



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

January 4, 2023

Mr. Q. Shane Lies
Senior Vice President and Chief
Nuclear Officer
Indiana Michigan Power Company
Nuclear Generation Group
One Cook Place
Bridgman, MI 49106

SUBJECT: DONALD C. COOK NUCLEAR PLANT, UNIT 2 - RELIEF REQUEST ISIR-5-06
RELATED TO ASME CODE CASE N-729-6 SUPPLEMENTAL EXAMINATION
REQUIREMENTS OF REACTOR VESSEL CLOSURE HEAD PENETRATION
NOZZLES (EPID L-2022-LLR-0073)

Dear Mr. Lies:

By letter dated October 24, 2022 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML22297A211), Indiana Michigan Power Company (I&M, or the licensee), submitted relief request (RR) ISIR-5-06, proposing an alternative to the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Case N-729-6, "Alternative Examination Requirements for PWR [pressurized-water reactor] Reactor Vessel Upper Heads with Nozzles Having Pressure-Retaining Partial-Penetration Welds Section XI, Division 1," as conditioned by Title 10 of the *Code of Federal Regulations* (10 CFR), paragraph 50.55a(g)(6)(ii)(D), for Donald C. Cook Nuclear Plant, Unit 2 (CNP-2).

Specifically, pursuant to 10 CFR 50.55a(z)(2), the licensee requested to use the proposed alternative in RR ISIR-5-06 on the basis that compliance with the specified ASME Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

On November 3, 2022 (ML22307A253), the U.S. Nuclear Regulatory Commission (NRC) verbally authorized the use of ISIR-5-06 at CNP-2 for one cycle of operation, not to exceed the end of the next refueling outage, U2C28. The enclosed safety evaluation describes the technical basis for the NRC's verbal authorization.

The NRC staff reviewed the licensee's submittal and determined that the proposed alternative in RR ISIR-5-06 provides reasonable assurance of structural integrity of the subject components and that complying with the specified ASME Code requirements would result in hardship or unusual difficulty 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). Therefore, the NRC staff authorizes the use of RR ISIR-5-06 at CNP-2 for one cycle of operation, not to exceed the next refueling outage, U2C28.

All other ASME Code, Section XI, requirements for which relief was not specifically requested and approved in the subject request for relief remain applicable, including the third-party review by the Authorized Nuclear Inservice Inspector.

If you have any questions, please contact Scott P. Wall, at 301-415-2855 or via e-mail at Scott.Wall@nrc.gov.

Sincerely,

Nancy L. Salgado, Chief
Plant Licensing Branch III
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-316

Enclosure:
Safety Evaluation

cc: Listserv



UNITED STATES
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST ISIR-5-06 REGARDING ALTERNATIVE INSPECTION OF

REACTOR PRESSURE VESSEL CLOSURE HEAD PENETRATION NOZZLES

INDIANA MICHIGAN POWER COMPANY

DONALD C. COOK NUCLEAR PLANT, UNIT NO. 2

DOCKET NO. 50-316

1.0 INTRODUCTION

By letter dated October 24, 2022 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML22297A211), Indiana Michigan Power Company (I&M, or the licensee) proposed an alternative in relief request (RR) ISIR-5-06 to the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR), paragraph 50.55a(g)(6)(ii)(D), "Augmented ISI [inservice inspection] requirements: Reactor vessel head inspections," which requires American Society of Mechanical Engineers Boiler and Pressure Vessel (ASME Code) Case N-729-6, "Alternative Examination Requirements for PWR [pressurized-water reactor] Reactor Vessel Upper Heads with Nozzles Having Pressure-Retaining Partial-Penetration Welds Section XI, Division 2," for inspection of the reactor vessel closure head (RVCH) at Donald C. Cook Nuclear Plant, Unit No. 2 (CNP-2).

Specifically, pursuant to 10 CFR 50.55a(z)(2), "Hardship without a compensating increase in quality and safety," the licensee requested authorization of its proposed alternative on the basis that compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

On November 3, 2022 (ML22307A253), the U.S. Nuclear Regulatory Commission (NRC) verbally authorized the use of ISIR-5-06 at CNP-2 for one cycle of operation, not to exceed the end of the next refueling outage, U2C28. The enclosed safety evaluation describes the technical basis for the NRC's verbal authorization.

2.0 REGULATORY EVALUATION

Repair and replacement activities for ASME Code Class 1, 2, and 3 components is to be performed in accordance with ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," and applicable editions and addenda as required by 10 CFR 50.55a(g), "Preservice and inservice inspection requirements," except where specific written relief has been granted by the NRC.

Enclosure

The regulation 10 CFR 50.55a(g)(6)(ii), "Augmented ISI program," states that "The Commission may require the licensee to follow an augmented inservice inspection program for systems and components for which the Commission deems that added assurance of structural reliability is necessary." In accordance with 10 CFR 50.55a(g)(6)(ii)(D), all licensees of PWRs must augment their ISI program with ASME Code Case N-729-6, subject to conditions specified in paragraphs (g)(6)(ii)(D)(2) through (4)."

Section 50.55a(z), "Alternatives to codes and standards requirements," of 10 CFR states, in part, that "Alternatives to the requirements of [paragraph (g) of 10 CFR 50.55a] 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 licensee must demonstrate that: (1) the proposed alternatives provide an acceptable level of quality and safety, or (2) 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 the use of an alternative and the NRC to authorize the proposed alternative.

3.0 TECHNICAL EVALUATION

3.1 ASME Code Components Affected

The affected components are ASME Code Class 1 PWR RVCH nozzle numbers 77 and 78 with partial-penetration welds of primary water stress corrosion cracking (PWSCC)-resistant materials. These nozzles and associated welds are categorized as Item B4.30 in ASME Code Case N-729-6, Table 1.

3.2 ISI Interval and Applicable Code Edition and Addenda

CNP-2 is currently in its fifth 10-year ISI interval, which began March 1, 2020, and is scheduled to end on February 28, 2030. The ASME Code of record for the fifth 10-year ISI interval is the 2013 Edition of ASME Code, Section XI, with no addenda.

3.3 Code Requirement for Which Relief is Requested

The regulation in 10 CFR 50.55a(g)(6)(ii)(D)(1), "Implementation," requires that licensees augment their ISI programs in accordance with ASME Code Case N-729-6, subject to the conditions specified in paragraphs (2) through (8) of 10 CFR 50.55a(g)(6)(ii)(D). ASME Code Case N-729-6, paragraph 3142.2, requires that nozzles with relevant conditions indicative of possible nozzle leakage undergo supplemental examinations consisting of a volumetric examination of the nozzle tube and surface examination of the partial-penetration weld or surface examination of the nozzle tube inside surface, the partial-penetration weld, and nozzle tube outside surface below the weld, in accordance with paragraph 3200(b).

Paragraph-3200(b), "Supplemental Examinations," requires supplemental volumetric examinations consisting of a volumetric examination of the nozzle, and surface examination of the partial penetration weld, or surface examination of the nozzle tube inside surface, the partial penetration weld, and nozzle tube outside surface below the weld.

3.4 Licensee's Proposed Alternative

The licensee submitted the proposed alternative on the basis that performing the supplemental examinations represents a hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Specifically, the licensee requested an alternative to performance of the Paragraph-3200(b) of ASME Code Case N-729-6 inspections of the CNP-2 RVCH penetration 77 and 78, during the current refueling outage, U2C27. Instead of the supplemental examinations for penetration numbers 77 and 78, the licensee stated that it will perform a bare metal visual examination of the Cook, Unit 2 RVCH in the next refueling outage, U2C28, in accordance with the latest revision of Code Case N-729 endorsed in 10 CFR 50.55a, to ensure that no leakage is occurring from the RVCH nozzles. During this outage the licensee cleaned the remaining area of the RVCH surface, including each annulus between the head and nozzle surface, and verified the structural integrity of the RVCH. During the upcoming cycle of operation, the licensee stated that it would monitor for leakage in a manner which will continue to ensure the structural integrity of the RVCH.

Specific details are provided in the October 24, 2022, application.

3.5 Licensee's Basis for the Proposed Alternative

During the fall 2022 refueling outage, U2C27, at CNP-2, the licensee performed a RVCH visual examination and identified two RVCH penetrations which after light cleaning methods could not have their relevant conditions of possible nozzle leakage resolved per ASME Code Case N-729-6. Therefore, the licensee followed the guidance in Regulatory Information Summary (RIS) 2018-06, "Clarification of the Requirements for Reactor Pressure Vessel Upper Head Bare Metal Visual Examinations" (ML18178A137). The licensee's analysis showed a likely source for the deposits on the RVCH to be the thermocouple sealing assemblies above the penetrations. However, consistent with the guidance provided in RIS 2018-06, an additional source from nozzle leakage could still be possible. Therefore, ASME Code Case N-729-6, Paragraph-3142.2, would require supplemental volumetric and surface examinations in accordance with Paragraph-3200(b).

The licensee will perform a bare metal visual examination of the RVCH during the next refueling outage, U2C28. Due to the carbon dioxide head cleaning during the U2C27 outage, the future bare metal visual examination should be able to identify any potential active leakage by that time.

The licensee indicated that to perform the supplemental volumetric and surface examinations required in Code Case N-729-6, Paragraph-3200(b), would result in approximately 754 mRem of additional dose to personnel performing these examinations.

For these reasons, pursuant to 10 CFR 50.55a(z)(2), the supplemental examinations represent a hardship or unusual difficulty without a compensating increase in the level of quality and safety.

3.6 Licensee's Proposed Duration of Relief Request

The licensee proposed this alternative during the fall 2022 refueling outage, U2C27, for one cycle of operation, until the end of refueling outage U2C28.

3.7 NRC Staff Review

The licensee identified two RVCH penetrations that had relevant conditions of possible nozzle leakage during the performance of the RVCH bare metal visual examination performed during refueling outage, U2C27. In accordance with 10 CFR 50.55a(g)(6)(ii)(D) which mandates ASME Code Case N-729-6, with conditions, the licensee would be required to perform volumetric and surface examinations of each penetration nozzle and associated weld. As a proposed alternative, under 10 CFR 50.55a(z)(2), the licensee requests to monitor the penetrations for leakage during the upcoming cycle of operation to ensure structural integrity of the RVCH and perform an effective visual examination during the next scheduled refueling outage, U2C28.

The licensee supported their proposed alternative by describing the possible sources of leakage, the location of the deposits, the final bare metal head surface condition at each penetration after cleaning, the crack resistance of the nozzle and weld materials of the RVCH at CNP-2 and the radiological dose hardship of performing additional supplemental examinations at CNP-2 during refueling outage, U2C27.

The NRC staff reviewed the licensee's identified hardship and found the licensee's estimation of radiological dose that would be imposed on personnel necessary to perform the supplemental volumetric examinations during this outage was consistent with estimates at other facilities. As such, the NRC staff finds that the radiological dose is a hardship on the licensee consistent with 10 CFR 50.55a(z)(2).

The NRC staff reviewed the licensee's proposed alternative by evaluating whether the actions identified by the licensee to provide reasonable assurance of structural integrity of the RVCH for the next operating cycle without requiring the licensee to perform supplemental volumetric examinations during the current refueling outage. The NRC reviewed photographs of the initial visual examination and the as left condition of the bare metal head surface. No indication of significant degradation was identified, and the head surface meets the requirements of ASME Code N-729-6 to allow an effective visual examination next refueling outage.

The NRC staff notes the nozzle and weld material of the RVCH at CNP-2 are fabricated with alloy 690/52/152 materials which have a demonstrated resistance to PWSCC in PWR environments. Additionally, extensive crack initiation testing in laboratories has been performed on these materials nationally and internationally with no indication of cracking under similar operating environments found at CNP-2. Confirmatory ongoing crack initiation testing is being performed by the NRC Office of Nuclear Regulatory Research (RES) simulating over 20 years of operation in similar environments at CNP-2, with no indications of cracking. This testing supports the conclusion that it is unlikely that cracking is currently present in the CNP-2 RVCH penetrations.

Further, if a crack had initiated and grown to a size to allow minor leakage of a RVCH penetration, the known resistance of alloy 690/52/152 to crack growth, verified by over 10 years of testing by RES, provides additional assurance that any cracking currently present would be unlikely to increase to the point of challenging the structural integrity of the RVCH over one additional operating cycle. Finally, the licensee's identified leakage monitoring actions enable detection of the onset or increase in leakage through a RVCH penetration prior to it presenting a significant challenge to structural integrity of the RVCH.

Hence, the NRC finds that the licensee's proposed alternative provides reasonable assurance of the structural integrity of the RVCH for the next operating cycle at CNP-2 without requiring the

licensee to perform supplemental volumetric and surface examinations during refueling outage, U2C27.

Therefore, based on the above evaluation, the NRC staff finds, given the actions of the licensee's proposed alternative under RR ISIR-5-06, that there is reasonable assurance of the structural integrity of the RVCH for one cycle of operation. Further, there would be limited gain in quality and safety by performing the required supplemental examinations to verify that no indications of cracking are present for the RVCH penetration nozzles 77 and 78 during the current refueling outage. Given the hardship, the NRC staff finds that (1) there is reasonable assurance that the licensee's proposed alternative has a minimal impact on quality and safety; and (2) the licensee's hardship justification is acceptable.

4.0 CONCLUSION

As set forth above, the NRC staff determines that the licensee has demonstrated that the proposed alternative in RR ISIR-5-06 provides reasonable assurance of structural integrity of the subject components and that complying with the specified ASME Code requirements would result in hardship or unusual difficulty 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). Therefore, the NRC staff authorizes the use of RR ISIR-5-06 at CNP-2 for one cycle of operation, not to exceed the end of the next refueling outage, U2C28.

All other ASME Code, Section XI, requirements for which an alternative was not specifically requested and authorized remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

Principal Contributors: Karen Sida, NRR
Varoujan Kalikian, NRR

Date: January 4, 2023

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