GALL-SLR items related to electrical Insulation for inaccessible power, control and instrumentation cables and other components not subject to 10 CFR 50.49 Environmental Qualification Requirements

REFERENCES

TRP	TRP Name	AMP input	AMR input
	2.5 Scoping and Screening Results: Electrical and Instrumentation and Controls Systems	**N/A**	N/A
51	Non-EQ Electrical Cable and Connection Insulation Material	**XI.E1**	Yes
53.1	Inaccessible Medium Voltage Cables	**XI.E3A**	Yes
53.2	Inaccessible Instrument and Control Cables	**XI.E3B**	Yes
57	High-Voltage Insulators	**N/A**	Yes
59	Transmission Conductors and Switchyard Buses	**N/A**	Yes

BACKGROUND

By letter dated June 7, 2021 (Agencywide Documents Access and Management System (ADAMS) Accession Package Number ML21158A193), Duke Energy Carolinas, LLC Company, (the applicant), submitted a subsequent license renewal application (SLRA) for Oconee Nuclear Station Units 1, 2 and 3. As part of the SLRA review, NRC staff from the Long Term Operations and Modernization Branch (ELTB) had a virtual audit on August 18, 2021 to assess material condition and operating experience of installed equipment. During the audit, the NRC staff noted some questions for further discussion.

Scoping of Electrical Equipment

Reference: Application Figure 2.1.3-1 Simplified Electrical of the Offsite and Onsite Power Sources – SBO Recovery Paths.

> The regulation in 10 CFR 54.4(a)(1) requires that all safety-related systems, structures, and components (SSCs) identified to satisfactory accomplish any of the intended function are in scope of license renewal. The regulation in 10 CFR 54.4(a)(3), in part, requires that all SSCs relied on in safety analyses or plant evaluation to perform a function that demonstrate compliance with the Commission's regulation for station black-out (SBO) are in scope of license renewal. The regulation at 10CFR 50.63 "Loss of all alternating current power" states, in part, that each light-water-cooled nuclear power plant must be able to withstand for a specified duration and recover from a station blackout as defined in 10CFR 50.2.

1. Recovery from an SBO involves restoration of alternating current (AC) power to the Emergency Safety Features (ESF) buses either from the onsite (Keowee Hydro Units) or the Offsite AC power sources. Provide the rationale for excluding the SBO recovery paths from

the onsite power sources (as shown in Figure 2.1.3-1) from being within the scope of subsequent license renewal.
2. Provide a discussion on the AC power requirements for the Auxiliary Service Water (ASW) and Protected Service Water System (PSW) and reactor coolant pump seal system as they pertain to SBO coping and recovery.
3. The Oconee nuclear station's 230 kilovolt (kV) yellow bus is the equivalent of the ESF bus used at conventional nuclear power plants which have diesel generators as emergency onsite power sources. In addition, the Oconee nuclear station's UFSAR and Technical Specifications include the 100 kV systems powered by gas turbines at the Lee Station. Given the unique nature of this configuration, please discuss how you considered these buses in your SLRA scoping evaluation.

<u>The staff made several observations during the virtual audit:</u>

1. Some of the pictures showed cables entering or leaving the manholes. In one picture, showed medium voltage cables entering and exiting electrical manholes. Some of openings seemed to be sealed with sealant at the entry/exit points. The staff also noted that the UFSAR section 8.3.1.4.6.2 "Cable Separation" states floor sleeves for cables associated with engineered safeguards and reactor protection systems are filled with a fire-retardant material. Please discuss:
    a. How Oconee is managing water accumulation inside the raceways/conduits from one manhole to the other.
    b. Typically, fire resistant resin sealed conduits or other form of raceways can be susceptible to water intrusion. In such cases, water penetrating the raceway can remain trapped and the cable may be permanently submerged. Further clarification on how these cables are managed is requested.
2. Control and instrumentation cables associated with switchyard breakers and control/protection systems may be directly buried or installed in trenches and subject to moisture intrusion/submergence concerns and in some cases damage by rodents. Please provide pictures depicting condition of installed cables if applicable.
3. During the virtual audit, Oconee staff explained that new cables associated with control systems of Keowee Hydro Units and the Engineered Safety Protective System (ESPS) of the three Oconee nuclear units, installed in a common trench, were disconnected and the original direct buried cables were back in service. The directly buried cables are potentially vulnerable to moisture intrusion/submergence degradation. Please provide a discussion on any failures (faults) that may have been observed during the life of the cables.
4. Control Panels associated with switchyard breakers and control/protection systems located in the switchyards are subjected to extreme weather, have condensation heaters and seals to prevent moisture intrusion. Operating experience at some nuclear plants has indicated problems with moisture intrusion in exposed. Please provide pictures depicting condition of installed cables, terminations, fuses etc. and a discussion on aging management measures taken at the station or provide technical justification of why aging management program is not required for these components.

<u>Operating experience at Oconee:</u>

On December 7, 2015, Oconee Unit 3 startup transformer (CT-3) had one of its phases disconnected at the phase bushing. Subsequent inspections identified broken strands on the incoming power feed from the 230kV switchyard to the Unit 1 startup transformer bushings also. The cause of conductor severance was determined to be fatigue cracking caused by Aeolian vibrations.

In 2002, Unit 2 startup transformer had experienced broken strands on its power cables. Oconee staff determined that the nature of the breaks indicated that the broken strands were the result of mechanical stress.

1. Based on the operating experience at Oconee, please discuss corrective actions that have been implemented to prevent stress related aging mechanism on overhead conductor strands resulting in gradual degradation of overhead conductors and eventual loss of safety significant circuits. In Oconee SLRA, the applicant proposed no aging management program (AMP) for these drop-down transmission conductors because it proposed to replace these drop-down transmission conductors every 10 years. Please explain how a 10-year replacement frequency is adequate to prevent stress related aging mechanism on these overhead conductor strands.

(NOTES: The NRC staff notes that an unaided visual inspection from ground level may not be adequate to detect smaller cracks and frays on the cables and connections. Thermal imaging may not detect an open circuit condition or degraded conductor conditions in overhead conductors during unloaded circuit conditions.)

2. Based on operating experience at Byron Nuclear Plant where a failure of an insulator resulted in an open phase condition, please discuss why Oconee does not have any AMP for detecting age related cracking of in-scope insulators.