

**TABLE 3.6.2-1 ELECTRICAL AND I&C SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION –
ELECTRICAL/I&C COMPONENTS/COMMODITIES**

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Non-EQ Insulated Cables and Connections	E-1	Various Organic Polymers	Adverse localized environment caused by heat, radiation, or moisture in the presence of oxygen	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced IR; electrical failure caused by thermal/thermooxidative degradation of organics; radiation-induced oxidation; moisture intrusion	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program	VI.A.1-a	3.6.1- 02	A, 601
Medium-Voltage Power Cables	E-1	Various Organic Polymers	Adverse localized environment caused by exposure to moisture and voltage	Formation of water trees, localized damage leading to electrical failure (breakdown of insulation)	Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program	VI.A.1-c	3.6.1- 04	A

TABLE 3.6.2-1 (continued) ELECTRICAL AND I&C SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – ELECTRICAL/I&C COMPONENTS/COMMODITIES

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Non-EQ Cables Used in Radiation Monitoring Instrumentation Circuits	E-1	Various Organic Polymers	Adverse localized environment caused by heat, radiation, or moisture in the presence of oxygen	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced IR; electrical failure caused by thermal/thermooxidative degradation of organics; radiation-induced oxidation; moisture intrusion	Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program	VI.A.1-b	3.6.1- 03	A, 602
Non-EQ Cables Used in Neutron Flux Instrumentation Circuits	E-1	Various Organic Polymers	Adverse localized environment caused by heat, radiation, or moisture in the presence of oxygen	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced IR; electrical failure caused by thermal/thermooxidative degradation of organics; radiation-induced oxidation; moisture intrusion	Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program	VI.A.1-b	3.6.1- 03	B, 602, 603
Phase Bus	E-1	Various Metals, Porcelain, PVC, Silicon Caulk	Adverse localized environment caused by heat, or moisture	Oxidation, Loosening of bolted connections due to thermal cycling, Corrosion due to moisture	Phase Bus Aging Management Program			J

TABLE 3.6.2-1 (continued) ELECTRICAL AND I&C SYSTEMS – SUMMARY OF AGING MANAGEMENT EVALUATION – ELECTRICAL/I&C COMPONENTS/COMMODITIES

Component Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Non-EQ Electrical and I&C Penetration Assemblies	E-1	XLPE, XLPO, SR, Ceramic, DC 185 encapsulant	Adverse localized environment caused by heat or radiation in the presence of oxygen	None	None			604
Non-EQ Electrical and I&C Penetration Assembly Pigtails	E-1	XLPO, XLPE	Adverse localized environment caused by heat or radiation in the presence of oxygen	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced IR; electrical failure caused by thermal/thermooxidative degradation of organics; radiation-induced oxidation; moisture intrusion	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program	VI.A.1-a	3.6.1- 02	A, 605
High-Voltage Insulators	E-2	Porcelain, Metal, Cement	Outdoor	None	None			J, 606
Switchyard Bus	E-1	Aluminum, Galvanized Steel	Outdoor	None	None			J, 607
Transmission Conductors	E-1	Aluminum, Steel	Outdoor	None	None			J, 608

Notes for Table 3.6.2-1:

Generic Notes:

- A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
- B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
- C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
- D. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
- E. Consistent with NUREG-1801 for material, environment, and aging effect, but a different AMP is credited.
- F. Material not in NUREG-1801 for this component.
- G. Environment not in NUREG-1801 for this component and material.
- H. Aging effect not in NUREG 1801 for this component, material, and environment combination.
- I. Aging effect in NUREG-1801 for this component, material, and environment combination is not applicable.
- J. Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-specific Notes:

- 601. There are no BSEP fuse holders that meet the screening criteria defined in ISG-5. Therefore, no aging management program for fuse holders is warranted under ISG-5. However, since fuse holders represent another type of electrical connection similar to terminal blocks, fuse holders are included in the aging management program for Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements.
- 602. The scope of this program applies to non-EQ cables used in the process radiation monitoring instrumentation circuits, area radiation monitoring instrumentation circuits, and neutron monitoring instrumentation circuits that are sensitive to a reduction in insulation resistance.
- 603. The test methods utilized for detecting the aging effects of the non-EQ cables associated with the neutron monitoring instrumentation circuits is based on industry comments to ISG-15.
- 604. Evaluation has shown that the insulation materials for the non-EQ Westinghouse Class E and Class D2 electrical penetration assemblies are aptly suited for their service conditions and acceptable for the period of extended operation.
- 605. The aging management program for Electrical Cables and Connections Not Subject To 10 CFR 50.49 EQ Requirements is applicable to the penetration assembly pigtails.

606. Surface contamination is not an applicable aging mechanism. The buildup of surface contamination is typically a slow, gradual process. BSEP is located in a rural area where airborne particle concentrations are comparatively low. Consequently, the rate of contamination buildup on the insulators is not significant. Any such contamination accumulation is washed away naturally, by rainwater. The glazed surface on high-voltage insulators at BSEP aids in the removal of this contamination. In March 1993, the Unit 2 switchyard experienced a flashover of some high-voltage insulators. The incident was attributed to a severe winter storm with gale force winds that persisted in the area for a number of days. The incident was considered a highly unusual atmospheric event and was not attributed to actual aging of the insulators but rather to the storm itself. The storm was unusual because it contained high winds but little or no precipitation to wash away the salt spray on the insulators. An event like this had not occurred prior or subsequent to March 1993. As the March 1993 incident was event-driven, it is concluded that surface contamination is not an applicable stressor for the high-voltage insulators within the scope of this review when exposed to their normal service conditions. Therefore, no aging management activities are required for the extended period of operation. This event resulted in the issuance of NRC IN 93-95, Storm-Related Loss of Offsite Power Events Due to Salt Buildup on Switchyard Insulators.

Cracking is not an applicable aging mechanism. Cracking or breaking of porcelain insulators is typically caused by physical damage which is event-driven rather than an age-related mechanism. Mechanical wear is an aging effect for strain and suspension insulators if they are subject to significant movement. BSEP transmission conductors do not normally swing and when they do, because of strong winds, they dampen quickly once the wind has subsided. Loss of material due to wear has not been identified during routine inspections at BSEP. It is concluded that no aging management activities are required for this commodity group.

607. Connection surface oxidation is not an applicable aging effect. All switchyard bus connections have welded and/or compression connections. For the service conditions encountered at BSEP, no aging effects have been identified that could cause a loss of intended function. Vibration is not an applicable aging mechanism since switchyard bus has no connections to moving or vibrating equipment. Switchyard buses are connected to flexible conductors that do not normally vibrate and are supported by insulators mounted to static, structural components such as concrete footings and structural steel. This configuration provides reasonable assurance that switchyard bus will perform its intended function for the extended period of operation.
608. Loss of conductor strength due to corrosion of ACSR transmission conductors is a very slow process. This process is even slower for rural areas with generally less suspended particles and SO₂ concentrations in the air than urban areas. BSEP is located in a rural area where airborne particle concentrations are comparatively low. Consequently, this is not considered a significant contributor to the aging of BSEP transmission conductors. Transmission conductor vibration would be caused by wind loading. Wind loading is considered in the initial design and field installation of transmission conductors and high-voltage insulators throughout the CP&L, doing business as Progress Energy Carolinas, Inc., transmission and distribution network. Compression connections to transmission conductors are equipped with Belleville washers which provide vibration absorption and prevent loosening. Loss of material (wear) and fatigue that could be caused by transmission conductor vibration or sway are not considered applicable aging effects that warrant aging management. It is concluded that no aging management activities are required for this commodity group.