



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

September 22, 2022

Ms. Cheryl A. Gayheart  
Regulatory Affairs Director  
Southern Nuclear Operating Co., Inc.  
3535 Colonnade Parkway  
Birmingham, AL 35243

SUBJECT: VOGTLE ELECTRIC GENERATING PLANT, UNITS 1 AND 2 – REQUEST FOR  
PROPOSED INSERVICE TESTING ALTERNATIVE ALT-VR-01  
(EPID L-2022-LLR-0053)

Dear Ms. Gayheart:

The U.S. Nuclear Regulatory Commission (NRC) has authorized your proposed alternative to the inservice testing (IST) 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) for the Fourth 10-Year IST Program interval at the Vogtle Electric Generating Plant (Vogtle, Units 1 and 2).

This action is in response to Southern Nuclear Operating Company's (SNC's) request dated June 29, 2022.

Specifically, pursuant to subparagraph (1) in paragraph (z), "Alternatives to codes and standards requirements," of Section 55a, "Codes and standards," in Part 50, "Domestic Licensing of Production and Utilization Facilities," to Title 10, "Energy," of the *Code of Federal Regulations* (10 CFR), the licensee requested to implement Alternative Request ALT-VR-01 for the frequency of testing of certain valves at Vogtle, Units 1 and 2, on the basis that the proposed alternative provides an acceptable level of quality and safety in accordance with 10 CFR 50.55a(z)(1).

This authorization is applicable to the Vogtle, Units 1 and 2, Fourth 10-Year IST Program interval that began on June 1, 2017, and is scheduled to end on May 31, 2027.

All other ASME OM Code requirements as incorporated by reference in 10 CFR 50.55a for which relief or an alternative was not specifically requested, and granted or authorized (as appropriate), in the subject request remain applicable.

C. Gayheart

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If you have any questions, contact John G. Lamb, the Senior Project Manager, via phone at 301-415-3100 or via email at [John.Lamb@nrc.gov](mailto:John.Lamb@nrc.gov).

Sincerely,

Michael T. Markley, Chief  
Plant Licensing Branch II-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket Nos. 50-424 and 50-425

cc: Listserv



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR ALTERNATIVE NO. ALT-VR-01

FOURTH TEN-YEAR INSERVICE TESTING PROGRAM INTERVAL

SOUTHERN NUCLEAR OPERATING COMPANY

VOGTLE ELECTRIC GENERATING PLANT, UNITS 1 AND 2

DOCKET NOS. 50-424 AND 50-425

EPID NO. L-2019-LLR-0053

1.0 INTRODUCTION

By letter dated June 29, 2022 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML22180A261), Southern Nuclear Operating Company (SNC, licensee) submitted Alternative Request ALT-VR-01 to the U.S. Nuclear Regulatory Commission (NRC) proposing to implement an alternative to specific inservice testing (IST) 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) for the Fourth 10-Year IST Program interval at the Vogtle Electric Generating Plant (Vogtle), Units 1 and 2.

Specifically, pursuant to subparagraph (1) in paragraph (z), "Alternatives to codes and standards requirements," of Section 55a, "Codes and standards," in Part 50, "Domestic Licensing of Production and Utilization Facilities," to Title 10, "Energy," of the *Code of Federal Regulations* (10 CFR), the licensee requested to implement Alternative Request ALT-VR-01 for the frequency of testing of certain valves at Vogtle, Units 1 and 2, on the basis that the proposed alternative provides an acceptable level of quality and safety in accordance with 10 CFR 50.55a(z)(1).

The alternative request is for the Vogtle, Units 1 and 2, Fourth 10-Year IST Program interval that began on June 1, 2017, and is scheduled to end on May 31, 2027.

## 2.0 REGULATORY EVALUATION

The NRC regulations in 10 CFR 50.55a(f)(4), "Inservice testing standards requirement for operating plants," state that throughout the service life of a boiling or pressurized water-cooled nuclear power facility, pumps and valves that are within the scope of the ASME OM Code must meet the IST requirements (except design and access provisions) set forth in the ASME OM Code editions and addenda that are incorporated by reference in 10 CFR 50.55a(a)(1)(iv), to the extent practical within the limitations of design, geometry, and materials of construction of the components.

The IST requirements for pumps and valves that are within the scope of the ASME OM Code but are not classified as ASME *Boiler and Pressure Vessel Code* (BPV Code) Class 1, Class 2, or Class 3 may be satisfied as an augmented IST program in accordance with 10 CFR 50.55a(f)(6)(ii) without requesting relief under 10 CFR 50.55a(f)(5) or alternatives under 10 CFR 50.55a(z). This use of an augmented IST program may be acceptable provided the basis for deviations from the ASME OM Code, as incorporated by reference in 10 CFR 50.55a, demonstrates an acceptable level of quality and safety, or that implementing the Code provisions would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety, where documented and available for NRC review.

In proposing an alternative to IST requirements in the applicable edition or addenda of the ASME OM Code as incorporated by reference in 10 CFR 50.55a, a licensee must demonstrate that (1) the proposed alternative provides an acceptable level of quality and safety in accordance with 10 CFR 50.55a(z)(1), or (2) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety in accordance with 10 CFR 50.55a(z)(2).

The NRC regulations in 10 CFR Part 50, Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors," provide requirements for the leakage testing of containment isolation valves (CIVs).

## 3.0 TECHNICAL EVALUATION

The information provided by the licensee in support of this 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 Licensee's Alternative Request ALT-VR-01

#### Applicable Code Edition

The applicable OM Code of Record for the Fourth 10-Year IST Program interval at Vogtle, Units 1 and 2, is the 2004 Edition through 2006 Addenda of the ASME OM Code as incorporated by reference in 10 CFR 50.55a.

#### ASME Code Components Affected

In its submittal, the licensee proposed an alternative test frequency for the following valves:

Table 1

Valve Number	Class	OM Code Category	Description
11204U6090	2	A/C	Safety Injection Pump A & B Suction Check Valve from Refueling Water Storage Tank (RWST)
11205U6001	2	A/C	Residual Heat Removal Pump A Suction Check Valve from RWST
11205U6002	2	A/C	Residual Heat Removal Pump B Suction Check Valve from RWST
11208U6189	2	A/C	Centrifugal Charging Pump from Pump A & B Suction Check Valve from RWST
21204U6090	2	A/C	Safety Injection Pump A & B Suction Check Valve from RWST
21205U6001	2	A/C	Residual Heat Removal Pump A Suction Check Valve from RWST
21205U6002	2	A/C	Residual Heat Removal Pump B Suction Check Valve from RWST
21208U6189	2	A/C	Centrifugal Charging Pump from Pump A & B Suction Check Valve from RWST

Applicable Code Requirement

The IST requirements in the ASME OM Code (2004 Edition through 2006 Addenda), Section IST, "Rules for Inservice Testing of Light-Water Reactor Power Plants," Subsection ISTC, "Inservice Testing of Valves in Light-Water Reactor Nuclear Power Plants," as incorporated by reference in 10 CFR 50.55a, related to this alternative request are as follows:

Paragraph ISTC-3630, "Leakage Rate for Other Containment Isolation Valves," states, in part, the following:

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 within acceptable limits. Valve closure before seat leakage testing shall be by using the valve operator with no additional closing force applied.

Subparagraph (a), *Frequency*, in paragraph ISTC-3630 requires that the tests shall be conducted at least once every 2 years.

Reason for Request

Pursuant to 10 CFR 50.55a(z)(1), the licensee is requesting an alternative to ASME OM Code, paragraph ISTC-3630(a), which requires leakage testing of Category A valves, other than containment isolation valves (CIVs), on a 2-year frequency. The licensee states that the valves in Table 1 are being leakage tested with water in response to NRC Information Notice 91-56, "Potential Radioactive Leakage to Tank Vented to Atmosphere." At Vogtle, Units 1 and 2, these valves are required to close or remain closed to prevent back-leakage to the RWST during the recirculation phase of a Loss of Coolant Accident (LOCA).

The licensee stated in the submittal dated June 29, 2022:

The subject valves function as a system during the sump recirculation phase of a LOCA to prevent backflow into the RWST and limit the potential for a release of radioactivity from inside containment to the atmosphere. The RWST is vented to atmosphere. The total administrative leakage limit for this system of valves is based on the calculated off-site dose limits (10 CFR100.11) and control room habitability limits (GDC 19). Individual leak rates of the subject valves can vary as long as the total back-leakage from the valves into the RWST is maintained less than the administrative limits. Dose consequences from potential releases through the RWST pathway have been evaluated with additional margin applied to address potential degradation in valve leakage from the time of testing to when the accident is assumed to happen.

The valves identified in Table 1 are all non-Appendix J tested valves that are leakage tested using water at least once every two years. Although they are not specifically included in the scope for performance-based testing as described in Nuclear Energy Institute (NEI) 94-01, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50 Appendix J," and are not leakage tested in accordance with 10 CFR 50 Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooler Power Reactors," Option B, "Performance Based Requirements," Southern Nuclear Company (SNC) requests to implement an approach similar to the performance-based testing frequency of Appendix J Option B instead of performing leakage testing with water of these valves once every two years at Plant Vogtle Unit 1 and Unit 2.

#### Licensee's Proposed Alternative and Basis for Use

In lieu of the 2-year leak test frequency requirement in ISTC-3630(a) for Category A valves whose closing function prevents back-leakage to the RWST during post-LOCA sump recirculation, the licensee proposes to implement performance-based 10 CFR Part 50, Appendix J, Option B, test frequencies. The specific interval for each valve would be a function of its performance and would be established in a manner consistent with the CIV process under 10 CFR Part 50, Appendix J, Option B. Using Alternative Request ALT-VR-01, valves that have demonstrated good performance for two consecutive cycles may have their test interval extended to every third refueling outage, not to exceed 60 months. The licensee proposes to adopt the test interval of every third refueling outage, provided two consecutive tests show a leakage rate below the aggregate administrative leakage limit. The licensee states that meeting the aggregate administrative leakage limit ensures that this leakage will not adversely impact LOCA on-site and off-site dose limits. If leakage testing results for any one valve in Table 1 exceed the aggregate administrative limit, Alternative Request ALT-VR-01 will require that all valves for that unit listed in Table 1 will be returned to the initial test frequency of every refueling outage until satisfactory performance is re-established for two consecutive tests.

The licensee stated in the submittal dated June 29, 2022:

NUREG-1493, "Performance-Based Containment Leak-Test Program," (ADAMS Accession No. ML20098D498) provides the technical basis that supported rulemaking to revise leakage rate testing requirements contained in Option B to Appendix J.

To determine the acceptability of extended testing intervals, the methodology described in NUREG-1493 was applied, with some modifications, to historical representative industry leakage rate testing data gathered from approximately 1987 to 1993, under the auspices of NEI. In all cases, extending testing intervals is acceptable and compares well to the guidance of the NRC's safety goals.

NUREG-1777, "Regulatory Effectiveness Assessment of Option B of Appendix J," (ADAMS Accession No. ML033030547) evaluated performance-based valve leakage testing program results for the industry after implementation and concluded that adopting Appendix J Option B (performance-based) has been effective. Its adoption has resulted in cost savings, burden reduction, and reduced occupational radiation exposure while having an insignificant impact on risk. NUREG-1777 concludes that Appendix J, Option B extended test intervals are acceptable and compare well with the NRC's safety goals.

Option B of Appendix J to 10 CFR 50 provides performance-based primary reactor containment leakage-rate test requirements. NEI 94-01, Revision 3-A (ADAMS Accession No. ML 12221A202), allows for an extended leak test interval consistent with this proposed alternative, and although NEI 94-01 does not address seat leakage testing with water, it has been determined that extending the frequency for leak rate testing provides a low level of risk, based on the information in NUREG-1493 and NUREG-1777. Therefore, the proposed alternative would provide an acceptable level of quality and safety.

The licensee's leakage testing results are tabulated in Table 2, "Measured Leakage Results for RWST Back-Leakage Valves for Unit 1 and Unit 2." Table 2 shows measured leakages well below the administrative leakage limits, which demonstrates satisfactory performance for the current 10-Year IST Program interval.

### 3.2 NRC Staff Evaluation

During the Fourth 10-Year IST Program interval at Vogtle, Units 1 and 2, the NRC regulations in 10 CFR 50.55a require that valves other than CIVs be tested in accordance with the 2004 Edition through 2006 Addenda of the ASME OM Code as incorporated by reference in 10 CFR 50.55a. In particular, ASME OM Code, Subsection ISTC, paragraph ISTC-3630, requires that OM Category A valves with a leakage requirement not based on the Owner's 10 CFR Part 50, Appendix J program, shall be tested to verify their seat leakage is within acceptable limits. Subparagraph (a) in paragraph ISTC-3630 requires that these tests be conducted at least once every 2 years.

In Alternative Request ALT-VR-01, the licensee proposes, in lieu of the 2-year leak test frequency requirement in ISTC-3630(a), that Category A valves whose closing function prevents back-leakage to the RWST during post-LOCA sump recirculation be tested using the performance-based 10 CFR Part 50, Appendix J, Option B test frequencies, which apply to valves whose function is also isolation of the extended containment boundary while on sump recirculation. The licensee proposes that the specific interval for each valve within the scope of the alternative request would be a function of its performance, and would be established in a manner consistent with the CIV process under 10 CFR Part 50, Appendix J, Option B. Alternative Request ALT-VR-01 would allow valves that have demonstrated good performance for two consecutive cycles to have their test interval extended to every third refueling outage, not to exceed 60 months.

Alternative Request ALT-VR-01 would allow a test interval of every third refueling outage provided two consecutive tests show a leakage rate below the aggregate administrative leakage limit. SNC asserts that meeting the aggregate administrative leakage limit ensures that this leakage will not adversely impact LOCA on-site and off-site dose limits. If leakage testing results for any one valve listed in Table 1 exceed the aggregate administrative limit, Alternative Request ALT-VR-01 would require that all valves for that unit listed in Table 1 would be returned to the initial test frequency of every refueling outage until satisfactory performance is re-established for two consecutive tests.

Guidance for implementation of acceptable leakage rate test methods, procedures, and analyses for 10 CFR Part 50, Appendix J, Option B, is provided in RG 1.163 (ADAMS Accession No. ML003740058), which endorses NEI Topical Report 94-01, Revision 0, dated July 26, 1995, with the limitation that the Type C component test intervals cannot extend greater than 60 months. Revision 3-A to NEI 94-01 allows the Type C containment isolation valve test intervals to be extended to 75 months with a permissible extension for non-routine emergent conditions of 9 months (84 months total). In its safety evaluation dated June 8, 2012, the NRC staff determined that the guidance in NEI 94-01, Revision 3-A, is acceptable (ADAMS Accession Nos. ML121030286 and ML12226A546) with the following conditions:

1. NEI 94-01, Revision 3, is requesting that the allowable extended interval for Type C local leak rate tests (LLRTs) 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., boiling water reactor 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 integrated leak rate testing (ILRT) 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.

In Alternative Request ALT-VR-01, Table 2, "Measured Leakage Results for RWST Back-Leakage Valves for Unit 1 and 2," the licensee summarizes test data that demonstrate good historical performance of the valves within the scope of the request at Vogtle, Units 1 and 2. The table provides leakage test results indicating no measurable leakage for the valves within the scope of the request during the previous three refueling outages. The NRC staff notes that the other requirements specified in ASME OM Code as incorporated by reference in 10 CFR 50.55a, such as exercising and/or condition monitoring, continue to apply to the valves with the scope of this request.

Based on good valve performance history and continued exercising tests and/or condition monitoring activities, the NRC staff finds that the performance-based leak testing interval approach proposed in Alternative Request ALT-VR-01 for valves within the scope of this request at Vogtle, Units 1 and 2, will provide an acceptable level of quality and safety as required by 10 CFR 50.55a(z)(1) where those valves have demonstrated successful leak test performance during the two most recent 2-year interval leak tests. If leakage testing results for any valve within the scope of this request exceed the aggregate administrative limit, Alternative Request ALT-VR-01 will require that all valves for that unit listed in Table 1 would be returned to the initial test frequency of every refueling outage until satisfactory performance is re-established over two consecutive 2-year test intervals.

#### 4.0 CONCLUSION

As indicated above, the NRC staff finds that the proposed Alternative Request ALT-VR-01 to establish performance-based leak testing intervals for valves at Vogtle, Units 1 and 2, within the scope of this request will provide an acceptable level of quality and safety where those valves have demonstrated successful leak test performance during the two most recent 2-year interval leak tests. If leakage testing results for any valve within the scope of this request exceed the aggregate administrative limit, Alternative Request ALT-VR-01 will require that all valves for that unit listed in Table 1 will be returned to the initial test frequency of every refueling outage until satisfactory performance is re-established over two consecutive 2-year test intervals.

Accordingly, the NRC staff concludes that SNC has adequately addressed the regulatory requirements set forth in 10 CFR 50.55a(z)(1). Therefore, the NRC staff authorizes Alternative Request ALT-VR-01 for the Fourth 10-Year IST Program interval at Vogtle, Units 1 and 2, which began on June 1, 2017, and is scheduled to end on May 31, 2027.

All other ASME OM Code requirements as incorporated by reference in 10 CFR 50.55a for which relief or an alternative was not specifically requested, and granted or authorized (as appropriate), in the subject request remain applicable.  
Principal Contributor: Thomas G. Scarbrough, NRR

Date: September 22, 2022

SUBJECT: VOGTLE ELECTRIC GENERATING PLANT, UNITS 1 AND 2 – REQUEST FOR PROPOSED INSERVICE TESTING ALTERNATIVE ALT-VR-01 (EPID L-2022-LLR-0053) DATED SEPTEMBER 22, 2022

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