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

SECTION 8.1 INTRODUCTION

REVIEW RESPONSIBILITIES

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

Secondary - Auxiliary and Power Conversion Systems Branch (APCSB)
Containment Systems Branch (CSB)
Reactor Systems Branch (RSB)

I. AREAS OF REVIEW

Section 8.1 of the applicant's safety analysis report (SAR) is reviewed to determine the adequacy of the information presented with reference to the information requirements of the corresponding section of the Standard Format, Revision 2 (Item 4.1 of Ref. 1).

The review is also to include evaluation of the proposed technical specifications (SAR Chapter 16) to assure that they are adequate with regard to limiting safety system settings, limiting conditions for operation, and periodic surveillance testing.

The secondary review branches (APCSB, CSB, and RSB) review the listing of safety loads for completeness, i.e., to verify that all safety loads within their respective areas of primary review responsibility have been identified. If loads other than those identified are deemed to be safety-related, this information will be transmitted to EICSB.

II. ACCEPTANCE CRITERIA

The description of the power grid and offsite power system is acceptable when it can be concluded that the interrelationships between the nuclear unit, the utility grid, and the interconnecting grids are clearly defined. The identification of safety loads is acceptable when it can be concluded that all systems and devices that require electric power (a-c or d-c) to perform safety functions are identified.

Table 8-1, "Acceptance Criteria for Electric Power," lists the criteria currently applied by the staff to safety-related electric power systems. Implementation of these criteria will provide assurance that safety-related electric power systems will perform design safety functions as required. The applicant's list of design criteria for safety-related

electric power systems is acceptable if it includes the items in Table 8-1, and if the SAR contains a statement to the effect that these criteria will be implemented (at the construction permit stage) or are implemented (at the operating license stage) in the design of the electrical power systems.

The fundamental bases for acceptance of the proposed technical specifications are that the limiting conditions for operation (LCO's) are such that sufficient equipment will be available for operation as required to meet the single failure criterion; that equipment outages that are permissible for a short period of time still leave available sufficient equipment to provide the protective function assuming no failures; and that the provisions of the technical specifications are compatible with the safety analyses. The operating procedures and restrictions which should be implemented if the available electric power sources are less than the LCO are discussed in Regulatory Guide 1.93.

III. REVIEW PROCEDURES

The objective of the review of Section 8.1 of the SAR is to determine if the information requirements defined in the corresponding section of the Standard Format, Revision 2, have been met.

The information presented should include: a brief description of the utility grid and its interconnections to other grids and to the nuclear unit (referred to as the preferred power system); a brief general description of the onsite power system (referred to as the standby power system); identification of the safety loads (i.e., the systems and devices that require electric power to perform safety functions); identification of the function performed by each load (e.g., emergency core cooling, containment cooling); the type of electric power (a-c or d-c) required by each load; and the design bases, criteria, standards, regulatory guides, and technical positions that will be implemented in the design of the safety-related electric power systems, including a discussion and a positive statement with regard to conformance of the design to each of these crtieria.

The review is performed as follows:

1. EICSB will establish that the utility grid is adequately described, and that the interconnections between the nuclear unit, the utility grid, and other grids are clearly defined. The descriptions should state whether facilities are existing or planned; if planned, the respective completion dates should be provided. The descriptions should not conflict with the more detailed information in subsequent sections of Chapter 8, and may reference these sections.

2. EICSB confirms that the description of the onsite power system (standby power system) is not in conflict with the more detailed information on this system in subsequent sections of Chapter 8.

3. EICSB will establish that all the devices and systems that require electric power to perform safety functions are identified, and that this identification does not conflict with the more detailed infromation provided in other sections of the SAR, particularly in Chapters 7 and 8. The definitions of safety-related systems in Standard Review Plan (SRP) 7.1 should be used as an aid in assessing the completeness of the identification of safety loads. Care should be exercised to assure that those loads required to maintain the plant within the envelope of operating conditions postulated in the accident analysis are identified as safety loads. Requests for evaluation should be made to the secondary review branches when there are novel designs or significant differences of opinion with regard to designations of safety loads.

4. The secondary review branches (APCSB, CSB, RSB) will confirm the identification of all safety loads within their respective areas of primary review responsibility. If loads other than those identified are deemed to be safety-related, this information should be transmitted to EICSB.

5. EICSB will confirm that the criteria identified as being applicable to the design of safety-related electric power systems include those items listed in Table 8-1. This will assure that the identification requirements of General Design Criteria (GDC) 1 of Appendix A of 10 CFR Part 50 are met. GDC 1 also require that "structures, systems, and components important to safety shall be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety function to be performed." Therefore, the SAR should include a discussion regarding the applicability of the criteria listed and a statement to the effect that the criteria will be implemented (CP) or are implemented (OL) in the design of safety-related electrical power systems.

6. The proposed plant technical specifications (Chapter 16) are reviewed by EICSB and the secondary review branches to:
   a. Confirm the suitability of the limiting safety system settings and the limiting conditions for operation, including the proposed time limits and reactor operating restrictions for periods when system equipment is inoperable due to repairs and maintenance.
   b. Verify that the frequency and scope of periodic surveillance testing is adequate.

For a construction permit (CP) review, it is only necessary to confirm that the applicant has identified those variables, conditions, or other items which have been determined to be probable subjects of the technical specifications. (See 10 CFR § 50.34 (a)(5).) The applicant's justification for the selection of those items is evaluated, with special attention to any that may significantly influence the final design. The specific provisions of the proposed technical specifications are not approved during the CP review. However, any specific provisions which are known to be unacceptable or which may influence acceptance of the preliminary design of the plant should be brought to the applicant's attention and, if appropriate, included in that portion of the staff's evaluation findings pertaining to the design of the affected systems.

For an operating license (OL) review, the proposed technical specifications are reviewed and evaluated in depth in accordance with the requirements of 10 CFR § 50.36. For the EICSB areas of review, a check is made that the limiting conditions for operation (LCO) correspond to the surveillance requirements; i.e., for each system or component that is the subject of a LCO, there must be corresponding surveillance requirements. Each system or component that performs a function for which credit is taken in the accident analyses should be the subject of an LCO. The limiting safety system settings should agree with the values assumed in the accident analyses, including appropriate allowances for instrument error, drift, etc. If the acceptance of the design of a particular system is based upon required plant conditions or particular operating procedures, such requirements should be included in the final technical specifications and, if appropriate, noted in that portion of the staff's evaluation findings pertaining to the design of the affected system. Operating procedures and restrictions acceptable to the Regulatory staff which should be implemented if the available electric power sources have less than the LCO are presented in Regulatory Guide 1.93.

IV. EVALUATION FINDINGS

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

> "The applicant has identified safety-related electric power systems, safety loads, and applicable power system criteria, and has documented his intent to design and construct these systems in accordance with the criteria. It is concluded that design and construction of safety-related electric power systems in accordance with the criteria provide assurance that these systems will perform as designed."

V. REFERENCES

1. Standard Review Plan Table 8-1, "Acceptance Criteria for Electric Power."

SRP Table 8-1

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TABLE 8-1

ACCEPTANCE CRITERIA FOR ELECTRIC POWER

Table 8-1 contains the acceptance criteria for the review plans of Chapter 8. These acceptance criteria include the applicable general design criteria, IEEE standards, regulatory guides, and branch technical positions (BTP) of the Electrical, Instrumentation and Control Systems Branch (EICSB). The table was prepared by EICSB for use by its members in reviewing Chapter 8 and for use by the secondary review branch reviewers.

The applicability of these criteria to specific sections of Chapter 8 in indicated by an X in the matrix listing of criteria and SAR sections. There is a corresponding similar table (7-1) at the end of Chapter 7 covering the acceptance criteria of safety-related instrumentation and controls. The BTP listed in Tables 7-1 and 8-1 are contained in Appendix 7-A to the Chapter 7 review plans.

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ACCEPTANCE CRITERIA FOR ELECTRIC POWER - TABLE 8-1

CRITERIA	TITLE	APPLICABILITY (SAR Section)				REMARKS
		8.1	8.2	8.3.1	8.3.2	
1. 10 CFR Part 50						
a. 10 CFR §50.34	Contents of Applications: Technical Information	X	X	X	X	
b. 10 CFR §50.36	Technical Specifications	X	X	X	X	
c. 10 CFR §50.55a	Codes and Standards	X	X	X	X	
2. General Design Criteria (GDC), Appendix A to 10 CFR Part 50						
a. GDC-1	Quality Standards and Records	X	X	X	X	
b. GDC-2	Design Bases for Protection Against Natural Phenomena	X	X	X	X	
c. GDC-3	Fire Protection	X	X	X	X	
d. GDC-4	Environmental and Missile Design Bases	X	X	X	X	
e. GDC-5	Sharing of Structures, Systems, and Components	X	X	X	X	
f. GDC-13	Instrumentation and Control	X	X	X	X	
g. GDC-17	Electric Power Systems	X	X	X	X	
h. GDC-18	Inspection and Testing of Electrical Power Systems	X	X	X	X	
i. GDC-21	Protection System Reliability and Testability	X	X	X	X	
j. GDC-22	Protection System Independence	X			X	

TABLE 8-1 (CONTINUED)

CRITERIA	TITLE	APPLICABILITY (SAR Section) 8.1	8.2	8.3.1	8.3.2	REMARKS
k. GDC-33	Reactor Coolant Makeup	X	X	X	X	
l. GDC-34	Residual Heat Removal	X	X	X	X	
m. GDC-35	Emergency Core Cooling	X	X	X	X	
n. GDC-38	Containment Heat Removal	X	X	X	X	
o. GDC-41	Containment Atmosphere Cleanup	X	X	X	X	
p. GDC-44	Cooling Water	X	X	X	X	
3. Institute of Electrical and Electronics Engineers (IEEE) Standards:						
a. IEEE Std 279-1971 (ANSI N42.7-1972)	Criteria for Protection Systems for Nuclear Power Generating Stations	X		X	X	See 10 CFR §50.55a(h) and Reg. Guide 1.62
b. IEEE Std 308-1971	Criteria for Class IE Electric Systems for Nuclear Power Generating Stations	X	X	X	X	See Reg. Guide 1.32.
c. IEEE Std 317-1972	Electric Penetration Assemblies in Containment Structures for Nuclear Power Generating Stations	X		X	X	See Reg. Guide 1.63.
d. IEEE Std 336-1971 (ANSI N45.2.4-1972)	Installation, Inspection and Testing Requirements for Instrumentation and Electric Equipment During the Construction of Nuclear Power Generating Stations	X	X	X	X	See Reg. Guide 1.30.
e. IEEE Std 338-1971	Criteria for the Periodic Testing of Nuclear Power Generating Station Protection Systems	X		X	X	
f. IEEE Std 344-1971 (ANSI N41.7)	Guide for Seismic Qualification of Class I Electrical Equipment for Nuclear Power Generating Stations	X		X	X	

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TABLE 8-1 (CONTINUED)

CRITERIA	TITLE	APPLICABILITY (SAR Section) 8.1	8.2	8.3.1	8.3.2	REMARKS
g. IEEE Std 379-1972 (ANSI N41.2)	Guide for the Application of the Single Failure Criterion to Nuclear Power Generating Station Protection Systems	X		X	X	See Reg. Guide 1.53
h. IEEE Std 384-1974 (ANSI N41.14)	Criteria for Separation of Class IE Equipment and Circuits	X		X	X	
i. IEEE Std 387-1972 (ANSI N41.13)	Criteria for Diesel-Generator Units Applied as Standby Power Supplies for Nuclear Power Stations	X		X		
j. IEEE Std 450-1972	Recommended Practice for Maintenance, Testing and Replacement of Large Stationary Type Power Plant and Substation Lead Storage Batteries	X			X	
4. Regulatory Guides (RG)						
a. RG 1.6	Independence Between Redundant Standby (Onsite) Power Sources and Between Their Distribution Systems	X		X	X	
b. RG 1.9	Selection of Diesel Generator Set Capacity for Standby Power Supplies	X		X		
c. RG 1.22	Periodic Testing of Protection System Actuation Functions	X	X	X	X	
d. RG 1.29	Seismic Design Classification	X		X	X	
e. RG 1.30	Quality Assurance Requirements for the Installation, Inspection, and Testing of Instrumentation and Electric Equipment	X	X	X	X	
f. RG 1.32	Use of IEEE Std 308-1971, "Criteria for Class IE Electric Systems for Nuclear Power Generating Stations"	X	X		X	

TABLE 8-1 (CONTINUED)

CRITERIA	TITLE	APPLICABILITY (SAR Section) 8.1	8.2	8.3.1	8.3.2	REMARKS
g. RG 1.41	Preoperational Testing of Redundant Onsite Electric Power Systems to Verify Proper Load Group Assignments	X	X	X	X	
h. RG 1.47	Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety Systems	X	X	X	X	Use in conjunction with Position 3, RG 1.17.
i. RG 1.53	Application of the Single-Failure Criterion to Nuclear Power Plant Protection Systems	X		X	X	
j. RG 1.63	Electric Penetration Assemblies in Containment Structures for Water-Cooled Nuclear Power Plants	X		X	X	
k. RG 1.68	Preoperational and Initial Startup Test Programs for Water-Cooled Power Reactors	X	X	X	X	
l. RG 1.70	Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants, Rev. 2	X	X	X	X	
m. RG 1.75	Physical Independence of Electric Systems	X		X	X	
n. RG 1.81	Shared Emergency and Shutdown Electric Systems for Multi-Unit Nuclear Power Plants	X		X	X	Use in conjunction with BTP-7
o. RG 1.89	Qualification of Class IE Equipment for Nuclear Power Plants	X		X	X	
p. RG 1.93	Availability of Electric Power Sources	X	X	X	X	
5. Branch Technical Positions (BTP) EICSB						
a. BTP EICSB 1	Backfitting of the Protection and Emergency Power Systems of Nuclear Reactors	X		X	X	
b. BTP EICSB 2	Diesel-Generator Reliability Qualification Testing	X		X		

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TABLE 8-1 (CONTINUED)

CRITERIA	TITLE	APPLICABILITY (SAR Section)				REMARKS
		8.1	8.2	8.3.1	8.3.2	
c. BTP EICSB 6	Capacity Test Requirements of Station Batteries-Technical Specifications	X			X	
d. BTP EICSB 7	Shared Onsite Emergency Electrical Power Systems for Multi-Unit Generating Stations	X		X	X	
e. BTP EICSB 8	Use of Diesel-Generator Sets for Peaking	X		X		
f. BTP EICSB 10	Electrical and Mechanical Equipment Seismic Qualification Program	X		X	X	
g. BTP EICSB 11	Stability of Offsite Power Systems	X	X			
h. BTP EICSB 17	Diesel Generator Protective Trip Circuit Bypasses	X		X		
i. BTP EICSB 21	Guidance for Application of Reg. Guide 1.47	X	X	X	X	
j. BTP EISCB 27	Design Criteria for Thermal Overload Protection for Motors of Motor-Operated Valves	X		X	X	

SRP 8.2