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

November 10, 2015

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

SUBJECT: CATAWBA NUCLEAR STATION UNIT 1: PROPOSED RELIEF REQUEST 15-CN-001, ALTERNATE REPAIR OF A MAIN STEAM SYSTEM BRAIDED FLEX-HOSE (CAC NO. MF5875)

Dear Mr. Henderson:

By letter dated March 19, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15082A074), as supplemented by letters dated May 4, July 16 and September 4, 2015 (ADAMS Accession Nos. ML15127A170, ML15201A499 and ML15253A487, respectively), Duke Energy Carolinas, LLC (the licensee) requested approval of a proposed alternative to the requirements the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," Appendix IX, "Mechanical Clamping Devices for Class 2 and 3 Piping Pressure Boundary," at Catawba Nuclear Station (Catawba), Unit 1. The licensee submitted relief request (RR) 15-CN-001 to use a mechanical clamp on piping that forms part of the containment boundary to isolate a leaking flex-hose that is part of level instrument 1SMLS-5710.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(2), the licensee proposed an alternative to the requirements of Appendix IX, Article IX-1000, Paragraph (c)(2) of ASME Code Section XI, to repair the flex-hose using a mechanical clamp on the basis that complying with the specified ASME Code requirement would result in a Unit 1 shutdown which would result in hardship without a compensating increase in the level of quality and safety. This requested alternative is related to the containment boundary.

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the subject request and concludes, as set forth in the enclosed safety evaluation, that complying with the requirements of the ASME Code, Section XI, Article IX, Article IX-1000, Paragraph (c)(2), would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

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,

Michael T. Markley, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-413

Enclosure:
Safety Evaluation

cc w/encl: Distribution via ListServ

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST CATAWBA 15-CN-001

ALTERNATE REPAIR OF A MAIN STEAM SYSTEM BRAIDED FLEX-HOSE

DUKE ENERGY CAROLINAS, LLC

CATAWBA NUCLEAR STATION, UNIT 1

DOCKET NO. 50-413 (CAC NO. MF5875)

1.0 INTRODUCTION

By letter dated March 19, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15082A074), as supplemented by letters dated May 4, July 16 and September 4, 2015 (ADAMS Accession Nos. ML15127A170, ML15201A499 and ML15253A487, respectively), Duke Energy Carolinas, LLC (the licensee) requested approval of a proposed alternative to the requirements the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," Appendix IX, "Mechanical Clamping Devices for Class 2 and 3 Piping Pressure Boundary," at Catawba Nuclear Station (Catawba), Unit 1. The licensee submitted relief request (RR) 15-CN-001 to use a mechanical clamp on piping that forms part of the containment boundary to isolate a leaking flex-hose that is part of level instrument 1SMLS-5710.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(2), the licensee proposed an alternative to the requirements of Appendix IX, Article IX-1000, Paragraph (c)(2) of ASME Code Section XI, to repair the flex-hose using a mechanical clamp on the basis that complying with the specified ASME Code requirement would result in a Unit 1 shutdown which would result in hardship without a compensating increase in the level of quality and safety. This requested alternative is related to the containment boundary.

2.0 REGULATORY EVALUATION

Adherence to Section XI of the ASME Code is mandated by 10 CFR 50.55a(g)(4), which states, in part, that ASME Code Class 1, 2, and 3 components (including supports) will meet the requirements, except the design and access provisions and the pre-service examination requirements, set forth in the ASME Code, Section XI.

10 CFR 50.55a(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.

Based on the above, the NRC staff finds that regulatory authority exists for the licensee to request and the Commission to authorize the proposed alternative requested by the licensee.

3.0 TECHNICAL EVALUATION

3.1 ASME Code Component Affected

The affected component is identified as a braided flex-hose that is part of level instrument 1SMLS-5710. The flex-hose is ½-inch SA-213 TP304 stainless steel with a 2500 lb. rating. The flex-hose is isolable by two ½-inch 1500 lb. rated SA-182 Grade F316 stainless steel globe valves on each side of the flex-hose. The piping material between the root valves is ½-inch Schedule 80 SA-376 TP304 stainless steel. The aforementioned components are part of the Main Steam (MS) System, have a design pressure of 1200 pound per square inch absolute (psia), a design temperature of 600°F, an ASME Code Class 2 designation and are part of the containment boundary.

3.2 Applicable Code Edition and Addenda

The Catawba, Unit 1, third 10-year Inservice Inspection (ISI) interval began on June 29, 2005, and is currently scheduled to end on June 29, 2016. The ASME Code Section XI edition and addenda applicable to the third 10-year interval is the 1998 Edition through the 2000 Addenda.

3.3 Applicable Code Requirement

ASME Code, Section XI, IWA-4133 states that mechanical clamping devices used to replace piping pressure boundary shall meet the requirements of Appendix IX.

ASME Code, Section XI, Appendix IX, provides requirements for the design and use of mechanical clamping devices for class 2 and 3 piping pressure boundary.

3.4 Proposed Alternative and Basis for Use

On August 12, 2014, the licensee identified a steam leak from a ½-inch SA213 TP304 stainless steel ASME Code Class 2 braided flex-hose that is part of level instrument 1SMLS-5710. Instrument 1SMLS-5710 is located within the containment isolation boundary of the Main Steam 1A Containment Penetration (M113) identified as Item 91 within the Updated Final Safety Analysis Report (UFSAR) Table 6-77, Unit 1 Containment Isolation Valves Data. The level switch is located in the Unit 1 Exterior Doghouse and controls valve 1SM-89 which dumps accumulated condensate to the Unit 1 main condenser as required. The licensee stated that the flex hose was isolated by closing four stainless steel root valves (two on each side of the flex hose). Once isolated, the licensee discovered that minor leakage still occurred from the flex-hose due to valve seat leakage past the upstream root valves. The licensee stated that the leaking flex-hose and root valves are located within the containment boundary.

The licensee stated that Unit 1 main steam isolation valves (MSIVs) are not required to be leak rate tested, per UFSAR Table 6-77 "Unit 1 Containment Isolation Valve Data," due to the main steam line being connected to the secondary side of the steam generator which is kept at a higher pressure than the primary side immediately after a loss-of-coolant accident (LOCA) occurs. Any leakage between the primary and secondary sides of the steam generator is directed inward to containment (i.e., the main steam header pressure is maintained higher than peak containment pressure). The licensee determined that the current steam leak does not invalidate any safety analysis calculations with regards to a postulated steam generator tube rupture (exam).

The licensee stated that because the root valves available to isolate the leaking flex hose are not leak-tight and are located upstream of the MSIVs, a unit shutdown would be required to facilitate a code-compliant repair. To enable complete isolation of the leak to remove and cap off the leaking flex-hose, the licensee is seeking an alternative to the requirements of ASME Code, Section XI, Appendix IX, Paragraph (c)(2). The licensee stated that because ASME Code Section IX, Appendix IX, Article IX-1000, Paragraph (c)(2) prohibits the use of mechanical clamping devices on portions of piping systems that form the containment boundary, an alternative to the Code requirements is required. The licensee proposed its alternative pursuant to 10 CFR 50.55a(z)(2) on the grounds that compliance with the specified requirement, which would result in a Unit 1 shutdown, would result in hardship without a compensating increase in the level of quality and safety.

The licensee's alternative repair involves installation of a mechanical clamp, designed to ASME Code Section XI, Appendix IX, between one or both sets of root valves with minor through valve leakage followed by the installation of an ASME Code Class 1 injection valve. After installation of the injection valve, a 3/16-inch diameter hole shall be drilled in the pipe to facilitate sealant injection to stop through valve leakage. The licensee stated that the sealant that will be injected into the pipe to isolate the leakage through the root valves has an application temperature range of 248°F to 842°F which bounds the system design temperature of 600°F. The licensee further stated that the sealant meets the licensee's power chemistry program limits for chlorides, fluorides, zinc, lead and sulfur to minimize the potential for stress corrosion cracking in stainless steel piping. After sealant injection is completed, the mechanical clamp and closed injection valve will serve as part of the ASME Code Class 2 pressure boundary. After verification that the leak has been fully isolated, the braided flex-hose shall be removed and ASME Code compliant caps (or plugs) shall be installed on the end of the outboard root valves and will also serve as part of the Class 2 pressure boundary until the braided flex-house, affected root valves, and piping can be replaced. The licensee stated that piping between the leaking root valves has been evaluated and the structural and leak-tight integrity of this piping shall be maintained during the installation of the clamp, during leak injection, and during subsequent operation until a permanent code-compliant repair/replacement activity can be performed. The licensee stated that other than its proposed alternative to Appendix IX, Article IX-1000, Paragraph (c)(2), it will meet all other ASME Code requirements.

3.5 Duration of Proposed Alternative

The licensee's proposed alternative to ASME Code is applicable for the third 10-year Inservice Inspection Interval at Catawba Nuclear Station, Unit 1, which began on June 29, 2005, and is currently scheduled to end on June 29, 2016. The licensee proposed alternative is requested until Code repair/replacement activities can be performed on level instrument 1SMLS-5710

piping and flex-hose during refueling outage 1EOC22 (fall 2015) or during a forced outage of sufficient duration before refueling outage 1EOC22.

4.0 NRC STAFF EVALUATION

The licensee is proposing to use a mechanical clamping device that will comply with all ASME Code Section XI, Appendix IX requirements with the exception of Appendix IX, Article IX-1000, Paragraph (c)(2), which prohibits the use of clamping devices on portions of a piping system that form the containment boundary. The clamp will be used to inject sealant in piping between root valves which are located upstream of a leaking flex hose that is part of level instrument 1SMLS-5710. The injection of sealant is intended to stop root valve seat leakage in order to remove the leaking flex hose and install ASME Code compliant caps (or plugs). The mechanical clamp may be installed between one or both sets of root valves that isolate level instrument 1SMLS-5710 and the leaking flex-hose.

The typical use of a mechanical clamping device is to provide a temporary pressure boundary around degraded piping. The licensee intends to install the clamp around 0.5-inch Schedule 80 (0.15-inch nominal wall thickness) stainless steel pipe between one or both sets of root valves upstream of level instrument 1SMLS-5710. The section of piping encapsulated by the clamp is not known to be degraded. After installation of the clamp and an injection valve, the licensee will then drill a 3/16 hole to inject sealant into the pipe, thus transferring the pressure boundary from the pipe to the mechanical clamp.

As required by ASME Code, Section XI, the mechanical clamp used by the licensee must meet all design requirements of Appendix IX, Article IX-3000 and be fabricated from materials meeting the requirements of Article IX-4000. The NRC staff verified that these requirements have been met. The NRC staff also verified that the sealant is compatible for use with stainless steel piping and the design temperature of the system is bounded by the temperature rating of the sealant. The NRC staff notes that the 3/16-inch hole (defect) drilled into the pipe is unlikely to grow during operation due to its size, geometry and the short duration that this alternative will be used (until November 2015). The licensee's alternative only applies to Paragraph (c) of Article IX-1000.

The basis for the limitation in Paragraph (c) of Article IX-1000 for use of a mechanical clamping device in piping that forms the containment boundary is to prevent temporary repair of containment boundaries, which could depressurize and create the potential for interactions between the affected line and the containment atmosphere during accident conditions. The licensee evaluated the current steam leak, which is adjacent to the proposed location of the mechanical clamp, and forms part of the containment boundary. The licensee stated that because the secondary side of the steam generator is kept at a higher pressure than the primary side immediately after a LOCA, any leakage between the primary side and the secondary side of the steam generator during a LOCA would be directed inward to containment. Additionally, the licensee evaluated the current steam leak against consequences during a postulated SGTR and determined that the current steam leak does not invalidate any safety analysis calculations with regards to a SGTR. The NRC staff finds that the licensee has provided adequate information to address the potential for interactions between the affected line (with mechanical clamp) and the containment atmosphere during accident conditions and, therefore, the licensee's alternative to the limitation in Paragraph (c) of Article IX-1000 is acceptable.

The NRC staff concludes that the clamping device has been designed in full compliance with the requirements of ASME Code, Section XI, Article IX-3000, and materials have been specified in accordance with Article IX-4000. The design of the clamping device also meets or exceeds the design rating of the associated piping. Given that the clamping device meets all design and materials requirements of ASME Code, Section XI, Appendix IX and the licensee has adequately addressed the potential for interactions between the affected line and the containment atmosphere during accident conditions, the NRC staff finds that the use of the mechanical clamp, with sealant injection, is an acceptable temporary leak repair method, and that the clamp is suitable for the intended application and capable of performing its specified design functions.

The NRC staff concludes that requiring the licensee to perform a permanent ASME Code repair would impose a hardship because the affected piping cannot be isolated and; therefore, the plant would need to be shut down in order to perform a permanent Code repair. The shut down and subsequent restart would unnecessarily cycle plant systems and components and expose personnel to unnecessary additional radiation exposure. Therefore, the NRC staff finds that complying with the specified ASME Code requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

5.0 CONCLUSION

As set forth above, the NRC staff concludes that the proposed alternative provides a reasonable assurance of structural integrity of the subject Main Steam System piping at Catawba Nuclear Station, Unit 1. The NRC staff concludes that complying with the requirements of ASME Code, Section XI, Appendix IX, Article IX-1000, Paragraph (c)(2), would result in hardship or unusual difficulty without a compensating increase in the 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)(2).

Therefore, the NRC authorizes the use of Relief Request 15-CN-001, at Catawba Nuclear Station, Unit 1, until the next scheduled refueling outage 1EOC22 (fall 2015) or during a forced outage of sufficient duration before refueling outage 1EOC22.

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

Principal Contributor: R. Davis, NRR

Date: November 10, 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/

Michael T. Markley, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-413

Enclosure:
Safety Evaluation

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