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

June 19, 2015

Mr. Kelvin 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 14-CN-002, ALTERNATIVE TO AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) SECTION XI REQUIREMENTS FOR CLASS 3 BURIED PIPING (TAC NOS. MF4864 AND MF4865)

Dear Mr. Henderson:

By letter dated September 15, 2014 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14265A043), as supplemented by letters dated December 2, 2014 (ADAMS Accession No. ML14338A620), and May 18, 2015 (ADAMS Accession No. ML15142A412), Duke Energy Carolinas, LLC requested approval of an alternative to the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, for Class 3 piping, for the fourth 10-year inservice inspection (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)(z)(1), the licensee requested continued use of installed high density polyethylene piping on the basis that the alternative examination provides an acceptable level of quality and safety.

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the subject request and concludes, as set forth in the enclosed safety evaluation, the examinations exams were performed to the extent practical and provide reasonable assurance of structural integrity of the subject areas. Therefore, the NRC staff authorizes the alternative as requested in 14-CN-002.

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 14-CN-002

FOURTH 10-YEAR INSERVICE INSPECTION INTERVAL

DUKE ENERGY CAROLINAS, LLC

CATAWBA NUCLEAR STATION, UNITS 1 AND 2

DOCKET NOS. 50-413 AND 50-414

1.0 INTRODUCTION

By letter dated September 15, 2014 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14265A043), as supplemented by letters dated December 2, 2014 (ADAMS Accession No. ML14338A620), and May 18, 2015 (ADAMS Accession No. ML15142A412), the licensee, requested relief from the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI, associated with requirements for class 3 buried piping systems at Catawba Nuclear Station, Units 1 and 2. The applicable code requirement is IWA-4221(b), which requires that "An item to be used for repair/replacement activities shall meet the Construction Code specified in accordance with (1), (2), or (3)," and ASME Section XI, IWA-4221(b)(1), which requires that "when replacing an existing item, the new item shall meet the Construction Code to which the original item was constructed."

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(a)(z)(1), the licensee requested continued use of installed high density polyethylene (HDPE) piping on the basis that the alternative examination provides an acceptable level of quality and safety.

2.0 REGULATORY EVALUATION

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the pre-service 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.

10 CFR 50.55a(a)(z) states that alternatives to the requirements of paragraph (g) of 10 CFR 50.55a may be used, when authorized by the NRC, if the licensee demonstrates (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.

3.0 PROPOSED ALTERNATIVE AND JUSTIFICATION

The ASME Code components affected by the licensee's request are as follows:

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

The ASME Section XI Code of Record for the 4th ISI interval is the ASME Section XI, 2007 Edition through the 2008 Addenda. Relief is requested for the fourth ISI interval, which is scheduled to begin on August 19, 2015, and is currently scheduled to end on November 19, 2025.

The applicable code requirement is IWA-4221(b), which requires that "An item to be used for repair/replacement activities shall meet the Construction Code specified in accordance with (1), (2), or (3)," and ASME Section XI, IWA-4221(b)(1), which requires that "when replacing an existing item, the new item shall meet the Construction Code to which the original item was constructed."

The Construction Code of record for buried ASME Class 3 piping is ASME Boiler and Pressure Vessel Code, Section III, Subsection ND, 1974 Edition, through Summer 1974 Addenda. This Construction Code and later editions and addenda of this Construction Code do not provide rules for the design, fabrication, installation, examination and testing of piping constructed using HDPE material. On May 27, 2009, the NRC approved HDPE for use for the buried section of the SWS system (RN system) in lieu of the carbon steel piping for Catawba's third 10-year ISI interval (ML090970160).

The licensee has stated that in-service testing of the subject piping is not feasible and as such, the licensee is basing support of continued structural integrity of the piping on reliability of the piping material, adequate installation requirements and flow testing of the system.

Catawba has installed approximately 20,000 linear feet of HDPE material in non-safety related Low Pressure Service Water System (RL system), which has been in service since 1998. The licensee stated the continued operability of this system provides evidence of long-term reliability of HDPE material, and in particular continued operability of the safety-related RN system because of the following considerations:

1. The material used in the RN system is bi-modal 4710 resin. The RL system used several types of resin, however, where bi-modal resin was used in the RL system, it was the same resin and pipe manufacturer for both the RN and RL systems.

2. Installation practices were more rigorous for the RN system. With the improved fusing procedure for the RN system, the joints should be of equal or greater quality than the RL system.

3. The RL system used a 10% nominal wall thickness gouge depth allowance, whereas the RN system was limited to 3.5%. RL system piping would be expected to exhibit degradation due to slow crack growth before the RN system piping because of this. Using the installed RL system piping to identify degradation resulting from an installation practice is conservative for the RN system piping.

4. Both systems use the same water source and therefore have the same water chemistry.

5. System design parameters (pressure and temperature) are similar for the two systems. The RL system is subjected to water temperatures above ambient lake temperature whenever the plant is in operation, as many plant non-safety related heat exchangers and motor coolers reject heat loads to the RL system. In contrast, the RN system is only subjected to temperatures above inlet header temperature during diesel generator operation. Using the RL system for monitoring HDPE for degradation is conservative since the RN system has only seen about 300 hours of operation at elevated temperatures.

6. The RL system piping is used inside the plant as well as in buried piping and as such is accessible for inspection and any leakage from this piping would be easily identified.

In the supplemental letter, the licensee stated that the RL piping is inspected during operator rounds performed each shift. Any leakage from RL piping is identified and documented in either the Corrective Action Program or the Fluid Leak Management program. In addition, the RL system engineer is required to perform a system walkdown annually and the piping is also inspected during plant maintenance activities. Any leakage found during either inspection would be evaluated using the Corrective Action Program. The licensee also provides a table of known leakage in the RL system and the action taken in regards to the RN system. As a result of recent operating experience with the HDPE flange joint leakage in the RL system, Catawba will perform VT-2 inspections of accessible RN system HDPE flanges. These inspections will encompass eleven underground vaults containing sixteen HDPE flanged joints and will occur during the fourth ISI interval.

The licensee performs an unimpaired flow test IWA-5244(b)(2) in conjunction with visual examinations of the ground surface areas. For each segment of buried pipe, periodic flow testing is performed in accordance with the flow balance test procedure for each train. These surveillance procedures require flow to be measured, recorded, and compared to established acceptance criteria to provide assurance that flow is not impaired during operation. The licensee stated that the visual examinations and unimpaired flow tests provide reasonable assurance of the structural and leak-tight integrity of the buried components.

The licensee proposed to continue use of the HDPE piping that was installed in the ESW system during the third ISI interval for the fourth ISI interval that is scheduled to begin on August 19, 2015 and end on November 19, 2025.

4.0 NRC STAFF EVALUATION

The use of HDPE was approved at Catawba for the third 10-year ISI interval in May 2009. The NRC staff has been involved in implementation of HDPE for use in nuclear power plants for several years and understands that the primary advantage is using HDPE in lieu of carbon steel is its resistance to corrosion, which ensures long-term reliability of structural integrity. With nearly 20 years of inservice history, there is compelling evidence that the continued use of HDPE will provide an acceptable level of quality and safety. However, since the licensee is unable to perform periodic inservice pressure testing, continued use of HDPE in the RN system is limited to the fourth 10 year ISI interval.

The NRC staff reviewed the information provided in support of this request. NRC staff evaluated the licensee's assertion that the RL system constitutes a leading indicator for the safety-related RN system. The NRC staff finds the licensee's assertion that leakage is more likely to occur in the non-safety RL system piping and monitoring of this system in addition to the RN system provides additional assurance of the continued operability of HDPE to be valid. The RL system has a greater potential for slow crack growth for several reasons. The RL system uses both uni-modal and bi-modal resins, whereas the RN system only uses the bi-modal resin. The uni-modal resin has a lower resistance to slow crack growth. The RL system also allowed a 10% nominal wall thickness gouge depth as compared to the 3.5% for the RN system. A greater percent gouge depth would be expected to degrade quicker. In addition, the RL system has consistently operated at higher temperatures than the RN system, which also would contribute to a faster growth rate. Because of these three reasons, the RL system piping would be expected to exhibit degradation before the RN system. The licensee monitors the RL piping through daily walk downs and yearly system inspections. Any leakage is evaluated through the Corrective Action Program and results are incorporated into inspection of the RN piping. These inspections and evaluation of any leakage provides reasonable assurance that the RL piping is in good working order.

The licensee currently monitors the RN system with an unimpaired flow test in conjunction with visual examinations of the ground surface areas. In addition, based on operating experience in the RL piping, the licensee will perform VT-2 inspections of accessible RN system HDPE flanges. The NRC finds that the visual examinations, unimpaired flow tests and using the RL piping as a leading indicator of operability provide reasonable assurance of the structural and leak-tight integrity of the buried components.

5.0 CONCLUSION

As set forth above, the NRC staff determines that the proposed alternative provides an acceptable level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1). Therefore, the NRC staff authorizes the continued use of HDPE for the fourth ISI interval at Catawba Units 1 and 2, which is scheduled to begin on August 19, 2015, and end on November 19, 2025.

All other requirements of the ASME Code for which relief has not been specifically requested and authorized remain applicable, including a third party review by the Authorized Nuclear In-service Inspector.

Principal Contributors: M. Audrain, NRR

Date of issuance: June 19, 2015

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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Safety Evaluation

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