

September 14, 2004

Mr. Daniel J. Malone  
Site Vice President  
Palisades Nuclear Plant  
Nuclear Management Company, LLC  
27780 Blue Star Memorial Highway  
Covert, MI 49043-9530

SUBJECT: PALISADES PLANT - REQUEST FOR RELIEF FROM THIRD 10-YEAR  
INTERVAL INSERVICE INSPECTION PROGRAM PLAN FOR THE PALISADES  
PLANT (TAC NO. MC0809)

Dear Mr. Malone:

By letter dated September 18, 2003, Nuclear Management Company, LLC (NMC, the licensee) submitted a relief request for the third 10-year interval inservice inspection program for the Palisades Nuclear Plant. The licensee proposed an alternative to the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) 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 Performance Demonstration Initiative for weld overlay qualifications. The proposed alternative is for the remaining third 10-year interval, which ends on December 12, 2006.

The U.S. Nuclear Regulatory Commission (NRC) staff, has reviewed and evaluated the information provided in the relief request and the associated proposed alternative testing method against the requirements of the ASME B&PV Code, 1989 Edition, which was referenced in Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a. The NRC staff has found the licensee's request to use the proposed alternative acceptable. Pursuant to 10 CFR 50.55a(a)(3)(i), the relief request is authorized for the remainder of the third 10-year interval inservice inspection interval based on the alternative providing an acceptable level of quality and safety.

D.J. Malone

-2-

The NRC staff's evaluation and conclusions are contained in the safety evaluation provided in the enclosure.

If you have any questions regarding this issue, please contact Mr. John F. Stang at 301-415-1345 or by e-mail at [jfs2@nrc.gov](mailto:jfs2@nrc.gov).

Sincerely,

*/RA/*

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

Docket No. 50-255

Enclosure: Safety Evaluation

cc w/encls: See next page

D.J. Malone

- 2 -

The NRC staff's evaluation and conclusions are contained in the safety evaluation provided in the enclosure.

If you have any questions regarding this issue, please contact Mr. John F. Stang at 301-415-1345 or by e-mail at [jfs2@nrc.gov](mailto:jfs2@nrc.gov).

Sincerely,

*/RA/*

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

Docket No. 50-255

Enclosure: Safety Evaluation

cc w/encls: See next page

DISTRIBUTION

PUBLIC	OGC	WRuland
PDIII-1 Reading	ACRS	GHill (2)
LRaghavan	JStang	DWeaver
THarris	EDuncan, RGN-III	DLPMDPR

ADAMS ACCESSION NO.: ML041910364

OFFICE	PDIII-1/PM	PDIII-1/LA	EMEB/SC	OGC	PDIII-1/SC
NAME	JStang	THarris	TChan	SZiplen	LRaghavan
DATE	09/01/04	09/01/04	09/01/04	09/09/04	09/14/04

OFFICIAL RECORD COPY

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
FOR THIRD 10-YEAR INTERVAL INSERVICE INSPECTION REQUEST FOR RELIEF  
NUCLEAR MANAGEMENT COMPANY, LLC

PALISADES PLANT

DOCKET NO. 50-255

## 1.0 INTRODUCTION

The staff of the U.S. Nuclear Regulatory Commission (NRC), reviewed and evaluated the information submitted by Nuclear Management Company, LLC (NMC, the licensee) in a letter dated September 18, 2003. The licensee proposed an alternative to the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Section XI, Appendix VIII, Supplement 11, "Qualification Requirements for Full Structural Overlaid Wrought Austenitic Piping Welds," requirements at the Palisades Plant. 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) for weld overlay qualifications.

## 2.0 REGULATORY EVALUATION

Inservice inspection (ISI) of the ASME Code Class 1, 2, and 3 components is performed in accordance with Section XI of the ASME B&PV 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). The requirements of 10 CFR 50.55a(a)(3) state that alternatives to the requirements of paragraph (g) may be used, when authorized by the 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 ISI for the Palisades Plant, is the 1989 Edition of the ASME Code, Section XI and the 1995 Edition with 1996 Addenda of Appendix VIII of Section XI of the ASME Code.

## 2.1 Code Requirements

Section 50.55a(g)(6)(ii)(C) of Title 10 of the *Code of Federal Regulations* requires a schedule for implementation of Appendix VIII to Section XI of the ASME Code, 1995 Edition with 1996 Addenda. Performance demonstration requirements for qualifying procedures, personnel and equipment to inspect austenitic piping welds having structural overlays are listed in the 1995 Edition, 1996 Addenda, of ASME Section XI, Appendix VIII, Supplement 11. Licensees may 1) elect to use the requirements of Supplement 11 as listed, 2) seek NRC approval for new ASME code cases currently being reviewed by Code Committees, or 3) propose an alternative to Code requirements. The licensee proposed to use the industry's PDI program as an alternative to the following paragraphs of Supplement 11:

- Paragraph 1.1(b) The specimen set shall consist of at least three specimens having different nominal pipe diameters and overlay thicknesses. They shall include the minimum and maximum nominal pipe diameters for which the examination procedure is applicable. Pipe diameters within a range of 0.9 to 1.5 times a nominal diameter shall be considered equivalent. If the procedure is applicable to pipe diameters of 24 in. or larger, the specimen set must include at least one specimen 24 in. or larger but need not include the maximum diameter. The specimen set must include at least one specimen with overlay thickness within -0.1 in. to +0.25 in. of the maximum nominal overlay thickness for which the procedure is applicable.
- Paragraph 1.1(d)(1) Base metal flaws. All flaws must be cracks in or near the butt weld heat-affected zone, open to the inside surface, and extending at least 75 percent through the base metal wall. Flaws may extend 100 percent through the base metal and into the overlay material; in this case, intentional overlay fabrication flaws shall not interfere with the ultrasonic detection or characterization of the cracking. Specimens containing intergranular stress-corrosion cracking (IGSCC) shall be used when available.
- Paragraph 1.1(e)(1) At least 20 percent but less than 40 percent of the flaws shall be oriented within  $\pm 20$  deg. of the pipe axial direction. The remainder shall be oriented circumferentially. Flaws shall not be open to any surface to which the candidate has physical or visual access. The rules of IWA-3300 shall be used to determine whether closely spaced flaws should be treated as single or multiple flaws.
- Paragraph 1.1(e)(2) Specimens shall be divided into base and overlay grading units. Each specimen shall contain one or both types of grading units.
- Paragraph 1.1(e)(2)(a)(1) A base grading unit shall include at least 3 in. of the length of the overlaid weld. The base grading unit includes the outer 25 percent of the overlaid weld and base metal on both sides. The base grading unit shall not include the inner 75 percent of the overlaid weld and base metal overlay material, or base metal-to-overlay interference.

- Paragraph 1.1(e)(2)(a)(2) When base metal cracking penetrates into the overlay material, the base grading unit shall include the overlay metal within 1 in. of the crack location. This portion of the overlay material shall not be used as part of any overlay grading unit.
- Paragraph 1.1(e)(2)(a)(3) When a base grading unit is designed to be unflawed, at least 1 in. of unflawed overlaid weld and base metal shall exist on either side of the base grading unit. The segment of weld length used in one base grading unit shall not be used in another base grading unit. Base grading units need not be uniformly spaced around the specimen.
- Paragraph 1.1(e)(2)(b)(1) An overlay grading unit shall include the overlay material and the base metal-to-overlay interference of at least 6 sq. in. The overlay grading unit shall be rectangular, with minimum dimensions of 2 in.
- Paragraph 1.1(e)(2)(b)(2) An overlay grading unit designed to be unflawed shall be surrounded by unflawed overlay material and unflawed base metal-to-overlay interface for at least 1 in. around its entire perimeter. The specific area used in one overlay grading unit shall not be used in another overlay grading unit. Overlay grading units need not be spaced uniformly about the specimen.
- Paragraph 1.1(e)(2)(b)(3) Detection sets shall be selected from Table VIII-S2-1. The minimum detection sample set is five flawed base grading units, ten unflawed base grading units, and ten unflawed overlay grading units. For each type of grading unit, the set shall contain at least twice as many unflawed as flawed grading units.
- Paragraph 1.1(f)(1) The minimum number of flaws shall be ten. At least 30 percent of the flaws shall be overlay fabrication flaws. At least 40 percent of the flaws shall be cracks open to the inside surface.
- Paragraph 1.1(f)(3) Base metal cracking used for length sizing demonstrations shall be oriented circumferentially.
- Paragraph 1.1(f)(4) Depth sizing specimen sets shall include at least two distinct locations where cracking in the base metal extends into the overlay material by at least 0.1 in. in the through-wall direction.
- Paragraph 2.0 The specimen inside surface and identification shall be concealed from the candidate. All examinations shall be completed prior to grading the results and presenting the results to the candidate. Divulgence of particular specimen results or candidate viewing of unmasked specimens after the performance demonstration is prohibited.
- Paragraph 2.1 Flawed and unflawed grading units shall be randomly mixed. Although the boundaries of specific grading units shall not be revealed to the candidate, the candidate shall be made aware of the type or types of grading units (base or overlay) that are present for each specimen.

- Paragraph 2.2(d) For flaws in base grading units, the candidate shall estimate the length of that part of the flaw that is in the outer 25 percent of the base wall thickness.
- Paragraph 2.3 For the depth sizing test, 80 percent of the flaws shall be sized at a specific location on the surface of the specimen identified to the candidate. For the remaining flaws, the regions of each specimen containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the maximum depth of the flaw in each region.
- Paragraph 3.1 Examination procedures, equipment, and personnel are qualified for detection when the results of the performance demonstration satisfy the acceptance criteria of Table VIII-S2-1 for both detection and false calls. The criteria shall be satisfied separately by the demonstration results for base grading units and for overlay grading units.
- Paragraph 3.2(a) The root mean square (RMS) error of the flaw length measurements, as compared to the true flaw lengths, is less than or equal to 0.75 inch. The length of base metal cracking is measured at 75 percent through-base-metal position.
- Paragraph 3.2(b) All extensions of base metal cracking into the overlay material by at least 0.1 in. are reported as being intrusions into the overlay material.
- Paragraph 3.2(c) The RMS error of the flaw depth measurements, as compared to the true flaw depths, is less than or equal to 0.125 in.

## 2.2 Licensee's Proposed Alternative

Pursuant to 10 CFR 50.55a(a)(3)(i), the licensee proposed using the PDI program in lieu of the requirements of ASME Section XI, 1995 Edition with 1996 Addenda, Appendix VIII, Supplement 11. The EPRI PDI program is described in the submittal.

## 2.3 Licensee's Basis for Alternative

Paragraph 1.1(d)(1), requires that all base metal flaws be cracks. As illustrated in the submittal, implanting a crack requires excavation of the base material on at least one side of the flaw. While this may be satisfactory for ferritic materials, it does not produce a useable axial flaw in austenitic materials because the sound beam, which normally passes only through base material, must now travel through weld material on at least one side, producing an unrealistic flaw response. To resolve this issue, the PDI program revised this paragraph to allow use of alternative flaw mechanisms under controlled conditions. For example, alternative flaws shall be limited to cases when implantation of cracks precludes obtaining an effective ultrasonic response, flaws shall be semi-elliptical with a tip width of less than or equal to 0.002 inches, and at least 70 percent of the flaws in the detection and sizing test shall be cracks and the remainder shall be alternative flaws.

Relief is requested to allow closer spacing of flaws provided they didn't interfere with detection or discrimination. The existing specimens used to date for qualifications to the Tri-party

(NRC/BWROG/EPRI) agreement have a flaw population density greater than allowed by the current Code requirements. These samples have been used successfully for all previous qualifications under the Tri-party agreement program to Supplement 11. The PDI Program has merged the Tri-party test specimens into their weld overlay program. For example: the requirement for using IWA-3300 for proximity flaw evaluation in paragraph 1.1(e)(1) was excluded, instead indications will be sized based on their individual merits; paragraph 1.1(d)(1) includes the statement that intentional overlay fabrication flaws shall not interfere with ultrasonic detection or characterization of the base metal flaws; paragraph 1.1(e)(2)(a)(1) was modified to require that a base metal grading unit include at least 1 inch of the length of the overlaid weld, rather than 3 inches; paragraph 1.1(e)(2)(a)(3) was modified to require sufficient unflawed overlaid weld and base metal to exist on all sides of the grading unit to preclude interfering reflections from adjacent flaws, rather than the 1 inch requirement of Supplement 11; paragraph 1.1(e)(2)(b)(1) was modified to define an overlay fabrication grading unit as including the overlay material and the base metal-to-overlay interface for a length of at least 1 inch rather than the 6 square inches requirement of Supplement 11; and paragraph 1.1(e)(2)(b)(2) states that overlay fabrication grading units designed to be unflawed shall be separated by unflawed overlay material and unflawed base metal-to-overlay interface for at least 1 inch at both ends, rather than around its entire perimeter.

Additionally, the requirement for axially-oriented overlay fabrication flaws in paragraph 1.1(e)(1) was excluded from the PDI Program as an improbable scenario. Weld overlays are typically applied using automated gas tungsten arc welding techniques with the filler metal being applied in a circumferential direction. Because resultant fabrication induced discontinuities would also be expected to have major dimensions oriented in the circumferential direction axial overlay, fabrication flaws are unrealistic.

The requirement in paragraph 3.2(b) for reporting all extensions of cracking into the overlay is omitted from the PDI Program because it is redundant to the RMS calculations performed in paragraph 3.2(c) and its presence adds confusion and ambiguity to depth sizing as required by paragraph 3.2(c). This also makes the weld overlay program consistent with the Supplement 2 depth sizing criteria.

These changes are contained in Code Case N-653. There are, however, some additional changes that were inadvertently omitted from the Code Case. The most important change is paragraph 1.1(a)(1) where the phrase "and base metal on both sides" was inadvertently included in the description of a base metal grading unit. The PDI program intentionally excludes this requirement because some of the qualification samples include flaws on both sides of the weld. To avoid confusion, several instances of the term "cracks" or "cracking" were changed to the term "flaws" because of the use of alternative flaw mechanisms. Additionally, to avoid confusion, the overlay thickness tolerance contained in paragraph 1.1(b) last sentence, was reworded and the phrase "and the remainder shall be alternative flaws" was added to the next to last sentence in paragraph 1.1(d)(1). Additional editorial changes were made to the PDI program to address an earlier request for additional information.

### 3.0 TECHNICAL EVALUATION

Code Requirement: Performance demonstration requirements for qualifying procedures, personnel and equipment to inspect austenitic piping welds having structural overlays are listed in the 1995 Edition/1996 Addenda of ASME Section XI, Appendix VIII, Supplement 11.



Licensees may 1) elect to use the requirements of Supplement 11 as listed, 2) seek NRC approval for new ASME code cases currently being reviewed by Code Committees, or 3) propose an alternative to Code requirements.

Licensee's Proposed Alternative to Code: Pursuant to 10 CFR 50.55a(a)(3)(i), the licensee proposed using the PDI program in lieu of the requirements of ASME Section XI, 1995 Edition with 1996 Addenda, Appendix VIII, Supplement 11. The EPRI PDI program is described in the licensee's September 18, 2003, submittal.

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 Agreement.<sup>1</sup> 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.<sup>2</sup>

The PDI program does not fully comport with the existing requirements of Supplement 11. PDI presented the differences at public meetings in which the NRC participated.<sup>3,4</sup> The differences are in flaw location within test specimens and fabricated flaw tolerances. The changes in flaw location permitted using test specimens from the Tri-party Agreement, and the changes in fabricated flaw tolerances provide ultrasonic testing acoustic responses similar to the responses associated with an IGSCC. Based on the discussion at these public meetings, the NRC staff determined that the PDI program provides assurance of an acceptable level of quality and safety.

Evaluations of the differences identified in the PDI program with Supplement 11, Paragraphs 1.1(b), 1.1(d)(1), 1.1(e)(1), 1.1(e)(2), 1.1(e)(2)(a)(1), 1.1(e)(2)(a)(2), 1.1(e)(2)(a)(3), 1.1(e)(2)(b)(1), 1.1(e)(2)(b)(2), 1.1(e)(2)(b)(3), 1.1(f)(1), 1.1(f)(3), 1.1(f)(4), 2.0, 2.1, 2.2(d), 2.3, 3.1, 3.2(a), 3.2(b) and 3.2(c) are as follows.

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

- 
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 to Michael Bratton, "Weld Overlay Performance Demonstration Administered by PDI as an Alternative for Generic Letter 88-01 Recommendations," January 15, 2002. **(ADAMS Accession Number: ML020160532)**
  3. Memorandum from Donald G. Naujock to Terence Chan, "Summary of Public Meeting Held January 31 - February 2, 2002, with PDI Representatives," March 22, 2001. **(ADAMS Accession Number: ML010940402)**
  4. Memorandum from Donald G. Naujock to Terence Chan, "Summary of Public Meeting Held June 12 through June 14, 2001, with PDI Representatives," November 29, 2001. **(ADAMS Accession Number: ML013330156)**

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.

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 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, and could potentially make ultrasonic examination more difficult and not representative of actual field conditions. 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 staff has reviewed the flaw fabrication process, compared the reflective characteristics between actual cracks and PDI-fabricated flaws, and found the fabricated flaws for this application are acceptable.<sup>3,4</sup>

Paragraph 1.1(e)(1) requires that at least 20 percent but not less than 40 percent of the flaws shall be oriented within  $\pm 20$  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 staff 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 shall 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, thus, potentially making the performance demonstration more challenging. Hence, PDI’s application for closely spaced flaws is acceptable.

Paragraph 1.1(e)(2) requires that specimens be divided into base metal and overlay grading units. The PDI program adds clarification with the addition of the word fabrication and ensures flaw identification by ensuring all flaws will not be masked by other flaws with the addition of "Flaws shall not interfere with ultrasonic detection or characterization of other flaws." PDI's clarification and assurance 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 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 near-side (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, PDI's 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, as described in the revised PDI Program alternative, is acceptable.

Paragraph 1.1(e)(2)(a)(2) requires when base metal cracking penetrates into the overlay material a portion of the base grading unit shall not be used as part of the overlay grading unit. The PDI program adjusts for the changes in Paragraph 1.1(e)(2)(a)(2) and conservatively states that when base metal flaws penetrate into the overlay material no portion of it shall be used as part of the overlay fabrication grading unit. The PDI program also provided clarification by the addition of the term flaws for cracks and the addition of fabrication to overlay grading unit. The PDI Program alternative provides clarification and conservatism, and therefore 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 exists on all sides of the grading unit and flawed grading units must be free of interfering reflections from adjacent flaws which addresses the same concerns as Code. Therefore, the NRC staff finds 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 the base metal-to-overlay interface of at least 6 square inches. The overlay grading unit shall be rectangular, with minimum dimensions of 2-inch. The PDI program reduces the base metal-to-overlay interface to at least 1-inch (in lieu of a minimum of 2-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)<sup>1</sup>. This criterion may be more challenging than Code because of the variability associated with the shape of the grading unit. Therefore the NRC staff finds, PDI's application of the grading unit is acceptable.

Paragraph 1.1(e)(2)(b)(2) requires that unflawed overlay grading units should be surrounded by unflawed material for 1-inch around its entire perimeter. The PDI program redefines the area by noting unflawed overlay fabrication grading units shall be separated by at least 1-inch of unflawed material at both ends and sufficient area on both sides to preclude interfering reflections from adjacent flaws. The relaxation in required area on the sides of the specimens, while still ensuring no interfering reflections, may be more challenging than Code because of the possibility for having a parallel flaw on the opposite side of the weld. Therefore, NRC staff finds the PDI's application is acceptable.

Paragraph 1.1(e)(2)(b)(3) requirements are contained in the PDI program. In addition, the PDI program requires that initial procedure qualification contain three times the number of flaws required for a personal qualification. To qualify new values of essential variables, the equivalent of at least one personal qualification set is required. PDI's additions enhance code requirements and the NRC staff therefore finds this acceptable.

Paragraph 1.1(f)(1) requirements are contained in the PDI program, with the clarification change of the term "flaws" for "cracks." In addition, the PDI program includes the requirements that sizing sets shall contain a distribution of flaw dimensions to verify sizing capabilities. The PDI program also requires that initial procedure qualification contain three times the number of flaws required for a personal qualification. To qualify new values of essential variables the equivalent of at least one personal qualification set is required. PDI's additions enhance code requirements and therefore the NRC staff finds them acceptable.

Paragraphs 1.1(f)(3) and 1.1(f)(4) were clarified by the PDI program by replacing the term "cracking" with "flaws" because of the use of alternative flaw mechanisms. Therefore, the NRC staff finds the PDI program clarification is acceptable.

Paragraph 2.0 requirements are contained in the PDI program alternative. In addition, the PDI program states for clarification that the overlay fabrication flaw test and the base metal flaw test may be performed separately. Therefore, the NRC staff finds the PDI program clarification is acceptable.

Paragraphs 2.1 and 2.2(d) were clarified by the PDI program by the addition of the terms "metal" and "fabrication." In each paragraph the terms provide acceptable classification of the terms they are enhancing. Therefore, the NRC staff finds the PDI program clarification 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 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 region 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 such 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, the NRC staff finds PDI's method acceptable.

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 ASME requirements for personnel, procedures, and equipment qualification, and therefore the NRC staff finds this acceptable.

Paragraph 3.2(a) is clarified by the PDI program by replacing the term "cracking" with "flaws" because of the use of alternative flaw mechanisms. Therefore, the NRC staff finds the PDI program clarification is acceptable.

Paragraph 3.2(b) requires that all extensions of base metal cracking into the overlay material by at least 0.10-inch are 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 specified in Code which is 0.125-inches. 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, the NRC staff finds the PDI's omission of highlighting a crack extending beyond 0.10-inch into the overlay material is acceptable.

Paragraph 3.2(c) is renumbered to Paragraph 3.2(b) but retained in its entirety. Therefore, the NRC staff finds the PDI program change is acceptable.

#### 4.0 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 as supplemented, 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 in the relief request is authorized for the third 10-year ISI interval at the Palisades Plant. All other requirements of the ASME Code, Section XI for which relief has not been specifically requested remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: John Stang

Date: September 14, 2004

Palisades Plant

cc:

Robert A. Fenech, Senior Vice President  
Nuclear, Fossil, and Hydro Operations  
Consumers Energy Company  
1945 Parnall Rd.  
Jackson, MI 49201

Arunas T. Udryns, Esquire  
Consumers Energy Company  
1 Energy Plaza  
Jackson, MI 49201

Regional Administrator, Region III  
U.S. Nuclear Regulatory Commission  
801 Warrenville Road  
Lisle, IL 60532-4351

Supervisor  
Covert Township  
P. O. Box 35  
Covert, MI 49043

Office of the Governor  
P. O. Box 30013  
Lansing, MI 48909

U.S. Nuclear Regulatory Commission  
Resident Inspector's Office  
Palisades Plant  
27782 Blue Star Memorial Highway  
Covert, MI 49043

Michigan Department of Environmental Quality  
Waste and Hazardous Materials Division  
Hazardous Waste and Radiological  
Protection Section  
Nuclear Facilities Unit  
Constitution Hall, Lower-Level North  
525 West Allegan Street  
P.O. Box 30241  
Lansing, MI 48909-7741

Michigan Department of Attorney General  
Special Litigation Division  
525 West Ottawa St.  
Sixth Floor, G. Mennen Williams Building  
Lansing, MI 48913

Manager, Regulatory Affairs  
Nuclear Management Company, LLC  
27780 Blue Star Memorial Highway  
Covert, MI 49043

Director of Nuclear Assets  
Consumers Energy Company  
Palisades Nuclear Plant  
27780 Blue Star Memorial Highway  
Covert, MI 49043

John Paul Cowan  
Executive Vice President & Chief Nuclear  
Officer  
Nuclear Management Company, LLC  
700 First Street  
Hudson, WI 54016

Jonathan Rogoff, Esquire  
Vice President, Counsel & Secretary  
Nuclear Management Company, LLC  
700 First Street  
Hudson, WI 54016

Douglas E. Cooper  
Senior Vice President - Group Operations  
Palisades Nuclear Plant  
Nuclear Management Company, LLC  
27780 Blue Star Memorial Highway  
Covert, MI 49043

October 2003