U.S. NUCLEAR REGULATORY COMMISSION

STANDARD REVIEW PLAN

OFFICE OF NUCLEAR REACTOR REGULATION

10.4.2 MAIN CONDENSER EVACUATION SYSTEM

REVIEW RESPONSIBILITIES

Primary - Effluent Treatment Systems Branch (ETSB)

Secondary - None

I. AREAS OF REVIEW

At the construction permit (CP) stage of review, ETSB reviews the information in the applicant's safety analysis report (SAR) in the specific areas that follow. At the operating license (OL) stage of review, the ETSB review consists of confirming the design accepted at the CP stage.

The main condenser evacuation system (MCES) generally consists of two subsystems: the "hogging" or startup system which initially establishes main condenser vacuum and the normal system which maintains condenser vacuum once it has been established.

1. The ETSB review of each MCES subsystem includes the design, design objectives, capacity, method of operation, and factors that influence gaseous radioactive material handling, e.g., system interfaces and potential bypass routes. The ETSB review includes the system piping and instrumentation diagrams (P&IDs).

2. Design features to preclude the possibility of an explosion if the potential for explosive mixtures exists are reviewed by ETSB.

3. Provisions incorporated to detect explosive gas mixture and monitor radioactive materials in gaseous effluents from the MCES are reviewed in SRP Sections 11.3 and 11.5 by ETSB.

In addition, the ETSB will coordinate evaluations of other branches that interface with the overall review of the system as follows: Mechanical Engineering Branch (MEB) reviews systems quality group classifications as part of its primary review responsibility for SRP Section 3.2.2. Quality Assurance Branch (QAB) reviews systems quality assurance programs as part of its primary review responsibility for SRP Sections 17.1 and 17.2.

USNRC STANDARD REVIEW PLAN

Standard review plans are prepared for the guidance of the Office of Nuclear Reactor Regulation staff responsible for the review of applications to construct and operate nuclear power plants. These documents are made available to the public as part of the Commission's policy to inform the nuclear industry and the general public of regulatory procedures and policies. Standard review plans are not substitutes for regulatory guides or the Commission's regulations and compliance with them is not required. The standard review plan sections are keyed to the Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants. Not all sections of the Standard Format have a corresponding review plan.

Published standard review plans will be revised periodically, as appropriate, to accommodate comments and to reflect new information and experience.

Comments and suggestions for improvement will be considered and should be sent to the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Washington, D.C. 20555.

For those areas of review identified as being reviewed as part of the primary review responsibility of other branches, the acceptance criteria necessary for the review and their methods of application are contained in the referenced SRP section of the corresponding primary branch.

II. ACCEPTANCE CRITERIA

ETSB will accept the MCES design if the following Commission regulations are met:

1. General Design Criterion 60 as it relates to the MCES design for the control of releases of radioactive materials to the environment.

2. General Design Criterion 64 as it relates to the MCES design for the monitoring of releases of radioactive materials to the environment.

The requirement of the Commission regulations identified above are met by using the regulatory positions contained in the following regulatory guides and industrial standard:

1. Regulatory Guide 1.26 as it relates to the quality group classification for the MCES that may contain radioactive materials, but are not part of the reactor coolant pressure boundary and are not important to safety.

2. Regulatory Guides 1.33 and 1.123 as they relate to the quality assurance programs for the MCES components that may contain radioactive materials.

3. "Standards for Steam Surface Condensers" as it relates to the MCES components that may contain radioactive materials.

Specific criteria necessary to meet the relevant requirements of 10 CFR Part 50, Appendix A, General Design Criteria 60 and 64 are as follows:

1. The MCES capacity should be consistent with the industry guidelines given in Reference 2. Either mechanical vacuum pumps or steam jet air ejectors may be used for hogging (startup) or normal evacuation of the main condenser.

2. The components of the MCES should be designed to Quality Group D as defined in Regulatory Guide 1.26 (Ref. 3) and to a nonseismic design classification. These quality standards meet the requirements of 10 CFR 50.55a for water- and steam-containing components that may contain radioactive materials but are not part of the reactor coolant pressure boundary and are less important to safety.

3. If there is a potential for explosive mixtures to exist, the MCES should be designed to withstand the effects of an explosion and provide instrumentation to detect and annunciate the buildup of potentially explosive mixtures, or provide dual instrumentation to detect, annunciate, and effect control measures to prevent the buildup of potentially explosive mixtures, as outlined in SRP Section 11.3, subsection II, "Acceptance Criteria," Item 6. Such a potential does <u>not</u> exist on systems designed to maintain the steam content above 58% by volume in hydrogen-air mixtures or nitrogen content above 92% by volume in hydrogen-oxygen mixtures in all MCES components.

4. Provisions to control and monitor releases of radioactivity to the environment from the MCES must conform to the requirements of General Design Criteria 60 and 64 (Ref. 1).

5. The design pressure and normal operational absolute pressure should be provided for MCES components containing potentially explosive mixtures.

III. REVIEW PROCEDURES

The ETSB reviewer will select and emphasize material from this SRP section as may be appropriate for a particular case.

1. In the ETSB review of the MCES, the P&IDs are reviewed to determine the flow paths of gases through the system, including all bypasses, and the points of release of gaseous wastes to the environment or other systems. This information is used in SRP Section 11.3 to calculate the quantity of radioactive material released annually in gaseous effluents during normal operations, including anticipated operational occurrences. ETSB verifies that water from the mechanical vacuum pumps and condensate from the steam jet air ejectors are classified as radioactive liquids and treated accordingly.

2. ETSB reviews the equipment quality group classifications to meet the guidelines of Regulatory Guide 1.26 (Ref. 3). Exceptions are transmitted to MEB, which has primary responsibility under SRP Section 3.2.2.

3. If there is a potential that explosive mixtures may exist, ETSB determines whether the applicant has designed the MCES to withstand the effects of such an explosion and has provided instrumentation to detect and annunciate or has provided dual instrumentation on redundant MCES trains to detect, annunciate, and effect control measures to prevent the buildup of potentially explosive mixtures. This review is conducted by ETSB concurrently with its review as outlined in SRP Section 11.3 for a gaseous radioactive waste management system. ETSB will also determine if the applicant's design includes adequate provisions to stop continuous leakage paths after an explosion.

4. ETSB reviews the quality assurance for the design, construction, and operational phases for the MCES according to the guidelines of Regulatory Guides 1.33 and 1.123 (Refs. 4 and 5). Exceptions are transmitted to QAB, which has primary responsibility under SRP Sections 17.1 and 17.2.

IV. EVALUATION FINDINGS

ETSB verifies that sufficient information has been provided and that the review is adequate to support conclusions of the following type, to be included in the staff's safety evaluation report:

> The main condenser evacuation system includes equipment and instruments to establish and maintain condenser vacuum and to prevent an uncontrolled release of radioactive material to the environment. The scope of our review included the system capability to transfer radioactive gases to the gaseous waste processing system or ventilation exhaust systems, the design provisions incorporated to monitor and control releases of radioactive materials in effluents. The staff has reviewed the applicant's system descriptions,

piping and instrumentation diagrams, and design criteria for the components of the main condenser evacuation system.

The staff concludes that the MCES design is acceptable in that the applicant has met the requirements of General Design Criteria 60 and 64 with respect to the control and monitoring of releases of radioactive materials to the environment by providing a controlled and monitored MCES. The applicant has met the requirements of industrial standard "Standards for Steam Surface Condensers" that has been reviewed by the staff and determined to be appropriate for this application.

V. IMPLEMENTATION

The following is intended to provide guidance to applicants and licensees regarding the NRC staff's plans for using this SRP section.

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

Implementation schedules for conformance to parts of the method discussed herein are contained in the referenced regulatory guides.

VI. REFERENCES

1. 10 CFR Part 50, Appendix A, General Design Criterion 60, "Control of Releases of Radioactive Materials to the Environment," and General Design Criterion 64, "Monitoring Radioactivity Releases."

2. "Standards for Steam Surface Condensers," 6th Ed., Heat Exchanger Institute (1970).

3. Regulatory Guide 1.26, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants."

4. Regulatory Guide 1.33, "Quality Assurance Program Requirements (Operation)."

5. Regulatory Guide 1.123, "Quality Assurance Requirements for Control of Procurement of Items and Services for Nuclear Power Plants."