Question

RAI 3.2.2.3.2-1a (Generic Filtration Follow-up) revised

Background

The response to RAI 3.2.2.3.2-1, dated January 10, 2018, states that, unlike piping, strainers and filters (with the intended function of filtration) are designed to collect debris, whether from aging effects or other causes. Consequently, provisions have been incorporated into the system design or operation to manage the debris collection, so the active function of providing system flow can continue to be accomplished. An overall summary of the response indicates that flow blockage would be detectable by: a) alarmed differential pressure, b) local indication of differential pressure, or c) abnormal operation indicated through performance monitoring of temperatures, pressures, or flows. In addition, the response indicates that some of these components are also periodically inspected and cleaned.

In its discussion regarding the IPA required by 10 CFR 54.21, the industry guidance endorsed by Regulatory Guide 1.188, "Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses," states that the information to be documented by the applicant should include an identification of the AERM and an identification of the specific program or activities [emphasis added by staff] that will manage the effects of aging for each component.

For the strainer in the main steam positive leakage control system, LRA Table 3.3.2-6 indicates that only the strainer is exposed to a treated water environment, which is consistent with the response's discussion regarding the compressor seal water cooler outlet strainer. However, PID-27-20C also shows a strainer (STR10BA), which takes a suction from the auxiliary building atmosphere through a 0.125-inch perforated screen, indicating an environment of indoor air.

Issue

1) Although considerations for debris collection may be incorporated into the system design or operation, the industry guidance endorsed in Regulatory Guide 1.188 states that the IPA should include an identification of the specific program or activities that are used to manage aging effects. For components with an intended function of filtration, it is not clear to the staff that in all cases the proposed operational controls (e.g., for abnormal operation), or maintenance tasks (e.g., periodic inspections or cleaning of strainers) are linked to a specific program.

   For the suppression pool suction strainers, it is also not clear how fouling is trended to ensure that accumulation of debris will not prevent an intended function from being met prior to the next inspection.

   In addition, given the normal movement of control rods, it is not clear to the staff that normal operation will be adequate to detect potential flow blockage in the hydraulic control unit (HCU) filters.

2) For the strainer STR10BA in the main steam positive leakage control, it is not clear to the staff whether this component is within the scope of license renewal and whether LRA Table 3.3.2-6 includes a corresponding AMR item.

Request

1) For each component in the table below provide additional information as follows:

Table No.	System	Component Type	Discussion from RAI Response
3.2.2-2	High Pressure Core Spray	Suction Strainer	Inspect and Clean
3.2.2-3	Residual Heat Removal	Suction Strainer	Inspect and Clean
3.2.2-4	Low Pressure Core Spray	Suction Strainer	Inspect and Clean
3.2.2-5	Reactor Core Isolation Cooling	Suction Strainer	Inspect and Clean
3.3.2-1	Control Rod Drive	Filter	Normal Operation will detect flow blockage. Inspect and replace during rebuilds

a. For strainers where periodic inspections are performed, state: (a) the specific AMP to be used; (b) whether the maintenance tasks will be linked to the AMP; (c) how monitoring and trending will be conducted; and (d) the frequency of the inspections being credited.
b. For the HCUs, state the basis for why monitoring during normal operation will be adequate to detect potential flow blockage of the filters. If monitoring might not be adequate, state the basis for why the periodicity of rebuilds provides reasonable assurance that the intended function of the control rods will be met.

2) For strainer STR10BA in the main steam positive leakage control system (PID-27-20C), provide additional information to clarify whether this component is within the scope of license renewal and, if so, state which aging management review item in LRA Table 3.3.2-6 is applicable.

Response

River Bend Station (RBS) previously responded to RAI 3.2.2.3.2-1a by letter dated April 3, 2018 (RBG-47846). The following is the response to RAI 3.2.2.3.2-1a revised to include additional information requested by the NRC during a public telephone conference call held on April 18, 2018. The revised response supersedes the previous response. Changes to the previous response of April 3 are marked with revision bars. .

1) a. Periodic inspections are performed for the suction strainers in the high pressure core spray, residual heat removal, low pressure core spray, and reactor core isolation cooling systems. (a) These inspections will be performed as part of the Periodic Surveillance and Preventive Maintenance Program. (b) These inspection tasks will be linked to the Periodic Surveillance and Preventive Maintenance Program. Changes to Appendix A and B that identify these tasks as part of the program are shown below. (c) The inspections of the suction strainers require all material/debris identified on the strainers to be cataloged and recorded to ensure the removed material/debris is identified and recorded. In addition, Engineering is required to inspect the removed material/debris. The task acceptance criteria limit the amount of debris. Not meeting the acceptance criteria requires initiation of a condition report to determine cause and corrective actions. (d) These inspections are performed once per refueling cycle. Changes to the

LRA are provided below.

b. In accordance with Technical Specification requirements, control rods are exercised at least once per month. The control rod exercise test serves as a periodic check of the control rod system which would detect flow blockage in the HCU filters. Blockage would be indicated by abnormal operation of the control rod. In addition, the control rod travel speed is tested every refueling outage. This test would detect abnormal speeds indicative of blockage in the filters. These tests provide the necessary information that could be used to detect flow blockage in the HCU filters.

2) As shown by the highlighting on PID-27-20C, STR10BA is subject to aging management review for license renewal as is STR10BB shown on PID-27-20D. Only the strainer housings were included in LRA Table 3.3.2-6. The strainers are stainless steel with 0.125 inch holes exposed to indoor air taking suction inside the auxiliary building. The potential for any blockage is extremely low. In addition, these strainers are periodically inspected and cleaned as necessary and flow blockage would be detected through normal monitoring of compressor performance. Changes to LRA Table 3.3.2-6 to include strainers in an indoor air environment are provided below.

The changes to LRA Sections 3.2.2.1.2, 3.2.2.1.3, 3.2.2.1.4, 3.2.2.1.5, A.1 .34 and B.1 .34 and Tables 3.2.2-2, 3.2.2-3, 3.2.2-4, 3.2.2-5 and 3.3.2-6 follow with additions underlined and deletions lined through.

3.2.2.1.2 High Pressure Core Spray System

Aging Effects Requiring Management

The following aging effects associated with the high pressure core spray system require management.

- Cracking – fatigue
- Loss of material
- Loss of preload
- Flow blockage

Aging Management Programs

The following aging management programs manage the effects of aging on the high pressure core spray components.

- Bolting Integrity
- External Surfaces Monitoring
- One-Time Inspection
- Water Chemistry Control – BWR

- Periodic Surveillance and Preventive Maintenance

3.2.2.1.3 Residual Heat Removal System

Aging Effects Requiring Management

The following aging effects associated with the residual heat removal system require management.

- Cracking
- Cracking – fatigue
- Loss of material
- Loss of material – FAC
- Loss of preload
- Reduction of heat transfer
- Flow blockage

Aging Management Programs

The following aging management programs manage the effects of aging on the residual heat removal system components.

- Bolting Integrity
- External Surfaces Monitoring
- Flow-Accelerated Corrosion
- One-Time Inspection
- Service Water Integrity
- Water Chemistry Control – BWR
- Water Chemistry Control – Closed Treated Water Systems
- Periodic Surveillance and Preventive Maintenance

3.2.2.1.4 Low Pressure Core Spray System

Aging Effects Requiring Management

The following aging effects associated with the low pressure core spray system require management.

- Cracking – fatigue
- Loss of material
- Loss of preload
- Flow blockage

Aging Management Programs

The following aging management programs manage the effects of aging on the low pressure core spray system components.

- Bolting Integrity
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- One-Time Inspection
- Water Chemistry Control – BWR
- Periodic Surveillance and Preventive Maintenance

3.2.2.1.5 Reactor Core Isolation Cooling System

Aging Effects Requiring Management

The following aging effects associated with the reactor core isolation cooling system require management.

- Cracking
- Cracking – fatigue
- Loss of material
- Loss of material – FAC
- Loss of preload
- Reduction of heat transfer
- Flow blockage

Aging Management Programs

The following aging management programs manage the effects of aging on the reactor core isolation cooling system components.

- Bolting Integrity
- External Surfaces Monitoring
- Flow-Accelerated Corrosion
- Oil Analysis
- One-Time Inspection
- Water Chemistry Control – BWR
- Periodic Surveillance and Preventive Maintenance

Notes for Tables 3.2.2-1 through 3.2.2-8-5

Plant-Specific Notes

201. The One-Time Inspection Program will verify effectiveness of the Water Chemistry Control – BWR Program.

202. The One-Time Inspection Program will verify the effectiveness of the Oil Analysis Program.

203. This piping passes through the waterline region of suppression pool. The environment for the internal and external surfaces of the piping in this region may alternate between wet and dry. The One-Time Inspection Program will use visual or other NDE techniques to inspect this piping to manage the potential accelerated loss of material.

204. This steam environment for this component type is produced from and is equivalent to treated water for the purposes of evaluating loss of material due to erosion.

205. For the purposes of evaluating cracking due to fatigue, this environment can be considered equivalent to the NUREG-1801 environment.

206. Strainers are designed to collect debris whether resulting from aging effects or other causes. Inspections are performed to ensure strainers are free of excessive debris that could cause flow blockage.

Table 3.2.2-2: High Pressure Core Spray System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**

Table 3.2.2-2: High Pressure Core Spray System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Strainer	Filtration	Stainless steel	Treated water (ext)	Flow Blockage	Periodic Surveillance and Preventive Maintenance	--	--	H, 206

Table 3.2.2-3 Residual Heat Removal System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Strainer	Filtration	Stainless steel	Treated water (ext)	Flow Blockage	Periodic Surveillance and Preventive Maintenance	--	--	H, 206

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Table 3.2.2-4 Low Pressure Core Spray System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Strainer	Filtration	Stainless steel	Treated water (ext)	Flow Blockage	Periodic Surveillance and Preventive Maintenance	--	--	H, 206

Table 3.2.2-5 Reactor Core Isolation Cooling System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Strainer	Filtration	Stainless steel	Treated water (ext)	Flow Blockage	Periodic Surveillance and Preventive Maintenance	--	--	H, 206

[The following revised LRA sections are unchanged from the previous RAI response submitted on April 3, 2018.]

A.1.34 Periodic Surveillance and Preventive Maintenance

The Periodic Surveillance and Preventive Maintenance (PSPM) Program includes periodic inspections and tests to manage aging effects including cracking, loss of material, reduction of heat transfer, and change in material properties, in cases where no NUREG-1801 program was found appropriate to manage the particular aging effects for specific components. At a minimum, in each 10-year period during the period of extended operation, a representative sample of 20 percent of the population (defined as components having the same combination of material, environment, and aging effect) or a maximum of 25 components per population is inspected. Where practical, the inspections will focus on the bounding or leading components most susceptible to aging because of time in service and severity of operating conditions. Physical manipulation of elastomers is conducted in conjunction with visual inspections. Indications or relevant conditions of degradation detected are evaluated.

Credit for program activities has been taken in the aging management review for the following components.

- Inspect the surface of the inflatable elastomer seal for the upper containment pool gates in the reactor building.
- Inspect the surface of the inflatable elastomer seal for the spent fuel storage pool gates in the auxiliary building.
- Visually inspect the surface of the high pressure core spray, residual heat removal, low pressure core spray, and reactor core isolation cooling suppression pool suction strainers for debris.

Addition to Section A.4, LICENSE RENEWAL COMMITMENT LIST

24	Periodic Surveillance and Preventive Maintenance	Enhance the PSPM Program as described in LRA Section A.1.34.	Prior to February 28, 2025, or the end of the last refueling outage prior to August 29, 2025, whichever is later.	RBG-47735 RBG-4XXXX

B.1.34 PERIODIC SURVEILLANCE AND PREVENTIVE MAINTENANCE

Program Description

There is no corresponding NUREG-1801 program.

The Periodic Surveillance and Preventive Maintenance (PSPM) Program includes periodic inspections and tests to manage aging effects, including cracking, loss of material, reduction of heat transfer, and change in material properties, in cases where no NUREG-1801 program was found appropriate to manage the particular aging effects for specific components. At a minimum, in each 10-year period during the period of extended operation, a representative sample of 20 percent of the population (defined as components having the same combination of material, environment, and aging effect) or a maximum of 25 components per population is inspected. Where practical, the inspections will focus on the bounding or leading components most susceptible to aging because of time in service and severity of operating conditions. Physical manipulation of elastomers is conducted in conjunction with visual inspections. Indications or relevant conditions of degradation detected are evaluated.

Credit for program activities has been taken in the aging management review for the following systems and structures.

Reactor building	Inspect the surface of the inflatable elastomer seal for the upper containment pool gates.
Auxiliary building	Inspect the surface of the inflatable elastomer seal for the spent fuel storage pool gates.
High pressure core spray system	Visually inspect the surface of the suppression pool suction strainer for debris.
Residual heat removal system	Visually inspect the surface of the suppression pool suction strainer for debris.
Low pressure core spray system	Visually inspect the surface of the suppression pool suction strainer for debris.
Reactor core isolation cooling	Visually inspect the surface of the suppression pool suction strainer for debris.

Table 3.3.2-6: Main Steam Positive Leakage Control System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	C, 301, 305
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-273	3.3.1-95	C
Strainer	Filtration	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Strainer	Filtration	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A