2.5 SYSTEM SCOPING AND SCREENING RESULTS: ELECTRICAL AND INSTRUMENTATION AND CONTROLS

Review Responsibilities

Primary - Branch responsible for electrical and Instrumentation and Controls engineering
Secondary - None

2.5.1 Areas of Review

This review plan section addresses the electrical and instrumentation and controls (I&C) scoping and screening results for license renewal. Typical electrical and I&C components consist of the following: electrical penetrations, electrical cables and connections, motors, diesel generators, air compressors, pressure transmitters, pressure indicators, water level indicators, switchgear, cooling fans, transistors, batteries, breakers, relays, switches, power inverters, circuit boards, battery chargers, and power supplies.

An applicant is required by 10 CFR 54.21(a)(1) to identify and list structures and components subject to an aging management review. These are "passive," "long-lived" structures and components that are within the scope of license renewal. In addition, an applicant is required by 10 CFR 54.21(a)(2) to describe and justify methods used to identify these structures and components. The staff reviews the applicant's methodology separately following the guidance in Section 2.1 of this standard review plan. To verify that the applicant has properly implemented its methodology, the staff focuses its review on the implementation results to confirm that there is no omission of electrical and I&C components that are subject to an aging management review.

An applicant would list all plant level systems and structures. Based on the Design Basis Events (DBEs) in the plant's current licensing basis (CLB) and other CLB information relating to non-safety-related systems and structures and certain regulated events, the applicant would identify those plant level systems and structures within the scope of license renewal, as defined in 10 CFR 54.4(a). This is "scoping" of the plant level systems and structures for license renewal. The staff reviews the applicant's plant level "scoping" results separately following the guidance in Section 2.2 of this standard review plan.

For an electrical and I&C system that is within the scope of license renewal, an applicant would not identify the specific electrical and I&C components that are subject to an aging management review. For example, an applicant would not "tag" each specific length of cable that is "passive," "long-lived," and performs an intended function as defined in 10 CFR 54.4(b). Instead, an applicant would use the so-called "plant spaces" approach (Ref. 1). The "plant spaces" approach provides efficiencies in aging management review of electrical equipment located within the same plant space environment.

Under the "plant spaces" approach, an applicant would identify all "passive," "long-lived" electrical equipment within a specified plant space as subject to an aging management review, regardless of whether these components perform any intended functions. For example, an applicant could identify all "passive," "long-lived" electrical equipment located within the turbine building ("plant space") to be subject to an aging management review for license renewal. In

the subsequent aging management review, the applicant would evaluate the environment of the turbine building to determine the appropriate aging management activities for these equipment. The applicant has options to further refine this encompassing scope on an as-needed basis. For the above example, if the applicant identified elevated temperatures in a particular area within the turbine building, the applicant may elect to identify only those "passive," "long-lived" electrical equipment that perform an intended function in this particular area as subject to an aging management review.

10 CFR 54.21(a)(1)(i) provides many examples of electrical and I&C components that are not considered to be "passive" and are not subject to an aging management review for license renewal. Therefore, an applicant is expected to identify only a few electrical and I&C components, such as electrical penetrations, cables, and connections, that are "passive" and subject to an aging management review. However, the time-limited aging analysis (TLAA) evaluation requirements in 10 CFR 54.21(c) apply to environmental qualification (EQ) of electrical equipment that is not limited to "passive."

An applicant has the flexibility to determine the set of structures and components for which an aging management review is performed, provided that this set encompasses the structures and components for which the Commission has determined an aging management review is required. This is based on the statements of consideration for the license renewal rule (60 FR 22478). Therefore, the reviewer should not review components that the applicant has identified as subject to an aging management review, because it is an applicant's option to include more components than those required by 10 CFR 54.21(a)(1).

The following areas relating to the methodology implementation results for the electrical and I&C systems are reviewed:

2.5.1.1 Components Within the Scope of License Renewal

The applicant's identification of electrical and I&C system components that are within the scope of license renewal is reviewed. (Scoping)

2.5.1.2 Components Subject to an Aging Management Review

The applicant's identification of electrical and I&C system components within the scope of license renewal that are "passive" and "long-lived." (Screening)

2.5.2 Acceptance Criteria

The acceptance criteria for the areas of review define methods for meeting the requirements of the Commission's regulations in 10 CFR 54.21(a)(1). For the applicant's implementation of its methodology in 10 CFR 54.21(a)(2) to be acceptable, the staff should find no omission of electrical and I&C system components that are subject to an aging management review.

2.5.2.1 Components Within the Scope of License Renewal

Electrical and I&C components are within the scope of license renewal as delineated in 10 CFR 54.4(a) if they are:

1. Safety-related systems, structures, and components which are those relied upon to remain functional during and following design-basis events (as defined in 10 CFR 50.49(b)(1)) to ensure the following functions --

   (i) The integrity of the reactor coolant pressure boundary;

   (ii) The capability to shut down the reactor and maintain it in a safe shutdown condition; or

   (iii) The capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposure comparable to the guidelines in 10 CFR 50.34(a)(1) or 10 CFR 100.11, as applicable.

2. All non-safety related systems, structures, and components whose failure could prevent satisfactory accomplishment of any of the functions identified in 1. above.

3. All systems, structures, and components relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48), environmental qualification (10 CFR 50.49), pressurized thermal shock (10 CFR 50.61), anticipated transients without scram (10 CFR 50.62), and station blackout (10 CFR 50.63).

2.5.2.2 Components Subject to Aging Management Review

Electrical and I&C components are subject to an aging management review if they are within the scope of license renewal and perform an intended function as defined in 10 CFR 54.4(b) without moving parts or without a change in configuration or properties ("passive"), and are not subject to replacement based on a qualified life or specified time period ("long-lived") (10 CFR 54.21(a)(1)(i) and (ii)).

2.5.3 Review Procedures

The reviewer should verify that an applicant has identified in the license renewal application the electrical and I&C components that are subject to an aging management review for its plant. The review procedures are presented below assuming an applicant has performed "scoping" and "screening" of electrical and I&C system components in that sequence. However, an applicant may elect to perform "screening" before "scoping" and that is acceptable because, regardless of the sequence, the end result should encompass the electrical and I&C components that are subject to an aging management review.

The scope of 10 CFR 50.49 electric equipment to be included within 10 CFR 54.4(a)(3) is that "long-lived" (qualified life of 40-years or greater) equipment already identified by licensees under 10 CFR 50.49(b) which specifies certain electric equipment important to safety. Licensees may rely upon their listing of EQ equipment, as required by 10 CFR 50.49(d), for

purposes of satisfying 10 CFR 54.4(a)(3) with respect to equipment within the scope of 10 CFR 50.49 (60 FR 22466). However, the license renewal rule has a requirement (10 CFR 54.21(c)) on the evaluation of TLAAs, including EQ (10 CFR 50.49). EQ equipment is not limited to "passive." An applicant may identify EQ equipment separately for TLAA evaluation and not include them as equipment subject to an aging management review under 10 CFR 54.21(a)(1). The EQ equipment identified for TLAA evaluation would encompass the "passive" EQ equipment subject to an aging management review. The TLAA evaluation would ensure that the EQ equipment would be functional for the period of extended operation. The staff reviews the applicant's EQ TLAA evaluation separately following the guidance in Section 4.4 of this standard review plan.

For each area of review, the following review procedures are to be followed:

2.5.3.1 Components Within the Scope of License Renewal

This step determines whether the applicant has properly identified the components within the scope of license renewal. The reviewer should review selected components that the applicant did not identify as within the scope of license renewal to verify that they did not omit components with intended functions.

The reviewer should use the plant Updated Final Safety Analysis Report (UFSAR), orders, applicable regulations, exemptions, and license conditions to determine the design basis for the systems, structures, and components. The design basis determines the system intended function(s), which in turn, determines the components within that system that are required for the system to perform its intended function(s).

An applicant may use the "plant spaces" approach in scoping electrical and I&C components for license renewal. In the "plant spaces" approach, an applicant may indicate that all electrical and I&C components located within a particular plant area ("plant space"), such as the containment and auxiliary building, are within the scope of license renewal. The applicant may also indicate that all electrical and I&C components located within a particular plant area ("plant space"), such as the warehouse, are not within the scope of license renewal. Table 2.5-1 contains some examples of this "plant spaces" approach and the corresponding review procedures.

An applicant would use the "plant spaces" approach for the subsequent aging management review of the electrical and I&C components. The applicant would evaluate the environment of the "plant spaces" to determine the appropriate aging management activities for these equipment. The applicant has options to further refine this encompassing scope on an as-needed basis. For example, if the applicant identified elevated temperatures in a particular area within a building ("plant space"), the applicant may elect to identify only those "passive," "long-lived" electrical and I&C components that perform an intended function in this particular area as subject to an aging management review. This approach to further narrow the "plant spaces" is consistent with the "plant spaces" approach. In this case, the reviewer verifies that the applicant has specifically identified the electrical and I&C components that are within the scope of license renewal in these narrow "plant spaces." The reviewer should verify that the electrical and I&C components that the applicant has elected to further exclude indeed do not have any intended functions as defined in 10 CFR 54.4(b).

The reviewer should find no omissions of components within the scope of license renewal by the applicant to make the staff finding that there is reasonable assurance that the applicant has identified the components within the scope of license renewal for the electrical and I&C systems.

Section 2.1 of this standard review plan contains additional guidance on scoping the following:

- commodity groups
- complex assemblies
- scoping events
- hypothetical failure
- cascading

At the completion of this review step, the reviewer has confidence that the applicant's identification has encompassed all electrical and I&C components within the scope of license renewal.

2.5.3.2 Component Subject to an Aging Management Review

This step determines whether the applicant has properly identified the components subject to an aging management review from among those identified in the previous step, that is, Subsection 2.5.3.1 of this review plan section. The reviewer should review selected components that the applicant has identified as within the scope of license renewal to verify that the applicant has identified these components as subject to an aging management review if they perform intended functions without moving parts or without a change in configuration or properties and are not subject to replacement on the basis of a qualified life or specified time period. The description of "passive" may also be interpreted to include structures and components that do not display "a change in state."

Only components that are "passive" and "long-lived" are subject to an aging management review. Table 2.1-2 of Section 2.1 of this standard review plan is provided for the reviewer to assist in identifying whether certain components are "passive." The reviewer should verify that electrical and I&C components identified as "passive" in Table 2.1-2 of Section 2.1 of this standard review plan have been included by the applicant as subject to an aging management review, as appropriate. An applicant should justify omitting a component that is within the scope of license renewal at their facility and is listed as "passive" in Table 2.1-2.

The reviewer should find no omissions of components subject to an aging management review by the applicant to make the staff finding that there is reasonable assurance that the applicant has identified the components subject to an aging management review for the electrical and I&C systems.

Section 2.1 of this standard review plan contains additional guidance on screening of the following:

- consumables
- multiple intended functions
- piece-parts

At the completion of this review step, the reviewer has confidence that the applicant has identified the “passive,” “long-lived” components subject to an aging management review.

2.5.4 Evaluation Findings

The reviewer verifies that sufficient and adequate information has been provided to satisfy the provision of this review plan section and that the staff’s evaluation supports conclusions of the following type, to be included in the staff’s safety evaluation report:

> The staff evaluation concludes that there is a reasonable assurance that the applicant has appropriately identified the electrical and instrumentation and controls system components subject to an aging management review to meet the requirements stated in 10 CFR 54.21(a)(1).

2.5.5 Implementation

Except in those cases in which the applicant proposes an acceptable alternative method for complying with specific portions of the Commission’s regulations, the method described herein will be used by the staff in its evaluation of conformance with Commission regulations.

2.5.6 References

1. SAND96-0344, “Aging Management Guideline for Commercial Nuclear Power Plants-Electrical Cable and Terminations,” Sandia National Laboratories, September 1996, page 6-11.

Table 2.5-1. Examples of "Plant Spaces" Approach for Electrical and I&C Scoping and Corresponding Review Procedures

Example	Review Procedures
An applicant indicates all electrical and I&C components on site are within the scope of license renewal.	This is acceptable and a staff review is not necessary, because all electrical and I&C components are included without exception and would encompass those required by the rule.
An applicant indicates all electrical and I&C components located in 7 specific buildings (containment, auxiliary building, turbine building, etc.) are within the scope of license renewal.	The reviewer should review in areas outside of these 7 buildings ("plant spaces"). The reviewer should verify that the applicant has included any direct-buried cables in trenches between these building as within the scope of license renewal if they perform an intended function. The reviewer should also select buildings other than the 7 specific building (for example, the radwaste facility), to verify that they do not contain any electrical and I&C components that perform any intended functions.
An applicant indicates that all electrical and I&C components located on site, except for the 525kV switchyard, 230kV transmission lines, radwaste facility, and 44kV substation, are within the scope of license renewal.	The reviewer should select the specifically excluded "plant spaces" (that is, the 525kV switchyard, 230kV transmission lines, radwaste facility, and 44kV substation) to verify that they do not contain any electrical and I&C components that perform any intended functions.
An applicant indicates that all electrical and I&C components associated with the systems specifically identified as within the scope of license renewal are themselves within the scope of license renewal.	This is not strictly the "plant spaces" approach for scoping. The applicant should provide marked-up electrical one-line drawings identifying those system components that are within the scope of license renewal. The reviewer should review the UFSAR to select electrical and I&C components that the applicant did not identify as within the scope of the rule to verify that they do not perform any intended functions as defined in 10 CFR 54.4(b). For example, if an applicant indicates that all electrical and I&C components of the reactor protection system are within the scope of license renewal, the reviewer should review drawings to verify that all reactor protection system electrical and I&C components have been included. The reviewer should also verify that electrical and I&C components not identified as within the scope of license renewal do not perform an intended function associated with the reactor protection system.