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

July 27, 2021

Mr. Ernest J. Kapopoulos, Jr.
Site Vice President
H. B. Robinson Steam Electric Plant
Duke Energy Progress, LLC
3581 West Entrance Road, RNPA01
Hartsville, SC 29550

SUBJECT: H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT 2 – RELIEF REQUEST PROPOSED ALTERNATIVES TO AMERICAN SOCIETY OF MECHANICAL ENGINEERS OPERATION AND MAINTENANCE CODE ISOLATION VALVE SEAL WATER SYSTEM (EPID L-2021-LLR-0020)

Dear Mr. Kapopoulos:

By letter dated March 29, 2021 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML21088A139), Duke Energy Progress, LLC (Duke Energy, the licensee) submitted a request to the U.S. Nuclear Regulatory Commission (NRC) for the use of an alternative to certain American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code) requirements at H. B. Robinson Steam Electric Plant, Unit 2.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(2), the licensee requested to use an alternative method to the Inservice Testing (IST) requirements for check valves within the Isolation Valve Seal Water System (IVSW) on the basis that complying with the OM Code requirements would result in hardship without a compensating increase in the level of quality and safety.

The NRC staff has reviewed the subject request and concludes, as set forth in the enclosed safety evaluation, that Duke Energy has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(2). All other ASME Boiler & Pressure Vessel Code or ASME OM Code requirements for which relief was not specifically requested and approved remain applicable.

If you have any questions, please contact Project Manager John Klos at 301-415-5136 or by e-mail to John.Klos@nrc.gov.

Sincerely,

David J. Wrona

Digitally signed by David J. Wrona
Date: 2021.07.27 13:55:11 -04'00'

David J. Wrona, Chief
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-261

Enclosure:
Safety Evaluation

cc: ListServ

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

PROPOSED ALTERNATIVE RELIEF REQUEST IST-RR-3

APPLIED TO THE SIXTH 10-YEAR INTERVAL INSERVICE TESTING PROGRAM

DUKE ENERGY PROGRESS, LLC

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT 2

DOCKET NO. 50-261

EPID-2021-LLR-0020

1.0 INTRODUCTION

By letter dated March 29, 2021 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML21088A139), Duke Energy Progress, LLC (Duke Energy, the licensee) submitted a request to the U.S. Nuclear Regulatory Commission (NRC) for the use of an alternative to certain requirements in the 2017 Edition of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants, Division 1: Section IST (Inservice Testing) (OM Code), at H. B. Robinson Steam Electric Plant, Unit 2 (Robinson) associated with the Sixth 10-Year IST program.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(2), the licensee requested to use the proposed alternative in Alternative Request IST-RR-3, regarding check valve IST, on the basis that compliance with the specified ASME OM Code requirements would result in hardship without a compensating increase in the level of quality or safety.

2.0 REGULATORY EVALUATION

Paragraph 50.55a(f)(4) of 10 CFR, “Inservice testing standards requirement for operating plants,” states, in part, that during the service life of a boiling or pressurized water-cooled nuclear power plant, components such as pumps and valves that are within the scope of the ASME OM Code must meet the inservice test requirements (except design and access provisions) set forth in the ASME OM Code and addenda that become effective subsequent to editions and addenda specified in [10 CFR 50.55a(f)(2) and (3)] and 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 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 (1) the proposed alternatives would

provide an acceptable level of quality and safety 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.

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 Robinson Sixth 10-Year IST program interval begins on February 19, 2022, and is scheduled to end on February 18, 2032. The applicable ASME OM Code edition for the Robinson Sixth 10-Year IST program interval is the 2017 Edition, which is incorporated by reference in 10 CFR 50.55a with conditions.

3.1 The Licensee's Alternative Request IST-RR-3

Pursuant to this relief request under 10 CFR 50.55a(z)(2), relief is requested from the requirements of the ASME OM Code, 2017 Edition, Subsections; ISTC 3522(a), ISTC-3530, ISTC-5221(a), ISTC-5221(a)(2), ISTC-5221(c)(2), and ISTC-5222 that require Category C check valve exercise tests or exams including both open and closed tests (bidirectional functionality).

These and other applicable ISTC subsections are described as follows;

ISTC-1300, "Valve Categories," defines uniform criteria for assigning valve categories. Category C valves are defined as "valves that are self-actuating in response to some system characteristic, such as pressure (relief valves) or flow direction (check valves) for fulfillment of the required function(s), as specified in para. ISTA-1100."

ISTC-3510, "Exercising Test Frequency" states, "Active Category A, Category B, and Category C check valves shall be exercised nominally every 3 months, except as provided by paras. ISTC-3520, ISTC-3540, ISTC-3550, ISTC-3570, ISTC-5221, and ISTC-5222. Power-operated relief valves shall be exercise tested once per fuel cycle."

ISTC-3522(a), "Category C Check Valves" states, "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. Open and close tests need only to be performed at an interval when it is practicable to perform both tests. Test order (e.g., whether the open test precedes the close test) shall be determined by the Owner. Open and close tests are not required to be performed at the same time if they are both performed within the same interval."

ISTC-3530, "Valve Obturator Movement," states, "The necessary valve obturator movement shall be determined by exercising the valve while observing an appropriate indicator, such as indicating lights that signal the required changes of obturator position, or by observing other evidence, such as changes in system pressure, flow rate, level or temperature, that reflects change of obturator position."

ISTC-5221(a), "Valve Obturator Movement," states, "The necessary obturator movement during exercise testing shall be demonstrated by performing both an open and a close test."

ISTC-5221(a)(2), “Valve Obturator Movement,” states, “Check valves that have a safety function in only the open direction shall be exercised by initiating flow and observing the obturator has traveled either to the open position or to the position required to perform its intended function(s) (See para. ISTA-1100) and verify closure.”

ISTC-5221(c)(2), “Valve Obturator Movement,” states, “During the assembly process, the full-stroke motion of the obturator shall be verified. Full-stroke motion of the obturator shall be reverified immediately prior to completing reassembly. Check valves that have their obturator disturbed before full-stroke motion is verified shall be examined to determine if a condition exists that could prevent full opening or reclosure of the obturator.”

ISTC-5222, “Condition Monitoring Program,” states, “As an alternative to the testing or examination requirements of paras. ISTC-3510, ISTC-3520, ISTC-3530, ISTC-3550, and ISTC-5221, the Owner may establish a condition monitoring program. The purpose of this program is both to improve valve performance and to optimize testing, examination, and preventive maintenance activities in order to maintain the continued acceptable performance of a select group of check valves. The Owner may implement this program on a valve or a group of similar valves. The program shall be implemented in accordance with this Division’s Mandatory Appendix II, Check Valve Condition Monitoring Program. If the condition-monitoring program for a valve or valve group is discontinued, then the requirements of Subsection ISTC shall apply.”

The licensee requested to use the proposed alternative described below for 3/8-inch check valves found in the Isolation Valve Seal Water System (IVSW); IVSW-71, IVSW-72, IVSW-74 through IVSW-97, IVSW-100A, IVSW-100B, and IVSW-100C which are classified as Category C valves.

Reason for Request

The licensee stated that 3/8-inch penetration check valves IVSW-71, IVSW-72, IVSW-74 through IVSW-97, IVSW-100A, IVSW-100B, and IVSW-100C have no safety function in the closed direction and are required to open in order to provide seal water to selected containment penetrations during a design-basis accident (DBA). The IVSW system operates to limit the release of fission products if leakage occurs. The licensee takes no credit for the operation of the IVSW system when calculating offsite accident dose.

The licensee stated that the IVSW system is a qualified seal water system according to the requirements of 10 CFR Part 50 Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors." The IVSW system is maintained at a minimum pressure of 1.1 times the peak accident pressure related to the design basis loss-of-coolant accident (LOCA). Therefore, the design and qualification of the system eliminates the need for these valves to close during a DBA in the unlikely event that closure is required.

The licensee stated that the disassembly to verify the obturator closure or modifications to facilitate IST for closure, (1) is impractical based on the large number of valves requiring verification and the insignificance associated with their failure to close and (2) may lead to maintenance-induced errors associated with re-assembly. The small size and construction of these IVSW check valves prohibits the ability to perform partial disassembly/inspection in a manner representative of its inservice condition (e.g., valve removal and decontamination activities could alter disc position).

The licensee stated that the IVSW system is a standby system that is typically operated during refueling outages to facilitate testing, and based on the infrequent use of the system, the valve obturator exhibits minimal wear. The licensee adopted bi-directional check valve testing to counter the effects of a faulty test strategy associated with the inability to detect a detached valve disc. The licensee stated that a satisfactory forward flow check valve test could be completed when the valve disc is detached and laying in the bottom of the valve body. Based on the design and materials of construction associated with these check valves, disc failure with subsequent migration into associated systems is not likely because the size of the disc is greater than the inner diameter of the valve outlet. The licensee stated that the failure of the valve in this manner would be detected by the current test method that is performed at refueling outages in conjunction with required 10 CFR Part 50 Appendix J leak rate testing.

Proposed Alternative

Check valves IVSW-71, IVSW-72, IVSW-74 through IVSW-97, IVSW-100A, IVSW-100B, and IVSW-100C will be tested in the open position at refueling intervals. Closure verification will not be performed.

3.2 NRC Staff Evaluation

The licensee began implementing an ASME OM Code, Appendix II Program at Robinson on February 19, 2002; however, the IVSW check valves were not included in the Check Valve Condition Monitoring Program because the small size and ball shape design of the disc would make dimensional measurements relatively difficult to obtain on a consistent basis. Consequently, the requirements of Subsection ISTC apply to these IVSW check valves.

The NRC staff evaluated the technical aspects of IST-RR-3 against the criteria in the ASME OM Code, Subsection ISTC, for the IVSW check valves IVSW-71, IVSW-72, IVSW-74 through IVSW-97, IVSW-100A, IVSW-100B, and IVSW-100C. Subparagraph ISTC-5221(a)(2) requires closure verification of check valves that only have a safety function in the open direction. Subparagraph ISTC-5221(c) requires a sample disassembly examination program for certain check valves that have been determined to be impractical to test. Closure verification after a successful open direction test ensures that the internals of the check valve assembly are still in place and remain intact.

The IVSW valves are in-line spring loaded ball check valves. The internal ball provides a seal against an o-ring seat to provide leak tight shutoff. The internal ball provides the valve closure and seal is secured in a leak tight body joint and seat assembly. The internal ball is physically unable to migrate away from the valve assembly and, therefore, would not adversely impact the function of the overall IVSW system.

The IVSW system, when actuated, delivers seal water through the check valves between two isolation points located outside the containment at a minimum pressure of 1.1 times the peak calculated containment accident pressure related to the design basis LOCA. The resulting water seal blocks leakage of the containment through valve seats and stem packing. The possibility of leakage from the containment past the isolation points is prevented by assuring that if leakage does exist, it will be from the seal water system into the containment.

The IVSW check valves have no safety function in the closed direction and are required to open to provide seal water to selected containment penetrations. The Robinson Updated Final Safety Analysis Report Revision No. 28, Section 6.8.2.1, “Isolation Valve Seal Water System - System

Description," (ADAMS Accession Number ML19155A091) states that "relief valves are provided to prevent over-pressurization of the system if a pressure control valve fails or if a seal water injection line communicates with a high-pressure line due to a check valve failure in the seal water line." Disassembly to verify obturator closure or modifications to facilitate IST for closure is impractical based on the large number of valves requiring verification and the insignificance associated with their failure to close.

The NRC staff has reviewed the check valve design and configuration and finds that the likely mode of failure is leakage through the valve seat. Because of the valve's unique design, failure of the ball-shaped disc would not result in subsequent migration into associated systems, and therefore would not adversely impact the safety function of the IVSW calculated containment accident pressure related to the design-basis LOCA. Therefore, containment out leakage will be prevented when the IVSW system is in operation following a LOCA. Further, as stated previously by the licensee, failure of these valves would be detected by the current test method that is performed at refueling outages in conjunction with the required 10 CFR Part 50 Appendix J leak rate testing. As a result, closure verification by a sample disassembly program of the IVSW system valves is unnecessary and would result in hardship without a compensating increase in the level of quality and safety. Therefore, the NRC staff finds the proposal of testing the affected check valves to only the open position acceptable and is adequate to demonstrate operational readiness of these valves.

The NRC staff notes that this alternative request was authorized for the Robinson Fifth 10-Year IST program interval.

4.0 CONCLUSION

As set forth above, the NRC staff finds that the proposed alternative described in alternative request IST-RR-3 will provide reasonable assurance that check valves IVSW-71, IVSW-72, IVSW-74 through IVSW-97, IVSW-100A, IVSW-100B, and IVSW-100C are operationally ready to perform their safety functions. The NRC staff finds that compliance with certain requirements in the ASME OM Code would result in hardship without a compensating increase in the level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed the regulatory requirements set forth in 10 CFR 50.55a(z)(2) for IST-RR-3. Therefore, the NRC staff authorizes the use of proposed alternative IST-RR-3 for the Sixth 10-Year IST program interval at Robinson, which begins on February 19, 2022, and is currently scheduled to end on February 18, 2032.

All other ASME OM Code requirements for which relief or an alternative was not specifically requested and approved as part of this request remain applicable.

Principal Contributor: Robert Wolfgang, NRR/DEX/EMIB

Date of Issuance: June 27, 2021

SUBJECT: H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT 2 – RELIEF REQUEST PROPOSED ALTERNATIVES TO AMERICAN SOCIETY OF MECHANICAL ENGINEERS OPERATION AND MAINTENANCE CODE ISOLATION VALVE SEAL WATER SYSTEM (EPID L-2021-LLR-0020) DATED JULY 27, 2021

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