REGIS T. REPKO
Vice President
McGuire Nuclear Station

Duke Energy
MG01VP / 12700 Hagers Ferry Rd.
Huntersville, NC 28078

980-875-4111
980-875-4809 fax
regis.repko@duke-energy.com

September 28, 2010

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

Subject: Duke Energy Carolinas, LLC (Duke)
McGuire Nuclear Station, Unit 1
Docket No. 50-369
Relief Request Serial #09-MN-002, Response to Requests for Additional Information

On May 4, 2009, Duke Energy submitted Relief Request 09-MN-002 pursuant to 10 CFR 50.55a(a)(3)(i) requesting NRC approval for an alternative to the requirements of the ASME Code, Section XI, IWA-4400. By letter dated February 1, 2010, Duke Energy provided a response to additional information requested by the NRC.

On May 26, 2010, the NRC Staff electronically requested additional information regarding this relief request. As a result of discussions between your staff and Duke Energy, please find attached as Enclosure 1 Revision 1 of Relief Request 09-MN-002, which is submitted pursuant to 10 CFR 50.55a(a)(3)(ii). Revision 1 reduces the scope of the requested relief and provides additional information to address your questions. Enclosure 2 provides a specific response to your request for additional information dated May 26, 2010.

Duke Energy requests NRC approval of this request by December 31, 2010, if possible, to support schedules for excavating and inspecting portions of the RN System buried piping in 2011.

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

Sincerely,

Regis T. Repko

Regis T. Repko

Attachment

A047
NRR

xc:

L. A. Reyes. Region II Administrator
U.S. Nuclear Regulatory Commission
Sam Nunn Atlanta Federal Center, 23 T85
61 Forsyth St.. SW
Atlanta, GA 30303-8931

J. H. Thompson, Project Manager
U. S. Nuclear Regulatory Commission
11 555 Rockville Pike
Mail Stop 0-8G9A
Rockville, MD 20852-2738

J. B. Brady
NRC Senior Resident Inspector
McGuire Nuclear Station

Enclosure 1

Duke Energy Carolinas, LLC

McGuire Nuclear Station, Unit 1

Relief Request Serial #09-MN-002, Rev. 1

Relief Requested in Accordance with 10 CFR 50.55a(a)(3)(ii) to use an Alternative to Defect Removal Prior to Performing Repair/Replacement Activities on Nuclear Service Water System Buried Piping

1. ASME Code Component(s) Affected

Nuclear Service Water (RN) System ASME Class 3 components listed below:

1.1. 36 inch and 42 inch diameter buried supply piping from the Low Level Intake (LLI) at Cowans Ford Dam to the Auxiliary Building. This piping contains raw water from Lake Norman.

1.2. 36 inch diameter buried supply and return piping from the Standby Nuclear Service Water Pond (SNSWP) to the Auxiliary Building. This piping contains raw water drawn from, and returned to, the SNSWP.

1.3. Design data applicable to the above piping is as follows:

Nominal Wall Thickness:	0.5 inches
Design Pressure:	25 to 35 psig
Design Temperature:	95 to 150 degrees, F
Material of Construction:	Carbon Steel

1.4. The above piping does not have an internal coating system, but the exterior of this piping was coated with coal tar epoxy in accordance with Duke Energy Specification MCS-1152.00-00-0001.

2. Applicable Code Edition and Addenda

ASME Code, Section XI, 1998 Edition with the 2000 Addenda.

Use of this Code edition and addenda was approved by the NRC, as documented in the Safety Evaluation Report for Duke Energy Relief Request #RR-03-001, Rev. 1, dated November 17, 2004.

3. Applicable Requirement

3.1. IWA-4410 requires that welding, brazing, defect removal, and installation activities be performed in accordance with IWA-4420.

3.2. IWA-4422 specifies requirements for defect removal and examination.

Relief is requested from the requirement of IWA-4400 that defective portions of components be removed prior to performing a repair/replacement activity by welding.

4. Reason for Request

4.1. McGuire plans to excavate and inspect portions of buried Class 3 Nuclear Service Water (RN) piping for external visual and ultrasonic examination starting in 2010 in accordance with requirements of the McGuire Buried Piping Integrity Program. This program was developed for the purpose of maintaining the safe and reliable operation of all buried piping systems within its scope, including portions of the RN System. This program was developed in direct response to industry awareness of aging buried pipe issues. Subsequently, NEI and the Buried Piping Integrity Task Force developed and issued on February 4, 2010 NEI 09-14, "Guideline for the Management of Buried Piping Integrity" to facilitate the industry implementation of the NEI Nuclear Strategic Issues Advisory Committee Buried Piping Integrity Initiative. Duke Energy believes that these examinations will help to confirm the structural and leak-tight integrity of these components, providing additional assurance that this system can continue to perform its intended safety function.

4.2. If excessive wall thinning or through-wall leakage resulting from internal or external corrosion is detected in this buried piping, the defective areas would require repair in accordance with the ASME Code, Section XI, 1998 Edition with the 2000 Addenda, IWA-4400. Prior to performing repair/replacement activities by welding, the article requires the defective portions of the component to be removed. The alternative proposed in this request will allow repairs to be made without removing the RN buried piping from service, and without the use of a hot tapping machine.

4.3. Duke Energy believes that requiring removal of defective portions of this piping prior to performing repairs represents a hardship or unusual difficulty without a compensating increase in the level of quality and safety for reasons identified in this request.

5. Proposed Alternative and Basis for Use

5.1. In lieu of the requirement of IWA-4400 to remove the defective portion of the component prior to performing repair/replacement activities by welding, the following alternative is proposed:

5.1.1. Unacceptable wall thickness loss or through-wall leakage caused by localized general or pitting corrosion may be repaired without removing the defective portion of the pipe wall, provided the following conditions are met:

1. The defective area shall be encapsulated on the O.D. of the pipe using pressure retaining parts that comply with the Construction Code and Owner's requirements. The diameter of the encapsulation shall not exceed 10 inch NPS, and spacing of adjacent encapsulations shall comply with Construction Code design limits. A surface examination (i.e., magnetic particle, liquid penetrant) shall be performed on the weld connecting the encapsulation to the pipe.
2. 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.
3. This alternative shall not be used for defects containing cracks or crack-like indications, and ultrasonic examination shall be performed to characterize the defect and to confirm that the defect does not contain cracks or crack-like indications. Ultrasonic thickness examinations shall also be performed on all pipe exterior surfaces within an area whose diameter is at least twice that of the encapsulation to confirm the absence of any additional flaws that could adversely affect the design of the modification or integrity of the piping.
4. 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.

5. Following pressure testing, sealant shall be installed into the encapsulation to inhibit corrosion, the pressure test fitting in the encapsulation shall be seal-welded, and protective coatings shall be restored on exterior surfaces of the pipe and the encapsulation in the vicinity of the repair area.
6. A visual examination of above ground surfaces in the vicinity of the encapsulation shall be performed at least once during each Unit 1 operating cycle to confirm the absence of leakage from the modified portion of the buried piping. Leakage, if detected, shall be addressed through the McGuire Corrective Action Program.
7. Encapsulation of a defective area shall be used only once at each discrete location requiring correction by repair/replacement activity.

5.2. The basis for the proposed alternative is as follows:

5.2.1. For repair of excessive wall thinning caused by external corrosion (without through-wall leakage), restoration of the required component wall thickness could be performed by weld overlay on the exterior of the pipe in accordance with applicable ASME Code requirements. However, the integrity of the pressure boundary could be jeopardized by welding directly on these areas during system operation.

5.2.2. The RN System Low Level Intake supply piping is a single header that is shared between Units 1 and 2, and is difficult to isolate, depressurize, and drain to allow the removal of a defect prior to performing a repair/replacement activity. As a shared line between both units, it is the normal water source for all Nuclear Service Water, and butterfly isolation valve 1RN001 at the low level intake cannot be tested to determine whether it is sufficiently leak-tight to allow the pipe to be isolated and dewatered without entering Technical Specification 3.7.7, Condition A. As such, Duke Energy believes that the use of a hot-tapping machine would be necessary to install a line stop to completely dewater the pipe to perform the defect removal, or to perform the defect removal and repair during system operation.

If a line stop is used to isolate this piping, the RN System would have to operate solely from the Standby Nuclear Service Water Pond (SNSWP) while the Low Level Intake supply piping is isolated. Since "A" train of both Units aligns to the Low Level Intake on an Engineered Safety Features actuation, repairs would have to be completed within the Technical Specification 3.7.7, Condition A Allowed Outage Time of 72 hours. Duke Energy believes that it would be difficult to complete such a repair within this timeframe.

If a hot-tapping machine is used to perform the defect removal and repair during system operation, there would be risks to system operation, as described in 5.2.4.

5.2.3. The RN System 36 inch diameter supply and return piping between the SNSWP and the Auxiliary Building does not contain valves. Therefore, isolation of this piping to permit depressurization and draining for repairs can only be accomplished by installing temporary blind flanges on the underwater intake and discharge piping at the SNSWP. As such, Duke Energy believes that the use of a hot-tapping machine would be necessary to install a line stop to completely dewater the pipe to perform the defect removal, or to perform the defect removal and repair during system operation.

If a line stop is used, or if a blind flange is installed at the SNSWP, one train of the RN System would be isolated, and Duke Energy believes that it would be difficult to complete the required repairs and return the affected train to service within the Technical Specification 3.7.7, Condition A Allowed Outage Time of 72 hours.

If a hot-tapping machine is used to perform the defect removal and repair during system operation, there would be risks to system operation, as described in 5.2.4.

5.2.4. Using a hot-tapping machine to permit defect removal and repairs is not desirable for the following reasons:

1. Hot-tapping the RN pipe could result in metal shavings or the removed, defective portion of the pipe wall dislodging, entering the system, and becoming debris that could hinder system operation and make it difficult to retrieve the loose material.
2. Typically, the installation of a branch connection using a hot-tapping machine results in a mechanical joint being installed on the new branch connection after the hot-tap is completed. Installation of a mechanical joint in a buried application is not desirable because it introduces a new path for potential system leakage.

5.2.5. Installation of sealant material within the encapsulation will provide protection against possible continued corrosion that could otherwise occur within the encapsulation. Restoration of protective coatings on the exterior of the encapsulation and exposed exterior surfaces of the piping will provide protection against external corrosion of these areas.

5.2.6. Duke Energy has over 220 corrosion inspection locations on the RN system at McGuire. The NDE data acquired since 1990 shows that the RN piping is experiencing an average general corrosion rate of 2 mils/year and an average pitting corrosion rate of 4 mils/year due to internal corrosion. As noted, the repair alternative will be utilized only where the flaw has been characterized as localized pitting or general corrosion, and shall not be used for repair of defects containing cracks or crack-like indications.

5.2.7. The encapsulation is designed to provide a margin against lateral growth of the defect due to internal corrosion of the pipe wall by requiring that the I.D. of the encapsulation be considerably larger than the defective area. Based on an average pitting corrosion rate of 4 mils/year, Duke Energy believes that continued internal corrosion of the pipe wall will not challenge the structural integrity of the encapsulation for the remaining plant life. For this reason, periodic reinspection of the repair areas is not necessary. Duke Energy believes that future leakage from the encapsulation would occur before structural integrity is challenged, due to the relatively low system operating pressure. The proposed visual examinations of the above ground surfaces in the vicinity of the repair area (as proposed in 5.1.1.6) are judged sufficient to detect this leakage before structural integrity of the modification or the piping in the vicinity of the modification is challenged.

5.3 For the reasons stated above, Duke Energy believes that compliance with the requirements of the ASME Code, Section XI, IWA-4400 to remove defective portions of buried RN System piping prior to performing a repair/replacement activity by welding would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

6. Duration of Proposed Alternative

The proposed alternative is requested for the remainder of the McGuire Unit 1 3rd Inservice Inspection Interval, currently scheduled to end on December 1, 2011.

7. References

7.1. Letter dated November 17, 2004, providing NRC Safety Evaluation Report for Duke Energy Corporation Relief Request #RR-03-001, Revision 1.

7.2. Letter dated February 1, 2010, providing Duke Energy's Response to NRC Request for Additional Information on Relief Request Serial #09-MN-002 (Revision 0).

Enclosure 2
Duke Energy
McGuire Nuclear Station, Unit 1
Relief Request #09-MN-002
Duke Response to NRC Request for Additional Information Received May 26, 2010

1. For each of the pipes being considered in this relief request, provide the following information:

   a. System and segment identification.
   b. Diameter and thickness.
   c. Material of construction.
   d. Working fluid, pressure and temperature.
   e. Internal coating (if any).
   f. External coating (if any).
   g. Whether the pipe is isolable.
   h. Whether the pipe is buried.
   i. Justify why code compliant repair and reexamination cannot be performed.

   Response: *The information requested above is documented in Revision 1 of this request.*

2. Identify all of the degradation mechanisms considered in this relief request and discuss whether corrosion-assisted cracking or any other form of cracking will be repaired under this relief request.

   Response: *This relief request is proposed for applications where general or pitting corrosion has occurred on interior or exterior surfaces of the Nuclear Service Water System (RN) buried piping. Section 5.1.1.3 of Revision 1 of this request clarifies that the proposed alternative shall not be used for defects containing cracks or crack-like indications.*

3. If a piping defect is found, discuss how the corrosion rate, both through thickness and laterally, will be determined for each of the corrosion mechanisms considered.

   Response:

   1. *For external corrosion of the pipe wall that does not result in a through-wall defect, continued corrosion through the thickness of the pipe wall and laterally will be arrested by installing sealant into the encapsulation following pressure testing. This will inhibit continued external corrosion of the pipe wall, as well as protect the interior of the encapsulation from future corrosion. Application of protective coatings on the exterior surfaces of the pipe wall and the encapsulation will inhibit future corrosion of these surfaces.*
   2. *For internal general corrosion of the pipe wall, the corrosion rate through the thickness of the pipe wall and laterally is expected to be consistent with the corrosion rate identified in Section 5.2.6 of Revision 1 of this request.*
   3. *For internal pitting corrosion of the pipe wall that has resulted in through-wall leakage, RN System piping NDE data has shown that corrosion occurs at an average rate of approximately 4 mils/year, as indicated in 5.2.6 of Revision 1 of this request. Although the rate of corrosion through the thickness of the pipe at through-wall defect locations is higher than 4 mils/year, Duke Energy believes that the lateral corrosion will not occur at a*

rate much greater than approximately 4 mils/year. Section 5.1.1.2 of Revision 1 of this request specifies requirements for the design of the encapsulation, which provides considerable margin against lateral corrosion by requiring that the I.D. of the encapsulation be larger than the maximum diameter of the defective area. This will help to ensure that possible growth of lateral corrosion of the defect at corrosion rates identified in Section 5.2.6 of Revision 1 of this request will not challenge the integrity of the encapsulation for the remaining plant life. Because of the relatively low design pressure of the RN System buried piping, Duke Energy believes that visual examinations of ground surfaces above the defective areas would detect leakage before the structural integrity of the encapsulation would be compromised.

4. For external corrosion of the pipe wall at locations where localized pitting has resulted in through-wall leakage, corrosion in the through-wall direction will be arrested by installation of sealant into the encapsulation. In the lateral direction, Duke Energy believes that the corrosion rate would be no greater than that anticipated for through-wall defects resulting from internal pitting corrosion, as discussed in 3 above.

4. If a pipe repair is not buried or otherwise inaccessible for reexamination, describe and justify the proposed repair reexamination schedule.

   Response: Sections 1.1 and 1.2 of Revision 1 of this request clarify that the proposed alternative shall be used only for buried portions of the Nuclear Service Water System piping, all of which is considered inaccessible for reexamination without extensive excavation.

5. Paragraph 5.3.c of the relief request [Rev. 0] states that, in certain cases in lieu of an engineering evaluation, when the inside diameter of the encapsulation is greater than the defect diameter plus twice the nominal wall thickness, successive examinations will not be performed. Justify using this encapsulation design parameter for all corrosion mechanisms identified above in response to question 2 to ensure the integrity of the repair without reexamination.

   Response:

   1. For internal general or pitting corrosion of the pipe wall, this encapsulation design parameter is specified to provide a margin against lateral growth of the defect following completion of the repair. Duke Energy believes that successive examinations are not necessary to ensure the integrity of the repair for reasons specified in 5.2.7 of Revision 1 of this request, and as follows:

      a. Installation of sealant material within the encapsulation (as specified in 5.2.5 of Revision 1 of this request) will provide protection against corrosion on the exterior surfaces of the pipe (and interior surfaces of the encapsulation) if through-wall leakage has already occurred, or if continued internal corrosion of the pipe wall results in a through-wall defect in the pipe wall after completion of the repair.

b. *Installation of protective coatings on exterior surfaces of the pipe and the encapsulation in the vicinity of the repair area (as specified in 5.2.5 of Revision 1 of this request) will provide protection against corrosion of these surfaces after completion of the repair.*

2. *For external general or pitting corrosion of the pipe wall that results in through-wall leakage, the encapsulation design parameter is specified to provide a margin against lateral growth of the defect following completion of the repair. Duke Energy believes that successive examinations are not necessary to ensure the integrity of the repair for the same reasons listed in 1 above.*

3. *For external general or pitting corrosion of the pipe wall that does not result in through-wall leakage, this encapsulation design parameter is not required by the proposed alternative. Duke Energy believes that successive examinations are not necessary to ensure the integrity of the repair for these conditions because installation of sealant material within the encapsulation and restoration of protective coatings on exterior surfaces of the pipe and the encapsulation in the vicinity of the repair area (as specified in 5.2.5 of Revision 1 of this request) provide protection against continued corrosion.*

6. In the case where a through-wall leak cannot be completely stopped with a temporary plug:

   a. Discuss what measures will be taken during and after welding to ensure a sound weld.

   Response: *The proposed alternative will not be used unless the weld surfaces are dry, allowing the weld to be made in accordance with qualified welding procedures. After the weld is completed, a pressure test shall be performed to ensure the leak tight integrity of the weld, as specified in Section 5.1.1.4 of Revision 1 of this request. A surface examination (i.e., magnetic particle, liquid penetrant) shall also be performed on the weld connecting the encapsulation to the pipe.*

   In the event that temporary plugs are not capable of stopping leakage, additional actions shall be taken to ensure that the weld surfaces are dry. Such actions may include, but are not limited to, installation of a metal plug over the defective area using a seal weld. This plug and its seal weld would be completely encapsulated and would not be relied upon for the leak-tight or structural integrity of the modification.

   b. Since a coating cannot be applied to the pipe outside diameter and the encapsulation interior, and stagnant water will exist in this volume, the corrosion environment at the repair site will have changed. Justify using the pre-repair corrosion rate to determine the reexamination frequency when the post-repair environment has changed.

   Response: *Section 5.1.1.5 of Revision 1 of this request clarifies that Duke Energy shall install sealant within the encapsulation following completion of* *pressure testing to inhibit corrosion of surfaces within the encapsulation, including external surfaces of the pipe.*

7. If the degradation has initiated on the inside diameter surface:

   a. Describe the procedure used to determine the root cause.

      Response: *The cause of the defective conditions shall be addressed by Duke Energy's Corrective Action Program.*

   b. Describe the extent of examination that will be performed to ensure that similar additional flaws have not formed in the immediate area.

      Response: *Section 5.1.1.3 of Revision 1 of this request clarifies that ultrasonic thickness examinations shall be performed in the vicinity of the modification to confirm the absence of flaws that could adversely affect the design of the modification or the integrity of the piping.*