U.S. NUCLEAR REGULATORY COMMISSION

STANDARD REVIEW PLAN

14.3.8 RADIATION PROTECTION - INSPECTIONS, TESTS, ANALYSES, AND ACCEPTANCE CRITERIA

REVIEW RESPONSIBILITIES

Primary - Organization responsible for the review of radiation protection

Secondary - None

I. AREAS OF REVIEW

This Standard Review Plan (SRP) section addresses inspection, test, analysis, and acceptance criteria (ITAAC) related to the radiation protection aspects of the design. ITAAC information is contained in the final safety analysis report (FSAR) of a combined license (COL) application or in the Tier 1 information from the design control document (DCD) of a design certification (DC) application.

The specific areas of review are as follows:

1. Primary review responsibility for area radiation monitoring systems and airborne radioactivity monitoring systems.

2. Primary review responsibility for radiation shielding provided by structures and components for normal and emergency conditions.

[Month] 2007

USNRC STANDARD REVIEW PLAN

This Standard Review Plan, NUREG-0800, has been prepared to establish criteria that the U.S. Nuclear Regulatory Commission staff responsible for the review of applications to construct and operate nuclear power plants intends to use in evaluating whether an applicant/licensee meets the NRC's regulations. The Standard Review Plan is not a substitute for the NRC's regulations, and compliance with it is not required. However, an applicant is required to identify differences between the design features, analytical techniques, and procedural measures proposed for its facility and the SRP acceptance criteria and evaluate how the proposed alternatives to the SRP acceptance criteria provide an acceptable method of complying with the NRC regulations.

The standard review plan sections are numbered in accordance with corresponding sections in Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants (LWR Edition)." Not all sections of Regulatory Guide 1.70 have a corresponding review plan section. The SRP sections applicable to a combined license application for a new light-water reactor (LWR) are based on Regulatory Guide 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)."

These documents are made available to the public as part of the NRC's policy to inform the nuclear industry and the general public of regulatory procedures and policies. Individual sections of NUREG-0800 will be revised periodically, as appropriate, to accommodate comments and to reflect new information and experience. Comments may be submitted electronically by email to NRR_SRP@nrc.gov.

Requests for single copies of SRP sections (which may be reproduced) should be made to the U.S. Nuclear Regulatory Commission, Washington, DC 20555, Attention: Reproduction and Distribution Services Section, or by fax to (301) 415-2289; or by email to DISTRIBUTION@nrc.gov. Electronic copies of this section are available through the NRC's public Web site at http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr0800/, or in the NRC's Agencywide Documents Access and Management System (ADAMS), at http://www.nrc.gov/reading-rm/adams.html, under Accession # MLxxxxxxxxx.

3. Primary review responsibility for design processes for radiation protection and their related design acceptance criteria (DAC).

4. Secondary review responsibility for all other Tier 1 and ITAACs which address the plant radiation protection design. These ITAACs include buildings, ventilation and filtration systems, and the postaccident sampling system.

5. For a DC application:

   A. The staff reviews the proposed ITAAC that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a plant that incorporates the design certification is built and will operate in accordance with the design certification, the Atomic Energy Act, and the NRC regulations.

   B. The staff reviews the justification that compliance with the interface requirements is verifiable through ITAAC. The staff also reviews the method that is to be used for verification of the interface requirements.

6. For a COL application:

   A. The staff reviews the proposed ITAAC that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, the facility has been constructed and will operate in conformity with the combined license, the Atomic Energy Act, and the NRC regulations.

   B. If the application references a standard design certification, the staff verifies that the ITAAC contained in the certified design apply to those portions of the facility design that are approved in the design certification.

7. <u>COL Action Items and Certification Requirements and Restrictions</u>. For a DC application, the review will also address COL action items and requirements and restrictions (e.g., interface requirements and site parameters).

   For a COL application referencing a DC, a COL applicant must address COL action items (referred to as COL license information in certain DCs) included in the referenced DC. Additionally, a COL applicant must address requirements and restrictions (e.g., interface requirements and site parameters) included in the referenced DC.

<u>Review Interfaces</u>

Other SRP sections interface with this section as follows:

1. SRP Section 14.3 provides general guidance on review interfaces.

2. Acceptability of ITAAC information regarding the ability of structures, systems, and components (SSCs) to withstand various natural phenomena is reviewed under SRP Sections 14.3.1 and 14.3.2.

3. Acceptability of ITAAC information for piping design is reviewed under SRP Section 14.3.3.

4. Acceptability of ITAAC information for reactor systems is reviewed under SRP Section 14.3.4.

5. Acceptability of ITAAC information for instrumentation and controls is reviewed under SRP Section 14.3.5.

6. Acceptability of ITAAC information for electrical systems and components is reviewed under SRP Section 14.3.6.

7. Acceptability of ITAAC information for plant systems including the heating, ventilation, and air conditioning design, containment isolation, and selected aspects of the containment design is reviewed under SRP Section 14.3.7.

8. Acceptability of ITAAC information for emergency preparedness is reviewed under SRP Section 14.3.10.

9. Acceptability of ITAAC information for containment systems is reviewed under SRP Section 14.3.11.

The specific acceptance criteria and review procedures are contained in the referenced SRP sections.

II. ACCEPTANCE CRITERIA

Requirements

Acceptance criteria are based on meeting the relevant requirements of the following Commission regulations:

1. 10 CFR 52.47(b)(1), which requires that a DC application contain the proposed inspections, tests, analyses, and acceptance criteria (ITAAC) that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a plant that incorporates the design certification is built and will operate in accordance with the design certification, the provisions of the Atomic Energy Act, and the NRC's regulations;

2. 10 CFR 52.80(a), which requires that a COL application contain the proposed inspections, tests, and analyses, including those applicable to emergency planning, that the licensee shall perform, and the acceptance criteria that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, the facility has been constructed and will operate in conformity with the combined license, the provisions of the Atomic Energy Act, and the NRC's regulations.

SRP Acceptance Criteria

Specific SRP acceptance criteria acceptable to meet the relevant requirements of the NRC's regulations identified above are as follows for the review described in this SRP section. The

SRP is not a substitute for the NRC's regulations, and compliance with it is not required. However, an applicant is required to identify differences between the design features, analytical techniques, and procedural measures proposed for its facility and the SRP acceptance criteria and evaluate how the proposed alternatives to the SRP acceptance criteria provide acceptable methods of compliance with the NRC regulations.

1. The reviewer should primarily use the applicable rules and regulations, general design criteria, regulatory guides, unresolved safety issues, and generic safety issues in the review of Tier 1 to determine the safety significance of SSCs with respect to the radiation protection for occupational workers and the general public they provide. Other sources include the SRP and applicable U.S. Nuclear Regulatory Commission (NRC) generic correspondence. The reviewer should use the guidance in Appendix C to SRP Section 14.3 as an aid for ensuring the comprehensiveness and consistency of this review.

2. Radiation Protection: The reviewer should ensure that Tier 1 identifies and describes, commensurate with their safety significance, those SSCs that provide radiation shielding, confinement or containment of radioactivity, ventilation of airborne contamination, or radiation (or radioactivity concentration) monitoring for normal operations and during accidents. Tier 1 identifies and describes the measures that need to be employed during first-of-a-kind engineering to ensure that final design details (i.e., materials and component selection, equipment placement, and pipe routing) are consistent with the radiation protection commitments (including the commitment that radiation exposures will be as low as is reasonably achievable (ALARA)) in the certified design. Tier 1 contains ITAAC that ensure that the identified SSCs will function in a manner consistent with the certified design.

3. Design Processes and Design Acceptance Criteria: A DC applicant may not provide sufficient detail in selected aspects of the design, including sufficient information to stipulate the source terms needed to verify the design of the shielding, ventilation, and airborne radioactivity monitoring systems. The applicant may choose to provide design processes and DAC for this material, as discussed in Appendix A to SRP Section 14.3. The applicant should document in DCD Tier 2, Section 14.3, its rationale for determining which areas of the design should use design processes and acceptance criteria. Essentially, the applicant should extract the most important design processes and acceptance criteria from DCD Chapter 12 of Tier 2 and identify them in Tier 1. This may be done either in a separate section of Tier 1 or in the applicable systems of Tier 1. A COL applicant or licensee must meet these criteria in the design of the plant, and the staff can audit the facility's design documentation to ensure that the criteria are met. The following discussion is specific to the review of design processes and acceptance criteria in this area.

   DC applicants may not provide the complete design information in this design area before the design is certified because the radiation shielding design and the calculated concentrations of airborne radioactive material depend on as-built and as-procured information about plant systems and components. Therefore, applicants may be unable to describe the standard design's radiation source terms (i.e., the quantity and concentration of radioactive materials contained in, or leaking from, plant systems) in sufficient detail to allow the staff to verify the adequacy of the shielding design, ventilation system designs, or the design and placement of the airborne radioactivity monitors. Instead, applicants may provide the processes and acceptance criteria by

which the details of the design in this area are to be developed, designed, and evaluated. The design description should state the scope of the material in Tier 1. The application could, for example, encompass the radiological shielding and ventilation design of the reactor building, turbine building, control building, service building, and radwaste building. The COL applicant or licensee is responsible for the implementation of the process and the design.

The DAC may be taken from the acceptance criteria in the applicable sections of Chapter 12 of the SRP. The analysis methods and source term assumptions specified in the DAC should be consistent with the approved methods and assumptions listed in the SRP. The SRP is the basis for the staff's safety review of the standard design. Therefore, demonstrating that the final design meets these DAC with the methods and assumptions specified in Tier 1 ensures that the as-built design will meet the applicable acceptance criteria of the SRP and the associated regulations and staff technical positions.

The DAC in Tier 1 should address the verification of the plant radiation shielding design and the plant airborne concentrations of radioactive materials (e.g., the ventilation system and airborne monitoring system designs). The DAC should require the COL applicant to calculate radiation levels and airborne radioactivity levels within the plant rooms and areas to verify the adequacy of these design features during plant construction (concurrently with the verification of the ITAAC). The plant rooms and areas to which the DAC apply may be given in figures in Tier 1. The appropriate section of DCD Tier 2, Chapter 12, should include detailed supporting information for the DAC.

The criteria in Tier 1 should ensure that the radiation shielding design (as provided by the plant structures or by permanent or temporary shielding included in the design) is adequate so that the maximum radiation levels in plant areas are commensurate with the areas' access requirements. This will allow radiation exposures to plant personnel to be maintained ALARA during normal plant operations and maintenance. Tier 1 should ensure that adequate shielding is provided for those plant areas that may require occupancy to permit an operator to aid in the mitigation of or the recovery from an accident. Tier 1 should ensure that the contribution of gamma shine to the radiation dose (particularly from the turbine building) to a member of the public (off site) will be a small fraction of the U.S. Environmental Protection Agency's dose limits in found at 40 CFR Part 190.

The criteria in Tier 1 should ensure that the plant provides adequate containment and ventilation flow rates to control the concentrations of airborne radioactivity to levels commensurate with the access requirements of areas in the plant. Tier 1 should ensure that once the concentrations of airborne radioactivity are determined, the required airborne monitors are placed in the appropriate locations in the plant.

Technical Rationale

The technical rationale for application of these requirements and/or SRP acceptance criteria to the areas of review addressed by this SRP section is discussed in the following paragraphs:

1. Application of 10 CFR 52.47(b)(1), as it relates to ITAAC (for DC), provides reasonable assurance that the SSCs in this area of review will operate in accordance with the design certification, the provisions of the Atomic Energy Act, and the NRC's regulations.

2. Application of 10 CFR 52.80(a), as it relates to ITAAC (for COLs), provides reasonable assurance that the SSCs in this area of review have been constructed and will be operated in conformity with the combined license, the provisions of the Atomic Energy Act, and the NRC's regulations.

III. REVIEW PROCEDURES

The reviewer will select and emphasize material from the procedures described below, as may be appropriate for a particular case.

For each area of review specified in Subsection I of this SRP section, the review procedure is identified below. These review procedures are based on the identified SRP acceptance criteria. For deviations from these specific acceptance criteria, the staff should review the applicant's evaluation of how the proposed alternatives to the SRP criteria provide an acceptable method of complying with the relevant NRC requirements identified in Subsection II.

Specifically, the reviewer should perform the following:

1. The reviewer should follow the general procedures for review of Tier 1 contained in the Review Procedures section of SRP Section 14.3. Ensure that the DCD is consistent with Appendix A to SRP Section 14.3. Review responsibilities may be consistent with those in Appendix B to SRP Section 14.3.

2. The reviewer should ensure that all Tier 1 information is consistent with Tier 2 information. Figures and diagrams should be reviewed to ensure that they accurately depict the functional arrangement and requirements of the systems. Reviewers should use the review checklists in Appendix C to SRP Section 14.3 as an aid in establishing consistent and comprehensive treatment of issues.

3. The reviewer should ensure that Tier 1 clearly describes the SSCs that provide a significant radiation protection function, including the key performance characteristics and safety functions of SSCs based on their safety significance.

4. The reviewer should ensure that Tier 1 identifies and describes the measures that to be employed during first-of-a-kind engineering to ensure that final design details (i.e., materials and component selection, equipment placement, and pipe routing) are consistent with the radiation protection commitments in the certified design.

5. The reviewer should ensure that appropriate guidance is provided to other branches so that radiation protection issues in Tier 1 are treated in a consistent manner among branches.

6. The reviewer should ensure that Tier 1 adequately addresses design features from the resolution of selected policy and technical issues on the basis of their safety significance. Ensure that the SER clearly documents the appropriate Commission guidance, requirements, bases, and resolutions for these items.

7. For review of a DC application, the reviewer should follow the above procedures to verify that the design, including requirements and restrictions (e.g., interface requirements and site parameters), set forth in the final safety analysis report (FSAR) meets the acceptance criteria. DCs have referred to the FSAR as the design control document

(DCD). The reviewer should also consider the appropriateness of identified COL action items. The reviewer may identify additional COL action items; however, to ensure these COL action items are addressed during a COL application, they should be added to the DC FSAR.

For review of a COL application, the scope of the review is dependent on whether the COL applicant references a DC, an early site permit (ESP) or other NRC approvals (e.g., manufacturing license, site suitability report or topical report).

8. Implementation of the ITAAC will be inspected in accordance with NRC Inspection Manual Chapter IMC-2503.

IV. EVALUATION FINDINGS

The reviewer verifies that the applicant has provided sufficient information and that the review and calculations (if applicable) support conclusions of the following type to be included in the staff's safety evaluation report. The reviewer also states the bases for those conclusions.

The reviewer verifies that sufficient information has been provided to satisfy the requirements of SRP Section 14.3 and this SRP section, and concludes that the ITAAC is acceptable. A finding similar to that in the Evaluation Findings section of SRP Section 14.3 should be provided in a separate section of the SER.

For DC and COL reviews, the findings will also summarize the staff's evaluation of requirements and restrictions (e.g., interface requirements and site parameters) and COL action items relevant to this SRP section.

In addition, to the extent that the review is not discussed in other SER sections, the findings will summarize the staff's evaluation of the ITAAC, including design acceptance criteria, as applicable.

V. IMPLEMENTATION

The staff will use this SRP section in performing safety evaluations of DC applications and license applications submitted by applicants pursuant to 10 CFR Part 50 or 10 CFR Part 52. Except when the applicant proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the staff will use the method described herein to evaluate conformance with Commission regulations.

The provisions of this SRP section apply to reviews of applications docketed six months or more after the date of issuance of this SRP section, unless superseded by a later revision.

VI. REFERENCES

1. 10 CFR 52.47 "Contents of Applications."

2. 10 CFR 52.80 "Contents of Applications."

3. NUREG-1503, "Final Safety Evaluation Report Related to the Certification of the Advanced Boiling Water Reactor," Vols. 1 and 2, July 1994.

4. NUREG-1462, “Final Safety Evaluation Report Related to the Certification of the System 80+ Design,” Vols. 1 and 2, August 1994.

5. NRC Inspection Manual Chapter IMC-2503, “Construction Inspection Program - TAAC Inspections,” April 26, 2006.

PAPERWORK REDUCTION ACT STATEMENT

The information collections contained in the Standard Review Plan are covered by the requirements of 10 CFR Part 50 and 10 CFR Part 52, and were approved by the Office of Management and Budget, approval number 3150-0011 and 3150-0151.

PUBLIC PROTECTION NOTIFICATION

The NRC may not conduct or sponsor, and a person is not required to respond to, a request for information or an information collection requirement unless the requesting document displays a currently valid OMB control number.

SRP Section 14.3.8
Description of Changes

This SRP section affirms the technical accuracy and adequacy of the guidance previously provided in (Draft) Revision 0, dated April 1996 of this SRP. See ADAMS accession number ML052070668.

This SRP section has been revised to remove discussion related to emergency planning, design basis accidents and meteorology. These items are covered in SRP Section 14.3.10. Section 14.3.8 now contains information on Radiation Protection only.

In addition this SRP section was administratively updated in accordance with NRR Office Instruction, LIC-200, Revision 1, "Standard Review Plan (SRP) Process." The revision also adds standard paragraphs to extend application of the updated SRP section to prospective submittals by applicants pursuant to 10 CFR Part 52.

The technical changes are incorporated in Revision 2, dated [Month] 2007:

Review Responsibilities - Reflects changes in review branches resulting from reorganization and branch consolidation. Change is reflected throughout the SRP.

I. AREAS OF REVIEW

1. Reference to Appendix B deleted.
2. Specific branch designations changed to "organization."
3. Section 5 added to address COL action items and DC requirements and restrictions.

II. ACCEPTANCE CRITERIA

1. Regulatory ITAAC acceptance criteria section added.
2. SRP acceptance overview paragraph added.
3. Technical Rationale section revised to include ITAAC.

III. REVIEW PROCEDURES

1. Review procedures overview paragraph added.
2. Item 6 added to cover DC and COL applications.
3. Item 7 added to cover ITAAC implementation inspections.

IV. EVALUATION FINDINGS

None.

V. IMPLEMENTATION

1. Revised implementation section added.

VI. REFERENCES

1. Reference 7 added.