



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

March 12, 2010

Mr. Paul A. Harden  
Site Vice President  
FirstEnergy Nuclear Operating Company  
Beaver Valley Power Station  
Mail Stop A-BV-SEB1  
P.O. Box 4, Route 168  
Shippingport, PA 15077

SUBJECT: BEAVER VALLEY POWER STATION, UNIT NO. 2 - RELIEF REQUEST FOR  
ALTERNATIVE WELD REPAIR METHOD FOR REACTOR VESSEL HEAD  
PENETRATIONS J-GROOVE WELDS (TAC NO. ME2608)

Dear Mr. Harden:

By letter dated November 14, 2009, FirstEnergy Nuclear Operating Company (licensee) submitted a request for authorization of a proposed alternative to American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) for certain requirements associated with reactor pressure vessel head penetration nozzles and associated J-groove welds at Beaver Valley Power Station, Unit No. 2 (BVPS-2) for the remainder of the current BVPS-2 10-year inservice inspection (ISI) interval, which ends August 28, 2018. The licensee intended to update a previous relief request dated October 9, 2008, which was authorized by the Nuclear Regulatory Commission (NRC) by letter dated October 6, 2009. Specifically, the licensee requested to utilize the surface non-destructive examination acceptance criteria of the original construction code versus the previously approved acceptance criteria of no surface indications for the imbedded flaw weld overlay repair technique for the remainder of the BVPS-2 third 10-year ISI interval, scheduled to end in August 2018.

Due to ongoing work during the previous refueling outage at BVPS-2, the NRC staff expedited its review of the licensee's relief request and found that the information provided a sufficient technical basis to determine that compliance with the current requirements of the previous relief request would result in hardship or unusual difficulty, without a compensating increase in the level of quality and safety for that limited section of the penetration nozzle number 57 repair weld over the stainless steel. Therefore, on November 15, 2009, via teleconference, the NRC staff verbally authorized the proposed alternative, which allowed the licensee to use the surface non-destructive examination acceptance criteria of the construction code, in lieu of the previous requirement of no indications, for the alloy 52 repair weld material over the stainless steel cladding only for penetration nozzle number 57 for one cycle of operation, in accordance with Section 50.55a(a)(3)(ii) of Part 50 of Title 10 of the *Code of Federal Regulations*.

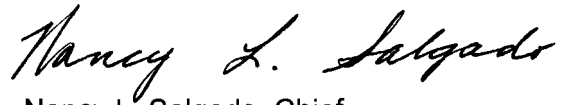
All other ASME Code, Section XI requirements for which relief was not specifically requested and approved in this relief request remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

P. Harden

- 2 -

If you have any questions, please contact the Beaver Valley Project Manager, Nadiyah Morgan, at (301) 415-1016.

Sincerely,

A handwritten signature in black ink that reads "Nancy L. Salgado". The signature is written in a cursive style with a large initial 'N' and 'S'.

Nancy L. Salgado, Chief  
Plant Licensing Branch I-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-412

Enclosure:  
As stated

cc w/encl: Distribution via Listserv



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REGARDING THE THIRD 10-YEAR INSERVICE INSPECTION PLAN INTERVAL

ALTERNATIVE WELD REPAIR METHOD FOR REACTOR VESSEL HEAD

PENETRATIONS J-GROOVE WELDS

FIRSTENERGY NUCLEAR OPERATING COMPANY

FIRSTENERGY NUCLEAR GENERATION CORP.

OHIO EDISON COMPANY

THE TOLEDO EDISON COMPANY

BEAVER VALLEY POWER STATION, UNIT NO. 2

DOCKET NO. 50-412

1.0 INTRODUCTION

By letter dated November 14, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML093220057), FirstEnergy Nuclear Operating Company (licensee) submitted a request for authorization of a proposed alternative to American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) for certain requirements associated with reactor pressure vessel head penetration nozzles and associated J-groove welds at Beaver Valley Power Station, Unit No. 2 (BVPS-2) for the remainder of the current BVPS-2 10-year inservice inspection (ISI) interval, which ends August 28, 2018. The licensee intended to update a previous relief request dated October 9, 2008 (ADAMS Accession No. ML082900208), which was authorized by the Nuclear Regulatory Commission (NRC) by letter dated October 6, 2009 (ADAMS Accession No. ML092700031). Specifically, the licensee requested to utilize the surface non-destructive examination acceptance criteria of the original construction code versus the previously approved acceptance criteria of no surface indications for the imbedded flaw weld overlay repair technique for the remainder of the BVPS-2 third 10-year ISI interval, scheduled to end in August 2018.

Enclosure

Due to ongoing work during the previous refueling outage at BVPS-2, the NRC staff expedited its review of the licensee's relief request and found that the information provided a sufficient technical basis to determine that compliance with the current requirements of the previous relief request would result in hardship or unusual difficulty, without a compensating increase in the level of quality and safety for that limited section of the penetration nozzle number 57 repair weld over the stainless steel. Therefore, on November 15, 2009, via teleconference, the NRC staff verbally authorized the proposed alternative, which allowed the licensee to use the surface non-destructive examination (NDE) acceptance criteria of the construction code, in lieu of the previous requirement of no indications, for the alloy 52 repair weld material over the stainless steel cladding only for penetration nozzle number 57 for one cycle of operation.

## 2.0 REGULATORY EVALUATION

In accordance Section 50.55a(g)(4) of Part 50 of Title 10 of the *Code of Federal Regulations* (10 CFR), 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 Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that all inservice examination 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 inspection interval. For BVPS-2, the ASME Code of record for the third 10-year ISI interval, which began on August 29, 2008, is the 2001 Edition through the 2003 Addenda.

Alternatives to requirements may be authorized or relief granted by the NRC pursuant to 10 CFR 50.55a(a)(3)(i), 10 CFR 50.55a(a)(3)(ii), or 10 CFR 50.55a(g)(6)(i). In proposing alternatives or requests for relief, the licensee must demonstrate that: (1) the proposed alternatives would provide an acceptable level of quality and safety; (2) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety; or (3) conformance is impractical for the facility. Pursuant to 10 CFR 50.5a(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.

## 3.0 TECHNICAL EVALUATION

### 3.1 System/Component Affected

BVPS-2 Reactor Vessel Head Penetrations 2RCS-REV-21, Numbers 1 through 65.

### 3.2 Applicable Code Requirements

ASME Code, Section XI, 2001 Edition through 2003 Addenda, subparagraph IWA-4400 contains requirements for the removal of defects from and welded repairs performed on ASME Code components. For the removal or mitigation of defects by welding, ASME Code, Section XI, IWA-4411 requires that repairs and installation of replacement items shall be performed in accordance with the Owner's Design Specification and the original Construction Code of the component or system.

The original Construction Code of the reactor vessel is ASME Code, Section III, 1971 Edition through summer 1972 Addenda. The licensee requested relief from subparagraphs NB-4131, NB-2538, NB-2539, which pertain to the removal of base material defects prior to repair by welding, and NB-4451, NB-4452, and NB-4553, which pertain to the removal of weld material defects prior to repair by welding. The licensee noted that the use of provisions of IWA-4340, "Mitigation of Defects by Modification" is prohibited per 10 CFR 50.55a(b)(2)(xxv).

### 3.3 Licensee's Proposed Alternative and Basis for Request

This request is identical to a prior relief request, which was approved on October 6, 2009 (ADAMS Accession No. ML092700031), with the exception of the requested final surface NDE acceptance criteria. The previously approved relief request required the entire weld overlay repair surface to be examined by dye penetrant test (PT) with acceptance criteria of "PT White" no indications.

During the BVPS-2 14th refueling outage, the licensee was unable to achieve "PT White" for two welds at reactor vessel head penetrations numbers 49 and 57. The licensee stated that a significant amount of personnel radiation exposure (approximately 54,000 mRem) had been expended while conducting the inspections and performing the repairs on the above penetration nozzles. The licensee estimated an additional 20,000 mRem would be expended in order to meet the acceptance criteria of "PT White" versus the ASME Construction Code acceptance criteria. After this request was submitted, the licensee was able to achieve "PT White," no indications for reactor vessel penetration nozzle number 49.

The licensee requested relief for the remainder of the current BVPS-2 10-year ISI interval, which ends August 28, 2018.

The licensee stated that the proposed alternative embedded flaw repair procedures described in the relief request and supporting documents will provide an acceptable level of quality and safety while conserving radiological dose, thus should be authorized under 10 CFR 50.55a(a)(3)(i).

### 3.4 NRC Staff's Evaluation

While the licensee requested authorization of their proposed alternative under 10 CFR 50.55a(a)(3)(i), the NRC staff found the basis for relief was linked to a hardship on the licensee. Therefore, the NRC staff reviewed the licensee's proposed alternative on an expedited basis to support plant restart under the criteria of 10 CFR 50.55a(a)(3)(ii) which states: "Compliance with the specified requirements of this section would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety."

The NRC staff finds that the licensee's estimate of an additional 20,000 mRem of accumulated radiological dose in order to be in compliance with the previously approved repair acceptance criteria for BVPS-2's penetration nozzle 57 is a hardship.

The purpose of the repair is to address primary water stress-corrosion cracking (PWSCC). PWSCC typically initiates in susceptible materials, such as Alloy 600 material and Alloy 82/182 weld materials, in areas of tensile stress and propagates in response to environmental

conditions of time, temperature, stress and a corrosive environment. The reactor vessel head penetrations and their associated J-groove attachment welds, where Alloy 600 and Alloy 82/182 are present and in contact with primary water, meet the conditions for potential PWSCC. The proposed repair technique isolates the susceptible material using a weld overlay of Alloy 52, which is less susceptible to PWSCC. In order to ensure complete coverage of all susceptible material, the weld overlay extends an additional 1/4 inch beyond the outer ring of the original J-groove weld onto the stainless steel cladding covering the inside surface of the head. The final NDE acceptance criteria of "PT White" ensure complete isolation of the susceptible material. The licensee's primary difficulty in meeting the NDE acceptance criteria for the repair weld was in obtaining a good quality Alloy 52 weld over the stainless steel cladding.

The final NDE surface acceptance criteria of the ASME Construction Code would allow only very small rounded liquid dye penetrant indications (<3/16 inch). This acceptance criteria is based on the finding that any defects identified using this criteria would not significantly impact the structural integrity of the original weld. The NRC staff notes that the licensee's generic request for the reduction of acceptance criterion for all penetration nozzle repair welds would be applicable to the Alloy 52 weld over the PWSCC susceptible Alloy 82/182 weld material. The NRC staff finds that this request goes beyond the NRC staff's available time to review the submittal and provide a response for plant restart. The NRC staff would need to review the final root cause report for welding fabrication flaws identified during the repair welding process to support this type of request. Therefore, generic acceptance of reduced NDE acceptance criteria for all penetration nozzles is not authorized at this time.

However, given the hardship identified by the licensee of 20,000 mRem additional dose to meet the "PT White" acceptance criteria for penetration nozzle 57, the NRC staff finds it acceptable to not require the licensee to meet "PT White" acceptance criteria for the pre-service PT of the Alloy 52 weld repair material over the stainless steel cladding of the reactor pressure vessel head, for penetration nozzle 57 for one cycle of operation. Given the licensee's identified hardship to obtain "PT White" acceptance criteria during BVPS-2 14th refueling outage, the NRC staff finds that requiring compliance with the current requirements of the previously approved relief request would cause an unnecessary burden on the licensee without a compensating increase in the level of quality and safety.

#### 4.0 CONCLUSION

Based on the above evaluation, the NRC staff has concluded that the licensee provided sufficient technical basis to find that compliance with the current requirements would cause an unnecessary burden on the licensee without a compensating increase in the level of quality and safety. Additionally, the NRC staff concluded that the licensee is in compliance with the ASME Code requirements and the proposed alternative provides reasonable assurance of structural integrity. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii), the NRC staff authorizes the proposed alternative for BVPS-2 penetration nozzle number 57 for one cycle of operation.

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

Principal Contributors: M. Audrain, NRR/DCI  
J. Collins, NRR/DCI

Date: March 12, 2010

P. Harden

- 2 -

If you have any questions, please contact the Beaver Valley Project Manager, Nadiyah Morgan, at (301) 415-1016.

Sincerely,

*/RA/*

Nancy L. Salgado, Chief  
Plant Licensing Branch I-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-412

Enclosure:  
As stated

cc w/encl: Distribution via Listserv

DISTRIBUTION:

PUBLIC LPL1-1 R/F  
RidsNrrNMorgan  
RidsNrrDorlLpl1-1  
JTsao, NRR

RidsNrrLASLittle  
RidsOGCRp  
RidsRgn1MailCenter  
JCollins, NRR

RidsAcrcsAcnw\_MailCTR  
RidsNrrDorlDpr  
RidsNrrDciCpnb  
MAudrain, NRR

ADAMS Accession No.: ML100680781

\*see memo dated March 4, 2010

OFFICE	LPL1-1/PM	LPL1-1/LA	NRR/DCI/BC*	LPL1-1/BC
NAME	NMorgan	SLittle	TLupold	NSalgado
DATE	03/10/10	03/10/10	03/04/10	03/12/10

**OFFICIAL RECORD COPY**