

August 7, 2002

Mr. Michael Kansler  
Sr. Vice President and Chief  
Operating Officer  
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440 Hamilton Avenue  
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SUBJECT: JAMES A. FITZPATRICK NUCLEAR POWER PLANT - REQUEST FOR RELIEF  
NO. RR-29 FROM THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS  
BOILER AND PRESSURE VESSEL CODE REQUIREMENTS (TAC NO.  
MB5037)

Dear Mr. Kansler:

By letter dated May 8, 2002, you submitted Relief Request (RR)-29 for relief from certain inservice inspection (ISI) requirements of Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) for the James A. FitzPatrick Nuclear Power Plant. Specifically, you proposed an alternative to use the Electric Power Research Institute Performance Demonstration Initiative in lieu of the 1995 Edition, with 1996 Addenda of ASME Section XI, Appendix VIII, Supplement 11 requirements for examination of Class 1 piping welds.

The Nuclear Regulatory Commission (NRC) staff has reviewed and evaluated RR-29 as documented in the enclosed Safety Evaluation. The NRC staff has determined that your proposed alternative will provide an acceptable level of quality and safety. Accordingly, RR-29 is authorized pursuant to Title 10 of the *Code of Federal Regulations* Section 50.55a(a)(3)(i) for the third 10-year ISI interval.

Sincerely,

*/RA/*

Richard J. Laufer, Chief, Section 1  
Project Directorate I  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket No. 50-333

Enclosure: Safety Evaluation

cc w/encl: As stated

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\*\*See previous concurrence

ACCESSION NUMBER: ML021990299 \*SE provided, no major changes made

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FitzPatrick Nuclear Power Plant

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

THIRD 10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM PLAN

REQUEST FOR RELIEF NO. 29

ENTERGY NUCLEAR NORTHEAST

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

1.0 INTRODUCTION

The inservice inspection (ISI) of American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Class 1, 2, and 3 components are to be performed in accordance with Section XI of the ASME Code and applicable edition and addenda as required by Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(g), except where specific relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). Section 50.55a(a)(3) states in part that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if the licensee demonstrates that: (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) will meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection 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) twelve months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The components (including supports) may meet the requirements set forth in subsequent editions and addenda of the ASME Code incorporated by reference in 10 CFR 50.55a(b) subject to the limitations and modifications listed therein and subject to Commission approval.

By letter dated May 8, 2002, Entergy Nuclear Northeast, the licensee, requested relief request (RR) No. 29 from ISI requirements associated with the implementation of Supplement 11 to Appendix VIII of Section XI of the ASME Code at the FitzPatrick Nuclear Power Plant. The licensee's proposed alternative is to use the Electric Power Research Institute (EPRI) Performance Demonstration Initiative (PDI) program in lieu of Code requirements.

Enclosure

## 2.0 NO. 29. EXAMINATIONS OF WELD OVERLAYS

This request is applicable to Class 1 pressure retaining welds in piping subject to Appendix VIII, Supplement 11 examinations.

### 2.1 Code Requirements for which Relief is Requested

Pursuant to 10 CFR 50.55a(a)(3)(i), the licensee is requesting relief from the weld overlay requirements in the following paragraphs to Section XI, Appendix VIII, Supplement 11.

Paragraph 1.1(d)(1) requires that all base metal flaws be cracks.

Paragraph 1.1(e)(1) requires that at least 20% but less than 40% of the flaws shall be oriented within  $\pm 20$  degrees of the axial direction.

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.

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 outer 25% of the overlaid weld and base metal on both sides.

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.

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 inches.

Paragraph 3.2(b) requires that 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.

### 2.2 Licensee's Proposed Alternative to Code

In lieu of the requirements of ASME Section XI, 1995 Edition, 1996 Addenda, Appendix VIII, Supplement 11, the PDI program as described in Table 1, 3<sup>rd</sup> column of this submittal shall be used. The relief is for the third 10-year ISI interval.

### 2.3 Licensee's Bases for Requesting Relief

Appendix VIII, Supp. 11, paragraph 1.1(d)(1), requires that all base metal flaws be cracks. As illustrated below in Figure 1 [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

when implantation of cracks precludes obtaining an effective ultrasonic response, flaws shall be semielliptical 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 qualification to the Tri-party NRC/BWROG/EPRI [Nuclear Regulatory Commission/Boiling Water Reactor Owners Group/Electric Power Research Institute (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 facilitate their use and provide continuity from the Tri-party agreement program 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 in. 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)(I) 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 in, rather than the 6 sq. in. 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 in. 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 [root mean square 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.

The PDI Program omits the phrase "and base metal on both sides," in paragraph 1.1(a)(1) because some of the qualification samples included 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).

## 2.4 Evaluation

The nuclear power industry tasked PDI with the implementation of a Section XI, Appendix VIII, Supplement 11 performance demonstration program. The PDI program is routinely assessed by the NRC staff for consistency with Code and proposed Code changes. In order to meet the scheduled implementation date of November 22, 2001, specified in 10 CFR 50.55a(g)(6)(ii)(C), PDI evaluated the applicability of using test specimens from an existing weld overlay program<sup>1</sup> for its Supplement 11 performance demonstration program. Their evaluation identified differences with Paragraphs 1.1(e)(1), 1.1(e)(2)(a)(1), 1.1(e)(2)(a)(3), 1.1(e)(2)(b)(1), and 3.2(b). PDI proposed through Code that these paragraphs be changed to permit using the existing weld overlay test specimens.

Paragraph 1.1(e)(1) requires that at least 20% but not less than 40% of the flaws shall be oriented within  $\pm 20$  degrees of the axial direction. In the PDI program, the flaws satisfy the requirement and the program specifies that the flaws must be in the base metal. This is a tightening of the requirements. Hence, PDI’s application of flaw angles to 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 would permit flaws to be closer together than what is allowed by IWA-3300, thus making 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% 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 test specimens from the existing weld overlay program have flaws on both sides of the welds which prevents them from satisfying the base grading unit requirements. These test specimens have been used successfully for testing the proficiency of personnel for over 16 years. This is a more challenging test because the individual must locate the flaw on the correct side of the weld. Hence, PDI’s application 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 is acceptable.

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<sup>1</sup> The existing weld overlay program is the industry’s response to Generic Letter 88-01 which resulted in a Tri-party Agreement between NRC, EPRI, and the Boiling Water Reactor Owners Group (BWROG), “Coordination Plan for NRC/EPRI/BWROG Training and Qualification Activities of NDE Personnel,” July 3, 1984.

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 identification of extraneous reflectors. The PDI program stipulates that unflawed overlaid weld and base metal exists on all sides of the grading unit and 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 the base metal-to-overlay interface of at least 6 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 2 inches) and eliminates the minimum rectangular dimension. This criterion is 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 3.2(b) requires that all extensions of base metal cracking into the overlay material by at least 0.1 inch are reported as being intrusions into the overlay material. The PDI program omits this criteria. The PDI program requires that cracks be sized to the tolerance specified in Code which is 0.125 inch. Since the Code tolerance is close to the 0.1 inch value of Paragraph 3.2(b), any crack extending beyond 0.1 inch into the overlay material would be identified from its dimensions. The reporting of an extension in the overlay material is redundant for performance demonstration testing. Hence, PDI's omission of highlighting a crack extending beyond 0.1 inch into the overlay material is acceptable.

In addition to the changes for flaw locations, PDI determined that certain Supplement 11 requirements pertaining to location and size of cracks would be extremely difficult to achieve. In an effort to satisfy the requirements, PDI developed a process for fabricating flaws that exhibited 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 NRC has reviewed the flaw fabrication process, and has compared the reflective characteristics between cracks and fabricated flaws. NRC found the fabricated flaws acceptable for the application.<sup>2,3</sup>

### 3.0 CONCLUSION:

Based on the above evaluation, the NRC staff has concluded that the proposed alternative to use the EPRI-PDI program requirements in lieu of Appendix VIII, Supplement 11 will provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the proposed alternative No. 29 is authorized for the third 10-year interval for FitzPatrick Nuclear Power Plant.

Principal Contributor: D. Naujock

Date: August 7, 2002

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<sup>2</sup> NRC memorandum, "Summary of Public Meeting Held January 31 - February 2, 2001," with PDI Representatives, March 2, 2001.

<sup>3</sup> NRC memorandum, "Summary of Public Meeting Held June 12 through June 14, 2001," with PDI Representatives, November 29, 2001.