Mr. Mark B. Bezilla
Site Vice President
FirstEnergy Nuclear Operating Company
Perry Nuclear Power Plant
Mail Stop A-PY-A290
P.O. Box 97, 10 Center Road
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September 4, 2008

SUBJECT: PERRY NUCLEAR POWER PLANT, UNIT NO. 1 - REQUEST TO ELIMINATE THE VOLUMETRIC EXAMINATION OF A NOZZLE-TO-SAFE END WELD FOR THE SECOND 10-YEAR INSERVICE INSPECTION INTERVAL (TAC NO. MD8197)

Dear Mr. Bezilla:

By letter to the Nuclear Regulatory Commission (NRC) dated February 20, 2008, FirstEnergy Nuclear Operating Company (FENOC), submitted relief request (RR) number IR-055 Rev 0, proposing an alternative to certain requirements of the American Society of Mechanical Engineers, Boiler and Pressure Vessel Code (ASME Code) at the Perry Nuclear Power Plant, Unit No. 1. Specifically, the licensee proposed eliminating the volumetric examination of a nozzle-to-safe end weld. The request is for the second 10-year inservice inspection interval.

The NRC staff has completed its review of RR IR-055, Rev 0 and the details of the NRC staff's review are set forth in the enclosed safety evaluation. Accordingly, RR IR-055, Rev. 0, is authorized pursuant to Title 10 of the *Code of Federal Regulations* Section 50.55a(a)(3)(ii) based on the NRC staff's determination that compliance with the specified ASME Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The NRC staff has also determined that the licensee's proposed alternative for examination of the subject weld provides reasonable assurance of structural integrity. This alternative is authorized for the second 10-year inservice inspection interval.

Sincerely,

/RA/

Russell Gibbs, Chief
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-440

Enclosure:
Safety Evaluation

cc w/encls: See next page

Mr. Mark B. Bezilla
Site Vice President
FirstEnergy Nuclear Operating Company
Perry Nuclear Power Plant
Mail Stop A-PY-A290
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Perry, OH 44081-0097

September 4, 2008

SUBJECT: PERRY NUCLEAR POWER PLANT, UNIT NO. 1 - REQUEST TO ELIMINATE SELECTED VOLUMETRIC EXAMINATIONS OF CAST VALVE BODY WELDS FOR THE SECOND 10-YEAR INSERVICE INSPECTION INTERVAL (TAC NO. MD8196)

Dear Mr. Bezilla:

By letter to the Nuclear Regulatory Commission (NRC) dated February 20, 2008, FirstEnergy Nuclear Operating Company (FENOC), submitted relief request (RR) number IR-055 Rev 0, proposing an alternative to certain requirements of the American Society of Mechanical Engineers, Boiler and Pressure Vessel Code (ASME Code) at the Perry Nuclear Power Plant, Unit No. 1. Specifically, the licensee proposed eliminating the volumetric examination of a nozzle-to-safe end weld. The request is for the second 10-year inservice inspection interval.

The NRC staff has completed its review of RR IR-055, Rev 0 and the details of the NRC staff's review are set forth in the enclosed safety evaluation. Accordingly, RR IR-055, Rev. 0, is authorized pursuant to Title 10 of the *Code of Federal Regulations* Section 50.55a(a)(3)(ii) based on the NRC staff's determination that compliance with the specified ASME Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The NRC staff has also determined that the licensee's proposed alternative for examination of the subject weld provides reasonable assurance of structural integrity. This alternative is authorized for the second 10-year inservice inspection interval.

Sincerely,
/RA/
Russell Gibbs, Chief
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-440

Enclosure:
Safety Evaluation
cc w/encls: See next page

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Perry Nuclear Power Plant, Unit No. 1

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO RELIEF REQUEST NUMBER IR-055

FIRSTENERGY NUCLEAR OPERATING COMPANY

FIRSTENERGY NUCLEAR GENERATION CORP.

OHIO EDISON COMPANY

PERRY NUCLEAR POWER PLANT, UNIT NO. 1

DOCKET NO. 50-440

1.0 INTRODUCTION

On February 20, 2008 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML080580410), FirstEnergy Nuclear Operating Company (the licensee), submitted a request for relief (IR-055) from certain American Society of Mechanical Engineers (ASME), Boiler and Pressure Vessel Code (Code), Section XI requirements at the Perry Nuclear Power Plant, Unit No. 1 (PNPP). Specifically, the licensee proposed eliminating the volumetric examination of the 22-inch reactor recirculation outlet nozzle-to-safe end weld. The request applies to the second 10-year inservice inspection (ISI) interval, which began November 18, 1998, and is scheduled to end May 17, 2009.

2.0 REGULATORY EVALUATION

In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(g)(4), ASME Code Class 1, 2, and 3 components must meet the requirements set forth in ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plants Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that all inservice examinations 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 ASME Code, Section XI, incorporated by reference in 10 CFR 50.55a(b) on the date 12 months prior to the start of the 10-year interval. For PNPP, the ASME Code of record for the second 10-year ISI interval is the 1989 Edition of Section XI of the ASME Code.

The Nuclear Regulatory Commission (NRC, Commission) may authorize alternatives to requirements pursuant to 10 CFR 50.55a(a)(3). In proposing alternatives pursuant to Section 50.55a(a)(3), the licensee must demonstrate that: (1) the proposed alternatives would provide an acceptable level of quality and safety; or (2) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality or safety. Pursuant to 10 CFR 50.55a(g)(4)(iv), ISI items may meet the requirements set forth in subsequent editions and addenda of the ASME Code that are incorporated by reference in 10 CFR 50.55a(b), subject to the limitations and modifications listed therein, and subject to Commission approval.

Portions of editions and addenda may be used provided that related requirements of the respective editions and addenda are met.

3.0 TECHNICAL EVALUATION FOR RELIEF REQUEST IR-055

3.1 Affected Component

The affected component is a Class 1, 22-inch reactor recirculation outlet nozzle-to-safe end weld (N1B) with ISI examination identification 1B13-N1B-KB.

3.2 Code Requirements from which Relief is Requested

The code requirement is the ASME Code Section XI, 1989 Edition, Examination Category B-F, Item, B5.130.

- ASME Code Section XI, Appendix VIII, "Performance Demonstration for Ultrasonic Examination Systems," of the 1995 Edition with the 1996 Addenda, provides requirements for ultrasonic examinations.

- PNPP's Risk Informed (RI) ISI Program was submitted to the NRC as Relief Request IR-049 by letters PY-CEI/NRR-2528L, dated February 12, 2001 (ADAMS Accession No. ML010470098), and PYCEI/NRR-2577L, dated July 9, 2001 (ADAMS Accession No. ML012050263), and was approved by the NRC on October 17, 2001 (ADAMS Accession No. ML012640496).

- The RI program adheres to the methodology contained in the Electric Power Research Institute (EPRI) topical report, TR 112657, Revision B-A, "Revised Risk-Informed Inservice Inspection Procedure." Section 6.4, Item 4 of the EPRI topical report permits new relief requests (RRs) for RI-ISI welds that cannot achieve greater than 90 percent volumetric examination coverage. Since PNPP has implemented a RI-ISI Program for Class 1 welds, the subject weld is classified as Examination Category R-A, Item No. R1.16.

- Section 6.5 of the EPRI topical report requires PNPP to continue its Generic Letter 88-01, "NRC Position on [intergranular stress corrosion cracking] IGSCC in BWR Austenitic Stainless Steel Piping," augmented inspection program that was implemented in response to NUREG-0313, "Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping."

3.3 Proposed Alternative

In accordance with Table IWB-2500-1, Examination Category B-P, Item B15.50, the weld will receive a VT-2 (visual testing for leakage) examination each refueling outage during the performance of the system leakage test of the Class 1 Boundary.

3.4 Licensee Basis for the Alternative

The licensee stated that the reason for the RR is to avoid high radiation dose rates. The weld is located in a high dose area with contact dose rates of 5,000 mRem/hour and general dose rates of 1,000 mRem/hr. The weld is in the reactor recirculation outlet nozzle that is located in the reactor vessel biological shield. To access the weld, the guillotine doors must be opened using a crank mechanism outside the bioshield. To access the guillotine doors, scaffolding must be erected and the metal jacketed insulation penetrations of the reactor recirculation outlet must be unbolted from the guillotine doors and removed. To open the N1B guillotine shield doors, the jet impingement shield must be partially disassembled. According to the licensee, the additional

work necessary to remove the jet impingement shield will double the doses associated with the work time in the high radiation areas to at least 16,000 mRem. The licensee also stated that it took dose rates of over 8,100 mRem to complete the examination of the N1A outlet nozzle-to-safe-end-weld during PNPP's most recent refueling outage (RFO11).

The licensee stated that:

> The structural integrity of the pressure boundary was demonstrated during construction by meeting the requirements of the ASME Code Section III. The subject weld was examined in accordance with the appropriate Code requirements, weld techniques and welders were qualified in accordance with Code requirements, and materials were purchased and traced in accordance with the appropriate Code and NRC requirements and guidelines. A review of the construction radiographs did not indicate any weld repairs.
>
> The N1B nozzle-to-safe-end weld was examined four times during the first 10-year inspection interval; RFO2 (1991), prior to and after receiving the Mechanical Stress Improvement Process (MSIP) during RFO3 (1992), and most recently in RFO5 (1996). All the examinations were performed using EPRI qualified IGSCC procedures and personnel. No relevant indications have been found. In light of recent industry operating experience, the electronic examination data from the 1996 examinations was reevaluated using the current state of the art evaluation software. The evaluation did find that there were transducer contact problems, but the contact problems were never greater than one scan increment in width (0.199") and the analyst concluded that it is unlikely that a flaw would have been missed. The 1996 electronic examination data from the identical N1A nozzle-to-safe-end weld was also reviewed and found to look very similar to the N1B data. The N1A nozzle-to-safe-end weld was examined in RFO11 (April 2007) using fully qualified Appendix VIII, Supplement 10 procedures and personnel, and no inservice flaw indications were found.
>
> As previously stated, the subject weld was not specifically a risk-informed selection under PNPP's RI-ISI program, but is scheduled for inspection because it was scheduled for inspection in accordance with PNPP's existing IGSCC program. Within PNPP's RI-ISI submittal, it states that only those locations selected strictly for RI-ISI purposes were compared to the Section XI inspection locations to determine the change in risk. Thus deleting examination of the subject weld has no impact on the RI-ISI change in risk assessment. Furthermore, PNPP has 800 Class 1 welds and 83 are scheduled for inspection under the RI-ISI program. With deletion of the subject weld, the overall RI-ISI program goal of examining at least 10 percent of the Class 1 weld population is still met.
>
> At the time that PNPP established its RI-ISI program for Class 1 welds, austenitic stainless steel and Inconel welds were all examined in accordance with the requirements of GL 88-01. This included examination of 100 percent of the GL 88-01 Category C welds every 10 years. Since that time, the Boiling-Water Reactor Vessel and Internals Project (BWRVIP) developed a technical report, BWRVIP-75-A, "BWR Vessel and Internals Project Technical Basis for Revisions to Generic Letter 88-01 Inspection Schedules" that provides an NRC-approved technical basis for revisions to the GL 88-01 inspection schedules. In accordance with BWRVIP-75-A, Category C welds that have

received a pre-service examination following stress improvement and a subsequent inservice examination need only be examined at a rate of 25 percent every 10 years, or only 10 percent with effective Hydrogen Water Chemistry (HWC). PNPP has 25 Category C welds, all of which received MSIP and a post-stress-improvement preservice examination in RFO3, an inservice examination in RFO5, and all have been examined or are scheduled for examination in the current 10-year ISI interval. Thus, apart from the commitment within PNPP's RI-ISI submittal to continue performing IGSCC examinations in accordance with the existing IGSCC program, deletion of the examination of only one of the 25 Category C welds is technically justified and will have no negative effect on meeting any other examination requirements.

Water chemistry is an important factor in the initiation and growth rates for IGSCC. Maintaining good water chemistry and implementation of HWC are the major strategies for limiting and/or mitigating IGSCC. The BWR water chemistry guidelines are contained in BWRVIP-130, "BWR Water Chemistry Guidelines." Furthermore, BWRVIP-62, "Technical Basis for Inspection Relief for BWR Internal Components with Hydrogen Injection" discusses applying Factors of Improvement (FOI) to reduce inspections of components subject to IGSCC for plants on either Moderate HWC or HWC with Noble Metals Chemical Addition (NMCA). PNPP implemented HWC with NMCA in 2002.

The oxidizing environment in a BWR is measured by Electrochemical Potential (ECP). PNPP's ECP levels have been calculated to be consistently <-230 my (SHE [standard hydrogen electrode]). With regard to HWC availability, in accordance with BWRVIP-130, the target for plants with HWC with NMCA is 98 percent. PNPP's availability over each operating cycle has averaged at least 87 percent and for the most recent full operating cycle PNPP's availability was 97.1 percent. As PNPP's HWC availability has not yet met the target set in BWRVIP-130, no inspection relief for piping examinations based on HWC has been applied. Although PNPP is not taking credit for HWC, BWRVIP-62 does show FOIs for HWC as low as 70 percent availability when a consistent ECP can be demonstrated. With an ECP consistently < -230 and >70 percent availability, it shows that a FOI of two in crack growth rate retardation can be achieved for both stainless steel and Alloy 182 materials (1B13-N1B-KB involves both of these materials).

4.0 NRC STAFF EVALUATION

In the submittal, the licensee referenced ASME Code Case N-578, "Risk-Informed Requirements for Class 1, 2, and 3 Piping Method B, Section XI, Division 1." Code Case N-578 is referenced in Regulatory Guide 1.193, "ASME Code Cases Not Approved For Use." Accordingly, the licensee's references to Code Case N-578 were not considered in the NRC staff's evaluation because Code Case N-578 has not yet been approved for use.

The licensee is proposing to continue inspecting weld N1B to the ASME Section XI, Examination Category B-P, Item B15.50, VT-2 examination requirements and eliminate the Examination Category B-F, Item B5.130, volumetric examination because of the high dosage associated with the examination. The licensee stated that it took doses of over 8,100 mRem to complete the examination of the comparable N1A outlet nozzle-to-safe-end weld during the most recent refueling outage (RFO11). The licensee estimated that performing the volumetric examination on N1B nozzle-to-safe-end weld would result in doses of at least 16,000 mRem. The NRC staff agrees that incurring these doses would represent a hardship.

Although the subject weld is part of the licensee's RI-ISI program, the subject weld was not selected for RI-ISI examinations. Therefore, the elimination of the volumetric examination has no impact on the RI-ISI assessment.

The RR is to address the licensee's response to GL 88-01, which stipulates inspection frequencies for welds susceptible to IGSCC. The subject weld is moderately susceptible to IGSCC. For that reason, the licensee proactively applied a mechanical stress improvement process to the weld, implemented HWC additions, and implemented NMCA as preventive measures against IGSCC. Over the years since GL 88-01 was issued, the BWR fleet has demonstrated the effectiveness of the mitigation actions developed by the Boiling-Water Reactor Vessel and Internals Project (BWRVIP) in topical report BWRVIP-75, "BWR Vessel and Internals Project Technical Basis for Revisions to Generic Letter 88-01 Inspection Schedules," as an alternative to GL 88-01. BWRVIP-75 reduces the number of IGSCC susceptible weld examinations and the examination frequency. The NRC staff has previously reviewed and approved BWRVIP-75 for generic application by the BWR fleet and agrees that it is thus appropriate for use by PNPP. For the subject weld, BWRVIP-75-A stipulates that only 25 percent of the welds in the subject weld category must be volumetrically examined every 10 years. With the implementation of the HWC above a given level for a specific length of time, as well as implementation of NMCA, BWRVIP-75 allows for the reduction of the volumetric examinations to 10 percent of the welds in the category every 10 years. The licensee has not yet satisfied all of the criteria in BWRVIP-75 to eliminate the volumetric examination of the subject weld. However, the NRC staff concludes that the aforementioned actions taken by the licensee in response to GL88-01 to mitigate IGSCC, in combination with the VT-2 inspection every refueling outage, provide reasonable assurance of the structural integrity of weld 1B13-N1B-KB.

5.0 CONCLUSION

Based on the above evaluation, the NRC staff concludes that the licensee's proposed alternative to eliminate the volumetric examinations and continue with a VT-2 examination every refueling outage, in combination with the programs to mitigate IGSCC, will provide reasonable assurance of the structural integrity of weld 1B13-N1B-KB. Thus, because of the radiation dosage associated with the ASME Code volumetric examination agreed to by the licensee in its response to GL 88-01, which was carried into the RI-ISI approved relief request, the NRC staff finds that complying with the specified requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii), the NRC staff authorizes relief request number IR-055 for weld 1B13-N1B-KB for the second 10 year interval inservice inspection at PNPP.

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: D. Naujock, NRR

Date: September 4, 2008