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

October 29, 2015

Mr. Lawrence J. Weber
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 – ALTERNATIVE ISIR-4-06 TO THE REQUIREMENTS OF THE ASME CODE (CAC NO. MF6639)

Dear Mr. Weber:

By letter dated August 23, 2015, as supplemented by letter dated August 24, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML15238A729 and ML15238A728, respectively), Indiana Michigan Power Company (I&M, the licensee), submitted inservice inspection request (ISIR)-4-06 to the U.S. Nuclear Regulatory Commission (NRC) for the use of an alternative to the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, for the Donald C. Cook Nuclear Plant, Unit 2 (CNP-2).

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(z)(2), the licensee submitted the proposed alternative on the basis that complying with the ASME Code requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The licensee requested to apply a weld overlay on the degraded socket weld FW-17 in the boric acid makeup piping of the chemical and volume control system in accordance with ASME Code Case N-666, "Weld Overlay of Class 1, 2, and 3 Socket Welded Connections Section XI, Division 1," with deviation.

The NRC staff has reviewed the subject request and has concluded, as set forth in the enclosed safety evaluation, that I&M has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(2). Therefore, the NRC staff authorizes the use of alternative ISIR-4-06 at CNP-2 for the remaining fuel cycle until the next refueling outage, which is currently scheduled for October 2016.

The NRC staff provided verbal authorization for ISIR-4-06 during a teleconference with the licensee on August 24, 2015 (ADAMS Accession No. ML15237A336).

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

If you have any questions, please contact Allison Dietrich at 301-415-2846, or via e-mail at Allison.Dietrich@nrc.gov

Sincerely,

David L. Pelton, Chief
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-316

Enclosure:
Safety Evaluation

cc w/encl: Distribution via ListServ

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

ALTERNATIVE REQUEST ISIR-4-06

INDIANA MICHIGAN POWER COMPANY

DONALD C. COOK NUCLEAR PLANT, UNIT 2

DOCKET NO. 50-316

1.0 INTRODUCTION

By letter dated August 23, 2015, as supplemented by letter dated August 24, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML15238A729 and ML15238A728, respectively), Indiana Michigan Power Company (I&M, the licensee), submitted inservice inspection request (ISIR)-4-06 to the U.S. Nuclear Regulatory Commission (NRC) for the use of an alternative to the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, for the Donald C. Cook Nuclear Plant, Unit 2 (CNP-2).

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(z)(2), the licensee submitted the proposed alternative on the basis that complying with the ASME Code requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The licensee requested to apply a weld overlay on the degraded socket weld FW-17 in the boric acid makeup piping of the chemical and volume control system in accordance with ASME Code Case N-666, "Weld Overlay of Class 1, 2, and 3 Socket Welded Connections Section XI, Division 1," with deviation.

On August 24, 2015 (ADAMS Accession No. ML15237A336), the NRC staff verbally authorized the use of alternative request ISIR-4-06 until the next refueling outage, which is currently scheduled for October 2016. This safety evaluation documents the technical basis for the NRC's verbal authorization.

2.0 REGULATORY EVALUATION

Pursuant to 10 CFR 50.55a(a)(3)(ii), the licensee requested authorization of an alternative to the requirements of IWA-4000 of the ASME Code, Section XI, and Code Case N-666. The NRC reorganized 10 CFR 50.55a such that alternative requests previously submitted pursuant to paragraph 50.55a(a)(3)(ii) are retitled under the equivalent paragraph 50.55a(z)(2), as provided in the *Federal Register* on November 5, 2014 (79 FR 65776).

Adherence to Section XI of the ASME Code is mandated by 10 CFR 50.55a(g)(4), which states, in part, that ASME Code Class 1, 2, and 3 components will meet the requirements, except the

design and access provisions and the pre-service examination requirements, set forth in the ASME Code, Section XI.

Pursuant to 10 CFR 50.55a(z), alternatives to requirements may be authorized by the NRC if the licensee demonstrates that: (1) the proposed alternatives 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 Commission to authorize the alternative requested by the licensee.

3.0 TECHNICAL EVALUATION

3.1 Component Affected

The affected component is socket weld FW-17, which attaches a flange fitting to the boric acid makeup piping of the chemical and volume control system. The subject socket weld is located on ASME Class 3 two-inch piping downstream of a flow indication instrument 2-QFI-420 in CNP-2.

3.2 Applicable Code Edition and Addenda

The applicable code of record is the ASME Code, Section XI, 2004 edition, no addenda. The code of record for subject piping is ASME/American National Standards Institute B31.1, "Power Piping" (1967).

3.3 Applicable Code Requirement

The applicable code requirement is IWA-4000 of the ASME Code, Section XI, 2004 edition, no addenda. Compliance with this code requirement would necessitate removal of the defect and replacement of the socket weld.

3.4 Reason for Request

With CNP-2 at 100 percent power during cycle U2C22, the licensee discovered leakage from a through wall defect at the toe of the flange socket weld FW-17. The licensee requested an alternative to the ASME Code requirement because performing an ASME Code repair would result in hardship and unusual difficulty without providing a compensating increase in quality and safety, compared to the repair as specified in Code Case N-666, with deviation. The licensee stated the following:

> This defect is located in a section of piping that can only be isolated from the charging system suction header by a single check valve, which is common to both charging pumps. Therefore, normal [ASME Code] repair would require re-welding this flange under a non-positive isolation boundary. In addition, after the repair is performed and the system is refilled; there is no means available to vent the piping to remove air from the system. It is unacceptable to introduce air into the charging system suction lines due to concerns for air binding of the high head

injection pumps. If a high point vent was to be installed, it would require extensive work to remove surrounding interferences and would potentially increase the risk of foreign material introduction into the charging system, and possibly, the reactor coolant system.

Based on the remaining duration of the current operating cycle, the licensee considers it prudent to repair this flaw prior to the next refueling outage scheduled for October 2016.

The licensee requested deviation from Code Case N-666, because it specifically addresses vibration induced failure mechanisms. The licensee "identified a possible cause of the leak as being a lack of fusion of the weld against the flange face, which is not vibration induced." The licensee stated that the cause of failure cannot be definitively determined without forensic analysis. However, the licensee selected Code Case N-666 to repair the weld, because it is suitable for socket welds, and it allows for the repair of an active leak. Per the code case, the weld overlay restores the structural integrity of the cracked or leaking socket weld. The licensee stated that the current leakage occurred after several operating cycles with no leakage evident, based on a review of maintenance and operating history.

The licensee stated that it did not identify leaks or repair work on the socket weld associated with the flow indication instrument 2-QFI-420 for the past 20-plus years. Additionally, the licensee did not identify evidence of additional through wall leakage in the vicinity of the flow indication instrument and other similar locations.

3.5 Proposed Alternative and Basis for Use

The licensee stated that the proposed alternative is application of a weld overlay in accordance with ASME Code Case N-666. This code case is approved in Regulatory Guide 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," Revision 17 (ADAMS Accession No. ML13339A689). Use of this code case will seal the leakage and defect and restore the structural integrity of the subject socket weld. The licensee stated, "The only exception that will be taken is that the failure mechanism is not currently believed to be vibration induced." The licensee will meet all other criteria of the code case including the following requirements.

- The structural portion of the overlay and seal layers shall be deposited in accordance with a Shielded Metal Arc or Gas Tungsten Arc Welding Procedure Specification qualified in accordance with the ASME Code, Section XI, IWA-4440.

- The review of the design, operating history, and changes to the piping system indicates that the current system configuration and operating condition have not changed for more than 20 years. Because operation history shows no evidence of previous leakage at this location, the weld overlay shall be acceptable for the remaining fuel cycle until the weld will be removed and examined to support a cause investigation.

- VT-1 visual examination shall be performed using a procedure that meets the requirements of the ASME Code, Section XI, IWA-2210.

The licensee stated that the through wall defect is on the toe flange side of the weld, which most likely propagated from the root of the weld.

The flange and pipe materials are listed in the following table, provided by the licensee.

Component	ASME/ASTM	Size/Schedule/Rating	P #
Flange	ASME SA-182 Grade F-304	2 inch, 150 pounds per square inch	P-8
Pipe	ASME SA-312 TP-304	2 inch, Schedule 40	P-8

The licensee stated that system conditions during the weld repair will be ambient temperature of less than 100 degrees Fahrenheit and system pressure of nominally 50 pounds per square inch gauge. The licensee has verified that the wall thickness of the piping is greater than the minimum wall thickness and is adequate to perform the repair. The leak will first be seal welded with 309L filler material. The licensee will perform a VT-1 visual inspection and a dye penetrant test before performing the weld overlay.

The licensee will use ER308L/E308L filler metal for the remaining weld passes, as specified in the American Electric Power (AEP) weld manual, which is compatible with the stainless base metals. The remaining weld passes may also be completed with ER309L/E309L filler metal, as specified in the AEP weld manual, as compatible filler material with the stainless base metals. The possible process and filler/rod combinations are shown in the following table, provided by the licensee.

Process	Filler/Rod
Gas Tungsten Arc Welding	ER308L or ER309L
Shielded Metal Arc Welding	E308L or ER309L

After the weld overlay is installed, the licensee will examine the weld overlay by a VT-1 visual examination and a dye penetrant test.

3.6 Duration of Proposed Alternative

The licensee stated that the duration of the proposed alternative would be for the remaining fuel cycle until the next CNP-2 refueling outage, scheduled for October 2016. The licensee clarified that relief from the ASME Code of record is requested only for this specific application and not intended to be applied for any other applications.

3.7 NRC Staff Evaluation

The licensee proposed to use ASME Code Case N-666, with deviation, to repair socket weld FW-17 by installing weld overlay on the outside surface of the pipe and flange. The NRC has approved Code Case N-666 in Regulatory Guide 1.147, Revision 17, for generic use.

The requirements of Code Case N-666 are summarized below with the NRC staff's evaluation of the licensee's proposed alternative:

Section 1, *General Requirements,* of the code case requires the weld overlay be performed per the ASME Code, Section XI, IWA-4150, and be limited to one-time use. Section 1 of the code case also provides limits for pipe sizes, pipe material, welding processes, and pressure and

temperature of the piping system. The NRC staff finds that the pipe size, pipe material, and welding processes that the licensee will use, and the operating pressure and temperature of the subject piping, meet the requirements of Section 1 of the code case. The licensee also stated that it will perform an ASME Code repair of the subject socket weld in the next refueling outage. Therefore, the NRC staff finds that the proposed alternative satisfies Section 1 of the code case.

Section 2, *Evaluation,* of the code case limits its use to failure caused by vibration fatigue, limits the duration of the application, and requires the review of the design and operating history of the degraded piping. The NRC staff notes that the licensee has not performed a destructive examination of the subject socket weld to determine the exact root cause of the flaw in the subject socket weld. However, based on the visual inspection of the leaking socket weld, and the location of the defect, the licensee believes that a possible cause for the defect was lack of fusion. The licensee stated that it did not identify leaks or repair work on the subject socket weld and the associated flange for the past 20-plus years. The licensee also did not identify evidence of additional through wall leakage in the vicinity of the subject socket weld and other similar locations. The NRC staff finds that the licensee's deviation does not negate the contribution of the weld overlay to support the structural integrity and leak tightness of the subject socket weld because the weld overlay is designed, installed, and examined per the requirements of the code case.

Section 3, *Design,* of the code case requires the weld overlay to be designed with a certain minimum thickness to meet the dimensional requirements of Figure 1 of the code case. Section 3 also requires certain weld filler metal to be used. The NRC staff finds that the proposed alternative has satisfied Section 3 of the code case because the licensee has not requested deviation from this section, and the filler material specified in the proposed alternative is acceptable for use.

Section 4, *Procedure,* of the code case provides requirements for pre-welding examinations, the application of the seal weld (first few weld layers), the examination of the seal weld, weld overlay deposition, and the condition of the final weld surface. The NRC staff finds that the proposed alternative satisfies Section 4 of the code case because the licensee stated that it will perform the necessary VT-1 examination of the flaw before weld overlay installation, and that the licensee has not taken any exceptions to Section 4.

Section 5, *Final Examination and Testing,* of the code case requires a VT-1 visual examination with associated acceptance criteria, and a nondestructive examination per the Construction Code, be conducted on the completed weld overlay. The licensee stated that it will perform the VT-1 visual examination and dye penetrant test of the completed weld overlay. The NRC staff finds that the licensee's proposed VT-1 examination and dye penetrant test satisfy Section 5 of the code case.

Regarding hardship, the licensee stated that the flaw at socket weld FW-17 is located in a section of piping that can only be isolated from the charging system suction header by a single check valve, which is common to both charging pumps. The licensee stated that the weld and piping in which the flaw is located is not isolable. Therefore, normal ASME Code repair would require re-welding this flange under a non-positive isolation boundary. The licensee stated that it is unacceptable to introduce air into the charging system suction lines due to concerns for air binding of the high head injection pumps. To perform the ASME Code repair would require installing a vent pipe, which would potentially increase the risk of foreign material introduction

into the charging system, and possibly, the reactor coolant system. On the basis of the licensee's justifications, the NRC staff finds that requiring the licensee to perform the ASME Code repair on the subject socket weld would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

4.0 CONCLUSION

The NRC staff finds that the proposed alternative in request ISIR-4-06 will provide reasonable assurance of the structural integrity and leak tightness of the subject socket weld. The NRC staff determines 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 all of the regulatory requirements set forth in 10 CFR 50.55a(z)(2). Therefore, the NRC authorizes the use of alternative ISIR-4-06 at CNP-2 until the next refueling outage, which is currently scheduled for October 2016.

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

Principal Contributor: J.Tsao, NRR

Date: October 29, 2015

If you have any questions, please contact Allison Dietrich at 301-415-2846, or via e-mail at Allison.Dietrich@nrc.gov

Sincerely,

/RA/

David L. Pelton, Chief
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-316

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Safety Evaluation

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