Xcel Energy®

Prairie Island Nuclear Generating Plant
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U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Director, Division of Spent Fuel Storage and Transportation
Office of Nuclear Material Safety and Safeguards
Washington, DC 20555-0001

Prairie Island Independent Spent Fuel Storage Installation
Docket No. 72-10
Materials License No. SNM-2506

Responses to Observations - Prairie Island Independent Spent Fuel Storage Installation (ISFSI) License Renewal Application (TAC No. L24592)

References:

1. Letter from Northern States Power Company, a Minnesota corporation, to the Nuclear Regulatory Commission, "Prairie Island Independent Spent Fuel Storage Installation (ISFSI) License Renewal Application," L-PI-11-074, dated October 20, 2011, ADAMS Accession Number ML11304A068.

2. Letter from Dr. P. Longmire (NRC) to M.A. Schimmel (NSPM), "Acceptance Review of Renewal Application to Materials License No. SNM-2506 for Prairie Island Independent Spent Fuel Storage Installation – Supplemental Information Needed (TAC No. L24592)," dated February 14, 2012, ADAMS Accession Number ML12046A157.

In Reference 1, Northern States Power Company, a Minnesota corporation, d/b/a Xcel Energy (hereafter "NSPM"), submitted a License Renewal Application (LRA) for renewal of the Prairie Island site-specific ISFSI license. In Reference 2, the U.S. Nuclear Regulatory Commission (NRC) Staff requested supplemental information to support its acceptance review of the NSPM application. This letter included several requests for supplemental information (RSI) and observations. As defined in Spent Fuel Storage and Transportation (SFST) Office Instruction SFST – 14, "Acceptance Review Process" (ML110450435), "observations" include questions identified by the NRC Staff during the acceptance review, which do not rise to the level of a RSI, but may require NRC staff to issue a request for additional information (RAI) during the detailed technical review. NSPM has chosen to provide responses to the observations detailed in Reference 2 to support NRC's review of Reference 1. NSPM's responses to the observations are provided in the enclosure to this letter.

If there are any questions or if additional information is needed, please contact Ms. Jennie Eckholt, NSPM Fleet Licensing Engineer, at 612-330-5788.

Summary of Commitments

This letter contains no new commitments and no revisions to existing commitments.

Mark A. Schimmel
Site Vice President, Prairie Island Nuclear Generating Plant
Northern States Power Company - Minnesota

Enclosure

cc: Administrator, Region III, USNRC
Director, Spent Fuel Project Office, USNRC
NMSS Project Manager, Prairie Island ISFSI, USNRC
NRR Project Manager, Prairie Island Nuclear Generating Plant (PINGP), USNRC
State of Minnesota
Senior Resident Inspector, PINGP, USNRC

UNITED STATES NUCLEAR REGULATORY COMMISSION

NORTHERN STATES POWER COMPANY - MINNESOTA

PRAIRIE ISLAND INDEPENDENT SPENT FUEL STORAGE INSTALLATION
DOCKET NO. 72-10

RESPONSE TO ACCEPTANCE REVIEW OBSERVATIONS

PRAIRIE ISLAND INDEPENDENT SPENT FUEL STORAGE INSTALLATION
LICENSE RENEWAL APPLICATION

The Northern States Power Company, a Minnesota corporation, d/b/a Xcel Energy, submits responses to the U.S. Nuclear Regulatory Commission's (NRC) observations to support the NRC Staff's review of the Prairie Island ISFSI License Renewal Application, as disclosed in the enclosure.

NORTHERN STATES POWER COMPANY - MINNESOTA

By _____
Mark A. Schimmel
Site Vice President, Prairie Island Nuclear Generating Plant
Northern States Power Company - Minnesota

State of MINNESOTA

County of DAKOTA

On this 26TH day of APRIL 2012 before me a notary public acting in said County, personally appeared Mark A. Schimmel, Site Vice President, Prairie Island Nuclear Generating Plant, and being first duly sworn acknowledged that he is authorized to execute this document on behalf of NSPM, that he knows the contents thereof, and that to the best of his knowledge, information, and belief the statements made in it are true.

_____

ELIZABETH A. MOENKEDICK
NOTARY PUBLIC - MINNESOTA
My Commission Expires Jan. 31, 2015

ENCLOSURE

RESPONSES TO OBSERVATIONS

13 Pages Follow

PRAIRIE ISLAND
APPLICATION FOR RENEWAL OF THE
INDEPENDENT SPENT FUEL STORAGE MATERIALS LICENSE

This enclosure includes responses from the Northern States Power Company, a Minnesota corporation (NSPM), to observations documented by the U.S. Nuclear Regulatory Commission (NRC) during the acceptance review of the Prairie Island site-specific Independent Spent Fuel Storage Installation (ISFSI) License Renewal Application (LRA).

These observations are associated with NSPM's LRA submitted on October 20, 2011 (Reference 1) which requested that the Materials License SNM-2506 be extended an additional 40 years. The observations were included in a letter from the NRC, dated February 14, 2012 (Reference 2).

This Enclosure quotes each observation in italics and each observation is followed by the NSPM response. Referenced documents are identified at the end of this enclosure.

Observation O-1:

Demonstrate the condition of the high burnup fuel in dry cask storage for the length of time the high burnup fuel will be in storage in the proposed Prairie Island renewal period of 20 to 60 years.

Low burnup fuel was used in the DOE/Surry cask demonstration program (cited by the applicant). This demonstration program is not applicable to the storage of high burnup fuel for periods beyond 20 years of storage. To staff's knowledge, DOE and other entities have not yet engaged in additional demonstration programs for storage of high burnup fuel to acquire additional performance data that is commensurate with the previous DOE program that examined low burnup fuel that had been stored for 15 years. High burnup cladding may experience a ductile to brittle transition as it cools and result in larger uncertainties in its long-term physical state and fragility.

The applicant should consider potential approaches for adequate demonstration under the principles of Aging Management, to include (1) obtaining further data regarding the properties and behavior of high burnup cladding in storage beyond 20 years; or (2) commitments to limit the actual storage time of high burnup fuel during the renewal period; or (3) commitments to monitor and inspect the behavior of high burnup cladding integrity while in storage; and/or (4) strategies to detect and mitigate unexpected degradation during longer storage periods.

This information may be required to demonstrate compliance with required the cladding protection and ready-retrieval standards of 10 CFR 72.122(h)(5) and the criticality safety design requirements of 10 CFR 72.124(a) that are inherent in the current licensing basis for Prairie Island license, as well as clarifying the potential technical basis for the applicant's Environmental Report for the entire renewal period.

NSPM Response to O-1:

NSPM followed the guidance of NUREG-1927, "Standard Review Plan for Renewal of Spent Fuel Dry Cask Storage System Licenses and Certificates of Compliance," (Reference 4) to develop its license renewal application. Section 3.4.3 of NUREG-1927 titled, "Aging Management Activity," addresses the aging management activities for dry cask storage system (DCSS) interiors and fuel cladding. Since the DCSS interior and fuel cladding cannot reasonably be inspected, NUREG-1927 recommends the following for aging management of high burnup fuel: "The staff should assess whether the applicant has considered the most recent revision of ISG-11 [Interim Staff Guidance] and research results in this area, especially with respect to high-burnup fuel. Research into fuel performance in storage is ongoing. It is expected that the applicants would monitor these developments to ensure that they have identified potential degradation effects. There is presently no data regarding potential long-term degradation of high-burnup fuel cladding. Thus, the applicant should provide any new supporting data demonstrating high-burnup fuel performance during extended storage. As an example, should an applicant have the opportunity for a DCSS interior and cladding inspection, the licensee should report any inspection findings in its evaluations."

At the time of submittal of NSPM's license renewal application (Reference 1), NSPM was not aware of any new data on the performance of high burnup fuel during extended storage. Therefore, NSPM considered the most recent revision of ISG-11, Revision 3, "Cladding Considerations for the Transportation and Storage of Spent Fuel" (Reference 5) to determine whether or not high burnup fuel would be subjected to a degradation mechanism, as recommended by NUREG-1927. NSPM concluded in Section 3.3.3, "Aging Effects Requiring Management [for Spent Fuel Assemblies]" of Enclosure 3 in Reference 1 that the likelihood of this degradation mechanism occurring is minimized by limiting peak cladding temperature to less than 752°F, the temperature limit designated in ISG-11. This temperature limit, as described in Appendix A of ISG-11, is specified for normal conditions of storage and for short-term fuel loading and Part 72 storage operations (which includes drying, backfilling with inert gas, and transfer of the cask to the storage pad). Remaining below this temperature threshold will limit cladding hoop stresses and limit the amount of soluble hydrogen available to form radial hydrides. Based on the guidance provided in ISG-11, Revision 3, on cladding performance of high burnup fuel in dry storage, NSPM concluded that the high burnup spent fuel assemblies in the TN-40HT casks are not impacted by radial hydride formation for the period of extended operation.

NSPM followed the most recent NRC guidance from NUREG-1927 and ISG-11, Revision 3, to develop its license renewal application. NSPM continues to meet the guidance in NUREG-1927 by monitoring the industry for new data on high burnup fuel performance during extended storage. If this strategy is not adequate to address the NRC's concerns on high burnup fuel, then generic communication is needed to document the NRC's specific concerns, and to provide additional guidance to the industry on the recommended path forward.

Observation O-2:

Justify why the Pressure Monitoring System is not included with Systems, Structures and Components (SSCs) that are within the scope of the licensing renewal.

The operation of the ISFSI Pressure Monitoring System is necessary to detect any leakage from the cask lid assembly.

This information may be required to demonstrate compliance with required 10 CFR 72.122(h)(4).

NSPM Response to O-2:

NSPM did not include the Pressure Monitoring System as a System, Structure, or Component within the scope of license renewal because the system is not classified as Safety-Related or Important To Safety. The Prairie Island ISFSI Safety Analysis Report (SAR) Sections 4.5.4 and A4.5.4, *Protective Cover and Overpressure System,* state that the Pressure Monitoring System has no safety function. SAR Section 4.5.4 for the TN-40 cask design states "The protective cover and overpressure system serve no safety function..." SAR Section A4.5.4 for the TN-40HT cask design states "The weather cover and overpressure system serve no safety function and are thus classified as not important to safety."

NSPM also concluded that failure of the Pressure Monitoring System would not prevent fulfillment of a function that is important to safety. This conclusion is based on the analyses contained in SAR Section A7A.8.6, *Confinement Requirement for Hypothetical Accident Conditions.* These analyses show that all applicable dose acceptance criteria have been satisfied if the Pressure Monitoring System is not functioning properly. The analyses also consider the condition of a latent seal failure and the removal of the Pressure Monitoring System due to an accident. This analysis demonstrates that there is time to recover from the condition prior to exceeding the applicable dose acceptance criteria.

In addition, the Pressure Monitoring System is an active component and would not be subject to an Aging Management Review. An aging management review is required for structures and components that perform an intended function without moving parts or without a change in configuration or properties (i.e., it is passive) and that are not subject to replacement based on a qualified life or specified time period (i.e., it is long-lived). The instrumentation is considered an active component because it undergoes a change in configuration. Further, instrumentation is sensitive equipment and degradation of its pressure retaining boundary would be readily determinable by existing and continuous surveillance and testing, discussed in Section A2.5.2 of Enclosure 3 of Reference 1.

The Pressure Monitoring System is not classified as Safety-Related or Important To Safety, its failure does not prevent fulfillment of a function that is important to safety, and consequently is not within the scope of license renewal. If the Pressure Monitoring System was considered in-scope, an aging management review would not be required because the instrumentation in the system is an active component.

Observation O-3:

Justify seven-year inspection intervals under the ISFSI Inspection and Monitoring Activities Program.

Concrete damage to the ISFSI is monitored on a seven-year interval using ACI 349.3R acceptance criteria, but ACI 349.3R recommends a 5-year inspection interval for concrete.

This information may be required to demonstrate compliance with required 10 CFR 72.24(c)(4).

NSPM Response to O-3:

The inspection interval under the ISFSI Inspection and Monitoring Activities Program for the concrete pads and earthen berm is five years, as described in Section A2.4 of Appendix A, "Aging Management Program," in Enclosure 3 of Reference 1. NSPM changed the frequency of its Structures Monitoring Program inspection from a seven-year frequency to a five-year frequency in February 2011, as described on pages A-14 and A-15 of Enclosure 3 in Reference 1.

Observation O-4:

Provide a plan for servicing and responding to events from the ISFSI when the reactor site support is no longer available.

The additional 40-year life extension request for the dry storage system is beyond the renewed reactor license period. To what extent does the dry storage system rely on the reactor site support? What is the plan for maintaining and event recovery for the dry storage system at the decommissioned site?

NSPM Response to O-4:

According to the requirements of 10 CFR 50.54(bb), NSPM must submit written notification to the Commission for its review and preliminary approval of the program by which the licensee intends to manage and provide funding for the management of all irradiated fuel at the reactor following permanent cessation of operation of the reactor until title to the irradiated fuel and possession of the fuel is transferred to the Secretary of Energy for its ultimate disposal in a repository. NSPM is required to submit this plan within 2 years following the permanent cessation of operation of the reactor or 5 years before expiration of the reactor operating license, whichever comes first. As required by 10 CFR 50.54(bb),

NSPM will develop and submit a plan for the plant decommissioning, which will address the impacts to the ISFSI.

NSPM is seeking renewal of the ISFSI license on the basis of the existing ISFSI and plant programs that are currently in place. NSPM is obligated to keep these programs in place until the expiration of the PI ISFSI materials license, unless the NRC authorizes NSPM to change these programs via a license amendment or other regulatory process.

Observation O-5:

Evaluate whether or not the top nozzle anchors should be considered in the aging management review.

NSPM Response to O-5:

NSPM evaluated whether or not the top nozzle anchors should be considered in the aging management review, and determined that an aging management review of the top nozzle (also referred to as "upper nozzle") anchors for the Prairie Island ISFSI license renewal is appropriate.

The upper nozzle anchors are an alternate means of securing the upper nozzle to the guide tubes of the fuel assemblies that are susceptible to the top nozzle stress corrosion cracking phenomenon. The upper nozzle anchors have a structural support (SS) intended function. They are also made of stainless steel and are in an Air/Gas environment. Since the upper nozzle anchors are stainless steel in Air/Gas environment, there are no associated aging effects or mechanisms that require aging management activities. Updates to the Prairie Island ISFSI License Renewal Application (Reference 1) Table 2.4-3, *Intended Functions of Spent Fuel Assembly Subcomponents*, and Table 3.3-1, *AMR Results for Spent Fuel Assemblies,* are provided in Attachment 1.

Observation O-6:

Explain why NSPM identified no aging effects/mechanisms for subcomponents in air/gas environments.

NSPM Response to O-6:

NSPM utilized EPRI Report 1010639 "Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools," Revision 4, January 2006, to identify potential aging effects for the metallic subcomponents of the casks. Appendix D of that report discusses the identification of aging effects of components subjected to an Air/Gas environment and includes Table 4-1, which contains a summary of the potential aging effects of components in an Air/Gas environment. The table contains criteria that must be met (or present) in order for the applicable aging effect/mechanism to occur.

Excerpts from Table 4-1 of Appendix D of EPRI Report 1010639 for the metals applicable to the PI ISFSI cask metallic components are shown in the table below, titled "Excerpts from Table 4-1 of Appendix D of EPRI Report 1010639." The far right column of the table lists the mechanism applicability criteria that must be met in order for a specific aging effect/mechanism to occur. The Air/Gas environment at the PI ISFSI does not meet any of the applicability criteria in this table. Therefore, no aging effects/mechanisms are expected to occur.

The polymeric compounds that are used in the neutron shielding in the casks are exposed to an Air/Gas environment. These components are in a solid form and are encased by a metallic structure. Since these compounds are encased by a rigid structure, the aging effects/mechanisms, such as loss of form, embrittlement, cracking, or loss of elasticity, would not affect the intended function of the component. Therefore, no aging effects requiring management for the polymeric compounds were identified.

No aging effects/mechanisms were identified for the fuel cladding material based on satisfying the cladding temperature limit specified in ISG-11, as described in Section 3.3.3 of Enclosure 3 in Reference 1 and the response to Observation O-1 above.

Excerpts from Table 4-1 of Appendix D of EPRI Report 1010639

Material	Aging Effect / Mechanism	Mechanism Applicability Criteria
All Metals	Cracking / Hydrogen Embrittlement	1. H_2 environment *and* 2. RayChem Cryofit Couplings present
All Metals	Loss of Material / Pitting and/or Crevice Corrosion	1. Replacement gas for fluorocarbons (refrigerants) or halon (fire suppressants) used *and* 2. Replacement gas is corrosive
Aluminum and Aluminum Alloys	Loss of Material / Galvanic Corrosion	1. Gas is not dried air, N_2, CO_2, H_2, halon, or fluorocarbons *and* 2. Material is in contact with a more cathodic (noble) metal in the galvanic series, in the presence of an electrolyte Note: Moisture collected in crevices and other low points in air systems, and condensation, provide an electrolyte. Aggressive species (such as salt air) in air system intakes also provide an electrolyte.
	Loss of Material / MIC	1. Gas is not dried air, N_2, CO_2, H_2, halon, or fluorocarbons *and* 2. Component subject to wetted environment *and* 3. Potential source of MIC

Material	Aging Effect / Mechanism	Mechanism Applicability Criteria
	Loss of Material / Pitting and Crevice Corrosion	1. Gas is not dried air, N_2, CO_2, H_2, halon, or fluorocarbons *and* 2. Component subject to wetted environment *and* 3. A potential for concentrating contaminants exists
	Cracking / SCC	1. Gas is not dried air, N_2, CO_2, H_2, halon, or fluorocarbons *and* 2. Component subject to wetted environment *and* 3. A potential for concentrating contaminants exists *and* 4. Alloy with > 12% Zn or > 6% Mg
Carbon and Low-Alloy Steel *and* Cast Iron	Loss of Material / General Corrosion	1. Gas is not dried air, N_2, CO_2, H_2, halon, or fluorocarbons
	Loss of Material / Galvanic Corrosion	1. Gas is not dried air, N_2, CO_2, H_2, halon, or fluorocarbons *and* 2. Material in contact with a more cathodic (noble) metal in the galvanic series, in the presence of an electrolyte Note: Moisture collected in crevices and other low points in air systems, and condensation, provide an electrolyte. Aggressive species (such as salt air) in air system intakes also provide an electrolyte.
	Loss of Material / Pitting and/or Crevice Corrosion	1. Gas is not dried air, N_2, CO_2, H_2, halon, or fluorocarbons *and* 2. Component subject to a wetted Environment *and* 3. A potential for concentrating contaminants exists (e.g., due to alternate wetting and drying)
	Loss of Material / MIC	1. Gas is not dried air, N_2, CO_2, H_2, halon, or fluorocarbons *and* 2. Component subject to wetted environment *and* 3. Potential source of MIC
Stainless Steel and CASS *and* Nickel-Base Alloys	Loss of Material / Pitting and Crevice Corrosion	1. Gas is not dried air, N_2, CO_2, H_2, halon, or fluorocarbons *and* 2. Component subject to wetted environment *and* 3. A potential for concentrating contaminants exists
	Loss of Material / MIC	1. Gas is not dried air, N_2, CO_2, H_2, halon, or fluorocarbons *and* 2. Component subject to wetted environment *and* 3. Potential source of MIC

Material	Aging Effect / Mechanism	Mechanism Applicability Criteria
Stainless Steel and CASS	Cracking / SCC	1. Gas is not dried air, N_2, CO_2, H_2, halon, or fluorocarbons *and* 2. Component subject to wetted environment *and* 3. A potential for concentrating contaminants exists *and* 4. Temperature > 140°F

Observation O-7:

Equate the alarm setpoint for the interseal pressure monitoring system to leakage of helium through the metallic seals.

NSPM Response to O-7:

The alarm setpoint for the interseal monitoring system is equated to leakage of helium through the metallic seals in Sections A7A.8.4 and A7A.8.6.3 of the Prairie Island ISFSI Safety Analysis Report (SAR) for the TN-40HT cask design. SAR Section A7A.8.4, *Monitoring of System Confinement*, contains the analysis of the Over Pressure (OP) monitoring system for the TN-40HT cask design. This analysis shows the system's response over time to the maximum acceptable leakage rate of 1.0×10^{-5} ref-cc/sec and contains a graphical depiction of the results including a comparison to the minimum OP monitoring system alarm setpoint. Additional information equating the OP monitoring system alarm setpoint to leakage through the seals is also contained in SAR Section A7A.8.6.3, *Latent Seal Failure.* This section of the SAR contains an analysis of latent seal failures for the TN-40HT cask design and shows the estimated time to reach the OP monitoring system alarm setpoint, completely lose OP system pressure, and exceed 10 CFR 72.106(b) limits for various leak rates.

The original design and licensing basis for the TN-40 cask design did not include an analysis to equate the alarm setpoint to helium leakage through the metallic seals. However, an analysis that compares interseal pressure to helium leakage is contained in the TN-40 SAR Section 3.3.2.1, *Confinement Barriers and Systems.* This analysis includes graphical depictions of the monitoring system pressure for various test leak rates and was used to determine the allowed helium test leakage rate of 1.0×10^{-5} atm-cc/sec.

Observation O-8:

Describe the vent path for the build-up of gases in the radial neutron shield. Reference the applicable SAR sections.

NSPM Response to O-8:

The vent path for the build-up of gases in the radial neutron shield is through a pressure relief valve, which is described in the Prairie Island ISFSI Safety Analysis Report (SAR) Sections 3.2.5.4.4 and A3.2.5.4.4, *Outer Shell.* The valve has a 1 psi relief pressure.

Observation O-9:

Provide a summary of the Operations procedure for the daily alarm surveillance of the interseal pressure monitoring system. Also, provide details of any preventative maintenance of the equipment in the interseal pressure monitoring system.

NSPM Response to O-9:

Operations verifies twice daily that there are no alarms on the overpressure monitoring panel (satisfying the ISFSI Technical Specification Surveillance Requirement, SR 3.1.5.1) and that the interseal pressure for each cask is above 60 psig. Operations records the interseal pressure for each cask twice a week.

The annual calibration of the OP monitoring system (required by ISFSI Technical Specification Surveillance Requirement, SR 3.1.5.2) includes steps to check the transmitter, valve manifold, and fittings for helium leaks. It also checks that the interseal pressure for all the casks are within 4 psi of each other. If the interseal pressures are not within 4 psi, an Action Request is initiated in the NSPM Corrective Action Program to evaluate the condition.

The preventive maintenance replacement program requires that the OP monitoring system circuitry cards be replaced every 10 years. The cards were last replaced during the summer of 2011.

Observation O-10:

Ensure the results from the lead cask inspection performed this summer at the Prairie Island ISFSI are available to the NRC technical reviewers.

NSPM Response to O-10:

A copy of the ISFSI License Renewal Baseline Inspection Report, ILR-INSPECTION-01, Revision 0 was provided to the NRC in Enclosure 1 of Reference 3.

References

1. Letter from NSPM to the NRC, "Prairie Island Independent Spent Fuel Storage Installation (ISFSI) License Renewal Application," L-PI-11-074, dated October 20, 2011, ADAMS Accession Number ML11304A068.

2. Letter from Dr. P. Longmire (NRC) to M.A. Schimmel (NSPM), "Acceptance Review of Renewal Application to Materials License No. SNM-2506 for Prairie Island Independent Spent Fuel Storage Installation – Supplemental Information Needed (TAC No. L24592)," dated February 14, 2012, ADAMS Accession Number ML12046A157.

3. Letter from NSPM to the NRC, "Responses to Requests for Supplemental Information – Prairie Island Independent Spent Fuel Storage Installation (ISFSI) License Renewal Application (TAC No. L24592)," L-PI-12-008, dated February 29, 2012.

4. NUREG-1927, "Standard Review Plan for Renewal of Spent Fuel Dry Cask Storage System Licenses and Certificates of Compliance," March 2011.

5. NRC Interim Staff Guidance 11, "Cladding Considerations for the Transportation and Storage of Spent Fuel," Revision 3, November 17, 2003.

ATTACHMENT 1

UPDATED TABLES FOR THE PRAIRIE ISLAND ISFSI LRA

Table 2.4-3 - Intended Functions of Spent Fuel Assembly Subcomponents

Spent Fuel Assemblies	Intended Function				
Subcomponent	**CC**	**HT**	**PB**	**SH**	**SS**
Fuel Assembly Insert	**None**				
Fuel Pellet	**None**				
Fuel Rod Spring	**None**				
Fuel Cladding	X	X	X		X
Fuel Cladding End Plug	X	X	X		X
Guide Tube					X
Grid Assembly, Mid Fuel Assembly	X	X			X
Grid Assembly, Top & Bottom	X	X			X
Instrument Tube	**None**				
Bottom Nozzle					X
Upper Nozzle					X
Upper Nozzle Anchor					X
Nozzle Spring Set	**None**				

Table 3.3-1
AMR Results for Spent Fuel Assemblies

Subcomponent	Intended Function	Material	Environment[1]	Aging Effect	Aging Mechanism	Aging Management Activities
Fuel Cladding	CC, HT, PB, SS	Zirconium-Based Alloys	(I) Air/Gas	None	N/A	N/A
			(E) Air/Gas	None	N/A	N/A
Fuel Cladding End Plug	CC, HT, PB, SS	Zirconium-Based Alloys	(E) Air/Gas	None	N/A	N/A
Guide Tube	SS	Zirconium-Based Alloys	(I) Air/Gas	None	N/A	N/A
			(E) Air/Gas	None	N/A	N/A
Grid Assembly, Mid Fuel Assembly	CC, HT, SS	Zirconium-Based Alloys	(E) Air/Gas	None	N/A	N/A
Grid Assembly, Top & Bottom	CC, HT, SS	Nickel-Based Alloys	(E) Air/Gas	None	N/A	N/A
Bottom Nozzle	SS	Stainless Steel	(E) Air/Gas	None	N/A	N/A
Upper Nozzle	SS	Stainless Steel	(E) Air/Gas	None	N/A	N/A
Upper Nozzle Anchor	SS	Stainless Steel	(E) Air/Gas	None	N/A	N/A

[1] (I) refers to an internal environment and (E) refers to an external environment.