Entergy

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William F. Maguire
Site Vice President
River Bend Station

RBG-47830

February 15, 2018

Attn: Document Control Desk
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852-2738

SUBJECT: License Renewal Application Update – Neutron Absorbing Material Monitoring Program
River Bend Station, Unit 1
Docket No. 50-458
License No. NPF-47

References: 1) Entergy Letter: License Renewal Application (RBG-47735 dated May 25, 2017) (ML17153A282)

2) NRC Letter, "Summary of October 12, 2017, Meeting with Entergy Operations, Inc. on its Intent to Change Neutron Absorbers for the River Bend Station, Unit 1 Spent Fuel Pool," dated November 2, 2017 (ML17303A042)

3) NUREG-1801, "Generic Aging Lessons Learned (GALL) Report," Revision 2, December 2010 (ML103490041)

4) Nuclear Energy Institute (NEI) 16-03, "Guidance for Monitoring of Fixed Neutron Absorbers in Spent Fuel Pools," Revision 0, May 2017 (ML17263A133).

Dear Sir or Madam:

In Reference 1, Entergy Operations, Inc. (Entergy) submitted an application for renewal of the Operating License for River Bend Station (RBS) for an additional 20 years beyond the current expiration date. The license renewal application (LRA) credited the Boraflex Monitoring Program, described in Section B.1.3, for managing aging of Boraflex during the period of extended operation.

Subsequently, Entergy notified the Nuclear Regulatory Commission (NRC) (Reference 2) of its intent to install NETCO's SNAP-IN® neutron inserts in the RBS spent fuel pool (SFP) storage cells and to change the SFP criticality analysis. This change will remove credit for Boraflex and credit the SNAP-IN® inserts in the new criticality analysis. Thus, during the period of extended operation, Entergy will no longer use the Boraflex Monitoring Program, but will use the Neutron Absorbing Material Monitoring Program described in Enclosure 1. The Neutron Absorbing Material Monitoring Program will be consistent with the program described

in NUREG-1801 (Reference 3), Section XI.M40, "Monitoring of Neutron-Absorbing Materials Other than Boraflex," and will follow the industry guidance in NEI 16-03 (Reference 4).

The commitment to enhance the Boraflex Monitoring Program is being replaced by a commitment to implement the Neutron Absorbing Material Monitoring Program. A new commitment is being made to replace the neutron absorbing material so that the Boraflex material in the spent fuel pool will not be required to perform a neutron absorption function during the period of extended operation. These commitments are described in Enclosure 2.

If you require additional information, please contact Mr. Tim Schenk at (225)-381-4177 or tschenk@entergy.com.

In accordance with 10 CFR 50.91(b)(1), Entergy is notifying the State of Louisiana and the State of Texas by transmitting a copy of this letter and attachment to the designated State Official.

I declare under penalty of perjury that the foregoing is true and correct. Executed on February 15, 2018.

Sincerely,

WFM/RMC/alc

Enclosure 1: License Renewal Application Revisions for the Neutron Absorbing Material Monitoring Program- River Bend Station
Enclosure 2: Commitments – River Bend Station

cc: (with Enclosure)

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RBFI-18-0028

Enclosure 1

License Renewal Application Revisions for the Neutron Absorbing Material Monitoring Program

2.3.3.15 Fuel Pool Cooling and Cleanup

System Description

The purpose of the fuel pool cooling and cleanup system (system code 602, SFC) is to provide heat removal for spent fuel, to maintain the spent fuel covered with water during all storage conditions, and to maintain required water purity under normal conditions. The system serves the fuel building pools (spent fuel storage pool, cask pool, and lower transfer pool) and the containment pools (refueling cavity, separator storage pool, dryer storage pool, and upper transfer pool).

The fuel pool cooling and cleanup system consists of two separate subsystems: fuel pool cooling and fuel pool purification. The fuel building spent fuel racks (system 054) employ Boraflex, a fixed neutron absorber or poison material for criticality control with the intended function of providing neutron absorption. Entergy has committed to install aluminum boron-carbide neutron absorbing material before the period of extended operation (i.e., prior to February 28, 2025, or the end of the last refueling outage prior to August 29, 2025, whichever is later). Upon completion of the installation, the Boraflex material in the spent fuel pool will not be credited to perform a neutron absorption function. ~~Boraflex~~ The neutron absorbing material and the spent fuel pool racks are considered to be components in the fuel pool cooling and cleanup system for purposes of aging management review.

3.3.2.1.15 Fuel Pool Cooling and Cleanup

Materials

Fuel pool cooling and cleanup system components are constructed of the following materials.

- Aluminum
- ~~Boron carbide/elastomer~~
- Aluminum/boron carbide
- Carbon steel
- Stainless steel

Aging Management Programs

The following aging management programs manage the aging effects for the fuel pool cooling and cleanup components.

- Bolting Integrity
- ~~Boraflex Monitoring~~
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- Neutron Absorbing Material Monitoring
- One-Time Inspection
- Water Chemistry Control – BWR
- Water Chemistry Control – Closed Treated Water Systems

Table 3.3.1
Summary of Aging Management Programs for the Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-51	Boraflex spent fuel storage racks: neutron-absorbing sheets (PWR), spent fuel storage racks: neutron-absorbing sheets (BWR) exposed to treated borated water, treated water	Reduction of neutron-absorbing capacity due to boraflex degradation	Chapter XI.M22, "Boraflex Monitoring"	No	~~Consistent with NUREG-1801. The change in material properties and reduction of neutron-absorbing capacity of the Boraflex spent fuel storage rack neutron-absorbing sheets exposed to treated water will be managed by the Boraflex Monitoring Program.~~This item was not used. Boraflex neutron absorbing sheets will not be credited for neutron absorption during the period of extended operation. Therefore, the Boraflex in the spent fuel storage racks will not perform a license renewal intended function.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-102	Boral®; boron steel, and other materials (excluding Boraflex) spent fuel storage racks: neutron-absorbing sheets (PWR), spent fuel storage racks: neutron-absorbing sheets (BWR) exposed to treated borated water, treated water	Reduction of neutron-absorbing capacity; change in dimensions and loss of material due to effects of SFP environment	Chapter XI.M40, "Monitoring of Neutron-Absorbing Materials other than Boraflex"	No	~~This item was not used. There are no aluminum/boron carbide spent fuel storage rack neutron-absorbing sheets in the auxiliary systems in the scope of license renewal.~~Consistent with NUREG-1801. The Neutron Absorbing Material Monitoring Program will manage reduction of neutron-absorbing capacity, change in dimensions, and loss of material of the neutron absorbing materials exposed to treated water.

Table 3.3.2-15
Fuel Pool Cooling and Cleanup System
Summary of Aging Management Evaluation

Table 3.3.2-15: Fuel Pool Cooling and Cleanup System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Neutron absorber	Neutron absorption	Aluminum / boron carbide	Treated water (ext)	Change in dimensions	Neutron Absorbing Material Monitoring	VII.A2.AP-236	3.3.1-102	A
Neutron absorber	Neutron absorption	Aluminum / boron carbide	Treated water (ext)	Loss of material	Neutron Absorbing Material Monitoring	VII.A2.AP-236	3.3.1-102	A
Neutron absorber	Neutron absorption	Aluminum / boron carbide	Treated water (ext)	Reduction in neutron absorption capacity	Neutron Absorbing Material Monitoring	VII.A2.AP-236	3.3.1-102	A
~~Neutron absorber~~	~~Neutron absorption~~	~~Boron carbide / elastomer~~	~~Treated water (ext)~~	~~Change in material properties~~	~~Boraflex Monitoring~~	~~VII.A2.A-87~~	~~3.3.1-51~~	~~A~~
~~Neutron absorber~~	~~Neutron absorption~~	~~Boron carbide / elastomer~~	~~Treated water (ext)~~	~~Reduction in neutron absorption capacity~~	~~Boraflex Monitoring~~	~~VII.A2.A-87~~	~~3.3.1-51~~	~~A~~

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A.1.3 ~~Boraflex~~ Neutron Absorbing Material Monitoring

~~The Boraflex Monitoring Program manages reduction in neutron-absorbing capacity and change in material properties in the Boraflex material affixed to spent fuel racks. A monitoring program for the Boraflex panels in the spent fuel storage racks is implemented to assure that degradation of the Boraflex material does not compromise the criticality analysis in support of the design of spent fuel storage racks. The program uses the RACKLIFE predictive computer code or equivalent to calculate the gamma dose absorbed by and the amount of boron carbide loss from the Boraflex panels.~~

~~The program entails (a) periodic sampling and analysis for silica levels in the spent fuel pool water and trending the results using the RACKLIFE code or equivalent, (b) performing periodic physical measurements of test coupons containing Boraflex material that have been located in the spent fuel pool, and (c) areal Boron-10 (B-10) density measurement testing of the spent fuel storage racks, such as BADGER [B-10 Areal Density Gage for Evaluating Racks] testing, at a frequency of not less than once every five years. This program assures that the required 5 percent sub-criticality margin is maintained.~~

~~The Boraflex Monitoring Program will be enhanced as follows.~~

- ~~Revise Boraflex Monitoring Program procedures to include areal B-10 density measurement testing of the spent fuel storage racks, such as BADGER testing, at a frequency of at least once every five years.~~

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

The Neutron Absorbing Material Monitoring Program is a new program that will manage change in material properties, loss of material, and reduction of neutron absorption capacity of the neutron absorbing material in the spent fuel pool. Degradation of the neutron absorbing material that could compromise the criticality analysis will be detected to assure that the required 5% sub-criticality margin is maintained during the period of extended operation. The parameters monitored include the physical condition and dimensions (corrosion, pitting, wear, blisters, bulges) and areal density (neutron absorber loss). Inspection and test frequencies will be based on plant-specific experience and will be informed by industry operating experience, but will be at least once every 10 years. Test results will be trended and, if necessary, corrective action will be taken to ensure the sub-criticality margin is met.

The program will use monitoring coupons and in-situ inspections and will follow the most current industry guidance, Nuclear Energy Institute (NEI) 16-03, "Guidance for Monitoring of Fixed Neutron Absorbers in Spent Fuel Pools," Revision 0, May 2017 (ML17263A133).

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

A.4 LICENSE RENEWAL COMMITMENT LIST

No.	Program or Activity	Commitment	Implementation Schedule	Source (Letter Number)
3	~~Boraflex~~ Neutron Absorbing Material Monitoring	~~Enhance the Boraflex~~ Implement the Neutron Absorbing Material Monitoring Program as described in LRA Section B.1.3.	Prior to February 28, 2025, or the end of the last refueling outage prior to August 29, 2025, whichever is later.	~~RBG-47735~~ RBG-47830
new	Neutron Absorbing Material Monitoring	Install aluminum boron-carbide neutron absorbing material before the period of extended operation so that the Boraflex material in the spent fuel pool will not be credited to perform a neutron absorption function. Entergy shall submit a letter to the NRC, within 60 days following installation of the new neutron absorbing material, confirming that the Boraflex material is no longer credited for neutron absorption.	Prior to February 28, 2025, or the end of the last refueling outage prior to August 29, 2025, whichever is later.	RBG-47830

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Table B-1
Aging Management Programs

Program	Section	New or Existing
~~Boraflex~~ Neutron Absorbing Material Monitoring	B.1.3	~~Existing~~New

Table B-2
RBS Aging Management Program Correlation with NUREG-1801 Programs

NUREG-1801 Number	NUREG-1801 Program	RBS Program
XI.M22	Boraflex Monitoring	~~Boraflex Monitoring [B.1.3]~~This NUREG-1801 program will not be credited during the period of extended operation.
XI.M40	Monitoring of Neutron-Absorbing Materials Other than Boraflex	~~This program is not in use at RBS.~~Neutron Absorbing Material Monitoring Program [B.1.3]

Table B-3
RBS Program Consistency with NUREG-1801

Program Name	Plant-Specific	NUREG-1801 Comparison	
		Program has Enhancements	Program has Exceptions to NUREG-1801
~~Boraflex~~ Neutron Absorbing Material Monitoring [B.1.3]		~~X~~	

B.1.3 ~~BORAFLEX~~ NEUTRON ABSORBING MATERIAL MONITORING

Program Description

~~The Boraflex Monitoring Program manages reduction in neutron-absorbing capacity and change in material properties in the Boraflex material affixed to spent fuel racks. A monitoring program for the Boraflex panels in the spent fuel storage racks is implemented to assure that degradation of the Boraflex material does not compromise the criticality analysis in support of the design of spent fuel storage racks. The program uses the RACKLIFE predictive computer code or equivalent to calculate the gamma dose absorbed by and the amount of boron carbide loss from the Boraflex panels.~~

~~The program entails (a) periodic sampling and analysis for silica levels in the spent fuel pool water and trending the results using the RACKLIFE code or equivalent, (b) performing periodic physical measurements of test coupons containing Boraflex material that have been located in the spent fuel pool, and (c) areal B-10 density measurement testing of the spent fuel storage racks, such as BADGER testing, at a frequency of not less than once every five years. This program assures that the required 5 percent sub-criticality margin is maintained.~~

The Neutron Absorbing Material Monitoring Program is a new program that will manage change in material properties, loss of material, and reduction of neutron absorption capacity of the neutron absorbing material in the spent fuel pool. Degradation of the neutron absorbing material that could compromise the criticality analysis will be detected to assure that the required 5% sub-criticality margin is maintained during the period of extended operation. The parameters monitored include the physical condition and dimensions (corrosion, pitting, wear, blisters, bulges), and areal density (neutron absorber loss). Inspection and test frequencies will be based on plant-specific experience and will be informed by industry operating experience, but will be at least once every 10 years. Test results will be trended and, if necessary, corrective action will be taken to ensure the sub-criticality margin is met.

The program will use monitoring coupons and in-situ inspections and will follow the industry guidance provided in Nuclear Energy Institute (NEI) 16-03, "Guidance for Monitoring of Fixed Neutron Absorbers in Spent Fuel Pools," Revision 0, May 2017 (ML17263A133).

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

NUREG-1801 Consistency

~~The Boraflex Monitoring Program, with enhancement, will be consistent with the program described in NUREG-1801, Section XI.M22, Boraflex Monitoring.~~

The Neutron Absorbing Material Monitoring Program will be consistent with the program described in NUREG-1801, Section XI.M40, Monitoring of Neutron-Absorbing Materials Other than Boraflex.

Exceptions to NUREG-1801

None

Enhancements

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

~~Element Affected~~	~~Enhancement~~
~~4. Detection of Aging Effects~~	~~Revise Boraflex Monitoring Program procedures to include areal B-10 density measurement testing of the spent fuel storage racks, such as BADGER testing, at a frequency of at least once every five years.~~

None

Operating Experience

~~The following operating experience provides objective evidence that the Boraflex Monitoring Program will be effective in ensuring that component intended functions are maintained consistent with the current licensing basis during the period of extended operation while Boraflex is credited for neutron absorption in the spent fuel pool.~~

~~In 2004, on-site testing was performed on a Boraflex coupon from the spent fuel pool with acceptable results.~~

~~In 2011, long-term Boraflex coupon holder A4 with coupons 1-3 was removed from the spent fuel pool for on-site testing and found acceptable.~~

~~In 2011, a condition was identified with a missing reference document listed in the spent fuel pool coupon surveillance program procedure and with how the coupon test evaluation uses the data from measurements of the length and thickness of the coupon. The reference document was found and sent to records. The program procedure was revised to add acceptance criteria based on the SFP criticality analysis assumptions of Boraflex length and thickness from EPRI Report NP-6159, "An Assessment of Boraflex Performance in Spent-Nuclear-Fuel Storage Racks," and a discussion of the basis of the new acceptance criteria was also included.~~

~~In 2012, a condition was identified with the criticality safety analysis (CSA) for the spent fuel pool (SFP) and the rate of degradation of Boraflex in the pool. Further analysis determined that the uncertainties associated with the existing information impacted the margin available to credit the Boraflex neutron absorber for long-term storage. Sufficient margin existed in the current CSA to bound the Boraflex degradation for more than seven years from the 2015 refueling outage. A project was initiated to determine an appropriate action plan to address the SFP Boraflex.~~

~~In 2014, long-term Boraflex coupon A-5 was removed from the spent fuel pool for on-site testing and found acceptable.~~

~~As discussed in element 10 to NUREG-1801, Section XI.M22, this program considers the technical information and industry operating experience provided in NRC Information Notice (IN) 87-43, IN 93-70, IN 95-38, and NRC GL 96-04.~~

~~The identification of degradation and initiation of corrective action prior to loss of intended function demonstrates that the Boraflex Monitoring Program has been effective. The continued application of proven monitoring methods provides reasonable assurance that the effects of aging will be managed such that neutron-absorbing components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.~~

The Neutron Absorbing Material Monitoring Program is a new program. Industry operating experience will be considered in the implementation of this program. Plant operating experience will be gained as the program is executed and will be factored into the program via the confirmation and corrective action elements of the RBS 10 CFR 50 Appendix B quality assurance program.

Although the Neutron Absorbing Material Monitoring Program is a new program, RBS has in place basic elements of the program, such as routine inspections performed to industry standards, deficiency identification processes, and corrective actions.

The Neutron Absorbing Material Monitoring Program will be consistent with the program described in NUREG-1801 and in NEI 16-03, both of which are based on industry operating experience that demonstrates that this program is effective for managing the aging effects requiring management. The use of proven program activities provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The ~~Boraflex~~ Neutron Absorbing Material Monitoring Program provides reasonable assurance that effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

Enclosure 2

License Renewal Application Revisions for the Neutron Absorbing Material Monitoring Program

Commitments

This table identifies actions discussed in this letter (Section A.4) that Entergy commits to perform. Any other actions discussed in this submittal are described for the NRC's information and are **not** commitments.

COMMITMENT	TYPE (Check one)		SCHEDULED COMPLETION DATE (If Required)
	ONE-TIME ACTION	CONTINUING COMPLIANCE	
~~Enhance the Boraflex~~ Implement the Neutron Absorbing Material Monitoring Program as described in LRA Section B.1.3.	X		Prior to February 28, 2025, or the end of the last refueling outage prior to August 29, 2025, whichever is later.
Entergy shall install aluminum boron-carbide neutron absorbing material before the period of extended operation (i.e., prior to February 28, 2025, or the end of the last refueling outage prior to August 29, 2025, whichever is later), so that the Boraflex material in the spent fuel pool will not be required to perform a neutron absorption function. Entergy shall submit a letter to the NRC, within 60 days following installation of the new neutron absorbing material, confirming that the Boraflex material is no longer credited for neutron absorption	X		Prior to February 28, 2025, or the end of the last refueling outage prior to August 29, 2025, whichever is later.