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June 26, 2002

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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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. Duke letter dated March 8, 2002 provided the initial response to the staff requests for additional information. Within this March 8 letter, Duke committed to provide 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 2.5-2. Attachment 1 provides the results of the aging management review of structures and components relied upon to restore power from offsite sources following station blackout (SBO). This submittal contains no commitments.

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

M. S. Tuckman

M. S. Tuckman
Attachment:

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 26TH day of June 2002.

Mary P. Nelms
Notary Public

My Commission Expires:
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Attachment 1
Application to Renew the Operating Licenses of
McGuire Nuclear Station and Catawba Nuclear Station
Supplemental Response to Provide the Results of
Aging Management Review of Structures and Components
Relied Upon to Restore Power from Offsite Sources Following Station Blackout

1.0 INTRODUCTION

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. Duke letter dated March 8, 2002 provided the initial response to the staff requests for additional information. Duke stated that based on the results of a recent review of plant documents 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. Within this March 8, 2002 letter, Duke committed to provide the results of the aging management review for the structures and components within the structures and systems identified above.

Consistent with the order of presenting aging management results in the Application, these aging management review results for structural components are provided in 20, Scoping and Screening Results for SBO: Structures and 3.0, Aging Management of Structures and Component Supports Required for SBO. The aging management review results for electrical components are provided in 4.0, Scoping and Screening Results for SBO: Electrical and Instrumentation and Controls, and 5.0 Aging Management of Electrical Components required for SBO. The aging management reviews are generically applicable to both McGuire Nuclear Station and Catawba Nuclear Station, unless otherwise noted.

The aging management review demonstrates that there is reasonable assurance that the McGuire and Catawba structural components, isolated-phase bus, nonsegregated-phase bus, transmission conductors, switchyard bus and high-voltage insulators will perform their intended functions in accordance with the current licensing basis during the period of extended operation and that no aging management is required. This conclusion is consistent with the conclusion that the staff reached during its review of the Oconee Application as documented in the *Safety Evaluation Report Related to the License Renewal of Oconee Nuclear Station, Units 1, 2, and 3,* NUREG-1723, Section 3.9.3.

2.0 SCOPING AND SCREENING RESULTS FOR SBO: STRUCTURES

For McGuire, the power path described above adds the 230 kV and 525 kV Switchyard and Relay House structures within the scope of license renewal. These structures are added to the structures within the Yard Structures grouping listed in Section 3.5 of the Application. The Relay House, which is located within the Switchyard, is a two level building that houses control, monitoring and protective relaying for the Switchyard equipment. The Relay House is constructed of concrete, steel and masonry. The components within the Relay House are exposed to a sheltered environment. Structural components within these structures exposed to the external environment of the yard and to the sheltered environment of the Relay House are listed in Table 1. Switchyard cable trenches and Transformer Station cable trenches, provide routing, support and protection to cables serving the Switchyard and Relay House equipment. Trenches are constructed of prefabricated concrete sections. The walls, covers, and ribs are made up of reinforced concrete. The trenches are also listed in Table 1.

For Catawba, the power path described above adds the 230 kV Switchyard and the Relay House structures within the scope of license renewal. These structures are added to the structures within the Yard Structures grouping listed in Section 3.5 of the Application. The Relay House, which is located within the switchyard, is a one story steel and masonry structure that houses control, monitoring and protective relaying for the Switchyard equipment. Structural components within these structures exposed to the external environment of the yard and to the sheltered environment of the Relay House are listed in Table 1. Switchyard cable trenches, and Transformer Station cable trenches, provide routing, support and protection to cables serving the Switchyard and Relay House equipment. Trenches are constructed of prefabricated concrete sections. The walls, covers, and ribs are made up of reinforced concrete. The trenches are also listed in Table 1.

3.0 AGING MANAGEMENT OF STRUCTURES AND COMPONENT SUPPORTS REQUIRED FOR SBO

The results of the aging management review for structures and component supports required for SBO are provided in Table 1. Information contained in this table was obtained in the following manner:

Column 1 – The component types listed in Column 1 were identified through the screening methodology described in Section 2.1.2 of the Application.

Column 2 – The component functions listed in Column 2 were obtained from plant specific engineering documents using the screening methodology described in Section 2.1.2 of the Application. Component function 11 is the same as component function 11 listed in Note (2) of Table 3.5-2 and Table 3.5-3 of the Application.

Column 3 – The materials listed in Column 3 were obtained from plant specific engineering documents.

Column 4 – The external environments listed in Column 4 were obtained from plant specific engineering documents. These environments are as follows:

- **Below Grade** – Below grade portions of structures are exposed to back fill and groundwater. The groundwater at McGuire and Catawba is not aggressive. The McGuire groundwater pH ranges between 8.1 and 8.4; the chloride concentration is less than 20 ppm; and the sulfate concentration is less than 30 ppm. The Catawba groundwater pH ranges between 5.7 and 7.0; the chloride concentration is less than 25 ppm; and the sulfate concentration is less than 35 ppm.

- **Concrete** – Steel components located in concrete are protected by the alkaline environment of the concrete.

- **External** – External surfaces of structures are exposed to the external ambient environment.

- **Sheltered** – The ambient conditions within the sheltered environment may or may not be controlled. The sheltered environment atmosphere is a moist air environment.

Based on the evaluation of the *Inspection Program for Civil Engineering Structures and Components* contained in Appendix B of the Application, the aging effects will be adequately managed such that the intended functions of the components listed in Table 1 will be maintained consistent with the current licensing basis for the period of extended operation.

TABLE 1
AGING MANAGEMENT REVIEW RESULTS
SWITCHYARD, TRANSFORMER STATION, AND RELAY HOUSE STRUCTURAL COMPONENTS
MCGUIRE NUCLEAR STATION, UNITS 1 AND 2; CATAWBA NUCLEAR STATION, UNITS 1 AND 2

1	2	3	4	5	6
Component Type	**Component Function (Note 1)**	**Material**	**Environment**	**Aging Effects**	**Aging Management Programs and Activities**
Steel Structural Components					
Anchorage	11	Steel	Concrete	None Identified	None Required
Anchorage (exposed surface)	11	Steel	Sheltered External	Loss of Material	Inspection Program for Civil Engineering Structures and Components
Battery Rack (Relay House)	11	Steel	Sheltered	Loss of Material	Inspection Program for Civil Engineering Structures and Components
Cable Tray & Conduit	11	Steel	Sheltered External	None Identified	None Required
Cable Tray & Conduit Supports	11	Steel	Sheltered External	Loss of Material	Inspection Program for Civil Engineering Structures and Components
Checkered Plate (Trench Covers)	11	Steel	External	Loss of Material	Inspection Program for Civil Engineering Structures and Components
Electrical & Instrument Panels & Enclosures	11	Steel	Sheltered External	None Identified	None Required
Embedments	11	Steel	Concrete	None Identified	None Required
Embedments (exposed surface)	11	Steel	Sheltered External	Loss of Material	Inspection Program for Civil Engineering Structures and Components
Equipment Component Supports (Busline supports)	11	Steel	Sheltered External	Loss of Material	Inspection Program for Civil Engineering Structures and Components
		Galvanized Steel	External	None Identified	None Required
Expansion Anchors	11	Steel	Sheltered External	Loss of Material	Inspection Program for Civil Engineering Structures and Components

TABLE 1
AGING MANAGEMENT REVIEW RESULTS
SWITCHYARD, TRANSFORMER STATION, AND RELAY HOUSE STRUCTURAL COMPONENTS
MCGUIRE NUCLEAR STATION, UNITS 1 AND 2; CATAWBA NUCLEAR STATION, UNITS 1 AND 2
(continued)

1	2	3	4	5	6
Component Type	**Component Function (Note 1)**	**Material**	**Environment (Note 2)**	**Aging Effects**	**Aging Management Programs and Activities**
Steel Structural Components (continued)					
HVAC Duct Supports (Relay House)	11	Steel	Sheltered	Loss of Material	Inspection Program for Civil Engineering Structures and Components
Instrument Racks & Frames	11	Steel	Sheltered	Loss of Material	Inspection Program for Civil Engineering Structures and Components
Stair, Platform, and Grating Supports (MNS Relay House)	11	Steel	Sheltered	Loss of Material	Inspection Program for Civil Engineering Structures and Components
Structural Steel Beams, Columns, Plates & Trusses	11	Steel	Sheltered External	Loss of Material	Inspection Program for Civil Engineering Structures and Components
Transmission Towers (MNS only)	11	Galvanized Steel	External	None Identified	None Required
Concrete Structural Components					
Equipment Pads	11	Concrete	Sheltered External	None Identified	None Required
Foundations (Relay House, Transmission Towers)	11	Concrete	Below Grade	None Identified	None Required
Masonry Block Walls (Relay House)	11	Masonry	Sheltered	Cracking	Inspection Program for Civil Engineering Structures and Components
Reinforced Concrete Beams, Columns, Floor Slabs, Walls (Relay House floor)	11	Concrete	Sheltered	None Identified	None Required
Trenches	11	Concrete	Below Grade	None Identified	None Required

TABLE 1
AGING MANAGEMENT REVIEW RESULTS
SWITCHYARD, TRANSFORMER STATION, AND RELAY HOUSE STRUCTURAL COMPONENTS
MCGUIRE NUCLEAR STATION, UNITS 1 AND 2; CATAWBA NUCLEAR STATION, UNITS 1 AND 2
(continued)

1	2	3	4	5	6
Component Type	**Component Function (Note 1)**	**Material**	**Environment**	**Aging Effects**	**Aging Management Programs and Activities**
Other Structural Components					
Roofing (Relay House)	11	Aggregate Bitumen Felt	External	Loss of Material	Inspection Program for Civil Engineering Structures and Components
Metal Siding (Relay House)	11	Aluminum	External	None Identified	None Required

Note 1: Component function number 11 provides structural support and/or shelter to components relied on during certain postulated fire, anticipated transients without scram, and/or station blackout events.

4.0 SCOPING AND SCREENING RESULTS FOR SBO: ELECTRICAL AND INSTRUMENTATION AND CONTROLS

For McGuire and Catawba, the power path described above adds the following electrical components as subject to aging management review:

- Isolated-phase bus – installed to connect the unit generator to the main step-up transformers, auxiliary power transformers and potential transformers as part of the Unit Main Power System.
- Nonsegregated-phase bus – installed to connect the auxiliary power transformers to the 6.9kV and 13.8kV switchgear as part of the 6.9kV and 13.8kV Normal Auxiliary Power Systems.
- Passive switchyard commodities – transmission conductors, switchyard bus and high-voltage insulators installed in the transformer yards and the 230 kV and 525 kV (McGuire only) switchyards and the unit busline towers (McGuire only).

No phase bus or passive switchyard commodities are scoped out. All phase bus and passive switchyard commodities are subject to an aging management review as part of a bounding review.

5.0 AGING MANAGEMENT OF ELECTRICAL COMPONENTS REQUIRED FOR SBO

The review of electrical components required for SBO utilizes the results of the review that Duke previously performed to support the renewal of the operating licenses of Oconee Nuclear Station Units 1, 2, and 3. The Oconee review covered the same set of equipment and the results of this review were contained the Oconee Application [Reference 1]. The staff's evaluation of the Oconee Application is contained in NUREG-1723, [Reference 2]. The following sections provide the results of the aging management review of isolated-phase bus and nonsegregated-phase bus (Section 5.1) and transmission conductors, switchyard bus, high-voltage insulators (Section 5.2). The results are summarized in Table 4.

5.1 AGING MANAGEMENT REVIEW OF ISOLATED-PHASE BUS AND NONSEGREGATED-PHASE BUS

The aging management review for McGuire and Catawba isolated-phase bus and nonsegregated-phase bus follows the guidance provided in the EPRI *License Renewal Electrical Handbook* [Reference 3] and is consistent with both the guidance provided in NEI 95-10 [Reference 4] and the previous review performed for Oconee. Isolated-phase bus and nonsegregated-phase bus descriptions are provided in Chapter 8 of the *License Renewal Electrical Handbook.*

McGuire and Catawba isolated-phase bus and nonsegregated-phase bus have three main parts or assemblies: the conductor, the conductor support (insulator), and the bus enclosure. Where nonsegregated-phase bus passes through an outside wall, a wall bushing assembly is used to provide a thermal barrier. As confirmed through a review of manufacturer's drawings and personnel interviews, McGuire and Catawba isolated-phase bus and nonsegregated-phase bus is similar in design, construction and materials to the Oconee phase bus described in Section 3.6.2.1 of the Oconee Application with two notable differences. One difference is that the aluminum conductor for bus sections is welded rather than bolted together, and the conductor is bolted only where braided conductors are installed to prevent the propagation of vibration to the rigid conductor. There are less bolted connections at McGuire and Catawba than at Oconee. The other difference is that the aluminum bus and braided mating surfaces are silver-plated. The potential formation of silver oxide at the connection for McGuire and Catawba rather than the formation of aluminum oxide at Oconee. Other differences between the Oconee, McGuire and Catawba bus are not significant to the aging management review.

Based on industry literature, plant operating experience and the Oconee Application review, the potential aging effects identified in Table 2 are required to be included in the phase bus aging management review. This review included the industry operating experience reports for phase bus identified in Chapter 11 of the *License Renewal Electrical Handbook* [Reference 3]. This aging effects identification process is consistent with the process used in Section 3.6 of the Oconee Application.

TABLE 2

POTENTIAL AGING EFFECTS INCLUDED IN THE AGING MANAGEMENT REVIEW FOR ISOLATED-PHASE BUS AND NONSEGREGATED-PHASE BUS

Name	Material (Application)	Stressor or Mechanism	Potential Aging Effect
Connection surface oxidation for aluminum conductor phase bus	Aluminum (conductor bolted connections)	Connection surface oxidation	Change in material properties leading to increased resistance and heating
Temperature and radiation for silicone caulk for phase bus	Silicone caulk (wall bushing/conductor interface)	Temperature and Radiation	Change in material properties leading to loss of maintained spacing between the bus and bushing
Moisture for steel hardware for phase bus enclosure	Steel (enclosure hardware)	Moisture	Change in material properties (corrosion) leading to loss of function for the part

5.1.1 Connection Surface Oxidation for Aluminum Conductor Phase Bus

The aluminum conductor of the bus sections are welded except where braided conductor are used to connect the bus to another component. The aluminum mating surfaces at these connections are coated with copper and then silver plated. The silver plating is highly conductive but does not make a good contact surface since silver exposed to air forms silver oxide on the surface, which is nonconductive. To prevent the formation of silver oxide on connection surfaces, the surfaces are periodically cleaned (to remove any existing silver oxide) and covered with a grease to prevent air from contacting the mating surfaces. The grease precludes oxidation of the silver surface thereby maintaining good conductivity at the bus connections. The grease is a consumable that is replaced during each routine maintenance of the bus. Therefore, there are no applicable aging effects for the aluminum bus connections when exposed to their service conditions for the extended period of operation.

5.1.2 Temperature and Radiation for Silicone Caulk for Phase Bus

Silicone rubber-based caulk is used to maintain spacing between the conductor and bushing in a wall bushing assembly. Silicone rubbers have a 60-year service-limiting temperature of 273°F as documented in Table 9-1 of the *License Renewal Electrical Handbook.* The isolated-phase bus and nonsegregated-phase bus are installed in the Turbine Building, Service Building and transformer yard, which have a bounding ambient design temperature of 110°F and negligible radiation. Adding design ohmic heating to the ambient temperature puts the service condition for temperature at 226°F, which is less than the 60-year service-limiting temperature of 273°F for silicone rubber. Therefore, silicone rubber has no aging effects due to heat for the extended period of operation that will cause loss of component intended function.

5.1.3 Moisture for Steel Hardware for Phase Bus

Steel hardware (bolts, washers, nuts, etc.) is used on parts of the bus enclosure that are not welded. The enclosure and hardware exposed to external environment (precipitation) was factory coated to inhibit corrosion. Based on collective service experiences at Oconee, McGuire, and Catawba (service of from 20 to over 30 years), no signs of corrosion or loss of material have been observed. Therefore, loss of material for steel hardware is not an applicable aging effect that will lead to a loss of intended function for the bus for the period of extended operation.

5.1.4 Conclusion

The above review of materials, service conditions and potential aging effects demonstrates that there is reasonable assurance that the McGuire and Catawba isolated-phase bus and nonsegregated-phase bus will perform their intended functions in accordance with the current licensing basis during the period of extended operation and that no aging management is required. This conclusion is consistent with the conclusion that the staff reached during its review of the Oconee Application as documented in the *Safety Evaluation Report Related to the License Renewal of Oconee Nuclear Station, Units 1, 2, and 3,* NUREG-1723, Section 3.9.3.

5.2 Aging Management Review for Transmission Conductors, Switchyard Bus, High-Voltage Insulators

The aging management review for McGuire and Catawba transmission conductors, switchyard bus and high-voltage insulators follows the guidance provided in the EPRI *License Renewal Electrical Handbook* [Reference 3] and is consistent with both the guidance provided in NEI 95-10 [Reference 4] and the previous review performed for Oconee. Transmission conductor, switchyard bus and high-voltage insulator descriptions are provided in Chapter 8 of the *License Renewal Electrical Handbook.*

McGuire and Catawba transmission conductors, switchyard bus and high-voltage insulators are designed, constructed and have the same materials as the Oconee transmission conductors, switchyard bus and high-voltage insulators described in Sections 3.6.2.2, 3.6.4 and 3.6.5 of the Oconee Application with one notable difference. The difference is that multi-cone insulators (where several porcelain cone insulators are cemented together to form a post) used in post applications were not included in the Oconee review. Other differences between the Oconee, McGuire and Catawba transmission conductors, switchyard bus, and high voltage insulators are not significant to the aging management review.

Based on industry literature, plant operating experience and the Oconee Application review, the potential aging effects identified in Table 3 are required to be included in the aging management review for transmission conductors, switchyard bus, and high voltage insulators. This review included the industry operating experience reports for transmission conductors, switchyard bus, and high voltage insulators identified in Chapter 11 of the *License Renewal Electrical Handbook* [Reference 3]. This aging effects identification process is consistent with the process used in Section 3.6 of the Oconee Application.

TABLE 3

POTENTIAL AGING EFFECTS INCLUDED IN THE AGING MANAGEMENT REVIEW FOR TRANSMISSION CONDUCTORS, SWITCHYARD BUS AND HIGH-VOLTAGE INSULATORS

Name	Material	Stressor or Mechanism	Potential Aging Effect
Loss of conductor strength for transmission conductors	Aluminum conductors reinforced with galvanized steel core	Corrosion	Loss of conductor strength
Connection surface oxidation for aluminum switchyard bus	Aluminum bus	Connection surface oxidation	Change in material properties leading to increased resistance and heating
Surface contamination assessment for high-voltage insulators	Porcelain	Airborne contaminants	Surface contamination
Cracking assessment for high-voltage insulators	Porcelain	Cement growth	Cracking
Loss of material due to wear assessment for high-voltage insulators	Metal	Mechanical wear	Loss of material

McGuire and Catawba transmission conductors, switchyard bus and high-voltage insulators are installed in an external environment (bounding 105°F, negligible radiation, and exposure to precipitation). The aging effects identified for transmission conductors, switchyard bus and high-voltage insulators are not heat-related so ohmic heating is not included.

5.2.1 Loss of Conductor Strength for Transmission Conductors

The transmission conductors included in the aging management review are constructed of aluminum conductors steel reinforced (ACSR). The most prevalent mechanism contributing to loss of conductor strength of an ACSR transmission conductor is corrosion, which includes corrosion of the steel core and aluminum strand pitting. For ACSR conductors, degradation begins as a loss of zinc from the galvanized steel core wires. Corrosion rates depend to a great extent on air quality which includes suspended particles chemistry, SO_2 concentration in air, precipitation, fog chemistry, and meteorological conditions. Tests performed by Ontario Hydroelectric showed a 30% loss of composite conductor strength of an 80-year-old ACSR conductor due to corrosion.

Corrosion of ACSR conductors is a very slow acting aging effect that is even slower for rural areas with generally less suspended particles and SO_2 concentrations in the air than urban areas. Duke has been installing and maintaining transmission conductors on its transmission system for more than 50 years and has not yet had to replace any conductors due to aging problems. There are no applicable aging effects that could cause loss of the intended function of the transmission conductors for the period of extended operation.

5.2.2 Connection Surface Oxidation for Aluminum Switchyard Bus

All bus connections within the component boundaries are welded connections. For the ambient environmental conditions at McGuire and Catawba, no aging effects have been identified that could cause a loss of intended function for the extended period of operation. Therefore, there are no applicable aging effects for the aluminum bus.

5.2.3 Surface Contamination Assessment for High-Voltage Insulators

Various airborne materials such as dust, salt and industrial effluents can contaminate insulator surfaces. The buildup of surface contamination is gradual and in most areas such contamination is washed away by rain; the glazed insulator surface aids this contamination removal. A large buildup of contamination enables the conductor voltage to track along the surface more easily and can lead to insulator flashover. Surface contamination can be a problem in areas where there are greater concentrations of airborne particles such as near facilities that discharge soot or near the sea coast where salt spray is prevalent. McGuire and Catawba are located in an area with moderate rainfall where airborne particle concentrations are comparatively low. Consequently, the rate of contamination buildup on the insulators is not significant. At McGuire and Catawba, as in most areas of the Duke Power transmission system, contamination build up on insulators is not a problem. Therefore, surface contamination is not an applicable aging effect for the insulators in the service conditions they are exposed to at McGuire and Catawba.

5.2.4 Cracking Assessment for High-Voltage Insulators

Cracks have been known to occur with insulators when the cement that binds the parts together expands enough to crack the porcelain. This phenomenon, know as cement growth, is mainly due to improper manufacturing process or materials, which make the cement more susceptible to moisture penetration, and due to specific design and application of the insulator.

The string insulators susceptible to porcelain cracking caused by cement growth are isolated to bad batches (specific, known brands and manufacture dates) of string insulators used in strain applications. The post insulators most susceptible to this aging effect are multi-cone (post) insulators used in cantilever applications. In the mid-1990's when this problem was identified, Duke undertook a program to identify and replace the most susceptible insulators system wide, including those in the McGuire and Catawba switchyards. Accordingly, cracking due to cement growth is not an applicable aging effect for the insulators currently installed in the McGuire and Catawba switchyards.

5.2.5 Loss of Material Due to Wear Assessment for High-Voltage Insulators

Mechanical wear is an aging effect for strain and suspension insulators in that they are subject to movement. Movement of the insulators can be caused by wind blowing the supported transmission conductor, causing it to swing from side to side. If this swinging is frequent enough, it could cause wear in the metal contact points of the insulator string and between an insulator and the supporting hardware. Although this mechanism is possible, experience has shown that the transmission conductors do not normally swing and that when they do, due to a substantial wind, do not continue to swing for very long once the wind has subsided. Wear has not been identified during routine inspections. Loss of material due to wear will not cause a loss of intended function of the insulators at McGuire and Catawba. Therefore, loss of material due to wear is not an applicable aging effect for insulators.

5.2.6 Conclusion

The above review of materials, service conditions and aging effects demonstrates that there is reasonable assurance that the McGuire and Catawba transmission conductors, switchyard bus and high-voltage insulators will perform their intended functions in accordance with the current licensing basis during the period of extended operation and that no aging management is required. This conclusion is consistent with the conclusion that the staff reached during its review of the Oconee Application as documented in the *Safety Evaluation Report Related to the License Renewal of Oconee Nuclear Station, Units 1, 2, and 3,* NUREG-1723, Section 3.9.3.

5.3 AGING MANAGEMENT REVIEW RESULTS TABLE

The results of the aging management review for isolated-phase bus, nonsegregated-phase bus, transmission conductors, switchyard bus and high-voltage insulators are provided in Table 4. Information contained in this table was obtained in the following manner:

Column 1 – The component types listed in Column 1 were obtained from plant specific engineering documentation.

Column 2 – The component function listed in Column 2 was obtained from plant specific engineering documentation.

Column 3 – The material and application information listed in Column 3 was obtained from plant specific engineering documentation.

Column 4 – The environment listed in Column 4 was obtained from plant specific engineering documents. These environments are as follows:

- **External** – External surfaces of electrical components are exposed to the external ambient environment.
- **Sheltered** – The ambient conditions within the sheltered environment may or may not be controlled. The sheltered environment atmosphere is a moist air environment.

Column 5 – This column would normally contain the aging effect that require management during the period of extended operation. The process described in Section 3.6 of the Application and Sections 5.1 and 5.2 above did not identify any aging effects that require aging management during the period of extended operation.

Column 6 – This column would normally contain the title of the credited aging management program or activity. As the aging management review did not identify any aging effects that require management during the period of extended operation, no aging management programs or activities are required.

TABLE 4

AGING MANAGEMENT REVIEW RESULTS – ISOLATED-PHASE BUS, NONSEGREGATED-PHASE BUS, TRANSMISSION CONDUCTORS, SWITCHYARD BUS AND HIGH-VOLTAGE INSULATORS

1	2	3	4	5	6
Component Type	**Component Function**	**Material**	**Environment**	**Aging Effect**	**Aging Management Program**
Isolated-phase bus and nonsegregated-phase bus	Maintain electrical connection to specified sections of an electrical circuit to deliver voltage, current or signals	Aluminum, silicone caulk, steel	External Sheltered	None Identified	None Required
Transmission conductors	Maintain electrical connection to specified sections of an electrical circuit to deliver voltage, current or signals	Aluminum conductors reinforced with galvanized steel core	External	None Identified	None Required
Switchyard bus	Maintain electrical connection to specified sections of an electrical circuit to deliver voltage, current or signals	Aluminum bus	External	None Identified	None Required
High-voltage insulators	Insulate and support an electrical conductor	Porcelain, Metal	External	None Identified	None Required

6.0 REFERENCES

1. *Application to Renew the Operating Licenses of Oconee Nuclear Station, Units 1, 2, and 3*, June 1998.
2. NUREG-1723, *Safety Evaluation Report Related to the License Renewal of Oconee Nuclear Station, Units 1, 2, and 3*, March 2000.
3. *License Renewal Electrical Handbook:* EPRI, Palo Alto, CA: 2001. 1003057
4. NEI 95-10 (Revision 3), *Industry Guideline for Implementing the Requirements of 10 CFR Part 54 - The License Renewal Rule.*