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

September 30, 2022

PRAIRIE ISLAND NUCLEAR GENERATING PLANT (PRAIRIE ISLAND), UNIT 2 AUTHORIZATION AND SAFETY EVALUATION FOR ALTERNATIVE REQUEST NO. RR-08 (EPID L-2022-LLR-0012)

LICENSEE INFORMATION

Recipient's Name and Address: Mr. Christopher P. Domingos
Site Vice President
Prairie Island Nuclear Generating Plant
Northern States Power Company - Minnesota
1717 Wakonade Drive East
Welch, MN 55089

Licensee: Northern States Power Company

Plant Name: Prairie Island Nuclear Generating Plant (Prairie Island), Unit 2

Docket No.: 50-306

APPLICATION INFORMATION

Submittal Date: February 8, 2022

Submittal Agencywide Documents Access and Management System (ADAMS) Accession Nos.: ML22039A340 and ML22039A341

Supplement Date: July 14, 2022

Supplement ADAMS Accession No.: ML22195A251

Alternative Provision: The applicant requested an alternative under Title 10 of the *Code of Federal Regulations* (10 CFR), paragraph 50.55a(z)(2).

Applicable Code Edition and Addenda: American Society of Mechanical Engineers (ASME), Operation and Maintenance of Nuclear Power Plants (OM) Code2004 Edition through 2006 Addenda, as incorporated by reference in 10 CFR 50.55a, for the fifth 10-year inservice testing (IST) interval at Prairie Island, Unit 2.

Applicable Inservice Inspection (ISI) or IST program interval and Interval Start/End Dates: Prairie Island Unit 2, fifth 10-year IST program interval began on December 21, 2014, and is scheduled to end on December 20, 2024. Alternative request RR-08 only requests that the alternative apply until the refueling outage (RFO) 2023.

IST Requirement: ASME OM Code, subsection ISTA, “General Requirements,” item ISTA-3300, “Corrective Actions,” requires that corrective actions requiring repair/replacement activities shall be performed in accordance with ASME Section XI, as applicable. Other corrective actions shall be performed in accordance with the Owner's quality assurance program.

ISTC-3630, “Leakage Rate for Other Than Containment Isolation Valves,” paragraph (e), “Analysis of Leakage Rates,” requires that leakage rate measurements shall be compared with the permissible leakage rates specified by the plant Owner for a specific valve or valve combination. If leakage rates are not specified by the Owner, the following rates shall be permissible:

(1) for water, 0.5D gal/min [gallons/minute] (12.4d ml/sec [milliliter/second]) or 5 gal/min (315 ml/sec), whichever is less, at function pressure differential

(2) for air, at function pressure differential, 7.5D standard ft^3/day (58d std. cc/min) where:

D = nominal valve size, inch.
d = nominal valve size, cm

STC-3630(f), “Corrective Action,” requires that valves or valve combinations with leakage rates exceeding the valves specified by Owner per ISTC-3630(e) shall be declared inoperable and be either repaired or replaced. A retest demonstrating acceptable operation shall be performed following any required corrective action before the valve is returned to service.

Brief Description of the Proposed Alternative: In lieu of repair or replacement of the pressure isolation valve (PIV) 21 Accumulator loop A check valve 2SI-6-4, the request proposes to use an evaluation and monitoring plan for leakage past this PIV until the 2023 RFO for Prairie Island, Unit 2. The monitoring plan will have the ability to evaluate increased accumulator leakage. This alternative will demonstrate that even though PIV 2SI-6-4 has exceeded its individual IST leakage rate, the leak rate to the accumulator will be maintained by check valve SI-6-3, which is currently meeting the IST PIV leakage requirement. The request was submitted in the event of a forced outage to delay the required repair or replacement of PIV 2SI-6-4 until the next planned RFO of Prairie Island, Unit 2, in 2023 if PIV 2SI-6-4 failed its leakage test.

For additional details on the licensee’s request, please refer to the documents located at the ADAMS Accession Nos. identified above.

STAFF EVALUATION

PIV 2SI-6-4 at Prairie Island, Unit 2, is a check valve in series with check valve 2SI-6-3 between the 21 Accumulator and the reactor coolant system (RCS) loop a cold leg to protect the lower design pressure accumulator and associated piping from the higher RCS pressure during normal operation. PIV 2SI-6-4 is categorized as an ASME OM Code, Category A, valve because leakage past the valve is consequential to the achievement of a safety function. Check valve 2SI-6-4 is a non-technical specification (TS) PIV and provides isolation between the high-pressure RCS and low-pressure safety injection (SI) system.

PIV 2SI-6-4 is tested in accordance with the 2004 Edition through 2006 Addenda of the ASME OM Code, subsection ISTC, “Inservice Testing of Valves in Light-Water Reactor Nuclear Power Plants,” paragraph ISTC- 3630. Paragraph ISTC-3630 states, in part, that Category A valves with leakage requirements not based on an Owner’s 10 CFR Part 50, Appendix J, program shall be tested to verify their seat leakages are within the acceptable limits. Paragraph ISTC-3630(a), “Frequency,” states that tests shall be conducted at least once every 2 years. Paragraph ISTC-3630(e) requires that leakage rate measurements shall be compared with the permissible leakage rates specified by the plant Owner for a specific valve or valve combination and provides alternative leakage rates if not specified by the Owner. Paragraph ISTC-3630(f) requires that valves or valve combinations with leakage rates exceeding the valves specified by the Owner per ISTC-3630(e) shall be declared inoperable and either repaired or replaced. Paragraph ISTC-3630(f) also requires that a retest demonstrating acceptable operation shall be performed following any required corrective action before the valve is returned to service.

The request states that PIV 2SI-6-4 is not part of its 10 CFR Part 50, Appendix J, program. As a result, the valve leakage criteria are governed by ASME OM Code, paragraphs ISTC-3630 and ISTC-3630(a), which require PIV 2SI-6-4 to be tested biennially in order to verify that the seat leakage is within acceptable limits. The licensee established the leakage rate acceptance criteria for both 2SI-6-3 and 2SI-6-4 as five gallons per minute (gpm) using the generic guidance in paragraph ISTC-3630(e).

During the October 2021 RFO (2R32), PIV 2SI-6-4 failed the IST leakage test with a leakage rate approximated to be 5.9 gpm. Check valve 2SI-6-3 passed the IST leakage testing with a measured leakage rate of 0.53 gpm. Based on diverse indication, the licensee considered the actual leakage of 2SI-6-3 to be zero gpm. Using this information, the licensee evaluated the impact of the as-found leakage rate of PIV 2SI-6-4 on TS operability. Based on its evaluation, the licensee determined that the PIV 2SI-6-4 leakage rate did not impact the operability of the 21 SI accumulator, and restarted Unit 2 without repairing PIV 2SI-6-4 contrary to the ASME OM Code requirement in paragraph ISTC-3630(f).

In NRC Inspection Report (IR) 05000282 and 05000306/2021004, dated February 11, 2022 (ML22041B542), the NRC determined that the Prairie Island, Unit 2, licensee violated the NRC regulations in 10 CFR 50.55a(f)(4) when it failed to meet the IST requirements set forth in the ASME OM Code, as incorporated by reference in 10 CFR 50.55a, after PIV 2SI-6-4 exceeded its ASME OM Code leakage acceptance criteria. In particular, the inspectors found that the licensee failed to repair or replace PIV 2SI-6-4 prior to returning the valve to service as required in ISTC-3630(f) following the failed leakage test. In IR 2021004, the inspectors noted that the licensee entered this issue into its corrective action program and planned on repairing or replacing the valve during the next RFO.

Alternative request RR-08 proposes a forward-looking alternative to the requirements of ISTC-3630 in the event of a forced outage prior to the 2023 RFO for Prairie Island, Unit 2. The request states that repairing or replacing PIV 2SI-6-4 will require the reactor to be defueled and drained in order to establish conditions that are safe to effectuate repair, including the establishment of dose levels that meet as low as reasonably achievable principles. Moving all the fuel from the reactor to the spent fuel pool and draining the reactor is resource intensive and a complex evolution. As such, the licensee asserts that a hardship or unusual difficulty would result from compliance with ISTC-3630(f) for PIV 2SI-6-4 in the event of a forced outage before the next planned Prairie Island, Unit 2, RFO in 2023.

The licensee asserts that the proposed alternative to the requirements of ISTC-3630(f) for PIV 2SI-6-4 provides an acceptable level of quality and safety by the combination of the leak-tightness of check valve 2SI-6-3 and the implementation of an additional evaluation and monitoring plan. As part of its monitoring plan, the licensee states that each accumulator is verified to be isolated and monitored every 12 hours. The licensee established an adverse condition monitoring plan to log the level of the 21 SI accumulator once per shift using the plant surveillance procedure. The licensee states that it will further evaluate and use the corrective action process to monitor the accumulator boron concentration should the SI accumulator level rise more than 5 percent in a day. If leakage is determined to impact operability, the licensee states that the corresponding TS Required Actions will be completed, and Prairie Island, Unit 2, will be shut down in order to complete an appropriate repair or replacement activity.

In a supplemental letter dated July 14, 2022, the licensee provided the leakage history of PIV 2SI-6-4 for approximately 10 years from May 23, 2012, through October 25, 2021. The history summary shows successful leakage performance of PIV 2SI-6-4 until the measured leakage of 5.9 gpm on October 25, 2021. The licensee states that a repair activity will be completed during the Prairie Island, Unit 2, RFO in 2023 to resolve the leakage issue.

Based on the described review, the NRC staff finds that the licensee has demonstrated that a hardship would exist to meet the ASME OM Code, paragraph ISTC-3630(f), requirements to repair or replace PIV 2SI-6-4 in the event of a unplanned outage of Prairie Island, Unit 2, without a compensating increase in the level of quality and safety where monitoring does not indicate a significant leakage increase in the accumulator line prior to the next RFO in 2023.

CONCLUSION

Based on the described review, the NRC staff finds that the licensee has demonstrated that a hardship would exist to meet the ASME OM Code, paragraph ISTC-3630(f), requirements to repair or replace PIV 2SI-6-4 in the event of a unplanned outage of Prairie Island, Unit 2, without a compensating increase in the level of quality and safety where monitoring does not indicate a significant leakage increase in the accumulator line until the next RFO in 2023. As a result, the NRC staff concludes that the licensee’s proposed alternative request RR-08 to the ASME OM Code requirements in ISTC-3630(f) for PIV 2SI-6-4 meets 10 CFR 50.55a(z)(2). This alternative does not apply to other isolation valves that perform leakage control functions. Therefore, the NRC staff authorizes the use of proposed alternative request RR-08 at Prairie Island, Unit 2, until end of the RFO in 2023.

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: Gurjendra Bedi, NRR
Thomas Scarbrough, NRR

Date: September 30, 2022

Joel S. Wiebe

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cc: Listserv

**PRAIRIE ISLAND NUCLEAR GENERATING PLANT (PRAIRIE ISLAND), UNIT 2
AUTHORIZATION AND SAFETY EVALUATION FOR ALTERNATIVE REQUEST NO. RR-08
(EPID L-2022-LLR-0012) DATED SEPTEMBER 30, 2022**

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