March 5, 2001

Mr. John K. Wood
Vice President - Nuclear, Perry
FirstEnergy Nuclear Operating Company
P.O. Box 97, A200
Perry, OH 44081

SUBJECT: PERRY NUCLEAR POWER PLANT, UNIT 1 - SAFETY EVALUATION FOR INSERVICE EXAMINATION PROGRAM RELIEF REQUESTS IR-046 AND IR-048 (TAC NO. MB0220)

Dear Mr. Wood:

By letter dated October 5, 2000 (PY-CEI/NRR-2518L), and as supplemented by letters dated December 14, 2000 (PY-CEI/NRR-2534L) and January 17, 2001 (PY-CEI-NRR-2536L), FirstEnergy Nuclear Operating Company submitted requests for relief from the requirements of the American Society of Mechanical Engineers (ASME) Code, Section XI, 1989 Edition, for the Inservice Examination Program for the Perry Nuclear Power Plant, Unit 1 (PNPP). All relief requests are for the second ten-year inspection interval.

Relief Request IR-046 requests relief from both the length sizing requirements of ASME Section XI, 1995 Edition, 1996 Addenda, Appendix VIII, Supplement 4, Subparagraph 3.2(b) and the statistical parameters of Subparagraph 3.2(c). Pursuant to the provisions of 10 CFR 50.55a(a)(3)(i), the staff authorizes the proposed alternative use of a length sizing qualification tolerance of 0.75 inch root mean square (RMS) in lieu of Subparagraph 3.2(b) and the RMS calculations of Subparagraphs 3.2(a) and 3.2(b) in lieu of Subparagraph 3.2(c), based on a finding that the proposed alternative provides an acceptable level of quality and safety.

Relief Request IR-047 was withdrawn by your letter of January 17, 2001.

Relief Request IR-048 requests relief from the 1995 Edition and 1996 Addenda of ASME Section XI, Subarticle VII-4240, that requires a minimum of 10 hours of annual training for all personnel qualified for performing ultrasonic examinations. Pursuant to the provisions of

10 CFR 50.55a(a)(3)(i), the staff authorizes annual ultrasonic training in accordance with 10 CFR 50.55a(b)(2)(xiv) on a finding that the proposed alternative provides an acceptable level of quality and safety.

The staff's safety evaluation is enclosed.

Sincerely,

/RA/

Anthony J. Mendiola, Chief, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-440

Enclosure: As stated

cc w/encl: See next page

10 CFR 50.55a(a)(3)(i), the staff authorizes annual ultrasonic training in accordance with 10 CFR 50.55a(b)(2)(xiv) on a finding that the proposed alternative provides an acceptable level of quality and safety.

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SECOND 10-YEAR INTERVAL INSERVICE INSPECTION

REQUESTS FOR RELIEF NO. IR-046 AND IR-048

PERRY NUCLEAR POWER PLANT, UNIT 1

FIRSTENERGY NUCLEAR OPERATING COMPANY

DOCKET NUMBER 50-440

1.0 INTRODUCTION

Inservice inspection of the American Society of Mechanical Engineers (ASME) Code Class 1, 2, and 3 components is to be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel (B&PV) Code and applicable addenda as required by 10 CFR 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). 10 CFR 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 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) 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 ten-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 Code of record for the Perry Nuclear Power Plant, Unit 1, second 10-year ISI interval is the 1989 Edition of the ASME B&PV Code.

By letter dated October 5, 2000, FirstEnergy Nuclear Operating Company (the licensee) submitted three relief requests for the second 10-year ISI interval for the Perry Nuclear Power Plant, Unit 1. The staff has reviewed the information contained in this letter along with the licensee's supplementary letter of December 14, 2000, for Relief Requests IR-046, IR-047, and IR-048. The licensee's letter of January 17, 2001, withdrew Relief Request IR-047.

Request for Relief No. IR–046:

Code Requirement: 10 CFR 50.55a(g)(6)(ii)(C) was amended to require expedited implementation of Appendix VIII of Section XI, Division 1, 1995 Edition with the 1996 Addenda (Federal Register, 64 FR 51370). Appendix VIII, Supplement 4, Subparagraph 3.2(b), requires that flaw lengths estimated by ultrasonics be the true length -1/4 inch, +1 inch for a length sizing qualification. However, 10 CFR 50.55a(b)(2)(xv)(C)(1) modifies the length sizing qualification criterion to a depth sizing acceptance criterion of 0.15 inch root mean square (RMS) and specifies that this be used in lieu of the requirements of Subparagraph 3.2(b).

Supplement 4, Subparagraph 3.2(c), requires that the ultrasonic test (UT) performance demonstration results be plotted on a two-dimensional plot with the measured depth plotted along the ordinate axis and the true depth plotted along the abscissa axis. For qualification, the plot must satisfy the following statistical parameters: (1) slope of the linear regression line is not less than 0.7; (2) the mean deviation of flaw depth is less than 0.25 inches; and (3) correlation coefficient is not less than 0.70.

Identification of Components

All ASME Section XI, Class 1, Examination Category B-A, Item No. B1.10, Shell Welds, and B1.20, Head Welds, at the Perry Nuclear Power Plant (PNPP) that are subject to Appendix VIII, Supplement 4, examination.

Licensee's Request for Relief (As Stated):

"Pursuant to 10 CFR 50.55a(a)(3)(i), relief is requested to use a length sizing qualification tolerance of 0.75 inch RMS in lieu of subparagraph 3.2(b), and use the RMS calculations of 3.2(a) and 3.2(b) in lieu of the statistical parameters of 3.2(c)."

Licensee's Proposed Alternative (As Stated):

"In lieu of the length sizing requirements of ASME Section XI, 1995 Edition, 1996 Addenda, Appendix VIII, Supplement 4, Subparagraph 3.2(b), a length sizing qualification tolerance of 0.75 inch RMS will be used. The RMS calculation will be used in lieu of Subparagraph 3.2(c)."

Licensee's Basis for Proposed Alternative (As Stated):

"On January 12, 2000, NRC staff, representatives from the Electric Power Research Institute (EPRI) Nondestructive Examination Center, and representatives from the Performance Demonstration Initiative (PDI) participated in a conference call. The discussion during the conference call included the differences between Supplement 4, "Qualification Requirements for the Clad/Base metal Interface of Reactor Vessel," of Appendix VIII, "Performance Demonstration for Ultrasonic Examination Systems;" Paragraph 10 CFR 50.55a(b)(2)(xv)(C)(1) in the rule (Federal Register, 64 FR 51370); and the implementation of Supplement 4 by the PDI Program. Supplement 4, Subparagraph 3.2(b) imposed a flaw sizing tolerance of -1/4 inch, +1.0 inch of the true length to the performance demonstration qualification criteria. Paragraph 10 CFR 50.55a(b)(2)(xv)(C)(1) requires a depth sizing acceptance criteria of 0.15 inch Root Mean Square (RMS) in lieu of the requirements of Supplement 4, Subparagraph 3.2(b). The PDI program uses a length sizing tolerance of 0.75 in RMS for Supplement 4, Subparagraph 3.2(b). The NRC staff acknowledged that Paragraph 10 CFR 50.55a(b)(2)(xv)(C)(1) in the rule

was an error and should actually be a length sizing tolerance of 0.75 inch RMS, the same tolerance that was being implemented by the PDI program.

“United States nuclear utilities created the PDI to implement demonstration requirements contained in Appendix VIll. PDI developed a performance demonstration program for qualifying ultrasonic testing techniques.

“In 1995, the NRC staff performed an assessment of the PDI program and reported that PDI was using a length sizing tolerance of 0.75 inch RMS for reactor pressure vessel performance demonstrations. This criterion was introduced to reduce testmanship (passing the test based on manipulation of results rather than skill).

“In a public meeting on October 11, 2000 at NRC offices in White Flint, MD, the PDI identified the discrepancy between the Subparagraph 3.2(c) and the PDI program. The NRC agrees that Paragraph 10 CFR 50.55a(b)(2)(xv)(C)(1) should have excluded Subparagraph 3.2(c) as a requirement.

“The NRC staff noted in their assessment report, dated March 6, 1996, that the length sizing tolerance was not according to Appendix VIll, but the report did not take exception to PDI's implementation of the 0.75 inch RMS length sizing tolerance. The NRC staff requested that the length sizing difference between PDI and the Code be resolved.

“Resolution of the differences between the PDI program and the Code was provided through PDI's participation in development of a Code case that reflected PDI's program. The Code case was presented to ASME for discussion and consensus building. NRC representatives participated in this process. ASME approved the Code case and published it as Code Case N-622, "Ultrasonic Examination of RPV and Piping, Bolts and Studs, Section XI, Division 1."

“Operating in parallel with the actions of PDI, the NRC staff incorporated most of Code Case N-622 criteria in the rule published in the Federal Register, 64 FR 51370. Appendix IV to code Case N-622 contains the proposed alternative sizing criteria, which has been authorized by the staff. The staff agrees that the omission of the length sizing tolerance of 0.75 inch RMS in the rule and the inclusion of the statistical parameters of Paragraph 3.2(c) of Supplement 4 to Appendix VIII was an oversight. The NRC staff will correct the error in an upcoming rule.”

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 performance demonstration program for qualifying UT equipment, procedures, and personnel. During the development of the performance demonstration for Supplement 4, PDI determined that the Code criteria for flaw sizing was unworkable. The length sizing tolerance of - 1/4 inch +1.0 inch in Supplement 4, Subparagraph 3.2(b), encouraged examiners to bias their results on the plus side. To discourage testmanship (passing the test based on manipulation of results rather than skill), PDI adopted a length sizing tolerance of 0.75 inch RMS which has been in use since 1994. As early as 1995, the staff has recognized and accepted PDI's use of 0.75 inch RMS for length sizing. PDI formalized their use of 0.75 inch RMS as the criterion for Supplement 4, Subparagraph 3.2(b), in Code Case N-622, "Ultrasonic Examination of Reactor Pressure Vessel (RPV) and Piping and Bolts and Studs, Section XI, Division 1." The NRC representatives to ASME Code meetings participated in the process leading up to the publishing of Code Case N-622.

The NRC staff intended to formalize the acceptability of the 0.75 inch RMS length sizing criterion in 10 CFR 50.55a(b)(2)(xv)(C)(1), but mistakenly published the value of 0.15 inch RMS for depth sizing tolerance in place of the existing length sizing tolerance. The omission of the length sizing tolerance of 0.75 inch RMS in the rule was an oversight, and the inclusion of the depth sizing tolerance in Subparagraph 3.2(b) was an error. The NRC staff considers that the proposed alternative to use a length sizing tolerance of 0.75 inch RMS in lieu of the requirements in Supplement 4, Subparagraph 3.2(b), will provide an acceptable level of quality and safety.

In the second part of the alternative, the licensee proposed eliminating the use of Supplement 4, Subparagraph 3.2(c) which imposes three statistical parameters for depth sizing. The first parameter, 3.2(c)(1), pertains to the slope of a linear regression line. The linear regression line is the difference between actual versus true value plotted along a through-wall thickness. For Supplement 4 performance demonstrations, a linear regression line of the data is not applicable because the performance demonstrations are performed on test specimens with flaws located in the inner 15 percent through-wall. The differences between actual versus true value produce a tight grouping of results which resemble a shot gun pattern. The slope of a regression line from such data is extremely sensitive to small variations, thus, making the parameter of Subparagraph 3.2(c)(1) a poor and inappropriate acceptance criterion. The second parameter, 3.2(c)(2), pertains to the mean deviation of flaw depth. The value used in the code is too lax with respect to evaluating flaw depths within the inner 15 percent of wall thickness. Therefore, the licensee proposed to use the more appropriate criterion of 0.15 inch RMS of 10 CFR 50.55a(b)(2)(xv)(C)(1), which modifies Subparagraph 3.2(a), as the acceptance criterion. The third parameter, 3.2(c)(3), pertains to a correlation coefficient. The value of the correlation coefficient in Subparagraph 3.2(c)(3) is inappropriate for this application since it is based on the linear regression from Subparagraph 3.2(c)(1).

PDI was aware of the inappropriateness of Subparagraph 3.2(c) early in the development of their program. They brought the issue before the appropriate ASME committee which formalized eliminating the use of Supplement 4, Subparagraph 3.2(c), in Code Case N-622. The NRC staff representatives participated in the discussions and consensus process of the code case. Based on the above, the NRC staff concludes that the use of Subparagraph 3.2(c) requirements in this context is inappropriate and that the proposed alternative to use the RMS values in Appendix VIII, Supplement 4, Subparagraph 3.2(a) and 3.2(b), in lieu of Subparagraph 3.2(c) will provide an acceptable level of quality and safety[1].

Conclusion:

Based on the discussion above, the staff has concluded that the proposed alternative length sizing qualification criterion of 0.75 inch RMS in lieu of Appendix VIII, Supplement 4, Subparagraph 3.2(b), and the RMS value of 10 CFR 50.55a(b)(2)(xv)(C)(1), which modifies the depth sizing criterion of Appendix VIII, Supplement 4, Subparagraph 3.2(a), in lieu of Subparagraph 3.2(c) will provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the staff authorizes the proposed alternative for the second 10-year inservice inspection interval.

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[1]The information which would have been required for Appendix VIII, Supplement 4, Subparagraph 3.2(c)(1) is still required and valid for the sizing qualification requirements of Appendix VIII, Supplement 6.

Request for Relief No. IR–048:

ASME B&PV Section XI Requirements:

The 1995 Edition and 1996 Addenda of ASME Section XI, Subsubarticle VII-4240 requires a minimum of 10 hours of annual training.

10 CFR 50.55a(b)(2)(xiv) requires that all personnel qualified for performing ultrasonic examinations in accordance with Appendix VIII shall receive 8 hours of annual hands-on training on specimens that contain cracks. This training must be completed no earlier than 6 months prior to performing ultrasonic examinations at a licensee's facility.

Identification of Components:

All components subject to ultrasonic examination in accordance with the 1995 Edition and 1996 Addenda of ASME Section XI, Appendix VIII.

Licensee's Request for Relief (As Stated):

"Relief is requested in accordance with 10 CFR 50.55a(a)(3)(i) from the requirements of Subsubarticle VII-4240, Annual Training."

Licensee's Proposed Alternative (As Stated):

"Annual ultrasonic training shall be conducted in accordance with 10 CFR 50.55a(b)(2)(xiv) in lieu of Section XI, Appendix VIl, Paragraph VII-4240."

Licensee's Basis for Proposed Alternative (As Stated):

"10 CFR 50.55a was amended in the Federal Register (Volume 64, No. 183 dated September 22, 1999) to require the 1995 Edition, with the 1996 Addenda of Section XI for Appendix VIll qualification requirements. This also imposes the requirements of Appendix VIl of the 1995 Edition, with 1996 Addenda of Section XI. This includes Subarticle VII-4240, which requires a minimum of 10 hours of annual training.

"10 CFR 50.55a(b)(2)(xiv) requires that all personnel qualified for performing ultrasonic examinations in accordance with Appendix VIII shall receive 8 hours of annual hands-on training on specimens that contain cracks. This training must be completed no earlier than 6 months prior to performing ultrasonic examinations at a licensee's facility.

"Paragraph 2.4.1.1.1 in the Federal Register contains the following statement,

"The NRC had determined that this requirement (10 hours of training on an annual basis) was inadequate for two reasons. The first reason was that the training does not require laboratory work and examination of flawed specimens. Signals can be difficult to interpret and, as detailed in the regulatory analysis for this rulemaking, experience and studies indicate that the examiner must practice on a frequent basis to maintain the capability for proper interpretation. The second reason is related to the length of training and its frequency. Studies have shown that an examiner's capability begins to diminish within approximately 6 months if skills are not

maintained. Thus, the NRC had determined that 10 hours of annual training is not sufficient practice to maintain skills, and that an examiner must practice on a more frequent basis to maintain proper skill level."

"The PDI program has adopted a requirement for 8 hours of training, but it is required to be hands-on practice. In addition, the training must be taken no earlier than 6 months prior to performing examinations at a licensee's facility. PDI believes that 8 hours will be acceptable relative to an examiner's abilities in this highly specialized skill area because personnel can gain knowledge of new developments, material failure modes, and other pertinent technical topics through other means. Thus, the NRC has decided to adopt in the Final Rule the PDI position on this matter. These changes are reflected in §50.55a(b)(2)(xiv)".

"Implementation of the requirements contained in ASME Section XI and the Final Rule will result in redundant systems. Use of the Final Rule requirements in lieu of the ASME Section XI annual training requirements will simplify record keeping, satisfy the need for maintaining skills, and provide an acceptable level of safety."

Evaluation:

Subarticle VII-4240, Appendix VII of Section XI of the Code, requires 10 hours of annual training to impart knowledge of new developments, material failure modes, and any pertinent technical topics as determined by the licensee. No hands-on training or practice is required to be included in the 10 hours of training. This training is required of all UT personnel qualified to perform examinations of ASME Code Class 1, 2, and 3 systems. Independent of the ASME Code, 10 CFR 50.55a(b)(2)(xiv) imposes the requirement that 8 hours of hands-on training with flawed specimens containing cracks be performed no earlier than 6 months prior to performing examinations at a licensee's facility. The licensee contends that maintaining two separate UT annual training programs create confusion, redundancies, and extra paper work.

As part of the staff's rule making effort to revise 10 CFR 50.55a(b)(2), the issue of UT annual training requirements was reviewed. The review was included in the summary of comments to the rule 64 FR 51370. In the review, the staff determined that the 10 hours of annual training requirement specified in the ASME Code was inadequate for two reasons. The first reason was that the training does not require practice with flawed specimens. Practice with flaws is necessary to maintain familiarity with signals that can be difficult to interpret. The second reason is related to the length of training and its frequency. Studies have shown that an examiner's capability begins to diminish within 6 months if skills are not maintained. Therefore, examiners must practice on a frequent basis to maintain their capability for proper interpretation of flaws.

Based on resolution of public comment for the above rulemaking, the staff accepted an industry initiative advanced by the Electric Power Research Institute EPRI, which proposed 8 hours of hands-on practice with flawed specimens containing cracks. The practice would occur no earlier than 6 months prior to performing examinations at a licensee's facility. The initiative was adopted in 10 CFR 50.55a(b)(2)(xiv) for personnel maintaining their Appendix VIII qualifications. The staff concludes that the proposed alternative to using 10 CFR 50.55a(b)(2)(xiv) in lieu Subarticle VII-4240 will maintain the skill and proficiency of UT personnel at or above the level provided in the Code for annual UT training, thereby, providing an acceptable level of quality and safety.

Conclusion:

For Request for Relief No. IR-048, the staff concludes that the proposed alternative annual training requirements of UT personnel, which includes eight hours of hands-on practice with flawed specimens containing cracks, provides an acceptable level of quality and safety. Pursuant to 10 CFR 50.55a(a)(3)(i), the licensee's alternative is authorized for the second 10-Year Inservice Inspection Interval.

Principal Contributor:

Thomas McLellan, NRR