November 30, 2001

LICENSEE : Duke Energy Corporation

FACILITIES: McGuire (MNS), Units 1 and 2, and Catawba (CNS), Units 1 and 2

SUBJECT: TELECOMMUNICATION WITH DUKE ENERGY CORPORATION TO DISCUSS INFORMATION IN THEIR LICENSE RENEWAL APPLICATION ON AGING MANAGEMENT OF CONTAINMENTS, STRUCTURES AND STRUCTURAL SUPPORTS

On October 25, 2001, after the NRC (the staff) reviewed information provided in Section 3.5 of the license renewal application (LRA), a conference call was conducted between the staff and Duke Energy Corporation (the applicant) to clarify information presented in the application pertaining to aging management programs for mechanical systems and components. Participants in the conference call are provided in an attachment.

The questions asked by the staff, as well as the responses provided by the applicant, are as follows:

Table 3.5-1, Aging Management Review Results - Reactor Building

1. Table 3.5-1 of the LRA indicates that no aging management is needed for the below grade portion of the foundation mat for the concrete shield buildings. Section 3.5.2.2.1.1 of the Standard Review Plan for License Renewal (SRP-LR, NUREG 1800, July 2001) states that increases in porosity and permeability, cracking, and spalling due to leaching of calcium hydroxide and aggressive chemical attack and cracking, spalling, loss of bond, and loss of material due to corrosion of embedded steel could occur in inaccessible areas of concrete containments. Table 3.5-2 of the LRA also indicates that no aging management program (AMP) is needed to manage loss of material due to corrosion of embedded steel that could occur in inaccessible areas of concrete situated in other structures. The Generic Aging Lessons Learned (GALL) report recommends further evaluation to manage the aging effects for inaccessible areas, when conditions do not exist in accessible areas that could indicate the presence of, or result in, degradation to such inaccessible areas. Why is further evaluation to manage aging effects in inaccessible areas not specified in the LRA?

   The applicant indicated the below grade portions of the concrete are exposed to back fill and groundwater. The groundwater at McGuire and Catawba is not aggressive since the pH, chloride, and sulfate concentrations are below the limits where degradation would occur. The pH, chloride, and sulfate levels are identified on page 3.5-2 of the LRA. The applicant also referenced page II A1-7 of the Generic Aging Lessons Learned report to demonstrate that inspection of inaccessible areas was not warranted. The staff will consider the information provided by the applicant, but may request additional information to confirm that below-grade chemistry is periodically monitored to demonstrate that the below-grade environment is not aggressive. This same response

was provided for a similar question (B.3.33 Question 3), as documented in a summary of an October 11, 2001, conference call on aging management programs for structures. A request for additional information will be generated from this section (3.5) of the LRA to confirm that below-grade chemistry is, and will continue to be, periodically monitored to demonstrate that the below-grade environment is not aggressive.

2. Table 3.5-1 of the LRA states that Technical Specification SR 3.6.16.3 visual inspection is credited for managing change in material properties due to leaching of both the shell wall and dome of the shield building. Describe the present extent of the aging due to change in material properties resulting from leaching for the shield buildings of CNS and MNS. Indicate the inspection experience gathered to date (e.g., growth of leached surface area, indications of loss of material of embedded rebars in the leached areas) and discuss the basis for maintaining that the visual inspection program should adequately manage the aging effect of the shield buildings due to leaching during the extended period of operation for both plants.

   The applicant indicated that this question was addressed in Appendix B of the LRA under the Technical Specification Surveillance Requirement 3.6.16.3 Visual Inspection program, which requires a visual inspection of the exposed interior and exterior surfaces of the reactor building three times every ten years. The applicant further asserted that results of these visual inspections indicate that the condition of the shield buildings is not degrading. Furthermore, inspections have not identified any degradation of rebar. Corrosion of rebar would result in staining of concrete and in cases where the rebar had severe corrosion, spalling and cracking of the concrete would be observed. The staff will consider the information provided, but may request additional information to complete its review.

3. Discuss if the initial licensing basis for CNS and MNS included a program to monitor settlement. If yes, assess the settlement potential of the plants based on past settlement monitoring data and discuss the need for managing aging effects of the MNS/CNS containments/shield buildings due to settlement for the extended period of operation.

   The applicant indicated that structures are built on bedrock, as reflected in their licensing basis documents, and that settlement monitoring was not required. As such, the staff will review the Updated Final Safety Analysis Report (UFSAR) to verify this information and preclude the need for additional information on this issue.

4. Section 3.5.2.2.1.3 of the SRP-LR discusses the issue of loss of compressive strength and modulus of elasticity for concrete structures due to elevated temperature.
   Table 3.5-1 of the LRA does not provide pertinent information related to this issue. Loss of strength and modulus of elasticity due to elevated temperatures could occur in localized areas of a PWR Ice Condenser containment. The GALL report recommends further evaluation if any portion of the concrete containment components exceeds specified temperature limits, i.e., general temperature 66°C (150°F) and local area temperature 93°C (200°F). Provide information related to this issue.
   The applicant indicated that no portion of the concrete containment is exposed to temperatures above the specified threshold limits where degradation would occur. In addition, both upper and lower containment temperatures are governed by technical

specifications, which require that average air temperatures remain below 100°F (for upper containment) and 120°F (for lower containment). As such, loss of compressive strength and modulus of elasticity for concrete structures due to elevated temperature is not a concern at CNS or MNS. The staff is satisfied with this response and has no additional questions on this issue.

5. With respect to component types, “steel containment vessel” and “structural steel beams, columns, plates & trusses” listed in Table 3.5-1 of the LRA, no information is provided regarding potential loss of material due to corrosion of inaccessible areas in liner plates and steel structures. Section 3.5.2.2.1.4 of the SRP-LR states that loss of material due to corrosion could occur in inaccessible areas of steel structures and liner plate for all types of PWR and BWR containments. The GALL report recommends further evaluation to manage the aging effects for steel components in inaccessible areas, when conditions do not exist in accessible areas that could indicate the presence of, or result in, degradation to such inaccessible areas. Discuss how this potential aging effect is managed for the CNS and the MNS. Additionally, provide information describing the applicant’s planned disposition of damaged seal between the containment floor and the containment steel liner that may be identified as a result of inservice inspection.

   The applicant suggested that this question is a good candidate for a formal request for additional information. As such, the staff will issue a formal request to provide the applicant an opportunity to submit a written response.

6. With respect to the bellows (penetration), electrical penetrations, fuel transfer tube penetration and mechanical penetrations listed in Table 3.5-1, “Steel Containment,” no information is provided for aging effect management of potential cracking due to cyclic loading and stress corrosion cracking (SCC). Section 3.5.2.2.1.7 of the SRP-LR states that cracking of containment penetrations (including penetration sleeves, penetration bellows, and dissimilar metal welds) due to cyclic loading could occur in all types of PWR and BWR containments. These cracks are inspected by a visual VT-3 examination. However, this inspection may not detect such cracks. A combination of Inspection Categories E-B & E-F, and enhanced VT-1 is an acceptable method. The GALL report recommends further evaluation of programs to manage these aging effects. Discuss how the GALL recommendation for establishment of aging management programs is implemented for the MNS and CNS.

   The applicant indicated that electrical penetrations, equipment hatch, and fuel transfer tube penetrations are not subject to cyclic loading. Mechanical penetrations are provided with bellows to accommodate differential movement between the containment and the reactor building for thermal, seismic, and containment test conditions (as documented in Section 4.6.3 of the LRA). The applicant further indicated that cracking (the aging effect) of penetration bellows (the component) is addressed in Table 3.5-1. The staff is satisfied with this response and has no additional questions on this item.

7. With respect to the items listed under “Ice Condenser Components” of Table 3.5-1 of the LRA (e.g., Ice baskets and others), Ice Condenser Inspections program is credited for managing the loss of material aging effect. Based on your plant inspection experience, summarize various types of aging degradation experienced in the past for

the listed ice condenser components including the loss of ice basket connecting screws due to loss of material and/or SCC. With reference to these experienced aging degradations, discuss your basis for asserting that the continued use of the Ice Condenser Inspections program alone can provide adequate aging management for the ice condenser components for the extended period of plant operation.

The applicant indicated that previous failures of ice basket connecting screws were caused by improper installation and maintenance practices and not caused by aging mechanisms and effects. The staff reviewed Section B.3.18 of the LRA, as well as other documents associated with ice basket connecting screws failures to confirm the applicant's response and is satisfied with the information provided. No additional information on this item is needed.

8. Regarding the reinforced concrete beams, columns, floor slabs, walls and some localized portions of the top layer-basemat concrete, which are rendered inaccessible because of the layout of the Ice Condenser/Ice Baskets System, increases in porosity and permeability, cracking, loss of material (spalling, scaling,) due to aggressive chemical attack and loss of material due to corrosion of embedded steel could occur. The GALL report (Section A1.1) recommends further evaluation to manage the aging effects for these inaccessible areas, when conditions do not exist in accessible areas that could indicate the presence of, or result in, degradation of such inaccessible areas. Table 3.5-1 of the LRA did not address this issue. Provide information which discusses how this concern is addressed at MNS and CNS.

   The applicant indicated that this question is similar to Question 5 and is a good candidate for a formal request for additional information. However, since it is particular to inaccessible areas of the ice condenser, the staff will issue a separate formal request to provide the applicant an opportunity to submit a written response.

9. The second to the last item on page 3.5-13 of Table 3.5-1 of the SRP-LR for steel elements protected by coating indicates that no further evaluation is required, if there is a protective coating monitoring and maintenance program (an AMP). State whether there is such a program and provide the reference.

   The applicant indicated that coatings are not relied upon to protect steel elements; other programs are credited in Table 3.5-1. The applicant referred the staff to page III A2-10 of the Generic Aging Lessons Learned (GALL) report. The GALL report states that the structures monitoring program should include requirements to address protective coating monitoring and maintenance only if protective coatings are relied upon to manage the effects of aging. The staff is satisfied with this response and has no additional questions on this issue.

10. Section 3.5.2.2.1.5 of SRP-LR indicates that loss of prestress forces due to relaxation, shrinkage, creep, and elevated temperatures for PWR prestressed concrete containment is a time-limited aging analysis (TLAA) and is required to be evaluated in accordance with 10 CFR 54.21(c). Tables 3.5-1 through 3.5-3 seem to indicate that MNS and CNS have no prestressed concrete structural elements that are within the scope of the LRA. As applicable, confirm the above statement or provide pertinent information to address the TLAA issue.

The applicant confirmed that, as documented in Section 4.5 of the LRA, ice condenser containments (including MNS and CNS) do not use prestressed tendons. The staff is satisfied with this response and requires no additional information on this issue.

11. Table 3.5-1, Aging Management Review Results - Reactor Building of the LRA lists no aging effects and their corresponding AMPs for the following component types: (1) dome concrete, foundation mat and shell wall of concrete shield building; (2) wear slab concrete of ice condenser components and (3) equipment pads, flood curbs, hatches, missile shields, reinforced concrete beams, columns, floor slabs, walls of reactor building interior structural components. It is widely known in the concrete industry that concrete components or materials are subject to aging effects. Aging effects on concrete components for several nuclear plants were specifically identified in NUREG-1522. As stated in a recent NRC staff position paper, all concrete structures within the scope of license renewal require an aging management program for license renewal. The scope and contents of the AMP should be consistent with or equivalent to those provided in the position. Please provide specific MNS and CNS AMP(s) for the above listed concrete elements for staff review.

    The applicant requested a copy of the staff's position paper on the aging of concrete structures and indicated that this question is a good candidate for a formal request for additional information. As such, the staff will issue a staff position statement and formal request for information pertaining to this issue.

<u>Table 3.5-2, Aging Management Review Results - Other Structures</u>

1. Table 3.5-2 of the LRA lists several below grade component types (i.e., foundation caissons for MNS turbine building, other foundations, reinforced concrete beams, columns, floor slabs, walls, foundation dowels, wear slab, manholes & covers, and trenches) as having no aging effects and, therefore, no AMPs. Discuss the specific below grade environments to which these items are exposed, including their potential exposure to aggressive ground water. As applicable, provide most recent test data supporting the finding that no AMPs are needed for the listed components.

    The applicant indicated that the groundwater is not aggressive at either Catawba or McGuire as a function of pH ranges, chloride concentration and sulfate concentration. Their response was similar to that which was provided for Question 1 on LRA Table 3.5-1 (as documented in the first page of this conference call summary). A request for additional information will be generated from this section (3.5) of the LRA to confirm that below-grade chemistry is, and will continue to be, periodically monitored to demonstrate that the below-grade environment is not aggressive.

2. Table 3.5-2 of the LRA assigns no aging management program for portions of the non-sheltered, externally exposed missile shields (auxiliary building and the nuclear service water pump structure only), whereas the same table designates the Inspection Program for Civil Engineering Structures and Components as the aging management program for the refueling water storage tank missile shield wall to manage an aging effect (change in material properties) due to leaching. Confirm, as appropriate, that past plant operating experience has shown that the auxiliary building and nuclear service water pump

structure at MNS and CNS exhibit insignificant leaching potential, or explain the different treatment of the missile shields.

The applicant stated that plant-specific operating experience indicated the auxiliary building and the nuclear service water pump structure do not exhibit signs of leaching. However, the applicant suggested that the staff issue a formal request for additional information to provide the applicant an opportunity to address this item in their response.

3. Table 3.5-2, Aging Management Review Results - Other Structures, of the LRA lists no aging effects and their corresponding AMPs for the following component types: equipment pads, floor curbs, foundation caissons, foundations, hatches, manholes and covers, missile shields, reinforced concrete beams, columns, floor slabs, walls, sumps and trenches under the "concrete structural components" subheading. It is widely known in the concrete industry that concrete components or materials are subject to aging effects. Aging effects on concrete components for several nuclear plants were specifically identified in NUREG-1522. The staff's position is that all concrete structures within the scope of license renewal require an aging management program for license renewal. The scope and contents of the AMP should be consistent with or equivalent to those applicable to the staff's position. Please provide specific CNS/MNS AMP(s) for the above listed concrete elements of other structures for staff review.

   The applicant indicated the below grade portions of the concrete are exposed to back fill and groundwater. The groundwater at McGuire and Catawba is not aggressive since the pH, chloride, and sulfate concentrations are below the limits where degradation would occur. The pH, chloride, and sulfate levels are identified on page 3.5-2 of the LRA. The applicant also referenced page II A1-7 of the Generic Aging Lessons Learned report to demonstrate that inspection of inaccessible areas was not warranted. The staff will consider the information provided by the applicant, but may request additional information to confirm that below-grade chemistry is periodically monitored to demonstrate that the below-grade environment is not aggressive. This same response was provided for question 3.5.1-1 and a similar question (B.3.33 Question 3), as documented in a summary of an October 11, 2001, conference call on aging management programs for structures. A request for additional information will be generated from this section (3.5) of the LRA to confirm that below-grade chemistry is, and will continue to be, periodically monitored to demonstrate that the below-grade environment is not aggressive.

<u>Table 3.5-3, Aging Management Review Results - Component Supports</u>

1. Table 3.5-3 provides no information to address the cracking initiation and growth from SCC for high strength low-alloy bolts. Last item on page 3.5-18 of Table 3.5-1 of the SRP-LR addresses the issue of bolting integrity for ASME Class I piping and components supports. It indicates that no further evaluation is required if there is a bolting integrity program to address the cracking initiation and growth from SCC for high strength low-alloy bolts. State whether there is such a program and provide the reference.

The applicant acknowledged that this question applies to the LRA generically. The staff will issue a general request for additional information to complete their review of the applicant's management of bolting aging mechanisms and effects.

2. Table 3.5-3 of the LRA states that no AMP is needed for cable tray & conduit, control boards, electrical & instrument panels & enclosures, and new fuel storage racks. Are these items all made of galvanized steel? If not, discuss the basis for not designating the Inspection Program for Civil Engineering Structures and Components as the AMP for items made of non-galvanized carbon steel.

   The applicant indicated that the reason for not identifying an AMP for these components is different for each type of component. For example, the new fuel storage racks are manufactured of carbon steel, but they are located in a controlled environment. Other components are constructed of galvanized steel; therefore, no AMP is required. The applicant indicated that this question is a good candidate for a formal request for additional information. As such, the staff will issue a formal request to provide the applicant an opportunity to submit a written response.

A draft of this telecommunication summary was provided to the applicant to allow them the opportunity to comment prior to the summary being issued.

/***RA***/

Rani L. Franovich, Project Manager
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Office of Nuclear Reactor Regulation

Docket Nos. 50-369, 50-370, 50-413, and 50-414

Attachment: As stated

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Table 3.5-3, Aging Management Review Results - Component Supports

1. Table 3.5-3 provides no information to address the cracking initiation and growth from SCC for high strength low-alloy bolts. Last item on page 3.5-18 of Table 3.5-1 of the SRP-LR addresses the issue of bolting integrity for ASME Class I piping and components supports. It indicates that no further evaluation is required if there is a bolting integrity program to address the cracking initiation and growth from SCC for high strength low-alloy bolts. State whether there is such a program and provide the reference.

   The applicant acknowledged that this question applies to the LRA generically. The staff will issue a general request for additional information to complete their review of the applicant's management of bolting aging mechanisms and effects.

2. Table 3.5-3 of the LRA states that no AMP is needed for cable tray & conduit, control boards, electrical & instrument panels & enclosures, and new fuel storage racks. Are these items all made of galvanized steel? If not, discuss the basis for not designating the Inspection Program for Civil Engineering Structures and Components as the AMP for items made of non-galvanized carbon steel.

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Docket Nos. 50-369, 50-370, 50-413, and 50-414
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