



JOSEPH DONAHUE
Vice President

Nuclear Engineering
526 South Church Street, EC-07H
Charlotte, NC 28202
980-373-1758
Joseph.Donahue@duke-energy.com

Serial: RA-18-0080
September 6, 2018

10 CFR 50.55a

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

CATAWBA NUCLEAR STATION, UNIT NOS. 1 AND 2
DOCKET NOS. 50-413, 50-414 / RENEWED LICENSE NOS. NPF-35 AND NPF-52

MCGUIRE NUCLEAR STATION, UNIT NOS. 1 AND 2
DOCKET NOS. 50-369, 50-370 / RENEWED LICENSE NOS. NPF-9 AND NPF-17

OCONEE NUCLEAR STATION, UNIT NOS. 1, 2 AND 3
DOCKET NOS. 50-269, 50-270, 50-287 / RENEWED LICENSE NOS. DPR-38, DPR-47 AND
DPR-55

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT NO. 1
DOCKET NO. 50-400 / RENEWED LICENSE NO. NPF-63

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-261 / RENEWED LICENSE NO. DPR-23

**SUBJECT: RELIEF REQUEST IN ACCORDANCE WITH 10 CFR 50.55a(g)(5)(iii) FOR AN
ALTERNATIVE TO THE DEPTH SIZING QUALIFICATION REQUIREMENT OF
APPENDIX VIII, SUPPLEMENTS 2 AND 10 (18-GO-001)**

Ladies and Gentlemen:

Pursuant to 10 CFR 50.55a(g)(5)(iii), Duke Energy Carolinas, LLC and Duke Energy Progress, LLC (Duke Energy) hereby submits Relief Request 18-GO-001 requesting U.S. Nuclear Regulatory Commission (NRC) approval to use an alternative weld depth sizing qualification at Catawba Nuclear Station Units 1 and 2 (CNS), McGuire Nuclear Station Units 1 and 2 (MNS), Oconee Nuclear Station Units 1, 2, and 3 (ONS), Shearon Harris Nuclear Power Plant, Unit 1 (HNP) and H. B. Robinson Steam Electric Plant, Unit 2 (RNP). Enclosure 1 contains details regarding this request.

This submittal contains no new regulatory commitments. Duke Energy requests approval of this relief request within one year of NRC acceptance of this submittal. If you have questions concerning this request, please contact Art Zaremba, Manager, Fleet Licensing, at (980) 373-2062.

Sincerely,

Joseph Donahue
Vice President – Nuclear Engineering

Enclosure:

1. Relief Request in Accordance with 10 CFR 50.55a(g)(5)(iii) for an Alternative to the Depth Sizing Qualification Requirement of Appendix VIII, Supplements 2 and 10 (18-GO-001)

cc: (all with Enclosure unless otherwise noted)

C. Haney, Regional Administrator USNRC Region II
G. A. Hutto, III, USNRC Resident Inspector – MNS
J. Zeiler, USNRC Resident Inspector – HNP
J. D. Austin, USNRC Resident Inspector – CNS
E. L. Crowe, USNRC Resident Inspector – ONS
J. Rotton, USNRC Resident Inspector – RNP
M. C. Barillas, NRR Project Manager – HNP
D. Galvin, NRR Project Manager – RNP
A. L. Klett, NRR Project Manager – ONS
M. Mahoney, NRR Project Manager – CNS & MNS

**Duke Energy Carolinas, LLC
Duke Energy Progress, LLC**

Relief Request Serial #18-GO-001

Enclosure 1

**Relief Requested in Accordance with 10 CFR 50.55a(g)(5)(iii)
Alternative to the Depth Sizing Qualification Requirement of Appendix
VIII, Supplements 2 and 10**

**Relief Request Serial #18-GO-001
Enclosure 1**

1. ASME Code Component(s) Affected

1.1 Class 1 Dissimilar Metal and Alloy 82/182 Welds Listed in Tables 1A through 1G.

Table 1A
Catawba Unit 1 Welds

Component ID	ASME Category or Code Case/ Inspection Item	Description	Nominal Nozzle Wall Thickness at Weld (Approximate)
1RPV-W52-01 1RPV-W52-02 1RPV-W52-03 1RPV-W52-04	N-770-2/B	Upper Head Injection Upper Tube to Lower Tube Welds (Auxiliary Head Adapter Welds)	0.65"
1RPV-W51-01-SE 1RPV-W51-02-SE 1RPV-W51-03-SE 1RPV-W51-04-SE	N-770-2/B	Reactor Vessel Closure Head to Upper Head Injection Lower Tube Welds (Auxiliary Head Adapter Welds)	0.88"

Table 1B
Catawba Unit 2 Welds

Component ID	ASME Category or Code Case/ Inspection Item	Description	Nominal Nozzle Wall Thickness at Weld (Approximate)
2RPV-W79-101 2RPV-W80-101 2RPV-W81-101 2RPV-W82-101	N-770-2/B	Upper Head Injection Upper Tube to Lower Tube Welds (Auxiliary Head Adapter Welds)	0.65"
2RPV-W79-101SE 2RPV-W80-101SE 2RPV-W81-101SE 2RPV-W82-101SE	N-770-2/B	Reactor Vessel Closure Head to Upper Head Injection Lower Tube Welds (Auxiliary Head Adapter Welds)	0.88"
2RPV-201-121ASE 2RPV-201-121BSE 2RPV-201-121CSE 2RPV-201-121DSE	N-770-2/B	Reactor Vessel Cold Leg Nozzle to Safe End Welds	2.3"
2RPV-202-121ASE 2RPV-202-121BSE 2RPV-202-121CSE 2RPV-202-121DSE	N-770-2/A-2	Reactor Vessel Hot Leg Nozzle to Safe End Welds	2.4"

**Relief Request Serial #18-GO-001
Enclosure 1**

**Table 1C
McGuire Unit 1 Welds**

Component ID	ASME Category or Code Case/ Inspection Item	Description	Nominal Nozzle Wall Thickness at Weld (Approximate)
1RPV3-445E-SE 1RPV3-445F-SE 1RPV3-445G-SE 1RPV3-445H-SE	N-770-2/A-2	Reactor Vessel Hot Leg Nozzle to Safe End Welds	2.5"
1RPV3-445A-SE 1RPV3-445B-SE 1RPV3-445C-SE 1RPV3-445D-SE	N-770-2/B	Reactor Vessel Cold Leg Nozzle to Safe End Welds	2.4"
1RPV1-462C-SE 1RPV1-462B-SE 1RPV1-462A-SE 1RPV1-462D-SE	N-770-2/B	Reactor Vessel Closure Head to Upper Head Injection Lower Tube Welds (Auxiliary Head Adapter Welds)	0.63"
1NI1FW-38-1 1NI1FW-38-2 1NI1FW-38-3 1NI1FW-38-4	N-770-2/B	Upper Head Injection Upper Tube to Lower Tube Welds (Auxiliary Head Adapter Welds)	0.63"

**Table 1D
McGuire Unit 2 Welds**

Component ID	ASME Category or Code Case/ Inspection Item	Description	Nominal Nozzle Wall Thickness at Weld (Approximate)
2RPV-W51-01-SE 2RPV-W51-02-SE 2RPV-W51-03-SE 2RPV-W51-04-SE	N-770-2/B	Reactor Vessel Closure Head to Upper Head Injection Lower Tube Welds (Auxiliary Head Adapter Welds)	0.63"
2RPV-W52-01 2RPV-W52-02 2RPV-W52-03 2RPV-W52-04	N-770-2/B	Upper Head Injection Upper Tube to Lower Tube Welds (Auxiliary Head Adapter Welds)	0.63"

**Relief Request Serial #18-GO-001
Enclosure 1**

**Table 1E
Oconee Units 1, 2, and 3 Welds**

Component ID	ASME Category or Code Case/ Inspection Item	Description	Nominal Nozzle Wall Thickness at Weld (Approximate)
1-RPV-WR-53 1-RPV-WR-53A	N-770-2/B and B-F ¹ /B5.10	Unit 1 Reactor Vessel Cold Leg Core Flood Nozzle-to-Safe End Welds	1.5"
2-RPV-WR-53 2-RPV-WR-53A	N-770-2/B and N-716-1, R-A/R1.11 and R1.15	Unit 2 Reactor Vessel Cold Leg Core Flood Nozzle-to-Safe End Welds	1.5"
3-RPV-WR-53 3-RPV-WR-53A	N-770-2/B and N-716-1, R-A/R1.11 and R1.15	Unit 3 Reactor Vessel Cold Leg Core Flood Nozzle-to-Safe End Welds	1.5"

**Table 1F
Robinson Unit 2 Welds**

Component ID	ASME Category or Code Case/ Inspection Item	Description	Nominal Nozzle Wall Thickness at Weld (Approximate)
107/01DM 107A/01DM 107B/01DM	N-770-2/A-2 B-F ² /B5.10	Reactor Vessel Hot Leg Nozzle to Safe End Welds	2.4"
107/14DM 107A/14DM 107B/14DM	N-770-2/B B-F ² /B5.10	Reactor Vessel Cold Leg Nozzle to Safe End Welds	2.4"

**Table 1G
Harris Unit 1 Welds**

Component ID	ASME Category or Code Case/ Inspection Item	Description	Nominal Nozzle Wall Thickness at Weld (Approximate)
II-RV-001 RVNOZAI-N-01SE II-RV-001 RVNOZBI-N-03SE II-RV-001 RVNOZCI-N-05SE	N-770-2/B	Reactor Vessel Cold Leg Nozzle to Safe End Welds	2.4"
II-RV-001 RVNOZAO-N-06SE II-RV-001 RVNOZBO-N-02SE II-RV-001 RVNOZCO-N-04SE	N-770-2/D	Reactor Vessel Hot Leg Nozzle to Safe End Welds	2.5"

¹ Oconee Unit 1 is in the process of implementing Code Case N-716-1. Category B-F, Item B5.10 will be replaced by the applicable Category R-A, Item Numbers for welds 1-RPV-WR-53 and 1-RPV-WR-53A when the inservice inspection plan and schedule are revised to implement this case.

² Robinson Unit 2 is in the process of implementing Code Case N-716-1. Category B-F, Item B5.10 will be replaced by the applicable Category R-A, Item Numbers for the welds listed in Table 1F when the inservice inspection plan and schedule are revised to implement this case.

**Relief Request Serial #18-GO-001
Enclosure 1**

2. Applicable Code Edition and Addenda

- 2.1 ASME Boiler and Pressure Vessel Code, Section XI, 2007 Edition with the 2008 Addenda
- 2.2 The inservice inspection intervals for plants included in this request are identified in Table 2.

Table 2

Plant/Unit(s)	ISI Interval	Interval Start Date	Current Interval End Date
Catawba Nuclear Station Units 1 and 2	Fourth	08/19/2015 (Unit 1) 08/19/2015 (Unit 2)	12/06/2024 (Unit 1) 02/24/2026 (Unit 2)
McGuire Nuclear Station Units 1 and 2	Fourth	12/1/2011 (Unit 1) 07/15/2014 (Unit 2)	11/30/2021 (Unit 1) 12/14/2024 (Unit 2)
Oconee Nuclear Station Units 1, 2 and 3	Fifth	07/15/2014	07/15/2024
Robinson Nuclear Plant Unit 2	Fifth	07/21/2012	02/19/2023
Shearon Harris Nuclear Plant Unit 1	Fourth	09/09/2017	09/08/2027

3. Applicable Code Requirement

- 3.1 ASME Code Case N-770-2, as referenced in 10 CFR 50.55a(g)(6)(ii)(F), requires ultrasonic examination of Category A-2, B, and D welds fabricated from Alloy 82/182 material. Table 1, Note 4 of this case requires that ultrasonic examinations meet the applicable requirements of Mandatory Appendix VIII.
- 3.2 For Category B-F welds, IWA-2232 requires that ultrasonic examinations be conducted in accordance with Mandatory Appendix I. Mandatory Appendix I, I-2220 requires that ultrasonic examinations be qualified by performance demonstration in accordance with Mandatory Appendix VIII.
- 3.3 For Category R-A welds (Oconee only), examinations are performed in accordance with ASME Code Case N-716-1. This case does not provide alternative requirements to those specified in IWA-2232, so the requirements of IWA-2232 apply, as described in 3.2 above.
- 3.4 Mandatory Appendix VIII, Supplement 10, "Qualification Requirements for Dissimilar Metal Piping Welds", Paragraph 3.3(c) requires that "Examination procedures, equipment, and personnel are qualified for depth-sizing when the RMS error of the flaw depth measurements, as compared to the true flaw depths, do not exceed 0.125 in. (3 mm)."³
- 3.5 Mandatory Appendix VIII, Supplement 2, "Qualification Requirements for Wrought Austenitic Piping Welds", Paragraph 3.2(b) requires that examination procedures, equipment, and personnel are qualified for depth-sizing if the "RMS error of the flaw depths estimated by ultrasonics, as compared with the true depths, do not exceed 0.125 in. (3 mm)."

³ RMS (root mean square) is defined in Mandatory Appendix VIII, VIII-3120.

Relief Request Serial #18-GO-001
Enclosure 1

4. Impracticality of Compliance:

- 4.1 ASME Code Case N-695, "Qualification Requirements for Dissimilar Metal Piping Welds, Section XI, Division 1," is shown as acceptable for use in Regulatory Guide (RG) 1.147, Revision 18, dated March 2017. This case provides alternatives to the requirements of Appendix VIII, Supplements 2 and 10, but paragraph 3.3(c) of this case requires that "Examination procedures, equipment, and personnel are qualified for depth-sizing when the RMS error of the flaw depth measurements, as compared to the true flaw depths, do not exceed 0.125 in. (3 mm)." The requirement for the 0.125-inch RMS error depth sizing accuracy criteria of Code Case N- 695 is impractical because, although examination vendors have qualified for detection and length sizing in accordance with the requirements for examinations from the inside diameter (ID) surface, vendors have not met the established RMS error of 0.125 inch for indication depth sizing. Several process enhancements including systems, new search units, and software modifications have been implemented, but these have not been successful in demonstrating the ability to meet the required measurement error accuracy. For these reasons, Duke Energy believes that achieving the RMS error of 0.125 inches is impractical for use with the ID ultrasonic examination technology employed in the qualification efforts.
- 4.2 Compliance with the requirements of Appendix VIII, Supplement 2, paragraph 3.2(b) and Supplement 10, paragraph 3.3(c) is possible for examinations performed from the outside diameter (OD) surface. However, Duke Energy has determined that examinations performed from the OD surface result in significant and unnecessary personnel radiation exposure that can be avoided by performing these examinations remotely from the ID surface.
- 4.3 Vendors that Duke Energy is using for performing these examinations have demonstrated RMS errors between 0.179" and 0.212".

5. Proposed Alternative and Basis for Use:

- 5.1 For examination of welds 2.1 in. (54 mm) or greater in thickness, Duke Energy proposes to use ASME Code Cases N-695-1 and N-696-1 to perform qualified ultrasonic examinations from the ID surface of the welds.
- 5.1.1 Paragraph 3.3(d) of ASME Code Case N-695-1 states:
" (d) For qualifications from the inside-surface, examination procedures, equipment, and personnel are qualified for depth sizing if the RMS error of the flaw depth measurements, as compared to the true flaw depths, does not exceed 0.125 in. (3 mm) for piping less than 2.1 in. (54 mm) in thickness, or 0.250 in. (6 mm) for piping 2.1 in. (54 mm) or greater in thickness."
- 5.1.2 Paragraph 3.3(c) of ASME Code Case N-696-1 states:
" (c) Supplement 2 examination procedures, equipment, and personnel are qualified for depth-sizing if the RMS error of the flaw depth measurements as compared to the true flaw depths, does not exceed 0.125 in. (3 mm) for piping less than 2.1 in. (54 mm) in thickness, or 0.250 in. (6 mm) for piping 2.1 in. (54 mm) or greater in thickness, when they are combined with a successful Supplement 10 qualification."
- 5.1.3 Personnel, procedures, and equipment shall satisfy all requirements of Code Cases N-695-1 and N-696-1.

**Relief Request Serial #18-GO-001
Enclosure 1**

- 5.1.4 Flaws detected and measured as less than 50 percent through-wall depth shall be sized using personnel, procedures, and equipment qualified to meet the requirements of ASME Code Cases N-695-1 and N-696-1.
- 5.2 For examination of welds less than 2.1 in. (54 m) in thickness, Duke Energy proposes to comply with Code Case N-695, except as follows:
 - 5.2.1 Welds shall be examined using UT techniques that are qualified for flaw detection and length sizing using procedures, personnel and equipment qualified by demonstration in all aspects except depth sizing.
 - 5.2.2 A correction factor equal to the difference between the procedure qualification RMS error and 0.125 inches shall be added to the depths of any measured flaws, prior to comparison to the applicable acceptance criteria. The correction factor shall be applied to the most critical location on the flaw in relation to surface proximity.
 - 5.2.3 Eddy current (EC) examinations shall be performed to confirm whether any detected flaws are surface-breaking.
- 5.3 For all welds listed in this request, if any ID surface-breaking flaw is detected and measured (from the ID surface) as 50 percent through-wall depth or greater, the flaw shall be considered to be of indeterminate depth. Duke Energy shall repair the component, or shall perform a volumetric examination from the OD surface of the component to determine the flaw depth and shall evaluate the component for continued service in accordance with IWB-3132.3.
- 5.4 All other requirements of the ASME Code, Section XI and Code Case N-770-2 [as conditioned by 10 CFR 50.55a(g)(6)(ii)(F)] for which relief was not specifically requested apply, including the third party review by the Authorized Nuclear Inservice Inspector.
- 5.5 The proposed alternative for welds less than 2.1 in. (54 m) in thickness is essentially identical to that approved for use during the Catawba Unit 1 Third Inservice Inspection Interval (Precedent 7.4).
- 5.6 The proposed alternative may be used in lieu of the alternative approved in Relief Request RR-08, for the Robinson Nuclear Plant, Unit 2 Fifth Inservice Inspection Interval (Precedent 7.5).
- 5.7 Because compliance with the applicable requirements is impractical, this request is submitted pursuant to 10 CFR 50.55a(g)(5)(iii). Duke Energy believes that the proposed alternative provides reasonable assurance that flaws detected during examination will be sufficiently sized to disposition in accordance with acceptance standards of the ASME Code, Section XI and ASME Code Case N-770-2.

6. Duration of Proposed Alternative:

This alternative is requested for the inservice inspection intervals listed in Table 2 of this request.

Relief Request Serial #18-GO-001
Enclosure 1

7. Precedents:

The following requests for relief were granted by the NRC pursuant to 10 CFR 50.55a(g)(6)(i). These requests provide similar alternatives to those proposed above.

- 7.1 NRC letter to Entergy Operations, Inc., "Arkansas Nuclear One, Unit 1 - Relief Request NO. AN01-ISI-025, Relief From American Society Of Mechanical Engineers Section XI Table IWB-2500-1 Requirements (CAC No. MF7625)", dated August 29, 2016 (ADAMS Accession No. ML16237A082)
- 7.2 NRC letter to Pacific Gas and Electric Company, "Diablo Canyon Power Plant, Unit No. 2 - Inservice Inspection Program Relief Request NDE-RCS-SE-2R19, Associated With The Use Of Alternate Sizing Qualification Criteria Through a Protective Clad Layer (CAC NO. MF5348)", dated November 4, 2015 (ADAMS Accession No. ML15299A034)
- 7.3 NRC letter to Exelon Nuclear, "Three Mile Island Nuclear Station, Unit 1 - Relief Request RR-14-01 Regarding Alternative Root Mean Square Depth Sizing Requirements (TAC NO. MF4873)", dated September 15, 2015 (ADAMS Accession No. ML15163A249)
- 7.4 NRC letter to Duke Energy Carolinas, LLC, "Catawba Nuclear Station, Unit 1: Proposed Relief Request 14-CN-003, American Society Of Mechanical Engineers (ASME) Boiler And Pressure Vessel Code (ASME Code), Code Case N-695 (TAC NO. MF5447)", dated October 26, 2015 (ADAMS Accession No. ML15286A326)
- 7.5 NRC letter to Carolina Power & Light Company, H. B. Robinson Steam Electric Plant, Unit No.2 - Relief Request-08 From ASME Code Root Mean Square Error Value For the Fifth 10-Year Inservice Inspection Program Plan (TAC NO. MF1015), dated July 16, 2013 (ADAMS Accession No. ML13191A930)

8. References:

- 8.1 ASME Boiler and Pressure Vessel Code, Section XI, Division 1, 2007 Edition with the 2008 Addenda
- 8.2 ASME Code Case N-695, Qualification Requirements for Dissimilar Metal Piping Welds, Section XI, Division 1
- 8.3 ASME Code Case N-695-1, Qualification Requirements for Dissimilar Metal Piping Welds, Section XI, Division 1
- 8.4 ASME Code Case N-696-1, Qualification Requirements for Mandatory Appendix VIII Piping Examinations Conducted From the Inside Surface, Section XI, Division 1
- 8.5 ASME Code Case N-770-2, Alternative Examination Requirements and Acceptance Standards for Class 1 PWR Piping and Vessel Nozzle Butt Welds Fabricated With UNS N06082 or UNS W86182 Weld Filler Material With or Without Application of Listed Mitigation Activities, Section XI, Division 1