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

March 14, 2017

Mr. Joseph W. Shea
Vice President, Nuclear Licensing
Tennessee Valley Authority
1101 Market Street, LP 3R-C
Chattanooga, TN 37402-2801

SUBJECT: BROWNS FERRY NUCLEAR PLANT, UNITS 2 AND 3 – REQUEST FOR ASME CODE, SECTION XI, ALTERNATIVES 2-ISI-30 AND 3-ISI-27 FOR THE PERIODS OF EXTENDED OPERATION REGARDING REACTOR PRESSURE VESSEL CIRCUMFERENTIAL SHELL WELD EXAMINATIONS (CAC NOS. MF7795 AND MF7796)

Dear Mr. Shea:

By letter dated June 10, 2016, as supplemented by letter dated December 7, 2016, (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML16165A234 and ML16343A935, respectively), Tennessee Valley Authority (TVA, the licensee) submitted a request to the U.S. Nuclear Regulatory Commission (NRC) for the use of alternatives to certain requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, for the reactor pressure vessel (RPV) circumferential shell weld examinations at Browns Ferry Nuclear Plant, Units 2 and 3 (BFN 2 and 3). The licensee's proposed alternatives are identified as Request for Alternative 2-ISI-30 and 3-ISI-27 for BFN 2 and 3, respectively. The licensee's request for the use of these alternatives was submitted pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(z)(1) on the basis that the alternatives would provide an acceptable level of quality and safety.

The licensee's December 7, 2016, letter withdrew Request for Alternative 2-ISI-30 because the licensee indicated that it was not able to provide the supplemental information requested by the NRC staff for BFN 2 within a schedule that supported the approval date requested in its June 10, 2016, application. However, the staff's technical review, as documented in Section 3.5 of the enclosed safety evaluation (SE), addresses the information provided in the licensee's June 10, 2016, submittal for both units, giving due consideration to the issue that prompted the withdraw of BFN 2 Request for Alternative 2-ISI-30.

The NRC staff finds that the information submitted by the licensee demonstrates that the conditional failure probabilities for the BFN 3 limiting RPV circumferential and axial shell welds at the end of the period of extended operation satisfies the NRC staff's acceptance criteria for these evaluations in its SEs for the Boiling Water Reactor Vessel and Internals Project (BWRVIP) Topical Reports BWRVIP-05 and BWRVIP-74-A. Additionally, the licensee will continue to implement operator training and procedures to limit the frequency of cold overpressure events in accordance with the NRC staff's SE for the BWRVIP-05 topical report, consistent with the staff's previous approval of these methods for the period of extended operation, as documented in Section 4.2.6 of NUREG-1843, "Safety Evaluation Report Related

to the License Renewal of the Browns Ferry Nuclear Plant, Units 1, 2, and 3." The licensee has therefore satisfied the plant-specific conditions required to obtain NRC authorization for this specific Code alternative.

On this basis, the NRC staff concludes that implementation of the BWRVIP-05 and BWRVIP-74-A methods in lieu of the specific ASME Code, Section XI, Category B-A, Item No. B1.11 requirements for volumetric examination of the subject RPV circumferential shell welds will provide an acceptable level of quality and safety at BFN 3 for the duration of the unit's 20-year extended license term. Therefore, pursuant to 10 CFR 50.55a(z)(1), BFN 3 Request for Alternative 3-ISI-27 is authorized for the remaining term of the BFN 3 renewed operating license, which expires at midnight on July 2, 2036.

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

In addition, the NRC grants the request of the licensee to withdraw its Request for Alternative 2-ISI-30 dated December 7, 2016. As a result, NRC staff ceased work activities on the requested alternative for BFN 2, which is as tracked by CAC No. MF7795.

If you have any questions, please contact the Project Manager, Ms. Farideh E. Saba at 301-415-1447 or Farideh.Saba@nrc.gov.

Sincerely,

Benjamin G. Beasley, Chief
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-260 and 50-296

Enclosure:
Safety Evaluation

cc: Listserv

SUBJECT: BROWNS FERRY NUCLEAR PLANT, UNITS 2 AND 3 – REQUEST FOR ASME CODE, SECTION XI, ALTERNATIVES 2-ISI-30 AND 3-ISI-27 FOR THE PERIODS OF EXTENDED OPERATION REGARDING REACTOR PRESSURE VESSEL CIRCUMFERENTIAL SHELL WELD EXAMINATIONS (CAC NOS. MF7795 AND MF7796) DATED MARCH 14, 2017

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ADAMS Accession No.: ML17045A772 ***via email**

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UNITED STATES
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR ALTERNATIVES 2-ISI-30 AND 3-ISI-27 FOR THE PERIOD OF EXTENDED OPERATION REGARDING REACTOR PRESSURE VESSEL CIRCUMFERENTIAL WELD EXAMINATIONS

TENNESSEE VALLEY AUTHORITY

BROWNS FERRY NUCLEAR PLANT, UNITS 2 AND 3

DOCKET NOS. 50-260 AND 50-296

1.0 INTRODUCTION

By letter dated June 10, 2016, as supplemented by letter dated December 7, 2016, (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML16165A234 and ML16343A935, respectively), Tennessee Valley Authority (TVA, the licensee) submitted a request to the U.S. Nuclear Regulatory Commission (NRC) for the use of alternatives to certain requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, for the reactor pressure vessel (RPV) circumferential shell weld examinations at Browns Ferry Nuclear Plant, Units 2 and 3 (BFN 2 and 3). The licensee's proposed alternatives are identified as Request for Alternatives 2-ISI-30 and 3-ISI-27 for BFN 2 and 3, respectively. The licensee's request for the use of these alternatives were submitted, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(z)(1), on the basis that the alternatives would provide an acceptable level of quality and safety.

The licensee's December 7, 2016, letter withdrew Request for Alternative 2-ISI-30 because the licensee indicated that it is not able to provide the supplemental information requested by the NRC staff for BFN 2 within a schedule that supports the approval date requested in its June 10, 2016, application. However, the staff's technical review, as documented in Section 3.5 of this safety evaluation (SE), addresses the information provided in the licensee's June 10, 2016, submittal for both units, giving due consideration to the issue that prompted the withdrawal of BFN 2 Request for Alternative 2-ISI-30.

The ASME Code, Section XI, alternatives proposed in the licensee's June 10, 2016, submittal would eliminate the requirement to inspect the RPV circumferential shell welds, except for the areas of intersection with the axial welds, for the duration of the units' 20-year extended license terms, also referred to as the periods of extended operation (PEOs). The licensee's proposed alternatives addressed the specific guidance provided in the NRC staff's July 28, 1998, final SE for Boiling Water Reactor (BWR) Vessel and Internals Project (BWRVIP) Topical Report BWRVIP-05, "BWR Reactor Pressure Vessel Shell Weld Inspection Recommendations,"

(ADAMS Legacy Accession No. 9808040037). This specific guidance provided staff expectations and acceptance criteria for plant-specific applications for Code alternatives to implement the BWRVIP-05 probabilistic fracture mechanics (PFM) methodology in lieu of the subject RPV circumferential shell weld examinations for the original 40-year license terms.

2.0 REGULATORY EVALUATION

Inservice inspection (ISI) of ASME Code Class 1, 2, and 3 components is to be performed in accordance with Section XI of the ASME Code and applicable editions and addenda as required by 10 CFR 50.55a(g), except where specific relief has been granted by the NRC pursuant to 10 CFR 50.55a(g)(6)(i). Pursuant to 10 CFR 50.55a(z), alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if (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 and safety.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) must meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, 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 ISI 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(a)(1)(ii), 12 months prior to the start of the 120-month interval, subject to the conditions listed in 10 CFR 50.55a(b)(2).

BFN 2 is currently in the fifth 10-year ISI interval, which began on February 1, 2016. BFN 3 is currently in the fourth 10-year ISI interval, which also began on February 1, 2016. The applicable ASME Code of record for the fifth and fourth 10-year ISI intervals at BFN 2 and 3, respectively, is the ASME Code, Section XI, 2007 Edition through 2008 Addenda at both units.

3.0 TECHNICAL EVALUATION

3.1 ASME Code Requirement to which the Alternatives are Requested

The ASME Code, Section XI, 2007 Edition through 2008 Addenda, Table IWB-2500-1, Examination Category B-A, Item B1.11 requires a volumetric examination of all the RPV circumferential shell welds each ISI interval, to include volumetric examination of "essentially 100 percent" (i.e., greater than 90 percent) of the length of the welds.

3.2 Component(s) for which the Alternatives are Requested

Code Class: 1
Examination Category: B-A
Item Number: B1.11
BFN 2 RPV Circumferential Shell Welds, Weld Nos. C-4-5, C-3-4, C-2-3, C-1-2, and C-BH-1
BFN 3 RPV Circumferential Shell Welds, Weld Nos. C-4-5, C-3-4, C-2-3, C-1-2, and C-BH-1
Examination Method: Volumetric

3.3 Licensee's Proposed Alternatives to the ASME Code Section XI

The licensee's June 10, 2016, application identified that BFN 2 and 3 were operating with NRC-authorized Code alternatives that allowed plant-specific implementation of the BWRVIP-05 PFM methods in lieu of the subject RPV circumferential shell weld examination requirements for the remainder of the 40-year license terms at the units. These 40-year Code alternatives were authorized for BFN 2 and 3 in NRC letters dated August 14, 2000, and November 18, 1999 (ADAMS Accession Nos. ML003740638 and ML993300264, respectively).

The licensee identified that the 40-year license terms ended on June 28, 2014, and July 2, 2016, for BFN 2 and 3, respectively. Therefore, Request for Alternatives 2-ISI-30 and 3-ISI-27 were submitted to implement the BWRVIP-05 PFM methods in lieu of the subject RPV circumferential shell weld examination requirements for the duration of the 20-year extended license terms at the units.

3.4 Licensee's Basis for the Proposed Alternatives

TVA submitted Request for Alternatives 2-ISI-30 and 3-ISI-27 in accordance with 10 CFR 50.55a(z)(1), on the basis that the proposed alternatives would provide an acceptable level of quality and safety. The licensee's technical basis for determining an acceptable level of quality and safety included plant-specific evaluations for demonstrating that the limiting RPV circumferential shell welds at the units have conditional failure probabilities that are bounded by (i.e., less than) the NRC staff's acceptance criteria for the weld failure probabilities, considering projected RPV weld neutron embrittlement through the end of the PEOs at BFN 2 and 3. The NRC staff's specific acceptance criteria for these circumferential shell weld failure probabilities are established in its July 28, 1998, SE for the BWRVIP-05 report.

The licensee's proposed Code alternatives also included some citations from Section 4.2.6 of NUREG-1843, "Safety Evaluation Report Related to the License Renewal of the Browns Ferry Nuclear Plant, Units 1, 2, and 3," January 2006 (ADAMS Accession No. ML060120453) regarding previous analyses of the RPV circumferential shell welds that were submitted as part of the BFN license renewal application (LRA). The licensee's submittal identified that the circumferential shell weld evaluations are updated for the proposed Code alternatives based on revised RPV neutron fluence inputs to the weld embrittlement analyses, in order to account for actual core operating conditions since the mid-2000s LRA review. The licensee stated these revised neutron fluence values were previously approved by the NRC for the current technical specification (TS) pressure-temperature limit curves.

The licensee determined that these RPV circumferential shell weld evaluations demonstrate that implementation of the proposed Code alternatives for the duration of the 20-year extended license terms would provide an acceptable level of quality and safety at BFN 2 and 3.

3.5 NRC Staff Evaluation

By letters dated August 14, 2000, and November 18, 1999, and in response to TVA applications dated March 24, 2000 and June 25, 1999, the NRC staff authorized alternatives to the volumetric examination requirements of the ASME Code, Section XI, for the subject RPV circumferential shell welds at BFN 2 and 3, pursuant to 10 CFR 50.55a(a)(3)(i), which is now 10 CFR 50.55a(z)(1). These NRC-authorized alternatives allowed for plant-specific implementation of the BWRVIP-05 RPV PFM analyses, as approved by the NRC staff in its BWRVIP-05 SE, in lieu of the subject ASME Code, Section XI, examination requirements for

the duration of the units' 40-year license terms. The subject Code alternatives expired when the units entered their respective 20-year extended license terms on June 28, 2014, and July 2, 2016, for BFN 2 and 3. Therefore, plant-specific implementation of these BWRVIP-05 PFM methods in lieu of the subject ASME Code, Section XI, requirements during the PEOs requires the submittal of a new request for a Code alternative, pursuant to 10 CFR 50.55a(z)(1).

The licensee's June 10, 2016, application requested alternatives to the subject circumferential weld examination requirements for the PEOs at BFN 2 and 3, based on plant-specific implementation of the NRC-approved BWRVIP-05 methods for the limiting circumferential shell welds at the units, considering projected RPV weld neutron embrittlement through 60-years of facility operation. The proposed 60-year Code alternatives included plant-specific calculations demonstrating that projected neutron embrittlement for the BFN 2 and 3 limiting RPV circumferential shell welds is less than that used by the NRC staff for calculating an acceptable circumferential shell weld conditional failure probability, [1] as documented in the NRC SE for BWRVIP-05. The specific RPV weld neutron embrittlement parameter used for this evaluation is referred to as the *mean reference nil-ductility transition temperature*, or *mean* RT_{NDT}.

The NRC staff confirmed that the proposed 60-year Code alternatives continued implementation of certain operator procedures and training needed to limit the frequency of cold overpressure events, per the criteria specified in the staff's SE for BWRVIP-05. The staff had previously endorsed these provisions in Section 4.2.6 of its safety evaluation report for the BFN LRA (NUREG-1843), regarding the subject circumferential weld analysis. The operator training and procedures are specifically needed to ensure that the overall plant-specific RPV failure probability per reactor operating year (a product of the weld conditional failure probability and the cold overpressure event frequency) is less than the acceptance criterion specified in the staff's SE for BWRVIP-05.

The mean RT_{NDT} value for demonstrating an acceptable RPV weld conditional failure probability is calculated based on three inputs:

(1) *The Projected RPV Neutron Fluence*: RPV neutron fluence, as determined based on staff-approved calculation methodologies, is the key time-dependent parameter for all RPV integrity analyses that consider neutron embrittlement of the RPV beltline materials. The projected neutron fluence input to the mean RT_{NDT} value, for demonstrating an acceptable RPV weld conditional failure probability at the end of the licensed operating term, shall include the effects of any power uprates that are implemented during the licensed operating term of the unit.

(2) *The Weld Chemistry Factor (CF)*: The CF is determined based on either copper and nickel content, or the application of credible RPV material surveillance data from a 10 CFR Part 50, Appendix H RPV material surveillance program. If the weld is represented in the plant-specific or industry integrated surveillance program, all credible RPV surveillance data shall be used for the CF calculation, per the requirements of 10 CFR Part 50, Appendix G. CF values shall be periodically recalculated based on new credible RPV surveillance data that becomes available when a surveillance capsule is pulled from the RPV in accordance with 10 CFR Part 50, Appendix H surveillance program requirements.

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[1] The weld conditional failure probability quantifies the probability of weld failure *if* the RPV were subjected to a cold overpressure event, as addressed in BWRVIP-05.

(3) *The Initial (Unirradiated) RT_{NDT}*: The initial RT_{NDT} is determined in accordance with the requirements of 10 CFR Part 50, Appendix G, based on the procured RPV material impact test data and the use of NRC-approved methods in NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," Branch Technical Position 5-3, "Fracture Toughness Requirements" (ADAMS Accession No. ML0708500035), as applicable to the unit. This is expected to remain fixed throughout the operating life of the plant.

The NRC staff confirmed that the neutron fluence inputs used for determining the BFN 2 and 3 circumferential weld mean RT_{NDT} values were appropriately re-calculated since the issuance of the renewed license in 2006 to account for actual core operating conditions in the interim. These neutron fluence values were previously approved by the NRC for the current BFN TS pressure-temperature (P-T limit curves, as documented in the NRC staff's SEs accompanying License Amendment No. 314 (ADAMS Accession No. ML15065A049), and License Amendment No. 278 (ADAMS Accession No. ML15344A321), for BFN 2 and 3, respectively.

By letter dated September 21, 2015 (ADAMS Accession No. ML15282A152), the licensee submitted a license amendment request for an extended power uprate (EPU), which is currently under NRC staff review. Therefore, in request for additional information (RAI)-1, the staff requested that the licensee state whether the neutron fluence inputs used for the mean RT_{NDT} calculations, and approved for the P-T limits TS change, are also applicable for the proposed 14.3 percent EPU conditions. In its December 7, 2016, RAI-1 response, the licensee identified that the neutron fluence input used for BFN 3 was applicable to the proposed 14.3 percent EPU conditions. However, the licensee indicated that its response to RAI-1 was only applicable to BFN 3 because BFN 2's Request for Code Alternative 2-ISI-30 was being withdrawn. The staff noted that the licensee's December 7, 2016, RAI response letter withdrew the proposed ASME Code alternative for BFN 2, based on TVA's determination that additional time was needed to complete analyses that are necessary to address the NRC staff's concerns raised in RAI-2.

Based on its review of the licensee's response to RAI-1, the NRC staff determined that, giving due consideration to the status of its pending EPU review for BFN, the staff has no outstanding technical concern with the validity of this previously-approved neutron fluence value for the proposed EPU conditions at BFN 3. Therefore, the staff finds that the neutron fluence input to the BFN 3 mean RT_{NDT} calculation is acceptable.

The NRC staff reviewed the CF value and initial RT_{NDT} value for the limiting RPV circumferential shell weld at BFN 3 and determined that they are the same as those used for P-T limit curve evaluation that were approved in the staff's SE for License Amendment No. 278. The staff also confirmed that the licensee correctly calculated the limiting circumferential shell weld mean RT_{NDT} value for BFN 3. Therefore, the staff determined that the licensee's mean RT_{NDT} calculation for the proposed 60-year Code alternative adequately demonstrated that the limiting circumferential shell weld at BFN 3 satisfies the mean RT_{NDT} acceptance criteria established in the staff's SE for BWRVIP-05, for ensuring an acceptable circumferential shell weld conditional failure probability. Accordingly, the staff finds that the licensee's analysis of the BFN 3 limiting circumferential shell weld, as provided in its June 10, 2016, submittal, is acceptable for satisfying the specific circumferential shell weld PFM acceptance criteria established in the NRC staff's BWRVIP-05 SE for the PEO at BFN 3.

Analysis of RPV Axial Welds for BWR Plants That Have Entered the PEO (BWRVIP-74-A)

The NRC staff's acceptance of U.S. BWRs 40-year Code alternatives for the RPV circumferential shell welds was based, in part, on having an acceptable generic RPV axial weld failure probability for the BWR fleet. Notably, the NRC staff's March 7, 2000, supplemental SE (ADAMS Accession No. ML003690281) for BWRVIP-05 specifically addressed the BWRVIP's generic analysis of RPV axial weld failure probability for supporting the plant-specific 40-year Code alternatives for elimination of RPV circumferential shell weld exams. In its supplemental SE, the staff stated that based on its review of the BWRVIP's generic axial weld PFM results, the limiting RPV axial weld failure probability for the BWR fleet at the end of the 40-year license terms for all BWR units is acceptable, given the assumptions described in the supplemental SE. The supplemental SE also stated that licensees would need to perform plant-specific evaluations (referred to as time-limited aging analyses, or TLAAs) of axial weld failure probability in LRAs to support demonstration that the PFM basis for elimination of circumferential shell weld exams remains acceptable for PEOs. These plant-specific axial weld evaluations would need to demonstrate acceptability using the NRC staff's specific acceptance criteria for axial weld failure probabilities from the March 7, 2000, supplemental SE.

Subsequently, by letter dated October 18, 2001 (ADAMS Accession No. ML012920549), the NRC staff issued its final license renewal safety evaluation report (LR-FSER) for the BWRVIP-74-A report, "BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines for License Renewal," wherein the staff identified that BWR licensee renewal applicants referencing the BWRVIP-74-A for their RPV neutron embrittlement TLAAs must evaluate both the RPV circumferential shell weld and axial shell weld failure probabilities as TLAAs for their proposed PEOs. The LR-FSER for BWRVIP-74-A indicates that an acceptable plant-specific evaluation of axial weld failure probability may consist of a plant-specific determination of the mean RT_{NDT} of the most limiting RPV axial beltline weld, based on projected neutron embrittlement at the end of the 60-year license term, and demonstrating that it is less than the values specified in Table 1 of the LR-FSER for BWRVIP-74-A. The LR-FSER Table 1 values correspond to the axial weld acceptance criteria cited above from the March 7, 2000, supplemental SE.

Based on the above acceptance criteria, Sections 4.2.6 and 4.2.7 of the BFN LRA includes TLAAs that determined the 60-year projected mean RT_{NDT} values for the limiting RPV circumferential and axial shell welds at BFN 2 and 3. As documented in Sections 4.2.6.4 and 4.2.7.4 of NUREG-1843, the NRC staff concluded that these analyses are acceptable for demonstrating compliance with the requirement for TLAAs set forth in 10 CFR 54.21(c)(1)(ii). The staff's finding was based on its determination that the 60-year projected mean RT_{NDT} values for the limiting RPV circumferential and axial welds satisfied the BWRVIP-74-A acceptance criteria at the time the staff performed the LRA review.

It should be noted that the LRA mean RT_{NDT} calculations used RPV weld neutron fluence and CFs that were valid at the time of the LRA review. Accordingly, the licensee's June 10, 2016, application for the subject Code alternatives considered that it was necessary to recalculate the limiting circumferential weld mean RT_{NDT} values using updated neutron fluence values, although staff had to request in RAI-1 that the licensee address whether the updated neutron fluence values are applicable for the pending EPU conditions. Based on its review of the licensee's response to RAI-1, the staff was able to confirm that the updated neutron fluence value for BFN 3 is applicable for the pending EPU conditions. The staff also identified that the CF value for the limiting circumferential weld at BFN 3 did not change since the LRA review. However,

the licensee's June 10, 2016, application did not consider the necessary updates to the limiting axial weld mean RT_{NDT} calculations since the LRA review.

For BFN 3, the staff independently confirmed that the limiting axial weld mean RT_{NDT} calculation supporting the axial weld TLAA, as documented in Section 4.2.7 of the LRA and approved by the NRC in NUREG-1843, remains bounding for the subject Code alternative because the actual projected mean RT_{NDT} has decreased since the staff's review of the LRA. Therefore, the staff determined that the BFN 3 limiting circumferential *and axial welds* satisfy the PFM acceptance criteria established in BWRVIP-74-A for the PEO at the unit. Accordingly, the staff finds that BFN 3 Request for Alternative 3-ISI-27 to implement the BWRVIP PFM results in lieu of subject RPV circumferential shell weld examination requirements will provide an acceptable level of quality and safety, and thus should be authorized pursuant to 10 CFR 50.55a(z)(1).

Withdrawal of Request for Alternative 2-ISI-30 for BFN 2

The staff's SE accompanying Amendment No. 314 for the current BFN 2 TS P-T limit curves indicates that since the LRA review, the licensee appropriately considered more recent BWRVIP integrated surveillance program surveillance data for determining the unit's P-T limits, based on methodologies that were approved by the NRC for meeting the requirements of 10 CFR Part 50, Appendices G and H. Based on its review of this information, the staff determined that the BFN 2 axial weld mean RT_{NDT} calculation documented in Section 4.2.7 of the LRA, as approved by the NRC in NUREG-1843, is no longer bounding for demonstrating an acceptable axial weld failure probability because the BFN 2 axial weld CF has increased based on the incorporation of credible surveillance data for this weld since the LRA review. The staff therefore identified that an updated axial weld analysis is necessary for its review of the proposed BFN 2 Code alternative. Therefore, in RAI-2, the staff requested that the licensee supplement its request to include an updated analysis of the failure probability for the limiting RPV axial weld at BFN 2 so that the staff can verify that it remains bounded by the BWRVIP-74-A acceptance criteria.

In its December 7, 2016, RAI response, the licensee stated that this updated analysis is currently in progress and is scheduled for completion at the end of 2017. As a result, the licensee indicated that it was not able to provide the requested analysis within a schedule that supports the approval date requested by TVA in its June 10, 2016, application for the BFN 2 Code alternative. Therefore, TVA stated that it withdrew its Request for Alternative 2-ISI-30 for BFN 2. The licensee indicated that it plans to resubmit a new request for Code alternative to the subject ISI requirements at BFN 2, pending completion of an updated axial weld failure probability analysis.

5.0 CONCLUSION

The NRC staff finds that the information submitted by the licensee demonstrates that the conditional failure probabilities for the BFN 3 limiting RPV circumferential and axial shell welds at the end of the PEO satisfies the NRC staff's acceptance criteria for these evaluations in its SEs for BWRVIP-05 and BWRVIP-74-A. Additionally, the licensee will continue to implement operator training and procedures to limit the frequency of cold overpressure events in accordance with the NRC staff's SE for the BWRVIP-05 report, consistent with the staff's previous approval of these methods for the PEO, as documented in Section 4.2.6 of NUREG-1843 for the license renewal of BFN. The licensee has therefore satisfied the plant-specific conditions required to obtain NRC authorization for this specific Code alternative.

On this basis, the NRC staff concludes that implementation of the BWRVIP-05 and BWRVIP-74-A methods in lieu of the specific ASME Code, Section XI, Category B-A, Item No. B1.11 requirements for volumetric examination of the subject RPV circumferential shell welds will provide an acceptable level of quality and safety at BFN 3 for the duration of the unit's 20-year extended license term. Therefore, pursuant to 10 CFR 50.55a(z)(1), BFN 3 Request for Alternative 3-ISI-27 is authorized for the remaining term of the BFN 3 renewed operating license, which expires at midnight on July 2, 2036.

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

In addition, on the basis that the licensee is not able to provide the supplemental information requested by the NRC staff for BFN 2 within a schedule that supports the approval date requested in its June 10, 2016, alternative request, the NRC grants the request of the licensee to withdraw its Request for Alternative 2-ISI-30 dated December 7, 2016.

Principal Contributor: Christopher Sydnor

Date: March 14, 2017