U.S. NUCLEAR REGULATORY COMMISSION

STANDARD REVIEW PLAN

OFFICE OF NUCLEAR REACTOR REGULATION

5.4.8 REACTOR WATER CLEANUP SYSTEM (BWR)

REVIEW RESPONSIBILITIES

Primary - ~~Chemical Engineering Branch (CMEB)~~Materials and Chemical Engineering Branch (EMCB)[1]

Secondary - None

I. AREAS OF REVIEW

At the construction permit (CP), standard design certification, or combined license (COL)[2] stage of review, the ~~CMEB~~EMCB[3] reviews the information in the applicant's safety analysis report (SAR) in the specific areas that follow. At the operating license (OL) or COL[4] stage of review, the ~~CMEB~~EMCB[5] review consists of confirming the design accepted at the CP or standard design certification[6] stage and evaluating the adequacy of the applicant's technical specifications in these areas.

1. The design of components, design features which influence system availability and reliability, and interconnections with the reactor primary coolant and radwaste systems are reviewed. Removal of chemical impurities and fission products by the reactor water cleanup system (RWCS) is considered. The provisions for isolating the RWCS from the reactor system following liquid poison injection, holding filter and demineralizer beds in place if system flow is decreased, straining resins from return flows to the primary system, component venting, and resin transfer are reviewed.

2. The component design parameters for flow, temperature, pressure, heat removal capability, and impurity removal capability to ~~assure~~ensure[7] the system capacity will meet the reactor coolant specifications are reviewed.

3. The quality group and seismic design ~~criteria~~classification[8] are reviewed.

4. The instrumentation and process controls provided to ensure proper system operation and system isolation when necessary, including instrumentation for (a) automatic system isolation to prevent removal of liquid poison in the event of standby liquid control system actuation and to prevent damage to the filter/demineralizer resins, and (b) monitoring impurity removal (conductivity measurements), differential pressure across pressure-sensitive components, and temperature control prior to demineralization, are reviewed. In addition, the process controls responding to these measurements to maintain operation within the established system parameters are reviewed.

~~The review for fire protection is performed as part of the primary review for SRP Section 9.5.1.~~[9]

Review Interfaces[10]

The EMCB also reviews the material properties and material compatibility requirements for those portions of the RWCS that are within the reactor coolant pressure boundary, as part of its primary review responsibility for Standard Review Plan (SRP) Section 5.2.3.[11]

In addition, the ~~CMEB~~EMCB[12] will coordinate other branches' evaluations that interface with the overall review of the RWCS as follows:

1. The ~~Auxiliary Systems Branch (ASB)~~ Plant Systems Branch (SPLB)[13] evaluates the effects of high and moderate energy piping failures outside the primary containment in the RWCS design to ensure that the other safety-related systems and equipment will not be made inoperable, as part of its primary review responsibility for SRP Section 3.6.1.

2. The ~~ASB also~~ Plant Systems Branch (SPLB)[14] evaluates the capability of safety-related systems to withstand the effects of internally-generated missiles, both inside and outside the primary containment, as part of its primary review responsibility for SRP Sections 3.5.1.1 and 3.5.1.2.

3. The ~~ASB also~~ Plant Systems Branch (SPLB)[15] evaluates the capability of the safety-related systems to withstand the effects of missiles generated by natural phenomena and externally-generated missiles, as part of its primary review responsibility for SRP Sections 3.5.1.4 and 3.5.2, respectively.

4. The ~~ASB also~~ Plant Systems Branch (SPLB)[16] evaluates the capability of structures housing the RWCS to withstand external and internal flood conditions, as part of its primary review responsibility for SRP Sections 3.4.1 and 9.3.3.

~~The Materials Engineering Branch (MTEB) reviews the material properties, material compatibility, and the inservice inspection requirements of the portions of the RWCS that comprise the reactor coolant pressure boundary, as part of its primary review responsibility for SRP Sections 5.2.3 and 5.2.4.~~[17]

~~The MTEB also verifies that inservice nondestructive examination requirements are met for the RWCS Class 2 and 3 components, as part of its primary review responsibility for SRP Section 6.6.~~[18]

5. The ~~Effluent Treatment Systems Branch (ETSB)~~ SPLB[19] reviews the liquid, gaseous, and solid waste management of the RWCS in SRP Sections 11.2, 11.3, and 11.4, respectively.~~, and the process and effluent radiological monitoring aspect of the RWCS in SRP Section 11.5, as part of its primary review responsibility for these SRP sections.~~[20]

6. The SPLB reviews the environmental qualification of mechanical and electrical equipment, as part of its review responsibility for SRP Section 3.11.[21]

7. The Instrumentation and Controls ~~Systems~~ Branch ~~(ICSB)~~ (HICB)[22] reviews the instrumentation and components of the RWCS with respect to their capabilities, reliability, and conformance to the acceptable criteria in SRP Sections 7.1 and 7.6 and branch technical positions in SRP Appendix 7-A, as part of its primary review responsibility for these sections.

8. Upon request from the ~~CMEB~~ EMCB,[23] the ~~Power Systems Branch (PSB)~~Electrical Engineering Branch (EELB)[24] will evaluate the adequacy of the design, installation, inspection, and testing of all electrical systems for the RWCS, as part of its primary review responsibility for SRP Section 8.3.1.

9. The Emergency Preparedness and Radiation Protection Branch (PERB) reviews the process and effluent radiological monitoring aspect of the RWCS in SRP Section 11.5, as part of its review responsibility.[25]

10. The ~~Radiological Assessment Branch (RAB)~~ PERB[26] reviews the RWCS with respect to maintaining occupational radiation exposure to as low as reasonably achievable and to provide radiation protection design features, as part of its primary review responsibility for SRP Sections 12.1 and 12.3, respectively.

11. The ~~Structural Engineering Branch (SEB)~~ Civil Engineering and Geosciences Branch (ECGB)[27] determines the acceptability of the design analysis, procedures, and criteria used to establish the ability of seismic Category I structures housing the RWCS and the supporting systems to withstand the effects of natural phenomena, such as the safe shutdown earthquake, the probable maximum flood, and tornado missiles, as part of its primary review responsibility for SRP Sections 3.3.1, 3.3.2, 3.4.2, 3.5.3, 3.7.1, 3.7.2, 3.7.3, 3.8.4, and 3.8.5.

12. The ECGB also reviews inservice inspection requirements for those portions of the RWCS that are within the reactor coolant pressure boundary as part of its primary review responsibility for SRP Sections 5.2.4.[28]

13. The ECGB verifies compliance of RWCS Class 2 and 3 components with inservice nondestructive examination requirements, as part of its primary review responsibility for SRP Section 6.6.[29]

14. The ~~Equipment Qualification Branch (EQB)~~Mechanical Engineering Branch (EMEB)[30] reviews the seismic qualification of Category I instrumentation and electrical equipment, ~~and the environmental qualification of mechanical and electrical equipment~~ as part of its primary review responsibility for SRP Section~~s~~ 3.10~~ and 3.11, respectively~~.[31]

15. The~~ Mechanical Engineering Branch (MEB)~~EMEB[32] determines the acceptability of the seismic and quality group classifications for the RWCS components, as part of its primary review responsibility for SRP Sections 3.2.1 and 3.2.2.

16. The~~ MEB also~~ EMEB[33] determines that the piping, components, and structures of the RWCS are assigned in accordance with the applicable codes and standards, as part of its primary review responsibility for SRP Sections 3.9.1, 3.9.2, and 3.9.3

17. The~~ MEB also~~ EMEB[34] reviews the adequacy of the functional testing programs of the isolation valves in the RWCS, as part of its primary review responsibility for SRP Section 3.9.6.

18. The~~ Containment Systems Branch (CSB)~~ Containment Systems and Severe Accident Branch (SCSB)[35] reviews the design of the isolation provisions of those portions of the RWCS that penetrate the primary containment, as part of its primary review responsibility for SRP Section 6.2.4.

~~The review of technical specifications and quality assurance of the RWCS are coordinated and performed by the Licensing Guidance Branch (LGB) and Quality Assurance Branch (QAB) as part of their primary review responsibility for SRP Sections 16.0 and 17.0, respectively.~~[36]

19. 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.[37]

20. 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.[38]

21. For new plant applicants, the Reactor Water Cleanup System may be included in the systematic assessment of shutdown risks as an alternate feature that can maintain core cooling in the event of a loss of normal decay heat removal during shutdown conditions. The Probabilistic Safety Assessment Branch (SPSB) coordinates and performs the shutdown risk assessment reviews as part of its primary review responsibility for SRP Section 19.1 (Proposed).[39]

For those areas of review identified~~ above as being reviewed~~ as part of the primary~~ review~~ responsibility of other branches, the acceptance criteria~~ necessary for the review~~ and~~ their~~ methods of application are contained in the referenced SRP section~~ of the corresponding primary branch~~.[40]

II. ACCEPTANCE CRITERIA

The ~~CMEB~~EMCB[41] acceptance criteria are based on meeting the relevant requirements of the following regulations:

A. General Design Criterion 1 (GDC 1)[42] as it relates to the design of the RWCS and components to standards commensurate with the importance of its safety function.

B. General Design Criterion 2 (GDC 2)[43] as it relates to the RWCS being able to withstand the effects of natural phenomena.

C. General Design Criterion 14 (GDC 14)[44] as it relates to ~~assuring~~ ensuring the reactor coolant pressure boundary integrity.

D. General Design Criterion 60 (GDC 60)[45] as it relates to the capability of the RWCS to control the release of radioactive effluents to the environment.

E. General Design Criterion 61 (GDC 61)[46] as it relates to designing the RWCS with appropriate confinement.

Specific criteria and the positions of Regulatory Guides 1.26, 1.29, and 1.56 are used to meet the relevant requirements of ~~GDC~~ General Design Criteria[47] 1, 2, 14, 60, and 61 as follows:

1. The system should be capable of maintaining acceptable reactor water purity in normal operation and during anticipated operational occurrences, e.g., reactor startup, refueling, and condensate demineralizer breakthrough to ~~assure~~ ensure reactor coolant pressure boundary material integrity in accordance with the requirements of ~~General Design Criterion 14~~GDC 14.[48] The following points should be included in the system design:

   a. The system should be designed to maintain reactor water purity within the guidelines of Regulatory Guide 1.56 ~~(reference 3)~~[49] and the technical specifications for water chemistry of reactor coolant systems for boiling water reactors. The system should provide demineralization of reactor water through mixed bed resins (beads or powdered) at approximately 1% of the main steam flow rate.

   b. The nonregenerative heat exchangers should be designed to reduce the cleanup flow temperature to the demineralizer operating temperature when the regenerative heat exchanger cooling capacity is reduced as a result of partially bypassing a portion of the return flow to the main condenser or radwaste system.

   c. The RWCS should have the capability to permit processing of excess reactor water during startups, shutdowns, and hot standby conditions. Interconnections between the reactor water cleanup and liquid waste and condensate storage systems to share the processing burden are acceptable.

d. The RWCS should be designed to permit processing of reactor water during periods of single active component failures or equipment downtime.

2. The reactor water cleanup system should include the following:

a. Provisions for automatically isolating the RWCS from the reactor coolant system in the event the liquid poison system is actuated for reactor shutdown.

b. Provisions for automatically isolating the RWCS in the event the nonregenerative heat exchanger effluent temperature exceeds the prescribed resin operating temperature for the cleanup demineralizer resins.

c. Means for automatically maintaining flow through filter/ demineralizer beds in the event of low process flow or loss of process flow through the system to prevent bed loss. The recirculation loop and holding pump subsystem provided for precoating can serve this purpose if it is activated on loss of flow or low flow conditions.

d. Means of transferring resins. Sight glass provisions (bull's eyes) are acceptable for monitoring resin transfers. Systems should be designed to prevent "resin traps" in sluice lines. A statement indicating that consideration will be given in the design to avoid resin traps, e.g., a statement that resin transfer lines will be designed to avoid resins collecting in valves, low points, or stagnant areas, will be acceptable for transfer line designs.

e. Provisions for draining and venting RWCS components through a closed system, i.e., not to the immediate atmosphere, in accordance with the requirements of General Design Criteria 60 and 61. The SAR should state that vent lines run to a ventilation duct exhausting from the plant.

f. Provision, in return lines to the reactor system or condensate system, of resin strainers capable of removing resin particles contained in demineralizer effluents.

g. Provisions to prevent inadvertent opening of the filter/ demineralizer backwash valves during normal operation.[50]

3. To meet the requirements of General Design Criteria 1 and 2, the regulatory position C.2.c in Regulatory Guide 1.26 ~~(reference 1)~~[51] and regulatory positions C.1, C.2, C.3, and C.4 in Regulatory Guide 1.29 ~~(reference 2),~~[52] are applicable so that the portion of the RWCS extending from the reactor vessel and recirculation loops to the outermost drywell isolation valves should be designed to seismic Category I and Quality Group A. The remainder of the system outside the primary containment should be designed to Quality Group C and need not be seismic Category I. The precoating unit for demineralizers need not be designed to Quality Group C and need not be seismic Category I.

4. The RWCS should include provisions for monitoring:

   a. System effluent conductivity. Instrumentation should be consistent with the regulatory positions on instrumentation in Regulatory Guide 1.56 ~~(reference 3)~~.[53]

   b. Temperature upstream of the demineralizer, to ~~assure~~ ensure the ion exchange resin temperature limits are not exceeded.

   c. Differential pressure, to ensure the design limits on filter/ demineralizer septums and resin strainers are not exceeded.

Technical Rationale[54]

The technical rationale for application of these acceptance criteria to reviewing the reactor water cleanup system is discussed in the following paragraphs:[55]

A. Compliance with GDC 1 requires that structures, systems, and components important to safety shall be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed.

GDC 1 applies to the RWCS because the system is connected directly to the reactor coolant system and contains reactor coolant and radioactive demineralizer resins. Failure of a component of the system could result in a loss-of-coolant accident, release of reactor coolant outside the containment structure, and/or release of demineralizer resins. For this reason, the portion of the RWCS extending from the reactor vessel and recirculation loops to the outermost drywell isolation valves should be designed to seismic Category I and Quality Group A. The remainder of the system need not be seismic Category I and should be designed to Quality Group C. The precoating unit for demineralizers need not be designed to Quality Group C and need not be seismic Category I.

Meeting the requirements of GDC 1 provides assurance that a failure of the RWCS will not occur, thus avoiding the potential for a loss-of-coolant accident or release of radioactive materials outside the containment structure.[56]

B. Compliance with GDC 2 requires that nuclear power plant structures, systems, and components important to safety be designed to withstand the effects of natural phenomena such as earthquake, tornado, hurricane, flood, tsunami, and seiche without loss of capability to perform their safety functions.

GDC 2 applies to the RWCS because the system carries reactor water outside the containment structure and contains radioactive material. Failure of a system component as the result of a natural phenomenon could result in release of reactor water until the containment isolation valves close and in release of radioactive materials outside the containment structure.

Meeting the requirements of GDC 2 provides assurance that a failure of the RWCS will not occur, thus decreasing the potential for release of reactor coolant or other radioactive materials outside the containment structure.[57]

C. Compliance with GDC 14 requires that the reactor coolant pressure boundary shall be designed, fabricated, erected, and tested to ensure extremely low probability of abnormal leakage, rapidly propagating failure, and gross rupture.

GDC 14 applies because the materials used in the reactor coolant system require careful control. Thus, reactor cooling water chemistry and levels of impurities must be monitored to avoid deterioration of the reactor coolant pressure boundary by general corrosion or by intergranular stress corrosion cracking (IGSCC). IGSCC results from the simultaneous occurrence of aggressive water environment, susceptible material, and tensile stress conditions. Should general corrosion or IGSCC occur, leakage, failure, or gross rupture could result. The RWCS provides a means of controlling reactor cooling water chemistry and levels of impurities. In addition, parts of the RWCS connected directly to the reactor coolant system must be fabricated to the same standards as the reactor coolant system.

Meeting the requirements of GDC 14 provides assurance that failure of the reactor coolant pressure boundary because of general corrosion or IGSCC will not occur, thus decreasing the potential for a loss-of-coolant accident.[58]

D. Compliance with GDC 60 requires that the nuclear power unit design shall include a suitable means to control the release of radioactive materials in gaseous and liquid effluents and to handle radioactive solid wastes produced during normal reactor operation, including anticipated operational occurrences.

GDC 60 applies because the RWCS is used to purify the reactor coolant. As such, gaseous, liquid, and solid radioactive materials will be accumulated within the system and will have the potential for discharge to the environment unless gaseous effluents, spent demineralizer resins, and liquid effluents are collected in closed systems and discharged to the radwaste system for processing and disposal.

Meeting the requirements of GDC 60 provides assurance that releases of radioactive materials during normal operation and during anticipated operational occurrences will not result in onsite radiation doses exceeding the limits specified in 10 CFR Part 50, Appendix I, or offsite radiation doses exceeding those specified in 10 CFR Part 20.[59]

E. Compliance with GDC 61 requires that the fuel storage and handling, radioactive waste, and other systems that may contain radioactivity shall be designed to ensure adequate safety under normal and postulated accident conditions.

GDC 61 applies because the RWCS is used to purify the reactor coolant. As such, gaseous, liquid, and solid radioactive materials will be accumulated within the system and will have the potential for discharge to the environment.

Meeting the requirements of GDC 61 provides assurance that releases of radioactive materials during normal operation and during anticipated operational occurrences will not result in radiation doses that exceed the limits specified in 10 CFR Part 20. In addition, meeting the requirements will provide assurance that the system will not fail under postulated accident conditions.[60]

III. REVIEW PROCEDURES

The reviewer will select and emphasize material from this SRP section, as may be appropriate for a particular case.

1. ~~CMEB~~EMCB[61] reviews the system description and piping and instrumentation diagrams (P&IDs) to determine the processing sequence, interconnections with other systems, and similarity to systems previously evaluated and establishes that the following are considered in the applicant's design:

   a. Provisions to automatically terminate flow to the RWCS following liquid poison injection into the reactor water.

   b. Provisions to automatically terminate flow to the cleanup demineralizers if the nonregenerative heat exchanger effluent temperature exceeds the resin operating temperature limits.

   c. Provisions for automatically maintaining flow through filter/ demineralizer units in the event system flow decreases to a point where the bed may drop from the septum.

   d. Provisions for monitoring resin transfers to ~~assure~~ ensure transfers are complete and design considerations are incorporated to eliminate resin traps.

   e. Provisions for venting cleanup system components during drain, fill, and air-mixing operations.

   f. Provisions for removing resin particles from cleanup system product water to prevent resins from entering the reactor system.

2. ~~CMEB~~EMCB[62] reviews the system capacity and processing flexibility and considers the following:

   a. The process equipment, resin types, and bed volumes compared ~~to~~ with those for similar reactors and the RWCS capability compared ~~to~~with[63] the guidelines of Regulatory Guide 1.56 ~~(reference 3)~~.[64]

   b. The design flows and temperatures through the system to ~~assure~~ ensure that criteria for outlet temperature relative to resin temperature are met.

c. The RWCS capability to process surplus refueling water prior to storage in the refueling water storage tanks or the condensate storage tanks.

d. Redundant or parallel components which will permit cleanup, if required, during periods of equipment downtime or single active component failure.

3. ~~CMEB~~The EMCB[65] coordinates with ~~MEB~~the EMEB[66] in the review of the quality group and seismic design classification of the system and compares the design to the guidelines of Regulatory Guides 1.26 ~~(reference 1)~~[67] and 1.29 ~~(reference 2)~~[68] to ~~assure~~ ensure conformance with Acceptance Criterion II.3, above.

4. ~~CMEB~~The EMCB[69] reviews the instrumentation and controls for the reactor water cleanup system to ~~assure~~ ensure that monitors are provided for:

a. Conductivity of demineralizer effluent.

b. Temperature and conductivity of demineralizer influent.

c. Differential pressure across the demineralizer and across the resin strainers.

~~CMEB~~EMCB[70] ensures that system controls are responsive to the monitor indications to maintain the required temperature and flow and that conductivity meters cover the entire range up to mandatory shutdown as delineated in the plant technical specifications in the final safety analysis report (FSAR).

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

~~CMEB~~EMCB[72] verifies that sufficient information has been provided and that the review is adequate to support conclusions of the following type, to be included in the staff's safety evaluation report:

The reactor water cleanup system (RWCS) will be used to aid in maintaining the reactor water purity and to reduce the reactor water inventory as required by plant operations. Our review has included piping and instrumentation diagrams and process diagrams along with descriptive information concerning the system design and operation.

The staff concludes that the proposed design of reactor water cleanup system (RWCS) is acceptable and meets the relevant requirements of General Design Criteria 1, 2, 14, 60, and 61. This conclusion is based on the following:

1. The applicant has met the requirements of General Design Criterion 1 by designing, in accordance with the guidelines of Regulatory Guide 1.26, the portion of the RWCS extending from the reactor vessel and recirculation loops to the outermost primary containment isolation valves to Quality Group A and by designing, in accordance with position C.2.c of Regulatory Guide 1.26, the remainder of the RWCS outside the primary containment (excluding the precoating unit) to Quality Group C.

2. The applicant has met the requirements of General Design Criterion 2 by designing in accordance with positions C.1, C.2, C.3, and C.4 of Regulatory Guide 1.29, the portion of the RWCS extending from the reactor vessel and recirculation loops to the outermost primary containment isolation valves to seismic Category I.

3. The applicant has met the requirements of General Design Criterion 14 by meeting the positions of Regulatory Guide 1.56 in maintaining reactor water purity and material compatibility to reduce corrosion probabilities, ~~and~~[73] thus reducing the probability of reactor coolant pressure boundary failure.

4. The applicant has met the requirements of General Design Criteria 60 and 61 by designing a system containing radioactivity with confinement and by venting and collecting drainage from the RWCS components through closed systems.

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.[74]

V. IMPLEMENTATION

The following is intended to provide guidance to applicants and licensees regarding the NRC staff's plans for using the 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.[75] 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.[76]

Implementation schedules for conformance to parts of the method discussed herein are contained in the referenced regulatory guides.

VI. REFERENCES

1. Regulatory Guide 1.26, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants."

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

3. Regulatory Guide 1.56, "Maintenance of Water Purity in Boiling Water Reactors."

4. 10 CFR Part 20, "Standards for Protection Against Radiation."[77]

~~4.~~5.[78] 10 CFR Part 50, Appendix A, General Design Criterion 1, "Quality Standards and Records."

~~5.~~6. 10 CFR Part 50, Appendix A, General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena."

~~6.~~7. 10 CFR Part 50, Appendix A, General Design Criterion 14, "Reactor Coolant Pressure Boundary."

~~7.~~8. 10 CFR Part 50, Appendix A, General Design Criterion 60, "Control of Releases of Radioactive Materials to the Environment."

~~8.~~9. 10 CFR Part 50, Appendix A, General Design Criterion 61, "Fuel Storage and Handling and Radioactivity Control."

10. 10 CFR Part 50, Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion 'As Low as is Reasonably Achievable' for Radioactive Material in Light-Water Cooled Nuclear Power Reactor Effluents."[79]

SRP Draft Section 5.4.8
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 Materials and Chemical Engineering Branch (EMCB).
2.	SRP-UDP format item	Added reference to standard design certification and combined license (COL) per 10 CFR Part 52.
3.	Current PRB abbreviation	Changed PRB to EMCB.
4.	SRP-UDP format item	Added reference to COL per 10 CFR Part 52.
5.	Current PRB abbreviation	Changed PRB to EMCB.
6.	SRP-UDP format item	Added reference to standard design certification per 10 CFR Part 52.
7.	Editorial	Changed "assure" to "ensure" (global change for entire SRP section).
8.	Editorial	Changed "criteria" to "classification."
9.	Current PRB review responsibility	The SPLB has review responsibility for SRP Section 9.5.1.
10.	SRP-UDP format item	Added "Review Interfaces" to AREAS OF REVIEW subsection and organized in numbered paragraph form to describe how EMCB reviews aspects of the reactor water cleanup system under other SRP sections and how other branches support the review of the reactor water cleanup system.
11.	Current PRB review responsibility	The EMCB has review responsibility for SRP Sections 5.2.3.
12.	Current PRB abbreviation	Changed PRB from CMEB to EMCB.
13.	Current PRB review responsibility	Change reflects current PRB name, SPLB, and responsibility for SRP Section 3.6.1.
14.	Current PRB review responsibility	Change reflects current PRB name, SPLB, and responsibility for SRP Sections 3.5.1.1 and 3.5.1.2.
15.	Current PRB review responsibility	Change reflects current PRB name, SPLB, and responsibility for SRP Sections 3.5.1.4 and 3.5.2.
16.	Current PRB review responsibility	Change reflects current PRB name, SPLB, and responsibility for SRP Sections 3.4.1 and 9.3.3.
17.	Current PRB review responsibility	EMCB has review responsibility for SRP Sections 5.2.3 and 5.2.4.
18.	Current PRB review responsibility	EMCB has review responsibility for SRP Section 6.6.
19.	Current PRB review responsibility	Change reflects current PRB abbreviation, SPLB, and responsibility for SRP Sections 11.2, 11.3, and 11.4.

Item	Source	Description
20.	Current PRB review responsibility	PERB has responsibility for SRP Section 11.5.
21.	Current PRB review responsibility	SPLB has review responsibility for SRP Section 3.11.
22.	Current PRB review responsibility	Change reflects current PRB name, HICB, and responsibility for SRP Sections 7.1, 7.6, and branch technical positions in SRP Appendix 7-A.
23.	Current PRB abbreviation	Changed PRB to EMCB.
24.	Current PRB review responsibility	Change reflects current PRB name, EELB, and responsibility for SRP Section 8.3.1.
25.	Current PRB review responsibility	PERB has responsibility for SRP Section 11.5.
26.	Current PRB review responsibility	Change reflects current PRB abbreviation, PERB, and responsibility for SRP Sections 12.1 and 12.3.
27.	Current PRB review responsibility	Change reflects current PRB name, ECGB, and responsibility for SRP Sections 3.3.1, 3.3.2, 3.4.2, 3.5.3, 3.7.1, 3.7.2, 3.7.3, 3.8.4, and 3.8.5.
28.	Current PRB review responsibility	The EMCB has review responsibility for SRP Sections 5.2.4.
29.	Current PRB review responsibility	The EMCB has review responsibility for SRP Section 6.6.
30.	Current PRB review responsibility	Change reflects current PRB name, EMEB, and responsibility for SRP Section 3.10.
31.	Current PRB review responsibility	SPLB has review responsibility for SRP Section 3.11.
32.	Current PRB review responsibility	Change reflects current PRB, EMEB, and responsibility for SRP Sections 3.2.1 and 3.2.2.
33.	Current PRB review responsibility	Change reflects current PRB, EMEB, and responsibility for SRP Sections 3.9.1, 3.9.2, and 3.9.3.
34.	Current PRB review responsibility	Change reflects current PRB name, EMEB, and responsibility for SRP Sections 3.9.6.
35.	Current PRB review responsibility	Change reflects current PRB name, SCSB, and responsibility for SRP Section 6.2.4.
36.	SRP-UDP format item	Sentence removed to reflect current SRP format.
37.	SRP-UDP format item	Sentence rewritten as subsection 2.r to reflect current SRP format.
38.	SRP-UDP format item	Sentence rewritten as subsection 2.s to reflect current SRP format.

Item	Source	Description
39.	SRP-UDP, Shutdown Low Power Operations issue resolution	This review interface identifies reviews conducted to satisfy SECY 93-087 and ABWR FSER Staff guidance on Shutdown and Low Power Operations. The staff requested that design certification applicants complete an assessment of shutdown and low-power risk. The shutdown and low-power risk assessment must identify design-specific vulnerabilities and weaknesses and document consideration and incorporation of design features that minimize such vulnerabilities. The RWCS was included in the ABWR FSER risk assessment review as a system that can provide alternative core cooling capability in the event of the loss of normal decay heat removal. Consideration of the RWCS in the shutdown and low-power risk assessment is the responsibility of the SPSB and will be included in the proposed SRP Section 19.1 on risk assessments
40.	Editorial	Simplified for clarity and readability.
41.	Current PRB abbreviation	Changed abbreviation to EMCB.
42.	Editorial	Provided "GDC 1" as initialism for "General Design Criterion 1."
43.	Editorial	Provided "GDC 2" as initialism for "General Design Criterion 2."
44.	Editorial	Provided "GDC 14" as initialism for "General Design Criterion 14."
45.	Editorial	Provided "GDC 60" as initialism for "General Design Criterion 60."
46.	Editorial	Provided "GDC 61" as initialism for "General Design Criterion 61."
47.	Editorial	Replaced "GDC" with "General Design Criteria" to accommodate plural usage.
48.	Editorial	Changed "General Design Criterion 14" to "GDC 14" as per item 43 above.
49.	SRP-UDP format item	Deleted reference identification.
50.	RG 1.70 requirements	Requirement added to ACCEPTANCE CRITERIA to conform to system description requirements specified in RG 1.70.
51.	SRP-UDP format item	Deleted reference identification.
52.	SRP-UDP format item	Deleted reference identification.
53.	SRP-UDP format item	Deleted reference identification.

Item	Source	Description
54.	SRP-UDP format item	Added "Technical Rationale" to ACCEPTANCE CRITERIA subsection and organized in numbered paragraph form to describe the bases for referencing the GDC.
55.	SRP-UDP format item	Added lead-in sentence for "Technical Rationale."
56.	SRP-UDP format item	Added technical rationale for GDC 1.
57.	SRP-UDP format item	Added technical rationale for GDC 2.
58.	SRP-UDP format item	Added technical rationale for GDC 14.
59.	SRP-UDP format item	Added technical rationale for GDC 60.
60.	SRP-UDP format item	Added technical rationale for GDC 61.
61.	Current PRB abbreviation	Changed PRB to EMCB.
62.	Current PRB abbreviation	Changed PRB to EMCB.
63.	Editorial	Changed "compared to" to "compared with" to comply with standard scientific usage.
64.	SRP-UDP format item	Deleted reference identification.
65.	Current PRB abbreviation	Changed PRB to EMCB.
66.	Current PRB abbreviation	Changed PRB to EMCB.
67.	SRP-UDP format item	Deleted reference identification.
68.	SRP-UDP format item	Deleted reference identification.
69.	Current PRB abbreviation	Changed PRB to EMCB.
70.	Current PRB abbreviation	Changed PRB to EMCB.
71.	SRP-UDP Guidance, Implementation of 10 CFR 52	Added standard paragraph to address application of Review Procedures in design certification reviews.
72.	Current PRB abbreviation	Changed PRB to EMCB.
73.	Editorial	Deleted one of two adjacent conjunctions.
74.	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.
75.	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.
76.	SRP-UDP Guidance	Added standard paragraph to indicate applicability of this section to reviews of future applications.

Item	Source	Description
77.	SRP-UDP format item	Added 10 CFR Part 20 to REFERENCES.
78.	Editorial	This and subsequent references renumbered to reflect addition of 10 CFR Part 20 to reference list.
79.	SRP-UDP format item	Added 10 CFR Part 50, Appendix, I to REFERENCES.

[This Page Intentionally Left Blank]

SRP Draft Section 5.4.8

Attachment B - Cross Reference of Integrated Impacts

Integrated Impact No.	Issue	SRP Subsections Affected
213	Modify REVIEW PROCEDURES for SRP Section 5.4.8 to include a discussion of the staff position, and provide additional guidance on the use of hydrogen water chemistry to reduce the level of oxidizing radiolysis products in the reactor water. Update the other subsections of SRP Section 5.4.8 as appropriate.	Make no changes to SRP Section 5.4.8 regarding review of hydrogen water chemistry. This topic is not directly related to the RWCS.