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

September 27, 2022

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

SUBJECT: RIVER BEND STATION, UNIT 1 – PROPOSED ALTERNATIVE TO THE REQUIREMENTS OF ASME CODE OF OPERATION AND MAINTENANCE OF NUCLEAR POWER PLANTS FOR PRESSURE ISOLATION VALVE TESTING FREQUENCY (EPID L-2021-LLR-0090)

Dear Sir or Madam:

By letter dated November 29, 2021 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML21333A187), Entergy Operations, Inc. (Entergy, the licensee) submitted Alternative Request VRR-RBS-2021-1 to the U.S. Nuclear Regulatory Commission (NRC) proposing the use of an alternative to specific requirements in the 2004 Edition through the 2006 Addenda of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code) at River Bend Station, Unit 1 (River Bend) associated with the fourth 10-year inservice testing (IST) program interval.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(1), the licensee requested to use the proposed alternative on the basis that the alternative provides an acceptable level of quality and safety.

The NRC staff has reviewed the subject request and concludes, as set forth in the enclosed safety evaluation, that Entergy has adequately addressed all the regulatory requirements set forth in 10 CFR 50.55a(z)(1). Therefore, the NRC staff authorizes the use of Alternative Request VRR-RBS-2021-1 at River Bend for the remainder of the fourth 10-year IST program interval, which is scheduled to end on November 30, 2027.

All other ASME OM Code requirements for which relief was not specifically requested and approved remain applicable.

If you have any questions, please contact the River Bend Project Manager at 301-415-8378 or via email at Jason.Drake@nrc.gov.

Sincerely,

Jennifer L. Dixon-Herrity

Digitally signed by Jennifer L. Dixon-Herrity
Date: 2022.09.27 10:46:42 -04'00'

Jennifer L. Dixon-Herrity, 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

# ALTERNATIVE REQUEST VRR-RBS-2021-1, REGARDING

# PRESSURE ISOLATION VALVES TESTING FREQUENCY FOR THE

# FOURTH 10-YEAR INSERVICE TESTING PROGRAM

# ENTERGY OPERATIONS, INC.

# RIVER BEND STATION, UNIT 1

# DOCKET NO. 50-458

## 1.0 INTRODUCTION

By letter dated November 29, 2021 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML21333A187), Entergy Operations, Inc. (Entergy, the licensee) submitted Alternative Request VRR-RBS-2021-1 to the U.S. Nuclear Regulatory Commission (NRC) proposing the use of an alternative to specific requirements in the 2004 Edition through the 2006 Addenda of the American Society of Mechanical Engineers (ASME) *Code for Operation and Maintenance of Nuclear Power Plants* (OM Code) at River Bend Station, Unit 1 (River Bend) associated with the fourth 10-year inservice testing (IST) program interval.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(z)(1), "Acceptable level of quality and safety," the licensee requested to implement Alternative Request VRR-RBS-2021-1 on the basis that the proposed alternative would provide an acceptable level of quality and safety.

The River Bend fourth 10-year IST program interval began on December 1, 2017, and is scheduled to end on November 30, 2027. The licensee proposed that Alternative Request VRR-RBS-2021-1 be authorized for the remainder of the fourth 10-year IST program interval.

## 2.0 REGULATORY EVALUATION

The NRC regulations in 10 CFR 50.55a(z), "Alternatives to codes and standards requirements," state that:

> Alternatives to the requirements of [10 CFR 50.55a(b) through (h)] or portions thereof may be used when authorized by the Director, Office of Nuclear Reactor Regulation. A proposed alternative must be submitted and authorized prior to implementation. The applicant or licensee must demonstrate that:

(1) “Acceptable level of quality and safety.” The proposed alternative would provide an acceptable level of quality and safety; or

(2) “Hardship without a compensating increase in quality and safety.” Compliance with the specified requirements of this section would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

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 NRC to authorize, the proposed alternative requested by the licensee.

## 3.0 TECHNICAL EVALUATION

The information provided by the licensee in support of the request for an alternative to ASME OM Code requirements as incorporated by reference in 10 CFR 50.55a has been evaluated and the bases for disposition are documented below.

### 3.1 The Licensee’s Proposed Alternative VRR-RBS-2021-1

Applicable Code Edition

The applicable Code of record for the fourth 10-year IST program interval at River Bend is the 2004 Edition through the 2006 Addenda of ASME OM Code.

ASME Code Components Affected

In its submittal, the licensee proposed alternative testing for the following 13 pressure isolation valves (PIVs):

| Component Number | Description | System | ASME Code Class | OM Code Category |
|---|---|---|---|---|
| 1E22-AOVF005 | High-Pressure Core Spray (HPCS) Pump Discharge Header Check Valve Inside Drywell | CSH | 1 | A/C |
| 1E22-MOVF004 | HPCS Pump Discharge Header Main Isolation Valve | CSH | 1 | A |
| 1E21-AOVF006 | Low-Pressure Core Spray (LPCS) Pump Injection InsideDrywell Check Valve | CSL | 1 | A/C |
| 1E21-MOVF005 | LPCS Pump Injection Shut Off Valve | CSL | 1 | A |
| 1E12-AOVF041A | Residual Heat Removal (RHR) Pump A Injection LineTestable Check Valve | RHS | 1 | A/C |
| 1E12-AOVF041B | RHR Pump B Injection Line Testable Check Valve | RHS | 1 | A/C |
| 1E12-AOVF041C | RHR Pump C Injection Line | RHS | 1 | A/C |

| Component Number | Description | System | ASME Code Class | OM Code Category |
|---|---|---|---|---|
| | Testable Check Valve | | | |
| 1E12-MOVF042A | RHR Pump A Return Line Isolation Valve | RHS | 1 | A |
| 1E12-MOVF042B | RHR Pump B Return Line Isolation Valve | RHS | 1 | A |
| 1E12-MOVF042C | RHR Pump C Return Line Isolation Valve | RHS | 1 | A |
| 1E12-MOVF008 | RHR Pump Shutdown Cooling Outboard Isolation Valve | RHS | 1 | A |
| 1E12-MOVF009 | RHR Pump Shutdown Cooling Inboard Isolation Valve | RHS | 1 | A |
| 1RHS-V240 | RHR Pump C Shutdown Cooling Inlet Check Valve | RHS | 1 | A/C |

Applicable Code Requirement

The IST requirements in the ASME OM Code, 2004 Edition through 2006 Addenda, as incorporated by reference in 10 CFR 50.55a, related to this alternative request are as follows:

- ASME OM Code, subsection ISTC, "Inservice Testing of Valves in Light-Water Reactor Nuclear Power Plants," paragraph ISTC-3522, "Category C Check Valves," subparagraph (a), states in part:

  > During operation at power, each check valve shall be exercised or examined in a manner that verifies obturator travel by using the methods in ISTC-5221.
  >
  > Each check valve exercise test shall include open and close tests.

- ASME OM Code, subsection ISTC, paragraph ISTC-3522, subparagraph (c), states:

  > If exercising is not practicable during operation at power and cold shutdowns, it shall be performed during refueling outages.

- ASME OM Code, subsection ISTC, paragraph ISTC-3630, "Leakage Rate for Other Than Containment Isolation Valves," states:

  > Category A valves with a leakage requirement not based on an Owner's 10 CFR 50, Appendix J program, shall be tested to verify their seat leakages [are] within acceptable limits. Valve closure before seat leakage testing shall be by using the valve operator with no additional closing force applied.

- ASME OM Code, subsection ISTC, paragraph ISTC-3630, subparagraph (a), "Frequency," states:

Tests shall be conducted at least once every 2 yr [years].

Reason for Request

The NRC staff summarizes the licensee's reason for its request provided in its submittal dated November 29, 2021, as follows:

ASME OM Code, subsection ISTC, paragraph ISTC-3630, requires that leakage rate testing for PIVs be performed at least once every 2 years. This proposed alternative will allow PIV testing to be performed at River Bend on a performance-based frequency. The proposed alternative provides for more efficient plant operation and lower cumulative radiation exposure (CRE), while maintaining an acceptable level of quality and safety.

PIVs are not necessarily included in the scope for performance-based testing as provided in 10 CFR Part 50, Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors," Option B, "Performance-Based Requirements." The concept behind the 10 CFR Part 50, Appendix J, Option B, alternative for containment isolation valves (CIVs) is that licensees may be allowed to adopt cost-effective methods for complying with regulatory requirements. Nuclear Energy Institute (NEI) 94-01, Revision 3-A, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J," dated July 2012 (ML12221A202) describes a risk-informed basis for the extended test intervals under Option B. This justification shows that for CIVs, which have demonstrated good performance by the successful completion of two consecutive leakage rate tests over two consecutive cycles, licensees may increase their test intervals. NEI 94-01 also presents the results of a comprehensive risk analysis, including the determination that the risk impact associated with increasing leak rate test intervals is negligible (i.e., less than 0.1 percent of total risk).

The proposed performance-based scheduling of PIV tests at River Bend will enable the licensee to implement a reduction in the resources required for testing, as well as a reduction in refueling outage duration.

NUREG-0933, "Resolution of Generic Safety Issues," Issue 105, "Interfacing Systems LOCA [loss-of-coolant accident] at LWRs [light-water reactors]," discusses the need for PIV leak rate testing based primarily on three pre-1985 historical failures of applicable valves industrywide. These failures all involved human errors in either operations or maintenance. None of these failures involved inservice equipment degradation.

The performance of PIV leak rate testing provides assurance of acceptable seat leakage with the valve in a closed condition. For check valves, functional testing is accomplished in accordance with ASME OM Code, subsection ISTC, paragraphs ISTC-3520, "Exercising Requirements," and ISTC-3522. Power-operated valves are routinely full stroke tested per ASME OM Code to ensure their functional capabilities. The functional testing of the PIV check valves will be monitored through a condition monitoring plan in accordance with ASME OM Code, subsection ISTC, paragraph ISTC-5222, "Condition-Monitoring Program," and Mandatory Appendix II, "Check Valve Condition Monitoring Program." Performance of the separate 2-year PIV leak rate testing does not contribute any additional assurance of functional capability; rather, it only determines the seat tightness of the closed valves.

The use of a condition monitoring plan is intended to align the frequency for the closure exercise

testing with the PIV test. By use of a condition monitoring plan, the check valve closure test, based on performance, would be verified concurrently with the PIV seat leakage test. The frequency of the check valve closure test would then be the same as the PIV seat leakage test because closure performance and seat leakage performance are linked. The PIV seat leakage test would not pass if the valve failed to close.

Licensee's Proposed Alternative

The NRC staff summarizes the licensee's description of its proposed alternative and basis for the use of the alternative provided in its submittal as follows:

The specific test interval for each PIV would be a function of its historical performance and would be established in a manner consistent with the CIV testing process under 10 CFR Part 50, Appendix J, Option B. Performance-based scheduling of PIV testing will be controlled in a manner similar to the methods described in NEI 94-01, Revision 3-A. PIV test performances would occur at a nominal frequency ranging from every refueling outage to every third refueling outage, subject to acceptable valve performance. Valves that have demonstrated good performance for two consecutive cycles may have their test interval extended up to 75 months, with a permissible extension (for non-routine emergent conditions) of 9 months (84 months total).

A conservative control will be established such that if any valve fails the PIV test, the test interval will be reduced consistent with 10 CFR Part 50, Appendix J, Option B, requirements. A PIV test failure is defined as the low-pressure and high-pressure tests exceeding the required action limit. Any PIV leakage test failure would require the component to be returned to the initial ASME OM Code interval until good performance can again be established.

The primary basis for this proposed alternative is the historically good performance of the PIVs. Attachment 1, "River Bend Station, Unit 1, Leakage History – Pressure Isolation Valves," of the enclosure to the licensee's submittal dated November 29, 2021, provides the leakage history for the 13 subject PIVs for 5 consecutive refueling outage test performances.

The functional capability of the check valves is demonstrated by the open and close exercise test. The open testing is separate and distinct from the PIV testing and is currently performed at a cold shutdown or refueling outage frequency, in accordance with ASME OM Code, subsection ISTC, paragraph ISTC-3522. The closed testing will take credit for the PIV leak rate testing and will be on the same frequency as the PIV leak rate testing. The fact that the PIVs exhibit good historical performance (i.e., none of the check valve test results has exceeded the required action limit) shows that the Category C check valves are exhibiting the required obturator movement to close and remain closed.

NEI 94-01, Revision 3-A, is not the sole basis for the request, because NEI 94-01, Revision 3-A, does not address seat leakage testing with water. The NEI document is being cited as an approach similar to the requested alternative method. If the proposed alternative is authorized and the valves exhibit good performance, the PIV test frequency will be controlled similar to the method described in NEI 94-01, Revision 3-A, so that testing of these PIVs would not be required each refueling outage.

The extension of test intervals proposed is consistent with the guidance provided in 10 CFR Part 50, Appendix J, Type C leak rate tests, as detailed in NEI 94-01, Revision 3-A, section 10.2.3.2, "Extended Test Interval," which states:

> Test intervals for Type C valves may be increased based upon completion of two consecutive periodic as-found Type C tests where the result of each test is within a licensee's allowable administrative limits. Elapsed time between the first and last tests in a series of consecutive passing tests used to determine performance shall be 24 months or the nominal test interval (e.g., refueling cycle) for the valve prior to implementing Option B to Appendix J. Intervals for Type C testing may be increased to a specific value in a range of frequencies from 30 months up to a maximum of 75 months. Test intervals for Type C valves should be determined by a licensee in accordance with Section 11.0.

In its submittal dated November 29, 2021, the licensee stated:

> Additional justification for this proposed alternative is as follows:
>
> - Separate functional testing of motor-operated valve (MOV) PIVs is performed in accordance with the ASME OM Code.
>
> - Relief valves in the low-pressure piping relief valves may not provide Intersystem Loss of Coolant Accident (ISLOCA) mitigation for inadvertent PIV mispositioning, but their relief capacity can accommodate conservative PIV seat leakage rates.
>
> - Operators are highly trained to recognize symptoms of the presence of an ISLOCA (i.e., alarms that identify high-pressure to low-pressure leakage), and to take appropriate actions.
>
> Following NRC authorization of this alternative, leakage test intervals will be established based on performance. The leakage test intervals remain consistent with the process established under 10 CFR 50 Appendix J, Option B.

3.2 NRC Staff Evaluation

Regulatory Guide (RG) 1.163, "Performance-based Containment Leak-Test Program," dated September 1995 (ML003740058) provides guidance for implementation of acceptable leakage rate test methods, procedures, and analyses. RG 1.163 endorses NEI 94-01, Revision 0 (ML11327A025), with the limitation that Type C component test intervals cannot extend greater than 60 months. The current version of NEI 94-01 is Revision 3-A, which allows Type C CIVs test intervals to be extended to 75 months with a permissible extension for nonroutine emergent conditions of 9 months (84 months total). By letter dated June 8, 2012, the NRC staff found the guidance in NEI 94-01, Revision 3-A, to be acceptable (ML121030286 and ML12226A546), with the following conditions:

1. NEI Topical Report (TR) 94-01, Revision 3, is requesting that the allowable extended interval for Type C LLRTs [local leakage-rate tests] be increased to 75 months, with a permissible extension (for non-routine emergent conditions) of nine months (84 months total). The staff is allowing the extended interval for Type C LLRTs be increased to 75 months with the

requirement that a licensee's post-outage report include the margin between the Type B and Type C leakage rate summation and its regulatory limit. In addition, a corrective action plan shall be developed to restore the margin to an acceptable level. The staff is also allowing the non-routine emergent extension out to 84-months as applied to Type C valves at a site, with some exceptions that must be detailed in NEI 94-01, Revision 3. At no time shall an extension be allowed for Type C valves that are restricted categorically (e.g., BWR [boiling water reactor] MSIVs [main steam isolation valves]), and those valves with a history of leakage, or any valves held to either a less than maximum interval or to the base refueling cycle interval. Only nonroutine emergent conditions allow an extension to 84 months.

2. The basis for acceptability of extending the ILRT [integrated leak rate testing] interval out to once per 15 years was the enhanced and robust primary containment inspection program and the local leakage rate testing of penetrations. Most of the primary containment leakage experienced has been attributed to penetration leakage and penetrations are thought to be the most likely location of most containment leakage at any time. The containment leakage condition monitoring regime involves a portion of the penetrations being tested each refueling outage, nearly all LLRTs being performed during plant outages. For the purposes of assessing and monitoring or trending overall containment leakage potential, the as-found minimum pathway leakage rates for the just tested penetrations are summed with the as-left minimum pathway leakage rates for penetrations tested during the previous 1 or 2 or even 3 refueling outages. Type C tests involve valves which, in the aggregate, will show increasing leakage potential due to normal wear and tear, some predictable and some not so predictable. Routine and appropriate maintenance may extend this increasing leakage potential. Allowing for longer intervals between LLRTs means that more leakage rate test results from farther back in time are summed with fewer just tested penetrations and that total used to assess the current containment leakage potential. This leads to the possibility that the LLRT totals calculated understate the actual leakage potential of the penetrations. Given the required margin included with the performance criterion and the considerable extra margin most plants consistently show with their testing, any understatement of the LLRT total using a 5-year test frequency is thought to be conservatively accounted for. Extending the LLRT intervals beyond 5 years to a 75-month interval should be similarly conservative provided an estimate is made of the potential understatement and its acceptability determined as part of the trending specified in NEI 94-01, Revision 3, Section 12.1.

   When routinely scheduling any LLRT valve interval beyond 60-months and up to 75-months, the primary containment leakage rate testing program trending or monitoring must include an estimate of the amount of understatement in the Type B & C total and must be included in a licensee's post-outage report. The report must include the reasoning and determination of the acceptability of the extension, demonstrating that the LLRT totals calculated represent the actual leakage potential of the penetrations.

The licensee is currently leak testing the 13 PIVs within the scope of this alternative request every refueling outage or 2 years. The licensee has demonstrated that these PIVs

have a history of good performance for five consecutive refueling outages as shown in Attachment 1 of the enclosure to the licensee's submittal dated November 29, 2021. The licensee reports that the performance of leakage testing for the 13 PIVs places a burden on test personnel being exposed to radiation. Extending the leakage test interval based on good performance is a logical progression for a performance-based approach.

Based on the information described above for the 13 PIVs within the scope of the licensee's Alternative Request VRR-RBS-2021-1 at River Bend, the NRC staff finds that (1) these PIVs has demonstrated good historical performance; (2) no current concerns with the performance of these PIVs have been identified; (3) periodic maintenance activities are not modified by this request; (4 the alternative request allows a performance-based approach for leak testing of these 13 PIVs such that PIVs that have demonstrated good performance for two consecutive cycles may have their test interval extended up to 75 months, with a permissible extension (for non-routine emergent conditions) of 9 months (84 months total); and (5) the alternative request specifies that any PIV leakage test failure would require the component to be returned to the initial ASME OM Code interval until good performance can again be established. Therefore, the NRC staff finds that Alternative Request VRR-RBS-2021-1 will implement performance-based leak testing intervals for the PIVs within the scope of this request at River Bend that will provide an acceptable level of quality and safety that satisfies 10 CFR 50.55a(z)(1).

## 4.0 CONCLUSION

As set forth above, the NRC staff determines that Entergy's proposal described in Alternative Request VRR-RBS-2021-1 will implement performance-based leak testing intervals for the specified 13 PIVs at River Bend that will provide an acceptable level of quality and safety for the remainder of the fourth 10-year IST program interval. Accordingly, the NRC staff concludes that the licensee has adequately addressed the regulatory requirements set forth in 10 CFR 50.55a(z)(1). Therefore, the NRC staff authorizes the use of Alternative Request VRR-RBS-2021-1 at River Bend for the remainder of the fourth 10-year IST program interval, which is scheduled to end on November 30, 2027.

All other ASME OM Code requirements for which relief was not specifically requested, and approved in the subject request remain applicable.

Principal Contributor: Gurjendra S. Bedi, NRR

Date: September 27, 2022

SUBJECT: RIVER BEND STATION, UNIT 1 – PROPOSED ALTERNATIVE TO THE REQUIREMENTS OF ASME CODE OF OPERATION AND MAINTENANCE OF NUCLEAR POWER PLANTS FOR PRESSURE ISOLATION VALVE TESTING FREQUENCY (EPID L-2021-LLR-0090) DATED SEPTEMBER 27, 2022

DISTRIBUTION:
PUBLIC
PM File Copy
RidsACRS_MailCTR Resource
RidsNrrDorlLpl4 Resource
RidsNrrPMRiverBend Resource
RidsNrrLAPBlechman Resource
RidsRgn4MailCenter Resource
GBedi, NRR
DJohnson, OEDO
LMcKown, OEDO

**ADAMS Accession No: ML22265A180** ***by email**

| OFFICE | NRR/DORL/LPL4/PM | NRR/DORL/LPL4/LA | NRR/DORL/LPL4/BC |
|---|---|---|---|
| NAME | JDrake | PBlechman | JDixon-Herrity |
| DATE | 09/22/2022 | 9/23/2022 | 9/27/2022 |

**OFFICIAL RECORD COPY**