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10 CFR 50.55a

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-003
Response to Request for Additional Information

By letter dated August 10, 2016, Duke Energy submitted the subject Relief Request to the U.S. Nuclear Regulatory Commission (NRC) for approval of an alternative to defect removal prior to performing temporary repair activities on three-inch-diameter Nuclear Service Water System piping associated with the 1B Diesel Generator Cooling Water Heat Exchanger. By electronic mail dated August 15, 2016, the NRC requested additional information. The enclosed document provides the requested information.

Attachment 1 of Enclosure 1 contains copyright material. Duke Energy requests that this attachment be withheld from public disclosure.

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

Sincerely,

Steven D. Capps

Enclosure

A047
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ENCLOSURE 1

RR 16-MN-003

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Enclosure 1

By letter dated August 10, 2016 2016 (Agencywide Documents and Access Management System (ADAMS) Accession No. ML 16224A806), 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-4420, at McGuire Nuclear Station Unit 1. Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(2), the licensee requested to use the alternative in Relief Request 16-MN-003 on the basis that compliance with the specified ASME requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Relief Request 16-MN-003 provides an alternative for the temporary repair of three-inch diameter nuclear service water system piping associated with the1B Diesel Generator Cooling Water Heat Exchanger. To complete its review, the Nuclear Regulatory Commission (NRC) staff requests the following additional information.

REQUEST FOR ADDITIONAL INFORMATION RELIEF REQUEST 16-MN-003 ALTERNATIVE REPAIR FOR NUCLEAR SERVICE WATER SYSTEM PIPING:

Question 1: Paragraph 4.1 of the relief request mentioned a corrosion rate of 0.001 inches per day in the vicinity of valve 1RN-884. Discuss the corrosion rate that was used in the design of the sleeve. Discuss the sleeve thickness. Demonstrate that the sleeve, considering the designed corrosion rate, will provide structural integrity and leak tightness to the affected piping until the next refueling outage.

Response: The sleeve nominal thickness is 0.226 inches. The corrosion rate in the vicinity of 1RN-884 was originally identified at 0.001 inches per day based on initial UT data sets. Subsequent inspections are being performed twice weekly and have thoroughly inspected the pipe component repeatedly over a time span comparable to the first time span (when the apparent accelerated corrosion rate was observed). These subsequent inspections show the corrosion rate has leveled out such that there is currently no discernable corrosion rate within the limits of detection. Through continued inspections, the actual condition of the pipe is believed to have been more accurately established and the corrosion rate to not be as severe as indicated by initial UT inspection data. Based on the worst case of these current readings, the calculated pitting rate of corrosion is 0.007 inches per year and the general rate of corrosion is 0.005 inches per year. This rate is commensurate with other raw water galvanic corrosion rates in the Service Water Corrosion database.

Based on this more accurate rate of corrosion and applying a multiplier of 4 shows the sleeve will be adequate until the next refueling outage. A sealant is to be injected into the sleeve after leak testing. The sealant is expected to prevent contact between any fluid in the process pipe and the sleeve. This will at least slow, if not completely prevent, any corrosion of the sleeve during its expected service life. Frequent visual and UT inspections will also ensure any unexpected corrosion is discovered and monitored appropriately.

Although the rate of corrosion is not as severe as originally identified, Duke Energy believes the wall thickness margin is at risk and that it is prudent to perform these temporary repairs at the earliest opportunity.

Question 2: Paragraph 4.2 of the relief request discusses the extent of condition inspection of the nuclear service water piping. It appears that the licensee only examined the vicinity of valve 1RN-883 in addition to valve 1RN-884. Discuss whether all locations of the nuclear service water piping that are potentially susceptible to corrosion have been examined.

Response: The number of extent of condition inspections performed was bounded by the requirements of Code Case N-513-3 with a total of 9 locations inspected specifically for this event. Valve 1RN-883 was identified during the first extent of condition locations which prompted a second set of extent of condition inspections as required by Code Case N-513-3. These extent of condition locations focused on but were not limited to the Emergency Diesel Generator Cooling Water for both units.

Inspection of locations that might experience galvanic corrosion is a license renewal commitment and has been underway at MNS. Not all locations have been identified or inspected to date. However, the Service Water Program database currently has over 491 corrosion inspection locations on the various raw water systems at MNS, with approximately 136 of those locations being related specifically to galvanic corrosion. Although galvanic corrosion has been observed at some of these locations, all inspected locations are within code allowable stress values. This sample size is believed to be a reasonable representation of the Nuclear Service Water system's current behavior relative to galvanic corrosion.

Question 3: Paragraph 5.1 of the relief request states that in lieu of the requirement of IWA-4400 to remove the defective portion of the component prior to performing repair/replacement activities by welding, Code Case N-786-2 will be utilized as an alternative, utilizing the "Type B" sleeve design. The NRC has not approved Code Case N-786-2 which does not appear in the NRC regulation.

(a) The licensee needs to include the code case in its entirety as an attachment to the relief request. Alternatively, the licensee could attach the code case in its entirety in the response to this question.

(b) The NRC staff notes that the relief request proposes exceptions and modifications to Section 3, but not other sections of the code case. For example, the NRC staff notes that the relief request did not take exception to paragraph 1(f) of the code case which prohibits the use of the code case on valves even though the proposed sleeve repair will involve welding on the valve body. For each paragraph of the code case, provide disposition in a table format to show that (1) the proposed alternative will follow the requirements of the paragraph in the code case, (2) the proposed alternative will take exceptions and propose modification to the paragraph in the code case, or (3) the paragraph of the code case is not applicable to the proposed alternative.

Response:

(a) As requested, Code Case N-786-2 is provided in Attachment 1 to this letter.

Enclosure 1

(b) A grid is provided below for each paragraph of the code case, providing disposition in a table format.

Code Case N-786-2 Section	The proposed alternative will follow the requirements of the paragraph in the code case	The proposed alternative will take exceptions and propose modification to the paragraph in the code case	The paragraph of the code case is not applicable to the proposed alternative.
1(a)-(e)	X		
1(f)		X See Note 1	
2(a) - 2(c)	X		
3.1(a)			X
3.1(b)(1)	X		
3.1(b)(2)			X
3.2(a)-(b)	X		
3.2(c)		X See Note 2	
3.2(d)-(g)	X		
3.2(h)			X
3.2(i)-(k)	X		
3.2(l)			X
3.2(m)	X		
3.2(n)-(o)			X
3.2(p)	X		
3.3			X
3.4(a)-(b)	X		
3.4(c)-(d)			X
3.4(e)		X See Note 3	
3.4(f)	X		
4(a)-(c)	X		
5(a)-(h)	X		
6(a)	X		
6(b)			X
6(c)	X		
6(d)-(e)		X See Note 4	
7	X		
8(a)-(f)		X See Note 5	

Note 1: Duke's interpretation of Section 1(f) is that sleeves are not to be applied specifically around the components (e.g. valves) listed that might be experiencing wall thinning. The thinning is not occurring on the valve and is occurring in the pipe. The sleeve will repair the pipe and only extends onto the valve body to the extent possible to create a fully qualified structural weld. The new sleeve is a full structural

replacement of the thinned pipe, not as a repair to the valve. The piping of concern is a short cantilevered configuration, and as such, has very low stress levels for all design loadings (i.e., gravity, thermal expansion, and seismic). There are no vibrational issues associated with this piping, and the relatively low design pressure (135 psig) results in very low pressure stresses. Analysis has demonstrated the pipe stresses to be low in this area and the sleeve to be structurally adequate as designed and shown in Attachment 2 of this submittal.

Note 2: As discussed in 5.1.18.1of the original submittal, there is insufficient space between the header pipe and the valve(s) to meet the minimum code case length requirement of 4 inches. The length provided by the proposed alternative, as shown in Attachment 2 of this submittal, is acceptable since the sleeve and piping analyses have been reviewed with stresses being significantly below required maximum allowable values.

Note 3: As noted in sections 5.1.18.2, 5.1.18.3, 5.1.18.4 of the initial submittal, the proposed alternative utilizes fillet welds in lieu of partial penetration welds at both ends of the sleeve. The rationale for this exception is noted in those sections of the initial submittal.

Note 4: Longitudinal welds will be visually and ultrasonically examined. Fillet welds will be visually inspected and examined with the liquid penetrant method.

Note 5: In lieu of the preservice examination and inservice examinations specified in Section 8, McGuire proposes to perform the non-destructive examinations (visual, surface, and ultrasonic examinations) with frequencies as specified in this relief request. The sleeve will have a baseline UT inspection for thickness monitoring. No additional inservice examinations are proposed, since the temporary repairs shall be removed during the next refueling outage.

Question 4: Paragraph 5.1.12 of the relief request states that a coupling will be shop welded to one side of the sleeve to allow for purging of any weld gasses and leak testing in accordance with IWA-4540. Attachment 3 of the relief request does not show the coupling. Provide a drawing or sketch of the coupling with respect to the sleeve.

Response: See Attachment 2 of this letter for a sketch of the coupling with respect to the sleeve. This sketch should be used in lieu of Attachment 3 of the initial submittal. Note that one coupling is to be installed to each half of the sleeve to ensure adequate venting and sealant installation.

Question 5: Paragraph 5.1.13 of the relief request states that sealant will be injected between the sleeve and the pipe. Discuss whether the sealant could fall into the pipe if a hole or crack occurs from corrosion. If the sealant does fall into the pipe, would the debris affect the operation of the nuclear service water system?

Response: The sleeve shall fit close to the pipe being repaired resulting in an extremely thin annular space. The amount of sealant injected into the sleeve will be a very small volume. The current leak is a small pinhole experiencing leakage best characterized as "weepage". The sealant shall be compatible with the raw water environment such that localized exposure due to an increase in the pit size would not challenge its integrity. The leak location would have to increase in size substantially to allow to challenge the sealant integrity. If the sealant were to deteriorate, the volume will be small such that it will not challenge system performance.

Question 6. Paragraph 5.1.15 of the relief request states that the sleeve will be visually monitored at least monthly and will be ultrasonically inspected at monthly intervals until the next refueling outage. (a) Discuss whether the visually monitoring and ultrasonic testing will be performed in a staggered fashion so that the sleeve can be monitored either visually or ultrasonically at least every two weeks. (b) Considering the aggressive corrosion rate of 0.001 inches per day, even with the proposed sleeve repair, discuss whether the daily walkdown at the plant should include the monitoring of the sleeve. (c) Discuss the elevation of the repaired piping with respect to the elevation of the plant personnel who performs visual monitoring.

Response: The following details changes to paragraph 5.1.15 of the initial submittal in terms of monitoring of the sleeve:

(a) Visual monitoring will be conducted daily during Operator rounds and ultrasonic testing will be performed at least once every two weeks.

(b) Considering the possible aggressive corrosion rate of 0.001 inches per day, visual monitoring will be conducted daily during Operator rounds.

(c) The floor elevation in this area is at plant elevation 716'-0". The centerline of the 8" diameter piping is at elevation 724'-0" for 1RN-824 and 726'-3" for 1RN-883 as shown on Attachment 2 of the initial submittal. A platform has been erected at this location to allow access for individuals performing both visual and UT inspections.