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March 8, 2002

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

Subject: Response to Requests for Additional Information in Support of the Staff Review of the Application to Renew the Facility Operating Licenses of McGuire Nuclear Station, Units 1 & 2 and Catawba Nuclear Station, Units 1 & 2

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

Dear Sir:
By letter dated June 13, 2001, Duke Energy Corporation (Duke) submitted an Application to Renew the Facility Operating Licenses of McGuire Nuclear Station and Catawba Nuclear Station (Application). The staff is reviewing the information provided in the Application and has identified areas where additional information is needed to complete its review.

In a letter dated January 17, 2002, the staff requested additional information concerning Sections 2.5, 3.6, and Appendix B, Section B.3.19 of the Application. These sections contain information related to the electrical elements of the license renewal review. Attachment 1 provides the Duke response to this letter. Some of these responses contain commitments. The commitments are restated in Attachment 2 to facilitate tracking and management.

If there are any questions, please contact Bob Gill at (704) 382-3339.

Very truly yours,

M. S. Tuckman

M. S. Tuckman

Attachments:

A085

Affidavit

M. S. Tuckman, being duly sworn, states that he is Executive Vice President, Nuclear Generation Department, Duke Energy Corporation; that he is authorized on the part of said Corporation to sign and file with the U. S. Nuclear Regulatory Commission the attached responses to staff requests for additional information relative to its review of the Application to Renew the Facility Operating Licenses of McGuire Nuclear Station and Catawba Nuclear Station, Docket Nos. 50-369, 50-370, 50-413 and 50-414 dated June 13, 2001, and that all the statements and matters set forth herein are true and correct to the best of his knowledge and belief. To the extent that these statements are not based on his personal knowledge, they are based on information provided by Duke employees and/or consultants. Such information has been reviewed in accordance with Duke Energy Corporation practice and is believed to be reliable.

M. S. Tuckman

M. S. Tuckman, Executive Vice President
Duke Energy Corporation

Subscribed and sworn to before me this 8TH day of MARCH 2002.

Mary P. Nelms
Notary Public

My Commission Expires:

JAN 22, 2006

xc: (w/ Attachment)

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Attachment 1
Application to Renew the Operating Licenses of
McGuire Nuclear Station and Catawba Nuclear Station
Responses to NRC Requests for Additional Information
NRC Letter dated January 17, 2002

2.5 Scoping and Screening Results: Electrical and Instrumentation and Controls

Note: RAI 2.5-1 and RAI 2.5-2 are related topics and a common response is provided.

RAI 2.5-1

Section 2.5 of the LRA indicates that the switchyard systems (i.e., switchyard bus, transmission conductors, and high-voltage insulators) do not meet any of the scoping criteria of §54.4(a). §54.4(a)(3) requires all systems, structures, and components to be included in the scope of license renewal that are relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for station blackout (§50.63). §50.63(a)(1) requires that the nuclear power plant be able to recover from a station blackout. Clarify why switchyard systems are not relied on in safety analyses or plant evaluations to perform a function in the recovery from a station blackout. Also clarify why these offsite system components do not meet the scoping criteria of §54.4(a)(1), §54.4(a)(2) or §54.4(a)(3).

RAI 2.5-2

Section 2.5 of the LRA indicates that the Unit Main Power System and Nonsegregated-Phase bus in the 6.9 kV Normal Auxiliary Power System were found not to meet any of the scoping criteria of §54.4(a). Clarify why the Unit Main Power System and the Nonsegregated-Phase bus in the 6.9 kV Normal Auxiliary Power System are not relied on in safety analyses or plant evaluations to perform a function in the recovery from a station blackout. Also clarify why these offsite system components do not meet the scoping criteria of §54.4(a)(1), §54.4(a)(2) or §54.4(a)(3).

Response to RAI 2.5-1 and RAI 2.5-2

Duke performed an initial review of the McGuire and Catawba station blackout (SBO) safety analyses and plan evaluations prior to submittal of the Application. Based on RAI 2.5-1 and RAI 2.5-2, along with the recent industry discussions, Duke re-reviewed the plant documents with emphasis on equipment related to the recovery of offsite power.

Based on the results of this recent review, Duke has decided that the McGuire and Catawba components that are part of the power path for offsite power from the switchyard are within the scope of license renewal in accordance with the SBO scoping criterion, §54.4(a)(3). This power path includes portions of the power path from the unit power circuit breakers (PCBs) in the respective switchyards to the safety-related buses in each plant. The power path includes portions of (1) the switchyard systems, (2) the Unit Main Power System, and (3) the Nonsegregated-Phase bus in the 6.9 kV Normal Auxiliary Power System of each station.

An aging management will be performed on the passive, long-lived structures and components associated with this offsite power path. The results of this aging management review will be submitted on or before June 30, 2002.

RAI 2.5-3
Section 2.5 of the LRA indicates that non-insulated ground conductors were found not to meet any of the scoping criteria of §54.4(a). Non-insulated ground conductors provide safety-related electrical systems with the capability to withstand transient conditions (e.g., electrical faults). Clarify why this function does not meet the scoping criteria of §54.4(a)(1) and §54.4(a)(2).

Response to RAI 2.5-3
Background
Uninsulated ground conductors are electrical conductors (e.g., copper cable, copper bar, steel bar) that are uninsulated (i.e., bare conductors). Uninsulated ground conductors are connected to electrical equipment housings, enclosures and cabinets as well as metal structural features such as the cable tray system, building structural steel and concrete reinforcing steel.

Uninsulated ground conductors do not include instrument grounding conductors or computer grounding conductors since these grounding conductors are insulated. Being insulated, instrument and computer grounding conductors are included in the aging management review of the general population of non-EQ insulated cables and connections.

Other than the Turkey Point and St. Lucie plants, no other plants undergoing license renewal have found uninsulated ground conductors to be within the scope of license renewal. At Turkey Point and St. Lucie uninsulated ground conductors are specifically identified in their Fire Protection commitments and are in scope only for the Fire Protection scoping criterion. McGuire and Catawba have no such commitments.

Scoping
Uninsulated ground conductors at McGuire and Catawba do not perform a safety-related function per §54.4(a)(1). They are also not relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with any §54.4(a)(3) regulated event. Not being within license renewal scope per the criteria of §54.4(a)(1) and §54.4(a)(3), the remaining scoping criterion to evaluate is the nonsafety-related criterion of §54.4(a)(2).

Uninsulated ground conductors perform a nonsafety-related function at both McGuire and Catawba. Per the nonsafety-related criterion of §54.4(a)(2), all nonsafety-related electrical systems and components whose failure could prevent satisfactory accomplishment of any of the functions identified in §54.4(a)(1)(i), (ii) or (iii) are in scope.

The nonsafety-related scoping criterion of §54.4(a)(2) is not a function-based criterion but a failure-based criterion. To further understand this scoping criterion and how a nonsafety-related

system or component could be within scope, the language of this criterion is expanded in Chapter 6 of the *License Renewal Electrical Handbook*, EPRI 1003057, (page 6-6) as follows:

> ***License Renewal Electrical Handbook***
> "A nonsafety-related system or component is not in scope (per §54.4(a)(2)) unless its failure would:
> - cause a loss of the integrity of the reactor coolant pressure boundary,
> - cause a loss of the capability to shut down the reactor or the capability to maintain it in a safe shutdown condition, or
> - cause a loss of the capability to prevent or mitigate the consequences of accidents that could result in the potential offsite exposure specified in §54.4(a)(1)(iii)."

This nonsafety-related failure is a single failure as discussed in licensing and station design documents. Single failures are considered as part of the current licensing basis for both McGuire and Catawba. McGuire and Catawba are in conformance with licensing commitments concerning single failure as contained in Section 3.1, "Conformance with General Design Criteria" of their respective UFSARs. Criterion 17 – Electrical Power Systems is excerpted below:

> **UFSAR Section 3.1, Conformance with General Design Criteria**
> **Criterion 17 – Electrical Power Systems**
> "...The onsite electrical power supplies...and the onsite electric distribution system, shall have sufficient independence, redundancy, and testability to perform their safety functions assuming a single failure...."

Based on conformance with single failure criteria as outlined in both the McGuire and Catawba UFSARs, no uninsulated ground conductor failure would prevent satisfactory accomplishment of any of the safety-related functions identified in §54.4(a)(1)(i), (ii) or (iii). Uninsulated ground conductors do not meet the nonsafety-related scoping criterion of §54.4(a)(2).

Uninsulated ground conductors are not within the scope of license renewal, because the scoping criteria of §54.4(a)(1), §54.4(a)(2) or §54.4(a)(3) are not met.

3.6 Aging Management of Electrical and Instrumentation and Controls

RAI 3.6.1-1
Exposure of electrical cables to localized environments caused by heat or radiation can result in reduced insulation resistance (IR). Reduced IR causes an increase in leakage currents between conductors and from individual conductors to ground. A reduction in IR is a concern for circuits with sensitive, low-level signals such as radiation monitoring and nuclear instrumentation since it may contribute to inaccuracies in instrument loop. The applicant states that the Non-EQ Insulated Cables and Connections Aging Management Program includes non-EQ cables used in low-level signal application that are sensitive to reduction in insulation resistance such as radiation monitoring and nuclear instrumentation. Further, the applicant states that the accessible non-EQ insulated cables installed in Reactor Buildings, Auxiliary Buildings and Turbine Building are visually inspected for cables jacket surface anomalies such as embrittlement, discoloration, cracking or surface contamination. Visual inspection may not be sufficient to detect aging degradation from heat and radiation in the instrumentation circuits with sensitive, low-level signal. Because low level signal instrumentation circuits may operate with signals that are normally in the milliamp range or less, they can be affected by extremely low levels of leakage current. These low levels of leakage current may affect instrument loop accuracy before the adverse localized environment that caused them produces changes that are visually detectable. Routine calibration test performed as part of the plant surveillance test program can be used to identify the potential existence of this aging degradation. Provide a description of your plant calibration test program that will be relied upon as the aging management activity used to detect this aging degradation in sensitive, low level signal circuits, or provide the technical basis for excluding it.

Response to RAI 3.6.1-1
Duke understands the basis of RAI 3.6.1-1 as concerning the adequate aging management of non-EQ electrical cables used in low-level signal applications that are sensitive to reduction in insulation resistance (IR), such as radiation monitoring and nuclear instrumentation. As stated in Section B.3.23 of the Application, the McGuire and Catawba *Non-EQ Insulated Cables and Connections Aging Management Program* includes these cables within the total population of cables and connections included in this visual inspection program. Having performed extensive, plant-wide visual inspections as part of the license renewal preparatory work at Oconee, Duke has a very high confidence that the visual inspections outlined in this program will detect early aging degradation of insulation of all types of cables and connections—including those that are the subject of RAI 3.6.1-1. The McGuire and Catawba *Non-EQ Insulated Cables and Connections Aging Management Program* is consistent with Gall Report program XI.E1. For these reasons, Duke does not credit a plant calibration test program for aging management.

Additional Information for Response to RAI 3.6.1-1 Regarding Visual Inspections and Detection of Aging Degradation

Two statements are made in RAI 3.6.1-1 regarding visual inspections that are inaccurate and unsupported. This additional information section examines these statements to assist the reviewer in recognizing the strength of visual inspections.

RAI 3.6.1-1 makes the following statement: "Visual inspection may not be sufficient to detect aging degradation from heat and radiation in the instrumentation circuits with sensitive, low-level signal."

This RAI statement is in disagreement with GALL Report Table VI.A (page VI A-3). Item A.1-a of Table VI.A pertains to all non-EQ cables and connections (including those that are the subject of RAI 3.6.1-1). Item A.1-a of Table VI.A identifies program XI.E1 (visual inspection program) as providing aging management for aging effects that include "*reduced insulation resistance*" and indicates that "*No*" further evaluation is recommended. The statement in the RAI that "*Visual inspection may not be sufficient to detect aging degradation...*" is in contradiction to the GALL Report.

For low-voltage cables, embrittlement and significant cracking (through cracks) of the cable jacket and conductor insulation would have to occur before the introduction of moisture around the cable could be an issue. As stated in the Program Description for GALL Report program XI.E1, "*the electrical cables and connections covered by this aging management program are either not exposed to harsh accident conditions or are not required to remain functional during or following an accident to which they are exposed.*" GALL Report Table VI.A (Item A.1-a, page VI A-3) indicates that visual inspection program XI.E1 manages "*moisture intrusion*" and indicates that "*No*" further evaluation is recommended.

RAI 3.6.1-1 makes the following statement: "These low levels of leakage current may affect instrument loop accuracy before the adverse localized environment that caused them produces changes that are visually detectable."

This RAI statement contradicts statements made in Department of Energy report SAND96-0344, *Aging Management Guideline for Commercial Nuclear Power Plants - Electrical Cable and Terminations*. SAND96-0344 is cited as a reference in both NUREG-1800 (SRP for license renewal applications) and NUREG-1801 (GALL Report). SAND96-0344 provides a comprehensive compilation and evaluation of information on the topic of aging and aging management for cables and their associated connections. SAND96-0344 Section 5.2.2, Measurement of Component or Circuit Properties, states the following (underline added for emphasis):

SAND96-0344, Section 5.2.2
"Diagnostic techniques to assist in assessment of the functionality and condition of power plant cables and terminations are described in this section....

"Significant changes in mechanical and physical properties (such as elongation-at-break and density) occur as a result of thermal- and radiation-induced aging. For low-voltage cables, these changes precede changes to the electrical performance of the dielectric. Essentially, the mechanical properties must change to the point of embrittlement and cracking before significant electrical changes are observed...."

"Embrittlement and cracking" are signs of extensive aging that are easily detectable by visual inspection. Signs of less extensive aging, such as discoloration, are also easily detectable by visual inspection. Visual inspections can detect aging degradation early in the aging process before significant aging degradation has occurred. SAND96-0344 Section 5.2.2.1.2, Insulation Resistance (IR)-Advantages/Disadvantages, provides further information on insulation resistance as an electrical property related to aging of cables as follows:

SAND96-0344, Section 5.2.2.1.2
"IR may give some indication of the aging of connections; however, it is generally considered of little use in predicting the aging of a cable. IR properties of dielectrics may change little until severe degradation of mechanical properties occurs. These measurements display some gradual changes with aging, but are generally nowhere near as sensitive to aging as techniques based on mechanical properties.... Conversely, even gross insulation damage may not be evidenced by changes in IR; for example, an insulation cut-through surrounded by dry air may not significantly affect IR readings.... Testing is usually conducted as a pass/fail...."

Performing visual inspections is supported as a promising condition monitoring technique. As described in Section 5.2.2.4 of SAND96-0344:

SAND96-0344, Section 5.2.2.4
"In mid-1993 the U.S. NRC Office of Nuclear Reactor Regulation (NRR) initiated an EQ task action plan (EQ TAP) which sets forth specific activities of the Office of Nuclear Regulatory Research (RES) and NRR relating to the qualification of electrical components. Potential safety issues addressed by the EQ TAP include...condition monitoring methods. One of the primary focal points of this effort relates to low-voltage cables."

An array of condition monitoring techniques were evaluated in the EQ TAP in order to identify those that are "*Promising*". Calibration testing was not included among the array of condition monitoring techniques evaluated as part of the EQ TAP. Visual inspection was evaluated as part of the EQ TAP and was identified as a "*Promising*" condition monitoring technique.

Visual inspections are also discussed in the *License Renewal Electrical Handbook* (EPRI 1003057, page 14-3) as follows:

> **License Renewal Electrical Handbook**
> "Research continues to be performed on condition monitoring methods that run the full spectrum from very unsophisticated to ultrasophisticated. To date, out of all that research, no sophisticated approach has been found workable for the full range of plant cables, cable installations and environments at the U.S. nuclear power plants. The only universal technique that was found to provide reasonable indication that could be related to cable degradation was visual inspections.... At present, visual inspection techniques are the only practical and universal type of condition monitoring program and are adequate for the cables and connections covered by this [XI.E1] GALL Report program."

SAND96-0344 (Chapter 5) also provides a comprehensive review of maintenance, surveillance and condition monitoring techniques for evaluation of electrical cable and terminations. SAND96-0344 Table 5-1 identifies Inspection Techniques Applicable to Various Degradation Mechanisms and "*Visual inspection*" is identified in the table as an applicable technique for each mechanism. Tables 5-2, 5-3, 5-4 and 5-5 list Destructive, Nondestructive and Essentially Nondestructive Condition Monitoring Techniques and calibration testing is not identified in any of these tables as a condition monitoring technique. In addition, a word search concluded that neither calibration nor calibration testing is identified in any part of SAND96-0344.

The additional information above provides a basis for the strength of visual inspections as a condition monitoring technique that is recognized by both the industry and the NRC. Duke intends that this additional information aid the reviewer in recognizing the strength of the McGuire and Catawba *Non-EQ Insulated Cables and Connections Aging Management Program*, which is based on visual inspections.

B.3.19 Inaccessible Non-EQ Medium-Voltage Cables Aging Management Program

Note: RAI B.3.19-1 and RAI B.3.19-2 are related topics and a common response is provided.

B.3.19-1

Periodic actions are taken to prevent cable from being exposed to significant moisture, such as inspecting for water collection in cable manholes and conduit, and draining water. These actions are considered as preventive actions. Section B.3.19 of the LRA under topic heading "Preventive Actions" indicates no preventive actions are required as part of the Inaccessible Non-EQ Medium-Voltage Cables Aging Management Program (AMP). Explain why no preventive actions are required as part of the AMP.

B.3.19-2

Section B.3.19 of the LRA under topic heading "Scope" defines significant moisture as exposure to long-term (over a long period such as a few years), continuous standing water. Similar words are used in Section 3.6.2 of the LRA. The Oconee LRA defined significant moisture as exposure to moisture that lasts more than a few days. Explain why exposure to moisture over more than a few days, and up to a few years, is not significant.

Response to RAI B.3.19-1 and RAI B.3.19-2

The response to these two RAIs is in preparation and will be provided on or before April 15, 2002.

Attachment 2
Application to Renew the Operating Licenses of
McGuire Nuclear Station and Catawba Nuclear Station
Responses to NRC Requests for Additional Information
NRC Letter dated January 17, 2002

LIST OF COMMITMENTS

Attachment 2
Duke Letter Dated March 8, 2002
Responses to NRC Requests for Additional Information
McGuire Nuclear Station and Catawba Nuclear Station

LIST OF COMMITMENTS

1. The results of the aging management review for the structures and components within the systems identified in the response to RAI 2.5-1 and RAI 2.5-2 will be submitted on or before June 30, 2002.

2. The response to RAI B.3.19-1 and RAI B.3.19-2 is in preparation and will be provided on or before April 15, 2002.