U.S. NUCLEAR REGULATORY COMMISSION

STANDARD REVIEW PLAN

OFFICE OF NUCLEAR REACTOR REGULATION

10.3 MAIN STEAM SUPPLY SYSTEM

REVIEW RESPONSIBILITIES

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

Secondary - None

I. AREAS OF REVIEW

The main steam supply system (MSSS) for both boiling water reactor (BWR) and pressurized water reactor (PWR) plants transports steam from the nuclear steam supply system to the power conversion system and various safety-related ~~or~~ and[2] nonsafety-related auxiliaries. Portions of the MSSS may be used as a part of the heat sink to remove heat from the reactor facility during certain operations and may also be used to supply steam to drive engineered safety feature pumps. The MSSS may also include provisions for secondary system pressure relief in PWR plants.

The MSSS for the BWR direct cycle plant extends from the outermost containment isolation valves up to and including the turbine stop valves, and includes connected piping of 6.4 centimeters (2-1/2 inches)[3] nominal diameter and larger up to and including the first valve that is either normally closed or is capable of automatic closure during all modes of reactor operation. The MSSS for the PWR indirect cycle plant extends from the connections to the secondary sides of the steam generators up to and including the turbine stop valves, and includes the containment isolation valves, safety and relief valves, connected piping of 6.4 centimeters (2-1/2 inches)[4] nominal diameter and larger up to and including the first valve that is either normally closed or capable of automatic closure during all modes of operation,[5] and the steam line to the auxiliary feedwater pump turbine. The SPLB~~ASB~~ is responsible for the review of the MSSS from the

containment up to the turbine stop valve ~~and including the outermost isolation valve. The PSB is responsible for the review of the remainder of the MSSS~~.[6] (The turbine stop valve review is included in SRP Section 10.2.) The SPLB~~PSB~~[7] also determines the adequacy of the design, installation, inspection, and testing of the electrical power supplies for essential components required for proper operation of the MSSS. The design of the MSSS must be in accordance with General Design Criteria 2, 4, 5, and 34 and 10 CFR 50.63.[8]

1. The SPLB ~~ASB and PSB~~ reviews[9] the MSSS to determine which, if any, portions of the system are essential for safe shutdown of the reactor or for preventing or mitigating the consequences of accidents. The system is reviewed to verify that:

   a. A single malfunction or failure of an active component would not preclude safety-related portions of the system from functioning as required during normal operations, adverse environmental occurrences, and accident conditions, including loss of offsite power.

   b. Appropriate quality group and seismic design classification are met for safety-related portions of the system.

   c. Failures of nonseismic Category I equipment or structures, or pipe cracks or breaks in high- and moderate-energy piping will not preclude essential functions of safety-related portions of the system.

   d. The system is capable of performing multiple functions such as transporting steam to the power conversion system, providing heat sink capacity or pressure relief capability, or supplying steam to drive safety system pumps (e.g., turbine-driven auxiliary feedwater pumps), as may be specified for a particular design.

   e. The design of the MSSS includes the capability to operate the atmospheric dump valves remotely from the control room following a safe shutdown earthquake coincident with the loss of offsite power so that a cold shutdown can be achieved with dependence upon safety-grade components only.

   f. The system design capability can withstand adverse dynamic loads, such as water (steam)[10] hammer resulting from rapid valve closure and relief valve fluid discharge loads.

2. The SPLB~~ASB~~[11] reviews the MSSS with regard to measures provided to limit blowdown of the system in the event of a steam line break.

3. For plants in which the design relies on the MSSS in response to a station blackout (SBO), SPLB reviews the MSSS to assure conformance with 10 CFR 50.63.[12]

~~3~~4.[13] The SPLB~~ASB and PSB~~ also reviews[14] the design of the MSSS with respect to the following:

a. The functional capability of the system to transport steam from the nuclear steam supply system as required during all operating conditions.

b. The capability to detect and control system leakage, and to isolate portions of the system in case of excessive leakage or component malfunctions.

c. The capability to preclude accidental releases to the environment.

d. Provisions for functional testing for safety-related portions of the system.

Review Interfaces:[15]

~~4.~~ The SPLB~~ASB~~[16] also performs the following reviews under the SRP sections indicated:

1~~a~~. Review for flood protection is performed under SRP Section 3.4.1.

2~~b~~. Review of the protection against internally generated missiles outside containment[17] is performed under SRP Section 3.5.1.1.

3. Review of the protection against internally generated missiles inside containment is performed under SRP Section 3.5.1.2.[18]

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

5~~d~~. Review of high- and moderate-energy pipe breaks is performed under SRP Section 3.6.1.

6. Review of the environmental qualification of components is performed under SRP Section 3.11.[19]

7. Review of the Main Steam Isolation Valve Leakage Control System is performed under SRP Section 6.7.[20]

8. Review of fire protection is performed under SRP Section 9.5.1.[21]

~~In the review of the main steam supply system, the ASB and PSB~~In addition, the SPLB[22] will coordinate other branches' evaluations that interface with the overall review of the system as follows:

1. The Reactor Systems Branch (SRXB)~~(RSB)~~[23] identifies essential components associated with the portion of the MSSS inside the primary containment that are required for normal operations and accident conditions, establishes shutdown cooling load requirements versus time, and verifies the design transient used in establishing the flow capacity and setpoint(s) of steam generator relief and safety valves as part of its primary review responsibility for SRP Section 5.2.2.[24]

2. The ~~Structural and Geotechnical~~Civil Engineering and Geosciences Branch (ECGB)~~(SGEB)~~[25] 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 through 3.7.4, 3.8.4, and 3.8.5.

3. ~~The Equipment Qualification Branch (EQB) reviews the seismic and environmental qualification of components under SRP Sections 3.10 and 3.11.~~[26] The Mechanical Engineering Branch (EMEB) reviews the seismic qualification of components as part of its primary review responsibility for SRP Section 3.10.[27]

4. The EMEB~~Mechanical Engineering Branch (MEB)~~[28] determines that the components, piping, and supports are designed in accordance with applicable codes and standards as part of its primary review responsibility for SRP Sections 3.9.1 through 3.9.3.

5. The EMEB[29] 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.

6. The EMEB[30] ~~also~~[31] reviews the adequacy of the inservice testing program of the system valves as part of its primary review responsibility for SRP Section 3.9.6.

7. The Materials and Chemical Engineering Branch (EMCB)~~(MTEB)~~[32] verifies, upon request, the compatibility of the materials of construction with service conditions as part of its primary review responsibility for SRP Sections 5.2.3 and 10.3.6.[33]

8. The Containment Systems and Severe Accident Branch (SCSB) reviews the adequacy of the containment isolation system as part of its primary review responsibility for SRP Section 6.2.4. SCSB also verifies the acceptability of the containment leakage testing program as part of its primary review responsibilities for SRP Section 6.2.6.[34]

9. The Instrumentation ~~and~~ & Controls ~~Systems~~ Branch (HICB)~~(ICSB)~~[35] reviews portions of the MSSS with respect to the adequacy of design, installation, inspection, and testing of essential components necessary for instrumentation and control functions as part of its primary review responsibility for SRP Sections 7.1, 7.4, 7.5, and 7.7.

10. The Quality Assurance and Maintenance ~~Procedures and Systems Review~~ Branch (HQMB)~~(PSRB)~~[36] determines the acceptability of the preoperational and startup tests as part of its primary review responsibility for SRP Section 14.2~~0~~.[37] ~~The reviews for fire protection, technical specifications, and quality assurance are coordinated and performed by the Chemical Engineering Branch, Standardization and Special Projects Branch (SSPB), and Quality Assurance Branch as part of their primary review responsibility for SRP Sections 9.5.1, 16.0, and 17.0, respectively.~~ [38]

11. The Electrical Engineering Branch (EELB) reviews the plant's capability to cope with a Station Blackout, including evaluation of required systems and their capabilities to support the overall determination of compliance with station blackout requirements, as part of its primary review responsibility for SRP Section 8.4 (proposed).[39]

12. The review of technical specifications is performed by the Technical Specifications Branch (TSB) as part of its primary review responsibility for SRP Section 16.0.[40]

13. The review of quality assurance is performed by the HQMB as part of its primary review responsibility for SRP Sections 17.1 through 17.3.[41]

For those areas of review identified above as being part of the ~~primary review responsibility of other branches~~review 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 branches~~[42].

II. ACCEPTANCE CRITERIA

Acceptability of the design of the MSSS, as described in the applicant's safety analysis report (SAR), is based on specific general design criteria, federal regulations, and regulatory guides.[43]

The design of the MSSS is acceptable if the integrated design of the system is in accordance with the following criteria:

1. General Design Criterion 2, as related to safety-related portions of the system being capable of withstanding the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, and floods, and the positions of the following:

    a. Regulatory Guide 1.29, as related to the seismic design classification of system components, Positions C.1.a, C.1.e, C.1.f, C.2, and C.3.

    b. SECY 93-087 (Reference 14), applicable to BWR plants that do not incorporate a main steam isolation valve leakage control system (MSIVLCS) and for which main steam line fission product hold-up and retention is credited in the analysis of design basis accident radiological consequences:

        (1) The main steam lines extending from the outermost containment isolation valve to the seismic interface restraint and connected piping up to the first normally closed valve are classified seismic Category I.

        (2) The main steam lines from the seismic interface restraint up to but not including the turbine stop valve (including connected piping to the first normally closed valve) may be classified as non-seismic Category I if the following criteria are met:

i. They have been analyzed using a dynamic seismic analysis method to demonstrate their structural integrity under SSE loading conditions.

ii. All pertinent QA requirements of Appendix B to 10 CFR Part 50 are applied.

iii. For lines utilized as an MSIV leakage path to the condenser, reliable power sources must be available for control and isolation valves so that a control operator can establish the flow path assuming a single active failure.

(3) Main steam lines and other main steam system components are assigned a quality group classification in accordance with the criteria of SRP Section 3.2.2, Appendix A.[44]

c~~b~~. Regulatory Guide 1.117, as related to the protection of structures, systems, and components important to safety from the effects of tornado missiles, Appendix Positions 2 and 4.

2. General Design Criterion 4, with respect to safety-related portions of the system being capable of withstanding the effects of external missiles and internally generated missiles, pipe whip, and jet impingement forces associated with pipe breaks, and the position of Regulatory Guide 1.115 as related to the protection of structures, systems, and components important to safety from the effects of turbine missiles, Position C.1.

   The system design should adequately consider water (steam)[45] hammer and relief valve discharge loads to assure that system safety functions can be achieved and should assure that operating and maintenance procedures include adequate precautions to avoid water (steam)[46] hammer and relief valve discharge loads. The system design should also include protection against water entrainment.

3. General Design Criterion 5, as related to the capability of shared systems and components important to safety to perform required safety functions.

4. General Design Criterion 34, as related to the system function of transferring residual and sensible heat from the reactor system in indirect cycle plants, and the following:

   a. The positions in Branch Technical Position RSB 5-1 as related to the design requirements for residual heat removal.

   b. Issue Number 1 of NUREG-0138 (Reference 13)[47] as related to credit being taken for all valves downstream of the main steam isolation valves (MSIV) to limit blowdown of a second steam generator in the event of a steam line break upstream of the MSIV.

5. 10 CFR Part 50, §50.63, "Loss of All Alternating Current Power", as it relates to the ability of a plant to withstand for a specified duration and recover from a station blackout. Acceptance is based on meeting Regulatory Guide 1.155 as it relates to the design of the MSSS.[48]

Technical Rationale:[49]

The technical rationale for application of the above acceptance criteria to the MSSS is discussed in the following paragraphs.

1. GDC 2 requires that structures, systems, and components important to safety be designed to withstand the effects of postulated local natural phenomena, such as earthquakes, tornadoes, floods, etc., without loss of the capability to perform their safety functions. The safety functions of the MSSS are plant design specific and may include: steam supply to safety-related auxiliaries and ESF pumps, provision of a heat sink during certain transients and accidents, limiting RCS pressure during certain transients, steam generator and MSSS overpressure protection, and termination of MSLB events. For BWRs, the MSSS provides fission product isolation during and following postulated accidents, and for BWRs without a MSIVLCS, fission product retention and holdup during and following an accident. The MSSS must be able to perform its safety functions while withstanding natural phenomena that may reasonably be expected to occur at the plant site. Regulatory Guide 1.29 provides specific guidance for determining which structures, systems, and components should be designated seismic category I and designed to meet the SSE. Regulatory Guide 1.117 provides specific guidance for determining which structures, systems, and components should be designed to withstand the effects of a Design Basis Tornado. Meeting the requirements of GDC 2 and the positions of Regulatory Guide 1.29 and Regulatory Guide 1.117 will ensure that the MSSS can perform its required safety functions in the event of adverse natural phenomena.

2. GDC 4 requires that structures, systems, and components important to safety be designed to withstand potential dynamic effects, such as missile impact, pipe whip, jet impingement, etc., caused by equipment failure or outside events. The safety functions of the MSSS are plant design specific and may include: steam supply to safety-related auxiliaries and ESF pumps, provision of a heat sink during certain transients and accidents, limiting RCS pressure during certain transients, steam generator and MSSS overpressure protection, and termination of MSLB events. For BWRs, the MSSS provides fission product isolation during and following postulated accidents, and for BWRs without a MSIVLCS, fission product retention and holdup during and following an accident. The MSSS must be able to perform its safety functions while withstanding the harshest effects of postulated plant equipment failures, such as pipe rupture, or potential outside events, such as an airplane crash. Regulatory Guide 1.115 provides specific guidance for protecting safety-related structures, systems, and components from low-trajectory missiles resulting from turbine failure. Meeting the requirements of GDC 4 and the positions of Regulatory Guide 1.115 will provide assurance that the MSSS is capable of carrying out its safety functions in the event of adverse conditions caused by equipment failure or outside events.

3. GDC 5 prohibits sharing of structures, systems, and components important to safety among nuclear units unless such sharing will not impair the ability of the structures, systems, and components to perform design safety functions in their respective units. The safety functions of the MSSS are plant design specific and may include: steam supply to safety-related auxiliaries and ESF pumps, provision of a heat sink during certain transients and accidents, limiting RCS pressure during certain transients, steam generator and MSSS overpressure protection, and termination of MSLB events. For BWRs, the MSSS provides fission product isolation during and following postulated accidents, and for BWRs without a MSIVLCS, fission product retention and holdup during and following an accident. For multiple unit sites, the MSSSs may be cross-connected between units for startup, maintenance, or other related purposes. For such shared systems, the licensee must show that each MSSS can perform all of its required safety functions for its respective unit. Meeting GDC 5 will ensure that shared MSSSs at multiple unit sites will be able to carry out their respective safety functions regardless of malfunctions in the opposite unit.

4. GDC 34 requires that a residual heat removal system be provided to remove decay and residual heat from the reactor and maintain the fuel and reactor coolant pressure boundary within design limits. GDC 34 further requires that such residual heat removal systems be designed with redundancy such that they can accomplish their safety functions assuming a single failure in either the onsite or offsite electric power system. The MSSS may be utilized for safety functions such as removing decay heat or supplying steam to engineered safety feature pumps. The design of such MSSS safety functions must support meeting fuel and reactor coolant pressure boundary design limits by providing sufficient cooldown capacity and suitable power supply and redundancy to assure functionality during a loss of offsite power. Meeting GDC 34 ensures that the MSSS can fulfill its safety functions related to decay heat removal and cooling of the reactor.

5. 10 CFR 50.63 invokes explicit requirements on the plant regarding the capability to ensure that the core is cooled in the event of a station blackout for a determined duration. The MSSS may supply pumps (e.g., AFW or RCIC) and provide decay heat removal capability necessary for core cooling and/or safe shutdown (non-design basis accident), respectively, during a station blackout. Its design capability to operate regardless of a-c power source availability enables performance of these important functions during a station blackout. Regulatory Guide 1.155 identifies methods acceptable for complying with the requirements of 10 CFR 50.63. Meeting the requirements of 10 CFR 50.63 and the positions of Regulatory Guide 1.155 provides assurance that the MSSS system is capable of supporting core cooling and/or safe shutdown (non-design basis accident) in the event of a station blackout.

III. REVIEW PROCEDURES

The procedures below are used during the 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 of this SRP section. For review of operating license (OL) applications, the procedures are used 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 procedures for OL applications include a determination that the content and intent of the technical specifications prepared by the applicant are in agreement with the requirements for system testing, minimum performance, and surveillance, developed as a result of the TSB~~SSPB~~[50] review, as indicated in subsection I of this SRP section.

The primary reviewers~~,~~[51] will coordinate this review with the other branches' areas of review as stated in subsection I of this SRP section. The primary reviewers obtain and use such input as required to assure that this review ~~procedure~~ [52]is complete.

The review procedures below are written for typical MSSSs for both direct and indirect cycle plants. The reviewer will select and emphasize material from this SRP section, as may be appropriate for a particular case.

1. There are significant differences in the design of the MSSS for an indirect cycle (PWR) plant as compared to that for a direct cycle (BWR) plant. Further, different portions of the MSSS are safety-related in different plant designs, although the safety functions of the system are much the same in all PWR plants, and also in all BWR plants. The first step in the review of the MSSS, then, is to determine which portions are designed to perform a safety function. For this purpose, the system is evaluated to determine the components and subsystems necessary for achieving safe reactor shutdown under ~~in~~[53] all conditions or for performing accident prevention or mitigation functions.

2. The reviewer determines that essential (safety-related) portions of the MSSS are correctly identified and are isolable, to the extent required,[54] from nonessential portions of the system. The system description and piping and instrumentation diagrams (P&IDs) are reviewed to verify that they clearly indicate the physical division between the safety-related and nonessential portions of the system ~~each portion~~.[55] System arrangement drawings are reviewed to identify the means provided for accomplishing system isolation.

3. The ECGB~~SGEB~~[56] reviews the seismic design bases and EMEB[57] reviews the quality and seismic classification as indicated in subsection I of this SRP section. The SAR is reviewed by the SPLB~~ASB and PSB~~[58] to verify that essential portions of the MSSS are designed to Quality Group B and/or seismic Category I requirements, and to verify that the design classifications specified meet the acceptance criteria specified in subsection II of this SRP section. In general:

   a. The main steam lines from the steam generators to the containment isolation valves in PWR plants are classified seismic Category I and Quality Group B.

   b. The main steam lines in BWR plants extending from the outermost containment isolation valve and connected piping up to and including the first valve that is either normally closed or capable of automatic closure during all modes of normal reactor operations but not including the turbine stop and bypass valves are

classified seismic Category I and assigned[59] a quality group classification in accordance with Appendix A to SRP Section 3.2.2 ~~BTP RSB 3-1~~.[60]

Alternatively, for BWRs containing a shutoff valve (in addition to the two containment isolation valves) in the MSSS, seismic Category I and a quality group classification in accordance with Appendix B to SRP Section 3.2.2 ~~BTP RSB 3-2~~[61] should be applied to that portion of the MSSS extending from the outermost containment isolation valves up to and including the shutoff valve.

c. Main steam lines and other main steam system components in BWR plants that do not incorporate an MSIVLCS and that take credit for fission product hold-up and retention in the main steam lines are reviewed for compliance with the criteria of II.1.b.

Details of the quality group and seismic classification of main steam lines for BWRs without an MSIVLCS are addressed in Table A-1 and Figure A-1 of Appendix A of SRP Section 3.2.2.[62]

4. The SAR is reviewed to assure that design provisions have been made to permit appropriate functional testing of system components important to safety. It is acceptable if the SAR delineates a testing and inspection program and the system drawings show any test recirculation loops or special connections around isolation valves that would be required by this program.

5. The system description, safety evaluation, component table, and P&IDs are reviewed to verify that the system has been designed to:

   a. Provide the necessary quantity of steam to any turbine-driven safety system pumps. The reviewer verifies that the design is capable of providing the required steam flow to the turbine so that an adequate supply of water can be pumped. (OL)

   b. Assure safe plant operation by including appropriate design margins for pressure relief capacity and setpoints for the secondary system, and for removal of decay heat during various accident conditions, as may be applicable in a particular case. The review is done on a case-by-case basis, and system acceptability is based on a comparison of system flow rates, heat loads, maximum temperatures, and heat removal capabilities to those of similarly designed systems for previously reviewed plants. For PWRs the design is reviewed to verify system capability for controlled cooldown to about 177°C (350°F)[63] to allow actuation of the[64] RHR system.

   c. Provide leakage detection means for steam leakage from the system in the event of a steam line break. Temperature or pressure sensors are acceptable means for initiating signals to close the main steam line isolation valves and/or turbine stop valves to limit the release of steam during a steam line break accident.

d. Assure that in the event of a postulated break in a main steam line in a PWR plant, the design will preclude the blowdown of more than one steam generator, assuming a concurrent single active component failure. In this regard, all main steam shut-off valves downstream of the MSIVs, the turbine stop valves, and the control valves are considered to be functional. The reviewer should verify that the main steam isolation valves, shut-off valves in connected ~~connecting~~[65] piping, turbine stop valves, and bypass valves can close against maximum steam flow. The reviewer verifies that the SAR provides a tabulation and descriptive text of all flow paths that branch off the main steam lines between the MSIVs and the turbine stop valves. The descriptive information shall include the following for each flow path:

(1) System identification

(2) Maximum steam flow in kilograms per second (pounds per hour)[66]
(3) Type of shut-off valve(s)

(4) Size of valve(s)

(5) Quality of the valve(s)

(6) Design code of the valve(s)

(7) Closure time of the valve(s)

(8) Actuation mechanism of the valve(s) (i.e., solenoid operated, motor operated, air operated diaphragm valve, etc.)

(9) Motive or power source for the valve actuating mechanism.

e. In the event of a main steam line break, termination of steam flow from all systems identified in d, above, except those that can be used for mitigation of the accident, is required to bring the reactor to a safe cold shutdown. For these systems the reviewer verifies that the SAR describes what design features have been incorporated to assure closure of the steam shut-off valve(s) and what operator actions, if any, are required. If the systems that can be used for mitigation of the accident are not available, or the decision is made to use other means to shut down the reactor, the reviewer verifies that the SAR describes how these systems are secured to assure positive steam shut-off and what operator actions, if any, are required.

f. Assure that in the event of a postulated safe shutdown earthquake in a PWR plant, the design includes the capability to operate atmospheric dump valves remotely from the control room so that cold shutdown can be achieved using only safety-grade components, assuming a concurrent loss of offsite power (refer to Branch Technical Position RSB 5-1 attached to SRP Section 5.4.7).

g. If (N-1) loop operation is anticipated, assure that the MSSS has been evaluated for the effects of (N-1) loop operation on the supply of steam to turbine-driven safety system pumps (Reference 15).[67]

6. The reviewer verifies that the system is designed so that essential functions will be maintained, as required, in the event of adverse environmental phenomena, certain pipe breaks, or loss of offsite power. The reviewer uses engineering judgment and the results of failure modes and effect analyses to determine that:

   a. Failure of nonseismic Category I portions of the MSSS or of other systems located close to essential portions of the system, or of nonseismic Category I structures that house, support, or are close to essential portions of the MSSS, do not preclude operation of the essential portions of the MSSS. 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. Statements in the SAR that confirm that the above conditions are met are acceptable.

   b. Essential portions of the MSSS are protected from the effects of floods, hurricanes, tornadoes, and internally and externally generated missiles. Flood protection and missile protection criteria are evaluated under the SRP Section 3 series. The locations and the design of the system and structures 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 winds, flooding, and tornado missiles is acceptable.

   c. Essential portions of the MSSS are protected from the effects of high and moderate energy line breaks and cracks, including pipe whip, jet forces, and environmental effects. The means of providing such protection will be given in Section 3.6 of the SAR and procedures for reviewing this information are given in SRP Section 3.6.1.[68]

   d. Essential components and subsystems necessary for safe shutdown can function as required in the event of loss of offsite power. The SAR is reviewed to verify that for each MSSS component or subsystem affected by a loss of offsite power, the system functional capability meets or exceeds minimum design requirements. Statements in the SAR and results of failure modes and effects analyses are considered in assuring that the system meets these requirements. This is an acceptable verification of system functional reliability.

7. The descriptive information, P&IDs, MSSS drawings, and failure modes and effects analyses in the SAR are reviewed to assure that essential portions of the system will function following design basis accidents assuming a concurrent single active component failure. The reviewer evaluates the analyses presented in the SAR to assure function of required components, traces the availability of these components on system drawings,

and checks that the SAR contains verification that minimum requirements are met for each accident situation for the required time spans. For each case the design is acceptable if minimum system requirements are met.

8. The SAR is reviewed to assure that the applicant has committed to address the potential for water (steam)[69] hammer and relief valve discharge loads, and will take adequate procedures action to minimize such occurrences. Drain pots, line slope and valve operators should be addressed.

9. The reviewer confirms that the MSSS system capability is sufficient with respect to the plant's ability to cope with, and recover from an SBO of a specified duration by determining compliance with Regulatory Guide 1.155 positions C.3.2, C.3.3, and C.3.5 as related to the design of the MSSS system. This review is coordinated with the review of the SBO event under SRP Section 8.4 (proposed).[70]

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.[71]

IV. EVALUATION FINDINGS

The reviewer verifies that sufficient information has been provided and ~~his~~ the[72] review supports conclusions of the following type, to be included in the staff's safety evaluation report:

The main steam supply system (MSSS) includes all components and piping from the outermost containment isolation valves (for BWRs) [from the steam generator connection (for PWRs)] up to and including the turbine stop valves. The essential portions of the MSSS are designed to quality Group B [for PWRs, from the steam generator to the containment isolation valves, and connected piping up to and including the first valve that is normally closed] [for BWRs, from the outermost containment isolation valves and connected ~~connecting~~ [73] piping up to and including the first valve that is either normally closed or capable of automatic closure during all modes of normal reactor operation, but not including the turbine stop and bypass valves]. Those portions of the MSSS necessary to mitigate the consequences of an accident such as a steam line break are designed to the quality standards commensurate with the importance to its safety function, and are designed to the following standards:_____The scope of review of the MSSS for the _____ plant included layout drawings, piping and instrumentation diagrams, and descriptive information for the system.

The basis for acceptance of the MSSS in our review was conformance of the applicant's design criteria and bases to the Commission's regulations as set forth in section 50.63 and in the General Design Criteria (GDC) of Appendix A to 10 CFR Part 50. The staff concludes that the plant design is acceptable and meets the requirements of GDC 2, 4, 5, and 34 and of 10 CFR 50.63.[74] This conclusion is based on the following:

1. The applicant has met the requirements of GDC 2, "Design Bases for Protection Against Natural Phenomena," with respect to the ability of structures housing the safety-related portions[75] of the system and the safety-related portions of the system being capable of withstanding the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, and floods,[76] and GDC 4,[77] "Environmental and Dynamic Effects ~~Missile~~[78] Design Bases,"[79] with respect to structures housing the safety-related portions of the system and the safety-related portions of the system being capable of withstanding the effects of external missiles, ~~and~~ internally-generated missiles, and[80] pipe whip and jet impingement forces associated with pipe breaks. The essential portions of the MSSS (as identified in the above discussion) are designed Seismic Category I and housed in a Seismic Category I structure which provides protection from the effects of tornadoes, tornado missiles, turbine missiles, and floods. This meets the positions of Regulatory Guide 1.29, "Seismic Design Classification," Position C.1.a, C.1.e, C.2 and C.3 or C.1.f, C.2 and C.3; Regulatory Guide 1.115, "Protection Against Low-Trajectory[81] Turbine Missiles," Position C.1; Regulatory Guide 1.117, "Tornado Design Classification," Appendix Positions 2 and 4.

   In addition, the system design ~~capabilities should~~ includes[82] the capability to accommodate water (steam)[83] hammer dynamic loads resulting from rapid closure of system~~s~~[84] valves (including turbine bypass and stop valves)~~,~~[85] and safety/relief valve operation without compromising required safety functions. Water entrainment considerations ~~should~~[86] include provisions for drain pots, line sloping and valve operation. Operating and maintenance procedures are to be reviewed by the applicant to alert plant personnel to the potential for and means to minimize water (steam) hammer occurrences ~~such occurrences and means to minimize such occurrences~~.[87] This commitment is ~~should be~~[88] stated in the applicants' SAR.

2. The applicant has met the requirements of GDC 5, "Sharing of Structures, Systems, and Components" with ~~R~~respect to the ~~C~~capability of ~~S~~shared ~~S~~systems and ~~C~~components~~,"~~[89] important to safety to perform required safety functions. We have reviewed the interconnections from the MSSS of each unit to _____. The interconnections are designed so that the capability to mitigate the consequences of an accident in either unit and achieve safe shutdown in that unit is retained without reducing the capability of the other unit to achieve safe shutdown.

   or

   Each unit of the _____ plant has its own MSSS with no interconnections between the safety-related and/or nonsafety-related portions.

3. The applicant has met the requirements of GDC 34, "Residual Heat Removal," with respect to the system function of transferring residual and sensible heat from the reactor system in PWR plants. The MSSS is capable of providing heat sink capacity and pressure relief capability and supplying steam to the steam driven safety-related pumps necessary for safe shutdown. The MSSS is also designed to include the capability to operate the atmospheric dump ~~pump~~[90] valves remotely from the control room following a safe shutdown earthquake coincident with the loss of offsite power so that a cold

shutdown can be achieved with dependence upon safety-grade components only. This meets the positions in Branch Technical Position RSB 5-1, "Design Requirements of the[91] Residual Heat Removal System," and in Issue 1 of NUREG-0138.

4. The applicant has met the requirements of 10 CFR 50.63 with respect to MSSS capacity and capability for station blackout. Acceptance is based on meeting the guidance of Regulatory Guide 1.155, Positions C.3.2, C.3.3, and C.3.5.[92]

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.[93]

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.[94] 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.[95]

Implementation schedules for conformance to parts of the method discussed herein are contained in the referenced regulations,[96] regulatory guides and ~~,~~ NUREGs,[97] and implementation of acceptance criterion subsection II.2, associated with water (steam)[98] hammer loads, is as follows:

(a) ~~Operating plants and OL applicants need not comply with the provisions of this revision.~~ Plants with an operating license issued prior to April 1, 1984 and operating license applicants docketed prior to April 1, 1984 need not comply with the provisions of this item but may voluntarily do so.

(b) ~~CP applicants will be required to comply with the provisions of this revision.~~ Operating license, construction permit, design certification, and combined license applications docketed on or after April 1, 1984 will be reviewed according to the provisions of this item.[99]

The provisions of specific Acceptance Criterion 1.c apply to reviews of applications for BWRs that do not incorporate an MSIVLCS and for which main steam line fission product hold-up and retention is credited in the analysis of design basis accident radiological consequences.[100]

VI. REFERENCES

1. 10 CFR 50.63, "Loss of All Alternating Current Power."[101]

~~2~~1.[102] 10 CFR Part 50, Appendix A, General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena."

~~3~~2. 10 CFR Part 50, Appendix A, General Design Criterion 4, "Environmental and Dynamic Effects ~~Missile~~[103] Design Bases."

~~4~~3. 10 CFR Part 50, Appendix A, General Design Criterion 5, "Sharing of Structures, Systems, and Components."[104]

~~5~~4. 10 CFR Part 50, Appendix A, General Design Criterion 34, "Residual Heat Removal."

~~5. Regulatory Guide 1.26, "Quality Group Classifications and Standards for Water, Steam, and Radioactive-Waste-Containing Components of Nuclear Power Plants."~~ [105]

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

7. Regulatory Guide 1.115, "Protection Against Low-Trajectory Turbine Missiles."

8. Regulatory Guide 1.117, "Tornado Design Classification."

9. Regulatory Guide 1.155, "Station Blackout."[106]

~~9. Branch Technical Positions ASB 3-1, "Protection Against Postulated Piping Failures in Fluid Systems Outside Containment," attached to SRP Section 3.6.1, Branch Technical Position MEB 3-1, "Postulated Break and Leakage Locations in Fluid System Piping Outside Containment," attached to SRP Section 3.6.2.~~ [107]

10. ~~Branch Technical Position RSB 3-1,~~ "Classification of Main Steam Components Other than the Reactor Coolant Pressure Boundary for BWR Plants," Appendix A ~~attached~~ to SRP Section 3.2.2.[108]

11. ~~Branch Technical Position RSB 3-2,~~ "Classification of BWR/6 Main Steam and Feedwater Components Other Than the Reactor Coolant Pressure Boundary," Appendix B ~~attached~~ to SRP Section 3.2.2.[109]

12. Branch Technical Position RSB 5-1, "Design Requirements of the Residual Heat Removal System," attached to SRP Section 5.4.7.

13. NUREG-0138, "Staff Discussion of Fifteen Technical Issues Listed in Attachment to November 3, 1976, memorandum from Director NRR to NRR Staff."

14. SECY 93-087, "Policy, Technical, and Licensing Issues Pertaining to Evolutionary and Advanced Light-Water Reactor (ALWR) Designs," April 2, 1993.[110]

15. NRC Letter to All Licensees of Operating BWRs and PWRs and License Applicants, "Technical Resolution of Generic Issue No. B-59, (N-1) Loop Operation in BWRs and PWRs, (Generic Letter 86-09)," March 31, 1986.[111]

[This Page Intentionally Left Blank]

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 names and abbreviations	Editorial change made to reflect current PRB names, abbreviations, and responsibilities for this SRP section.
2.	Editorial	Changed "or" to "and" to clarify that the MSSS supplies steam to both safety and non-safety auxiliaries, not just one or the other
3.	NRC metrication policy	Added the SI equivalent of 2-1/2 inches and reformatted per the NRC Metrication policy. See attached conversion documentation.
4.	NRC metrication policy	Added the SI equivalent of 2-1/2 inches and reformatted per the NRC metrication policy. See attached conversion documentation.
5.	Editorial	A comma was added to clarify the meaning of the sentence.
6.	Current PRB names and abbreviations/Editorial	Editorial change made to reflect current PRB names, abbreviations, and responsibilities for this SRP section. Also, one sentence was reworded and one deleted to properly show that this system is now assigned to a single PRB rather than split between two PRBs.
7.	Current PRB names and abbreviations	Editorial change made to reflect current PRB names, abbreviations, and responsibilities for this SRP section.
8.	**Integrated Impact 561**	Added reference to 10 CFR 50.63 in the 2nd introductory paragraph of Areas of Review.
9.	Current PRB names and abbreviations/Editorial	Editorial change made to reflect current PRB names, abbreviations, and responsibilities for this SRP section. Also, "review" was changed to "reviews" to provide the correct verb for reference to a single PRB.
10.	Editorial	For consistency with other SRP Sections, "steam hammer" was changed to "water (steam) hammer". As noted in NUREG 0933, SRP 10.3 was revised to add reference to steam hammer to resolve USI A-1 "Water Hammer". NUREG 0933 cites NUREG 0927 as the document which resolved the water hammer issue. NUREG 0927 refers to events in the MSSS as "steam (water) hammer". Besides Section 10.3, four other SRP Sections refer to these events as "water (steam) hammer" (sections 3.9.3, 5.4.6, 5.4.7, and 6.3).
11.	Current PRB names and abbreviations	Editorial change made to reflect current PRB names, abbreviations, and responsibilities for this SRP section.
12.	**Integrated Impact 561**	Section I, Areas of Review was modified by adding a new item regarding review for conformance with station blackout rule.

Item	Source	Description
13.	Editorial	Item renumbered due to addition of new Areas of Review item.
14.	Current PRB names and abbreviations/Editorial	Editorial change made to reflect current PRB names, abbreviations, and responsibilities for this SRP section. Also, "review" was changed to "reviews" to provide the correct verb for reference to a single PRB.
15.	SRP-UDP format item, Review Interfaces	Revised Review Interface section of Areas of Review including modification of lead in statement and changing interface item letters to numbers to be consistent with SRP-UDP required format.
16.	Current PRB names and abbreviations/Editorial	Editorial change made to reflect current PRB names, abbreviations, and responsibilities for SRP sections. Also, "The" was added to provide the proper article at the start of the sentence.
17.	Editorial	Added "outside containment" to more accurately describe the cited SRP section.
18.	Editorial	A new review interface item was added for SPLB to more accurately describe their responsibilities and to be consistent with item 2 above. This change is also consistent with Review Procedures item 6.b which requires review of internally generated missiles.
19.	SRP-UDP format item.	New interface item created by splitting previous item into two separate items to properly show PRB assignments. Additionally, this item was moved into the SPLB interface section to properly group it with other SPLB items.
20.	**Integrated Impact 559**	Added a new SPLB Review Interface item.
21.	SRP-UDP format item	New interface item created by splitting another item into separate items for each separate PRB as required by SRP-UDP program.
22.	SRP-UDP format item.	Revised Review Interface section for other branches' evaluations including modification of lead in statement and numbering interface items to be consistent with SRP-UDP required format.
23.	Current PRB names and abbreviations	Editorial change made to reflect current PRB names, abbreviations, and responsibilities for SRP Section 5.2.2.
24.	Editorial	SRP section number was corrected from 5.2 to 5.2.2.
25.	Current PRB names and abbreviations	Editorial change made to reflect current PRB names, abbreviations, and responsibilities for SRP Sections 3.3.1, 3.3.2, 3.5.3, 3.7.1 through 3.7.4, 3.8.4 and 3.8.5.

Item	Source	Description
26.	SRP-UDP format item.	This review interface item was split into two separate interface items to show the proper PRB assignments for SRP Sections 3.10 and 3.11.
27.	SRP-UDP format item.	New interface item created by splitting previous item into two separate items to properly show PRB assignments.
28.	Editorial	The branch title was replaced with the branch abbreviation since the full title is previously mentioned in new interface item 3. This is consistent with the format followed for the entire section.
29.	Current PRB names and abbreviations	Editorial change made to reflect current PRB names, abbreviations, and responsibilities for SRP Sections 3.2.1 and 3.2.2.
30.	Current PRB names and abbreviations	Editorial change made to reflect current PRB names, abbreviations, and responsibilities for SRP section 3.9.6.
31.	Editorial	"Also" was deleted for consistency with other review interface items.
32.	Current PRB names and abbreviations	Editorial change made to reflect current PRB names, abbreviations, and responsibilities for SRP Sections 5.2.3 and 10.3.6.
33.	Editorial	Reference to the proper SRP Sections was added to this review interface item to make it consistent with the format utilized throughout this section.
34.	**Integrated Impact 559**	Added SRP Sections 6.2.4 and 6.2.5 as new Review Interface items for SCSB.
35.	Current PRB names and abbreviations	Editorial change made to reflect current PRB names, abbreviations, and responsibilities for SRP Sections 7.1, 7.4, 7.5, and 7.7.
36.	Current PRB names and abbreviations	Editorial change made to reflect current PRB names, abbreviations, and responsibilities for SRP Section 14.2.
37.	Editorial	SRP section number was corrected from 14.0 to 14.2.
38.	SRP-UDP format item	This review interface item was split into three separate items, one for each separate PRB assignment, as required by the SRP-UDP program.
39.	**Integrated Impact 561**	Section I, Areas of Review was modified by adding a new Review Interface referring to EELB review of Station Blackout under SRP Section 8.4 (proposed).
40.	SRP-UDP format item	New interface item created by splitting previous item into separate items for each separate PRB as required by SRP-UDP program.

Item	Source	Description
41.	SRP-UDP format item	New interface item created by splitting previous item into separate items for each separate PRB as required by SRP-UDP program. Also, the referenced SRP Section was corrected from "17.0" to "17.1 through 17.3" to show the proper QA review sections.
42.	SRP-UDP format item	Revised to address interfaces with other SPLB reviews and with other PRBs.
43.	**Integrated Impact 561**	Added "federal regulations" to the list of documents on which the acceptance criteria are based since 10 CFR 50.63 is added by this Integrated Impact.
44.	**Integrated Impact 559**	Modified Acceptance Criteria to incorporate SECY 93-087 positions for BWRs that do not utilize an MSIVLCS and that take credit for fission product hold-up and retention in the main steam line.
45.	Editorial	For consistency with other SRP Sections, "steam hammer" was changed to "water (steam) hammer". As noted in NUREG 0933, SRP 10.3 was revised to add reference to steam hammer to resolve USI A-1 "Water Hammer". NUREG 0933 cites NUREG 0927 as the document which resolved the water hammer issue. NUREG 0927 refers to events in the MSSS as "steam (water) hammer". Besides Section 10.3, four other SRP Sections refer to these events as "water (steam) hammer" (sections 3.9.3, 5.4.6, 5.4.7, and 6.3).
46.	Editorial	For consistency with other SRP Sections, "steam hammer" was changed to "water (steam) hammer". As noted in NUREG 0933, SRP 10.3 was revised to add reference to steam hammer to resolve USI A-1 "Water Hammer". NUREG 0933 cites NUREG 0927 as the document which resolved the water hammer issue. NUREG 0927 refers to events in the MSSS as "steam (water) hammer". Besides Section 10.3, four other SRP Sections refer to these events as "water (steam) hammer" (sections 3.9.3, 5.4.6, 5.4.7, and 6.3).
47.	SRP-UDP format item	Revised reference citation to be consistent with the SRP-UDP format.
48.	**Integrated Impact 561**	Added a new acceptance criterion for station blackout based on 10 CFR 50.63.
49.	SRP-UDP format item, develop Technical Rationale	Technical rationale were developed and added for GDC 2, 4, 5, and 34 and 10 CFR 50.63 per SRP-UDP requirements.
50.	Current PRB names and abbreviations	Editorial change made to reflect current PRB names, abbreviations, and responsibilities for SRP sections.
51.	Editorial	Deleted a comma to clarify the sentence and make it more grammatically correct.

Item	Source	Description
52.	Editorial	Deleted the word "procedure" since the PRB is performing a review and not a review procedure.
53.	Editorial	Changed "in" to "under" to clarify the sentence.
54.	Editorial	The phrase "to the extent required" was offset by commas to clarify the sentence.
55.	Editorial	Changed "between each portion" to "between the safety-related and nonessential portions of the system" to clarify the sentence.
56.	Current PRB names and abbreviations	Editorial change made to reflect current PRB names, abbreviations, and responsibilities for SRP Sections 3.7.1 through 3.7.4, 3.8.4, and 3.8.5.
57.	Current PRB names and abbreviations	Editorial change made to reflect current PRB names, abbreviations, and responsibilities for SRP Sections 3.2.1 and 3.2.2.
58.	Current PRB names and abbreviations	Editorial change made to reflect current PRB names, abbreviations, and responsibilities for this SRP section.
59.	Editorial	Added the word "assigned" to clarify the sentence and make it more grammatically correct.
60.	Editorial, Reference verification	Corrected the title of this reference which has been changed from a BTP to an Appendix.
61.	Editorial, Reference verification	Corrected the title of this reference which has been changed from a BTP to an Appendix.
62.	**Integrated Impact 559**	Modified Review Procedures to incorporate SECY 93-087 positions for BWRs that do not utilize an MSIVLCS and that take credit for fission product hold-up and retention in the main steam line. Also added new guidance concerning the seismic classification of portions of the main steam lines for evolutionary BWRs without a MSIVLCS.
63.	NRC metrication policy	Added the SI equivalent of 350°F and reformatted per the NRC Metrication policy. See attached conversion documentation.
64.	Editorial	Added "the" to the sentence to place the proper article before RHR.
65.	Editorial	Changed "connecting" to "connected" for clarification. All other sections refer to MSSS branch lines as connected piping.
66.	NRC metrication policy	Added the SI equivalent of pounds per hour and reformatted per the NRC metrication policy. Since this was a simple unit conversion which involved no calculations, no conversion documentation was created.

Item	Source	Description
67.	**Integrated Impact 560**	Added requirements concerning (N-1) loop operation to subsection III, Review Procedures.
68.	Editorial, Reference verification	Changed SRP Section number from 3.6 to 3.6.1 to show the proper reference.
69.	Editorial	For consistency with other SRP Sections, "steam hammer" was changed to "water (steam) hammer". As noted in NUREG 0933, SRP 10.3 was revised to add reference to steam hammer to resolve USI A-1 "Water Hammer". NUREG 0933 cites NUREG 0927 as the document which resolved the water hammer issue. NUREG 0927 refers to events in the MSSS as "steam (water) hammer". Besides Section 10.3, four other SRP Sections refer to these events as "water (steam) hammer" (sections 3.9.3, 5.4.6, 5.4.7, and 6.3).
70.	**Integrated Impact 561**	Added a Review Procedure for compliance with Regulatory Guide 1.155.
71.	SRP-UDP Guidance, Implementation of 10 CFR 52	Added standard paragraph to address application of Review Procedures in design certification reviews.
72.	Editorial	Changed "his" to "the" for clarity and consistency with other sections.
73.	Editorial	Changed "connecting" to "connected" for clarification. All other sections refer to MSSS branch lines as connected piping.
74.	**Integrated Impact 561**	Added two references to 10 CFR 50.63 in the 2nd paragraph of the Evaluation Findings subsection.
75.	Editorial	Changed "portion" to "portions" to clarify the sentence and add consistency.
76.	Editorial	Added a comma between the first and second parts of the sentence for clarification.
77.	Editorial	Placed a comma between the GDC number and title for clarity and consistency.
78.	Editorial, Reference verification **PI 21777**	Corrected the title of GDC 4 to reflect the current title.
79.	Editorial	Placed a comma at the end of the GDC title for clarity and consistency.
80.	Editorial	Moved "and" to the last phrase of the sentence for clarification and to correct the grammar.
81.	Editorial, Reference verification	A dash was added to show the proper title of Reg Guide 1.115.

Item	Source	Description
82.	Editorial	Deleted the word "capabilities" to clarify the sentence and eliminate redundant use of this word. Also, deleted the word "should" since this subsection states what the evaluation has found, not what the licensee should do.
83.	Editorial	For consistency with other SRP Sections, "steam hammer" was changed to "water (steam) hammer". As noted in NUREG 0933, SRP 10.3 was revised to add reference to steam hammer to resolve USI A-1 "Water Hammer". NUREG 0933 cites NUREG 0927 as the document which resolved the water hammer issue. NUREG 0927 refers to events in the MSSS as "steam (water) hammer". Besides Section 10.3, four other SRP Sections refer to these events as "water (steam) hammer" (sections 3.9.3, 5.4.6, 5.4.7, and 6.3).
84.	Editorial	Changed "systems" to "system" since this sentence is discussing only one system (MSSS).
85.	Editorial	Deleted a misplaced comma to clarify and correct the sentence.
86.	Editorial	Deleted the word "should" since this subsection states what the evaluation has found, not what the licensee should do.
87.	Editorial	The phrase "to alert plant personnel to the potential for such occurrences and means to minimize such occurrences" was changed to "to alert plant personnel to the potential for and means to minimize water(steam) hammer occurrences" to clarify the sentence.
88.	Editorial	Changed "should be" to "is" since this subsection states what the evaluation has found, not what the licensee should do.
89.	Editorial, Reference verification	The title of GDC 5 and the subsequent phrase in the sentence were incorrectly combined to form an erroneous title. The GDC 5 title and sentence were corrected.
90.	Editorial	The word "pump" was changed to the proper word "dump".
91.	Editorial, Reference verification	Added "the" to show the correct title of BTP RSB 5-1.
92.	**Integrated Impact 561**	Included an evaluation finding statement for 10 CFR 50.63.
93.	10 CFR 52 applicability related change	Standard design certification (DC) paragraph was added to the Evaluation Findings section.

Item	Source	Description
94.	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.
95.	SRP-UDP Guidance	Added standard paragraph to indicate applicability of this section to reviews of future applications.
96.	Editorial	Added "regulations" to the list of documents which implement schedules since such documents have been added to this SRP Section.
97.	Editorial	An "and" was added and a comma moved to clarify the meaning of the first half of the sentence.
98.	Editorial	For consistency with other SRP Sections, "steam hammer" was changed to "water (steam) hammer". As noted in NUREG 0933, SRP 10.3 was revised to add reference to steam hammer to resolve USI A-1 "Water Hammer". NUREG 0933 cites NUREG 0927 as the document which resolved the water hammer issue. NUREG 0927 refers to events in the MSSS as "steam (water) hammer". Besides Section 10.3, four other SRP Sections refer to these events as "water (steam) hammer" (sections 3.9.3, 5.4.6, 5.4.7, and 6.3).
99.	Implementation applicability	Modified the applicability statements in the implementation section to make this revision consistent with the previous revision per SRP-UDP guidance.
100.	**Integrated Impact 559**	Modified the Implementation subsection to note that Acceptance Criterion 1.c applies only to BWRs that do not utilize an MSIVLCS and that take credit for fission product hold-up and retention in the main steam line.
101.	**Integrated Impact 561**	Added 10 CFR 50.63 to the reference subsection.
102.	Editorial	Renumbered this and subsequent references due to the addition of a new reference.
103.	Editorial, Reference verification **PI 21777**	Corrected the title of GDC 4 to reflect the current title.
104.	Editorial, Reference verification	Corrected the punctuation in the title of GDC 5 to reflect the current title.
105.	SRP-UDP format item, Reference verification	Deleted reference since it is not cited in the SRP text.
106.	**Integrated Impact 561**	Added reference document which was the source of this integrated impact.
107.	SRP-UDP format item	Deleted references since they are not cited in the SRP text.

Item	Source	Description
108.	Editorial, Reference verification	Corrected the title of this reference which has been changed from a BTP to an Appendix.
109.	Editorial, Reference verification	Corrected the title of this reference which has been changed from a BTP to an Appendix.
110.	**Integrated Impact 559**	Added reference document which was the source of this integrated impact.
111.	**Integrated Impact 560**	Added reference document which was the source of this integrated impact.

[This Page Intentionally Left Blank]

Integrated Impact No.	Issue	SRP Subsections Affected
559	Revise Review Interfaces and Review Procedures to include modified seismic classification guidelines from SECY 93-087 for BWRs that do not include an MSIVLCS.	Subsection I, Areas of Review, SPLB interface 7 and other branches' interfaces 8. Subsection II, Acceptance Criteria, new criterion 1.b Subsection III, Review Procedures, step 3.c. Subsection V, Implementation, add new paragraph. Subsection VI, References, item 15.
560	Revise Review Procedures to include reference to (N-1) loop operation requirements from Generic Letter 86-09.	Subsection III, Review Procedures, step 5.g. Subsection VI, References, item 16.
561	Revise Acceptance Criteria and Review Procedures to add review of the MSSS capability to cope with station blackout per 10 CFR 50.63.	Subsection I, Areas of Review; 2nd paragraph, step 3, and Review Interface 11. Subsection II, Acceptance Criteria; 1st paragraph and criterion 5. Subsection III, Review Procedures; step 9. Subsection IV, Evaluation Findings; 2nd paragraph and step 4. Subsection VI, References; items 1 and 9.