



## U.S. NUCLEAR REGULATORY COMMISSION

# STANDARD REVIEW PLAN

### 9.5.3 LIGHTING SYSTEMS

#### REVIEW RESPONSIBILITIES

**Primary** - Organization Responsible for Electrical Engineering

**Secondary** - None

#### I. AREAS OF REVIEW

The branch with primary review responsibility will review the normal and emergency or supplementary plant lighting systems, including reference information associated with that review.

The specific areas of review are as follows:

1. The capability of the normal lighting system(s) to provide adequate lighting during all plant operating conditions.
2. The capability of the emergency lighting system to provide adequate lighting during all plant operating conditions, including fire, transient and accident conditions.
3. The effect of the loss of all alternating current (AC) power (i.e. during a station blackout) on the emergency lighting system.

Rev. [3] - [Month] 2007

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### 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 the Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants (LWR Edition)." Not all sections of the standard format have a corresponding review plan section. The SRP sections applicable to a combined license application for a new light-water reactor (LWR) will be based on Regulatory Guide 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)," until the SRP itself is updated.

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](mailto:NRR_SRP@nrc.gov).

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4. The failure analysis of normal and emergency lighting systems.
5. Inspection, Test, Analysis, and Acceptance Criteria (ITAAC). For design certification (DC) and combined license (COL) reviews, the applicant's proposed information on the ITAAC associated with the systems, structures, and components (SSCs) related to this SRP section is reviewed in accordance with SRP Section 14.3, "Inspections, Tests, Analyses, and Acceptance Criteria - Design Certification." The staff recognizes that the review of ITAAC is performed after review of the rest of this portion of the application against acceptance criteria contained in this SRP section. Furthermore, the ITAAC are reviewed to assure that all SSCs in this area of review are identified and addressed as appropriate in accordance with SRP Section 14.3.
3. COL Action Items and Certification Requirements and Restrictions. COL action items may be identified in the NRC staff's final safety evaluation report (FSER) for each certified design to identify information that COL applicants must address in the application. Additionally, DCs contain requirements and restrictions (e.g., interface requirements) that COL applicants must address in the application. For COL applications referencing a DC, the review performed under this SRP section includes information provided in response to COL action items and certification requirements and restrictions pertaining to this SRP section, as identified in the FSER for the referenced certified design.

### Review Interfaces

The listed SRP sections interface with this section as follows:

1. The review for lighting requirements for fire protection is coordinated and performed by the branch that has primary review responsibility for SRP Section 9.5.1.
2. The review of the adequacy of lighting systems and their power supplies with respect to security and physical protection requirements is coordinated and performed by the staff that has primary review responsibility for SRP Section 13.6.
3. The review of the adequacy of control room lighting systems and features related to their effectiveness to support reliable human performance, including evaluation with respect to the criteria specified in NUREG-0700 (Reference 1), is performed by the staff that has primary review responsibility for SRP Section 18.0.

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. There are no general design criteria or other requirements that directly apply to the normal and emergency or supplementary plant lighting systems.

2. 10 CFR 52.47(a)(1)(vi), as it relates to ITAAC (for design certification) sufficient to assure that the SSCs in this area of review will operate in accordance with the certification.
3. 10 CFR 52.97(b)(1), as it relates to ITAAC (for combined licenses) sufficient to assure that the SSCs in this area of review have been constructed and will be operated in conformity with the license and the Commission'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 review described in Subsection I of 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. Acceptance criteria of the design of the normal and emergency lighting systems, as described in the applicant's safety analysis report (SAR), is based in part on the degree of similarity of the systems design with those for previously reviewed plants with satisfactory operating experience.
2. The normal lighting system(s) is acceptable if the integrated design of the system(s) will provide adequate station lighting in all areas, from power sources described in Section 8.2 of the SRP that are required for control and maintenance of equipment and plant access routes during normal plant operations.
3. The emergency lighting system(s) is acceptable if the integrated design of the system(s) will provide adequate emergency station lighting in all areas, required for fire fighting, control and maintenance of equipment used for implementing safe shutdown of the plant during all plant operating conditions, and the access routes to and from these areas.
4. The lighting systems designs will be acceptable if they conform to the lighting levels recommended in NUREG-0700, which is based on the Illuminating Engineering Society of North America (IESNA) Lighting Handbook (Reference 2) as related to systems design and illumination levels recommended for industrial facilities.

### 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.

1. The information provided in the SAR pertaining to the designs of the normal and emergency lighting systems including failure analysis is evaluated to determine that the lighting in all plant areas and access routes to and from these areas is adequate. An

**engineering assessment using the above acceptance criteria**, in conjunction with a comparison to equipment and lighting systems provided on previously approved plants, is to be used as a basis for determining acceptability.

2. For reviews of DC and COL applications under 10 CFR Part 52, the reviewer should follow the above procedures to verify that the design set forth in the safety analysis report, and if applicable, site interface requirements meet the acceptance criteria. For DC applications, the reviewer should identify necessary COL action items. With respect to COL applications, the scope of the review is dependent on whether the COL applicant references a DC, an ESP or other NRC-approved material, applications, and/or reports.

After this review, SRP Section 14.3 should be followed for the review of Tier I information for the design, including the postulated site parameters, interface criteria, and ITAAC.

#### 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 normal and emergency lighting systems include all components necessary to provide adequate lighting during normal and emergency plant operating conditions. The scope of review of the lighting systems provided for the \_\_\_\_\_ plant included assessment of the systems designs, adequacy of the normal and emergency power sources, and verification of adequate lighting during fire, transient, and accident conditions.

The basis for acceptance of the normal and emergency lighting systems was conformance of the design, design criteria, and design bases to staff positions and industry standards and the ability of the emergency lighting system to provide adequate station lighting in all vital areas from onsite power sources during the full spectrum of accident and/or transient conditions and to the access routes to and from these areas.

The staff concludes that the design of the lighting system conforms to the applicable staff positions and industry standards and is therefore acceptable.

For DC and COL reviews, the findings will also summarize (to the extent that the review is not discussed in other SER sections) the staff's evaluation of the ITAAC, including design acceptance criteria, as applicable, and interface requirements and combined license action items relevant to this SRP section.

#### 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. NUREG-0700, "Human-System Interface Design Review Guidelines," Rev. 2, May, 2002.
2. NUREG-1793, "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design."
3. NRC Draft Regulatory Guide DG-1145, "Combined License Applications for Nuclear Power Plants (LWR Edition)," June 30, 2006.
4. Standard Review Plan Section 8.2, "Offsite Power."
5. Illuminating Engineering Society of North America Lighting Handbook.

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**PAPERWORK REDUCTION ACT STATEMENT**

The information collections contained in the draft 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 9.5.3** Description of Changes

This SRP section affirms the technical accuracy and adequacy of the guidance previously provided in (Draft) Revision 3, dated April 1996 of this SRP. See ADAMS accession number ML052070567.

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

The technical changes are incorporated in Revision 3, dated 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. Added a review of the lighting failure analysis for consistency with Regulatory Guide 1.70 and DG -1145 requirements.
2. Included guidance for the review of COL applications.

#### II. ACCEPTANCE CRITERIA

1. The 1996 revision of the SRP stated emergency lighting was required for "safety-related" equipment. Since implementation of safe shutdown under 10 CFR 50.63 is not limited to equipment designed to safety-related standards only (i.e. RCIC in a BWR), the words "safety-related" were deleted and the words "used for implementing safe shutdown of the plant" were inserted for technical clarification.
2. The parenthetical expression "(as defined in Section 8.2 of the SRP)" was added to clarify the phrase "offsite power."

#### III. REVIEW PROCEDURES

1. The words "engineering judgement" were replaced with "an engineering assessment using the above acceptance criteria" to ensure acceptance criteria elements were incorporated in the review process.
2. Included guidance for review of design certifications and COL applications.

#### IV. EVALUATION FINDINGS

1. Included guidance to address findings for design certifications and COL applications.

#### V. IMPLEMENTATION

No changes.

## VI. REFERENCES

1. Added reference to DG-1145
2. Added reference to NUREG 1793
3. Updated reference to NUREG-0700 Revision 2
4. Added reference to SRP Section 8.2