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U.S. NUCLEAR REGULATORY COMMISSION
STANDARD REVIEW PLAN
OFFICE OF NUCLEAR REACTOR REGULATION

SECTION 10.4.5 CIRCULATING WATER SYSTEM

REVIEW RESPONSIBILITIES

Primary - Auxiliary and Power Conversion Systems Branch (APCSB)

Secondary - Electrical, Instrumentation and Control Systems Branch (EICSB)

I. AREAS OF REVIEW

The circulating water system (CWS) provides a continuous supply of cooling water to the main condenser to remove the heat rejected by the turbine cycle and auxiliary systems.

1. The APCSB reviews the performance of the CWS with respect to its functional requirements and the effects of adverse environmental occurrences, abnormal operational transients, or accident conditions such as loss of offsite power.

2. The APCSB reviews the CWS to determine that a malfunction, failure of a component, or failure of a circulating water pipe do not have unacceptable adverse effects on the functional performance capabilities of safety-related systems located in the immediate area.

3. APCSB further reviews the design of the circulating water system with respect to the following:

   a. The capability to detect and control flooding of safety related areas due to circulating water system leakage.

   b. The compatibility of the methods proposed for control of water chemistry and of long-term corrosion and organic fouling with system components and piping materials.

   c. Provisions for instrumentation to permit operational testing of the system and to annunciate abnormal and unsafe operating conditions.

4. The APCSB reviews the applicant's proposed technical specifications for operating license applications as they relate to areas covered in this plan.

Secondary reviews are performed by other branches and the results used by the APCSB to complete the overall evaluation of the system. The secondary reviews are as follows:

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the EICSB will, upon request, review the system instrumentation and controls as they may relate to operations that could effect safety-related systems or components.

II. ACCEPTANCE CRITERIA

Acceptability of the circulating water system, as described in the applicant's safety analysis report (SAR), is based on the criteria below and on the degree of similarity of the design with that for previously reviewed plants with satisfactory operating experience. There are no general design criteria or regulatory guides that directly apply to the functional performance requirements for the CWS. Specific criteria for the CWS are as follows:

1. Means should be provided to detect and control flooding of safety related areas due to leakage from the CWS.

2. Malfunction or a failure of a component or piping of the CWS should not have unacceptable adverse effects on the functional performance capabilities of safety-related systems or components.

3. Agents used for the control of water chemistry, corrosion, and organic fouling should be compatible with the materials of the system.

4. Branch Technical Positions APCSB 3-1 and MEB 3-1, as related to breaks in high and cracks in moderate energy piping systems outside containment.

III. REVIEW PROCEDURES

The procedures below are used during the construction permit (CP) review to determine that the design criteria and bases and the preliminary design as set forth in the preliminary safety analysis report meet the acceptance criteria given in Section II of this plan. For the review of operating license (OL) applications, the procedures are used to verify that the initial design criteria and bases have been appropriately implemented in the final design as set forth in the final safety analysis report.

The procedures for OL reviews include a determination that the content and intent of the technical specifications prepared by the applicant are in agreement with the requirements for system testing, minimum performance, and surveillance developed as a result of the staff's review.

The reviewer will select and emphasize material from this review plan as may be appropriate for a particular case.

1. Although the circulating water system is not safety-related, a failure of this system, or any of its components, may affect a safety-related component or system. Since large quantities of water flow through the CWS, a leak or break in a component or pipe could cause severe and unacceptable flooding of adjacent areas. The APCSB reviews the descriptions and drawings in the SAR and determines that provisions are incorporated in the design to prevent flooding of areas containing safety-related equipment or to mitigate the consequences of flooding.

2. The APCSB reviews the CWS to verify that the capability to detect leaks and secure the system quickly and effectively exists. The reviewer verifies that the design includes provisions to minimize hydraulic transients and their effect upon the functional capability and the integrity of system components.

3. Based on the information contained in the SAR, the reviewer verifies that the applicant's proposed methods for control of water chemistry and of long-term corrosion and organic fouling, and the chemical agents used for these purposes are compatible with the system materials.

IV. EVALUATION FINDINGS

The reviewer verifies that sufficient information has been provided and his review supports conclusions of the following type, to be included in the staff's safety evaluation report:

"The circulating water system includes all components and equipment necessary to provide the main condenser with a continuous supply of cooling water. The scope of review of the cooling water system for the ________________ plant, included layout drawings, piping and instrumentation diagrams, and descriptive information for the system. [The review has determined the adequacy of the applicant's proposed design criteria and bases for the circulating water system. (CP)] [The review has determined that the design of the circulating water system is in conformance with the design criteria and design bases. (OL)]

"The basis for acceptance in the staff review has been conformance of the applicant's designs, design criteria, and design bases for the circulating water system to applicable staff positions and industry standards.

"The staff concludes that the design of the circulating water system conforms to all applicable staff positions and industry standards, and is acceptable."

V. REFERENCES

1. Branch Technical Positions APCSB 3-1, "Protection Against Postulated Piping Failures in Fluid Systems Outside Containment," attached to Standard Review Plan 3.6.1, and MEB 3-1, "Postulated Break and Leakage Locations in Fluid System Piping Outside Containment," attached to Standard Review Plan 3.6.2.

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