NUCLEAR ENERGY INSTITUTE

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Mr. Christopher I. Grimes
Chief, License Renewal and Standardization Branch
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20006

SUBJECT: Generic Aging Lessons Learned Report Comments

PROJECT NUMBER: 690

Dear Mr. Grimes:

Enclosed are comments on Generic Aging Lessons Learned (GALL) Report Chapter VII Sections A1 and A2. The enclosure includes three documents. One document is a mark-up of the existing GALL pages to reflect our comments. Each comment is identified by number. The second document is a table containing our comments, numbered consistent with the marked-up pages. The third document is a clean copy of the GALL pages to reflect how GALL reads with our comments incorporated.

We look forward to discussing the enclosed comments with the NRC staff. Please contact me to establish a meeting date.

Sincerely,

Douglas J. Walters

Douglas J. Walters

Enclosures

c: Mr. Sam Lee
Mr. P.T.Kuo

D042

A1. New Fuel Storage

A1 New Fuel Storage

A1.1 New Fuel Rack

A1.1.1 New Fuel Rack Assembly

A1. New Fuel Storage

System, Structures, and Components

The system, structures, and components included in this table comprise the new fuel storage which contains carbon steel new fuel storage racks located in the auxiliary building. The racks are exposed to temperature and humidity conditions of the auxiliary building. The racks are generally painted with protecting coating. Based on US Nuclear Regulatory Commission Regulatory Guide 1.26, "Quality Group Classifications and Standards for Water, Steam, and Radioactive-Waste-Containing Components of Nuclear Power Plants," all components in the new fuel storage are classified as Group C Quality Standards.

System Interfaces

No other systems contained in this report interface with the new fuel storage.

or the fuel handling building

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Stainless steel storage racks are not included in the table because the do not have any aging effect requiring management

2

VII AUXILIARY SYSTEMS

A1. NEW FUEL STORAGE

Item	Structure and Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
A1.1.1	New Fuel Rack	New Fuel Rack Assembly	Carbon Steel	Indoors: Exposed to temperature and humidity conditions inside the Auxiliary Building ~~and~~ Fuel Handling Building	Loss of Material	General ~~Corrosion, Coating Degradation~~ 4	Plant Technical Specifications.
A1.1.1	New Fuel Rack	New Fuel Rack Assembly	Carbon Steel	Indoors: exposed to temperature and humidity conditions inside the ~~Auxiliary~~ Building ~~and~~ Fuel Handling Building 3	Local Loss of Material	Pitting Corrosion and Crevice ~~Corrosion, Coating Degradation~~ 4	Plant Technical Specifications.

VII AUXILIARY SYSTEMS
A1. NEW FUEL STORAGE

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
~~The component is generally painted~~ with a protective coating. The applicable AMP should rely on periodic plant system walkdowns and plant maintenance procedures. The system walkdowns should require visual inspection for degraded protective coating and reporting the walkdown results. Periodic walkdowns should be performed such as before, during, and after outages. When degradation of the protective coating is found, the plant maintenance procedures for paint and protective coating and the QA procedures, should require a review and evaluation of the walkdown findings. Corrective actions should be initiated as necessary.~~**.**~~**~~ Plant-specific program required	~~***(1) Scope of Program:*** The applicable AMP should rely on~~ periodic plant system walkdowns and plant maintenance procedures to monitor the effects of general corrosion on the intended function of the new fuel storage component. ***(2) Preventive Actions:*** Paint or coating prevents corrosion by protecting the external surfaces of the component from environmental exposure. ***(3) Parameters Monitored/Inspected:*** Plant system walkdowns should be performed to monitor coating degradation, which is a condition directly related to potential loss of material due to corrosion. ***(4) Detection of Aging Effects:*** Degradation of the exterior carbon steel surfaces cannot occur without degradation of paint or coating, inspection and confirmation that the paint or coating is intact is an effective method to ensure that corrosion on external surfaces of the component has not occurred and the intended function of the component is maintained. ~~***(5) Monitoring and Trending:*** The effects of corrosion are~~ detectable by visual techniques and, based on operating experience, plant system walkdowns during each outage should provide for timely detection of aging effects. ***(6) Acceptance Criteria:*** Any coating degradation should be reported and require further evaluation. ***(7-9) Corrective Actions, Confirmation Process, and Administrative Controls:*** Site corrective actions program, QA procedures, site review and approval process, and administrative controls are implemented in accordance with Appendix B to 10 CFR Part 50 requirements and will continue to be adequate for license renewal. ***(10) Operating Experience:*** No major corrosion-related problems have been reported ~~for the new fuel rack assembly~~.	Yes, no generic AMP
~~*Same as for General Corrosion of Item A1. 1.1 New Fuel Rack Assembly.*~~ Plant-specific program required	~~*Same as for General Corrosion of Item A1.1.1 New Fuel Rack Assembly.*~~	Yes, no generic AMP

AeL comments are #5

A2. Spent Fuel Storage

A2.1 Spent Fuel Storage Rack

A2.1.1 Neutron-Absorbing Sheets

A2. Spent Fuel Storage

System, Structures, and Components

The system, structures, and components included in this table comprise the pressurized water reactor (PWR) spent fuel storage. The PWR spent fuel storage contains stainless steel spent fuel storage racks and Boraflex sheets (if used) submerged in a chemically treated borated water. The intended function of the spent fuel rack is to separate spent fuel assemblies. Boraflex sheets fastened to the storage cells provide for neutron absorption and help maintain subcriticality of spent fuel assemblies in the spent fuel pool. Based on US Nuclear Regulatory Commission Regulatory Guide 1.26, "Quality Group Classifications and Standards for Water, Steam, and Radioactive-Waste-Containing Components of Nuclear Power Plants," all components in the spent fuel storage are classified as Group C Quality Standards.

System Interfaces

No other systems contained in this report interfaces with the PWR spent fuel storage.

VII AUXILIARY SYSTEMS
A2. SPENT FUEL STORAGE

Item	Structure and Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
A2.1.1	Spent Fuel Storage Racks	Neutron-Absorbing Sheets	Boraflex	~~Immersed in Chemically~~ Treated Borated Water	Loss of Boron Carbide Material; Reduction of Neutron-Absorbing Capacity; Gap Formation due to Shrinkage of Boraflex Panels	~~Boraflex Degradation~~ Irradiation, Elevated Temperature	EPRI NP-6159. EPRI TR-101926. EPRI TR-103300. Plant Technical Specifications. Operating Experience NRC IN 87-43. NRC IN 93-70. NRC IN 95-38. NRC GL 96-04.

VII AUXILIARY SYSTEMS
A2. SPENT FUEL STORAGE

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
~~Generally, a Boraflex monitoring~~ program on the test coupons or the actual Boraflex panels, based on manufacturer's recommendations, should be implemented in the initial installation of the spent fuel racks to assure that no unexpected degradation of the Boraflex material would compromise the criticality analysis in support of the design of spent fuel storage racks. The applicable AMP, based on manufacturer's suggestion, is usually implemented by the plant technical specifications and relies on periodic inspection, testing, monitoring and analysis of the criticality design to assure that the required 5% subcriticality margin is maintained. The frequency of the inspection and testing should be about every 4-5 years based on the manufacturer's recommendation for a 40-year service life for the spent fuel racks. The AMP should include: (1) Visual inspection of the physical conditions of the sampling coupons for detecting degradation of the Boraflex material, such as discoloration and reduction of thickness. (2) Performing neutron attenuation testing called "blackness testing" to determine gap formation in Boraflex panels. (3) Sampling and analysis for silica levels in the spent fuel pool water and trending the results using the RACKLIFE code. (4) Measuring boron areal density by the BADGER device. (5) Corrective actions should be initiated if the test results found that the 5% subcriticality margin cannot be maintained because of the current or projected future Boraflex degradation. Plant-specific program required	***(1) Scope of Program:*** ~~The AMP should focus on managing~~ the effects of Boraflex material degradation (i.e., loss of boron carbide neutron absorber due to gradual degradation of polymer matrix in the release of silica from Boraflex following gamma irradiation and long-term exposure to the wet pool environment) on the intended function of the spent fuel racks to prevent criticality. ***(2) Preventive Actions:*** Periodic visual inspection of sampling coupons prevents unexpected degradation of the Boraflex material. ***(3) Parameters Monitored/Inspected:*** The parameters monitored should include physical conditions of the sample coupons such as thickness, discoloration, and hardness, which are conditions directly related degradation of the Boraflex material. Operating experience has shown that the degraded surfaces of the test coupons have a gray discoloration. When Boraflex is subjected to gamma radiation and long-term exposure to the spent fuel pool environment, the ply siloxane polymer matrix becomes degraded and silica filler and boron carbide are released. ~~NRC Information Notice (IN) 95-38 indicated~~ that the loss of boron carbide (washout) from Boraflex is characterized by slow dissolution of the silica from the surface of the Boraflex and a gradual thinning of the material. Visual inspection should be used to detect Boraflex degradation such as discoloration and reduction of thickness. In addition gap formation and decrease of areal boron density should be monitored. ***(4) Detection of Aging Effects:*** Because Boraflex contains about 25 percent silica, 25 percent polydimethyl soloxane polymer, and 50 percent boron carbide, sampling and analysis the presence of silica in the spent fuel pool provide an indication of depletion of boron carbide from Boraflex. The amount of boron carbide released from Boraflex should be correlated to the levels of silica present in the spent fuel pool. This is supplemented by direct measurement of boron loss using BADGER device. ***(5) Monitoring and Trending:*** The periodic inspection measurements and analysis should provide data for trending. ***(6) Acceptance Criteria:*** The 5% subcriticality margin of the spent fuel racks must be maintained for the period of license renewal. ***(7) Corrective Actions:*** Corrective actions should be initiated if the test results found that the 5% subcriticality margin cannot be maintained because of the current or projected future Boraflex degradation. These corrective actions may consist of providing additional neutron absorbing capacity by borated steel inserts. ***(8-9) Confirmation Process, and Administrative Controls:*** Site QA procedures, site review and approval process, and administrative controls are implemented in accordance with Appendix B to ~~10 CFR Part 50 requirements~~ and will continue to be adequate for license renewal. ***(10) Operating Experience:***	Yes, no generic AMP

All comments are #8

VII AUXILIARY SYSTEMS
A2. SPENT FUEL STORAGE

Item	Structure and Component	Region of Interest	Material	Environ-ment	Aging Effect	Aging Mechanism	References

VII AUXILIARY SYSTEMS
A2. SPENT FUEL STORAGE

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Plant-specific program required	~~(continue from previous page)~~ NRC IN 87-43 addressed the problems of development of tears and gaps (average 1-2 inches, with the largest 4 inches) in the Boraflex material due to gamma radiation-induced shrinkage of the material. IN 93-70, IN 95-38, and NRC Generic Letter (GL) 96-04 addressed several cases of significant degradation of Boraflex test coupons due to accelerated dissolution of the Boraflex caused by pool water flow through the panel enclosures and the high accumulated gamma dose. Two spent fuel rack cells with about 12-year service have only 40% of the Boraflex remained.	

A1. New Fuel Storage

A.1 New Fuel Storage

A1.1 New Fuel Rack

A.1.1.1 New Fuel Rack Assembly

A1. New Fuel Storage

Systems, Structures, and Components

The system, structures, and components included in this table comprise the new fuel storage which contains carbon steel new fuel storage racks located in the auxiliary building and the fuel handling building. Stainless steel storage racks are not included in the table because they do not have any aging effects that require management for license renewal. The racks are exposed to temperature and humidity conditions of the auxiliary building. The racks are generally painted with protecting coating. Based on US Nuclear Regulatory Commission Regulatory Guide 1.26, "Quality Group Classifications and Standards for Water, Steam, and Radioactive-Waste-Containing Components of Nuclear Power Plants," all components in the new fuel storage are classified as Group C Quality Standards.

System Interfaces

No other systems contained in this report interface with the new fuel storage.

VII. AUILIARY SYSTEMS

A1. NEW FUEL STORAGE

Item	Structure/ Component	Region of Interest	Material	Environ-ment	Aging Effect	Aging Mechanism	References
A.1.1.1	New Fuel Rack	New Fuel rack assembly	Carbon Steel	Indoors: Exposed to temper-ature and humidity conditions inside the Auxiliary Building or the Fuel Handling Building	Loss of Material	General Corrosion	Plant Technical Specifications
A.1.1.1	New Fuel rack	New Fuel rack assembly	Carbon Steel	Indoors: Exposed to temper-ature and humidity conditions inside the Auxiliary Building or the Fuel Handling Building	Loss of material	Pitting Corrosion and crevice corrosion	Plant Technical Specifications

VII. AUILIARY SYSTEMS

A1. NEW FUEL STORAGE

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Plant-specific program required	Plant-specific program required	Yes, no generic AMP
Plant-specific program required	Plant-specific program required	Yes, no generic AMP

A2. Spent Fuel Storage

A2.1 Spent Fuel Storage Rack

A2.1.1 Neutron-absorbing Sheets

A2. Spent fuel Storage

Systems, Structures, and Components

The system, structures, and components included in this table comprise the pressurized water reactor (PWR) spent fuel storage. The PWR spent fuel storage contains stainless steel spent fuel storage racks and Boraflex sheets (if used) submerged in chemically treated borated water. The intended function of the spent fuel rack is to separate spent fuel assemblies. Boraflex sheets fastened to the storage cells provide for neutron absorption and help maintain subcriticality of spent fuel assemblies in the spent fuel pool. Based on US Nuclear Regulatory Commission Regulatory Guide 1.26, "Quality Group Classifications and Standards for Water, Steam, and Radioactive-Waste-Containing Components of Nuclear Power Plants," all components in the spent fuel storage are classified as Group C Quality Standards.

System Interfaces

No other systems contained in this report interfaces with the PWR spent fuel storage.

VII. AUXILIARY SYSTEMS

A2. SPENT FUEL STORAGE

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
A2.1.1	Spent Fuel Storage Racks	Neutron Absorbing Sheets	Boraflex	Treated Borated Water	Loss of Boron carbide Material; Reduction of Neutron-Absorbing Capacity; Gap Formation due to Shrinkage of Boraflex Panels	Irradiation; Elevated Temperature	EPRI NP-6159 EPRI TR-101926 EPRI TR-103300 Plant Technical Specifications Operating experience NRC IN 87-43 NRC IN 93-70 NRC IN 95-38 NRC GL 96-04

VII. AUXILIARY SYSTEMS

A2. SPENT FUEL STORAGE

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Plant-specific program required	Plant-specific program required	Yes, no generic AMP

VII. AUXILIARY SYSTEMS

A2. SPENT FUEL STORAGE

Item	Structure/ Component	Region of Interest	Material	Environ-ment	Aging Effect	Aging Mechanism	References

VII. AUXILIARY SYSTEMS

A2. SPENT FUEL STORAGE

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation

GALL REPORT- CIVIL / STRUCTURAL DISCIPLINE COMMENTS
Sections VII A1 and A2

COMMENT NO.	GALL SECTION	ITEM NO.	PAGE	COMMENT
1	VII A1		General	It is not clear that new fuel racks are in the scope of license renewal.
2	VIIA1		VII A1-3	The introductory paragraph only addresses new fuel storage that is carbon steel. A statement should also be included that other material like stainless steel is not addressed because they have no aging effects.
3	VIIA1		VII A1-3 VII A1-4	The introductory paragraph states that the racks are located in the auxiliary building. It is possible that these racks are located in the fuel handling building.
4	VII A1	VII A1.1.1	VII A1-4	Delete Coating Degradation from the "Aging Mechanism" column. BASIS: Degradation of the coating does not in and of itself, result in loss of material. Coating degradation is not an aging mechanism.
5	VII A1	VII A1.1.1	VII A1-5	Since there is no generic aging management program we recommend eliminating the discussion the Existing Aging Management Program column and the Evaluation and Technical Basis column. In its place recommend merely stating that a plant-specific program is required.
6	VII A2	VII A2.1.1	VII A2-4	Environment should be Treated Borated Water
7	VII A2	VII A2.1.1	VII A2-4	Aging Mechanism should be Irradiation and Elevated Temperature
8	VII A 2	VII A2.1.1	VII A2-5 VII A2-7	Since there is no generic aging management program we recommend eliminating the discussion the Existing Aging Management Program column and the Evaluation and Technical Basis column. In its place recommend merely stating that a plant-specific program is required.