Entergy

Entergy Operations, Inc.
River Bend Station
5485 U.S. Highway 61N
St. Francisville, LA 70775
Tel 225-381-4374

William F. Maguire
Site Vice President
River Bend Station

RBG-47807

January 10, 2018

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

SUBJECT: Response to License Renewal Application NRC Requests for Additional Information Set 3
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)

2) NRC email: River Bend Station, Unit 1, Request for Additional Information, Set 3 – RBS License Renewal Application – dated November 29, 2017 (ADAMS Accession No. ML17335A098)

3) Entergy Letter: Request for Due Date Extension for License Renewal Application NRC Request for Additional Information – Set 3 (RBG-47809 dated December 12, 2017)

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. In an email dated November 29, 2017, (Reference 2) the NRC staff provided Requests for Additional Information (RAIs), needed to complete the license renewal application review. On December 12, 2017, (Reference 3) Entergy requested that the due date for response to these requests be extended from December 29, 2017, to January 10, 2018. The extension was requested due to the limited personnel resources available during the latter part of December 2017. Enclosure 1 provides the responses to the Set 3 RAIs.

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.

I declare under penalty of perjury that the foregoing is true and correct. Executed on January 10, 2018.

Sincerely,

WFM/RMC/alc

Enclosure 1: Set 3 RAI Responses – River Bend Station

cc: (with Enclosure)

U. S. Nuclear Regulatory Commission
Attn: Emmanuel Sayoc
11555 Rockville Pike
Rockville, MD 20852

cc: (w/o Enclosure)

U. S. Nuclear Regulatory Commission
Attn: Lisa Regner
11555 Rockville Pike
Rockville, MD 20852

U.S. Nuclear Regulatory Commission
Region IV
1600 East Lamar Blvd.
Arlington, TX 76011-4511

NRC Resident Inspector
PO Box 1050
St. Francisville, LA 70775

Central Records Clerk
Public Utility Commission of Texas
1701 N. Congress Ave.
Austin, TX 78711-3326

Department of Environmental Quality
Office of Environmental Compliance
Radiological Emergency Planning and Response Section
Ji Young Wiley
P.O. Box 4312
Baton Rouge, LA 70821-4312

RBF1-17-0154

RBG-47807

Enclosure 1

Response to Requests for Additional Information

Set 3

REQUESTS FOR ADDITIONAL INFORMATION
LICENSE RENEWAL APPLICATION
RIVER BEND STATION, UNIT 1 – SET 3
DOCKET NO.: 50-458
CAC NO.: MF9757
Office of Nuclear Reactor Regulation
Division of Materials and License Renewal

Question
RAI 3.2.2.3.2-1 (Generic Filtration)

Background
LRA Table 2.0-1, "Component Intended Functions: Abbreviations and Definitions," states that the filtration function is, "[p]rovide removal of unwanted material." LRA Table 2.0-1 states that the mechanical pressure boundary function is, "[p]rovide pressure boundary integrity such that adequate flow and pressure can be delivered..."

LR-ISG-2012-02, "Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation," added a new term, "flow blockage," defined as:

> Flow blockage is the reduction of flow or pressure, or both, in a component due to fouling, which can occur from an accumulation of debris such as particulate fouling (e.g., eroded coatings, corrosion products), biofouling, or macro fouling. Flow blockage can result in a reduction of heat transfer or the inability of a system to meet its intended safety function, or both. This definition is consistent with the definition of the term "pressure boundary" as found in SRP-LR Table 2.1-4(b), "Typical 'Passive' Component-Intended Functions."

In addition, the term "fouling" was revised to state in part, "[f]ouling can result in a reduction of heat transfer, flow or pressure, or a loss of material."

SRP-LR, Section A.1.2.1, Applicable Aging Effects states, in part, that the effects of aging on the intended functions of components should be considered. In the case of components with an intended function of "filtration," flow blockage due to fouling would appear to be an applicable aging effect to be considered. In addition, Section A.1.2.1 also states:

> An aging effect should be identified as applicable for license renewal even if there is a prevention or mitigation program associated with that aging effect. For example, water chemistry, a coating, or use of cathodic protection could prevent or mitigate corrosion, but corrosion should be identified as applicable for license renewal, and the AMR should consider the adequacy of the AMP referencing water chemistry, coating, or cathodic protection.

Issue
Several LRA Table 2s cite components with a filtration intended function, see table below. None of the Table 2 entries cite flow blockage due to fouling as an aging effect requiring management (AERM). The staff recognizes that for some components, flow blockage due to fouling might be effectively managed by routine plant operations, for example, differential pressure is monitored on

both sides of the component that has a filtration function. In other instances, flow blockage due to fouling might not be an applicable AERM, for example, a stainless steel strainer in a treated-water environment that has no internal coating or material/environment subjected to loss of material due to general corrosion upstream of the strainer. Based on the staff's review of the LRA, current licensing basis, and the associated components, the staff lacks sufficient information to conclude that the pressure boundary function of downstream components would be met if flow blockage due to fouling is not managed for the following components.

Table No.	System	Component Type
3.2.2-2	High Pressure Core Spray	Strainer
3.2.2-3	Residual Heat Removal	Cyclone separator, Orifice[1], Strainer
3.2.2-4	Low Pressure Core Spray	Strainer
3.2.2-5	Reactor Core Isolation Cooling	Strainer[2]
3.2.2-6	Standby Gas Treatment	Moisture separator
3.3.2-1	Control Rod Drive	Filter
3.3.2-3	Service Water	Strainer
3.3.2-4	Compressed Air	Strainer
3.3.2-6	Main Steam Positive Leakage Control	Strainer
3.3.2-10	Standby Diesel Generator	Strainer
3.3.2-11	HPCS Diesel Generator	Strainer
3.3.2-12	Control Building HVAC	Demister
3.3.2-13	Miscellaneous HVAC	Screen
3.3.2-14	Chilled Water	Strainer, Air dryer
3.3.2-17	Fuel Oil	Strainer
3.4.2-1	Condensate Makeup, Storage and Transfer	Screen

Notes:

1) For the residual heat removal system, as noted on P&IDs 27-07A, and 27-07B, the restricting orifice plates for RHS-RO208A and RO208B were replaced with an "Inline Drag Resistor." This multistage flow restricting device was designed to eliminate cavitation, and consists of a set of 149 "punched disks," in addition to a multi-port baffle plate, which allow particles 0.125 inch diameter or less to pass. Although not intended to function as strainers, based on a review of the drawing for the inline drag resistor, it is not clear how large the openings are in order to determine if these components will act as strainers.

2) For the reactor core isolation cooling system, as noted on P&ID 27-06A, there is a pump inlet strainer, STRT1, shown for E51-PC003 "Sub System Fill Pump." Although Note 9 says the strainer element for STRT2 for E51-PC001, "Reactor Core Isolation Cooling Pump" was removed, there is no comparable note associated with STRT1 for the Sub System Fill Pump. It is not clear to the staff whether the E51-PC003 strainer was removed.

Request

1. State the basis for why the core spray inline drag resistor does not act as a strainer, or if it could, respond to Request No. 3.

2. State whether the E51-PC003 strainer was removed. If it has not been removed, respond to Request No. 3.

3. For each of the above components that cite filtration as an intended function, state the basis for why flow blockage due to fouling is not considered as an applicable AERM. Alternatively, revise the Table 2s, cite the AMP(s) that will be used to manage this AERM, and revise the AMP(s) to address this AERM.

Response

1. Note 1 indicates that the component in question is in the RHR system rather than the core spray system as specified in the request. The RHR Drag in-line resistors were installed to reduce vibration in RHR test return lines. The Drag resistors have holes in them large enough to pass particles up to 0.125 inches in diameter. These components are downstream of the RHR pump suction strainers in the suppression pool which have an opening size of 0.0937 inches. The suction strainers would trap any debris large enough to be trapped by the Drag resistors. Therefore, this component does not function as a strainer.

2. The STRT1 temporary strainer for the E51-PC003 RCIC fill pump has been removed from the system.

3. As discussed in LR-ISG-2012-02, fire water piping and piping components are susceptible to flow blockage due to operating conditions of the system, such as periodically wetted piping that is normally dry. Flow blockage is applicable to piping components, such as nozzles, that are not designed to collect particulates, such as degraded coatings, corrosion products, and biological fouling products. Unlike piping and piping components, strainers and filters are designed to collect debris from a fluid and allow its removal to prevent damage and maintain function of downstream components. This debris collection, whether from aging effects or other causes, is anticipated to occur and provisions have been incorporated into the system design and operation, as necessary, to manage the collection of debris on the strainer or filter such that the active function of providing system flow can continue to be accomplished. As discussed in the Issue section of this RAI, strainers and filters are designed such that fouling is detected through various means, such as, monitoring differential pressure across the component or monitoring system flow during testing or normal operation. They can then be cleaned to maintain the active function of providing flow. Fouling of strainers or filters is not an aging effect, but is an effect of system operation that is managed, both during the original license term and during the period of extended operation, through operational features and monitoring activities that are discussed in the table below.

   The table below provides information on the components identified in the request above with filtration as a component intended function. Included in the last column is the basis for why routine monitoring of the active function of flow delivery manages potential flow blockage of the strainers.

LRA Table No.	System Name	Component Type / Description	Additional Basis for Monitoring Active Flow Delivery Function
3.2.2-2	High Pressure Core Spray	Strainer / HPCS pump suppression pool suction strainer CSH-STR1	This ECCS suction strainer is designed for post LOCA debris loading that is significantly higher than would be experienced from the collection of debris related to aging effects. In addition, the strainer is inspected for debris and cleaned as necessary every refueling outage to ensure there is no buildup of debris that could affect the function of downstream components.
3.2.2-3	Residual Heat Removal	Cyclone separator / RHR pump seal water supply Strainer / RHR pump suppression pool suction strainers RHS-STR1A, 1B and 1C	Cyclone separators are self-cleaning using cyclonic action to remove debris such that flow blockage does not occur. This ECCS suction strainer is designed for post LOCA debris loading that is significantly higher than would be experienced from the collection of debris related to aging effects. The pumps are periodically tested with suction through the strainers that would identify significant debris buildup. In addition, the strainer is inspected for debris and cleaned as necessary every refueling outage to ensure there is no buildup of debris that could affect the function of downstream components.
3.2.2-4	Low Pressure Core Spray	Strainer / LPCS pump suppression pool suction strainer CSL-STR1	This ECCS suction strainer is designed for post LOCA debris loading that is significantly higher than would be experienced from the collection of debris related to aging effects. In addition, the strainer is inspected for debris and cleaned as necessary every refueling outage to ensure there is no buildup of debris that could affect the function of downstream components.
3.2.2-5	Reactor Core Isolation Cooling	Strainer / suppression pool ICS-STR1	Suppression pool suction strainer is designed to support RCIC operation with 50% blockage which would not be expected to occur from debris related to aging effects. In addition, the strainer is inspected for debris and cleaned as necessary every refueling outage to ensure there is no buildup of debris that could affect the function of downstream components.
3.2.2-6	Standby Gas	Moisture separator /	These devices are designed to remove

LRA Table No.	System Name	Component Type / Description	Additional Basis for Monitoring Active Flow Delivery Function
	Treatment	Inlet to charcoal filter	moisture from the air not particulates. Differential pressure indication is provided that is alarmed prior to flow blockage affecting intended function.
3.3.2-1	Control Rod Drive	Filter / CRD hydraulic control units (HCU)	These small filters in the HCUs are inspected and replaced as necessary during rebuilds. The water in the CRD system is treated water from condensate storage with minimal particulates and the majority of components are stainless steel. In addition, normal operation of CRDs would allow detection if flow blockage of filters occurred.
3.3.2-3	Service Water	Strainer / Penetration valve leakage control compressor A and B seal water makeup line, service water heat exchanger (HX) inlet (service water, system SWP), service water heat exchanger inlet (service water cooling, system SWC)	Flow blockage in these service water strainers would be detected by differential pressure indication and alarm on the strainer (SWC HX) or via local pressure indication across the strainer (SWP HX). For the penetration valve compressors, it would be detected through normal system operation via compressor performance with reduced seal water makeup flow. In addition, the makeup line strainers are periodically inspected and cleaned as necessary.
3.3.2-4	Compressed Air	Strainer / Inlet strainers to instrument air solenoid valves	Flow blockage would be detected by abnormal operation of the downstream components supplied by the solenoid valves during normal operation and periodic testing.
3.3.2-6	Main Steam Positive Leakage Control	Strainer / Penetration valve leakage control compressor seal water cooler outlet	Flow blockage of the strainers would be detected through normal operation of the compressors via temperature and performance monitoring. In addition, the cooler outlet strainers are periodically inspected and cleaned as necessary.
3.3.2-10	Standby Diesel Generator	Strainer / Air start supply line, lube oil pump discharge, and lube oil sump tank heater circ pump discharge	Air flowing through the air start supply line strainers is dried air such that there should be no debris or deposits to cause flow blockage. The lube oil system is managed to minimize the potential for water accumulation and debris that could cause blockage. However, flow blockage of the lube oil pump discharge strainers would be detected by alarmed differential pressure

LRA Table No.	System Name	Component Type / Description	Additional Basis for Monitoring Active Flow Delivery Function
			switches, and lube oil heater circ pump strainer blockage would be detected during standby operation of the diesels via abnormal pressure due to a reduction in flow.
3.3.2-11	HPCS Diesel Generator	Strainer / Air start, lube oil pump discharge, lube oil sump pump suction and lube oil sump main bearing press pump suction	Air flowing through the air start supply line strainers is dried air such that there should be no debris or deposits to cause flow blockage. This lube oil system is managed to minimize the potential for water accumulation and debris that could cause blockage. However, flow blockage of the lube oil pump discharge and suction strainers would be detected during normal testing and operation of the diesel via abnormal temperatures and pressures due to a reduction in flow..
3.3.2-12	Control Building HVAC	Demister / Charcoal filter housing inlet	These devices are designed to remove moisture from the air not particulates. Flow blockage would be detected via alarmed differential pressure indication.
3.3.2-13	Miscellaneous HVAC	Screen / Upstream of HVR-AOV123 and 128	These screens are grating installed to protect valves from large debris during a loss of coolant accident. Flow blockage is not credible during normal operation due to the size of openings in the screen grating.
3.3.2-14	Chilled Water	Strainer / HVAC chilled water chiller purge unit gas from condenser inlet, chilled water chiller purge unit liquid from condenser inlet and chilled water pump suction Dryer / HVAC chilled water chiller evaporator filter dryer	The air dryers are designed to remove moisture from Freon (not debris) such that flow blockage is not an aging effect. The strainers on the chiller purge units contain Freon liquid and gas that should contain no debris. Flow blockage of the strainers, if it occurred, would be detected through chilled water system and chiller operation and testing.
3.3.2-17	Fuel Oil	Strainer / fuel oil day tank supply lines to diesels	The fuel oil system is managed to minimize the potential for water accumulation, particulates, sediment and debris that could cause blockage in these strainers. However, flow blockage would be detected by alarmed differential pressure indication.
3.4.2-1	Condensate Makeup, Storage	Screen / Condensate storage tank vent bird	Flow blockage due to fouling is not credible for this #10 mesh screen

LRA Table No.	System Name	Component Type / Description	Additional Basis for Monitoring Active Flow Delivery Function
	and Transfer	screen	exposed to air that is designed to prevent birds from entering the tank vent.

Question
RAI 3.4.1.11-1 (Potential Aging Effects of Control Rod Drive (CRD) Hydraulic Control Unit (HCU) Accumulators)

Background
LRA Table 3.3.2-1 addresses aging management review results for the control rod drive hydraulic system. The LRA table indicates that stainless steel accumulators, exposed to treated water (greater than 140 °C), are subject to cracking due to stress corrosion cracking (SCC) and that the aging effect of SCC is managed by using the Water Chemistry Control – BWR Program and the One-Time Inspection Program.

During the audit, the staff noted that CR-RBS-2015-00855 (dated February 11, 2015) addresses an adverse trend of equipment reliability for the hydraulic control unit (HCU) accumulators in the control rod drive hydraulic system. The CR indicates an increasing trend of high temperature alarms for these HCU accumulators and a plan for accumulator replacements. In addition, The CR indicates that these accumulators are made with carbon steel or stainless steel and that preventive maintenance activities will be emphasized to prevent accumulator faults.

Issue
The staff needs additional information to clarify whether aging effects are associated with the reliability concern of the accumulators discussed above.

Request
1. Provide additional information on the following: (1) whether aging effects are associated with the reliability concern of HCU accumulators (e.g., the reliability issue resulted from aging effects or high temperature conditions facilitated aging effects); and (2) if aging effects are associated with the reliability concern, what aging effects are involved and what aging management programs and activities are used to manage the aging effects.

2. Revise aging management review results for these accumulators (e.g., LRA Table 3.3.2-1), as needed.

Response
1. Entergy identified an adverse trend for alarms received on the HCU accumulators. The alarms do not indicate that the control rod drive HCU accumulators would be unable to accomplish their intended function, but they detect leakage internal to the accumulator.

   USAR Section 4.6.1.1.2.4.3.9 describes the accumulator as a free floating piston in a hydraulic cylinder with associated nitrogen pressure alarm and water leakage alarm. These alarm conditions result from reduction of nitrogen pressure or water leakage past the moveable piston that separates the nitrogen and the water within the accumulator. The piston with its associated sealing features performs its function with moving parts and is, therefore, not subject to aging management review in accordance with 10 CFR 54.21(a)(1).

Loss of material from the internal surfaces of the carbon steel cylinders has been a contributor to the trend of alarms associated with the accumulators. To reduce the number of alarms associated with the accumulators, a plan was approved in 2016 to replace the remaining carbon steel accumulators with stainless steel accumulators over the next four refueling outages. As indicated in LRA Table 3.3.2-1, the Water Chemistry Control – BWR Program manages loss of material and cracking of the HCU accumulators to maintain the passive pressure boundary function.

2. The aging effects on the passive accumulator are managed as identified in LRA Table 3.3.2-1. Since the alarm conditions do not indicate a loss of intended function for the accumulators, no change to the LRA is warranted.

Question
3.3.2.1-1 (Aging Management for Control Rod Drive (CRD) Hydraulic Control Unit (HCU) Directional Control Valve (DCV) Cap Screws)

Background
LRA Table 3.3.2-1 addresses aging management review results for the control rod drive hydraulic system. During the audit, the staff noted that CR-RBS-2016-02942 addresses signs of corrosion in ASTM A574 cap screws of control rod drive (CRD) hydraulic control unit (HCU) directional control valves (DCVs). This CR indicates that the cap screws are used to maintain the pressure boundary integrity of DCVs. The CR further indicates that, as addressed in GE SIL 678, these alloy steel cap screws are susceptible to stress corrosion cracking.

Issue
LRA does not clearly address aging management programs or activities that are used to manage loss of material due to corrosion and cracking due to stress corrosion cracking for these HCU DCV cap screws.

Request
Describe aging management programs and activities that the applicant uses to manage loss of material and cracking for these cap screws. In addition, revise the LRA to describe the aging management programs and activities, as needed.

Response
In accordance with GE SIL 678, RBS replaced the directional control valve cap screws on all 145 hydraulic control units with material that is not susceptible to stress corrosion cracking. Therefore, the LRA does not require revision to identify cracking of the directional control valve cap screws. The component type utilized for cap screws is "bolting." The Bolting Integrity Program manages loss of material and loss of preload for bolting as identified in LRA Table 3.3.2-1.