UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

September 27, 2019

Vice President, Operations
Entergy Operations, Inc.
River Bend Station
5485 US Highway 61
St. Francisville, LA 70775

SUBJECT: RIVER BEND STATION, UNIT 1 – RELIEF REQUEST RBS-ISI-021, PROPOSED ALTERNATIVE TO 10 CFR 50.55a EXAMINATION REQUIREMENTS FOR THIRD 10-YEAR INTERVAL VOLUMETRIC EXAMINATIONS (EPID L-2018-LLR-0388)

Dear Sir or Madam:

By letter dated November 30, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18334A259), as supplemented by letter dated May 9, 2019 (ADAMS Accession No. ML19129A425), Entergy Operations, Inc. (the licensee), submitted Relief Request RBS-ISI-021 for the U.S. Nuclear Regulatory Commission (NRC) review and approval for the third 10-year inservice inspection (ISI) interval at River Bend Station, Unit 1. In its submittal of Relief Request RBS-ISI-021, the licensee requested relief from the examination coverage requirements of Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) for certain ASME Code Class 1 components and welds.

Specifically, pursuant to paragraph 50.55a(g)(5)(iii) of Title 10 of the *Code of Federal Regulations* (10 CFR), the licensee requested relief on the basis that achieving the ASME Code required examination coverage for the components and welds identified in Relief Request RBS-ISI-021 is impractical.

The NRC staff has reviewed the proposed alternative and concludes that the examinations performed to the extent practical provide reasonable assurance of structural integrity of the subject components. The NRC staff finds that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property, or the common defense and security, and is otherwise in the public interest, given due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Accordingly, the NRC staff concludes that the licensee has adequately addressed all the regulatory requirements set forth in 10 CFR 50.55a(g)(6)(i). Therefore, the NRC staff grants the use of Relief Request RBS-ISI-021 at the River Bend Station, Unit 1, for the duration of the third 10-year ISI interval, which ended on November 30, 2017.

All other requirements of the ASME Code, Section XI, for which relief has not been specifically requested and authorized by NRC staff remain applicable, including a third-party review by the Authorized Nuclear Inservice Inspector.

If you have any questions, please contact the River Bend Project Manager, Margaret O'Banion, at 301-415-1233 or via e-mail at Margaret.O'Banion@nrc.gov.

Sincerely,

Robert J. Pascarelli, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-458

Enclosure:
Safety Evaluation

cc: Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST RBS-ISI-021

ALTERNATIVE EXAMINATION COVERAGE DURING

THIRD 10-YEAR INSERVICE INSPECTION INTERVAL

ENTERGY OPERATIONS, INC.

RIVER BEND STATION, UNIT 1

DOCKET NO. 50-458

1.0 INTRODUCTION

By letter dated November 30, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18334A259), as supplemented by letter dated May 9, 2019 (ADAMS Accession No. ML19129A425), Entergy Operations, Inc. (Entergy, the licensee) submitted Relief Request RBS-ISI-021 for the U.S. Nuclear Regulatory Commission (NRC) review and approval for the third 10-year inservice inspection (ISI) interval at River Bend Station, Unit 1 (River Bend or RBS). In its submittal of Relief Request RBS-ISI-021, the licensee requested relief from the examination coverage requirements of Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) for certain ASME Code Class 1 components and welds.

Specifically, pursuant to paragraph 50.55a(g)(5)(iii) of Title 10 of the *Code of Federal Regulations* (10 CFR), the licensee requested relief on the basis that achieving the ASME Code required examination coverage for the components and welds identified in Relief Request RBS-ISI-021 is impractical.

2.0 REGULATORY EVALUATION

The NRC staff considered the following regulatory requirements and guidance in its evaluation.

As required by 10 CFR 50.55a(g)(4), "Inservice inspection standards requirement for operating plants," throughout the service life of a boiling or pressurized water-cooled nuclear power facility, components that are classified as ASME Code Class 1, 2, and 3 must meet the requirements, except the design and access provisions and preservice examination requirements, as set forth in Section XI of the ASME Code incorporated by reference in

10 CFR 50.55a(a) 12 months prior to the start of the 120-month interval, subject to the conditions listed in 10 CFR 50.55a(b).

The regulation at 10 CFR 50.55a(g)(5)(iii), "ISI program update: Notification of impractical ISI Code requirements," states that,

> If the licensee has determined that conformance with a Code requirement is impractical for its facility the licensee must notify the NRC and submit, as specified in § 50.4, information to support the determinations. Determinations of impracticality in accordance with this section must be based on the demonstrated limitations experienced when attempting to comply with the Code requirements during the inservice inspection interval for which the request is being submitted. Requests for relief made in accordance with this section must be submitted to the NRC no later than 12 months after the expiration of the initial or subsequent 120-month inspection interval for which relief is sought.

The regulation at 10 CFR 50.55a(g)(6)(i), "Impractical ISI requirements: Granting of relief," states that,

> The Commission will evaluate determinations under paragraph (g)(5) of this section that code requirements are impractical. The Commission may grant such relief and may impose such alternative requirements as it determines are authorized by law, will not endanger life or property or the common defense and security, and are otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists for the licensee to request and the Commission to grant, the relief requested by the licensee.

3.0 TECHNICAL EVALUATION

3.1 Relief Request RBS-ISI-021

3.1.1 ASME Code Components Affected

The affected components are listed in the table below, which is based on the information provided from Table 1 of the relief request in the letter dated November 30, 2018.

As shown in the table below, the first three components are related to the traditional ISI program and are classified and examined in accordance with the ASME Code, Section XI, Table IWB-2500-1. The first two components are welds, B13-D001-AE and B13-D001-AG and are classified as Examination Category B-A, "Pressure Retaining Welds in Reactor Vessel," with the associated Item Nos. B1.30 and B1.40, respectively. The third component, B13-D001-LG, is classified as Examination Category B-G-1, "Pressure Retaining Bolting, Greater than 2 in. [inches] (50 mm [millimeter] in Diameter," with associated Item No. B6.40. The third component represents studs and threads associated with reactor pressure vessel flange stub holes.

The remaining eight welds in the table below are part of the risk-informed ISI program and are classified and examined in accordance with ASME Code Case N-716, "Alternative Piping

Classification and Examination Requirements, Section XI, Division 1." The examination category is R-A and item number is R1.20 for the eight welds. Six of the eight welds are part of the reactor water cleanup system (WCS) and the remaining two welds are part of the standby liquid control system (SLS).

Table of Affected Components

Cat	Item No.	Component ID	Item Description	Material 1	Material 2
B-A	B1.30	B13-D001-AE	Reactor Vessel Shell-to-Flange Weld	Shell: SA-533	Flange: SA-508
B-A	B1.40	B13-D001-AG	Reactor Vessel Shell-to-Flange Weld	Shell: SA-533	Flange: SA-508
B-G-1	B6.40	B13-D001-LG (64 Stud Holes)	RPV Flange Stud Hole Threads	SA-540	N/A
R-A	R1.20	WCS-003A-XI-FW003/WCS-003-CD-A	Pipe to Valve Weld	Pipe: SA-312 TP316L	Valve: SA-182 F316L
R-A	R1.20	WCS-003A-XI-FW004/WCS-003-CD-A	Valve to Pipe Weld	Valve: SA-182 F316L	Pipe: SA-312 TP316L
R-A	R1.20	WCS-006B2-XI-FW011/WCS-006-CD-B2	Pipe to Valve Weld	Pipe: SA-312 TP316L	Valve: SA-182 F316L
R-A	R1.20	WCS-006B2-XI-FW013/WCS-006-CD-B2	Bent Pipe-to-Reducer Weld	Pipe: SA-312 TP316L	Reducer: SA-403 WP316L
R-A	R1.20	WCS-006B2-XI-SW001/WCS-006-CD-B2	Bent Pipe-to-Tee Weld	Pipe: SA-312 TP316L	Tee: SA-403 WP316L
R-A	R1.20	WCS-006B2-XI-SW004/WCS-006-CD-B2	Tee-to-Pipe Weld	Tee: SA-403 WP316L	Pipe: SA-312 TP316L
R-A	R1.20	SLS-042B-FW001/SLS-042-CD-B	2-inch Tee-to-90 Degree Elbow Weld	Tee: SA-403 WP304L	Elbow: SA-403 WP304L
R-A	R1.20	SLS-042B-FW015/SLS-042-CD-B	2-inch Tee-to-Pipe Weld	Tee: SA-312 TP304L	Pipe: SA-403 WP304L

3.1.2 Applicable Code Edition and Addenda

The licensee stated that the code of record for the third 10-year ISI interval is ASME Code, Section XI, 2001 Edition through 2003 Addenda. The third 10-year ISI interval was from May 31, 2008 to November 30, 2017.

The requirements of ASME Code, Section XI, Appendix VIII and use of the Performance Demonstration Initiative are in accordance with the 2001 Edition of the ASME Code, Section XI, as conditioned by 10 CFR 50.55a(b)(2)(xv) and 10 CFR 50.55a(b)(2)(xxiv).

The licensee stated that as an alternative to the requirements for the ASME Code, Section XI, Examination Category B-F, B-J, C-F-1 and C-F-2 welds, it received NRC authorization for River Bend on June 30, 2010, to use a risk-informed safety based inservice inspection (RIS_B) program. The duration of this alternative to the ASME Code, Section XI, is for the remainder of the third 10-year ISI interval. The licensee further stated that this RIS_B program is based, in part, on using ASME Code Case N-716 as guidance and from its authorization date forward, Examination Category B-F, B-J, C-F-1, and C-F-2 welds, such as the WCS and SLS welds in the table above, were all included under Examination Category R-A of the new RIS_B program.

3.1.3 Applicable Code Requirements

ASME Code Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds, Section XI, Division 1," as approved in Regulatory Guide 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," permits essentially 100 percent examination coverage of welds, which is defined as more than 90 percent of the examination volume or required surface area of each weld where the reduction in coverage is due to interference by another component or part geometry. Additional guidance in NRC Information Notice 98-42, "Implementation of 10 CFR 50.55a(g) Inservice Inspection Requirements," dated December 1, 1998, has also been applied at River Bend on how the ASME Code, Section XI should meet examination coverage criteria in Code Case N-460. These requirements have been applied at River Bend for all welds contained in this relief request.

The licensee stated that the ASME Code, Section XI, Table IWB-2500-1, Examination Category B-A, Item No. B1.30 for the reactor vessel shell-to-flange weld and Item No. B1.40 for the reactor vessel head-to-flange weld requires volumetric examinations. The licensee chose these welds to be examined to meet the third 10-year ISI interval requirements. The required examination volume is defined by the applicable Figures IWB-2500-4 and IWB-2500-5 of the ASME Code, Section XI, respectively. However, the licensee encountered limited examination coverage of these two welds and could not achieve the essentially 100 percent coverage.

The licensee further stated that the ASME Code, Section XI, Table IWB-2500-1, Examination Category B-G-1. Item No. B6.40 requires volumetric examination of the threads in the reactor vessel flange stud holes as depicted by Figure IWB-2500-12 of the ASME Code, Section XI. These areas are required to be examined to meet the third 10-year ISI interval requirements. As permitted by Table IWB-2500-1, Item No. B6.40, these examinations were deferred to and performed in the third period of the third ISI interval. The licensee performed these examinations in accordance with ASME Code, Section V, Article 4, as supplemented by the ASME Code, Section XI, Appendix I, Table I-2000-1. The licensee stated that due to the configuration of the reactor vessel flange surface, it did not achieve the essentially 100 percent examination coverage.

The licensee indicated that the ASME Code Case N-716, Table 1, Examination Category R-A, Item No. R1.20, "Elements Not Subject to a Degradation Mechanism," requires selected welds to have a volumetric examination performed in accordance with the volume required in the ASME Code, Section XI, Figures IWB-2500-8(c), 9, 10, and 11, as applicable. The licensee was not able to achieve the essentially 100 percent examination coverage for the eight WCS and SLS welds.

3.1.4 Reason for Request

The licensee stated that pursuant to 10 CFR 50.55a(g)(5)(iii), "the required submittal of this relief request is due on or before November 30, 2018, for RBS, because Entergy has determined that compliance with the code requirements of achieving essentially 100% coverage of the welds listed in this relief request is impractical for RBS." The licensee indicated that the welds listed in Table 1 of the relief request in the letter dated November 30, 2018, did not receive the required code volume coverage due to their component design configurations.

The licensee stated that impracticality was caused by the physical obstructions, plant locations, and/or component geometry, which could affect the accessibility to conduct any inspection of a given piping component. The licensee stated that although the design of the plant has provided access for examinations to the extent practical, component design configurations such as support interference, geometric configurations, and materials such as fitting or valve bodies made of cast stainless steel, may not allow the full required examination volume or surface area coverage with the latest techniques available.

The licensee stated in its letter dated November 30, 2018, that,

> To comply with the code required examination volumes for obtaining essentially 100% coverage for the welds listed in this relief request, the welds and their associated components would have to be physically modified and/or disassembled beyond their current design. Overall, components and fittings associated with the welds listed in this relief request are constructed of standard design items meeting typical national standards that specify required configurations and dimensions. To replace these items with items of alternate configurations to enhance examination coverage would require unique redesign and fabrication. Because these items are in the Class 1 boundary and form a part of the reactor coolant pressure boundary, their redesign and fabrication would be an extensive effort based on the limitations that exist.

The licensee stated in its letter dated November 30, 2018, that,

> for the Class 1 Category B-A Flange-to-Vessel and Head-to-Flange Welds of the Reactor Vessel the design configurations of these welds do not allow the required examination coverage to be obtained without a design modification of the components. For the Class 1 Category B-G-1 RPV [reactor pressure vessel] [f]lange stud hole threads, the configuration of the sealing surface prevents complete access to the area around each stud hole. To improve examination coverage would require a design modification of the RPV shell flange and head flange seating surfaces.

The licensee stated in its letter dated November 30, 2018, that ,

> For the Class 1 Category R-A welds listed in this relief request they are typically limited by their design configurations also. The configurations of these welds such as Pipe-to-Valve, Pipe-to-Tee, or Elbow-to-Tee Welds only allow ultrasonic examination coverage from one side of the weld or limited coverage from a specific area or areas of one side of the weld and thus they would also require a design modification to obtain the required examination coverage.

The licensee explained that it has performed examinations to the maximum extent possible and using radiography to examine the subject components is impractical due to the amount of work being performed in the areas on a 24-hour basis when the welds are available for examination. The licensee further explained that, "This would result in numerous work-related stoppages and increased exposure due to the shutdown and startup of other work in the areas. The water must be drained from systems or components where radiography is performed, which increases the radiation dose rates over a much broader area than the weld being examined. Therefore, there is significant impracticality associated with the performance of weld or area modifications or the use of radiography in order to increase the examination coverage."

3.1.5 Proposed Alternative

In lieu of achieving essentially 100 percent ultrasonic examination coverage for the subject welds in accordance with the ASME Code, Section XI, Table IWB-2500-1, the licensee achieved the alternate examination coverage as shown in Table 1 of the submitted relief request.

As part of the proposed alternative, the licensee stated that (1) it will continue to perform periodic system pressure tests and VT-2 visual examinations in accordance with the ASME Code, Section XI, Examination Category B-P, "All Pressure Retaining Components," for Class 1 pressure retaining welds and items (i.e., pressure-retaining components) each refueling outage in accordance with Table IWB-2500-1; and (2) it conducted and will conduct ultrasonic examinations to the maximum extent possible when required by the ASME Code, Section XI or the RIS_ B Program.

3.1.6 Basis for Use

The licensee ultrasonically examined components listed in this relief request to the maximum extent possible. The licensee stated, in part, that "Plant-specific, or industry operating experience regarding potential degradation specific to welds in this relief request has been taken into account with the identification of potential degradation mechanisms within the scope of the applied RIS_B Program." The licensee examined the subject welds ultrasonically with manual techniques.

In its letter dated November 30, 2018, the licensee stated, in part that,

> All the Class 1 Examination Category B-A and R-A welds with limited examinations included in the Attachment of this relief request are located inside the drywell at RBS. The following RCS leakage detection equipment and requirements help to ensure the early identification of any leakage of these welds during Reactor Coolant System (RCS) operation. Even though the limitations associated with the examinations identified in this relief request did not meet the essentially 100% code required volume coverage requirement there is instrumentation in place to assure that early detection of any RCS pressure boundary leakage is identified. This is accomplished by the leakage monitoring systems inside the drywell at RBS where the RCS leakage detection systems are required to be operable in accordance with RBS Technical Specification (TS) Limiting Condition for Operation (LCO) 3.4.7, "RCS Leakage Detection Instrumentation." The system's instrumentation consists of the drywell or pedestal floor drain sump monitoring system, the drywell atmospheric monitoring system or atmospheric gaseous monitoring system, and the drywell air cooler flow rate monitoring system. These systems are used to quantify any

unidentified leakage from the RCS and to meet RBS TS LCO 3.4.5, "RCS Operational Leakage." RCS Surveillance Requirements (SRs) 3.4.7.1, 3.4.7.2, 3.4.7.3, and 3.4.5.1 ensure operability of the RCS leakage detection systems, and compliance with TS LCO 3.4.5, which states: "RCS Operational Leakage shall be limited to (a) No pressure boundary leakage; (b) ≤ 5 gpm [gallons per minute] unidentified leakage; (c) ≤ 30 gpm total leakage averaged over the previous 24 hour period; and (d) ≤ 2 gpm increase in unidentified leakage with the previous 24 hour period in MODE 1.

3.1.7 Duration of Proposed Alternative

The licensee stated that this relief request covers the limited examinations that have been identified for the entire third 10-year ISI Interval that started on May 31, 2008, and ended on November 30, 2017.

3.2 NRC Staff Evaluation

The NRC staff reviewed the following topics in this relief request: (1) examination coverage calculations for the subject welds and reactor vessel flange stub hole threads, (2) analysis of the risk-informed ISI program, (3) justification for the impracticality, and (4) the acceptability of monitoring of the subject components. The NRC staff notes that the examinations required for the following affected components are based on the ultrasonic testing technique.

Weld B13-D001-AE - Reactor Vessel Shell-to-Flange Weld

Weld B13-D001-AE joins the reactor vessel shell to the reactor vessel flange and is classified as Examination Category B-A, Item No. B1.30, in accordance with Table IWB-2500-1 of the ASME Code, Section XI. The last time the licensee examined this weld was in 1999. The code required volume (CRV) is specified in the ASME Code, Section XI, Figure IWB-2500-4 as A-B-C-D. The licensee achieved examination coverage of 74.8 percent for this weld as shown in Table 2 in the licensee's submitted relief request and found no recordable indication.

The NRC staff reviewed the coverage diagram of Weld B13-D001-AE as shown in Figure B and Table 2 of the licensee's submittal, which presents the coverage calculation. The licensee averaged the coverage achieved with the shear wave (T-scan) and longitudinal wave (P-scan) to obtain the overall composite coverage. The NRC staff determined that the licensee can only examine the AE weld from the shell side due to the proximity of the reactor vessel flange (i.e., one-sided examination). The NRC staff notes that the 74.8 percent coverage represents a significant portion of the AE weld volume, such that, if significant degradation were present in this weld, it is likely that the degradation would have been detected in the portion of the AE weld that was examined because the examined volume (1) is the same material as the unexamined volume; (2) is under the same loading conditions; and (3) is exposed to the same reactor coolant environment. In addition, the NRC staff is not aware of any active degradation mechanisms on this type of weld in boiling-water reactors (BWRs).

Weld B13-D001-AG- Reactor Vessel Head-to-Flange Weld

Weld B13-D001-AG joins the reactor vessel head to the reactor vessel flange and is classified as Examination Category B-A, Item No. B1.40, in accordance with Table IWB-2500-1. The last time the licensee examined this weld was in 1999. The CRV was determined based on the ASME Code, Section XI, Figure IWB-2500-5, which includes an ultrasonic examination volume

of A-B-C-D and a surface examination area of B-E as shown in the figure. The licensee achieved the coverage of 74.7 percent for this weld as shown in Table 3 in the licensee's submitted relief request, and found no recordable indications.

The NRC staff reviewed the coverage diagram of the weld as shown in Figure C and Table 3 of the licensee's submittal, which presented the coverage calculation. The NRC staff determined that the configuration of the AG weld prevented achieving essentially 100 percent examination coverage, and that the licensee examined the ASME Code required examination volume to the extent possible. The NRC staff determined that the licensee could only examine from the reactor vessel head side due to the proximity of the reactor vessel flange (i.e., one-sided examination). The NRC staff notes that the 74.7 percent coverage achieved represents a significant portion of the weld volume, such that if significant degradation were present in the AG weld, it is likely that the degradation would have been detected in the portion of the weld that was examined because the examined volume (1) is the same material as the unexamined volume; (2) is under the same loading conditions; and (3) is exposed to the same reactor coolant environment. In addition, the NRC staff is not aware of any active degradation mechanisms on this type of weld in BWRs.

Weld B13-D001-LG - RPV Flange Stud Hole Threads

Component B13-D001-LG is related to the reactor vessel flange stud and stud hole threads. They are classified as Examination Category B-G-1, Item No. B6.40, in accordance with the ASME Code, Section XI, Table IWB-2500-1. Figure IWB-2500-12 of the ASME Code, Section XI, describes the required examination areas and volumes. There are 64 reactor vessel stud holes in the River Bend reactor vessel. The licensee achieved a coverage of 80 percent of required examination volume for each reactor vessel flange stud and all stud hole threads. The licensee did not find any recordable indication.

The NRC staff notes that the 80 percent coverage achieved on the required examination represents a significant sample of the examination volume required for this item. The NRC staff determines that if degradation were present, it would have been detected. As shown in Figure D of the licensee's submitted relief request, the NRC staff notes that the sealing surface of the reactor vessel flange is a raised strip of stainless steel material that covers the inner edge of the flange, overlapping a portion of each flange stud hole. The NRC staff finds that the stainless steel sealing surface near the stud hole prevented the licensee to achieve the essentially 100 percent examination coverage. The NRC staff recognizes that removal of the sealing surface would require redesign of the reactor vessel closure head and flange and is an extensive modification.

Weld WCS-003A-XI-FW003 (Pipe-to-Valve Weld)

Weld WCS-003A-XI-FW003 joins a pipe segment to a valve in the WCS system. This weld is classified as Examination Category R-A, Item No. R1.20, in accordance with Code Case N-716. The NRC staff reviewed Figure E of the submitted relief request and noted that the licensee could only scan the pipe side (upstream) of the weld and could not scan the valve side (downstream) of the weld because of the valve configuration. The licensee stated that it obtained 100 percent of examination coverage of the weld in the axial and circumferential scans from the pipe side of the weld and 0 percent coverage from the valve side of the weld. The licensee obtained a total CRV coverage of 50 percent ((0+0+100+100)/4). The licensee did not identify any recordable indications in the weld volume that was scanned. The NRC staff recognizes that because of the obstruction by the valve, the licensee can only perform a

single-sided examination. As such, the NRC staff finds that a coverage of 50 percent of the required examination volume is expected due to the valve configuration and finds it acceptable as discussed in the "Risk-Informed ISI Analysis" section of this safety evaluation.

Weld WCS-003A-XI-FW004 (Valve-to-Pipe Weld)

Weld WCS-003A-XI-FW004 joins a valve to a pipe segment in the WCS system. This weld is classified as Examination Category R-A, Item No. R1.20, in accordance with Code Case N-716. The NRC staff reviewed Figure F of the licensee's submitted relief request and noted that the licensee could only scan the weld from the pipe side (upstream) and could not scan the weld from the valve side (downstream) because of the valve configuration. The licensee stated that it obtained 100 percent of examination coverage of the weld in the axial and circumferential scans from the pipe side of the weld and 0 percent coverage from the valve side of the weld because of the valve configuration. The licensee obtained a total CRV coverage of 50 percent ((0+0+100+100)/4). The licensee did not identify any recordable indications. The NRC staff recognizes that because of the obstruction by the valve, the licensee can only perform a single-sided examination. As such, the NRC staff finds that a coverage of 50 percent of the required examination volume is expected due to the valve configuration and finds it acceptable as discussed in the "Risk-Informed ISI Analysis" section of this safety evaluation.

Weld WCS-006B2-XI-FW011 (Pipe-to-Valve Weld)

Weld WCS-006B2-XI-FW011 joins a pipe segment to a valve in the WCS system. This weld is classified as Examination Category R-A, Item No. R1.20, in accordance with Code Case N-716. The NRC staff reviewed Figure G of the licensee's submitted relief request and noted that the licensee could only scan the weld from the pipe side and could not scan the weld from the valve side because of the valve configuration. The licensee stated that it obtained 100 percent of examination coverage of the weld in the axial and circumferential scans from the pipe side and 0 percent coverage from the valve side of the weld. The total CRV coverage is 50 percent ((0+0+100+100)/4). The licensee did not identify any recordable indications. The NRC staff recognizes that because of the obstruction by the valve, the licensee can only perform a single-sided examination. As such, the NRC staff finds that a coverage of 50 percent of the required examination volume is expected due to the valve configuration and finds it acceptable as discussed in the "Risk-Informed ISI Analysis" section of this safety evaluation.

Weld WCS-006B2-XI-FW013 (Pipe-to-Reducer Weld)

Weld WCS-006B2-XI-FW013 joins a pipe segment to a reducer in the WCS system. This weld is classified as Examination Category R-A, Item No. R1.20, in accordance with Code Case N-716. The NRC staff reviewed Figure H of the licensee's submitted relief request and noted that because of the obstruction of the reducer, the licensee could only scan the weld from the pipe side and could not scan the weld from the reducer side. The licensee stated that it obtained 100 percent of examination coverage of the weld in the axial and circumferential scans from the pipe side of the weld, but 0 percent coverage from the reducer side of the weld because of reducer's configuration. The licensee obtained a total of 50 percent CRV (0+0+100+100) /4). The licensee did not identify any recordable indications. The NRC staff recognizes that because of the obstruction by the reducer, the licensee can only perform a single-sided examination. As such, the NRC staff finds that a coverage of 50 percent of the required examination volume is expected due to the reducer configuration and finds it acceptable as discussed in the "Risk-Informed ISI Analysis" section of this safety evaluation.

Weld WCS-006B2-XI-SW001 (Bent Pipe-to-Tee Weld)

Weld WCS-006B2-XI-SW001 joins a bent WCS pipe to a tee. This weld is classified as Examination Category R-A, Item No. R1.20, in accordance with Code Case N-716. The NRC staff reviewed Figure I of the licensee's submitted relief request and finds that because the configuration of the tee prevented a proper scan, the licensee could only scan the bent pipe side of the weld and could not scan the tee side of the weld. The licensee stated that it obtained 100 percent of examination coverage of the weld in the axial and circumferential scans from the pipe side of the weld, but 0 percent coverage from the tee side of the weld because of tee's configuration. The licensee obtained a total of 50 percent CRV (0+0+100+100) /4). The licensee did not identify any recordable indications. The NRC staff recognizes that because of the obstruction by the tee, the licensee can only perform a single-sided examination. As such, the NRC staff finds that a coverage of 50 percent of the required examination volume is expected due to the tee configuration and finds it acceptable as discussed in the "Risk-Informed ISI Analysis" section of this safety evaluation.

Weld WCS-006B2-XI-SW004 (Tee-to-Pipe Weld)

Weld WCS-006B2-XI-SW004 joins a tee to a pipe segment in the WCS system. This weld is classified as Examination Category R-A, Item No. R1.20, in accordance with Code Case N-716. The NRC staff reviewed Figure J of the licensee's submitted relief request and finds that because of the configuration of the tee, the licensee could only scan the pipe side of the weld quest and could not scan the tee side of the weld. The licensee stated that it obtained 100 percent of examination coverage of the weld in the axial and circumferential scans from the pipe side of the weld and obtained 0 percent coverage from the tee side of the weld because of tee's configuration. The licensee stated that it obtained a total of 50 percent CRV ((0+0+100+100) /4). The licensee did not identify any recordable indications. The NRC staff recognizes that because of the obstruction by the tee, the licensee can only perform a single-sided examination. As such, the NRC staff finds that a coverage of 50 percent of the required examination volume is expected due to the tee configuration and finds it acceptable as discussed in the "Risk-Informed ISI Analysis" section of this safety evaluation.

Weld SLS-042B-FW001 (Tee-to-90 °Elbow Weld)

Weld SLS-042B-FW001 joins a tee to a 90 ° elbow in the SLS system. This weld is classified as Examination Category R-A, Item No. R1.20, in accordance with Code Case N-716. The NRC staff reviewed Figures K and L of the licensee's submitted relief request and finds that the licensee was able to scan from both the tee side and elbow side of the weld. The NRC staff determines that; however, the configuration of the tee and intrados of the elbow limited the examination coverage in the axial scan of this weld. The licensee stated that it obtained 100 percent examination coverage of the weld in the circumferential scan in the tee (upstream) and elbow (downstream). The licensee encountered coverage limitation when performing the axial scans. The licensee was able to obtain 71.8 percent coverage in the axial scan in the tee side and elbow side. The licensee obtained a total CRV of 85.9 percent ((71.8 + 71.8+ 100+100)/4). The licensee did not identify any recordable indications. The NRC staff recognizes that because of the configuration of the tee and elbow, the licensee was not able to achieve greater than 90 percent of coverage. However, the NRC noted that the licensee was able to achieve 85.9 percent coverage, which represents a significant portion of the weld volume. The NRC staff notes that if significant degradation were present in the weld, it is likely that the degradation would have been detected in the portion of the weld that was examined,

because the examined volume is the same material as the unexamined volume, is under the same loading conditions, and is exposed to the same reactor coolant environment.

Weld SLS-042B-FW015 (Pipe-To-Tee Weld)

Weld SLS-042B-FW015 joins a pipe segment to a tee in the SLS system. This weld is classified as Examination Category R-A, Item No. R1.20, in accordance with Code Case N-716. The NRC staff reviewed Figures M and N of the licensee's submitted relief request and finds that the licensee was able to scan from both the pipe side (upstream) and tee side (downstream) of the weld; however, the configuration of a combination of the pipe and tee limited the examination coverage. The licensee stated that it obtained 100 percent examination coverage of the weld for axial and circumferential scan from the tee side of the weld. The licensee also obtained 100 percent coverage on the circumferential scan of the pipe side of the weld. However, the licensee could only obtain 43.6 percent coverage in the axial scan on the pipe side of the weld. The licensee obtained a CRV of 85.9 percent ((43.6 +100+100+100)/4). The licensee did not identify any recordable indications.

The NRC staff recognizes that because of the configuration of a combination of the pipe and tee, the licensee was not able to achieve greater than 90 percent of coverage per Code Case N-460. However, the NRC staff notes that the licensee was able to achieve 85.9 percent coverage, which represents a significant portion of the weld volume. The NRC staff noted that if significant degradation were present in the weld, it is likely that the degradation would have been detected in the portion of the weld that was examined because the examined volume is the same material as the unexamined volume, is under the same loading conditions, and is exposed to the same reactor coolant environment.

Risk-Informed ISI Analysis

The NRC staff noted that because the state of un-inspected volumes of the WCS and SLS welds is unknown, the NRC staff needed additional information to complete its review. Therefore, the NRC staff issued a request for additional information (RAI), dated April 11, 2019 (ADAMS Accession No. ML19102A072). The NRC staff needed information on the original risk analysis for these welds based on some of the essential variables in the original risk assessment (e.g., (1) consequence evaluation; (2) risk categorization; and (3) the validity of the risk assessment). In Question 1 of the NRC's RAI, the NRC staff noted that the subject welds did not meet the ASME Code-required examination coverage as specified in Table IWB-2500-1, Footnote 4 for B-J category piping, which requires that the examination "includes essentially 100% of weld length." The B-J category welds are pressure retaining welds which are applicable to the WCS and SLS welds in the relief request. The NRC staff asked the licensee whether there were any piping welds (composed of the same material and exposed to a similar environment as the WCS and SLS welds in the relief request) examined with essentially 100 percent coverage and with acceptable results in the third 10-year ISI interval. If other welds in the piping systems that were examined with essentially 100 percent coverage and those welds do not degrade, the subject welds with less than essentially 100 percent coverage would not likely to have degradation, given the same material and the similar environment.

The licensee responded in its letter dated May 9, 2019, that in addition to examining the six WCS welds as shown in Table 1 of its relief request, the licensee also examined three additional WCS welds, WCS-005A-FW007, WCS-001A1-XI-SW001, and WCS-001A1-XI-SW002. The licensee stated that it "obtained greater than 90% coverage and yielded no recordable indications" for these three WCS welds. These welds are of the R-A category, Item number

R1.20 and operating under the same conditions as the six WCS welds in the relief request. In addition to examining the two SLS welds as shown in Table 1 of the relief request, the licensee also examined four additional SLS welds, SLS-037D-FW001, SLS-037D-FW002, SLS-037D-FW003A, SLS-037D-FW004, and SLS-042B-FW008. The licensee obtained greater than 90 percent coverage and yielded no recordable indications for these four SLS welds. These welds are of the R-A category, Item number R1.20 and operating under the same conditions as the two SLS welds in the relief request. The NRC staff finds that the licensee's inspection of additional WCS and SLS welds supports the NRC staff's determination that the structural integrity of the WCS and SLS welds in the relief request will be maintained because the additional examined welds are composed of the same material and exposed to a similar environment as the WCS and SLS welds in the relief request.

In Question 2 of the NRC's RAI, the NRC staff noted that given the limited coverage achieved for the R-A welds (i.e., ranging from 50 percent to 85.9 percent), the NRC staff asked the licensee to provide a summary of the evaluation for accepting the proposed limited coverages required by Note 3 of ASME Code Case N-716. Note 3 states, in part that, "When the required examination volume or area cannot be examined due to interference by another component or part geometry, limited examinations shall be evaluated for acceptability. Acceptance of limited examinations or volumes shall not invalidate the results of the change-in-risk evaluation."

The licensee's supplemental letter dated May 9, 2019, provided a summary of the cumulative effect of the limited examinations reported in Relief Request RBS-ISI-021. This summary demonstrates that the limited examinations do not invalidate the results of the initial change-in-risk evaluation, as required by Note 3 of Table 1 in ASME Code Case N-716.

The licensee performed a probabilistic analysis per ASME Code Case N-716 to show the differences in risk (delta risk) in the limited examination of the six WCS welds. The licensee indicated that to conservatively quantify the effect on delta risk, the delta risk is adjusted by not crediting the examinations for the WCS welds. The licensee's supplemental letter dated May 9, 2019, provided the delta risk with and without crediting the examinations of the six WCS welds. Based on the licensee's calculation, the NRC staff finds that the delta risk is negligible when the six WCS welds were assumed not to have been examined. The NRC staff finds that the delta risk is below the ASME Code Case N-716 acceptable limits of 1E-07 for core damage frequency (CDF) and 1E-08 for large early release frequency (LERF). Therefore, the NRC staff finds that a limited examination of the six WCS welds is acceptable in term of impact to CDF and LERF.

Relief request RBS-ISI-021 also included two SLS welds. The licensee indicated that if all risk-informed examinations are removed from the SLS system, the result is risk neutral. The licensee stated that to conservatively quantify the effect on delta risk, it did not take credit for the two SLS welds with limited examination coverage. The NRC staff determines that the delta risk is negligible and well below the ASME Code Case N-716 acceptable limits of 1E-07 for CDF and 1E-08 for LERF. Therefore, the NRC staff finds that a limited examination of the two SLS welds is acceptable in terms of impact to CDF and LERF.

The licensee stated that in its initial request to use a risk-informed ISI program for the third ISI interval as shown in Relief Request RBS-ISI-013, the licensee provided the delta risk for each system and cumulatively for all systems. The licensee's supplemental letter dated May 9, 2019, provided the cumulative effect on the total delta risk of the six WCS welds and two SLS welds. The NRC staff notes that the delta risk for the total of eight WCS and SLS welds is negligible and well below the ASME Code Case N-716 acceptable limits of 1E-07 for CDF and 1E-08 for

LERF. Therefore, the NRC staff finds that the limited examination coverage of the six WCS and two SLS welds is acceptable in terms of impact to the overall risk.

Impracticality

The NRC staff finds that to obtain the essentially 100 percent examination coverage for the subject welds and reactor vessel flange stud hole threads is impractical because it would require significant modifications to components and fittings. The NRC staff understands that the affected components form part of the reactor coolant pressure boundary and their redesign and fabrication would be an extensive effort, and that, in addition to obtaining the non-standard items, their installation into the Class 1 boundaries is also a significant effort requiring disassembly of portions of the reactor coolant pressure boundary.

The NRC staff recognizes that radiographic testing is not a desired option because it is limited in the ability to detect service-induced flaws, and that the water must be drained from the systems where radiography is performed. The licensee stated that this increases operational risk through prolonged system restoration times and increased station exposure due to increased general radiation dose rates over a much broader area than in the weld being examined. Therefore, the NRC staff determined that obtaining essentially 100 percent coverage is impractical and burden to the licensee because it would cause significant redesign, increased radiation exposure, and/or an increased potential to damage the plant or the component itself.

Monitoring

The NRC staff notes that the subject welds and reactor vessel flange stud hole threads are all located inside the drywell. If these components degraded and caused leakage, the leakage will be detected by the RCS leakage detection systems and collected in the sump inside the drywell. The plant operators would be notified of the leakage and would take corrective actions timely in accordance with River Bend TS 3.4.5 and plant procedures. The NRC staff finds that the licensee will perform system leakage testing and associated VT-2 examination prior to the plant startup after every refueling outage per the ASME Code, Section XI, IWA-5000 as a method to monitor the condition of these components. The NRC staff finds that structural integrity of the subject welds and reactor vessel flange stud hole threads is adequately monitored between the required ultrasonic examinations.

Summary

Based on the above evaluation, the NRC staff determines that obtaining the essentially 100 percent examination coverage for the subject welds and reactor vessel flange stud hole threads is impractical. The NRC staff determines that the licensee has adequately demonstrated reasonable assurance of structural integrity of the subject welds and the reactor vessel flange studs and threads because (1) the licensee detected no recordable indications, (2) evidence of significant service-induced degradation in these welds, if it were to occur, would likely have been detected in the examined volume, (3) the RCS leakage detection systems will detect leakage, and (4) system leakage test and VT-2 examination will be performed prior to the plant startup during every refueling outage.

4.0 CONCLUSION

As set forth above, the NRC staff has determined that the examinations performed to the extent practical provide reasonable assurance of structural integrity of the subject components. The

NRC staff finds that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property, or the common defense and security, and is otherwise in the public interest, given due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Accordingly, the NRC staff concludes that the licensee has adequately addressed all the regulatory requirements set forth in 10 CFR 50.55a(g)(6)(i). Therefore, the NRC staff grants the use of Relief Request RBS-ISI-021 at the River Bend for the duration of the third 10-year ISI interval, which ended on November 30, 2017.

All other ASME Code, Section XI requirements for which relief was not specifically requested and approved in this relief request remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

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Date: September 27, 2019

SUBJECT: RIVER BEND STATION, UNIT 1 – RELIEF REQUEST RBS-ISI-021, PROPOSED ALTERNATIVE TO 10 CFR 50.55a EXAMINATION REQUIREMENTS FOR THIRD 10-YEAR INTERVAL VOLUMETRIC EXAMINATIONS (EPID L-2018-LLR-0388) DATED SEPTEMBER 27, 2019

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