

June 27, 2005

Mr. Mano K. Nazar
Senior Vice President and
Chief Nuclear Officer
Indiana Michigan Power Company
Nuclear Generation Group
One Cook Place
Buchanan, MI 49107

SUBJECT: DONALD C. COOK NUCLEAR PLANT, UNIT 1 - ALTERNATIVE TO REPAIR
REQUIREMENTS OF SECTION XI OF THE AMERICAN SOCIETY OF
MECHANICAL ENGINEERS CODE (TAC NO. MC6751)

Dear Mr. Nazar:

By letter dated April 15, 2005 (ML051160176), Indiana Michigan Power Company (I&M, or the licensee) requested relief from specific requirements in the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI, for the Donald C. Cook Nuclear Plant (CNP), Unit 1. The licensee proposed the use of the Electric Power Research Institute Performance Demonstration Initiative Program for implementation of Appendix VIII, Supplement 11, requirements. The U.S. Nuclear Regulatory Commission (NRC) staff verbally approved your request in a telephone conversation held on April 18, 2005, between D. Fadel and M. Scarpello, et al. (I&M), and T. Chan and L. Raghavan, et al. (NRC).

The need for this relief was not originally recognized by your staff. It was brought to your attention by NRC staff during its review of your Relief Request ISIR-15, dated April 12, 2005 (ML051100417). Relief Request ISIR-15 will be addressed by separate correspondence.

Based on the enclosed safety evaluation, the NRC staff concludes that the proposed alternative provides an acceptable level of quality and safety. Therefore, pursuant to Title 10 of the *Code of Federal Regulations* Section 50.55a(a)(3)(i), the NRC staff authorizes the proposed alternative in Relief Request ISIR-16 to the repair requirements ASME Code Section XI at CNP, Unit 1, for the third 10-year inservice inspection interval.

M. Nazar

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The detailed results of the NRC staff's review are provided in the enclosed safety evaluation. If you have any questions concerning this matter, please call Mr. F. Lyon of my staff at (301) 415-2296.

Sincerely,

/RA/

L. Raghavan, Chief, Section 1
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-315

Enclosure: Safety Evaluation

cc w/encl: See next page

M. Nazar

-2-

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ADAMS ACCESSION NUMBER: **ML051720006**

*SE dated 6/8/05

OFFICE	PM:PD3-1	LA:PD3-1	SC:EMCB	OGC	SC:PD3-1
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DATE	06/23/05	06/22/05	6/8/05	06/24/05	06/27/05

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

INSERVICE INSPECTION PROGRAM RELIEF REQUEST ISIR-16

INDIANA MICHIGAN POWER COMPANY

DONALD C. COOK NUCLEAR PLANT, UNIT 1

DOCKET NO. 50-315

1.0 INTRODUCTION

By letter dated April 15, 2005, Indiana Michigan Power Company (the licensee) submitted Relief Request ISIR-16 for the Donald C. Cook Nuclear Plant, Unit 1, which proposed an alternative to the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI, Appendix VIII, Supplement 11 requirements. In lieu of the Code requirements, the licensee proposed using the qualification process as administered by the Electric Power Research Institute (EPRI) - Performance Demonstration Initiative (PDI) Program for weld overlay qualifications. The duration of the alternative requested by the licensee is for the remaining service life of the component.

2.0 REGULATORY REQUIREMENTS

Inservice inspection of the ASME Code Class 1, 2, and 3 components is performed in accordance with Section XI of the ASME Code and applicable addenda as required by Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). Title 10 of the *Code of Federal Regulations* Section 50.55a(a)(3) states that alternatives to the requirements of paragraph (g) may be used, when authorized by the Nuclear Regulatory Commission (NRC), if: (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the pre-service examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection (ISI) of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) 12-months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The applicable Code of record for the third 10-year inservice inspection interval for Donald C. Cook Nuclear Plant, Unit 1, is the 1995 Edition of the ASME Code, Section XI, with 1996 Addenda.

3.0 LICENSEE'S REQUEST FOR RELIEF

Pursuant to 10 CFR 50.55a(a)(3)(i), the licensee requests relief to use the EPRI - PDI Program for implementation of ASME Code, Section XI, Appendix VIII, Supplement 11 requirements, in lieu of ASME Code, Section XI, Appendix VIII, Supplement 11.

4.0 CODE REQUIREMENTS

ASME Code Section XI, 1995 Edition with 1996 Addenda, Appendix VIII, Supplement 11, "Qualification Requirements For Full Structural Overlaid Wrought Austenitic Piping Welds."

5.0 TECHNICAL EVALUATION

The U.S. nuclear utilities created the PDI to implement performance demonstration requirements contained in Appendix VIII of Section XI of the Code. To this end, PDI has developed a program for qualifying equipment, procedures, and personnel in accordance with the ultrasonic testing criteria of Appendix VIII, Supplement 11. Prior to the Supplement 11 program, EPRI was maintaining a performance demonstration program for weld overlay qualification under the Tri-party Agreement¹. Instead of having two programs with similar objectives, the NRC staff recognized the PDI program for weld overlay qualifications as an acceptable alternative to the Tri-party Agreement.² The PDI program which the licensee proposes to use does not fully comport with the existing requirements of Supplement 11. The differences are discussed below.

Paragraph 1.1(b) of Supplement 11 states limitations to the maximum thickness for which a procedure may be qualified. The Code states that "The specimen set must include at least one specimen with overlay thickness within minus 0.10-inch to plus 0.25-inch of the maximum nominal overlay thickness for which the procedure is applicable." The Code requirement addresses the specimen thickness tolerance for a single specimen set, but is confusing when multiple specimen sets are used. The PDI proposed alternative states that "the specimen set shall include specimens with overlay not thicker than 0.10-inch more than the minimum thickness, nor thinner than 0.25-inch of the maximum nominal overlay thickness for which the examination procedure is applicable." The proposed alternative provides clarification on the application of the tolerance. The tolerance is unchanged for a single specimen set; however, it clarifies the tolerance for multiple specimen sets by providing tolerances for both the minimum and maximum thicknesses. The proposed wording eliminates confusion while maintaining the intent of the overlay thickness tolerance. Therefore, the NRC staff finds this PDI program revision acceptable.

¹ The Tri-party Agreement is between NRC, EPRI, and the Boiling-Water Reactor Owners Group (BWROG), "Coordination Plan for NRC/EPRI/BWROG Training and Qualification Activities of NDE (Nondestructive Examination) Personnel," July 3, 1984.

² Letter from William H. Bateman, NRC, to Michael Bratton, PDI, "Weld Overlay Performance Demonstration Administered by PDI as an Alternative for Generic Letter 88-01 Recommendations," January 15, 2002 (ML020160532).

Paragraph 1.1(d)(1) requires that all base metal flaws be cracks. PDI determined that certain Supplement 11 requirements pertaining to location and size of cracks in test specimens would be extremely difficult to achieve. For example, flaw implantation requires excavating a volume of base material to allow a pre-cracked coupon to be welded into this area. This process would add weld material to an area of the specimens that typically consists of only base material. This configuration would not be representative of actual field conditions which may be more difficult to examine. In an effort to satisfy the requirements, PDI developed a process for fabricating flaws that exhibit crack-like reflective characteristics. Instead of all flaws being cracks as required by Paragraph 1.1(d)(1), the PDI weld overlay performance demonstrations contain at least 70 percent cracks with the remainder being fabricated flaws exhibiting crack-like reflective characteristics. The fabricated flaws are semi-elliptical with tip widths of less than 0.002 inches. The licensee provided further information describing a revision to the PDI Program alternative to clarify when real cracks, as opposed to fabricated flaws, will be used: "Flaws shall be limited to the cases where implantation of cracks produces spurious reflectors that are uncharacteristic of actual flaws." The NRC has reviewed the flaw fabrication process, compared the reflective characteristics between actual cracks and PDI-fabricated flaws, and found the fabricated flaws acceptable for this application.^{3,4}

Paragraph 1.1(e)(1) requires that at least 20 percent but not less than 40 percent of the flaws shall be oriented within ± 20 degrees of the axial direction of the piping test specimen. Flaws contained in the original base metal heat-affected zone satisfy this requirement. However, PDI excludes axial fabrication flaws in the weld overlay material. PDI has concluded that axial flaws in the overlay material are improbable because the overlay filler material is applied in the circumferential direction (parallel to the girth weld); therefore fabrication anomalies would also be expected to have major dimensions in the circumferential direction. The NRC finds this approach to implantation of fabrication flaws to be reasonable. Therefore, PDI's application of flaws oriented in the axial direction is acceptable.

Paragraph 1.1(e)(1) also requires that the rules of IWA-3300 be used to determine whether closely spaced flaws should be treated as single or multiple flaws. PDI treats each flaw as an individual flaw and not as part of a system of closely spaced flaws. PDI controls the flaws going into a test specimen set such that the flaws are free of interfering reflections from adjacent flaws. In some cases, this permits flaws to be spaced closer than what is allowed for classification as a multiple set of flaws by IWA-3300, which potentially makes the performance demonstration more challenging. Hence, PDI's application for closely spaced flaws is acceptable.

Paragraph 1.1(e)(2)(a)(1) requires that a base grading unit shall include at least 3-inches of the length of the overlaid weld, and the base grading unit includes the outer 25 percent of the overlaid weld and base metal on both sides. The PDI program reduced the criteria to 1-inch of the length of the overlaid weld and eliminated from the grading unit the need to include both sides of the weld. The proposed change permits the PDI program to continue using test

³ NRC memorandum, "Summary of Public Meeting Held January 31 - February 2, 2001," with PDI Representatives, March 22, 2001 (ML010940402).

⁴ NRC memorandum, "Summary of Public Meeting Held June 12 through June 14, 2001," with PD1 Representatives, November 29, 2001 (ML013330156).

specimens from the existing weld overlay program which have flaws on both sides of the welds. These test specimens have been used successfully for testing the proficiency of personnel for over 16 years. The weld overlay qualification is designed to be a nearside (relative to the weld) examination, and it is improbable that a candidate would detect a flaw on the opposite side of the weld due to the sound attenuation and re-direction caused by the weld microstructure. However, the presence of flaws on both sides of the original weld (outside the PDI grading unit) may actually provide a more challenging examination, as candidates must determine the relevancy of these flaws, if detected. Therefore, use of the 1-inch length of the overlaid weld base grading unit and elimination from the grading unit the need to include both sides of the weld in the PDI Program is acceptable.

Paragraph 1.1(e)(2)(a)(3) requires that for unflawed base grading units, at least 1-inch of unflawed overlaid weld and base metal shall exist on either side of the base grading unit. This is to minimize the number of false identifications of extraneous reflectors. The PDI program stipulates that unflawed overlaid weld and base metal exist on all sides of the grading unit and that flawed grading units must be free of interfering reflections from adjacent flaws, which addresses the same concerns as Code. Hence, PDI's application of the variable flaw-free area adjacent to the grading unit is acceptable.

Paragraph 1.1(e)(2)(b)(1) requires that an overlay grading unit shall include the overlay material and a base metal-to-overlay interface of at least six square inches. The overlay grading unit shall be rectangular, with minimum dimensions of 2-inches. The PDI program reduces the base metal-to-overlay interface to at least 1-inch (in lieu of a minimum of two inches) and eliminates the minimum rectangular dimension. This criterion is necessary to allow use of existing examination specimens that were fabricated in order to meet NRC Generic Letter 88-01 (Tri-party Agreement, July 1984)¹. This criterion may be more challenging than Code because of the variability associated with the shape of the grading unit. Hence, PDI's application of the grading unit is acceptable.

Paragraph 2.3 states that, for depth sizing tests, 80 percent of the flaws shall be sized at a specific location on the surface of the specimen identified to the candidate. This requires detection and sizing tests to be separate. PDI revised the weld overlay program to allow sizing to be conducted either in conjunction with, or separately from, the flaw detection test. If performed in conjunction with detection, and the detected flaws do not meet the Supplement 11 range criteria, additional specimens will be presented to the candidate with the regions containing flaws identified. Each candidate will be required to determine the maximum depth of flaw in each region. For separate sizing tests, the regions of interest will also be identified and the maximum depth and length of each flaw in the five regions will similarly be determined. In addition, PDI stated that grading units are not applicable to sizing tests, and that each sizing region will be large enough to contain the target flaw, but small enough that candidates will not attempt to size a different flaw. The above clarification provides a basis for implementing sizing tests in a systematic, consistent manner that meets the intent of Supplement 11. As such, this method is acceptable to the NRC staff.

Paragraphs 3.1 and 3.2 of Supplement 11 state that procedures, equipment and personnel as a complete ultrasonic system are qualified for detection or sizing of flaws, as applicable, when certain criteria are met. The PDI program allows procedure qualification to be performed separately from personnel and equipment qualification. Historical data indicate that, if

ultrasonic detection or sizing procedures are thoroughly tested, personnel and equipment using those procedures have a higher probability of successfully passing a qualification test. In an effort to increase this passing rate, PDI has elected to perform procedure qualifications separately in order to assess and modify essential variables that may affect overall system capabilities. For a procedure to be qualified, the PDI program requires three times as many flaws to be detected (or sized) as shown in Supplement 11 for the entire ultrasonic system. The personnel and equipment are still required to meet Supplement 11. Therefore, the PDI program exceeds the Supplement 11 requirements for personnel, procedures, and equipment qualification.

Paragraph 3.2(b) requires that all extensions of base metal cracking into the overlay material by at least 0.10-inch be reported as being intrusions into the overlay material. The PDI program omits this criterion because of the difficulty in actually fabricating a flaw with a 0.10-inch minimum extension into the overlay, while still knowing the true state of the flaw dimensions. However, the PDI program requires that cracks be depth-sized to the tolerance of 0.125-inch as specified in Code. Since the Code tolerance is close to the 0.10-inch value of Paragraph 3.2(b), any crack extending beyond 0.10-inch into the overlay material would be identified as such from the characterized dimensions. The reporting of an extension in the overlay material is redundant for performance demonstration testing because of the flaw sizing tolerance. Therefore, PDI's omission of highlighting a crack extending beyond 0.10-inch into the overlay material is acceptable.

The duration of the alternative requested by the licensee is for the remaining service life of the component. The staff considered the request only for the third 10-year ISI interval, due to potential future changes in Code requirements which might affect the need for the relief.

6.0 CONCLUSION

The NRC staff has determined that the licensee's proposed alternative to use the PDI program for weld overlay qualifications as described in the submittal, in lieu of Supplement 11 to Appendix VIII of Section XI of the Code, will provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the proposed alternative under Relief Request ISIR-16 is authorized for the third 10-year ISI interval at Donald C. Cook Nuclear Plant, Unit 1.

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

Donald C. Cook Nuclear Plant, Units 1 and 2

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