



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

January 29, 2018

Mr. David B. Hamilton  
Site Vice President  
FirstEnergy Nuclear Operating Company  
Mail Stop A-PY-A290  
P.O. Box 97, 10 Center Road  
Perry, OH 44081-0097

SUBJECT: PERRY NUCLEAR POWER PLANT, UNIT NO. 1 – APPROVAL OF  
ALTERNATIVE TO USE BWRVIP GUIDELINES IN LIEU OF CERTAIN ASME  
CODE REQUIREMENTS (CAC NO. MG0149; EPID 2017-LLR-0112) (L-17-183)

Dear Mr. Hamilton:

By letter dated September 29, 2017, FirstEnergy Nuclear Operating Company (FENOC) submitted a request in accordance with paragraph 50.55a(z)(1) of Title 10 of the *Code of Federal Regulations* (10 CFR) for a proposed alternative to the requirements of Section XI, “Rules for Inservice Inspection of Nuclear Power Plant Components,” of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) for Perry Nuclear Power Plant, Unit 1 (PNPP).

Specifically, pursuant to 10 CFR 50.55a(z)(1), FENOC requested to use Boiling Water Reactor Vessel and Internals Project inspection and evaluation guidelines, in lieu of specific ASME Code, Section XI, requirements for the reactor pressure vessel internals and component inspections, on the basis that the alternative provides an acceptable level of quality and safety.

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the subject request and concludes, as set forth in the enclosed safety evaluation, that the proposed alternatives, as described in relief request IR-056, Revision 2, provide an acceptable level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1).

The NRC authorizes the use of proposed alternatives for PNPP until the end of the third 10-year inservice inspection interval which ends on May 17, 2019.

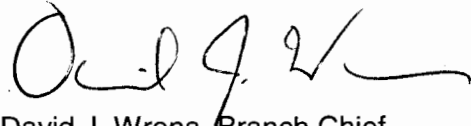
All other requirements of ASME Code, Section XI, for which relief was not specifically requested and authorized by the NRC staff remain applicable, including the third-party review by the Authorized Nuclear In-service Inspector.

D. Hamilton

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If you have any questions, please contact Kimberly Green at (301) 415-1627.

Sincerely,

A handwritten signature in black ink, appearing to read "David J. Wrona". The signature is fluid and cursive, with a long horizontal stroke at the end.

David J. Wrona, Branch Chief  
Plant Licensing Branch III  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-440

Enclosure:  
Safety Evaluation

cc: ListServ



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO 10 CFR 50.55a REQUEST FOR ALTERNATIVE

TO APPLY BWRVIP INSPECTION AND EVALUATION GUIDELINES

FIRSTENERGY NUCLEAR OPERATING COMPANY

FIRSTENERGY NUCLEAR GENERATION, LLC

PERRY NUCLEAR POWER PLANT, UNIT NO. 1

DOCKET NO. 50-440

1.0 INTRODUCTION

By letter dated September 29, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17272A093), FirstEnergy Nuclear Operating Company (FENOC, the licensee), submitted a relief request, IR-056, Revision 2, to apply alternative examination methods to certain American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, inservice inspection (ISI) Class 1 components at the Perry Nuclear Power Plant, Unit 1 (PNPP).

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), paragraph 50.55a(z)(1), the licensee requested to use certain Boiling Water Reactor Vessel and Internals Project (BWRVIP) inspection and evaluation (I&E) guidelines, in lieu of specific ASME Code, Section XI, requirements for the reactor pressure vessel internals and component inspections (i.e., vessel interior, interior attachments within beltline region, interior attachments beyond beltline region, and core support structure), on the basis that the alternative provides an acceptable level of quality and safety.

2.0 REGULATORY EVALUATION

Adherence to Section XI of the ASME Code is mandated by 10 CFR 50.55a(g)(4), which states, in part, that ASME Code Class 1, 2, and 3 components (including supports) will meet the requirements, except the design and access provisions and the pre-service examination requirements, set forth in the ASME Code, Section XI.

Regulation 10 CFR 50.55a(z) states that “[a]lternatives to the requirements of paragraphs (b) through (h) of section or portions thereof may be used when authorized by the Director, Office of Nuclear Reactor Regulation, or Director, Office of New Reactors, as appropriate. A proposed alternative must be submitted and authorized prior to implementation. The applicant or licensee must demonstrate that: (1) *Acceptable level of quality and safety*. The proposed alternative would provide an acceptable level of quality and safety; or (2) *Hardship without a compensating*

*increase in quality and safety.* 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.”

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists for the licensee to request the use of an alternative and the NRC to authorize the proposed alternative.

### 3.0 TECHNICAL EVALUATION

#### 3.1 Licensee's Request for Alternative

##### 3.1.1 ASME Code Component Affected

ASME Code, Section XI, Class 1, Examination Category B-N-1 (Interior of Reactor Vessel), and B-N-2 (Welded Core Support Structures and Interior Attachments to Reactor Vessels), item numbers:

- B13.10 - Vessel Interior
- B13.20 - Vessel Interior Attachments within Beltline Region
- B13.30 - Interior Attachments beyond Beltline Region
- B13.40 - Core Support Structure

##### 3.1.2 Applicable Code Edition and Addenda

Section XI, of ASME Code, 2001 Edition through the 2003 Addenda

##### 3.1.3 Applicable Code Requirement

Section XI of the ASME Code, requires the visual examination (VT) of certain reactor vessel internal (RVI) components. These examinations are included in Table IWB-2500-1, Categories B-N-1 and B-N-2, and are identified with the following item numbers:

- B13.10 - Examine accessible areas of the RV interior each inspection period using a technique which meets the requirements for a VT-3 examination, as defined in paragraph IWA-2213 of the ASME Code, Section XI
- B13.20 - Examine accessible interior attachment welds within the beltline region each interval using a technique which meets the requirements for a VT-1 examination as defined in paragraph IWA-2211 of the ASME Code, Section XI
- B13.30 - Examine accessible interior attachment welds beyond the beltline region each interval using a technique which meets the requirements for a VT-3 examination, as defined in paragraph IWA-2213 of the ASME Code, Section XI
- B13.40 - Examine accessible surfaces of the core support structures each interval using a technique which meets the requirements for a VT-3 examination, as defined in paragraph IWA-2213 of the ASME Code, Section XI

##### 3.1.4 Reason for Request

As an alternative to the ASME Code inspection requirements, use of BWRVIP I&E guidelines will avoid unnecessary inspections, while reducing radiological dose.

### 3.1.5 Proposed Alternative

The licensee proposes to apply the BWRVIP I&E guidelines listed below to affected ASME Code components identified in Table 1 of its submittal, in lieu of the requirements of ASME Code, Section XI, paragraph IWB-2500(a), and Table IWB-2500-1, including the examination method, examination volume, frequency, training, successive and additional examinations, flaw evaluations, and reporting.

- BWRVIP-03, "BWR Vessel and Internals Project, Reactor Pressure Vessel and Internals Examination Guidelines"
- BWRVIP-18, Revision 2-A, "BWR Core Spray Internals Inspection and Flaw Evaluation Guidelines"
- BWRVIP-25, "BWR Core Plate Inspection and Flaw Evaluation Guidelines"
- BWRVIP-26-A, "BWR Top Guide Inspection and Flaw Evaluation Guidelines"
- BWRVIP-27-A, "BWR Standby Liquid Control System/Core Plate  $\Delta P$  Inspection and Flaw Evaluation Guidelines"
- BWRVIP-38, "BWR Shroud Support Inspection and Flaw Evaluation Guidelines"
- BWRVIP-41, Revision 3, "BWR Jet Pump Assembly Inspection and Flaw Evaluation Guidelines"
- BWRVIP-42, Revision 1, "BWR Vessel and Internals Project, Low Pressure Coolant Injection (LPCI) Coupling Inspection and Flaw Evaluation Guidelines"
- BWRVIP-47-A, "BWR Lower Plenum Inspection and Flaw Evaluation Guidelines"
- BWRVIP-48-A, "Vessel ID [Internal Diameter] Attachment Weld Inspection and Flaw Evaluation Guidelines"
- BWRVIP-76, Revision 1-A, "BWR Core Shroud Inspection and Flaw Evaluation Guidelines" (see note)
- BWRVIP-94NP, Revision 2, "BWR Vessel and Internals Project Program Implementation Guide"
- BWRVIP-100, Revision 1-A, "Updated Assessment of the Fracture Toughness of Irradiated Stainless Steel for BWR Core Shrouds"
- BWRVIP-138, Revision 1-A, "Updated Jet Pump Beam Inspection and Flaw Evaluation"
- BWRVIP-180, "BWR Vessel and Internals Project, Access Hole Cover Inspection and Flaw Evaluation Guidelines"
- BWRVIP-183-A, "Top Guide Grid Beam Inspection and Flaw Evaluation Guidelines"

Note: If flaw evaluations are required for BWRVIP-76 examinations, the fracture toughness values of BWRVIP-100 will be utilized.

The licensee stated that any deviations from the referenced BWRVIP I&E guidelines for the duration of the proposed alternative will be appropriately documented and communicated to the NRC, per the BWRVIP Deviation Disposition Process. Furthermore, FENOC stated that PNPP does not currently have any deviations from the subject guidelines.

### 3.1.6 Basis for Use

Licensees of boiling-water reactors (BWRs) examine reactor internals in accordance with BWRVIP guidelines. These guidelines were written to address the safety significant vessel internal components and to examine and evaluate the examination results for these components using appropriate methods and reexamination frequencies. The BWRVIP has established a reporting protocol for examination results and deviations.

The BWRVIP recommended examinations specify locations that are known to be vulnerable to BWR relevant degradation mechanisms rather than “all surfaces.” The BWRVIP examination methods (including an enhanced visual examination VT-1 [EVT-1] or ultrasonic test [UT]) are superior to the ASME Code required VT-3 for flaw detection and characterization. In most cases, the BWRVIP examination frequency is equivalent to or more frequent than the examination frequency required by the ASME Code. In cases where the BWRVIP examination frequency is less frequent than required by the ASME Code, the BWRVIP examinations are performed in a more comprehensive manner and focus on areas that are most vulnerable.

The enhanced flaw detection and characterization capability, with an equivalent or more frequent examination frequency, or with a less frequent examination frequency but with those examinations being performed in a more comprehensive manner, and using comparable flaw evaluation criteria, results in the BWRVIP criteria providing a level of quality and safety that is equivalent to or exceeds that provided by the ASME Code requirements. Thus, the licensee determined that use of these BWRVIP guidelines as alternatives to the ASME Code requirements provide an acceptable level of quality and safety.

The BWRVIP executive committee periodically revises the BWRVIP I&E guidelines to include enhancements in inspection techniques and flaw evaluation methodologies. Where the revised version of a BWRVIP guideline continues to also meet the requirements of the version of the BWRVIP guideline that forms the safety basis for the NRC-authorized proposed alternative to the requirements of 10 CFR 50.55a, it may be implemented. Otherwise, the revised guidelines will only be implemented after NRC approval of the revised BWRVIP guidelines or a plant-specific request for an alternative has been authorized.

The licensee provided with its submittal a comparison of ASME Code, Section XI, Examination Category B-N-1 and B-N-2 requirements with BWRVIP guidance requirements which provides specific examples comparing the inspection requirements of ASME Code, Section XI, item numbers B13.10, B13.20, B13.30, and B13.40 in Table IWB-2500-1, to the inspection requirements in the BWRVIP documents, including inspection methods. Furthermore, the licensee provided specific examples of how the I&E guidelines from various BWRVIP reports compare to the ASME Code requirements with respect to inspection scope, examination method, and frequency.

### 3.1.7 Duration of Proposed Alternative

The alternative is requested for the balance of the third 10-year ISI interval, which expires on May 17, 2019.

## 3.2 NRC Staff Evaluation

The NRC staff found the referenced BWRVIP reports identified in the licensee’s submittal to be acceptable for use because the I&E guidelines addressed in these reports would identify degradation in a timely manner and ensures that the integrity of the RVI components will be maintained. In addition, PNPP compliance with inspection criteria included in the reports would provide reasonable assurance that age related degradation in the RVI components will be identified in a timely manner.

Specifically, BWRVIP-18 (Revision 2-A), BWRVIP-26-A, BWRVIP-27-A, BWRVIP-47-A, BWRVIP-48-A, BWRVIP-76 (Revision 1-A), BWRVIP-100, (Revision 1-A), BWRVIP-138 (Revision 1-A), and BWRVIP-183-A, have been previously reviewed and approved by the NRC

staff with a corresponding safety evaluation (SE) attached to each of the “-A” reports. Although BWRVIP-25 and BWRVIP-38 do not have a corresponding “-A” report, they were reviewed and approved by the NRC staff by letters dated December 19, 1999, and July 24, 2000, respectively. The BWRVIP-41 and BWRVIP-42 I&E guidelines were previously reviewed and approved by the NRC staff with a corresponding SE attached to each of the “-A” reports. These two reports (BWRVIP-41 and BWRVIP-42) have since been updated, and the revisions identified in the licensee’s submittal continue to incorporate adequate I&E guidelines to detect degradation in the stated components. The staff authorizes the use of the BWRVIP I&E guidelines, discussed above, in lieu of ASME requirements for the stated components because the inspection techniques that are recommended by the BWRVIP meet or exceed the inspection techniques mandated by the ASME Code, Section XI, ISI program. In addition, the BWRVIP I&E guidelines provide inspection frequencies sufficient to detect aging degradation; therefore, subsequent inspections of the RVI components per the relevant BWRVIP I&E guidelines will provide reasonable assurance that any emerging aging effects will be identified in a timely manner and provides an acceptable level of quality and safety.

The BWRVIP-180 I&E guideline has not been submitted to the NRC for review and approval; however, the I&E guideline meets or exceed the inspection frequency and techniques mandated by the ASME Code, Section XI, ISI program, and degradation can be identified in a timely manner and ensures that the integrity of the RVI components will be maintained; thus, the staff authorizes the use of this report in lieu of ASME Code requirements for the stated components.

In addition, the staff notes that BWRVIP-03 and BWRVIP-94NP, Revision 2, do not contain I&E guidelines for any specific components. Rather, BWRVIP-03, in general: (1) provides an overview of the structure of the BWRVIP, and (2) includes guideline documents that establish protocols to follow in order to gain access to BWRVIP-owned mockups; to perform formal demonstrations of nondestructive examinations (NDE) techniques using BWRVIP mockups; and to perform their own demonstrations of NDE techniques or inspection tooling in an acceptable manner. Furthermore, BWRVIP-94NP, Revision 2, establishes a framework for structuring and strengthening existing BWR vessel and internals programs to ensure consistent application of guidelines by BWRVIP members.

As part of its evaluation of this alternative request, the NRC staff reviewed the results of the reactor internals inspection history up until the most recent inspections in 2015 for PNPP that were available. These results were referenced by the licensee as supporting information in its submittal and provide information regarding inspection methods used on the RVI components, inspection dates, the inspection results, and corrective actions related to the inspection findings. These results are documented in a letter submitted by the Electric Power Research Institute, “Project No. 704-BWR Vessel and Internals Inspection Summaries for Spring 2015 Outages,” dated May 23, 2016 (ADAMS Accession No. ML16152A162).

Based on its review of these inspection summaries for PNPP, the NRC staff finds that the licensee has adequately demonstrated its capability in: (1) identifying the weld flaws (cracking); (2) taking appropriate corrective actions to ensure that the structural integrity of the component is maintained (i.e., proper repair (if necessary), or flaw evaluation with proper engineering justification); and (3) complying with scope expansion of inspections and subsequent inspections per the applicable BWRVIP reports.

Based on the above considerations, the NRC staff finds that the implementation of the BWRVIP I&E guidelines specified in the licensee's proposed alternative will ensure that the integrity of the RVI components will be maintained with an acceptable level of quality and safety.

The NRC staff acknowledges that the BWRVIP Executive Committee periodically revises the BWRVIP guidelines to include enhancements in inspection techniques and flaw evaluation methodologies. While the licensee may choose to implement enhancements described in a revised version of a BWRVIP I&E guideline, the licensee must continue to also meet the requirements of the version of the BWRVIP I&E guideline that forms the basis for the NRC staff's authorized alternative to the requirements of 10 CFR 50.55a. The licensee may also choose to return to complying with the inspection requirements of the ASME Code of Record for PNPP.

Thus, the NRC staff authorizes only the BWRVIP I&E guidelines proposed as an alternative in this relief request. In the event the licensee decides to take exceptions to, or deviations from, the authorized alternative, the licensee must revise and resubmit its request for authorization to use the proposed alternative under 10 CFR 50.55a(z).

#### 4.0 CONCLUSION

As set forth above, the NRC staff determines that the licensee-proposed alternatives, as described in request IR-056, Revision 2, provide an acceptable level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1). Therefore, the NRC staff authorizes the licensee-proposed alternatives, as described in request IR-056, Revision 2, for the remainder of the third 10-year ISI interval at PNPP.

All other requirements of ASME Code, Section XI, for which relief was not specifically requested and authorized by the NRC staff remain applicable, including the third-party review by the Authorized Nuclear In-Service Inspector.

Principal Contributor: O. Yee, NRR

Date of issuance: January 29, 2018



SUBJECT: PERRY NUCLEAR POWER PLANT, UNIT NO. 1 – APPROVAL OF ALTERNATIVE TO USE BWRVIP GUIDELINES IN LIEU OF CERTAIN ASME CODE REQUIREMENTS (CAC NO. MG0149; EPID 2017-LLR-0112) (L-17-183) DATED JANUARY 29, 2018

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