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

Subject: Duke Energy Carolinas, LLC (Duke Energy)
McGuire Nuclear Station, Unit 1
Docket No. 50-369
Relief Request 16-MN-002
Alternative to Defect Removal Prior to Performing Repair Activities on Nuclear Service Water System Piping
Response to Request for Additional Information

By letter dated June 23, 2016, Duke Energy submitted the subject relief request for Nuclear Regulatory Commission's (NRC's) approval. By electronic mail dated September 14, 2016, the NRC requested for additional information regarding this relief request. The attachment to this letter contains Duke Energy's response to the NRC's questions.

If you have any questions or require additional information, please contact P.T. Vu of Regulatory Affairs at (980) 875-4302.

Sincerely,

Jeremy Glean
for

Steven D. Capps

Attachment

A047 NRR

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ATTACHMENT

RELIEF REQUEST 16-MN-002

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

By letter dated June 23, 2016 (Agencywide Documents and Access Management System (ADAMS) Accession No. ML16180A177), Duke Energy (the licensee) requested relief from the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, IWA-4400, at McGuire Nuclear Station Unit 1. The licensee requested to use the alternative in contingency Relief Request 16-MN-002 for the repair of nuclear service water system piping. To complete its review, the Nuclear Regulatory Commission (NRC) staff requests the following additional information:

Question 1: Paragraph 5.1.3, Item 2, of the relief request states that "...The defective area shall be encapsulated on the outside diameter of the pipe using pressure retaining parts that comply with the Construction Code and Owner's requirements..." Provide the title of the Construction Code (e.g., ASME Code, Section III, year of edition or ANSI B31.1, year of edition).

Response: Original Construction Code is ANSI B31.7 Class III, 1969 Edition including Addenda a, b, & c. However, Duke Energy Specification MCS-1206.00-02-0002, "Specification for the Design Of Power Piping Systems Materials And Components, QA Conditions 1, 2, 3, & 4" specifies that repairs, replacements and modifications performed under ASME XI shall be made in accordance with ASME III, Subsection ND, 1971 Edition with Winter 71 Addenda.

Question 2: Paragraph 5.1.3, Item 3, of the relief request states that "...For corrosion initiated on the I.D. of the pipe (with or without through-wall leakage), and for corrosion initiated on the O.D. of the pipe that results in through-wall leakage, the repair/replacement activity shall be designed such that the I.D. of the encapsulation is greater than the maximum diameter of the defective area plus twice the nominal thickness of the component. In addition, the nominal thickness of the encapsulation and its connecting weld to the pipe O.D. surface shall be equal to, or greater than, the nominal wall thickness of the pipe..." The above first sentence does not discuss the encapsulation design requirement for the case that corrosion is initiated on the exterior surface of the pipe that results in no pin hole. Discuss the design requirement for the encapsulation if corrosion is initiated on the exterior surface of the pipe that results in no pin hole.

Response: As noted in Section 5.1.1 of the original request, encapsulations shall not be used at locations where corrosion initiated on the exterior surface of the pipe can be repaired utilizing suitable techniques such as wall thickness restoration by welding without jeopardizing the integrity of the pressure boundary. For corrosion initiated on the exterior surface of the pipe that results in no pin hole, where an encapsulation is needed, it shall be designed such that the I.D. of the encapsulation is greater than the maximum diameter of the defective area plus twice the nominal thickness of the component. In addition, the nominal thickness of the encapsulation and its connecting weld to the pipe O.D. surface shall be equal to, or greater than, the nominal wall thickness of the pipe. The additional details of the design are covered in paragraph 5.1.3, Item 5.a of the original submittal.

Question 3: Paragraph 5.1.3, item 5.b, of the relief request requires that for internal general corrosion of the pipe wall that does not result in leakage, the design of the encapsulation should use 2 mils per year as the corrosion rate. Paragraph 5.1.3, Item 5.c requires that for internal pitting corrosion, 4 mils per year should be used as the corrosion rate for the design. By letter dated December 14, 2010, in a response to the NRC request for additional information Question Number 2.a.2, for the review of Relief Request 09-MN-002 (ADAMS Accession No, ML103560592), the licensee stated that the "...The lateral corrosion rate (in any single direction)

of the defective area shall be not less than 8 mils/year, which is approximately 4 times the average general corrosion rate and 2 times the average pitting corrosion rate of surfaces on the interior of the RN pipe, based on data collected during the service life of the RN piping..." Also, in response to NRC Question Number 2.a.2 and 2.a.3, the licensee stated that it used a factor of 2 to the corrosion rate in the encapsulation design. The NRC staff notes that Relief Request 09-MN-002 is related to the encapsulation repair. Discuss why the lateral corrosion rate of 8 mils per year or a factor of 2 is not part of the encapsulation design in the current relief request, 16-MN-002.

Response: To be consistent with Relief Request 09-MN-002 (ADAMS Accession No. ML103560592, a lateral corrosion rate (in any single direction) of the defective area of not less than 8 mils/year shall be utilized in all encapsulation designs.

Question 4: Paragraph 5.1.3, Item 9, of the relief request discusses welding of encapsulation to the pipe. Cite the reference (e.g., the ASME Code) for the welding procedures and process that will be followed for the weld joint between the encapsulation and the pipe base metal.

Response: Duke Energy will utilize IWA-4400 which specifies requirements for welding, brazing, metal removal, fabrication, and installation. Manual welding of encapsulations on water-backed piping shall use the Shielded Metal Arc Welding (SMAW) process and low- hydrogen electrodes.

Question 5: Paragraph 5.1.3, Item 11, of the relief request states that "The encapsulation shall be pressure tested in accordance with IWA-4540 upon completion of the repair/replacement activity to confirm the leak-tight integrity of the encapsulation and its connecting welds to the pipe wall..." (a) The 2007 edition of the ASME Code, Section XI, IWA-4540 has two subsections. IWA-4540(a) requires pressure tests. IWA-4540(b) exempts pressure tests for certain components. Specify the exact subsection of IWA-4540 that the proposed alternative will follow. (b) Discuss the pressure that will be used for the pressure testing for the encapsulation, the medium that will be used, and the hold time. (c) It appears that the pressure test as specified in Item 11 is performed on the inside of the encapsulation, not the subject piping. If the repair is for a through-wall leak on the subject piping, discuss whether the subject piping will be pressure tested after encapsulation installation. If not, justify.

Response: (a) Encapsulations shall not be exempted from pressure testing for any reason (e.g. size) and shall be tested in accordance with IWA-4540(a).

(b) Encapsulations shall be tested with a pressure equivalent to that attained by the system during normal operation in accordance with the requirements of IWD-5221. The test medium shall be water, and the minimum hold time shall be 10 minutes (as required by IWA-5213(b) for noninsulated components).

c) The goal of the subject relief request is to avoid depressurizing the RN system since the piping for which the request is being made is unisolable. As such, the pipe will be under pressure during the repair and not tested after encapsulation installation. Duke Energy also believes this to also be acceptable per IWA-4540(a)..."Only brazed joints and welds made in the course of a repair/replacement activity require pressurization and VT-2 visual examination during the test."

Question 6: Confirm that a stress analysis will be performed considering all loads, including seismic, to address the presence of the encapsulation, including its weight.

Response: A stress analysis shall be performed considering all loads, including seismic, to address the presence of the encapsulation, including its weight. The encapsulation location will also be shown on applicable plant drawings.

Question 7: Paragraph 5.1.3, Item 13, requires visual examinations of ground surfaces above buried piping and underground piping in the vicinity of each encapsulation as well as each encapsulation in the Auxiliary building. The frequency of these visual examinations is at least once during each inservice inspection period. By letter dated September 28, 2010 (ADAMS Accession No, ML102790167), the licensee required visual examination of the installed encapsulation after every operating cycle as part of Relief Request 09-MN-002. Discuss why the inservice visual examination of the installed encapsulation(s) is reduced from every refueling outage to every inservice inspection period for Relief Request 16-MN-002.

Response: Duke Energy believes an inspection during every inservice inspection period is sufficient based on the expected low system corrosion rates. Additionally, a visual examination once each inspection period is consistent with visual examination requirements during system leakage testing of buried Class 3 components, as specified in IWA-5244(b)(1) and Table IWD-2500-1, Examination Category D-B, Item D2.10 in the 2013 Edition of Section XI.

Question 8: The relief request does not appear to provide a limitation on the minimum distance between two installed encapsulations. This limitation is to minimize residual stresses on the wall of the base metal. Provide a distance within which no two encapsulations can be installed nearby each other.

Response: In order to minimize residual stresses on the wall of the base metal, Duke Energy proposes the distance between the weld edges of any two encapsulations shall not be less than 2.5 $(R\, t_{nom})^{1/2}$, where R is the outer radius of the pipe being repaired and t_{nom} is the nominal thickness of the pipe being repaired. This value is consistent with limits specified in Figure 1 of ASME Code Case N-562-2.

Question 9: Given the potential that a large number of encapsulations could be installed in a small area of pipe, this could be indicative of a corrosion issue which is more significant than is typical (based on operating experience). Please describe an appropriate limit, e.g., number of repairs per unit length of pipe, which is considered acceptable for the proposed repair method.

Response: Duke Energy agrees that an area that might require a large number of encapsulations would be indicative of corrosion issue which is more significant than is expected (based on operating experience). Quantifying and defining a limit applicable to all scenarios is challenging. 20 of the maximum size encapsulations requested in a length of pipe is obviously more significant than 20 of the smallest size. However, should more than 10 encapsulations of any size be required in any 20 foot length of pipe, Duke Energy believes this would be indicative of a significantly degraded portion of pipe, and this alternative shall not be used at locations where the number of encapsulations exceeds this limit. Allowable spacing between such encapsulations is addressed in Question 8 above.