

SSCs Scoping & Screening Methodology for CANDU PLiM Study

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1. Introduction

As a part of a Plant Lifetime Management (PLiM) study, we at KOPEC, KEPRI, and KHNP are evaluating the aging effects for CANDU reactors. To perform a scoping and screening of systems, structures, and components (SSCs) for PLiM study, a procedure and methodology for scoping and screening have been developed. This procedures and methodologies are described herein, and representative results are presented.

2. Methods and Results

In this section some of the techniques used to scoping and screening SSCs for CANDU reactors are described. The techniques include assumptions and initial conditions, first-level screening, information gathering and information sources, system level scoping, and component level scoping.

2.1 Assumptions and Initial Conditions

The plant aging assessment methodology relies on a number of basic assumption and initial conditions. They include:

- a. The scoping methodology assumes that the most effective approach in scoping is the use of two levels of scoping, i.e., system level and component level.
- b. The plant aging assessment methodology is designed to make maximum use of existing plant programs, system and equipment lists, documents, and databases.
- c. Structural components and components, which contribute to one or more passive functions and are long-lived, require evaluation to demonstrate that the effect of aging are adequately managed.

There are a variety of methods available for managing the effects of aging in order to assure the passive intended function. The appropriate method for a given situation depends on a number of factors, including the severity of the aging effects and the level of concern associated with degraded equipment condition.

2.2 First-Level Screening

The plant systems and structures identified by the first-level screening as candidates for condition assessments are:

- a. Safety-related SSCs which are those relied upon to remain functional during and following design-basis events to ensure the following functions:
 - (i) The integrity of the reactor coolant pressure boundary (RCPB) ;
 - (ii) The capability to shutdown the reactor and maintain it in a safe shutdown condition; or
 - (iii) The capability to prevent or mitigate the consequences of accidents that could results in potential off-site exposure comparable to regulatory limits
- b. All non safety-related SSCs whose failure could prevent satisfactory accomplishment of any of the functions identified in paragraph a(i), (ii) or (iii).
- c. All SSCs relied on in safety analyses or plant evaluation to perform a function that demonstrates compliance with the regulations for fire protection, environmental qualification, and with station emergency operating procedures (EOPs).

As a result of the first-level screening, SCs are assigned to one of two categories: (1) those that are within the scope of plant aging assessment; and (2) those that not. SCs that belong to category (1) require further scoping in preparation for the plant assessment process and proceed to component level scoping[1].

2.3 Information Gathering and Information Sources

Data gathering is essential to identify the system constituents, understand all dominant aging processes and eventually identify or develop practical and effective methods for refurbishing system components and equipment in order to guarantee system performance in relation to plant safety goals over operating time of plants.

The list of documents identified in reference identified the sources considered for the plant assessment methodology. And the major list of information sources is as followings:

- Equipment Database
- Design Data

- Manufacturing and Installation Data
- Service Conditions
- Operation, Surveillance & Maintenance Histories
- Interview with System Engineer & Other Plant Staff
- PLiM related Data
- Other Data

2.4 System Level Scoping

The system level scoping process tabulates some basic information about each of the candidate SS resulting from the first-level screening activity. In this activity, two types of physical interaction was considered for the purposes of scoping SSCs: (1) the structural integrity of mechanical components that must remain in place such that they do not fall into equipment that is performing a safety-related function and prevent it from performing that function, (2) the leakage of fluid from mechanical system components onto nearby equipment that is performing a safety-related function that could prevent it from performing function.

In the former case, structural integrity for these mechanical components is the responsibility of the component support that is required to remain intact in order to fulfill the function. In the latter case, pressure boundary and structural integrity of the mechanical component are of concern.

2.5 Component Level Scoping

The component level scoping process is conducted one SS at a time for each candidate SS designated as within the scope of plant assessment. The component level scoping process for system is implemented by systematically reviewing the intended functions of the candidate SS to determine which SS components contribute to the performance of functions. Components are designated as within the scope of the plant condition assessment if they are required for their SS to perform an intended function.

The component level scoping process for SSs is divided into several distinct steps. Each step is as follow:

- a. Establish master list of Structures, Components and Commodities
- b. Identification of detailed SS functions
 - (i) Passive functions
 - (ii) Active functions
 - (iii) Determine whether components are long-lived or Short-lived
 - (iv) Commodity Grouping

3. Conclusion

This SSCs scoping and screening methodology for plant aging assessment can be useful tools for continued operation. Figure 1 is shown in Procedure for Scoping

and Screening. This methodology has been applied for SSCs scoping and screening for CANDU PLiM study. And the results of scoping and screening were selected about 80 systems and components[2-4].

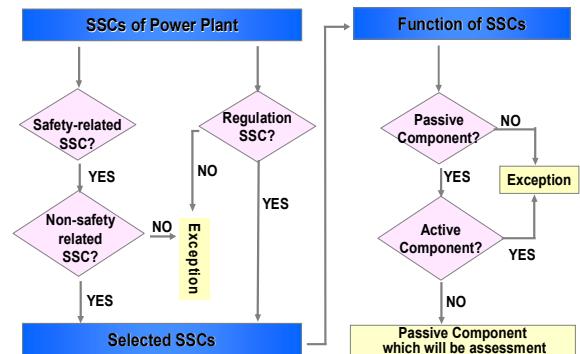


Figure 1. Procedure for Scoping and Screening

REFERENCES

- [1] USNRC, Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants, NUREG-1800, Chapter 2, 2005
- [2] AECL, "Wolsong-1 Nuclear Power Plant Safety Related Systems and Structures Classification", Safety Design Guide, DG-59-68000-001, Oct. 1979
- [3] AECL, "Wolsong-1 Nuclear Power Plant Seismic Classification of Safety Related Systems and Structures", Safety Design Guide, DG-59-68000-002, Nov. 1979
- [4] AECL, "Wolsong-1 Nuclear Power Plant Environmental Qualification of Safety Related Systems and Structures", Safety Design Guide, DG-59-68000-003, Jul. 1982