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

March 26, 2014

Mr. K. Henderson
Site Vice President
Catawba Nuclear Station
Duke Energy Carolinas, LLC
4800 Concord Road
York, SC 29745

SUBJECT: CATAWBA NUCLEAR STATION UNITS 1 AND 2: PROPOSED RELIEF REQUEST 13-CN-003, REQUEST FOR ALTERNATIVE TO THE REQUIREMENT OF IWB-2500, TABLE IWB-2500-1, CATEGORY B-A AND CATEGORY B-D FOR REACTOR PRESSURE VESSEL WELDS (TAC NOS. MF1922 AND MF1923)

Dear Mr. Henderson:

By letter dated May 20, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No.) ML13148A310), Duke Energy Carolinas, LLC (Duke Energy, the licensee) proposed an alternative to the inservice inspection (ISI) interval requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, for the third 10-year ISI interval for Catawba Nuclear Station (Catawba), Units 1 and 2.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(a)(3)(i), the licensee requested to use the alternative in Relief Request 13-CN-003 on the basis that it provides an acceptable level of quality and safety. Relief Request 13-CN-003 provides an alternative to the requirements of the ASME Code, Section XI, Table IWB-2500-1 to extend the third 10-year ISI interval from 10 to 20 years to allow for the deferral of examinations of the reactor pressure vessel (RPV) welds (Examination Category B-A) as well as the RPV nozzle-to-shell welds and nozzle inner radius sections (Examination Category B-D). The licensee's proposed alternative would allow for the deferral of the subject RPV examinations until 2024 for both units, plus or minus one refueling cycle. The third 10-year ISI interval began on June 29, 2005 for Catawba, Unit 1, and October 15, 2005 for Catawba, Unit 2.

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the subject request and concludes, as set forth in the enclosed safety evaluation, that increasing the ISI interval for the Examination Categories B-A and B-D components from 10 to 20 years will result in no appreciable increase in risk. Accordingly, the ASME Code Section XI, Table IWB-2500-1 examinations of the subject RPV welds can be deferred until calendar year 2024, consistent with the revised implementation plan in Pressurized Water Reactor Owners Group (PWROG) Letter OG-10-238. However, since 20 years is the maximum interval allowed for the subject RPV weld examinations, per WCAP-16168-NP-A, Rev. 3, the licensee's proposal to allow for the deferred exams to occur plus or minus one refueling cycle relative to calendar year 2024 is not acceptable beyond 20 years from the start of the third 10-year ISI interval for Catawba, Units 1 and 2. Therefore, per WCAP-16168-NP-A, Rev. 3, application of this ASME Code, Section XI

alternative is only valid until June 29, 2025 for Catawba, Unit 1 and October 15, 2025 for Catawba, Unit 2.

The NRC staff concludes that Request for Alternative 13-CN-003 provides an acceptable level of quality and safety, and the alternative is authorized for the Examination Categories B-A and B-D components pursuant to 10 CFR 50.55a(a)(3)(i).

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

If you have any questions, please contact the Project Manager, Ed Miller at 301-415-2481 or via e-mail at Ed.Miller@NRC.gov.

Sincerely,

Robert J. Pascarelli, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-413 and 50-414

Enclosure:
Safety Evaluation

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

RELIEF REQUEST 13-CN-003

THIRD TEN-YEAR INSERVICE INSPECTION INTERVAL

DUKE ENERGY CAROLINAS, LLC

CATAWBA NUCLEAR STATION, UNITS 1 AND 2

DOCKET NUMBERS 50-413 AND 50-414

1.0 INTRODUCTION

By letter dated May 20, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13148A310), Duke Energy Carolinas, LLC (Duke Energy, the licensee) proposed an alternative to the inservice inspection (ISI) interval requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, for the third 10-year ISI interval for Catawba Nuclear Station, Units 1 and 2 (Catawba, Units 1 and 2). Specifically, the licensee requested an alternative to the requirements of the ASME Code, Section XI, Table IWB-2500-1 to extend the third 10-year ISI interval from 10 to 20 years to allow for the deferral of examinations of the reactor pressure vessel (RPV) welds (Examination Category B-A) as well as the RPV nozzle-to-shell welds and nozzle inner radius sections (Examination Category B-D).

The third 10-year ISI interval began on June 29, 2005 for Catawba, Unit 1, and October 15, 2005 for Catawba, Unit 2. This ISI interval is currently scheduled to end on July 15, 2014 for Catawba, Unit 1 and August 19, 2016 for Catawba, Unit 2. The licensee's proposed alternative would allow for the deferral of the subject RPV examinations until 2024 for both units, plus or minus one refueling cycle. The U.S. Nuclear Regulatory Commission (NRC) staff reviewed Request for Alternative 13-CN-003 pursuant to Section 50.55a(a)(3)(i) of Title 10 of the *Code of Federal Regulations* (10 CFR) to determine whether the licensee's proposed alternative to the ISI interval requirements of the ASME Code, Section XI will provide an acceptable level of quality and safety.

2.0 REGULATORY EVALUATION

2.1 Regulations and Guidance

In accordance with 10 CFR 50.55a(g)(4), the licensee is required to perform ISI of ASME Code Class 1, 2, and 3 components and system pressure tests during the first 10-year interval and

subsequent 10-year intervals that 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), subject to the limitations and modifications listed therein.

For the third 10-year ISI intervals at Catawba, Units 1 and 2, the Code of record for the inspection of ASME Code Class 1, 2, and 3 components is the 1998 Edition through the 2003 Addenda of the ASME Code, Section XI. The regulation in 10 CFR 50.55a(a)(3) states, in part, that the Director of the Office of Nuclear Reactor Regulation may authorize an alternative to the requirements of 10 CFR 50.55a(g). There are two justifications for an alternative to be authorized. First, per 10 CFR 50.55a(a)(3)(i), the licensee must demonstrate that the proposed alternative would provide an acceptable level of quality and safety. For the second possible justification for an alternative to be authorized, described in 10 CFR 50.55a(a)(3)(ii), the licensee must show that following the ASME Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Regulatory Guide (RG) 1.99, Revision (Rev.) 2, "Radiation Embrittlement of Reactor Vessel Materials," describes general procedures acceptable to the staff for calculating the effects of neutron irradiation embrittlement of the low-alloy steels currently used for light-water-cooled RPVs.

RG 1.174, Rev. 1, "An Approach For Using Probabilistic Risk Assessment In Risk-Informed Decisions On Plant-Specific Changes To The Licensing Basis," describes a risk-informed approach, acceptable to the NRC, for assessing the nature and impact of proposed licensing basis changes by considering engineering issues and applying risk insights.

RG 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence," describes methods and assumptions acceptable to the staff for determining the RPV neutron fluence.

2.2 Background

The ISI of Categories B-A and B-D components consists of volumetric and surface examinations intended to discover whether flaws have initiated, whether pre-existing flaws have extended, and whether pre-existing flaws may have been missed in prior examinations. These examinations are required to be performed at regular intervals, as defined in Section XI of the ASME Code.

2.3 Summary of WCAP-16168-NP-A, Rev. 2

In June 2008, the Pressurized Water Reactor Owners Group (PWROG) issued the NRC approved topical report WCAP-16168-NP-A, Rev. 2, "Risk-Informed Extension of the Reactor Vessel In-Service Inspection Interval" (ADAMS Accession No. ML082820046), which is in support of a risk-informed assessment of extensions to the ISI intervals for Examination Categories B-A and B-D components. Specifically, WCAP-16168-NP-A, Rev. 2 took data associated with three different PWR plants (referred to as the pilot plants), one designed by each of the three main vendors (Westinghouse, Combustion Engineering (CE), and Babcock and Wilcox (B&W)) for PWR nuclear power plants in the USA, and performed studies on these

pilot plants to justify the proposed extension of the ISI interval for the Examination Categories B-A and B-D components from 10 to 20 years.

The analyses in WCAP-16168-NP-A, Rev. 2 used probabilistic fracture mechanics (PFM) tools and inputs from the work described in NUREG-1806, "Technical Basis for Revision of the Pressurized Thermal Shock (PTS) Screening Limit in the PTS Rule (10 CFR 50.61)" (ADAMS Accession No. ML061580318) and NUREG-1874, "Recommended Screening Limits for Pressurized Thermal Shock (PTS)" (ADAMS Accession No. ML070860156). The PWROG analyses incorporated the effects of fatigue crack growth and ISI examination histories. Design basis transient data was used as input to the fatigue crack growth evaluation. The effects of ISI examination histories were modeled consistent with a previously-approved PFM Code in WCAP-14572-NP-A, "Westinghouse Owners Group Application of Risk-Informed Methods to Piping Inservice Inspection" (ADAMS Accession Nos. ML012630327, ML012630349, and ML012630313). These effects were considered in the PFM evaluations, using the Fracture Analysis of Vessels - Oak Ridge (FAVOR) computer code (ADAMS Accession No. ML042960391). All other inputs were identical to those used in the PTS risk re-evaluation underlying 10 CFR 50.61a, "Alternate Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock Events," heretofore identified as the alternate PTS rule.

From the results of the studies, the PWROG concluded that the ASME Code, Section XI 10-year inspection interval for Categories B-A and B-D components in PWR RPVs can be extended to 20 years. Their conclusion from the results for the pilot plants was considered to apply to any plant designed by the three vendors as long as the critical, plant-specific parameters (defined in Appendix A of WCAP-16168-NP-A, Rev. 2) are bounded by the parameters of the pilot plants.

2.4 Summary of the July 26, 2011, NRC Safety Evaluation (SE) for WCAP-16168-NP-A, Rev. 2

The original SE in WCAP-16168-NP-A, Rev. 2 that was published in 2008, was superseded by the July 26, 2011, SE (ADAMS Accession No. ML111600303) to address the PWROG's request for clarification of the information needed in applications utilizing WCAP-16168-NP-A, Rev. 2. The NRC staff's conclusion in this latter SE indicates that the methodology presented in WCAP-16168-NP-A, Rev. 2 is consistent with RG 1.174, Rev. 1 and is acceptable for referencing in requests to implement alternatives to ASME Code inspection requirements for PWR plants in accordance with the limitations and conditions in the SE. In addition to showing that the subject plant parameters and inspection history are bounded by the critical parameters identified in Appendix A in WCAP-16168-NP-A, Rev. 2, the licensee's application must provide the following plant-specific information:

(1) Licensees must demonstrate that the embrittlement of their RPV is within the envelope used in the supporting analyses. Licensees must provide the 95th percentile total through-wall cracking frequency ($TWCF_{TOTAL}$) and its supporting material properties at the end of the period in which the relief is requested to extend the ISI from 10 to 20 years. The 95th percentile $TWCF_{TOTAL}$ must be calculated using the methodology in NUREG-1874. The Charpy transition temperature for the RPV, RT_{MAX-X}, and the shift in the Charpy transition temperature produced by irradiation defined at the 30 ft-lb energy

level, ΔT_{30}, must be calculated using the methodology documented in the latest revision of RG 1.99 or other NRC-approved methodology.

(2) Licensees must report whether the frequency of the limiting design basis transients during prior plant operation are less than the frequency of the design basis transients identified in the PWROG fatigue analysis that are considered to significantly contribute to fatigue crack growth.

(3) Licensees must report the results of prior ISI of the RPV welds and the proposed schedule for the deferred RPV weld exams for the 20-year ISI interval. The 20-year inspection interval is the maximum interval allowed per WCAP-16168-NP, Rev. 2. In its request for an alternative, each licensee shall identify the years in which the deferred inspections will be performed. The dates provided in licensees' requests must be within plus or minus one refueling cycle of the dates identified in the revised implementation plan provided to the NRC in PWROG Letter OG-10-238, dated July 12, 2010 (ADAMS Accession No. ML11153A033).

(4) Licensees with B&W plants must (a) verify that the fatigue crack growth for 12 heat-up/cool-down transients per year that was used in the PWROG fatigue analysis bound the fatigue crack growth for all of its design basis transients and (b) identify the design bases transients that contribute to significant fatigue crack growth.

(5) Licensees with RPVs having forgings that are susceptible to underclad cracking and with RT_{MAX-FO} values exceeding 240 °F must submit a plant-specific evaluation to extend the inspection interval for the ASME Code, Section XI, Examination Category B-A and B-D RPV welds from 10 to a maximum of 20 years because the analyses performed in the WCAP-A are not applicable.

(6) Licensees seeking second or additional interval extensions shall provide the information and analyses requested in Section (e) of 10 CFR 50.61a.

Eventually, WCAP-16168-NP-A, Rev. 3, which contains this latter SE for WCAP-16168-NP-A, Rev. 2, was issued in October 2011 (ADAMS Accession No. ML11306A084, referred to as the WCAP-A in the rest of this SE).

3.0 PROPOSED ALTERNATE FOR CATAWBA, UNITS 1 AND 2

3.1 Description of Proposed Alternative

In Request for Alternative 13-CN-003, the licensee proposed to defer the RPV weld examinations required by the ASME Code, Section XI, Table IWB-2500-1, Examination Categories B-A and B-D for Catawba, Units 1 and 2 until 2024, plus or minus one refueling cycle.

3.2 Components for Which the Proposed Alternative is Requested

The licensee requested deferral of the Catawba, Units 1 and 2, third 10-year ISI interval examinations for the following RPV examination categories and item numbers from Table IWB-2500-1 of the ASME Code, Section XI:

Examination Category	Item Number	Description
B-A	B1.11	Circumferential Shell Welds
B-A	B1.12	Longitudinal Shell Welds
B-A	B1.21	Circumferential Head Welds
B-A	B1.22	Meridional Head Welds
B-A	B1.30	Shell-to-Flange Weld
B-D	B3.90	Nozzle-to-Vessel Welds
B-D	B3.100	Nozzle Inner Radius Section

3.3 Licensee's Basis for the Proposed Alternative

The licensee stated that the methodology used to demonstrate the acceptability of extending the inspection interval for the Examination Category B-A and B-D RPV welds is contained in the WCAP-A. This methodology used the estimated $TWCF_{TOTAL}$ as a measure of the risk of RPV failure. The licensee indicated that the inspection interval for the affected components can be extended from 10 to 20 years, meeting the change in risk guidelines in RG 1.174. The licensee addressed the plant-specific information discussed in Section 2.4 of this SE as follows:

(1) The licensee provided detailed $TWCF_{TOTAL}$ calculations along with critical input parameters (neutron fluence and material properties) for demonstrating that the embrittlement of the Catawba, Units 1 and 2, RPVs are bounded by the Westinghouse pilot plant analysis. The $TWCF_{TOTAL}$ values were calculated as 1.11×10^{-14} events per year for Unit 1 and 1.40×10^{-13} events per year for Unit 2; these values are less than the value of 1.76×10^{-08} events per year for the Westinghouse pilot plant study in the WCAP-A.

(2) The frequencies of the Catawba, Units 1 and 2 RPV, limiting design basis transients are bounded by the frequencies identified in the PWROG fatigue analysis.

(3) The results of the previous RPV inspections for Catawba, Units 1 and 2 are provided, which confirm that satisfactory examinations have been performed for the Catawba, Units 1 and 2 RPVs. The RPV examinations, which are currently scheduled to occur prior to the end of the third 10-year ISI interval in 2014 for Catawba, Unit 1 and 2016 for Catawba, Unit 2, will be deferred until 2024, plus or minus one refueling cycle. The proposed examination date of 2024 corresponds to the revised implementation plan schedule for Catawba, Units 1 and 2, in PWROG Letter OG-10-238.

Plant-Specific information for Items (4), (5), and (6) were not addressed in the licensee's application for the proposed alternative because, according to the licensee, they do not apply to Catawba, Units 1 and 2. The licensee concluded that both Catawba units are bounded by the Westinghouse pilot plant analysis in the WCAP-A, and therefore, the use of this proposed alternative will provide an acceptable level of quality and safety. Accordingly, the licensee

requested that the NRC authorize Request for Alternative 13-CN-003, pursuant to 10 CFR 50.55a(a)(3)(i).

3.4 Duration of Proposed Alternatives

Request for Alternative 13-CN-003 proposed to extend the duration of the third 10-year ISI interval for the above ASME Code, Section XI, Examination Category B-A and B-D components until 2024, plus or minus one refueling cycle, for Catawba, Units 1 and 2.

4.0 TECHNICAL EVALUATION

The NRC staff reviewed Request for Alternative 13-CN-003 to determine whether Catawba, Units 1 and 2, are bounded by the Westinghouse pilot plant study performed in the WCAP-A. The staff conducted its review by performing an independent evaluation of Plant-Specific information for Items (1), (2), and (3), as provided in the licensee's submittal. The NRC staff also reviewed the licensee's submittal to verify that plant-specific information for Items (4), (5), and (6) are not applicable to Catawba, Units 1 and 2, and therefore do require a plant-specific evaluation.

Regarding plant-specific information for Item (1), the NC staff reviewed the licensee's statement in Table 1 of Enclosures 1 and 2 of the submittal that the plant-specific values for $TWCF_{TOTAL}$ (1.11×10^{-14} events per year for Unit 1 and 1.40×10^{-13} events per year for Unit 2) are bounded by the $TWCF_{TOTAL}$ of 1.76×10^{-08} events per year for the Westinghouse pilot plant study in the WCAP-A. Table 3 of Enclosure 1 and Table 4 of Enclosure 2 of the submittal provide details of the $TWCF_{TOTAL}$ calculation for Catawba, Units 1 and 2, respectively. The NRC staff performed an independent calculation to verify that the licensee's $TWCF_{TOTAL}$ values for Catawba, Units 1 and 2 were correctly determined in accordance with NUREG-1874, as required by the WCAP-A. The staff also verified that the RT_{MAX-X} and ΔT_{30} values for Catawba, Units 1 and 2, were calculated using the methodology in RG 1.99, Rev. 2, consistent with the WCAP-A. Additionally, the staff reviewed the critical material property inputs used for the $TWCF_{TOTAL}$ calculation against those used as the basis for the 60-year embrittlement analysis of the Catawba, Units 1 and 2 RPVs in the License Renewal Application (LRA). The NRC staff determined that the critical material property inputs for the RPV beltline shell materials are consistent with those documented in Section 4.2, "Reactor Vessel Neutron Embrittlement," of the LRA. The RPV beltline nozzle shell forging, nozzle shell plate, and associated nozzle shell weld materials were not specifically analyzed in the LRA. However, the NRC staff confirmed that these material properties are consistent with those documented in a response to a request for additional information (RAI) that the NRC staff issued as part of its LRA review and with those listed in Section 5.3, "Reactor Vessel," of the Catawba Units 1 and 2, Updated Final Safety Analysis Report (UFSAR). Section 4.2 of NUREG-1772, "Safety Evaluation Report [SER] Related to the License Renewal of McGuire Nuclear Station, Units 1 and 2, and Catawba Nuclear Station, Units 1 and 2," March 2003 (ADAMS Accession No. ML030850251), documents the NRC staff's approval of the RPV beltline shell material properties as the basis for the RPV neutron embrittlement analysis for 60 years of facility operation. Based on this assessment, the NRC staff finds that the $TWCF_{TOTAL}$ values for Catawba, Units 1 and 2, are bounded by the WCAP-A results, and therefore, the licensee has satisfactorily addressed plant-specific information for Item (1) for Catawba, Units 1 and 2.

Regarding plant-specific information for Item (2), the NRC staff reviewed the licensee's statement in Table 1 of Enclosures 1 and 2 of the submittal that the frequency and severity of the design basis transients for Catawba, Units 1 and 2, are bounded by the Westinghouse pilot plant study in the WCAP-A. The Westinghouse pilot plant study in the WCAP-A analyzed fatigue crack growth based on seven heatup/cooldown cycles per year; this was determined to be the bounding design basis transient frequency and severity for fatigue crack growth for the Westinghouse design. The NRC staff reviewed the licensee's statement in Table 1 of the Enclosures of the submittal against the information in Section 4.3, "Metal Fatigue," of the LRA and Section 4.3 of the final SER (NUREG-1772) for the LRA regarding the evaluation of the transient cycles for 60 years of facility operation. LRA Section 4.3 indicates that the Fatigue Monitoring Program is relied upon to manage the number of transient cycles to ensure that the design basis continues to be satisfied during the period of extended operation. The LRA pointed to Table 3-50 of the UFSAR, which lists the design basis transients for the ASME Code Class 1 reactor coolant system (RCS) components. UFSAR Table 3-50 lists the total number of heatup/cooldown cycles that are allowable per the design requirements, which corresponds to substantially less than seven heatup/cooldown cycles per year. The SER for the LRA documents that the applicant stated in an RAI response that the projected number of transient cycles for 60 years would not exceed the allowable number assumed in the design; however, the Fatigue Monitoring Program is implemented to ensure the design cycles are not exceeded for the Class 1 RCS components during the period of extended operation. The NRC staff concluded in the SER that the licensee's proposal to implement the Fatigue Monitoring Program to ensure that transient cycles do not exceed the design basis for Class 1 components satisfies the requirements for time-limiting aging analyses in 10 CFR 54.21(c)(1). Based on its review of this information, the staff determined that there is adequate assurance that the number of heatup/cooldown cycles for Catawba, Units 1 and 2 will remain less than that assumed for the Westinghouse pilot plant study in the WCAP-A. Therefore, the NRC staff finds that the licensee has satisfactorily addressed plant-specific information for Item (2) for Catawba, Units 1 and 2.

Regarding plant-specific information for Item (3), the NRC staff reviewed the information provided in Table 2 of Enclosures 1 and 2 of the submittal pertaining to the results of previous inspections of the RPV Examination Category B-A and B-D welds. Table 2 states that two 10-year ISIs have been performed to date for both units, and the RPV volumetric examinations performed during the most recent (second 10-year interval) ISI met the performance demonstration requirements of Appendix VIII, "Performance Demonstration for Ultrasonic Examination Systems," of the ASME Code, Section XI. The NRC staff finds this information acceptable because paragraph (e), "Examination and Flaw Assessment Requirements," of the alternate PTS rule, 10 CFR 50.61a, requires that volumetric examinations performed in support of demonstrating the applicability of the rule (which is the basis for the risk-informed analysis of the WCAP-A) must use procedures, equipment, and personnel that have been qualified in accordance with Appendix VIII of the ASME Code, Section XI, as specified in 10 CFR 50.55a(b)(2)(xv). The staff's evaluation of the licensee's second 10-year ISI interval RPV beltline volumetric examination results, relative to the acceptance criteria of 10 CFR 50.61a, are discussed below.

Table 2 of Enclosure 1 of the submittal indicates that one indication was identified in the beltline region of the Catawba, Unit 1 RPV during the most recent ISI, and this indication was found to be acceptable for continued service (without the need for repair or detailed analytical evaluation) per the flaw screening criteria of Table IWB-3510-1 of the ASME Code, Section XI.

Furthermore, Table 2 indicates that this indication is not located within ten percent of the RPV wall thickness or one inch from the RPV clad-to-base metal interface, whichever is greater. Accordingly, the licensee determined that the lack of any indications in this range of RPV wall thickness from the clad-to-base metal interface meets the requirements of the alternate PTS rule, 10 CFR 50.61a.

The NRC staff reviewed the licensee's assessment of the inspection results for the Catawba, Unit 1 RPV and determined that these results meet the examination and flaw assessment requirements of 10 CFR 50.61a because there are no indications located within ten percent of the RPV wall thickness or one inch from the RPV clad-to-base metal interface. Therefore, the NRC staff finds that the volumetric examination results for Catawba, Unit 1, are bounded by the requirements of 10 CFR 50.61a, and the risk-informed analyses of the WCAP-A are applicable, based on these ASME Code, Section XI, Appendix VIII examination results.

Table 2 of Enclosure 2 of the submittal indicates that six indications were identified in the Catawba, Unit 2 RPV beltline region during the most recent ISI, and all of these indications were found to be acceptable for continued service per the flaw screening criteria of Table IWB-3510-1 of the ASME Code, Section XI. Table 2 of Enclosure 2 of the submittal also indicates that two of these indications are located within one inch from the RPV clad-to-base metal interface. Both indications are subsurface flaws located in the weld material for Lower Axial Weld No. 101-142A. The licensee performed an evaluation of these indications relative to the acceptance criteria of Table 2, "Allowable Number of Flaws in Welds," of 10 CFR 50.61a. Figure 1 of Enclosure 2 of the submittal provides a sketch of the RPV beltline shell region and a geometric depiction of the two indications, along with the critical dimensions for the indications: the indication length, the minimum separation of the indications from the clad-to-base metal interface, and the through-wall extent (TWE) of the indications. Table 3 of Enclosure 2 of the submittal summarizes the evaluation of the TWE for the indications relative to the acceptance criteria of Table 2 of 10 CFR 50.61a. Based on the evaluation in Table 3 of Enclosure 2 of the submittal, the licensee concluded that the two indications are bounded by the acceptance criteria of Table 2 of the alternate PTS rule.

The NRC staff reviewed the licensee's assessment of the inspection results for the Catawba, Unit 2 RPV and determined that these results meet the examination and flaw assessment requirements of 10 CFR 50.61a because the two indications that are located within one inch from the RPV clad-to-base metal interface are bounded by the 10 CFR 50.61a acceptance criteria for the maximum number of allowable flaws, based on the TWE for the indications. Specifically, Table 2 of 10 CFR 50.61a allows a maximum of three indications with a TWE in the range of 0.325 inches (in.) to 0.475 in. per 1000 in. of inspected weld length, and maximum of 8.66 indications with a TWE in the range of 0.225 in. to 0.475 in. per 1000 in. of inspected weld length. For Catawba, Unit 2, there is one indication with a TWE of 0.34 in. and a second with a TWE of 0.25 in. The presence of one indication with a TWE between 0.325 in. and 0.475 in. and two indications with a TWE between 0.225 in. and 0.475 in. is below the maximum number allowed by Table 2 of 10 CFR 50.61a for these TWE ranges. Therefore, the staff finds that the volumetric examination results for Catawba, Unit 2 are bounded by the requirements of 10 CFR 50.61a, and the risk-informed analyses of the WCAP-A are applicable, based on these ASME Code, Section XI, Appendix VIII examination results.

Plant-specific information for Item (3) states that the deferred RPV weld examination dates provided in licensees' requests to implement this alternative must be within plus or minus one refueling cycle of the dates identified in the revised implementation plan provided to the NRC in PWROG Letter OG-10-238. The NRC staff confirmed that the licensee's proposed examination date of 2024 corresponds to the revised implementation plan schedule in PWROG Letter OG-10-238 and is therefore consistent with this information item. However, since 20 years is the maximum interval allowed for the subject RPV weld examinations, per the WCAP-A, the licensee's proposal to allow for the deferred exams to occur plus or minus one refueling cycle relative to calendar year 2024 is not acceptable if it results in the RPV weld exams being deferred longer than 20 years from the start of the third 10-year ISI interval. The third 10-year ISI interval began on June 29, 2005 for Catawba, Unit 1, and October 15, 2005 for Catawba, Unit 2. Therefore, per the WCAP-A, application of the proposed alternative is only valid until June 29, 2025 for Catawba, Unit 1. and October 15, 2025 for Catawba, Unit 2. With this limitation, the licensee's proposed examination date of 2024 is acceptable for Catawba, Units 1 and 2.

Based on the acceptable second 10-year ISI interval volumetric examination results, as discussed above, and the acceptable deferred RPV weld examination date of 2024, the staff finds that the licensee has satisfactorily addressed plant-specific information for Item (3) for Catawba, Units 1 and 2.

Regarding Plant-Specific information for Item (4), the NRC staff noted that this item is only applicable to B&W plants since this is the only plant design for which plant-specific verification of the fatigue crack growth for all design basis transients is necessary. Catawba, Units 1 and 2, are Westinghouse plants, and it has already been established in the WCAP-A that the fatigue crack growth corresponding to seven heatup/cooldown cycles per year is bounding for all design basis transients, per the Westinghouse pilot plant study. Therefore, the NRC staff finds that plant-specific information for Item (4) is not applicable to Catawba, Units 1 and 2, and no plant-specific evaluation is required for this item.

Regarding Plant-Specific information for Item (5), the NRC staff noted that both Catawba units have RT_{MAX-FO} values that do not exceed 240 °F. This item is only applicable to plants with RT_{MAX-FO} values exceeding 240 °F (regardless of the number of cladding layers). Therefore, the NRC staff finds that plant-specific information for Item (5) is not applicable to Catawba, Units 1 and 2, and no plant-specific evaluation is required for this item.

Regarding plant-specific information for Item (6), the NRC staff finds that this item is not applicable to Catawba, Units 1 and 2, because the licensee's proposed alternative requested deferral of the subject RPV weld examinations for only the third 10-year ISI interval.

Based on its review of the licensee's submittal, and its findings regarding plant-specific information for Items (1), (2), (3), (4), (5), and (6), as documented above, the staff has determined that the licensee adequately demonstrated that Catawba, Units 1 and 2 are bounded by Westinghouse pilot plant study from the WCAP-A. Consequently, the licensee has demonstrated that the proposed alternative will provide an acceptable level of quality and safety, and it meets the guidance provided by RG 1.174, Rev. 1 for risk-informed decisions.

5.0 CONCLUSION

The NRC staff has completed its review of Request for Alternative 13-CN-003 for Catawba, Units 1 and 2. The NRC staff concludes that increasing the ISI interval for the Examination Categories B-A and B-D components from 10 to 20 years will result in no appreciable increase in risk. This conclusion is based on the fact that the plant-specific information provided by the licensee is bounded by the data in the WCAP-A, and the requests meet all the conditions and limitations described in the WCAP-A. Therefore, the NRC staff concludes that Request for Alternative 13-CN-003 provides an acceptable level of quality and safety, and the alternative is authorized for the Examination Categories B-A and B-D components pursuant to 10 CFR 50.55a(a)(3)(i). Accordingly, the ASME Code Section XI, Table IWB-2500-1 examinations of the subject RPV welds can be deferred until calendar year 2024, consistent with the revised implementation plan in PWROG Letter OG-10-238. However, since 20 years is the maximum interval allowed for the subject RPV weld examinations, per the WCAP-A, the licensee's proposal to allow for the deferred exams to occur plus or minus one refueling cycle relative to calendar year 2024 is not acceptable beyond 20 years from the start of the third 10-year ISI interval for Catawba, Units 1 and 2. Therefore, per the WCAP-A, application of this ASME Code, Section XI alternative is only valid until June 29, 2025 for Catawba, Unit 1, and October 15, 2025 for Catawba, Unit 2.

All other requirements of the ASME Code, Section XI, not specifically included in the request for the proposed alternative, remain in effect.

Principal Contributor: C. Sydnor, NRR

Date: March 26, 2014

alternative is only valid until June 29, 2025 for Catawba, Unit 1 and October 15, 2025 for Catawba, Unit 2.

The NRC staff concludes that Request for Alternative 13-CN-003 provides an acceptable level of quality and safety, and the alternative is authorized for the Examination Categories B-A and B-D components pursuant to 10 CFR 50.55a(a)(3)(i).

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

If you have any questions, please contact the Project Manager, Ed Miller at 301-415-2481 or via e-mail at Ed.Miller@NRC.gov.

Sincerely,

/RA/

Robert J. Pascarelli, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-413 and 50-414

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