UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
1600 EAST LAMAR BOULEVARD
ARLINGTON, TEXAS 76011-4511

May 7, 2018

Mr. William F. Maguire, Vice President
Entergy Operations, Inc.
River Bend Station
5485 US Highway 61N
St. Francisville, LA 70775

SUBJECT: RIVER BEND STATION – NRC LICENSE RENEWAL INSPECTION REPORT 05000458/2018011

Dear Mr. Maguire:

On March 22, 2018, a U.S. Nuclear Regulatory Commission (NRC) team completed the onsite portion of an inspection of your application for license renewal for the River Bend Station. The team discussed the inspection results with you and other members of your staff.

This inspection examined activities that supported the application for a renewed license for the River Bend Station. The inspection addressed your processes for scoping and screening structures, systems, and components (SSCs) to select equipment subject to an aging management review. Further, the inspection addressed the development and implementation of aging management programs to support continued plant operation into the period of extended operation. As part of the inspection, the NRC examined procedures and representative records, interviewed personnel, and visually examined accessible portions of various SSCs to verify license renewal boundaries and to observe any effects of equipment aging. These NRC inspection activities constitute one of several inputs into the NRC review process for license renewal applications.

The team concluded that your staff appropriately implemented the scoping and screening of non-safety related SSCs that could affect safety-related SSCs as required in 10 CFR 54.4(a)(2). The team concluded that your staff conducted an appropriate review of the materials and environments, and established appropriate aging management programs as described in the license renewal application and as supplemented through your responses to requests for additional information from the NRC. The team concluded that your staff maintained the documentation supporting the application in an auditable and retrievable form.

Based on the samples reviewed by the team, the inspection results support a conclusion of reasonable assurance that actions have been identified and have been, or will be, taken to manage the effects of aging in the SSCs identified in your application, and that the intended functions of these SSCs will be maintained in the period of extended operation.

In accordance with 10 CFR 2.390 of the NRC's “Rules of Practice,” a copy of this letter,

and its enclosure, will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

James F. Drake, Chief
Engineering Branch 2
Division of Reactor Safety

Docket: 50-458
License: NPF-47

Enclosure:
Inspection Report 05000458/2018011
w/ Attachment: License Renewal
Inspection Document Request

cc: Electronic Distribution

U.S. NUCLEAR REGULATORY COMMISSION
Inspection Report

Docket Number(s):	05000458
License Number(s):	NPF-47
Report Number(s):	05000458/2018011
Enterprise Identifier:	I-2018-011-0008
Licensee:	Entergy Operations, Inc.
Facility:	River Bend Station
Location:	Saint Francisville, Louisiana
Inspection Dates:	February 26, 2018, to March 22, 2018
Inspectors:	G. Pick, Senior Reactor Inspector, Engineering Branch 2 S. Makor, Reactor Inspector, Engineering Branch 2 J. Melfi, Project Engineer, Division of Reactor Safety, Branch B N. Okonkwo, Reactor Inspector, Engineering Branch 2
Approved By:	J. Drake, Chief Engineering Branch 2 Division of Reactor Safety

Enclosure

SUMMARY

IR 05000458/2018011; 02/26/2018 – 03/22/2018; River Bend Station; Scoping of Non-Safety Related Systems Affecting Safety-Related Systems and Review of License Renewal Aging Management Programs

The Nuclear Regulatory Commission (NRC) team from Region IV performed onsite inspections of the applicant's license renewal activities. The team performed the evaluations in accordance with Manual Chapter 2516, “Policy and Guidance for the License Renewal Inspection Programs,” and Inspection Procedure 71002, “License Renewal Inspection.” The team did not identify any findings as defined in NRC Manual Chapter 0612.

The team concluded the applicant adequately performed screening and scoping of non-safety related structures, systems, and components as required in 10 CFR 54.4(a)(2). The team concluded that the applicant conducted an appropriate review of the materials and environments, and established appropriate aging management programs as described in the license renewal application and as supplemented through responses to requests for additional information from the NRC. The team concluded that the applicant provided the documentation that supported the application and inspection process in an auditable and retrievable form.

Based on the samples reviewed by the team, the inspection results support a conclusion of reasonable assurance that actions have been identified and have been or will be taken to manage the effects of aging in the structures, systems, and components identified in your application, and that the intended functions of these structures, systems, and components should be maintained in the period of extended operation.

A. NRC-Identified Findings and Self-Revealing Findings

None

B. Licensee-Identified Violations

None

REPORT DETAILS

4. OTHER ACTIVITIES (OA)

4OA5 Other - License Renewal (IP 71002)

a. Inspection Scope

This inspection was performed to evaluate the thoroughness and accuracy of the applicant's scoping and screening of non-safety related structures, systems, and components (SSC), as required in 10 CFR 54.4(a)(2). Also, the team evaluated whether aging management programs will be capable of managing identified aging effects in an appropriate manner.

In order to evaluate scoping activities, the team selected a number of SSCs for review to evaluate whether the methodology used by the applicant appropriately addressed the non-safety related systems affecting the safety functions of a structure, system, or component within the scope of license renewal.

The team selected a sample of 25 of the 43 aging management programs to verify the adequacy of the applicant's guidance, implementation activities, and documentation. The team evaluated the programs to determine whether the applicant would appropriately manage the effects of aging and to verify that the applicant would maintain the safety functions of the SSCs during the period of extended operation. The team evaluated the applicant's review and consideration of industry and plant-specific operating experience related to aging effects.

The team reviewed supporting documentation and interviewed applicant personnel to confirm the accuracy of the license renewal application conclusions. For a sample of plant structures and systems, the team walked down accessible portions of the systems to observe aging effects, which included the material condition of the SSCs.

b.1 Evaluation of Scoping of Non-Safety Related Structures, Systems, and Components

For scoping of non-safety related SSCs affecting safety-related SSCs, as required by 10 CFR 54.4(a)(2), the team reviewed the applicant's program guidance and scoping results. The team assessed the thoroughness and accuracy of the methods used to identify the SSCs required to be within the scope of the license renewal application. The team verified that the applicant had established procedures consistent with the NRC-endorsed guidance contained in Nuclear Energy Institute 95-10, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule," Revision 6, Appendix F, Sections 3, 4, and 5. The team assessed whether the applicant evaluated: (1) non-safety related SSCs within the scope of the current licensing basis; (2) non-safety related SSCs directly connected to safety-related SSCs; and (3) non-safety related SSCs not directly connected, but spatially near safety-related SSCs.

The team reviewed the license renewal drawings listed in the appendix. The applicant had color coded the drawings to indicate in-scope systems and components required by 10 CFR 54.4(a)(1), (a)(2), and (a)(3). The team interviewed personnel, reviewed program documents, and independently walked down numerous areas within the plant. The areas walked down included:

- Auxiliary building
- Cooling towers
- Condensate storage tank
- Control building
- Diesel generator building
- Fire pump house
- Fuel building
- Intake structure
- Normal service water structure
- Piping Tunnels E, F, and G
- Reactor building
- Standby service water structure

For SSCs selected because of potential spatial interactions, where failure of non-safety related components could adversely affect adjacent safety-related components, the team determined that the applicant accurately categorized the in-plant configuration within the license renewal documents. The team determined the personnel involved in the process were knowledgeable and appropriately trained.

For SSCs selected because of potential structural interaction (seismic design of safety-related components potentially affected by non-safety related components), the team determined that the applicant accurately identified and categorized the structural boundaries within the program documents. Based on in-plant walkdowns and the seismic boundary determinations, the team determined that the applicant appropriately identified the seismic design boundaries and correctly included the applicable components within the license renewal scope.

In summary, the team concluded that the applicant had implemented an acceptable method of scoping non-safety related SSCs and that this method resulted in appropriate scoping determinations for the samples reviewed.

b.2 Evaluation of New Aging Management Programs

The team reviewed 6 of the 11 new aging management programs to determine whether the applicant had established appropriate actions or had actions planned to manage the effects of aging as specified in NUREG-1801, “Generic Aging Lessons Learned (GALL) Report,” Revision 2 (GALL Report). The team independently reviewed site-specific operating experience to determine whether there were any aging effects for the systems and components within the scope of these programs that had not been identified when considering applicable industry operating experience.

The team selected in-scope SSCs to assess how the applicant maintained plant equipment material conditions under existing programs and to visually observe examples of non-safety related equipment determined to be within scope because of

the proximity to safety-related equipment and the potential for failure as a result of aging effects.

For each aging management program reviewed, the team:

- Evaluated whether the applicant had established the aging management program consistent with the GALL Report to manage the aging effects described. The team considered any applicable interim staff guidance.

- Reviewed the license renewal application, list of SSCs included in each aging management program, aging management program evaluation report, implementing procedures, plant specific operating experience, and corrective action documents. The team also interviewed the program owner and license renewal project personnel.

.1 B.1.1 Aboveground Metallic Tanks (XI.M29)

This program manages loss of material for the aluminum condensate storage tank. This program specified prevention and inspection measures that included using a protective multi-layer vapor barrier beneath the tank. The protective multi-layer vapor barrier beneath the tank serves as a seal at the concrete-to-tank interface. The inner volume of the concrete ring foundation is filled with clean dry sand, which is sloped downward from the tank center to the tank exterior.

The applicant identified that they planned to visually inspect the interior and exterior surfaces of the condensate storage tank. The applicant specified that they will ultrasonically test condensate storage tank bottom to assess the thickness against the design specified thickness during each 10-year period starting 10 years before the period of extended operation.

.2 B.1.4 Buried and Underground Piping and Tanks Inspection (XI.M41)

This aging management program manages loss of material, cracking or changes in material properties resulting from general corrosion, and loss of material on external surfaces of buried and underground piping and tanks. The program specified prevention, mitigation, and inspection activities. The applicant included all in-scope underground piping and components of carbon steel, gray cast iron, polymers, cementitious and concrete materials. This program included the following systems: condensate make-up, storage and transfer, control building heating, ventilation and air conditioning, fire water, fuel oil, and service water.

The applicant identified that they would manage the effects of aging through visual inspection either during opportunistic excavations for other maintenance or during planned excavations. The inspections will evaluate the condition of the external surfaces, the backfill, and protective coatings and wrappings. The applicant will perform one excavation of each material type once every 10 years, beginning in the 10-year period prior to the period of extended operation.

In addition to the program owner, the team interviewed the cathodic protection systems engineer. The team reviewed the cathodic protection system evaluation reports, cathodic protection system surveys, and backfill design specifications.

.3 B.1.11 Coating Integrity (XI.M42)

This aging management program manages loss of coating or lining integrity in carbon steel tanks, piping, and heat exchangers that could impact the current licensing basis intended functions. The program specified periodic visual inspections of components with coated surfaces in raw water, treated water, and lubricating oil environments.

For coated surfaces that do not meet the acceptance criteria, physical testing will be performed. The training and qualification of individuals must meet the standards endorsed in Regulatory Guide 1.54, "Service Level I, II, and III Protective Coatings Applied to Nuclear Power Plants." The applicant will implement this program within the 10-year period prior to entering the period of extended operation.

.4 B.1.28 Non Environmentally Qualified Inaccessible Power Cables (>400V) (XI.E3)

This program manages the effects of reduced insulation resistance on inaccessible power cables (greater than or equal to 400V) exposed to adverse localized environments caused by significant moisture. The applicant had no in-scope safety-related cables installed through manholes below grade.

Inspections for water accumulation in manholes are performed annually. In addition to the periodic manhole inspections, manhole inspections for water after event-driven occurrences, such as flooding, will be performed. The inspections will include direct observation to ensure cables are not wetted or submerged; that cables, splices and cable support structures are intact; and dewatering systems (i.e., sump pumps) and associated alarms, if applicable, operate properly. Inspection frequency will be increased as necessary based on evaluation of inspection results.

The team reviewed the applicant's efforts to mitigate the in-scope cables exposure to submergence and their current and proposed process for inspections. The team inspected and observed the as-found conditions of the cables, cable support assemblies, and the structural condition of the cable vault and ducting in a manhole. The applicant planned to use existing model work orders to perform visual inspections of the in-scope cables and cable support assemblies. The applicant will electrically test the inaccessible power cabling prior to entering the period of extended operation and once every 6 years thereafter. The applicant will use a proven test for detecting deterioration of the insulation system caused by wetting or submergence.

.5 B.1.32 One-Time Inspection (XI.M32)

This program conducts inspections to verify that chemistry programs had effectively managed aging effects related to loss of material, cracking, and reduction of heat transfer internal to plant systems. The applicant will conduct these one-time inspections to identify and characterize the material conditions in representative low-flow and stagnant areas of plant piping, and components addressed by the Water Chemistry Control – Boiling Water Reactor (BWR) and Closed Treated Water Systems, Fuel Oil Chemistry and Lubricating Oil Analysis programs. The planned visual and volumetric inspections would provide direct evidence that no loss of material resulting from corrosion in these treated liquid environments. The applicant will implement this program within the 10-year period prior to entering the period of extended operation.

The applicant proposed an acceptable method to select their sample population for each set of common material and environment combinations (20 percent of the sample population up to a maximum of 25 components).

.6 B.1.39 Selective Leaching (XI.M33)

This one-time program will sample components in systems that could experience selective leaching. Potentially affected components included material made of gray cast iron and copper alloy with greater than 15 percent nickel (i.e., bronze or brass) exposed to raw water, treated water, and ground. The program will include a one-time visual inspection and mechanical testing of a sample of components with metallurgical properties susceptible to selective leaching to demonstrate the absence of this aging effect, or to implement an aging management program if a loss of material has occurred.

b.3 Evaluation of Existing Aging Management Programs

The team reviewed 19 of the 32 existing programs credited with managing the effects of aging to determine whether the applicant had taken or planned to take appropriate actions to manage the effects of aging as described in the GALL Report and any related license renewal interim staff guidance (LR-ISG).

The team reviewed site-specific operating experience to determine whether there were any aging effects for the systems and components within the scope of these programs that had not been identified from the applicant's review of industry operating experience.

The team evaluated whether the applicant implemented or planned to implement appropriate actions to manage the effects of aging. These programs had established procedures, records of past corrective actions, and previous operating experience related to applicable components. Some programs required enhancements and took exceptions (i.e., changes to program aspects required to be implemented prior to entering the period of extended operation) to be consistent with the GALL Report and their processes.

The team walked down selected SSCs to assess how the applicant maintained plant equipment under the current operating license; to observe examples of non-safety related equipment determined to be in-scope because of the proximity to safety-related equipment; and to assess the potential for failures as a result of aging effects.

For each existing aging management program reviewed, the team:

- Evaluated whether the applicant had established the aging management program consistent with the GALL Report to manage the aging effects described. The team considered any applicable interim staff guidance.

- Reviewed the license renewal application, list of SSCs included in each aging management program, aging management program evaluation report, implementing procedures, plant specific operating experience, and corrective action documents. The team also interviewed the program owner and license renewal project personnel.

.1 B.1.2 Bolting Integrity (XI.M18)

This program manages the aging of closure bolting for in-scope pressure retaining components. The program included the selection of bolting materials and use of lubricants and sealants consistent with industry guidance to prevent or mitigate degradation and failure of bolting. In addition, the applicant as specified in industry guidelines and manufacturer recommendations established torque values, gasket activation, preload, torqueing, fit-up, and restricted the use of molybdenum disulfide.

The applicant requested two exceptions for this aging management program. The first exception related to inspecting the buried fire water system bolting as part of the Buried and Underground Piping and Tanks Inspection Program rather than this program. The second exception related to the inaccessible surfaces of suppression pool suction strainer submerged bolting, the applicant requested to conduct visual inspections once every 10 years instead of once every refueling cycle. The applicant planned to verify the bolting was hand tight. The applicant considered this frequency appropriate because the stainless steel bolts are in a treated water environment, and are either torqued at installation in accordance with manufacturer specification or have the bolts/nuts lock-wired together. These bolting inspections will include visual inspection of the bolt heads, nuts, and threaded bolt shank beyond the nut, where accessible. The team had no concerns with the exceptions.

The applicant identified three enhancements needed to ensure consistency with the GALL Report. The applicant planned to revise procedures to: include submerged pressure-retaining bolting, monitor high-strength bolting locations for cracking, and include volumetric examinations per ASME Code Section XI for high-strength bolting. The team had no concerns with these enhancements.

.2 B.1.12 Compressed Air Monitoring (XI.M24)

This program manages the loss of material in compressed air systems by periodically monitoring the system air for moisture and contaminants, and by inspecting system internal surfaces. The applicant maintained their air system quality in accordance with manufacturer recommendations and industry guidelines.

The applicant identified one exception. The applicant monitored dew points quarterly instead of daily as recommended. The team reviewed the most recent health report and 3 years of dew point data. The team determined that the applicant had a moisture indicator checked daily during operator rounds that would provide gross indication of moisture in leakage. The team identified no concerns with this exception.

The applicant identified two enhancements needed to ensure consistency with the GALL Report. The applicant identified the need to revise implementing procedures to incorporate industry-specified limits for air system contaminants and to specify using both periodic and opportunistic visual inspections of accessible internal surfaces of

system components. The team identified no concerns with the enhancements.

.3 B.1.14 Containment Leak Rate (XI.S4)

This program manages aging effects related to a loss of leak tightness, loss of material, cracking, or loss of sealing in the steal containment vessel associated welds, penetrations, fittings, and other access openings. The program also provided for detection of age-related degradation in material properties of gaskets, O-rings, and packing materials for the primary containment pressure boundary access points.

The applicant performed containment leakage rate tests to assure that leakage through the containment and systems and components penetrating primary containment did not exceed allowable leakage limits specified in the licensing basis documents and technical specifications. The applicant performed the integrated leak rate test, while shutdown, in accordance with regulatory requirements, which demonstrated the leak-tightness and structural integrity of the containment. Similarly, the applicant performed local leak rate tests on isolation valves and containment access penetrations.

The applicant identified two exceptions for this program. The first exception related to using NEI 94-01, “Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50 Appendix J,” Revision 3A instead of Revision 2A, which extended the test intervals for Type C tests. The second exception described the conditions for taking corrective actions; specifically, the applicant will evaluate the cause of test failures that exceed limits specified in their license amendment and implement the actions specified by NEI 94-01. The team identified no concerns with the exceptions.

The team reviewed the most recent integrated leak rate test results as well as the trend from previous tests. Since the applicant implemented a performance-based leak rate test program, the applicant performed integrated leak rate tests on a 15-year frequency, and performed Type B and Type C local leak rate tests at the frequencies allowed by their program and regulatory requirements.

.4 B.1.15 Diesel Fuel Monitoring (XI.M30)

This program manages the effects of aging related to general, pitting, crevice, and microbiological influenced corrosion and fouling on internal surfaces of the diesel fuel oil system tanks. The program managed aging effects by minimizing exposure of fuel oil to water and microbiological organisms. The components monitored by this program included the standby diesel generator fuel oil storage tanks, standby diesel generator fuel oil day tanks, high pressure core spray diesel generator fuel oil storage tank, and diesel-driven fire pump fuel oil storage tanks.

The applicant identified four enhancements needed to ensure consistency with the GALL Report. These applicant planned to revise oil sampling procedures to: (1) monitor for microbiological organisms; (2) perform periodic multilevel sampling or obtain a representative sample from the lowest point in the tank, if tank design features do not allow for multi-level sampling; (3) periodically clean and visually inspect the tank internals once within 10 years prior to the period of extended operation and every 10 years thereafter; and (4) monitor quarterly for biological activity and particulate concentrations. The team had no concerns with the enhancements.

.5 B.1.17 External Surfaces Monitoring (XI.M36)

This program manages the effects of aging related to loss of material, cracking, and change in material properties of external plant surfaces. The program established periodic inspections and walkdowns to monitor for material degradation and leakage, including integrity of coatings, insulation degradation, and loss of material. The applicant specified that they would inspect accessible mechanical components at least once per refueling cycle and would inspect inaccessible mechanical components when plant conditions permit, but at a frequency that ensured components maintained their ability to perform their intended function.

The applicant identified numerous enhancements needed to ensure consistency with the Gall Report. The applicant conducted code inspections in accordance with the code requirements. In the absence of such requirements, the applicant developed plant-specific requirements, which included visual inspections of metallic surfaces by qualified personnel using approved procedures. The enhancements included:

- Instructions to visually inspect all accessible flexible polymeric component surfaces to monitor for loss of material caused by dimensional change, surface cracking, crazing, and scuffing. If internally reinforced, monitor for exposure of reinforcing fibers, mesh, or underlying metal. In addition, establish the requirement to manipulate 10 percent of the available flexible polymeric surface area should receive physical manipulation to augment the visual inspection to confirm the absence of hardening and loss of strength.

- Inspections for in-scope insulated components in a condensation or air outdoor environment perform representative inspections during each 10-year period. For each material type the applicant agreed to meet the specific inspection requirements based on axial length or configuration surface area, and to select locations with a higher likelihood of under insulation corrosion.

- The following criteria related to surface conditions: stainless steel should have a clean shiny surface with no discoloration; other metals should not have abnormal surface indications; flexible polymeric materials should have a uniform surface texture and color with no cracks and no unanticipated dimensional change, no abnormal surface with the material in an as new condition with respect to hardness, flexibility, physical dimensions, and color; and rigid polymeric materials should have no erosion, cracking, checking, or chalking.

The team had no concerns with the enhancements.

.6 B.1.18 Fatigue Monitoring (X.M1)

This program manages the effects of aging by ensuring that fatigue usage remains within allowable limits for those components identified as having a time-limited aging analysis. The applicant implemented the objectives of the program by: (1) tracking the number of critical thermal and pressure transients for selected components and (2) verifying that the severity of monitored transients are bounded by the design transient definitions for which they are classified. The applicant trended the cycles to ensure that the fatigue usage factor remains below the design limit during the period of extended

operation.

The applicant identified several enhancements were needed to ensure consistency with the GALL Report. The applicant planned to revise plant procedures to monitor and track critical thermal and pressure transients for components with a fatigue time limited aging analysis and to account for updates of fatigue usage calculations if an allowable limit is approached, an unanticipated new thermal limit is discovered or the geometry of a component is modified. At least 2 years prior to entering the period of extended operation, the applicant planned to develop a set of fatigue usage calculations that consider the effects of the reactor water environment for a set of the most limiting reactor coolant system components, consider all six stress components for environmentally assisted fatigue, and use the maximum temperature if the average temperature is below the threshold (otherwise use an average temperature).

The team had no concerns with the enhancements.

.7 B.1.19 Fire Protection (XI.M26)

This program manages the effects of aging related to loss of material, cracking, change in material properties, delamination, separation, increased hardness, shrinkage, and loss of strength for components that serve a fire barrier function. The fire barriers included penetration fire seals, fire barrier walls, ceilings, floors, other fire resistance materials that serve an intended fire barrier function, and all fire-rated doors that perform a fire barrier function. The applicant performed the inspections and functional tests in accordance with the applicant controlled specifications and the fire protection program.

The applicant planned to manage the effects of aging through visual inspections and functional testing. The applicant visually inspected 10 percent of each type of fire-rated penetration seal every 18 months. Fire doors are visually inspected and functionally tested every 18 months. The applicant visually inspected fire barrier walls, ceilings, and floors; including coatings and wraps at least once every refueling cycle examining for any signs of aging such as cracking, spalling, and loss of material. The applicant managed the aging effects on the intended function of the halon fire suppression system associated with the control room for loss of material.

.8 B.1.20 Fire Water System (XI.M27)

This program manages the effects of aging related to loss of material, flow blockage caused by fouling, and loss of coating integrity for the fire water piping and suppression systems. The applicant specified monitoring water-based fire suppression system components using periodic flow testing and visual inspections in accordance with NFPA 25-2011, “Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.” The program included dry-pipe systems downstream of manual isolation valves or deluge valves, which may not drain correctly or allow water to collect in piping sections.

The applicant performed system flow testing, including that of underground headers, hose stations, main drains, and selected inspector test valves to ensure the system maintains its intended function. Fire suppression water system parameters monitored during periodic flow testing included fire pump discharge pressure, pressure at fire hydrants, and local areas being tested (e.g., local static and flow pressure at main drain

valves being opened for testing). The applicant continuously monitored fire water system pressure in order to immediately detect a loss of pressure and initiate corrective actions. The applicant used visual inspection techniques that would detect loss of material and fouling, or detect surface irregularities that could indicate wall loss caused by corrosion, corrosion product deposition, and flow blockage caused by fouling.

The applicant identified several exceptions to the GALL Report. Specifically, instead of:

- Annual sprinkler inspections, the applicant specified sprinkler inspections once every 18 months and every 24 months, if located in a high radiation area since inspections at these intervals have effectively demonstrated the function was maintained.

- Annual main drain tests at each riser to identify a change in the condition of the water piping and control valves, the applicant will conduct these tests on 20 percent of the risers every 24 months.

- Flow testing every 5 years at the hydraulically most remote hose connections of each zone of an automatic standpipe system, the applicant performed alternative testing. Specifically, the applicant: (1) performs fire water pump flow testing to verify the water supply provides the design pressure and required flow; (2) flow tests fire hoses every 3 years; and (3) performs main drain tests on 20 percent of standpipes every 24 months to verify valve operability, and confirm no flow restrictions or obstructions exist.

- Performing the destructive “cross-hatch” coating adherence test, the applicant described an alternative test method that used a fixed-alignment adhesion tester and performed in accordance with industry standards. If needed, the applicant specified that they would use a qualified specialist to conduct water jet cleaning to identify any loss of adhesion and confirm tank integrity.

- Trip testing preaction valves every 3 years with the control valve fully open, the applicant planned an alternative test every 5 years that has the control valves closed to prevent water entering the normally dry section of the system. The applicant identified specific additional actions and inspections considered to be equivalent to testing with the valves open.

- Conducting an obstruction evaluation related to a 50 percent increase in time to flow out the team’s test valve, the applicant identified an alternative test since they do not allow water to enter the piping designed to be dry. Alternatively, the applicant verified water flow by closing the control valve prior to the preaction valve and opening a drain valve downstream of the preaction valve before conducting the trip test. The applicant inspects the dry piping downstream of preaction valve to no blockage exists.

The team identified no concerns with these exceptions.

The applicant identified several enhancements needed to ensure consistency with the Gall Report. The applicant planned to revise implementing procedures to perform:

- Actions required by NFPA 25-2011, which included fire sprinkler head inspections; test or replace the sprinkler heads at 50 years; performing main drain tests on 20 percent of the standpipes and risers; and inspect, test and maintain pressure-reducing valves

- Every 5 years internal inspections to evaluate specific conditions of: (1) the dry piping of the preaction systems for loss of material; (2) the dry piping downstream of the deluge valves for the control building cable vaults, cable tunnel spray system, tunnels, and auxiliary building water curtains that could indicate wall loss below nominal pipe wall thickness or flow blockage; and (3) every other wet fire water system to inspect for loss of material and the presence of foreign material that could cause flow blockage

- Every 5 years: (1) inspect and clean the mainline strainers; (2) conduct a flow test or flush sufficient to detect potential flow blockage, or conduct a visual inspection of 100 percent of the internal surface of piping segments that allow water to collect; (3) volumetric wall thickness inspections of 20 percent of the length of piping segments that allow water to collect

- A flush of the mainline strainers at least once per refueling cycle if a fire water system actuation occurred or flow testing occurred during that refueling cycle

- An annual air flow test of the charcoal filter units, if obstructions are found, the system shall be cleaned and retested

- A test to confirm fire hydrants drain within 60 minutes after flushing or flow testing

- Replacement of sprinkler heads that show signs of leakage, excessive loading, or corrosion

- An obstruction evaluation for specific conditions listed in the license renewal application

- Evaluations for microbiologically induced corrosion if tubercules or slime are identified during internal inspections of fire water piping

- Flow testing of underground piping in accordance with NFPA 291, “Recommended Practice for Fire Flow Testing and Marking of Hydrants”

- Inspection of the fire water tanks in accordance with the numerous specific requirements related to inspecting, acceptance criteria, and corrective actions related to the interior condition, including the qualifications of the inspection personnel

The team identified no concerns related to these enhancements.

.9 B.1.21 Flow-Accelerated Corrosion (XI.M17)

This program manages loss of material caused by flow-accelerated corrosion (FAC) (wall thinning) and flow erosion. The applicant implemented the objectives of the program by: (1) performing an analysis to determine systems susceptible to FAC; (2) conducting appropriate analysis to predict wall thinning; (3) performing wall thickness measurements based on wall thinning predictions and operating experience; and (4) evaluating measurement results to determine the remaining service life, and the need for replacement or repair of components. The program applied to carbon steel piping and valve bodies containing two-phase and single-phase fluids, and followed guidance consistent with EPRI NSAC-202L, "Recommendations for an Effective Flow-Accelerated Corrosion Program," Revision 3.

The team determined the applicant used procedures and methods in the FAC program consistent with their commitments to Bulletin 87-01, "Thinning of Pipe Wall in Nuclear Power Plants," and Generic Letter 89-08, "Erosion/Corrosion Induced Pipe Wall Thinning."

The applicant identified enhancements needed to ensure consistency with the GALL Report. Specifically, the applicant identified the need to revise the FAC program implementing procedures to: (1) include provisions for managing wall thinning caused by erosion mechanisms such as cavitation, flashing, liquid droplet impingement, and solid particle impingement; (2) include susceptible locations based on the extent-of-condition reviews in response to plant-specific or industry operating experience; and (3) ensure wall thinning caused by erosion mechanisms has suitable replacement materials identified and these replacements are not excluded from planned inspections until the effectiveness of corrective actions are confirmed. The team had no concerns with the enhancements.

.10 B.1.24 Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (XI.M23)

This program manages loss of material resulting from corrosion and wear for all cranes, trolley, and hoist structural components, fuel handling equipment, and rails. The cranes and hoists in the program include: (1) reactor building polar crane; (2) fuel handling building platform bridge crane; (3) non-safety related jib cranes; and (4) boom crane and monorails located in the reactor building, turbine building, auxiliary facilities, and yard structures.

The team determined the applicant established inspection requirements consistent with the guidance contained in industry standards for heavy load handling systems that can directly or indirectly cause a release of radioactive material, as well as other cranes within the scope of license renewal.

The applicant identified four enhancements needed to ensure consistency with the GALL Report. The applicant planned to revise implementing procedures to:

- Inspect: (1) crane rails for wear; (2) bridge, trolley, and hoist structural components for deformation, cracking, and loss of material caused by

corrosion; and (3) structural connections for loose or missing bolts, nuts, pins or rivets, and any other conditions indicative of loss of bolting integrity.

- Establish inspection frequencies in accordance with specified industry guidelines. Require inspection of inaccessible or infrequently used cranes and hoists prior to use. Bolted connections will be visually inspected for loose or missing bolts, nuts, pins or rivets at the same frequency as crane rails and structural components.

- Establish acceptance criteria for any visual indication of loss of material caused by corrosion or wear, and any visual sign of loss of bolting pre-load is evaluated according to specified industry standards.

- Conduct maintenance and repair activities utilizing the guidance provided in appropriate industry standards.

The team had no concerns with the enhancements.

.11 B.1.26 Masonry Wall (XI.S5)

This program managed the aging effects related to cracking of masonry walls, as well as degradation of the structural steel restraint systems of the masonry walls. This program contained inspection guidelines and listed attributes that caused aging of masonry walls, which were monitored during structural inspections, as well as established examination criteria, evaluation requirements, and acceptance criteria. The applicant included reinforced masonry walls in proximity to safety-related components within the scope of the program if the wall could collapse and damage the components, or removable walls stacked to allow equipment removal.

The applicant identified four enhancements needed to ensure consistency with the GALL Report. The applicant planned to revise masonry wall implementing procedures to: (1) include all masonry walls located within in-scope structures in the program; (2) monitor gaps between the structural steel supports and masonry walls that could potentially affect wall qualification; (3) inspect at least once every 5 years with provisions for more frequent inspections in areas where significant aging effects are observed to ensure the function was maintained; and (4) develop inspection acceptance that ensure observed aging effects do not invalidate the intended function of the walls. The team had no concerns with the enhancements.

.12 B.1.17 Oil Analysis (XI.M39)

This program managed aging effects by maintaining oil systems free of contaminants (primarily water and particulates), thereby preserving an environment that was not conducive to loss of material and reduction of heat transfer. The applicant performed sampling, analysis, and trending of results to provide an early indication of adverse equipment condition in the lube and hydraulic oil environments. The affected materials include aluminum, carbon and stainless steels, copper and nickel alloy, and titanium. This program included the following systems: reactor recirculation flow control valves, standby liquid control pump, reactor core isolation cooling pump/turbine, service water pump, turbine, standby diesel generator, chillers, and high pressure coolant system diesel generator.

The applicant monitors for water and particulate contamination, and compares the sample results to limits specified by the vendor and industry standards. Personnel review, trend, and analyze data to detect any degradation of equipment condition and initiate corrective actions, as necessary, including the performance of additional testing to confirm suspected deficient conditions.

.13 B.1.34 Periodic Surveillance and Preventive Maintenance (Plant Specific)

The applicant developed this program to conduct periodic inspections and tests to manage aging that resulted from cracking, loss of material, reduction of heat transfer, and change in material properties. The applicant identified components fabricated from aluminum, carbon steel, copper alloy, elastomers, and stainless steel located in environments of exhaust gas, lubricating oil, raw and waste water. The applicant identified a specific list of components in the license renewal application where they identified no appropriate program in the GALL Report. For each component, the applicant will sample 20 percent of the population with a maximum of 25 components.

The applicant established the inspection and test intervals to ensure timely detection of degradation prior to loss of intended functions. The applicant planned to conduct the inspections at least once every 6 years during the period of extended operation, except as noted (e.g., diesel component inspections have an 8-year frequency). Inspection and test intervals, sample sizes, and data collection methods will be dependent on component material and environment, biased toward locations most susceptible to aging where practical, and derived with consideration of industry and plant-specific operating experience and manufacturers' recommendations. Established inspection methods to detect aging effects of loss of material and cracking include visual inspections for metallic components. Inspection of elastomeric materials to detect change in material properties includes visual inspections while manually flexing the component.

The applicant will revise implementing procedures to: (1) include the specific inspections included in their license renewal application and (2) establish acceptance criterion of no indication of relevant degradation, and that such indications will be evaluated.

.14 B.1.35 Protective Coating Monitoring and Maintenance (XI.S8)

This program managed the effects of aging caused by the loss of integrity of Service Level I coatings inside containment. The program included visual inspections of accessible coatings that covered steel and concrete surfaces inside the steel concrete vessel (e.g., steel liner, steel shell, supports, concrete surfaces, and penetrations). As specified by industry standards the applicant inspects for signs of aging that included blistering, cracking, flaking, peeling, rusting, and other signs of physical damage. The applicant performs the condition monitoring Service Level 1 coatings inspections every other outage.

.15 B.1.38 Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (X1.S7)

This program manages the effects of aging of concrete resulting from cracking, spalling, rust bleeding or stains, damaged concrete, abrasion, indication of water infiltration, and

observed settlement issues. For steel components the program manages the effects of aging caused by corrosion. The applicant will perform periodic visual examinations to monitor the condition of water-control structures and structural components, including structural steel and structural bolting.

The applicant identified several enhancements needed to ensure consistency with the GALL Report. Specifically, the applicant planned to revise the implementing procedures to:

- Include a list of structural components and commodities within the scope Water Control Structures Program

- Include preventive actions for storage of ASTM A325, ASTM F1852, and ASTM A490 bolting

- Include monitor or inspect concrete structures and components for degradation from loss of material; loss of bond; loss of strength; increase in porosity or permeability, or loss of anchor capacity; perform chemical analysis of groundwater to monitor pH, chlorides, and sulfates; inspect anchor bolts for loss of material, and loose or missing nuts and bolts

- Include the following: inspect structures at least once every 5 years, with provisions for more frequent inspections in accordance with the maintenance rule; inspect submerged structures in the same interval; and sample and chemically analyze ground water at least once every 5 years and trend the results.

The team had no concerns with the enhancements.

.16 B.1.40 Service Water Integrity (X1.M20)

This program manages loss of material and reduction of heat transfer for service water system components fabricated from carbon steel, carbon steel with copper cladding, stainless steel, and copper alloy in an environment of treated water. Service water included the following systems: normal service water, standby service water, and service water cooling. The closed-loop, treated normal service water system cools the reactor plant auxiliary and turbine systems and components (safety and non-safety). The program includes: (1) periodic testing of the residual heat removal (RHR) heat exchangers to verify heat transfer capability, (2) inspection and maintenance of the auxiliary building unit coolers, and (3) routine cleaning of the RHR heat exchanger radiation monitor coolers and penetration valve leakage control system compressor aftercoolers.

The applicant injects corrosion inhibitors and biocide into the normal service water system. The anaerobic, essentially, closed loop normal service water system operates continuously during normal and shutdown operations. The service water cooling system rejects the heat from the normal service water system using plate heat exchangers.

During an accident the normal service water system isolates the non-safety turbine

loads, and standby service water system initiates and uses the ultimate heat sink to cool the safety-related loads. Each outage the applicant performs integrated testing that injects 110,000 gallons of untreated water into the 555,000 gallon closed loop normal service water system. After completing this test, Water Chemistry Control samples the water, and adds the appropriate biocides and corrosion inhibitors to bring them back into specification.

The team determined that the applicant had excluded their inspections of heat exchangers cooled by service water since they had modified their system to be an essentially closed loop system. Specifically, because of microbiologically induced corrosion concerns in the early 1990's, the applicant established a cooling tower for their normal service water system and began operating the system as an anaerobic closed loop system during normal operation, and treated the water with corrosion inhibitors and biocides. As specified in the license renewal application, the applicant only inspected and tested the heat exchangers listed above as a result of their commitments to Generic Letter 89-13, "Service Water System Problems Affecting Safety-Related Components." The team verified that the applicant operated the system in this manner, except when they perform Technical Specification required emergency core cooling system tests using their safety trains.

The team expressed concerns that the applicant had not included other heat exchanger inspections as part of their aging management activities since the system was not operated totally as a closed loop system and because they had an already established inspection schedule. Specifically, the applicant performed periodic visual inspections and eddy current testing of their heat exchangers to determine the condition of the heat exchangers. The periodicity varied from 4 to 12 years. The applicant agreed to include the heat exchanger inspections as part of their periodic surveillance and preventive maintenance program with their existing periodicities. The applicant documented the need to include heat exchanger inspections as part of their aging management activities in Condition Report CR-RBS-2018-01857.

.17 B.1.41 Structures Monitoring (XI.S6)

This program manages the effects of aging of concrete structures resulting from cracking, spalling, rust bleeding or stains, damaged concrete, abrasion, indication of water infiltration, and observed settlement issues. For steel structures and components, the program manages the effects of aging resulting from loss of material caused by corrosion, deformation of structural members, and loose, missing, or damaged anchors or fasteners. The underground environment is not aggressive, consequently the applicant will sample and chemically analyze groundwater for pH, chlorides, and sulfates to identify any changes or concerns.

The structures and structural components in the program are inspected by qualified personnel. These personnel inspect the structures and components using the guidance specified by industry standards. The applicant inspects the structures at least once every 5 years to ensure there is no loss of intended function. Inspections can be performed more frequently, if it fails to meet the inspection criteria.

The applicant identified several enhancements needed to ensure consistency with the GALL Report. Specifically, the applicant planned to revise the implementing procedures to:

- Add the numerous structures specifically listed in their license renewal application and Section 3.4 of the civil/structural aging management program evaluation report, and establish the requirement to inspect in accordance with industry guidelines. The applicant will also include a list of commodities required to be added, and establish requirements to periodically chemically sample and analyze ground water.

- Include the preventive actions for storage of certain types of bolting listed in Section 2 of Research Council on Structural Connections publication, "Specification for Structural Joints Using ASTM A325 or A490 Bolts."

- Monitor and inspect concrete structures and components to include: (1) loss of material, loss of bond, increase in porosity and permeability, loss of strength, and reduction in concrete anchor capacity caused by local concrete degradation; (2) analyze ground water for pH, chlorides, and sulfates; (3) evaluate anchor nuts and bolts for loss of material, and loose or missing nuts and bolts; and (4) inspect elastomeric vibration isolators and structural sealants for cracking, loss of material, loss of sealing, and change in material properties (e.g., hardening).

- Inspect elastomeric material by feel or touch to detect hardening and to augment the visual examination of elastomeric material with physical manipulation of at least 10 percent of available surface area.

- At least once every 5 years, inspect submerged structures and samples, and chemically analyze ground water, including review, evaluate anomalies, and trend the results.

The team had no concerns with the enhancements.

.18 B.1.42 Water Chemistry Control – Boiling Water Reactor (XI.M2)

This program manages the effects of aging related to loss of material caused by general, crevice and pitting corrosion, stress corrosion cracking, change in material properties, and reduction of heat transfer in components, in an environment of treated water through periodic monitoring and control of water chemistry. The program provides corrosion control for the reactor vessel, reactor coolant system, engineered safety features systems, and balance of plant components.

The program is a mitigation program that relies on chemical additive processes such as hydrogen water chemistry and/or noble metal chemical additions. The applicant monitors the water chemistry in accordance with industry guidelines. The program includes specifications and limits for chemical species, impurities and additives, sampling and analysis frequencies, and corrective actions for control of reactor water chemistry.

.19 B.1.43 Water Chemistry Control - Closed Treated Water Systems (XI.M21A)

This program manages loss of material, cracking, and reduction of heat transfer in components in a closed treated water environment through monitoring and control of

water chemistry. The program uses corrosion inhibitors, chemical testing, and visual inspections of internal surfaces. The systems managed by this program include normal service water; diesel engine jacket cooling water; reactor plant and turbine plant component cooling water; control building, turbine building, and radioactive waste chilled water; and firewater diesel engine jacket cooling water.

The program monitored and controlled the following parameters to maintain optimal water chemistry: concentration of iron, copper, silica, and oxygen; hardness; alkalinity; specific conductivity; and pH. The applicant established a closed cooling water systems strategic plan that specified the chemicals added, monitoring frequency, parameter limits, and action level limits. The program implemented the guidance recommended in industry standards.

The applicant identified several enhancements needed to ensure consistency with the GALL Report. Specifically, the applicant planned to revise the implementing procedures to:

- Inspect accessible components whenever a closed treated water system boundary is opened

- Ensure that a representative sample of piping and components is inspected at a frequency of at least once every 10 years by qualified personnel

- Inspect components with the highest likelihood of corrosion, reduction of heat transfer caused by fouling or cracking. Establish, conducting a representative sample (20 percent of the same material, environment, and aging effect combination with a maximum of 25 components).

- Provide acceptance criteria for inspections of accessible components. Ensure components meet system design requirements, such as minimum wall thickness.

The team identified no concerns with these enhancements.

c. Overall Conclusion

Overall, based on the samples reviewed by the team, the inspection results supported a conclusion that there is reasonable assurance that actions have been identified and have been taken or will be taken to manage the effects of aging in the SSCs identified in the license renewal application, and that the intended functions of these SSCs will be maintained in the period of extended operation.

4OA6 Meetings, Including Exit

Exit Meeting Summary

The team presented the inspection results to Mr. W. McGuire, Site Vice President, and other members of the applicant staff during an exit meeting conducted on March 22, 2018. The applicant acknowledged the NRC inspection observations. The team returned all proprietary information reviewed during this inspection.

DOCUMENTS REVIEWED

General

License Renewal

Number	Title	Revision/Date
	River Bend Station License Renewal Application Technical Information	
LR-ISG-2012-01	Wall Thinning Due to Erosion Mechanisms	
LR-ISG-2012-02	Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation	
LR-ISG-2013-01	Aging Management of Loss of Coating or Lining Integrity for Internal Coatings/Linings on In-Scope Piping, Piping Components, Heat Exchangers, and Tanks	
LR-ISG-2015-01	Changes to Buried and Underground Piping and Tank Recommendations	
NUREG-1801, Volume 2	Generic Aging Lessons Learned (GALL) Report	September 2005
NUREG-1828	Safety Evaluation Report Related to the License Renewal of Arkansas Nuclear One, Unit 2	April 2001
RBS-EP-15-00003	Operating Experience Review Results – Aging Management Program Effectiveness	1
RBS-ME-15-00029	Aging Management Review of Non-Safety Related Systems and Components Affecting Safety-Related Systems	0

License Renewal Drawings

Number	Title	Revision
LRA-PID-08-09A	System 309 Diesel Generator	14
LRA-PID-08-09B	System 309 Diesel Generator	22
LRA-PID-08-09C	System 309 Diesel Generator	17
LRA-PID-08-09D	System 309 Diesel Generator	36
LRA-PID-09-10A	System 118 Service Water—Normal	33
LRA-PID-09-10B	System 118 Service Water—Normal	47
LRA-PID-09-10C	System 118 Service Water—Normal	26
LRA-PID-09-10D	System 118 Service Water—Normal	35
LRA-PID-09-10E	System 256 Service Water—Standby	24

License Renewal Drawings

Number	Title	Revision
LRA-PID-09-10F	System 118 Service Water—Normal	32
LRA-PID-09-10H	System 118 Service Water—Normal	28
LRA-PID-09-11A	System 130 Service Water—Cooling	13
LRA-PID-09-11B	System 130 Service Water—Cooling	8
LRA-PID-09-15A	System 659 Makeup Water System	19
LRA-PID-15-01A	System 251 Fire Protection—Water and Engine Pumps	18
LRA-PID-15-01A	System 251 Fire Protection—Water and Engine Pumps	18
LRA-PID-15-01B	System 251 Fire Protection—Water and Engine Pumps	16
LRA-PID-15-01B	System 251 Fire Protection—Water and Engine Pumps	16
LRA-PID-15-01C	System 251 Fire Protection—Water and Engine Pumps	13
LRA-PID-15-01C	System 251 Fire Protection—Water and Engine Pumps	13
LRA-PID-15-01E	System 251 Fire Protection—Water and Engine Pumps	12
LRA-PID-15-01E	System 251 Fire Protection—Water and Engine Pumps	12
LRA-PID-27-04A	System 203 High Pressure Core Spray System	26
LRA-PID-27-05A	System 205 Low Pressure Core Spray System	23
LRA-PID-27-06A	System 209 Reactor Core Isolation Cooling System	45
LRA-PID-27-15A	System 257 Standby Gas Treatment	16

New Aging Management Programs

B.1.1 Aboveground Metallic Tanks (XI.M29)

License Renewal

Number	Title	Revision
RBS-EP-15-00007	River Bend Station License Renewal Project Aging Management Program Evaluation Results – Non-Class 1 Mechanical, Section 3.1 – Above Ground Metallic Tanks	0

Miscellaneous

Number	Title	Revision
PID-04-03A	Engineering P&I Diagram System 106 Condensate Makeup Storage and Transfer	14
SDC-104/106/608	River Bend Station System Design Criteria	2
RBS-T-15411	Field-Fabricated Aluminum Tanks	3
PID-32-09K	Engineering P&I Diagram System 609 Drains-Floor and Equipment	19
PID-27-04A	Engineering P&I Diagram System 203 High Pressure Core Spray System	26

B.1.4 Buried and Underground Piping and Tanks Inspection (XI.M41)

License Renewal

Number	Title	Revision
RBS-EP-15-00007	River Bend Station License Renewal Project Aging Management Program Evaluation Results – Non-Class 1 Mechanical, Section 3.2 – Buried and Underground Piping and Tanks Inspection	0

Miscellaneous

Number	Title	Revision
CEP-UPT-0100	Underground Piping and Tanks Inspection and Monitoring	3
EN-EP-S-002-MULTI	Underground Piping and Tanks General Visual Inspection	4
SEP-UIP-RBS	River Bend Station Underground Components Inspection Plan	3
Specification 228. 160	Specification for Field Fabrication and Erection of Piping	6

Procedures

Number	Title	Revision
EN-DC-343	Underground Piping and Tanks Inspection and Monitoring Program	9
EN-IS-112	Trenching, Excavating, and Ground Penetrating Activities	9

B.1.11 Coating Integrity (XI.M42)

License Renewal

Number	Title	Revision
RBS-EP-15-00007	River Bend Station License Renewal Project Aging Management Program Evaluation Results – Non-Class 1 Mechanical, Section 3.3 – Coating Integrity	0
RBS-ME-15-00032	License Renewal Topical Report on Coating Integrity	0

B.1.28 Non Environmentally-Qualified Inaccessible Power Cables (>400V) (XI.E3)

Drawing

Number	Description	Revision
EE-32W-6	Arrangement Duct Lines, Transformer Yard Unit 1	6
EE-32E-11	Arrangement Duct Line Plan 7 Details	1
EE-032AU	Solar Sump Pump Details	0
EE-032AV	Solar Sump Pump Details	0
EE-032AW	Solar Sump Pump Details	0
EE-032AT	Solar Sump Pump Details	0
EE-32AG-5	Arrangement – Manholes Plan and Details	5
EE-32A	Arrangement – Duct Line Plan and Details	10
PMRQ 24769-6M	EMH30-Sump Pump Installed – Contains Splices – High Risk	
OSP-32	Log Report – Radwaste/Auxiliary Control Building and Auxiliary Control Room	334

License Renewal

Number	Title	Revision
RBS-EE-15-00001	Electrical Screening and Aging Management Review	1
RBS-EP-15-00007	River Bend Station License Renewal Project Aging Management Program Evaluation Results – Electrical, Section 3.2 – Non-EQ Inaccessible Power Cables (>400V)	1

Miscellaneous

Number	Title	Date
	Generic Letter 2001-01, “Inaccessible or Underground Power Cable Failures that Disable Accident Mitigation Systems or Cause Plant Transients” – Summary Report	November 12, 2008
RBFI-07-0070	Response to Generic Letter 2007-01	May 3, 2007

Work Order
52560107

B.1.32 One-time Inspection (XI.M32)

License Renewal

Number	Title	Revision
RBS-EP-15-00007	River Bend Station License Renewal Project Aging Management Program Evaluation Results – Non-Class 1 Mechanical, Section 3.5 – One-Time Inspection	0

B.1.39 Selective Leaching (XI.M33)

License Renewal

Number	Title	Revision
RBS-EP-15-00007	River Bend Station License Renewal Project Aging Management Program Evaluation Results – Non-Class 1 Mechanical, Section 3.6 – Selective Leaching	0

Existing Aging Management Programs

B.1.2 Bolting Integrity (XI.M18)

Condition Report (CR-RB-)
2017-03912

License Renewal

Number	Title	Revision
RBS-EP-15-00007	River Bend Station License Renewal Project Aging Management Program Evaluation Results – Non-Class 1 Mechanical, Section 4.1 – Bolting Integrity	0

Miscellaneous

Number	Title	Revision/Date
CEP-NDE-0902	VT-2 Inspections	7
CEP-RR-001	ASME Section XI Repair/Replacement Program	311
ENG-3-043	River Bend Station Section XI Pressure Test Program	9
EPRI NP-5769	Degradation and Failure of Bolting in Nuclear Power Plants	April 1998
EPRI TR-104213	Bolting Joint Maintenance and Application Guide	December 1995
NUREG-1339	Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants	June 1990

Procedure

Number	Title	Revision
ADM-0047	Leakage Reduction and Monitoring Program	7
EC-DC-150	Condition Monitoring of Maintenance Rule Structures	9
EN-EV-112	Chemical Control Program	16
EN-MA-145	Maintenance Standard for Torque Applications	7

Work Order

5503551135-01

B.1.12 Compressed Air Monitoring (XI.M24)

License Renewal

Number	Title	Revision
RBS-EP-15-00007	River Bend Station License Renewal Project Aging Management Program Evaluation Results – Non-Class 1 Mechanical, Section 4.3 – Compressed Air Monitoring	0
RBS-ME-15-00007	Service Water System	2
RBS-ME-15-00025	Compressed Air System	0

Miscellaneous

Number	Title	Date
ANSI/ISA-S7.0.01-1996	Quality Standard for Instrument Air	

Miscellaneous

Number	Title	Date
ASME OM-S/G-1998	Part 17, Performance Testing of Instrument Air Systems Information Notice Light-Water Reactor Power Plants	
EPRI NP-7079	Instrument Air System: A Guide for Power Plant Maintenance Personnel	December 1990
EPRI/NMAC TR-108147	Compressor and Instrument Air System Maintenance Guide: Revision to NP-7079	March 1998
Generic Letter 88-14	Instrument Air Supply Problems Affecting Safety-Related Components	August 8, 1988
Information Notice 81-38	Potentially Significant Components Failures Resulting from Contamination of Air-Operated Systems	December 17, 1981
NUREG-1837	Regulatory Effectiveness Assessment of Generic Issue 43 and Generic Letter 88-14	October 2005

Procedure

Number	Title	Revision
EN-DC-164	Environmental Qualification Program	4
COP-0043	Sampling Instrument Air Systems for Particulate and Oil Analyses	4
TSP-0028	Periodic Sampling of Plant Compressed Air Systems	306

B.1.14 Containment Leak Rate Program (XI.S4)

Condition Report (CR-RBS-)

2015-03912

License Renewal

Numbers	Title	Revision
RBS-EP-15-00008	River Bend Station License Renewal Project Aging Management Program Evaluation Report Civil/Structural, Section 3.1 – Containment Leak Rate Program	1
RBS-ME-15-00007	Aging Management Review of the Containment Penetrations	1

Miscellaneous

Number	Title	Revision/Date
	River Bend Station, Unit 1 - Issuance of Amendment Re: Extension of Containment Leakage Tests Frequency	October 27, 2016
CEP-APJ-001	Primary Containment Leakage Rate Testing (10 CFR 50 Appendix J) Program Plan	3
CEP-NDE-0903	VT-3 Examination	5
EC 72829	RF-19 Post-Outage – Local Leak Rate Test (LLRT) Frequency Determination	0
NEI 94-01	Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50 Appendix J	3A
Regulatory Guide 1.163	Performance-Based Containment Leak-Test Program	September 1995
SEP-APJ-004	Primary Containment Leakage Rate Testing (Appendix J) Program	4
SEP-CISI-RBS-001	Program Section for ASME Code, Section XI, Division 1, River Bend Station Containment Inservice Inspection (CISI) Program	0

Procedures

Number	Title	Revision
EN-DC-334	Primary Containment Leakage Rate Testing (Appendix J)	3

B.1.15 Diesel Fuel Monitoring (XI.M30)

License Renewal

Number	Title	Revision
RBS-EP-15-00007	River Bend Station License Renewal Project Aging Management Program Evaluation Results – Non-Class 1 Mechanical, Section 4.4 – Diesel Fuel Monitoring	0

Miscellaneous

Number	Title	Revision
CEP-UPT-0100	Underground Piping and Tanks Inspection and Monitoring	3

Miscellaneous

Number	Title	Revision
EN-EP-S-002-MULTI	Underground Piping and Tanks General Visual Inspection	4
SEP-UIP-RBS	River Bend Station Underground Components Inspection Plan	3
Specification 228. 160	Specification for Field Fabrication and Erection of Piping	6

Procedures

Number	Title	Revision
EN-CY-103	Diesel Fuel, Lubricating Oil and Grease Analytical Services	1
COP-0002	Sampling of Petroleum and Petroleum Products	12
COP-0100	Chemistry-Required Surveillances and Actions	29
COP-0106	Addition of Fuel Oil Additives to the Fuel Oil Storage Tanks	12
CSP-0131	Receipt, Storage, and Handling of Diesel Fuel Used in Standby Diesel Engines in Standby Diesel Engines	304
PMID 10032-02	Clean and Inspect Day Tank EGF-TK2A, B, C	2
PMID-15836-01	10 Year Diesel Tank Cleaning for EGF-TK2A Storage Tank	1
STP-309-0201	Division 1, Diesel Generator Operability Test	56

B.1.17 External Surfaces Monitoring (XI.M36)

License Renewal

Number	Title	Revision
RBS-EP-15-00007	River Bend Station License Renewal Project Aging Management Program Evaluation Results – Class 1 Mechanical, Section 4.5 – External Surfaces Monitoring	0

Miscellaneous

Number	Title	Revision
Calculation G13.18. 2.1-061	Auxiliary Building Design Basis Heat Loads and Unit Cooler Sizing Verification	3

Miscellaneous

Number	Title	Revision
SEP-ISI-RBS-001	Program Section for ASME Code, Section XI, Division 1, Inservice Inspection (ISI) Program	0

Procedures

Number	Title	Revision
EN-DC-150	Condition Monitoring of Maintenance Rule Structures	9
EN-DC-178	System WalkDowns	7
EN-TQ-104	Engineering Support Personnel Training Program	0

B.1.18 Fatigue Monitoring (X.M1)

License Renewal

Number	Title	Revision
RBS-EP-15-00005	Time Limited Aging Analysis – Mechanical Fatigue	0
RBS-EP-15-00007	River Bend Station License Renewal Project Aging Management Program Evaluation Results – Class 1 Mechanical, Section 4.7 – Fatigue Monitoring	0

Miscellaneous

Number	Title	Revision
FP-RBS-301	River Bend Fatigue Pro Update	0
NUREG/CR-6260	Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components	
NUREG/CR-6909	Effects of Light Water Reactor Coolant Environments on the Fatigue Life of Reactor Materials	

Procedure

Number	Title	Revision
EDP-MP-05	Fatigue Management	301

B.1.19 Fire Protection (XI.M26)

License Renewal

Number	Title	Revision
RBS-EP-15-00007	River Bend Station License Renewal Project Aging Management Program Evaluation Results – Class 1 Mechanical, Section 4.6 – Fire Protection	0

Miscellaneous

Number	Title	Revision
QA-9-2018-RBS-1	Fire Protection Quality Assurance Audit Report	11
SEP-FPP-RBS-001	River Bend Station Fire Protection Program	3

Procedures

Number	Title	Revision
EN-DC-178	System WalkDowns	7
EN-DC-330	Fire Protection Program	4
STP-000-3401	Fire Door Release and Closing Mechanism Inspection	301
STP-000-3601	Inaccessible Fire Barrier Outage Inspection	3
STP-000-3602	Fire Barrier Visual Inspection	15
STP-000-3604	Fire Barrier Sealed Penetration Inspection	302
STP-000-3608	Fire Door Visual Inspection	301

Work Order

52721815

B.1.20 Fire Water System (XI.M27)

License Renewal

Number	Title	Revision
RBS-EP-15-00007	River Bend Station License Renewal Project Aging Management Program Evaluation Results – Class 1 Mechanical, Section 4.7 – Fire Water System	0
RBS-ME-00015	Aging Management Review of the Fire Protection-Water System	1

Miscellaneous

Number	Title	Revision
R-STM-0250	Fire Protection and Detection	7

Miscellaneous

Number	Title	Revision
VTD-C742-0102	Cummins Operation and Maintenance Manual for Fire Pump Drive Engines	1

Procedures

Number	Title	Revision
FPP-0109	Fire Protection Sprinkler System Functional Test Outside the Protected Area	3
FPP-0113	Fire Hose Station Water Flow Test and Hose Hydrogen Inspection	8
STP-251-0204	Fire Protection Water System Monthly Valve Position Check	10
STP-251-3401	Fire Hydrant 6 Month Inspection	10
STP-251-3501	Technical Specification Related Yard Fire Hydrant Flow Test and Hose Hydrogen Inspection	16
STP-251-3601	Fire Protection Sprinkler Header/Nozzle Inspection	12
STP-251-3602	Fire Pump Functional Test	16
STP-251-3700	Fire System Yard Water Suppression Loop Flow Test	10
STP-251-3701	Spray and Sprinkler Open Nozzle Head Air Flow Test	5A

B.1.21 Flow-Accelerated Corrosion (FAC) Program (XI.M17)

License Renewal

Number	Title	Revision
RBS-EP-15-00007	River Bend Station License Renewal Project Aging Management Program Evaluation Results – Non-Class 1 Mechanical, Section 4.8 – Flow-Accelerated Corrosion	0

Miscellaneous

Number	Title	Revision/Date
	River Bend Station Strategic Chemistry Plan	10
CEP-FAC-001	Flow-Accelerated Corrosion Program Component Scanning and Gridding Standard	0
EC 72133	Refuel 19 Flow-Accelerated Corrosion Post-Outage Report	0

Miscellaneous

Number	Title	Revision/Date
EN-EP-S-002-MULTI	Underground Piping and Tanks General Visual Inspection	4
NUREG-1344	Erosion/Corrosion-Induced Pipe Wall Thinning in U.S. Nuclear Power Plants	April 1989
RBS-EP-11-00005	River Bend Station Flow-Accelerated Corrosion System Susceptible Evaluation Report	0
RBS-EP-11-00006	River Bend Station Flow-Accelerated Corrosion Susceptible Non-Modeled Program Report	0
RBS-EP-11-00007	River Bend Station Flow Accelerated Program RF16 Post-Outage Report	0
SEP-FAC-RBS-001	Flow-Accelerated Corrosion Program Section	0

Procedure

Number	Title	Revision
EN-DC-315	Flow-Accelerated Corrosion Program	12

B.1.24 Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (XI.M23)

License Renewal

Number	Title	Revision
RBS-EP-15-00008	River Bend Station License Renewal Project Aging Management Program Evaluation Report Civil/Structural – Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	0

Miscellaneous

Number	Title	Revision/Date
RBS-CS-07-00001	NEI Heavy Load Drop Initiative	0
NUREG 0612	Control of Heavy Loads at Nuclear Power Plants	1980
T3231	MHT-CR1 Major Inspection	June 12, 2017

Procedures

Number	Title	Revision
MLP-7500	Operation of the Spent Fuel Cask Crane	21

Procedures

Number	Title	Revision
MLP-7501	Operation of the Fuel Building Bridge Crane	16
MLP-7509	Operation of the Polar Crane	19
MLP-7515	Operation of Bridge and Gantry Cranes	8

Work Order
52699941-01

B.1.26 Masonry Wall (XI.S5)

License Renewal

Number	Title	Revision
RBS-CS-15-00001	Aging Management Review of the Reactor Building	1
RBS-CS-15-00002	Aging Management Review of Water Control Structures	1
RBS-CS-15-00003	Aging Management Review of the Turbine Building, Auxiliary Building, and Yard Structures	1
RBS-EP-15-00008	River Bend Station License Renewal Project Aging Management Program Evaluation Report Civil/Structural – Section 3.5, Masonry Wall Program	1

Procedures

Number	Title	Revision
EN-DC-150	Condition Monitoring of Maintenance Rule Structures	9
STP-000-3602	Fire Barrier Visual Inspection	15

B.1.31 Oil Analysis (XI.M39)

License Renewal

Number	Title	Revision
RBS-EP-15-00007	River Bend Station License Renewal Project Aging Management Program Evaluation Results – Non-Class 1 Mechanical, Section 4.9 – Oil Analysis	0

Miscellaneous

Number	Title	Revision
SEP-LUB-RBS-001	Oil Analysis Program	8

Procedures

Number	Title	Revision
EN-DC-159	System and Component Monitoring	8
EN-DC-310	Predictive Maintenance Program	7
GMP-0015	Lubrication Procedure	13

B.1.34 Periodic Surveillance and Preventive Maintenance (Plant Specific)

License Renewal

Number	Title	Revision
RBS-EP-15-00007	River Bend Station License Renewal Project Aging Management Program Evaluation Results – Non-Class 1 Mechanical, Section 4.10 – Periodic Surveillance and Preventive Maintenance	0

Procedures

Number	Title	Revision
ADM-0085	Periodic Maintenance Program	7
EN-DC-310	Predictive Maintenance Program	7
EN-DC-324	Periodic Maintenance Program	15

B.1.35 Protective Coating Monitoring and Maintenance (XI.S8)

License Renewal

Number	Title	Revision
RBS-CS-15-00001	Aging Management Review of the Reactor Building	0
RBS-EP-15-00008	River Bend Station License Renewal Project Aging Management Program Evaluation Report Civil/Structural – Section 3.6, Protective Coating Monitoring and Maintenance Program	1

Miscellaneous

Number	Title	Revision
RBS-CS-13-00006	RF-17 Drywell Coating Inspection Report	0
RBS-CS-14-00001	2014 Maintenance Rule Structures Periodic Assessment	0

Procedures

Number	Title	Revision
EN-DC-220	Safety-Related Coatings Program	3

B.1.38 Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (XI.S7)

License Renewal

Number	Title	Revision
RBS-EP-15-00008	River Bend Station License Renewal Project Aging Management Program Evaluation Report Civil/Structural – Section 3.7, Regulatory Guided 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	1

Procedures

Number	Title	Revision
EN-DC-141	Design Inputs	15
EN-DC-150	Condition Monitoring of Maintenance Rule Structures	9
EN-MA-145	Maintenance Standard for Torque Applications	8

B.1.40 Service Water Integrity (XI.M20)

Drawings

Number	Title	Revision
88130-131	M30-FG , Plate Heat Exchanger	1
004-440, Sheet 1	Cooling Tower General Arrangement	A
004-440, Sheet 2	Cooling Tower General Arrangement	A

License Renewal

Number	Title	Revision/Date
RBS-EP-11-00004	Summary Report Cycle 16 and RF 16 Heat Exchanger Inspections	November 1, 2011
RBS-EP-15-00007	River Bend Station License Renewal Project Aging Management Program Evaluation Results – Non-Class 1 Mechanical, Section 4.11 – Service Water Integrity	0

Miscellaneous

Number	Title	Revision/Date
	River Bend Station Strategic Chemistry Plan	9
Modification Request 95-0040	Install Cross Ties to Prevent Water Stagnation	June 28, 1995
RBS-44655	Updated Response to Generic Letter 89-13	
RBS-EP-15-00019	Summary Report Cycle 18 and RF18 Heat Exchanger Inspections	December 16, 2015
SEP-HX-RBS-001	Service Water Heat Exchanger Inspections	1
SEP-SW-RBS-001	River Bend Station Generic Letter 89-13 Service Water Heat Exchanger Program	0

Procedure

Number	Title	Revision
COP-0119	Chemical Additions to the Service Water System	3
EN-DC-184	NRC Generic Letter 89-13 Service Water Program	3
EN-DC-316	Heat Exchanger Performance and Condition Monitoring	7

B.1.41 Structure Monitoring (XI.S6)

License Renewal

Number	Title	Revision
RBS-CS-15-00001	Aging Management Review of the Reactor Building	1
RBS-CS-15-00002	Aging Management Review of Water Control Structures	1
RBS-CS-15-00003	Aging Management Review of the Turbine Building, Auxiliary Building, and Yard Structures	1
RBS-EP-15-00008	River Bend Station License Renewal Project Aging Management Program Evaluation Report Civil/Structural – Section 3.4, Structures Monitoring Program	1

Miscellaneous

Number	Title	Revision/Date
ACI 201.1R	Guide for Conducting a Visual Inspection of Concrete in Service	July 2008

Miscellaneous

Number	Title	Revision/Date
ACI 349.3R	Evaluation of Existing Nuclear Safety-Related Concrete Structures	July 2008
EPRI NP-5067	Nuclear Maintenance Applications Center: Bolted Joint Fundamentals	December 2007
EPRI NP-5769	Degradation and Failure of Bolting in Nuclear Power Plants, Volume 1	April 1988
EPRI NP-5769	Degradation and Failure of Bolting in Nuclear Power Plants, Volume 2	April 1988
TR-104213	Bolted Joint Maintenance and Applications Guide	December 1995
NUREG/CR-4652	Concrete-Component Aging and its Significance Relative to Life Extension of Nuclear Power Plants	September 1986
RBS-CS-14-00001	2014 Maintenance Rule Structures Periodic Assessment	0

Procedures

Number	Title	Revision
EN-DC-141	Design Inputs	15
EN-DC-150	Condition Monitoring of Maintenance Rule Structures	9
EN-MA-145	Maintenance Standard for Torque Applications	8

Work Order
00377117

B.1.42 Water Chemistry Control – Boiling Water Reactor (BWR) (XI.M2)

License Renewal

Number	Title	Revision
RBS-EP-15-00007	River Bend Station License Renewal Project Aging Management Program Evaluation Results – Non-Class 1 Mechanical, Section 4.12 – Water Chemistry Control – Boiling Water Reactor	0

Procedures

Number	Title	Revision
ADM-0042	Conduct of Chemistry	16
CSP-0004	Chemistry Surveillance Procedure on Monitoring	301

Procedures

Number	Title	Revision
CSP-0006	Chemistry Surveillance and Scheduling System	39
CSP-0009	Program Effectiveness	301
CSP-0100	Chemistry – Required Surveillances and Actions	29
CSP-0143	Noble Chemistry Application	1
EN-CY-100	Conduct of Chemistry	0
EN-CY-101	Chemistry Activities	4
EN-CY-102	Laboratory Analytical Quality Control	6
EN-CY-121	Chemistry Fundamentals Program	0

B.1.43 Water Chemistry Control – Closed Treated Water Systems (XI.M21A)

License Renewal

Number	Title	Revision
RBS-EP-15-00007	River Bend Station License Renewal Project Aging Management Program Evaluation Results – Non-Class 1 Mechanical, Section 4.13 – Water Chemistry Control – Closed Treated Water Systems	0

Procedures

Number	Title	Revision
CSP-0006	Chemistry Surveillance and Scheduling System	39
COP-0070	Feed and Bleed of the Closed Cooling Water Systems	4
COP-0105	Standby Diesel Jacket Cooling Water Chemical Addition	11
COP-0119	Chemical Additions to the Service Water System	3
COP-0237	Operation of the Cooling Water Corrosion Monitoring Systems	6
EN-CY-102	Laboratory Analytical Quality Control	6

LICENSE RENEWAL INSPECTION DOCUMENT REQUEST

1. License Renewal Application Development Instructions (station blackout, scoping and screening, aging management reviews, operating experience reviews)

2. License Renewal Process Instructions (developing aging management review report, developing the aging management programs, working with the database)

3. Aging management programs

4. References specified in the aging management programs, aging management reviews, and scoping and screening processes

5. Copy of any license amendments

6. A minimum of 10 years of operating experience

7. Issued or draft procedures related to the aging management programs selected

8. Single set of marked up license renewal drawings (hard copy); size 24 x 36

RIVER BEND STATION – NRC LICENSE RENEWAL INSPECTION
REPORT 05000458/2018011 – MAY 7, 2018

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