U.S. NUCLEAR REGULATORY COMMISSION

STANDARD REVIEW PLAN

OFFICE OF NUCLEAR REACTOR REGULATION

9.4.5 ENGINEERED SAFETY FEATURE VENTILATION SYSTEM

REVIEW RESPONSIBILITIES

Primary - ~~Auxiliary~~ Plant Systems Branch (~~ASB~~ SPLB)[1]

Secondary - ~~None~~ Emergency Preparedness and Radiation Protection Branch (PERB)[2]

I. AREAS OF REVIEW

The function of the engineered safety feature ventilation system (ESFVS) is to provide a suitable and controlled environment for engineered safety feature components following certain anticipated transients and design basis accidents.

The ~~ASB~~ SPLB[3] reviews the ESFVS from air intake to the point of discharge to the atmosphere to ensure conformance with the requirements of General Design Criteria 2, 4, 5, 17, and 60 and 10 CFR 50.63.[4] The review includes components such as air intakes, ducts, air-conditioning units, flow control devices, isolation dampers, exhaust vents, and exhaust fans.

The review of the ESFVS covers all ventilation systems utilized to maintain a controlled environment in areas containing safety-related equipment. These include the service water pump house, diesel generator area, emergency core cooling system (ECCS) pump rooms, component cooling water pump room, auxiliary feedwater pump area, and other areas containing equipment essential for the safe shutdown of the reactor or necessary to prevent or mitigate the consequences of an accident.

1. The ~~ASB~~ SPLB[5] reviews the ESFVS to determine the safety significance of the various portions and subsystems. Based on this determination, the safety-related portions of the system are reviewed with respect to functional performance requirements associated with

engineered safety feature areas during normal operation, during adverse environmental occurrences, and during and subsequent to postulated accidents, including the loss of offsite power. The ~~ASB~~ SPLB[6] reviews safety-related portions of the system to ensure that:

a. A single active failure cannot result in loss of the system functional performance capabilities; and

b. Failures of nonseismic Category I equipment or components will not result in damage to essential portions of the ESFVS.

2. The ~~ASB~~ SPLB[7] also reviews safety-related portions of the ESFVS with respect to the following:

a. The ability of the heating and cooling systems to maintain a suitable ambient temperature range in the areas serviced, assuming proper performance of equipment contained in these areas;

b. Provisions to detect the need for isolation and to isolate portions of the system in the event of failures or malfunctions;

c. The ability of the safety features equipment in the areas being serviced by the ventilation system to function under the worst anticipated degraded ESFVS system performance;

d. Capability of the system to circulate sufficient air to prevent accumulation of ~~in~~flammable[8] or explosive gas or fuel-vapor mixtures from components such as storage batteries and stored fuel;

e. The capability of the system to automatically actuate components not operating during normal conditions, or to actuate standby components (redundant equipment) in the event of a failure or malfunction, as needed; and

f. The capability of the system to control airborne particulate material (dust) accumulation.

3. The SPLB also reviews the ESFVS with respect to ensuring that suitable environmental conditions are maintained in areas containing equipment required to function for a station blackout. This review includes verification that failure of nonrequired equipment will not preclude operation of required equipment when preferred and onsite emergency ac power is lost.[9]

4. The PERB, as part of its secondary review responsibility for Standard Review Plan (SRP) Section 9.4.5, reviews safety-related portions of the ESFVS with respect to the following:[10]

   a. The capability of the ESFVS to detect and control leakage of radioactive contamination from the system is performed under SRP Section 11.5;[11]

   b. The ~~Radiological Assessment Branch (RAB) evaluates the~~ radiation protection criteria as part of its primary review responsibility for SRP Section 12.3; and[12]

   c. The ~~Accident Evaluation Branch (AEB) evaluates the~~ radiological consequences of airborne contaminants resulting from accident conditions ~~(see Appendix B to SRP Section 15.6.5).~~ as part of its primary review responsibility for Appendix B to SRP Section 15.6.5.[13]

Review Interfaces[14]

~~3~~The ~~ASB~~ SPLB also performs the following reviews under the SRP sections indicated as part of its primary review responsibility for those sections:[15]

   a. ~~Review of f~~Flood protection ~~is performed~~ under SRP Section 3.4.1;

   b. ~~Review of the p~~Protection against internally generated missiles ~~is performed~~ under SRP Section 3.5.1.1;

   c. ~~Review of t~~The structures, systems, and components to be protected against externally generated missiles ~~is performed~~ under SRP Section 3.5.2;

   d. ~~Review of h~~High-energy and moderate-energy pipe breaks ~~is performed~~[16] under SRP Section 3.6.1;

   e. Acceptability of the combustion air supply portions of system under SRP Section 9.5.8, where combustion air for diesel generators is supplied from the ESFVS;[17]

   f. Effectiveness of ESFVS filters in removing airborne contaminants before discharge to the environment under SRP Section 6.5.1;[18]

   g. Functional performance ensuring that the system meets acceptable limits for radioactive releases during normal operations under SRP Section 11.3; and[19]

   h. Fire protection under SRP Section 9.5.1.[20]

The ~~ASB~~ SPLB[21] will coordinate evaluations performed by other branches that interface with the overall evaluation of the system as follows:

a. The ~~ICSB and PSB~~ Instrumentation and Controls Branch (HICB) and Electrical Engineering Branch (EELB)[22] determine the adequacy of the design, environmental ratings, installation, inspection, and testing of ~~all essential~~ instrumentation and electrical components, equipment, and systems (sensing, control, and power) ~~required for proper operation,~~ as part of their primary review responsibility for SRP Chapters 7 and 8 ~~Sections 7.3 and 8.3.1~~, respectively. The EELB also performs the overall review of compliance with station blackout requirements, as part of its primary review responsibility for SRP Section 8.4 (proposed)[23].

b. The ~~SEB~~ Civil Engineering and Geosciences Branch (ECGB)[24] determines the acceptability of the design analyses, procedures, and criteria used to establish the ability of seismic Category I structures housing the system and supporting systems to withstand the effects of natural phenomena such as the safe shutdown earthquake (SSE), the probable maximum flood (PMF), and tornado missiles as part of its primary review responsibility for SRP Sections 3.3.1, 3.3.2, 3.5.3, 3.7.1 ~~thru~~ through[25] 3.7.4, 3.8.4, and 3.8.5. The ECGB also verifies that inservice inspection requirements are met for system components as part of its primary review responsibility for SRP Section 6.6.[26]

c. The ~~MEB~~ Mechanical Engineering Branch (EMEB)[27] determines that the components, piping, and structures are designed in accordance with applicable codes and standards as part of its primary review responsibility for SRP Sections 3.9.1 ~~thru~~ through 3.9.3.

d. The ~~MEB, also,~~ EMEB[28] determines the acceptability of the seismic and quality group classifications for system components as part of its primary review responsibility for SRP Sections 3.2.1 and 3.2.2.

e. The ~~MEB also~~ EMEB[29] reviews the adequacy of the inservice testing program of pumps and valves as part of its primary review responsibility for SRP Section 3.9.6.

~~The Materials Engineering Branch (MTEB) verifies that inservice inspection requirements are met for system components as part of its primary review responsibility for SRP Section 6.6.~~

~~The Effluent Treatment Systems Branch (ETSB) evaluates the system functional performance to assure that the system meets acceptable limits for radioactive releases during normal operations as part of its primary review responsibility for SRP Section 11.3.~~[30]

~~The Radiological Assessment Branch (RAB) evaluates the radiation protection criteria as part of its primary review responsibility for SRP Section 12.3.~~[31]

~~In the event that the system is utilized for the purpose of supplying combustion air as well as providing a ventilation function, the PSB reviews the acceptability for that portion of the system as part of its primary review responsibility for SRP Section 9.5.8.~~[32]

~~The Accident Evaluation Branch (AEB) evaluates the radiological consequences of airborne contaminants resulting from accident conditions (see Appendix B to SRP Section 15.6.5).~~[33]

~~The ETSB evaluates the effectiveness of the ESFVS filters to remove airborne contaminants prior to discharge to the environment (see SRP Section 6.5.1). ETSB also reviews and evaluates the capability of the ESFVS to detect and control leakage of radioactive contamination from the system as described in SRP Section 11.5.~~[34]

~~The review for Fire Protection, Technical Specifications, and Quality Assurance are coordinated and performed by the Chemical Engineering Branch, Licensing Guidance Branch, and Quality Assurance Branch as part of their primary review responsibility for SRP Sections 9.5.1, 16.0, and 17.0, respectively.~~[35]

f. The Technical Specifications Branch (TSB) coordinates and performs reviews of the proposed technical specifications as part of its primary review responsibility for SRP Chapter 16.[36]

g. The Quality Assurance and Maintenance Branch (HQMB) coordinates and performs reviews of quality assurance programs as part of its primary review responsibility for SRP Chapter 17.[37]

For those areas of review identified above as being reviewed ~~as part of the primary review responsibility of other branches~~under other SRP sections, the acceptance criteria necessary for the review and their methods of application are contained in the referenced SRP sections ~~of the corresponding primary branch~~.[38]

II. ACCEPTANCE CRITERIA

Acceptability of the ESFVS design, as described in the applicant's safety analysis report (SAR), is based on specific general design criteria and regulatory guides.

The design of safety-related portions of the ESFVS is acceptable if the integrated design of the systems is in accordance with the following criteria:

1. General Design Criterion 2 (GDC 2),[39] as related to the system being capable of withstanding the effects of earthquakes. Acceptance is based on meeting the guidance of Regulatory Guide 1.29, position C.1, for safety-related portions and position[40] C.2 for nonsafety-related portions.

2. General Design Criterion 4 (GDC 4),[41] ~~with respect to maintaining environmental conditions in essential areas compatible with the design limits of the essential equipment located therein during normal, transient, and accident conditions.~~with respect to the ESFVS being appropriately protected against dynamic effects and being designed to

accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents.[42] The evaluation with respect to GDC 4 also includes evaluation of the adequacy of environmental support provided to structures, systems, and components important to safety located within areas served by the ESFVS.[43]

3. General Design Criterion 5 (GDC 5),[44] as related to shared systems and components important to safety.

4. General Design Criterion 17 (GDC 17),[45] as related to ~~assuring~~ ensuring[46] proper functioning of the essential electric power system. Acceptance is based on meeting the guidance of item 2 under subsection A and item 1 under subsection C of the section on "Recommendations" of NUREG-CR/0660 ~~(Ref. 10)~~[47] relating to the protection of essential electrical components from failure due to the accumulation of dust and particulate materials.

5. General Design Criterion 60 (GDC 60),[48] as related to the system being capable to suitably control release of gaseous radioactive effluents to the environment. Acceptance is based on meeting the guidance of Regulatory Guides 1.52 (position C.2) and 1.140 (positions C.1 and C.2), as related to design, testing, and maintenance criteria for atmosphere cleanup system, and normal ventilation exhaust system air filtration and adsorption units of light-water-cooled nuclear power plants~~, Position C.2 and Positions C.1 and C.2, respectively~~.[49]

6. 10 CFR 50.63, as related to necessary support systems providing sufficient capacity and capability for coping with a station blackout event. An analysis to determine capability for withstanding (if an acceptable alternate ac source is provided) or coping with a station blackout event is required. The analysis should address, as appropriate, the potential failures of equipment/systems during the event (e.g., loss of or degraded operability of HVAC systems, including the ESFVS, as appropriate), the expected environmental conditions associated with the event, the operability and reliability of equipment necessary to cope with the event under the expected environmental conditions, and the habitability of plant areas requiring operator access during the event and associated recovery period. Acceptance is based on meeting the applicable guidance provided in Regulatory Guide 1.155 including position C.3.2.4.[50]

Technical Rationale[51]

The technical rationale for application of the above acceptance criteria to the ESFVS is discussed in the following paragraphs:[52]

1. Compliance with GDC 2, as related to the system being capable of withstanding the effects of earthquakes, requires that structures, systems, and components important to safety be designed to withstand the effects of a design basis earthquake without loss of capability to perform their safety functions.

The function of the ESFVS is to provide a suitable and controlled operating environment for engineered safety feature components during normal operation, during adverse environmental occurrences, and during and subsequent to postulated accidents, including loss of offsite power. GDC 2 is imposed to ensure that engineered safety features will remain functional during and after a design basis earthquake.

Meeting this requirement provides assurance that engineered safety features will operate as designed, thus providing protection against loss of core cooling and/or loss of containment integrity.[53]

2. Compliance with GDC 4 requires that structures, systems, and components important to safety be designed to accommodate the effects of, and be compatible with, environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents. These structures, systems, and components shall be protected against dynamic effects (e.g., those of missiles, pipe whipping, and discharging fluids) that may result from equipment failure and from events and conditions outside the nuclear power unit.

The function of the ESFVS is to provide a suitable and controlled operating environment for engineered safety feature components during normal operation, during adverse environmental occurrences, and during and subsequent to postulated accidents, including loss of offsite power. This requirement is imposed to ensure that engineered safety features function through the course of operating and accident events. In addition, the ESFVS design must withstand dynamic effects associated with postulated accidents.

Meeting these requirements provides assurance that engineered safety features will not fail to operate as designed, thus providing protection against loss of core cooling and/or containment integrity.[54]

3. Compliance with GDC 5 requires that structures, systems, and components important to safety shall not be shared between nuclear power units unless it can be shown that such sharing will not significantly impair the ability of each unit to perform its safety function. In the event of an accident in one unit, the remaining units must be able to implement an orderly shutdown and cooldown.

With regard to the ESFVS, the plant design should provide for essential independence of its components, ensuring that an accident in one part of a multiple-unit facility will not propagate to unaffected units. Therefore, the ESFVS for each unit should be designed to accommodate accident conditions. At the same time, the operating environment of equipment associated with unaffected units must be maintained within specified limits.

Meeting these requirements provides assurance that a failure will not affect additional units of a multiple-unit facility.[55]

4. Compliance with GDC 17 requires that onsite and offsite electrical power be provided to permit functioning of structures, systems, and components important to safety. Each electric power system must provide sufficient capacity to ensure that specified fuel

design limits and design conditions of the reactor coolant pressure boundary are not exceeded as a result of anticipated operational occurrences. In addition, core cooling, containment integrity, and other vital functions must be maintained in the event of postulated accidents.

With regard to the ESFVS, the plant design should ensure that electrical contacts and relays in diesel generator rooms are protected from dust, dirt, and grit. For example, contacts and relays must be enclosed in dust-tight cabinets with fully gasketed openings and ventilation louvers must be equipped with filters. In addition, air used for ventilation should be filtered and should be taken from a height of at least 7 meters (20 feet) above ground level.

Meeting these requirements provides assurance that a reliable electric power supply will be available for all facility operating modes, including anticipated operational occurrences and postulated accidents.[56]

5. Compliance with GDC 60 requires that provisions be included in the nuclear power unit design to control the release of radioactive materials in gaseous effluents during normal reactor operation, including anticipated operational occurrences.

Regulatory Guides 1.140 and 1.52 present methods acceptable to the Commission staff with regard to design, testing, and maintenance criteria for air filtration and adsorption units of normal ventilation exhaust systems and of engineered safety feature atmosphere cleanup systems used in light-water-cooled nuclear power plants. Atmosphere cleanup systems are included in the design to reduce the quantities of radioactive materials in gaseous effluents released to the environment.

Meeting these requirements provides assurance that release of radioactive materials entrained in gaseous effluents will not exceed the limits specified in 10 CFR Part 20 for normal operation and anticipated operational occurrences.[57]

6. Compliance with 10 CFR 50.63 requires a demonstration that the plant has the capability to withstand and recover from a station blackout (i.e., loss of offsite electric power system concurrent with reactor trip and unavailability of the onsite emergency ac electric power system). A station blackout analysis covering a minimum acceptable duration (either to "withstand" the event until an alternate ac source and shutdown systems are lined up for operation or to "cope" with it for its duration, including the associated recovery period) is required. Regulatory Guide 1.155 provides guidance for complying with station blackout requirements.

Regardless of the extent to which the ESFVS is expected to function to maintain suitable environmental conditions during a station blackout event, equipment that is necessary to accomplish core cooling, maintenance of appropriate containment integrity, and other functions that constitute "withstanding" and/or "coping" during the event should be capable of functioning under the expected environmental conditions associated with the event. The station blackout analysis is therefore verified to appropriately address the potential failures of equipment/systems during the event (e.g., loss of or degraded

operability of the ESFVS, as appropriate), the expected environmental conditions associated with the event, the operability and reliability of equipment necessary to cope with the event under the expected environmental conditions, and the habitability of plant areas requiring operator access during the event and associated recovery period.

Those portions of the ESFVS that are identified in a coping analysis as necessary to support the functioning of equipment required to cope with the event or recovery therefrom are verified to be of sufficient capacity and capability to provide such support.

Meeting the requirements 10 CFR 50.63 provides assurance that necessary operator actions can be performed and that necessary equipment will be functional under the expected environmental conditions during and following a station blackout, thereby ensuring that the core will be cooled and appropriate containment integrity will be maintained.[58]

III. REVIEW PROCEDURES

The procedures below are used during 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 subsection II. For the review of operating license (OL), standard design certification, or combined license (COL)[59] applications, the procedures are utilized 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 primary reviewer will coordinate this review with the other branches' areas of review as stated in subsection I. The primary reviewer obtains and uses such inputs as required to ~~assure~~ ensure that this review procedure is complete.

As a result of various ESFVS designs proposed by applicants, there will be variations in system requirements. For the purpose of this SRP section, a typical system is assumed which has fully redundant subsystems, each having an identical essential (safety features) portion. For cases where there are variations from this typical arrangement, the reviewer would adjust the review procedures given below. However, the system design would be required to meet the acceptance criteria given in subsection II. The reviewer will select and emphasize material from this SRP section as may be appropriate for a particular case.

1. The SAR is reviewed to verify that the system description and piping and instrumentation diagrams (P&IDs) show the ESFVS equipment used for normal operation, and the ambient temperature limits for the areas serviced. The system performance requirements are reviewed to determine that they limit allowable component operational degradation (e.g., loss of function, damper leakage) and describe the procedures that will be followed to detect and correct these conditions. The reviewer, using results from failure modes and effects analyses as appropriate, will determine that the safety-related portion of the system is capable of sustaining the failure of any active component.

2. The system P&IDs, layout drawings, and component descriptions and characteristics are then reviewed to determine that:

   a. Essential portions of the ESFVS are correctly identified and are isolatable from nonessential portions of the system. The P&IDs are reviewed to verify that they clearly indicate the physical divisions between such portions and indicate design classification changes. System drawings are also reviewed to see that they show the means for accomplishing isolation, and the system description is reviewed to identify minimum performance requirements for the isolation dampers. For the typical system, the drawings and description are reviewed to verify that two automatically operated isolation dampers in series separate nonessential portions and components from the essential portions.

   b. Essential portions of the ESFVS, including the isolation dampers separating essential from nonessential portions, are classified seismic Category I. Component and system descriptions in the SAR that identify mechanical and performance characteristics are reviewed to verify that the above classifications have been included, and that the P&IDs indicate points of change in design classification.

   c. Design provisions have been made that permit appropriate inservice inspection and functional testing of system components important to safety. It is acceptable if the SAR information delineates a testing and inspection program and if the system drawings show the necessary test recirculation loops around fans or isolation dampers that would be required by this program.

3. The reviewer verifies that the system has been designed so that system function will be maintained as required in the event of adverse environmental phenomena or loss of offsite power. The reviewer evaluates the system, using engineering judgment and the results of failure modes and effects analyses, to determine that:

   a. The failure of nonessential portions of the system or of other nonseismic systems, components, or structures located close to essential portions of the system will not preclude operation of the essential portions of the ESFVS. Reference to SAR sections describing site features and the general arrangement and layout drawings will be necessary, as well as the SAR tabulation of seismic design classifications for structures and systems.

   b. The essential portions of the ESFVS are protected from the effects of floods, hurricanes, tornadoes, and internally and externally generated missiles. Flood protection and missile protection criteria are discussed and evaluated in detail under the Section 3 series of the SRP. The location and the design of the system, structures, and fan rooms (cubicles) are reviewed to determine that the degree of protection provided is adequate. A statement to the effect that the system is located in a seismic Category I structure that is tornado missile and flood protected, or that components of the system will be located in individual cubicles

or rooms that will withstand the effects of both flooding and missiles is acceptable.

c. The total system has the capability to detect and control leakage of airborne contamination from the system. It is acceptable if the following conditions are met:

(1) The capability for isolating nonessential portions of the ESFVS by two automatically actuated isolation dampers in series is shown on the P&IDs.

(2) The ESFVS has provisions to actuate ventilation equipment in the engineered safety feature areas before ambient temperatures exceed design rated temperatures of components.

d. Essential components and subsystems can function as required in the event of loss of offsite power. The system design will be acceptable if the ESFVS meets minimum system requirements as stated in the SAR, assuming a failure of a single active component within the system itself or in the auxiliary electric power source which supplies the system. The SAR is reviewed to see that for each ESFVS component or subsystem affected by the loss of offsite power, the resulting system performance will not affect the capability of any engineered safety feature equipment. Statements in the SAR and results of failure modes and effects analyses are considered in verifying that the system meets these requirements. This will be an acceptable verification of system functional reliability.

4. The descriptive information, P&IDs, ESFVS drawings, and failure modes and effects analyses in the SAR are reviewed to ensure that essential portions of the system can function following design basis accidents assuming a concurrent single active failure. The reviewer evaluates the analyses presented in the SAR to ~~assure~~ ensure function of required components, traces the availability of these components on system drawings, and checks that the SAR contains verification that minimum system isolation or filtration requirements are met for each accident situation for the required time spans. For each case, the design will be acceptable if minimum system requirements are met.

5. The ESFVS is reviewed to ensure that adequate means is provided in the system design for control of airborne particulate material (dust) accumulation. The system arrangement is reviewed to verify that a minimum of 7 meters (20 feet)[60] exists from the bottom of all fresh air intakes to grade elevation, or that electrical cabinets are provided with suitable seals or gaskets.

6. The reviewer verifies that a suitable environment is demonstrated to be maintained in areas served by the ESFVS for the duration of a station blackout event and the associated recovery period with or without credit for ESFVS operation, as applicable. Where applicable, the functionality of equipment necessary to cope with the event under the expected environmental conditions and the habitability of areas where operator actions are performed should be appropriately addressed during the review as described in

Regulatory Guide 1.155, position C.3.2.4. Where portions of the ESFVS are credited to function for station blackout, the reviewer verifies that the ESFVS has been designed so that system functions will be performed as required in the event of a station blackout, that the ESFVS has sufficient capacity and capability to maintain a suitable environment for the duration of a station blackout event and the associated recovery period, and that failure of non-required portions of the ESFVS will not adversely affect the functioning of required equipment. As necessary, the reviewer interfaces with HICB and EELB reviewers as described in subsection I to evaluate the instrumentation and electrical provisions for ESFVS functionality in the event of a station blackout and also to ensure that appropriate instrumentation and electrical equipment environmental limits have been considered.[61]

For standard design certification reviews under 10 CFR Part 52, the procedures above should be followed, as modified by the procedures in SRP Section 14.3 (proposed), to verify that the design set forth in the standard safety analysis report, including inspections, tests, analysis, and acceptance criteria (ITAAC), site interface requirements and combined license action items, meet the acceptance criteria given in subsection II. SRP Section 14.3 (proposed) contains procedures for the review of certified design material (CDM) for the standard design, including the site parameters, interface criteria, and ITAAC.[62]

IV. EVALUATION FINDINGS

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

The engineered safety feature ventilation system (ESFVS) includes all components and ducting associated with the system from air intake to the point of discharge to the atmosphere. All portions of the system whose failure may result in release of radioactivity which causes an offsite dose of more than 5 mSv (0.5 rem)[63] to the whole body or its equivalent to any part of the body are classified seismic Category I and safety related. Based on the review of the applicant's proposed design criteria, design bases, and safety classification for the engineered safety feature ventilation system, and the requirements for system performance to preclude equipment malfunction in the engineered safety feature areas due to a failure of the system during normal, abnormal, and accident conditions, the staff concludes that the design of the engineered safety feature ventilation system and supporting systems is acceptable and meets the Commission's regulations as set forth in General Design Criteria 2, 4, 5, 17, and 60 and 10 CFR 50.63.[64]

This conclusion is based on the following:

1. The applicant has met the requirements of GDC 2 with respect to the system being capable of withstanding the effects of earthquakes by meeting the guidelines of Regulatory Guide 1.29, "Seismic Design Classification," position C.1, for safety-related portions of the system and position C.2 for nonsafety-related portions of the system.

2. The applicant has met the environmental requirements of GDC 4 by appropriately addressing adverse environmental conditions and dynamic effects in the design of the system to ensure its capability for maintaining environmental conditions in ~~essential~~ areas served by the system within the design limits of the ~~essential~~ equipment important to safety located in these areas for normal, transient, or accident conditions.[65]

3. The applicant has met the requirements of GDC 5 with respect to capability of shared systems and components important to safety to perform required safety functions since no postulated single active failure will prevent the system from performing its safety function.

4. The applicant has met the requirements of GDC 17 as related to ~~assuring~~ ensuring proper functioning of the essential electric power system by meeting the guidelines of NUREG-CR/0660 as related to the accumulation of dust and particulate materials.

5. The applicant has met the requirements of GDC 60 with respect to the capability of the system to suitably control release of gaseous radioactive effluents to the environment by meeting the guidelines of Regulatory Guide 1.52, "Design, Testing and Maintenance Criteria for Atmosphere Cleanup System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants," position C.2, and Regulatory Guide 1.140, "Design, Testing and Maintenance Criteria for Normal Ventilation Exhaust System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants," positions C.1 and C.2.

6. The applicant has met the requirements of 10 CFR 50.63 by demonstrating that suitable environmental conditions to support operator access/egress and equipment functionality will be maintained during a station blackout event and its associated recovery period in those areas which contain equipment whose function is required for the safe shutdown of the plant in the event of a station blackout and by meeting the applicable guidance set forth in Regulatory Guide 1.155.[66]

For design certification reviews, the findings will also summarize, to the extent that the review is not discussed in other safety evaluation report sections, the staff's evaluation of inspections, tests, analyses, and acceptance criteria (ITAAC), including design acceptance criteria (DAC), site interface requirements, and combined license action items that are relevant to this SRP section.[67]

V. IMPLEMENTATION

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

This SRP section will be used by the staff when performing safety evaluations of license applications submitted by applicants pursuant to 10 CFR 50 or 10 CFR 52.[68] 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.

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.[69]

Implementation schedules for conformance to parts of the method discussed herein are contained in the referenced regulatory guides, ~~and~~ NUREG, and in 10 CFR 50.63.[70] ~~The implementation of new position~~Review Procedure 5 under subsection III is ~~applicable only to~~used in the evaluation of ~~CP~~ applications docketed on or after July 1981.[71]

VI. REFERENCES

1. 10 CFR 50.63, "Loss of All Alternating Current Power."[72]

~~1~~2. 10 CFR Part 50, Appendix A, General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena."

~~2~~3. 10 CFR Part 50, Appendix A, General Design Criterion 4, "Environmental and ~~Missile~~Dynamic Effects Design Bases."[73]

~~3~~4. 10 CFR Part 50, Appendix A, General Design Criterion 5, "Sharing of Structures, Systems, and Components."

~~4~~5. 10 CFR Part 50, Appendix A, General Design Criterion 17, "Electric Power Systems."

~~5~~6. 10 CFR Part 50, Appendix A, General Design Criterion 60, "Control of Releases of Radioactive Materials to the Environment."

~~6~~7. Regulatory Guide 1.29, "Seismic Design Classification."

~~7~~8. Regulatory Guide 1.52, "Design, Testing and Maintenance Criteria for Atmosphere Cleanup System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants."

~~8~~9. Regulatory Guide 1.140, "Design, Testing and Maintenance Criteria for Normal Ventilation Exhaust System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants."

10. Regulatory Guide 1.155, "Station Blackout."[74]

~~9~~11. NUREG-CR/0660, "Enhancement of Onsite Emergency Diesel Generator Reliability."

SRP Draft Section 9.4.5
Attachment A - Proposed Changes in Order of Occurrence

Item numbers in the following table correspond to superscript numbers in the redline/strikeout copy of the draft SRP section.

Item	Source	Description
1.	Current PRB name and abbreviation	Changed PRB to Plant Systems Branch (SPLB).
2.	Current SRB name and abbreviation	Added SRB, Emergency Preparedness and Radiation Protection Branch (PERB).
3.	Current PRB abbreviation	Changed PRB to SPLB.
4.	Integrated Impact No. 349	Added reference to 10 CFR 50.63.
5.	Current PRB abbreviation	Changed PRB to SPLB.
6.	Current PRB abbreviation	Changed PRB to SPLB.
7.	Current PRB abbreviation	Changed PRB to SPLB.
8.	Editorial	Revised to reflect the prevention of accumulation of flammables rather than inflammables.
9.	Integrated Impact No. 349	Added station blackout to SPLB review responsibility.
10.	SRP-UDP format item	Added lead-in sentence for section on PERB review responsibilities.
11.	Current SRB responsibility	Added review responsibility for SRP Section 11.5.
12.	SRP-UDP format item/ Current SRB responsibility	Deleted obsolete branch name. Added review responsibility for SRP Section 12.3.
13.	SRP-UDP format item/ Current SRB responsibility	Deleted obsolete branch name. Added review responsibility for SRP Section 15.6.5.

Item	Source	Description
14.	SRP-UDP format item	Added "Review Interfaces" to AREAS OF REVIEW and arranged in numbered paragraph form to describe how SPLB reviews aspects of the ESFVS under other SRP sections and how other branches support that review.
15.	Current PRB abbreviation/ SRP-UDP format item	Changed PRB to SPLB. Added phrase to clarify PRB responsibility.
16.	Editorial modification	"Review of" and "is performed" are redundant.
17.	Current PRB responsibility	Changed to reflect SPLB review responsibility for SRP Section 9.5.8.
18.	Current PRB responsibility	Changed to reflect SPLB review responsibility for SRP Section 6.5.1.
19.	Current PRB responsibility	Changed to reflect SPLB review responsibility for SRP Section 11.3.
20.	Current PRB responsibility	Changed to reflect SPLB review responsibility for SRP Section 9.5.1
21.	Current PRB abbreviation	Changed PRB to SPLB.
22.	Current review branch names and abbreviations	Changed review branch names to Instrumentation and Controls Branch (HICB) and Electrical Engineering Branch (EELB).

Item	Source	Description
23.	SRP-UDP Integration of SBO Issues	Added reference to SRP Section 8.4 for review of SBO issues. Also revised the interface to reflect not only I&C and electrical reviews associated with operation of the ESFVS but also reviews of I&C and electrical components, equipment, and systems located in areas served by the ESFVS. This change was made because SRP Section 9.4.5 includes reviews of the adequacy of environmental support provided by the ESFVS to SSCs important to safety under specified conditions/events. The adequacy of environmental support must be evaluated with respect to I&C and electrical component and equipment specifications, ratings, etc.
24.	Current review branch name and abbreviation	Changed review branch name to Civil Engineering and Geosciences Branch (ECGB).
25.	Editorial modification	Provided correct spelling for "through" (global change for this SRP section).
26.	Current PRB review responsibilities	Revised/relocated this interface description to reflect that the ECGB is currently responsible for this review formerly performed by MTEB.
27.	Current review branch name and abbreviation	Changed review branch name to Mechanical Engineering Branch (EMEB).
28.	Current review branch name and abbreviation	Changed review branch name to Mechanical Engineering Branch (EMEB).
29.	Current review branch name and abbreviation	Changed review branch name to Mechanical Engineering Branch (EMEB).

Item	Source	Description
30.	Current PRB review responsibility	Relocated/revised to reflect that the ECGB is now the PRB for SRP Section 6.6 and that the SPLB has assumed review responsibility for SRP Section 11.3.
31.	Current SRB review responsibility	The PERB has assumed review responsibility for SRP Section 12.3.
32.	Current PRB review responsibility	The SPLB has assumed review responsibility for SRP Section 9.5.8.
33.	Current SRB review responsibility	The SPLB has assumed review responsibility for SRP Section 15.6.5.
34.	Current PRB review responsibility	The SPLB has assumed review responsibility for SRP Sections 6.5.1 and 11.5.
35.	SRP-UDP format item	Section deleted to reflect current SRP format.
36.	SRP-UDP format item/ Current review branch responsibility	Section rewritten to reflect current SRP format. Changed review branch to TSB.
37.	SRP-UDP format item/ Current review branch responsibility	Section rewritten to reflect current SRP format. Changed review branch to HQMB.
38.	SRP-UDP format item	Since this subsection describes interfaces with other SPLB reviews and other PRBs, this paragraph was revised to address both types of interfaces.
39.	Editorial modification	Introduced initialism for General Criterion 2.
40.	Editorial modification	Added "position" for clarity and parallelism.
41.	Editorial modification	Introduced initialism for General Criterion 4.

Item	Source	Description
42.	Editorial	Revised sentence to reflect the current relevant requirements of GDC 4 as reflected in the review of the ESFVS design adequacy as described in subsection III where the ESFVS is verified to be functional under adverse environmental conditions and protected from floods, missiles, etc.
43.	Editorial	Revised clarification that the review for compliance with GDC 4 also includes evaluation of ESFVS auxiliary support functions to provide a suitable environment for SSCs important to safety located within the area served by the ESFVS, consistent with Review Procedures described in subsection III and Evaluation Findings described in subsection IV.
44.	Editorial modification	Introduced initialism for General Criterion 5.
45.	Editorial modification	Introduced initialism for General Criterion 17.
46.	Editorial modification	Changed "assuring" to "ensuring" (global change for this SRP section).
47.	SRP-UDP format item	Deleted (Ref. 10).
48.	Editorial modification	Introduced initialism for General Criterion 60.
49.	Editorial	Revised sentence to clarify intent.
50.	Integrated Impact No. 349	Added 10 CFR 50.63 to ACCEPTANCE CRITERIA to specify functional requirements for the performance of the ESFVS in the event of a station blackout and reference to Regulatory Guide 1.155 as providing guidance acceptable for meeting the requirements of 10 CFR 50.63.

Item	Source	Description
51.	SRP-UDP format item/ Develop technical rationale	Added "Technical Rationale" to ACCEPTANCE CRITERIA and arranged in numbered paragraph form to describe the bases for referencing the GDCs and 10 CFR 50.63.
52.	SRP-UDP format item/ Develop technical rationale	Added lead-in sentence for "Technical Rationale."
53.	SRP-UDP format item/ Develop technical rationale	Added technical rationale for GDC 2.
54.	SRP-UDP format item/ Develop technical rationale	Added technical rationale for GDC 4.
55.	SRP-UDP format item/ Develop technical rationale	Added technical rationale for GDC 5.
56.	SRP-UDP format item/ Develop technical rationale	Added technical rationale for GDC 17.
57.	SRP-UDP format item/ Develop technical rationale	Added technical rationale for GDC 60.
58.	SRP-UDP format item/ Develop technical rationale	Added technical rationale for 10 CFR 50.63.
59.	SRP-UDP format item	Added reference to standard design certification and COL applications per 10 CFR Part 52.
60.	Conversion to SI units	Converted a minimum of 20 feet to 7 meters.
61.	Integrated Impact No. 349	Added consideration of station blackout to REVIEW PROCEDURES.
62.	SRP-UDP Guidance, Implementation of 10 CFR 52	Added standard paragraph to address application of Review Procedures in design certification reviews.
63.	Conversion to SI units	Converted 0.5 rem to 5 mSv.
64.	Integrated Impact No. 349	Added reference to 10 CFR 50.63.

Item	Source	Description
65.	Editorial	Revised finding for consistency with relevant GDC 4 requirements reflected in subsection II and the review pursuant thereto performed in subsection III.
66.	Integrated Impact No. 349	Added consideration of station blackout to EVALUATION FINDINGS.
67.	SRP-UDP Format Item, Implement 10 CFR 52 Related Changes	To address design certification reviews a new paragraph was added to the end of the Evaluation Findings. This paragraph addresses design certification specific items including ITAAC, DAC, site interface requirements, and combined license action items relevant to the SRP section.
68.	SRP-UDP Guidance, Implementation of 10 CFR 52	Added standard sentence to address application of the SRP section to reviews of applications filed under 10 CFR Part 52, as well as Part 50.
69.	SRP-UDP Guidance	Added standard paragraph to indicate applicability of this section to reviews of future applications.
70.	Integrated Impact No. 349	Added 10 CFR 50.63 to paragraph that discusses implementation schedules.
71.	SRP-UDP format item, 10 CFR 52 Implementation	Revised based on date of last SRP section revision to reflect the applications to which procedure 5 applies. Also revised to reflect nonexclusive applicability to CP applications since the procedure can and should also be used for DC, COL, and OL applications.
72.	Integrated Impact No. 349	Added 10 CFR 50.63 to REFERENCES and renumbered subsequent references.
73.	Reference Verification	Revised to reflect current title of GDC 4.
74.	Integrated Impact No. 349	Added RG 1.155 to REFERENCES.

Integrated Impact No.	Issue	SRP Subsections Affected
349	Incorporate requirements of 10 CFR 50.63(a)(2), "Station Blackout," into SRP Section 9.4.5 subsections, as appropriate.	Subsection I, AREAS OF REVIEW, second paragraph Subsection I, AREAS OF REVIEW, subparagraph 3 Subsection II, ACCEPTANCE CRITERIA, subparagraph 6 Subsection III, REVIEW PROCEDURES, subparagraph 6 Subsection IV, EVALUATION FINDINGS, first paragraph Subsection IV, EVALUATION FINDINGS, subparagraph 6 Subsection V, IMPLEMENTATION, fourth paragraph Subsection VI, REFERENCES, Reference 1 Subsection VI, REFERENCES, Reference 10