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CNS-14-097

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10 CFR 50.55a

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Subject: Duke Energy Carolinas, LLC (Duke Energy)
Catawba Nuclear Station, Units 1 and 2
Docket Numbers 50-413 and 50-414
Request for Relief Number 14-CN-002
Continued Use of High Density Polyethylene (HDPE) Material in Nuclear Safety Related Piping Application

Pursuant to 10 CFR 50.55a(a)(3)(i), please find attached Request for Relief 14-CN-002. This request for relief is to support the continued use of a proposed alternative of HDPE material in lieu of steel material in Nuclear Service Water System piping associated with the emergency diesel generator jacket water coolers. This request is for the fourth ten-year Inservice Inspection (ISI) interval at Catawba through the remainder of plant life, including applicable life extension. The NRC had previously approved the installation and use of HDPE material in this application for the third ten-year ISI interval under Request for Relief Number 06-CN-003, which was submitted on October 26, 2006 (ADAMS Accession Number ML063120215) and supplemented on June 21, 2007 (ADAMS Accession Number ML091350309), March 13, 2008 (ADAMS Accession Number ML080790104), May 29, 2008 (ADAMS Accession Number ML081550652), October 21, 2008 (ADAMS Accession Number ML083010087), and November 20, 2008 (ADAMS Accession Number ML090260120). The NRC approved Request for Relief Number 06-CN-003 in a Safety Evaluation dated May 27, 2009 (ADAMS Accession Number ML091240156).

The attachment to this letter contains all technical information necessary in support of this request for relief. Duke Energy is requesting NRC review and approval of this request by June 30, 2015.

Note that the May 27, 2009 Safety Evaluation for Request for Relief Number 06-CN-003 documented a regulatory commitment made by Duke Energy as stated below:

"Techniques to ensure the structural integrity of the fusion joints are still evolving. There is no performance or operating history regarding the use of HDPE piping in nuclear safety-related applications. The licensee made the following regulatory commitments to address this issue:

A047
NRR

1. *Prior to submitting the Catawba 1 and 2 fourth 10-year ISI interval plan, the licensee will submit information obtained from the above referenced testing program to the NRC staff. If the information supports operation of the HDPE piping using the PE 4710 material for the remainder of the plant life, then this information will be submitted to the NRC staff for information only.*

2. *If the results from the testing program do not support the use of HDPE piping with PE 4710 material for the remainder of the plant life, this information will be submitted to the NRC staff as a part of a subsequent request for an alternative to the fourth 10-year ISI Interval."*

Duke Energy has reviewed the information from the industry testing program on HDPE piping and maintains that it supports the continued use of PE 4710 material in the approved Catawba application for the remainder of the plant life, including applicable life extension. Therefore, this information will be submitted to the NRC staff for information only prior to submitting the Catawba 1 and 2 fourth 10-year ISI interval plan.

There are no regulatory commitments contained in this letter or its attachment.

If you have any questions concerning this material, please call L.J. Rudy at (803) 701-3084.

Very truly yours,

Kelvin Henderson
Vice President, Catawba Nuclear Station

LJR/s

Attachment

xc (with attachment):

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Duke Energy Corporation (Duke Energy)

Catawba Nuclear Station, Units 1 and 2

Relief Request Serial Number 14-CN-002

Alternative to Section XI Requirements Under 10 CFR 50.55a(a)(3)(i) for Continued Service of Class 3 Buried Piping Replaced Pursuant to Relief Request 06-CN-003

1. ASME Code Component(s) Affected

   ASME Class 3 buried piping in the Catawba Nuclear Service Water System serving the diesel generator jacket water coolers.

2. Applicable Code Edition and Addenda

   ASME Boiler and Pressure Vessel Code, Section XI, 2007 Edition through 2008 Addenda.

3. Applicable Code Requirement

   IWA-4221(b) requires that "An item to be used for repair/replacement activities shall meet the Construction Code specified in accordance with (1), (2), or (3) below." and IWA-4221(b)(1) requires that "When replacing an existing item, the new item shall meet the Construction Code to which the original item was constructed."

4. Reason for Request

   The Construction Code of record for buried ASME Class 3 piping is the ASME Boiler and Pressure Vessel Code, Section III, Subsection ND, 1974 Edition including Summer 1974 Addendum. This Construction Code and later editions and addenda of this Construction Code do not provide rules for use of high density polyethylene (HDPE) material. ASME Code Case N-755 and Code Case N-755-1 were issued by the ASME Boiler and Pressure Vessel Code Committee for use of HDPE but have not been approved for use by NRC Regulatory Guide 1.84, "Design, Fabrication, and Materials Code Case Acceptability, ASME Section III".

   This relief request is being submitted for approval for continued use of HDPE material installed pursuant to Catawba Relief Request 06-CN-003. Relief Request 06-CN-003 was originally submitted by Duke Energy on October 26, 2006, supplemented in response to NRC Requests for Additional Information (RAIs), and approved by the NRC on May 27, 2009. The NRC Safety Evaluation for Relief Request 06-CN-003 only approved the use of HDPE material for the third ten-year ISI interval. This new relief request applies only to the HDPE material that was installed during the third ten-year ISI interval in accordance with Relief Request 06-CN-003. No additional use of HDPE material is being requested by this relief request.

5. Proposed Alternative and Basis for Use

   Catawba proposes to continue use of the HDPE material installed in the Nuclear Service Water System during the fourth ten-year ISI interval. Pursuant to 10 CFR 50.55a(a)(3)(i), in lieu of the requirement of Section XI IWA-4221(b)(1), this alternative to the original Construction Code provides an acceptable level of quality and safety for repair/replacement activities for ASME Class 3 buried piping. HDPE material installed pursuant to Relief Request 06-CN-003 has been in service since 2010 for Unit 2 and since 2011 for Unit 1. There have been no leaks in this piping from corrosion or degradation during this period.

Basis for Use of Proposed Alternative

The primary advantage in using HDPE material versus carbon steel pipe material is its resistance to fouling, corrosion, and microbiologically induced corrosion (MIC). The resistance of HDPE material to corrosion and fouling (i.e., tubercle formation and MIC) ensures long term reliability from a structural integrity and flow standpoint.

The more than 20,000 linear feet of HDPE material in service in the Catawba non-safety related Low Pressure Service Water System since 1998 continues to demonstrate the acceptability of this material for this service.

Description of Proposed Alternative

Materials
Based on Catawba experience, HDPE material does not experience fouling or corrosion and is not susceptible to galvanic attack, since polyethylene is an electrical insulating material. By comparison, installed carbon steel metallic service water piping at Catawba has experienced severe fouling and significant internal and external corrosion. Polyethylene is also not susceptible to localized degradation from microbiological attack, which has occurred frequently with some corrosion resistant steel alloys.

Design
The same design criteria are used for HDPE material and the original carbon steel material. Both polyethylene and the original carbon steel materials are qualified for identical loading conditions (e.g., pressure, temperature, seismic).

The ASME Boiler and Pressure Vessel Code, Section XI, 1998 Edition with 1999 and 2000 Addenda was used for repair/replacement activities for installation of the HDPE material that was installed pursuant to Relief Request 06-CN-003.

Fabrication and Installation
Catawba fusing procedures are based on fusing process variables from PPI TR-33/2006, "Generic Butt Fusion Joining Procedure for Field Joining of Polyethylene Pipe". Catawba verified PPI TR-33 pressure and temperature procedure parameters by tensile impact testing coupons using 12-inch NPD, SDR 11 fused joints made at all of the procedure limiting values.

During installation of the HDPE material, Catawba conducted in-process tensile impact testing of fused joints in accordance with ASTM 2634, "Standard Test Method for Laboratory testing of PE Butt Fusion Joints using Tensile Impact Method". Relief Request 06-CN-003 required tensile impact testing of a minimum of 10% of field joints for each production shift and also tensile impact testing of a minimum of one random joint for each four work shift periods. In actuality, 43% of the field joints were tensile impact tested during installation, exceeding the 10% minimum requirement by a large margin. 14% of the joints were randomly chosen for tensile impact testing. All joints tested passed the ASTM 2634 tensile impact test.

Extensive in-process tensile impact testing during HDPE material installation, use of qualified fusing procedures, fusing operator training, data logger recording of fusing

parameters, engineering review of data logger results, hydrostatic testing of completed joints, camera inspection inside of completed joints, and quality assurance inspection of joints during and after fusing provide a very high level of confidence in the integrity of the piping joints.

Flaw Depth Allowance
A maximum scratch depth allowance of 0.041 inches was used for installation of HDPE material pursuant to Relief Request 06-CN-003. This corresponds to a scratch depth allowance of 3.5% of the pipe wall thickness. Pipe with unacceptable scratches was either cut out or the scratches were removed by blending smoothly for cases where the remaining wall thickness exceeded the design wall thickness.

Examination
VT-1 visual examination was required and performed for all fused joints. VT-2 examinations were performed during hydrostatic testing for all fused joints and external surfaces of the piping.

Testing
All HDPE material and fused joints were hydrostatically pressure tested at 1.5 times the design pressure plus 10 psig after the installation of the piping.

Overpressure Protection
The HDPE material has the same overpressure protection as the original carbon steel material.

Test Program for HDPE Material for Application in ASME Class 3 Piping
The NRC Safety Evaluation for Relief Request 06-CN-003 requires that Catawba submit information obtained from the ongoing testing and research prior to submitting the Catawba Unit 1 and Unit 2 fourth ten-year ISI interval plan. Research and testing performed by EPRI for HDPE material to date supports operation of the Catawba units for the remainder of plant life. In accordance with the NRC Safety Evaluation for Relief Request 06-CN-003, this research information will be submitted to the NRC for information only.

Conclusion
The use of HDPE material in the diesel generator jacket water cooler application will continue to provide improved Nuclear Service Water System performance and will enhance system reliability. Based on the information provided in Relief Request 06-CN-003, the proposed alternative will continue to provide an acceptable level of quality and safety.

6. Duration of Proposed Alternative

The use of the proposed alternative is requested beginning with the start of the fourth ten-year ISI interval for Catawba Nuclear Station, Unit 1 and Unit 2, throughout the remainder of plant life (including licensed plant life extension), through December 5, 2043.

The Unit 1 and Unit 2 fourth ten-year ISI interval is currently scheduled to begin on August 19, 2015.