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

October 28, 2021

Vice President, Operations
Entergy Operations, Inc.
Grand Gulf Nuclear Station
P.O. Box 756
Port Gibson, MS 39150

SUBJECT: GRAND GULF NUCLEAR STATION, UNIT 1 – INSERVICE TESTING PROGRAM RELIEF REQUEST VRR-GGNS-2021-1, ALTERNATIVE REQUEST FOR PRESSURE ISOLATION VALVE TESTING FREQUENCY (EPID L-2021-LLR-0040)

Dear Sir or Madam:

By letter dated June 1, 2021 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML21152A290), Entergy Operations, Inc. (the licensee) submitted Alternative Request VRR-GGNS-2021-1 to the U.S. Nuclear Regulatory Commission (NRC) for 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), Division 1: OM Code: Section IST, at Grand Gulf Nuclear Station, Unit 1 (Grand Gulf) associated with the fourth 10-year inservice testing (IST) interval.

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

As set forth in the enclosed safety evaluation, the NRC staff finds that the proposed alternative described in Alternative Request VRR-GGNS-2021-1 for the 22 valves at Grand Gulf will provide an acceptable level of quality and safety until November 30, 2027. Accordingly, the NRC staff concludes that the licensee has adequately addressed all the regulatory requirements set forth in 10 CFR 50.55a(z)(1). Therefore, the NRC staff authorizes the use of the proposed Alternative Request VRR-GGNS-2021-1 at Grand Gulf, until November 30, 2027.

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

If you have any questions, please contact the Project Manager, Siva P. Lingam, at 301-415-1564 or via e-mail at Siva.Lingam@nrc.gov.

Sincerely,

Jennifer L. Dixon-Herrity

Digitally signed by Jennifer L. Dixon-Herrity
Date: 2021.10.28 11:52:32 -04'00'

Jennifer L. Dixon-Herrity, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-416

Enclosure:
Safety Evaluation

cc: Listserv

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

INSERVICE TESTING PROGRAM RELIEF REQUEST VRR-GGNS-2021-1

PRESSURE ISOLATION VALVES TESTING FREQUENCY

ENTERGY OPERATIONS, INC.

GRAND GULF NUCLEAR STATION, UNIT 1

DOCKET NO. 50-416

1.0 INTRODUCTION

By letter dated June 1, 2021 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML21152A290), Entergy Operations, Inc. (Entergy, the licensee) submitted Alternative Request VRR-GGNS-2021-1 to the U.S. Nuclear Regulatory Commission (NRC) for 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 Grand Gulf Nuclear Station, Unit 1 (Grand Gulf) associated with the fourth 10-year inservice testing (IST) interval.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(z)(1), the licensee requested to use the proposed Alternative Request VRR-GGNS-2021-1 on the basis that the proposed alternative provides an acceptable quality and safety.

2.0 REGULATORY EVALUATION

Adherence to the ASME OM Code is mandated by 10 CFR 50.55a(f)(4), “Inservice testing standards requirement for operating plants,” which states, in part, that, valves that are within the scope of the ASME OM Code must meet the IST requirements set forth in the ASME OM Code; and valves that are within the scope of the ASME OM Code, but are not classified as ASME Boiler and Pressure Vessel Code Class 1, 2, or 3, may be satisfied as part of an augmented IST program.

The regulations in 10 CFR 50.55a(z), “Alternatives to codes and standards requirements,” states, in part, that alternatives to the requirements of 10 CFR 50.55a(f) may be used, when authorized by the NRC, if the licensee demonstrates the proposed alternatives would provide an acceptable level of quality and safety.

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

- ASME OM Code, paragraph ISTC-3522, "Category C Check Valves" (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 para. ISTC-5221.
>
> Each check valve exercise test shall include open and close tests.

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

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

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

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

3.0 TECHNICAL EVALUATION

The information provided by the licensee in support of the request for alternative to the ASME OM Code requirements has been evaluated, and the bases for disposition are documented below.

3.1 Licensee's Alternative Request VRR-GGNS-2021-1

In its submittal, the licensee requests an alternative to the testing frequency for 22 pressure isolation valves (PIVs) at Grand Gulf listed in the alternative request.

Reason for Request

ASME OM Code, paragraph ISTC-3630 requires that leakage rate testing for PIVs be performed at least once every 2 years. PIVs are not specifically included in the scope for performance-based testing as provided for in 10 CFR Part 50, Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors," Option B, "Performance-Based Requirements." These motor-operated valves and PIVs are, in some cases, containment isolation valves (CIVs), but are not within the Appendix J scope since the reactor shutdown cooling system valves are considered water-sealed.

The concept behind the 10 CFR Part 50, Appendix J, Option B alternative for CIVs is that licensees should 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 (ADAMS Accession No. ML12221A202), describes the risk-informed basis for the extended test intervals under Option B. That justification shows that for CIVs, which have demonstrated good performance by the successful completion of two consecutive leakage rate tests over two consecutive cycles, may increase their test frequencies. Furthermore, it states that if the component does not fail within two operating cycles, further failures appear to be governed by the random failure rate of the component. NEI 94-01 also presents the results of a comprehensive risk analysis, including the conclusion that "the risk impact associated with increasing [leak rate] test intervals, is negligible ([i.e.,] less than 0.1 percent of total risk)."

The valves identified in this relief request are all in water applications except for the reactor core isolation cooling steam supply system inboard isolation valve, outboard isolation valve, and warmup valve. Testing is currently performed utilizing high- and low-pressure water, as applicable. This relief request is intended to provide for a performance-based scheduling of PIV tests at Grand Gulf. The reason for requesting this relief is to reduce the required resources and dose required for testing, as well as refueling outage duration.

NUREG-0933, "Resolution of Generic Safety Issues," Issue 105, "Interfacing Systems LOCA [loss-of-coolant accident] at LWRs [light-water reactors]," discussed 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, 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, 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 since 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 specific test interval for each PIV would be a function of its historical performance and would be established in a manner consistent with the containment isolation valve 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 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. 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, 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.

3.2 NRC Staff Evaluation

The licensee has proposed an alternative test in lieu of the requirements found in the 2004 Edition through the 2006 Addenda of the ASME OM Code, paragraphs ISTC 3522 and ISTC 3630 for 22 PIVs. Specifically, the licensee proposes to functionally test and verify the leakage rate of these PIVs using a 10 CFR Part 50, Appendix J, Option B, performance-based schedule. Valves would initially be tested at the required interval schedule, which is every refueling outage or 2 years as specified by ASME OM Code, paragraph ISTC 3630(a). In transitioning to 10 CFR Part 50, Appendix J, Option B schedule as detailed in NEI 94 01, Revision 3 A, the licensee proposes to perform PIV testing at the ASME OM Code test interval. Valves that have demonstrated good performance for two consecutive cycles may have their test interval extended up to 75 months. Any PIV leakage test failure would require the component to return to the initial interval of every 30 months until good performance can again be established.

PIVs are defined as two valves in series within the reactor coolant pressure boundary that separate the high-pressure reactor coolant system from an attached lower pressure system. Failure of a PIV could result in an over-pressurization event, which could lead to a system rupture and possible release of fission products to the environment. This type of failure event was analyzed under NUREG/CR 5928, “ISLOCA [Inter-System Loss-of-Coolant Accident] Research Program” (ADAMS Accession No. ML072430731, not publicly available). The purpose of NUREG/CR 5928 is to quantify the risk associated with an ISLOCA event. NUREG/CR 5928 analyzed boiling water reactor (BWR) and pressurized water reactor designs. The conclusion of the analysis resulted in ISLOCA not being a risk concern for BWR designs. Grand Gulf is a BWR.

Guidance for implementation of acceptable leakage rate test methods, procedures, and analyses is provided in Regulatory Guide (RG) 1.163, “Performance-based Containment Leak Test Program” (ADAMS Accession No. ML003740058). RG 1.163 endorses NEI 94-01, Revision 0 (ADAMS Accession No. ML11327A025), with the limitation that Type C components 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 (ADAMS Accession Nos. ML121030286 and ML12226A546)), with the following conditions:

(1) Extended interval for Type C local leak rate tests (LLRTs) may be increased to 75 months with the requirement that a licensee's post outage report include the margin between 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. Extensions of up to 9 months (total maximum interval of 84 months for Type C tests) are permissible only for nonroutine emergent conditions. This provision (a 9-month extension) does not apply to valves that are restricted and/or limited to 30-month intervals in Section 10.2 (such as BWR main steam isolation valves or to valves held to the base interval (30 months) due to unsatisfactory LLRT performance.

(2) 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 Types B and 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 22 PIVs are currently being leak tested every refueling outage or 2 years. The valves have a history of good performance with two exceptions. One exception is due to a missed high pressure water test for RHR "A" check valve E12F041A. It was later determined that the test would have met the required surveillance criteria, and the valve was fully functional. The second exception is due to inadequate valve thrust for the high-pressure core spray injection shutoff valve E22F004. The limit switch was adjusted to maximize thrust, and the post maintenance water leakage test was satisfactory. Performance of the leakage test of the 22 PIVs places a burden on test personnel being exposed to radiation. Extending the leakage test interval based on good performance and the low risk factor as noted in NUREG/CR 5928 is a logical progression to a performance-based program. Finally, the alternative request to test 22 PIVs per the guidance of NEI 94 01, Revision 3 A, provides an acceptable level of quality and safety.

Based on the information described above for these 22 valves, the NRC staff finds that (1) previous IST testing, including position verification testing of these valves, indicates their acceptable historical performance; (2) no current concerns with the performance of these valves have been identified; (3) periodic maintenance activities are not modified by this request; and (4) the alternative request provides an acceptable level of quality and safety. Therefore, the licensee is authorized to implement a performance-based program for the 22 PIVs at Grand Gulf. The performance-based program interval shall not exceed three refueling outages or 75 months. Nonroutine emergent conditions may extend the program interval to 9 months (84 months total).

3.0 CONCLUSION

As set forth above, the NRC staff finds that the proposed alternative described in Alternative Request VRR-GGNS-2021-1 for the 22 valves at Grand Gulf will provide an acceptable level of quality and safety until November 30, 2027. Accordingly, the NRC staff concludes that the licensee has adequately addressed all the regulatory requirements set forth in

10 CFR 50.55a(z)(1). Therefore, the NRC staff authorizes the use of proposed alternative VRR-GGNS-2021-1 at Grand Gulf, until November 30, 2027.

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

Principal Contributors: M. Farnan, NRR
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Date: October 28, 2021

SUBJECT: GRAND GULF NUCLEAR STATION, UNIT 1 – INSERVICE TESTING PROGRAM RELIEF REQUEST VRR-GGNS-2021-1, ALTERNATIVE REQUEST FOR PRESSURE ISOLATION VALVE TESTING FREQUENCY (EPID L-2021-LLR-0040) DATED OCTOBER 28, 2021

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