience related to program implementation. A review of applicable plant operating experience did reveal cases of underground cable problems that resulted in corrective actions. In its response to NRC Generic Letter 2007-01, “Inaccessible or Underground Power Cable Failures that Disable Accident Mitigation Systems or Cause Plant Transients,” dated February 7, 2007, PINGP reported that three underground medium voltage power cable failures had occurred (two circuit failures - one from lightning strike, the other from water intrusion; and one megger test failure).

Conclusion

The Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a new program that implements periodic tests on underground non-EQ medium voltage cables and connections in scope of License Renewal, and exposed to the conditions that promote the growth of water trees.

Implementation of the Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program provides reasonable assurance that aging effects will be managed such that electrical cables and connections within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

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

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

Program Description

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is a condition monitoring program that performs visual inspections of the internal surfaces of mechanical components within the scope of License Renewal not covered by other AMPs. The internal inspections are performed during scheduled preventive and corrective maintenance activities, or during other routinely scheduled tasks such as surveillance procedures, when internal surfaces are made accessible for inspections. The program inspections are performed to provide assurance that existing environmental

conditions are not resulting in degradation that could result in a loss of component intended functions. The program manages the effects of loss of material and cracking.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is a new program. It will be consistent with the recommendations of NUREG-1801, Chapter XI, Program XI.M38, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is a new program, and therefore, has no operating experience related to program implementation. A review of plant-specific operating experience has revealed some examples of corrosion and erosion-corrosion on component internal surfaces. Appropriate corrective actions were taken.

Both plant and industry operating experience will be used to establish inspection intervals, inspection techniques, and inspection locations. Plant maintenance history will provide insight in the selection of inspection locations likely to exhibit the expected aging effects. After program implementation has begun, plant-specific operating experience (including program inspection results) will be routinely evaluated for new insights and lessons learned.

Conclusion

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is a new program that implements internal inspections of mechanical components within the scope of License Renewal made available for inspection during routine activities.

Implementation of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this

program will continue to perform their intended function(s) during the period of extended operation.

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

B2.1.23 Inspection of Overhead Heavy Load and LIght Load (Related to Refueling) Handling Systems Program

Program Description

The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program is a condition monitoring program that ensures structural components of load handling systems within the scope of License Renewal are capable of sustaining their rated loads for the period of extended operation. The load handling components in scope of License Renewal are overhead heavy load handling components subject to the requirements of NUREG-0612, and light load handling components associated with refueling activities. The program provides for periodic visual inspections of structural components including crane rails, structural girders, beams, special lifting devices, and welded and bolted connections.

The program provides for periodic visual inspections in support of load handling systems to include the following:

- Containment polar cranes load-carrying components
- Turbine building cranes load-carrying components
- Auxiliary building crane load-carrying components
- Spent fuel pool bridge crane load-carrying components
- Special lifting devices
- Manipulator cranes load-carrying components
- Fuel transfer system conveyer car load-carrying components
- Fuel transfer tipping devices load-carrying components
- Crane above the safeguard traveling screens load-carrying components

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program is an existing program. It will be enhanced to be consistent with the recommendations of NUREG-1801, Chapter XI, Program XI.M23, Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements are required to satisfy NUREG-1801 aging management program recommendations. Enhancements will be implemented prior to the period of extended operation.

- Scope of Program

  Program implementing procedures will be revised to ensure the components and structures subject to inspection are clearly identified.

- Parameters Monitored/Inspected

  Inspection procedures will be enhanced to include the parameters corrosion and wear where omitted.

Operating Experience

Plant operating experience was used to identify aging effects and mechanisms for the Cranes, Heavy Loads, and Fuel Handling System. The operating experience review showed that examples of paint damage and corrosion in load handling systems had been identified and corrected prior to loss of intended functions. Crane inspections also identified one cracked weld in a turbine building crane girder diaphragm plate. Appropriate corrective actions were taken. The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program has been effective in monitoring and detecting degradation and taking effective corrective actions.

Conclusion

The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program is an existing program that manages the aging effect loss of material due to corrosion and wear for crane rails, structural girders, beams, special lifting devices, and welded and bolted connections of load handling systems within the scope of License Renewal.

Implementation of the enhanced Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

B2.1.24 Lubricating Oil Analysis Program

Program Description

The Lubricating Oil Analysis Program obtains and analyzes lubricating and hydraulic oil samples from plant equipment to ensure that the oil quality is maintained within established limits. The program maintains oil contaminants (primarily water and particulates which may be indicative of inleakage and corrosion product buildup) within acceptable limits to preserve an operating environment that is not conducive to loss of material, cracking, or heat transfer degradation. Oil testing activities include periodic sampling, analysis, and trending of results. The program provides for evaluation of oil sample results and appropriate corrective actions. The Lubricating Oil Analysis Program provides an early indication of an adverse equipment condition in lubricating and hydraulic oil environments.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Lubricating Oil Analysis Program is an existing program. It is consistent with the recommendations of NUREG-1801, Chapter XI, Program XI.M39, Lubricating Oil Analysis Program.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

A review of the PINGP operating experience related to the Lubricating Oil Analysis Program indicates that the program has been effective in preventing component failures due to oil contamination or degradation. Some instances have been identified in which oil samples contained water or particulate contamination in excess of the established limits. Appropriate actions were taken in accordance with the Corrective Action Program to correct the identified conditions. No instances of component failures attributed to lubricating oil contamination or degradation have been identified.

Conclusion

The Lubricating Oil Analysis Program is an existing program that implements manufacturer's recommendations, industry standards, and plant requirements for oil quality and acceptance criteria to monitor for potential degradation of equipment. The

program has been effective in controlling oil quality, preventing the use of oil not meeting quality standards, and minimizing the potential for corrosion.

Implementation of the Lubricating Oil Analysis Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

B2.1.25 Masonry Wall Program

Program Description

The Masonry Wall Program is a condition monitoring program that is based on NRC IE Bulletin 80-11, “Masonry Wall Design” and the guidance provided in NRC Information Notice 87-67, “Lessons Learned from Regional Inspections of Licensee Actions in Response to IE Bulletin 80-11.” The program manages cracking of masonry walls in proximity to, or having attachments to, safety related equipment by conducting periodic visual inspections.

The Masonry Wall Program manages the aging effect of cracking in masonry walls so that the evaluation basis established for each masonry wall within the scope of License Renewal remains valid through the period of extended operation. Administrative controls are in place to ensure any reclassification of masonry walls (i.e., for newly added wall attachments, safety related equipment routed in the vicinity of the wall, etc.) are evaluated in accordance with the requirements of IE Bulletin 80-11.

Structural steel supports are incorporated in the masonry wall design where required by analyses. Steel supports and steel bracing of masonry walls in scope of License Renewal are inspected as part of the Structures Monitoring Program.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Masonry Wall Program is an existing program. It is consistent with the recommendations of NUREG-1801, Chapter XI, Program XI.S5, Masonry Wall Program.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

A review of operating experience related to the Masonry Wall Program revealed that numerous PINGP inspections of structural components have been documented. The inspections have identified minor cracking that was found to be acceptable as-is without repair. Other issues unrelated to aging have also been identified and resolved.

The review of operating experience indicates the Masonry Wall Program is effective in monitoring and detecting degradation and taking effective corrective actions as needed when acceptance criteria are not met.

Conclusion

The Masonry Wall Program is an existing program that monitors the condition of masonry walls within the scope of License Renewal through periodic visual inspections.

Implementation of the Masonry Wall Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this program will continue to perform their intended functions during the period of extended operation.

B2.1.26 Metal-Enclosed Bus Program

Program Description

The Metal-Enclosed Bus Program is a condition monitoring program that inspects representative samples of the interiors of non-segregated 4160V phase bus between station offsite source auxiliary transformers and plant buses. Internal visual inspection is performed to observe signs of aging of the bus insulation materials (such as cracking and discoloration), evidence of loose connections, and signs of moisture and debris intrusion. Internal bus supports are visually examined for structural integrity and signs of cracks. The inspection may also include thermography and/or electrical resistance testing to ensure the integrity of bus connections. The program manages the aging effect of reduction of insulation resistance in insulation components, loose connections, and corrosion from moisture/debris intrusion in non-segregated bus ducts. The interior visual inspection will be conducted at least once every five years, or, if conducted with thermography or electrical resistance testing, at least once every ten years. The first inspections and/or tests will be completed before the period of extended operation.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Metal-Enclosed Bus Program is a new program. It will be consistent with the recommendations of NUREG-1801, Chapter XI, Program XI.E4, Metal-Enclosed Bus.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Metal Enclosed Bus Program is a new program, and therefore, has no operating experience related to program implementation. A review of plant operating experience reveals that previous periodic inspections of bus ducts have identified degraded components that were repaired/replaced to preclude electrical failures.

Conclusion

The Metal-Enclosed Bus Program is a new program that implements periodic inspections and tests on non-segregated bus ducts in scope of License Renewal.

Implementation of the Metal-Enclosed Bus Program provides reasonable assurance that aging effects will be managed such that the non-segregated bus ducts within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

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

B2.1.27 Nickel-Alloy Nozzles and Penetrations Program

For the Nickel-Alloy Nozzles and Penetrations Program, PINGP is providing a commitment to the following activities for managing the aging of nickel-alloy components susceptible to primary water stress corrosion cracking:

1. comply with applicable NRC orders, and
2. implement applicable NRC Bulletins, Generic Letters, and staff-accepted industry guidelines.

This commitment is included in LRA Appendix A (USAR Supplement) for incorporation into the USAR.

B2.1.28 Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program

Program Description

The Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program (Nickel-Alloy Vessel Head Penetration Nozzle Program) is a condition monitoring program that implements the requirements of the NRC First Revised Order EA-03-009, “Issue of Order Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors,” dated February 20, 2004 (Order). This program manages the aging effects of cracking due to primary water stress corrosion cracking (PWSCC) of the nickel-alloy vessel head penetration nozzles welded to the upper reactor vessel head. In addition the program monitors the upper reactor vessel head surface and the region above the reactor vessel head for boric acid leakage.

This program is a mandated augmented inservice inspection program that supplements the leakage tests and visual VT-2 examinations required by ASME Section XI, Table IWB-2500-1, Examination Category B-P. The program incorporates the susceptibility ranking of the upper vessel head penetration nozzles to PWSCC, and the required process for establishing the inspection methods and inspection frequencies in accordance with the susceptibility ranking, as required by the Order, as amended.

The upper reactor vessel heads for both Units 1 and 2 have been replaced. The new heads now incorporate Nickel-Alloy 690 (SB167) for each of the reactor head penetration nozzles instead of the Nickel-Alloy 600 utilized in the previous heads.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program is an existing program. It will be enhanced to be consistent with the recommendations of NUREG-1801, Chapter XI, Program XI.M11A, Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements are required to satisfy NUREG-1801 aging management program recommendations. Enhancements will be implemented prior to the period of extended operation.

- Detection of Aging Effects

  The program will require that any deviations from implementing the appropriate required inspection methods of the NRC First Revised Order EA-03-009, “Issue of Order Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors,” dated February 20, 2004 (Order), as amended, will be submitted for NRC review and approval in accordance with the Order, as amended.

- Monitoring and Trending

  The program will require that any deviations from implementing the required inspection frequencies mandated by the Order, as amended, will be submitted for NRC review and approval in accordance with the Order, as amended.

- Acceptance Criteria

  Relevant flaw indications detected during the augmented inspections of the upper vessel head penetration nozzles will be evaluated in accordance with the criteria provided in the letter from Mr. Richard Barrett, NRC, Office of Nuclear Reactor Regulation (NRR), Division of Engineering to Alex Marion, Nuclear Energy Institute (NEI), dated April 11, 2003, or in accordance with NRC-approved Code Cases that incorporate the flaw evaluation procedures and criteria of the NRC's April 11, 2003, letter to NEI.

- Corrective Actions

  The program will require that, if leakage or evidence of cracking in the vessel head penetration nozzles (including associated J-groove welds) is detected while ranked in the “Low,” “Moderate,” or “Replaced” susceptibility category, the nozzles are to be immediately reclassified to the “High” susceptibility category and the required augmented inspections for the “High” susceptibility category are to be implemented during the same outage the leakage or cracking is detected.

Operating Experience

The upper reactor vessel heads for both Units 1 and 2 have been replaced. The Unit 1 head was replaced during the 1R24 refueling outage in 2006 and the Unit 2 head was replaced during the 2R23 refueling outage in 2005. The new heads now incorporate

Nickel-Alloy 690 (SB167) for each of the reactor head penetration nozzles instead of the Nickel-Alloy 600 utilized in the previous heads. Inspections for the upper reactor vessel head surface, each nickel-alloy reactor head penetration nozzle, and the region above the reactor vessel head are being implemented in accordance with the requirements of the NRC First Revised Order EA-03-009 dated February 20, 2004.

A review of operating experience for the Nickel-Alloy Vessel Head Penetration Nozzle Program identified no adverse trends or issues with program performance. A few minor non-relevant leaks from valves were identified and corrected prior to causing any significant impact to safe operation or loss of intended functions. Adequate corrective actions were taken to prevent recurrence.

The review of operating experience indicates the Nickel-Alloy Vessel Head Penetration Nozzle Program has been effective in monitoring and detecting degradation and taking effective corrective actions as needed when acceptance criteria are not met.

Conclusion

The Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program is an existing program that manages the effects of cracking due to PWSCC of the nickel-alloy vessel head penetration nozzles welded to the upper reactor vessel head. In addition the program provides for condition monitoring of the upper reactor vessel head surface and the region above the reactor vessel head for boric acid leakage.

Implementation of the Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

B2.1.29 One-Time Inspection Program

Program Description

The One-Time Inspection Program provides additional assurance, through sampling inspections using nondestructive examination (NDE) techniques, that aging is not occurring or that the rate of degradation is so insignificant that additional aging management actions are not warranted. The program includes measures to verify the effectiveness of other AMPs, such as the Water Chemistry Program, to mitigate aging effects. In other cases, this program confirms that a separate AMP is not warranted when significant aging is not expected to occur. If aging effects are identified that could

adversely impact an intended function prior to the end of the period of extended operation, additional actions will be taken to correct the condition, perform additional inspections, and/or perform periodic inspections, as needed.

Program elements 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 inspection locations in the system, component, or structure based on the aging effect; (c) determination of the examination technique, including acceptance criteria that would be effective in managing the aging effect that is being examined; and (d) evaluation of the need for follow-up examination if degradation is identified that could jeopardize an intended function prior to the end of the period of extended operation. The program must be implemented prior to the period of extended operation and should only rely on the results of inspections performed within the 10-year period preceding the period of extended operation. This program expires at the time of entry into the period of extended operation.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant One-Time Inspection Program is a new program. It will be consistent with the recommendations of NUREG-1801, Chapter XI, Program XI.M32, One-Time Inspection.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The One-Time Inspection Program is a new program, and therefore, has no operating experience related to program implementation. For discussions of operating experience related to the programs whose effectiveness is being verified by one-time inspections (i.e., Water Chemistry, Fuel Oil Chemistry, and Lubricating Oil Analysis Programs), the LRA Appendix B descriptions of these programs should be consulted. Both plant and industry operating experience will be used to establish sample size, inspection locations, and examination techniques for inspections under this program.

Conclusion

The One-Time Inspection Program is a new program that implements sampling inspections to verify the effectiveness of selected AMPs, such as the Water Chemistry Program.

Implementation of the One-Time Inspection Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

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

B2.1.30 One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program

Program Description

The One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program (Class 1 Small-Bore Piping Program) is a condition monitoring program that provides additional assurance that aging of Class 1 small-bore piping either is not occurring or is insignificant, such that a new plant-specific AMP is not warranted.

The Class 1 Small-Bore Piping Program inspects for the presence of cracking by performing one-time volumetric examinations on a sample of butt welds in Class 1 piping (including pipes, fittings, and branch connections) less than 4-inch nominal pipe size. The one-time inspections are performed at locations that are determined to be potentially susceptible to cracking, based on the methodology of the site-specific, NRC approved, Risk Informed Inservice Inspection Program.

Based upon a review of previous operating experience, PINGP has not experienced cracking of ASME Code Class 1 small-bore piping. If evidence of aging-related cracking is identified through the implementation of the Class 1 Small-Bore Piping Program, a periodic inspection program will be implemented to manage applicable aging effects during the period of extended operation.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program is a new program. It will be consistent with the recommendations of NUREG-1801, Chapter XI, Program XI.M35, One-Time Inspection of ASME Code Class 1 Small-Bore Piping.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Class 1 Small-Bore Piping Program is a new program, and therefore, has no operating experience related to program implementation. However, both plant and industry operating experience will be used to establish the program. The specific examination techniques utilized are qualified prior to performing the examinations.

Based upon a review of previous operating experience, PINGP has not experienced cracking of ASME Code Class 1 small-bore piping. During the 2006 refueling outages of both Units 1 and 2, UT examinations of ASME Class 1 and 2 small-bore piping welds were performed by the Risk-Informed Inservice Inspection Program. Welds in the Reactor Coolant, Safety Injection, and Chemical and Volume Control Systems were examined. The examination results from both Class 1 and Class 2 piping welds in these systems are relevant to this program, since all three systems are constructed of similar materials and contain borated water with similar chemistry. On Unit 1, inservice UT examinations of 14 welds were performed. On Unit 2, inservice UT examinations of 27 welds were performed. No rejectable indications were detected in either Unit.

Conclusion

The Class 1 Small-Bore Piping Program is a new program that will be effective in determining whether aging of Class 1 small-bore piping either is not occurring, or is insignificant, such that a new AMP is not warranted.

Implementation of the One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program provides reasonable assurance that aging effects will be managed such that the small-bore piping within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

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

B2.1.31 Open-Cycle Cooling Water System Program

Program Description

The Open-Cycle Cooling Water (OCCW) System Program implements the commitments made in the PINGP response to NRC Generic Letter 89-13, “Service Water System Problems Affecting Safety-Related Equipment,” to ensure that the effects of aging in OCCW systems, and in components serviced by the OCCW systems, will be managed for the period of extended operation. This program manages aging effects associated

with metallic components exposed to a raw water environment. These aging effects are due to corrosion, erosion, and fouling (including silting and coating failure). The program includes (a) surveillance and control of fouling, (b) tests to verify heat transfer capabilities, and (c) routine inspection and maintenance activities.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Open-Cycle Cooling Water System Program is an existing program. It is consistent with the recommendations of NUREG-1801, Chapter XI, Program XI.M20, Open-Cycle Cooling Water System.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

A review of operating experience for the Open-Cycle Cooling Water System Program identified no adverse trends or issues with program performance. The review revealed a number of examples where equipment issues have been identified and are being managed under the Open-Cycle Cooling Water System Program. These issues include:

- Accumulations of silt, corrosion products, and debris in cooling water piping, valves, and heat exchangers
- Accumulation of biological growth (mussels, clams, and shells) in river cooling water piping and intake bays
- Some instances of MIC causing pitting attack of cooling water piping
- Some instances of heat exchanger tubes requiring plugging due to corrosion

The conditions were identified and corrected prior to causing a significant impact to safe operation or loss of intended functions.

The review of operating experience indicates the Open-Cycle Cooling Water System Program is effective in monitoring and detecting degradation and taking effective corrective actions as needed when acceptance criteria are not met.

Conclusion

The Open-Cycle Cooling Water System Program is an existing program that implements the recommendations of NRC Generic Letter 89-13 to ensure that the effects of aging on

raw water systems will be managed for the period of extended operation. This program has been effective in managing aging effects due to corrosion, erosion, and fouling in systems and components serviced by the OCCW systems.

Implementation of the Open-Cycle Cooling Water System Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

B2.1.32 PWR Vessel Internals Program

For the PWR Vessel Internals Program, PINGP is providing a commitment to the following activities for managing the aging of reactor vessel internals components:

1. participate in the industry programs for investigating and managing aging effects on reactor internals;

2. evaluate and implement the results of the industry programs as applicable to the reactor internals; and

3. upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan for reactor internals to the NRC for review and approval.

This commitment is included in LRA Appendix A (USAR Supplement) for incorporation into the USAR.

B2.1.33 Reactor Head Closure Studs Program

Program Description

The Reactor Head Closure Studs Program is a condition monitoring program that implements inservice inspection of reactor vessel head closure studs. The program is implemented in accordance with the requirements of 10 CFR 50.55a, with specified limitations, modifications, and NRC-approved alternatives, and utilizes the 1998 Edition of ASME Section XI including the 1998, 1999, and 2000 Addenda for the current inspection interval. Inspections are in accordance with Subsection IWB, Table IWB-2500-1, Examination Category B-G-1 of the ASME Section XI edition and addenda of record.

The program also includes preventive measures to mitigate cracking. Preventive measures include proper material selection, avoiding the use of metal-plated stud bolting, and controlling the use of surface treatments and lubricants. As specified in NRC Regulatory Guide 1.65, only approved lubricants are used.

The program is updated periodically as required by 10 CFR 50.55a.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Reactor Head Closure Studs Program is an existing program. It will be enhanced to be consistent with the recommendations of NUREG-1801, Chapter XI, Program XI.M3, Reactor Head Closure Studs.

Exceptions to NUREG-1801

None

Enhancements

The following enhancement is required to satisfy NUREG-1801 aging management program recommendations. The enhancement will be implemented prior to the period of extended operation.

- Corrective Actions

  Controls will be put in place to ensure that any future procurement of reactor head closure studs will be in accordance with the material and inspection guidance provided in NRC Regulatory Guide 1.65.

Operating Experience

A review of plant operating experience for the Reactor Head Closure Studs Program did not identify any adverse trend in program performance. Cracking of the head studs from SCC or loss of material due to wear has not occurred. However, some occurrences of mechanical damage due to mishandling have been identified. Minor nicks, scratches, gouges, and thread damage have occurred due to maintenance activities during refueling outages. This damage was considered normal wear, and the studs were determined to be acceptable for continued service. There have been no deficiencies attributed to distortion or plastic deformation from stress relaxation.

The experience at PINGP with the Reactor Head Closure Studs Program shows that the program is effective in managing cracking due to SCC or loss of material due to wear, and also detecting reactor coolant leakage associated with the closure bolting.

Conclusion

The Reactor Head Closure Studs Program is an existing program which provides for preventive measures and condition monitoring of the reactor head closure stud bolting. The program has been effective in monitoring the reactor head closure bolting and no

adverse trends or significant conditions related to the reactor head closure stud bolting have been identified.

Implementation of the enhanced Reactor Head Closure Studs Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

B2.1.34 Reactor Vessel Surveillance Program

Program Description

The Reactor Vessel Surveillance Program manages the reduction of fracture toughness due to neutron embrittlement of the low alloy steel reactor vessels. The program ensures that reactor vessel materials meet the requirements of 10 CFR 50.60 for fracture prevention and 10 CFR 50.61 for Pressurized Thermal Shock (PTS). This program includes surveillance capsule removal and specimen mechanical testing/evaluation, radiation analysis, development of pressure-temperature operating limits, and determination of low-temperature overpressure protection setpoints. Withdrawn untested capsules placed in storage are maintained for future insertion. Monitoring methods are in accordance with 10 CFR 50, Appendix H. Fracture toughness is in accordance with 10 CFR 50, Appendix G. In addition, the program complies with Regulatory Guide 1.99 and ASTM E-185.

The Reactor Vessel Surveillance Program manages updates of pressure-temperature operating limitations and the surveillance specimen withdrawal schedule, as needed, consistent with plant Technical Specifications, the Pressure and Temperature Limits Report, and 10 CFR 50.60 and 10 CFR 50, Appendix H.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Reactor Vessel Surveillance Program is an existing program. It will be enhanced to be consistent with the recommendations of NUREG-1801, Chapter XI, Program XI.M31, Reactor Vessel Surveillance.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements are required to satisfy NUREG-1801 aging management program recommendations. Enhancements will be implemented prior to the period of extended operation.

- Scope of Program

  A requirement will be added to the program to ensure that all withdrawn and tested surveillance capsules, not discarded as of August 31, 2000, are placed in storage for possible future reconstitution and use.

- Parameters Monitored/Inspected

  A requirement will be added to the program to ensure that in the event spare capsules are withdrawn, the untested capsules are placed in storage and maintained for future insertion.

Operating Experience

A review of operating experience for the Reactor Vessel Surveillance Program identified no adverse trends or issues with program performance. The Reactor Vessel Surveillance Program has been effective in monitoring and evaluating vessel material aging effects due to neutron irradiation embrittlement.

Maximum reactor vessel fluence has been projected to the end of the period of extended operation, or 54 EFPY, based on a 90% capacity factor. Upper-shelf energy projections indicate that all vessel beltline materials will maintain projected upper-shelf energy values greater than 50 ft-lbs up to 54 EFPY. The PTS reference temperatures (RT_{PTS}) are projected to be below the screening criteria of 270°F for longitudinal welds, plates and forgings and 300°F for circumferential welds for the beltline materials at 54 EFPY.

Conclusion

The Reactor Vessel Surveillance Program is an existing program which manages the reduction of fracture toughness due to neutron embrittlement of the low alloy steel reactor vessels. The program complies with the requirements of 10 CFR 50.60, 10 CFR 50.61, 10 CFR 50, Appendices G and H, Regulatory Guide 1.99 and ASTM E-185.

Implementation of the Reactor Vessel Surveillance Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

B2.1.35 RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program

Program Description

The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program manages aging effects in water-control structures and components,

including bolting, through periodic visual inspections and hydrographic surveys. The program addresses age-related degradation as well as degradation due to extreme environmental conditions and the effects of natural phenomena. Program elements include guidance on inspection scope, aids to facilitate the inspection process, criteria used to evaluate the inspection results, guidance on inspection frequency, and documentation requirements. Structures included within the scope of the program are the Screenhouse, Emergency Cooling Water Intake (crib), Intake Canal, and Approach Canal. Periodic inspection and monitoring activities are performed to ensure water-control structures remain capable of performing their intended function through early detection and timely correction of degraded conditions prior to loss of any intended function.

This program does not constitute a commitment to the guidance of NRC RG 1.127. RG 1.127 focuses on dams, reservoirs behind those dams, and dam safety and outlet works that deliver cooling water from reservoirs and spill excess water to prevent dam overtopping. These components are not within the scope of License Renewal at PINGP. However, the program considers the guidance in NRC RG 1.127 and ACI 349.3R-96 if it is necessary to evaluate degradation mechanisms and questionable concrete conditions.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program is an existing program. It will be enhanced to be consistent with the recommendations of NUREG-1801, Chapter XI, Program XI.S7, RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements are required to satisfy NUREG-1801 aging management program recommendations. Enhancements will be implemented prior to the period of extended operation.

- Scope of Program

  The scope of the program will be enhanced to add inspections of concrete and steel components that are below the water line at the Screenhouse and Intake Canal. The scope will also be enhanced to require inspections of the Approach Canal, Intake Canal, Emergency Cooling Water Intake, and Screenhouse immediately following

extreme environmental conditions or natural phenomena including an earthquake, flood, tornado, severe thunderstorm, or high winds.

- Parameters Monitored/Inspected

  The program parameters inspected will be enhanced to include an inspection of water-control concrete components that are below the water line for cavitation and erosion degradation. The program will also be enhanced to visually inspect for damage such as cracking, settlement, movement, broken bolted and welded connections, buckling, and other degraded conditions following extreme environmental conditions or natural phenomena

Operating Experience

A review of operating experience related to the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program indicates the program has been effective in ensuring that structures or components remain capable of performing their intended function. Issues have been identified, and corrective actions taken, for minor degradation of items such as gasket materials, grout and bolting. As an example, during an inspection of the Screenhouse in 1997, minor calcium deposits, a concrete spall, and minor wall cracks were observed. The spall was repaired and the calcium deposit and cracks were determined to be non-active and not a structural concern.

Conclusion

The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program is an existing program that monitors the condition of water-control structures and components, including bolting.

Implementation of the enhanced RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this program will continue to perform their intended functions during the period of extended operation.

B2.1.36 Selective Leaching of Materials Program

Program Description

The Selective Leaching of Materials Program ensures the integrity of components in scope of License Renewal which may be subject to selective leaching. The program performs a one-time visual inspection in conjunction with a hardness measurement, or other suitable detection technique, of selected components made of cast iron, copper

alloys >15% zinc, and copper-nickel, in environments conducive to selective leaching. Through inspections of representative samples, the program will determine if selective leaching is occurring and, if found, whether the aging mechanism will affect the ability of the component to perform its intended function.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Selective Leaching of Materials Program is a new program. It will be consistent, with exceptions, to the recommendations of NUREG-1801, Chapter XI, Program XI.M33, Selective Leaching of Materials.

Exceptions to NUREG-1801

Program Elements Affected

- Scope of Program, Parameters Monitored/Inspected, Detection of Aging Effects

  Alternative detection techniques may be used instead of, or in addition to, visual inspection and hardness testing for the detection of selective leaching. NUREG-1801 specifies use of only visual inspection and hardness testing. Visual inspection and hardness measurement may not be feasible due to component configuration and location. In addition, other available detection techniques (e.g., mechanical scraping, chipping), and additional examination methods that become available to the nuclear industry, may be shown to be at least as effective as visual inspection and hardness testing in detecting and assessing the extent of selective leaching.

Enhancements

None

Operating Experience

The Selective Leaching of Materials Program is a new program to be implemented prior to the period of extended operation and, therefore, has no operating experience related to program implementation. A search of plant operating experience did not reveal any instances of selective leaching having been documented at PINGP in the past. For implementation of this program, however, available plant and industry operating experience will be used to establish sample size, inspection locations, and inspection techniques.

Conclusion

The Selective Leaching of Materials Program is a new program which performs a one-time visual inspection and hardness test, or other suitable detection technique, on selected components that may be susceptible to selective leaching. The one-time examinations will determine whether loss of material due to selective leaching is occurring, and, if found, whether the aging mechanism will affect the ability of the components to perform their intended function(s) for the period of extended operation.

Implementation of the Selective Leaching of Materials Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

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

B2.1.37 Steam Generator Tube Integrity Program

Program Description

The Steam Generator Tube Integrity Program consists of activities that manage the aging effects cracking, denting, ligament cracking, and loss of material for steam generator tubes, tube plugs, tube repairs, and various secondary side internal components. The Steam Generator Tube Integrity Program is implemented in accordance with Technical Specifications Section 5.5.8 and applicable industry guidance to maintain the integrity of the steam generators. The program manages aging effects through a balance of prevention, inspection, evaluation, repair, and leakage monitoring. Eddy current testing is used to detect steam generator tube flaws and degradation. Visual examinations are conducted on tube plugs, sleeve plugs, and sleeves as necessary. In addition, visual inspections are performed to identify degradation of secondary side steam generator internal components.

The plant Technical Specifications assure timely assessment of tube integrity and compliance with primary-to-secondary leakage limits. Technical Specifications specify steam generator inspection scope, frequency, and acceptance criteria for the plugging and repair of flawed tubes. In addition, the Technical Specifications identify approved tube repair methods. Prairie Island Technical Specifications provide alternate repair criteria for Unit 2 steam generator degradation management.

The Steam Generator Tube Integrity Program follows the guidelines contained in the latest revision of EPRI “PWR Steam Generator Examination Guidelines” which provide criteria for the qualification of personnel, specific techniques, and the associated acquisition and analysis of data, including procedures, probe selection, analysis

protocols, and reporting criteria. The program also incorporates the guidance of NEI 97-06, “Steam Generator Program Guidelines,” for performance criteria which pertains to structural integrity, accident-induced leakage, and operational leakage. The program also includes guidance on assessment of degradation mechanisms, inspection, tube integrity assessment, maintenance, plugging, repair, and leakage monitoring, as well as procedures for monitoring and controlling secondary side and primary side water chemistry.

In response to Generic Letter 97-06, PINGP outlined the program in place to detect degradation of steam generator internals and a description of the inspection plans, including the inspection scope, frequency, methods, and equipment. The program demonstrated that the steam generator internals were in compliance with the plant’s current licensing basis.

The Technical Specifications, including alternate repair criteria for Unit 2 steam generator degradation management, PINGP’s response to Generic Letter 97-06, and PINGP’s commitment to implement the Steam Generator Program Guidelines as described in NEI 97-06, ensure the Steam Generator Tube Integrity Program is effective for maintaining the intended function of the steam generators including tubes, tube plugs or other tube repairs, and various secondary side tube supports.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Steam Generator Tube Integrity Program is an existing program. It is consistent, with exception, to the recommendations of NUREG-1801, Chapter XI, Program XI.M19, Steam Generator Tube Integrity.

Exceptions to NUREG-1801

Program Elements Affected

- Scope of Program

  The Steam Generator Tube Integrity Program incorporates the guidance of NEI 97-06, Revision 2, “Steam Generator Program Guidelines.” NUREG-1801 refers to Revision 1 of NEI 97-06. This is considered an exception to NUREG-1801. NEI 97-06 Revision 2 is consistent with Technical Specification Task Force Standard Technical Specification Change Traveler, TSTF-449, “Steam Generator Tube Integrity,” Revision 4, and incorporates additional changes developed by the industry as part of a continuing effort to improve steam generator program guidance. Therefore, the use of Revision 2 of NEI 97-06 is considered acceptable.

Enhancements

None

Operating Experience

A review of operating experience related to the Steam Generator Tube Integrity Program indicates the program has been effective in ensuring the timely detection and correction of steam generator aging effects such as loss of material, cracking, ligament cracking, and denting. The program utilizes operating experience to promote the identification and transfer of lessons learned from both internal and industry events so that the knowledge gained can be used to improve nuclear plant safety and operations.

The Steam Generator Tube Integrity Program has evolved to include improvements in programmatic features, such as non-destructive examination, primary-to-secondary leakage monitoring, and degradation-specific management. Recognizing the importance of steam generators to safe plant operations, NEI 97-06 provides a framework for a comprehensive Steam Generator Tube Integrity Program. PINGP has evaluated its existing Steam Generator Tube Integrity Program against NEI 97-06, and, where necessary, revised and strengthened the program attributes to meet the intent of the guidance. The industry, working through EPRI, has also strengthened their Steam Generator Tube Integrity Programs with aggressive improvements in control of secondary side water chemistry and upgrades in secondary side equipment, thus essentially eliminating both wastage and denting.

In accordance with NEI 97-06, the PINGP Steam Generator Tube Integrity Program conducts a condition monitoring assessment to assess the “As Found” condition of the steam generator tubing relative to structural integrity and leakage integrity criteria. The evaluation is performed to confirm that adequate tube integrity has been maintained since the previous inspection. This assessment is conducted during each outage during which the steam generator tubes are inspected, plugged, or repaired to confirm that the performance criteria are being met. Following each steam generator tube inspection, an operational assessment is conducted to confirm that adequate tube integrity will be maintained for the operating interval between inspections. A comparison of the latest condition monitoring results is made to the previous cycle's operational assessment prediction. If the comparison shows that the operational assessment did not bound the latest condition monitoring results, then corrective action is initiated to identify the cause and adjust the new operational assessment as necessary.

Conclusion

The Steam Generator Tube Integrity Program is an existing program that maintains the integrity of the steam generators by managing the effects of aging in steam generator tubes, tube plugs, tube repairs, and various steam generator secondary side internal components. The program manages aging effects through a balance of prevention, inspection, evaluation, repair, and leakage monitoring measures.

Implementation of the Steam Generator Tube Integrity Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

B2.1.38 Structures Monitoring Program

Program Description

The Structures Monitoring Program is a condition monitoring program that manages aging effects in structures, supports and structural components, including bolting, within the scope of License Renewal. The Structures Monitoring Program is a sub-element of the Maintenance Rule Program, which implements current industry guidance (e.g., NUMARC 93-01, “Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants”) as endorsed by NRC Regulatory Guides 1.160 “Monitoring the Effectiveness of Maintenance at Nuclear Power Plants,” and 1.182, “Assessing and Managing Risk before Maintenance Activities at Nuclear Power Plants.” The program performs periodic visual inspections to monitor the condition of structures, supports and components, including bolting, against established acceptance criteria to ensure that degraded conditions are identified, evaluated, and, when necessary, corrected such that there is no loss of intended function.

The program incorporates inspection guidance based on recommendations contained in ACI 349.3R, “Evaluation of Existing Nuclear Safety-Related Concrete Structures.”

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Structures Monitoring Program is an existing program. It will be enhanced to be consistent with the recommendations of NUREG-1801, Chapter XI, Program XI.S6, Structures Monitoring Program.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements are required to satisfy NUREG-1801 aging management program recommendations. Enhancements will be implemented prior to the period of extended operation.

- Scope of Program

  The program will be enhanced to add the following structures, components, and component supports to the scope of the inspections:

  a. Approach Canal

  b. Fuel Oil Transfer House

  c. Old Administration Building and Administration Building Addition

  d. Component supports for cable tray, conduit, cable, tubing tray, tubing, non-ASME vessels, exchangers, pumps, valves, piping, mirror insulation, non-ASME valves, cabinets, panels, racks, equipment enclosures, junction boxes, bus ducts, breakers, transformers, instruments, diesel equipment, housings for HVAC fans, louvers and dampers, HVAC ducts, vibration isolation elements for diesel equipment, and miscellaneous electrical and mechanical equipment items

  e. Miscellaneous electrical equipment and instrumentation enclosures including cable tray, conduit, wireway, tube tray, cabinets, panels, racks, equipment enclosures, junction boxes, breaker housings, transformer housings, lighting fixtures, and metal bus enclosure assemblies

  f. Miscellaneous mechanical equipment enclosures including housings for HVAC fans, louvers, and dampers

  g. SBO Yard Structures and components including SBO cable vault and bus duct enclosures.

  h. Fire Protection System hydrant houses

  i. Caulking, sealant and elastomer materials

  j. Non-safety related masonry walls that support equipment relied upon to perform a function that demonstrates compliance with a regulated event(s).

- Parameters Monitored/Inspected

  The program will be enhanced to include additional inspection parameters.

- Detection of Aging Effects

  The program will be enhanced to require an inspection frequency of once every five (5) years for the inspection of structures and structural components within the scope of the program. The frequency of inspections can be adjusted, if necessary, to allow for early detection and timely correction of negative trends.

  The program will be enhanced to require periodic sampling of groundwater and river water chemistries to ensure they remain non-aggressive.

Operating Experience

A review of operating experience indicates that the Structures Monitoring Program has been effective in maintaining plant structures and structural components. Aging effects, such as minor examples of leakage, corrosion, and concrete degradation, have been identified, evaluated, and managed effectively, ensuring that structures and components remain capable of performing their intended functions.

The review of operating experience indicates that the Structures Monitoring Program is effective in monitoring and detecting degradation and taking effective corrective actions as needed when acceptance criteria are not met.

Conclusion

The Structures Monitoring Program is an existing program that monitors the condition of structures, supports and structural components, including bolting, through periodic visual inspections.

Implementation of the enhanced Structures Monitoring Program provides reasonable assurance that aging effects will be managed effectively such that structures and components within the scope of this program will continue to perform their intended functions during the period of extended operation.

B2.1.39 Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) Program

Program Description

The Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) Program manages loss of fracture toughness due to thermal aging embrittlement of CASS components, other than pump casings and valve bodies, that are exposed to reactor coolant operating temperatures. The program determines the susceptibility of CASS components to loss of fracture toughness due to thermal aging embrittlement based on the casting method, molybdenum content, and percent ferrite. For components determined to be potentially susceptible to thermal aging embrittlement, the program

provides for enhanced volumetric examinations or component-specific flaw tolerance evaluations. The program augments the PINGP ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program.

The CASS pump casings and valve bodies are excluded from screening for susceptibility to thermal aging based on the assessment documented in the letter dated May 19, 2000, from Christopher Grimes, Nuclear Regulatory Commission (NRC), to Douglas Walters, Nuclear Energy Institute (NEI), “Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Components” (ADAMS Accession number ML003717179). The CASS pump casings and valve bodies are adequately addressed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program requirements.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) Program is a new program. It will be consistent with the recommendations of NUREG-1801, Chapter XI, Program XI.M12, Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS).

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Program is a new program to be implemented prior to the period of extended operation, and therefore, has no operating experience related to program implementation.

Conclusion

The Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) Program is a new program that augments the PINGP ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program. This program determines the susceptibility to thermal aging embrittlement of cast austenitic stainless steel components exposed to reactor coolant operating temperatures. For components determined to be potentially susceptible to thermal aging embrittlement, the program provides for enhanced volumetric examinations or component-specific flaw tolerance evaluations.

Implementation of the Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Program will provide reasonable assurance that aging effects will be managed such that the CASS components within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

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

B2.1.40 Water Chemistry Program

Program Description

The Water Chemistry Program manages aging effects by controlling the internal environment of systems and components. The program mitigates corrosion, stress corrosion cracking (SCC) and heat transfer degradation due to fouling in the primary, auxiliary (borated), and secondary water systems included in the scope of the program. Aging effects are managed by controlling concentrations of known detrimental chemical species such as chlorides, fluorides, sulfates and dissolved oxygen below the levels known to cause degradation. The program includes specifications for chemical species, sampling and analysis frequencies, and corrective actions for control of water chemistry. This program conforms to both the EPRI “PWR Primary Water Chemistry Guidelines” and the EPRI “PWR Secondary Water Chemistry Guidelines.”

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Water Chemistry Program is an existing program. It will be enhanced to be consistent, with exceptions, to the recommendations of NUREG-1801, Chapter XI, Program XI.M2, Water Chemistry.

Exceptions to NUREG-1801

Program Elements Affected

- Parameters Monitored/Inspected

  Feedwater samples are not monitored for total copper as PINGP is an all-ferrous plant with no copper sources.

- Acceptance Criteria

  Primary water (reactor coolant) dissolved oxygen Action Level limits are consistent with the PINGP Technical Requirements Manual, but above the corresponding recommended EPRI guideline limits. However, typical plant oxygen levels are well below EPRI Action Level limits, and hydrogen levels are maintained in the reactor coolant to mitigate oxidizing effects due to radiolysis or oxygen ingress.

Feedwater hydrazine levels during heatup, hot shutdown, and startup (Modes 2, 3, and 4) are maintained greater than 100 ppb, which is higher and more conservative than the 20 ppb required by the EPRI guidance to control the input of oxygen by feedwater.

Enhancements

The following enhancement is required to satisfy NUREG-1801 aging management program recommendations. The enhancement will be implemented prior to the period of extended operation.

- Monitoring and Trending

  The program will be enhanced to require increased sampling to be performed as needed to confirm the effectiveness of corrective actions taken to address an abnormal chemistry condition.

Operating Experience

A review of operating experience for the Water Chemistry Program identified no adverse trends or issues with program performance. Some instances have occurred where chemistry parameters did not meet limits. The plant has taken timely and effective corrective action in these cases to resolve the abnormal conditions. Many of these conditions were the result of equipment or plant transient conditions (e.g., plant startup), and were resolved once the transient condition subsided. The time durations of these conditions were typically short, and no evidence of detrimental equipment impacts could be found. No examples of component functional failures due to corrosion, cracking, or heat transfer degradation resulting from inadequate chemistry control were identified.

Industry experience related to cracking in the primary systems and cracking and corrosion in the secondary systems have been addressed by component replacements with less susceptible materials, continued reviews of industry experience, and adoption of the latest EPRI water chemistry guidelines. When cracking was identified in the primary systems (e.g., safety injection accumulator stainless steel cladding cracks) actions were taken to expand the inspection areas, perform metallurgical evaluations, repair as needed, and continue to follow the latest available primary water chemistry control guidelines.

With the exception of the Unit 1 chemistry performance index, no adverse trends in water chemistry were identified by review of recent sampling results. The Unit 1 chemistry performance index had been demonstrating an adverse trend due to higher than desired sulfate levels. This issue was documented in the site Corrective Action Program, a troubleshooting plan was prepared and implemented, and the source of the sulfate was

identified (main condenser tube leakage). Actions were taken to identify and correct the specific location of the leakage through a scheduled plant down power to access the main condenser tubes for testing and repair. The chemistry performance index was restored to an acceptable value.

The Water Chemistry Program effectively monitors the condition of the pressure retaining components included in the scope of the program and ensures aging effects are acceptably managed. The review of operating experience indicates the Water Chemistry Program is effective in monitoring and detecting degradation and taking effective corrective actions as needed when acceptance criteria are not met.

Conclusion

The Water Chemistry Program is an existing program that manages aging effects by controlling concentrations of known detrimental chemical species such as chlorides, fluorides, sulfates and dissolved oxygen below levels known to cause degradation. The program has been effective in controlling plant chemistry and taking required actions to address out-of-specification values.

Implementation of the enhanced Water Chemistry Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this program will continue to perform their intended function(s) during the period of extended operation.

B3.0 Time-Limited Aging Analyses Aging Management Programs

B3.1 Environmental Qualification (EQ) of Electrical Components Program

Program Description

The Environmental Qualification (EQ) of Electrical Components Program (EQ Program) implements the requirements of 10 CFR 50.49, (as further defined and clarified by the DOR Guidelines and NUREG-0588), and the guidance provided in Regulatory Guide 1.89, "Environmental Qualification of Certain Electrical Equipment Important to Safety for Nuclear Plants," Revision 1. The EQ Program has been established to demonstrate that certain electrical components located in harsh plant environments are qualified to perform their safety functions in those harsh environments, consistent with 10 CFR 50.49 requirements. The EQ Program manages component thermal, radiation, and cyclical 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 to be refurbished or replaced, or have their qualification extended by reanalysis, prior to reaching the aging limits established in the evaluation.

Aging evaluations for EQ components that specify a qualification of at least 40 years are considered TLAAs. The EQ Program will manage the aging effects of the components addressed by the EQ TLAAs through the period of extended operation.

The reanalysis of an aging evaluation for the qualification of components under 10 CFR 50.49(e) is performed on an as-needed basis as part of the EQ Program. Reanalysis may be performed to extend the qualification through the refinement of previous methods or conservative environmental condition assumptions. Important attributes of the reanalysis of an aging evaluation include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, and corrective actions (if acceptance criteria are not met).

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Environmental Qualification (EQ) of Electrical Components Program is an existing program. It is consistent with the recommendations of NUREG-1801, Chapter X, Program X.E1, Environmental Qualification (EQ) of Electrical Components.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

A review of operating experience for the PINGP EQ Program identified no adverse trends or issues with program performance. Minor issues, such as improper splice configurations in the field differing from the tested configuration and normal temperature reference improvements, have been identified and corrected prior to causing any significant impact to safe operation or loss of intended functions.

Conclusion

The Environmental Qualification of Electrical Components Program is an existing program that implements the requirements of 10 CFR 50.49 to maintain the environmental qualification requirements for all EQ electrical equipment within the scope of the program.

Implementation of the Environmental Qualification of Electrical Components Program provides reasonable assurance that aging effects will be managed such that the electrical equipment within the scope of this program will continue to perform their intended functions during the period of extended operation.

B3.2 Metal Fatigue of Reactor Coolant Pressure Boundary Program

Program Description

The Metal Fatigue of Reactor Coolant Pressure Boundary Program monitors the thermal and pressure transients experienced by selected reactor coolant system pressure boundary components to ensure those components remain within their design fatigue usage limits. The program uses the systematic counting of plant transient cycles to ensure that design assumptions for cumulative transient cycles are not exceeded. The program also uses computerized cycle-based or stress-based monitoring methods to track fatigue usage in critical high-usage components. Locations monitored by the program include the six component locations for older vintage Westinghouse plants identified in NUREG/CR-6260 as representative locations for the effect of reactor coolant environment on component fatigue life.

The program ensures that cumulative fatigue usage of each affected primary system location is evaluated, and corrective actions taken if necessary, when the number or magnitude of accumulated thermal and pressure transients approach or exceed design cycle assumptions, or when the projected fatigue usage approaches a value of 1.0, during the life of the plant including the period of extended operation.

NUREG-1801 Consistency

The Prairie Island Nuclear Generating Plant Metal Fatigue of Reactor Coolant Pressure Boundary Program is an existing program. It will be enhanced to be consistent with the

recommendations of NUREG-1801, Chapter X, Program X.M1, Metal Fatigue of Reactor Coolant Pressure Boundary.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements are required to satisfy NUREG-1801 aging management program recommendations. Enhancements will be implemented prior to the period of extended operation.

- Scope of Program, Preventive Actions, Parameters Monitored/Inspected, Detection of Aging Effects, Monitoring and Trending

  The program will monitor the six component locations identified in NUREG/CR-6260 for older vintage Westinghouse plants, either by tracking the cumulative number of imposed stress cycles using cycle counting, or by tracking the cumulative fatigue usage, including the effects of coolant environment, using cycle-based or stress-based fatigue usage monitoring. The following locations will be monitored:

  NUREG/CR-6260 Location (Monitoring Type)

  Reactor Pressure Vessel Inlet and Outlet Nozzles (Cycle Counting)

  Reactor Pressure Vessel Shell to Lower Head (Cycle Counting)

  RCS Hot Leg Surge Line Nozzle (Stress-Based Fatigue Usage Monitoring)

  RCS Cold Leg Charging Nozzle (Stress-Based Fatigue Usage Monitoring)

  RCS Cold Leg Safety Injection Accumulator Nozzle (Cycle-Based Fatigue Usage Monitoring)

  RHR-to-Accumulator Piping Tee (Cycle-Based Fatigue Usage Monitoring)

  The program will implement stress-based fatigue usage monitoring for selected locations subject to pressurizer insurge/outsurge transients. The following locations will be monitored:

  Component Location

  RCS Hot Leg Surge Line Nozzle (also a NUREG/CR-6260 Location)

  Pressurizer Lower Head (Heater Penetrations)

  Pressurizer Surge Nozzle

  Pressurizer Surge Line Elbow

- Acceptance Criteria

  Program acceptance criteria will be clarified to require corrective action to be taken before a cumulative fatigue usage factor exceeds 1.0 or a design basis transient cycle limit is exceeded.

  Reactor internals baffle bolt fatigue transient limits of 1835 cycles of plant loading at 5% per minute and 1835 cycles of plant unloading at 5% per minute will be incorporated into the Metal Fatigue of Reactor Coolant Pressure Boundary Program and USAR Table 4.1-8 to conform to the baffle bolt fatigue limits discussed in LRA Section 4.3.1.2, Reactor Vessel Internals.

Operating Experience

A review of operating experience associated with the Metal Fatigue of Reactor Coolant Pressure Boundary Program has demonstrated that the program effectively monitors plant transients and tracks the accumulation of these transients. Industry experience has been factored into the program as appropriate, including evaluation of thermal/operating stresses that were not considered in the original design. Evaluation has been performed for NRC Bulletin 88-11, “Pressurizer Surge Line Thermal Stratification,” and is in progress for EPRI MRP-146, “Management of Thermal Fatigue in Normally Stagnant Non-Isolable RCS Branch Lines.”

In addition, plant-specific fatigue analyses that include environmental effects were performed for the six component locations in older vintage Westinghouse plants evaluated in NUREG/CR-6260, Section 5.5. The corresponding locations at PINGP are the reactor vessel inlet and outlet nozzles, reactor vessel shell and lower head, reactor coolant system hot leg surge line nozzle, reactor coolant piping charging nozzle, reactor coolant piping safety injection nozzle, and residual heat removal Class 1 piping tee (12-inch by 10-inch reducing tee). Three of these component locations were designed in accordance with B31.1.0 (charging nozzle, safety injection nozzle, and residual heat removal Class 1 piping tee) and did not have original design fatigue analyses. It was concluded that fatigue usage monitoring should be expanded to include the NUREG/CR-6260 locations not previously monitored by the cycle counting program.

Conclusion

The Metal Fatigue of Reactor Coolant Pressure Boundary Program is an existing program that 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 program has been effective in monitoring plant transients and corrective actions have been taken when design cycles have been approached and when design limits have been exceeded.

Implementation of the Metal Fatigue of Reactor Coolant Pressure Boundary Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this program will continue to perform their intended function(s) during the period of extended operation.