U.S. NUCLEAR REGULATORY COMMISSION

STANDARD REVIEW PLAN

OFFICE OF NUCLEAR REACTOR REGULATION

11.2 LIQUID WASTE MANAGEMENT SYSTEM

REVIEW RESPONSIBILITIES

Primary - ~~Effluent Treatment~~ Plant Systems Branch ~~(ETSB)~~ (SPLB)[1]

Secondary - ~~Radiological Assessment Branch (RAB)~~ Emergency Preparedness and Radiation Protection Branch (PERB)[2]

I. AREAS OF REVIEW

The primary review function is performed by ~~ETSB~~ SPLB.[3] At the construction permit (CP) or standard design certification[4] stage, ~~ETSB~~ SPLB reviews the information in the applicant's preliminary safety analysis report (PSAR) in the specific areas that follow. During the operating license (OL) or combined license (COL)[5] stage of review, the ~~ETSB~~ SPLB 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. The ~~ETSB~~ SPLB review includes:

1. The liquid ~~rad~~waste ~~treatment~~ management[7] system design, design objectives, design criteria, methods of treatment, expected releases, and principal parameters used in calculating the releases of radioactive materials in liquid effluents including the system piping and instrumentation diagrams (P&IDs) and process flow diagrams showing methods of operation and factors that influence waste treatment, e.g., system interfaces and potential bypass routes.

2. Equipment design capacities, expected flow and radionuclide concentrations, expected decontamination factors for radionuclides, and available holdup time.

3. The system design capacity relative to the design and expected input flows, and the period of time the system is required to be in service to process normal waste flows.

4. The availability of standby equipment, alternate processing routes, and interconnections between subsystems in order to evaluate the overall system capability to meet anticipated demands imposed by major processing equipment downtime and waste volume surges due to anticipated operational occurrences.

5. The quality group classifications of piping, and equipment, and the bases governing the design criteria chosen.

6. Provisions to prevent, control and collect releases of radioactive material in liquids due to tank overflows from all plant systems, outside reactor containment having the potential to incur such releases.

7. Design and expected temperatures and pressures, and materials of construction of the components of the liquid waste management system.

8. Design provisions to preclude placing the components and structures of the system under adverse vacuum conditions.[8]

9. Design provisions incorporated in the equipment and facility design to reduce leakage and facilitate operation and maintenance in accordance with the guidelines of Regulatory Guide 1.143.[9]

10. Design features that would reduce liquid input volumes or discharge of radioactive material in liquid effluents.

11. Special design features that may be unique to the plant, topical reports incorporated by reference, and data obtained from previous experience with similar systems which are submitted with the SAR.

Review Interfaces[10]

1. The SPLB performs the following reviews as part of its primary review responsibility under the Standard Review Plan (SRP) sections indicated:[11]

   a. ~~ETSB~~ SPLB reviews the design provisions of the liquid ~~rad~~waste management system incorporated to sample and monitor radioactive elements in liquid process and effluent streams as part of its primary responsibility for SRP Section 11.5.

   b. ~~ETSB~~ SPLB also reviews the consequences of a liquid tank failure having the potential to release radioactive material to a potable water supply as part of its primary review responsibility for SRP Section 15.7.3.

2. The SPLB will coordinate evaluations performed by other branches that interface with the overall evaluation of the system, as follows:[12]

a. A secondary review is performed by the ~~RAB~~ PERB[13] and the results are used by ~~ETSB~~ SPLB to complete the overall evaluation of the system. ~~as follows~~ The PERB:[14]

1. ~~RAB~~ [15]Performs the dose calculations based on the liquid source term provided by ~~ETSB~~ SPLB and transmits the results to ~~ETSB~~ SPLB for their use in evaluating the liquid waste processing system.

2. ~~RAB also~~ [16]Reviews the dose calculational portions of the radiological effluent technical specifications, i.e., Offsite Dose Calculation Manual (ODCM),[17] for input into SRP Section 16.0.

~~In addition, ETSB will coordinate other branches' evaluations that interface with the overall review of the system as follows:~~[18]

b. The ~~Structural Engineering~~ Civil Engineering and Geosciences Branch (~~SEB~~ ECGB[19]) determines the acceptability of the design analyses, procedures, and criteria used to establish the ability of seismic Category 1 structures housing the system and supporting systems to withstand the effects of natural phenomena such as the safe shutdown earthquake (SSE), 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.

c. The Mechanical Engineering Branch (EMEB) 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.

d. The Technical Specifications Branch (TSB) coordinates and performs reviews of the proposed technical specifications as part of its primary review responsibility for SRP Section 16.0.[20]

e. 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.[21]

~~The Accident Evaluation Branch (AEB) evaluates the radiological consequences of the release to the atmosphere of radioactive fission gases resulting from an unexpected and uncontrolled release of radioactive liquids as part of its primary review responsibility for SRP Section 15.7.2.~~[22]

~~The reviews for technical specifications and quality assurance are coordinated and performed by the Licensing Guidance Branch and the Quality Assurance Branch (QAB) as part of their primary review responsibility for SRP Sections 16.0 and 17.0, respectively.~~[23]

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~~.[24]

II. ACCEPTANCE CRITERIA

~~ETSB~~ SPLB acceptance criteria are based on meeting the relevant requirements of the following regulations:

1. 10 CFR Part 20, ~~§20.106~~ §20.1302,[25] as it relates to radioactivity in effluents to unrestricted areas.

2. 10 CFR Part 50, § 50.34a as it relates to sufficient design information being provided to demonstrate that design objectives for equipment necessary to control releases of radioactive effluents to the environment have been met.

3. General Design Criterion 60 (GDC 60)[26] as it relates to the ~~radioactive~~ liquid waste management system~~s~~ being designed to control releases of radioactive materials to the environment.

4. General Design Criterion 61 (GDC 61)[27] as it relates to ~~radioactive~~ liquid waste management system~~s to~~ being[28] designed to ~~assure~~ ensure[29] adequate safety under normal and postulated accident conditions.

   The relevant requirements of the Commission regulations identified above are met by using the regulatory positions contained in the following regulatory guides listed below:

   a. Regulatory Guide 1.110 as it relates to performing a cost-benefit analysis for reducing cumulative dose to the population by using available technology.

   b. Regulatory Guide 1.143 as it relates to the seismic design and quality group classification of components used in the liquid waste ~~treatment~~ management system and structures housing the system~~s~~[30] and the provisions used to control leakages.

5. 10 CFR Part 50, Appendix I, Sections II.A and II.D as it relates to the numerical guides for dose design objectives and limiting conditions for operation to meet the "as low as is reasonably achievable" criterion.

The liquid ~~rad~~waste ~~treatment~~ management system should have the capability to meet the requirements specified in 10 CFR Part 20, ~~§20.106~~ § 20.1302,[31] and 10 CFR Part 50, § 50.34a, and General Design Criteria 60 and 61 of Appendix A of 10 CFR Part 50 and the dose design objectives specified in Sections II.A and II.D of Appendix I to 10 CFR Part 50, including provisions to treat liquid radioactive waste.

1. Specific criteria necessary to meet the relevant requirements of the Commission regulations are as follows:

a. The calculated annual total quantity of all radioactive material released from each reactor at the site to unrestricted areas will not result in an estimated annual dose or dose commitment from liquid effluents for any individual in an unrestricted area from all pathways of exposure in excess of ~~3 millirems~~0.03 mSv (3 mrem)[32] to the total body or ~~10 millirems~~0.1 mSv (10 mrem)[33] to any organ.

b. In addition to 1.a above, the liquid ~~rad~~waste ~~treatment~~ management system~~s~~ should include all items of reasonably demonstrated technology that when added to the system sequentially and in order of diminishing cost-benefit return, can for a favorable cost-benefit ratio effect reductions in dose to the population reasonably expected to be within ~~50 miles~~80 km (50 mi)[34] of the reactor. Regulatory Guide 1.110 provides an acceptable method for performing this analysis.

c. The concentrations of radioactive materials in liquid effluents released to an unrestricted area should not exceed the limits in 10 CFR Part 20, Appendix B, Table ~~II~~ 2,[35] Column 2.

2. The liquid ~~rad~~waste ~~treatment~~ management system should be designed to meet the anticipated processing requirements of the station. Adequate capacity should be provided to process liquid wastes during periods when major processing equipment may be down for maintenance (single failures) and during periods of excessive waste generation. ~~ETSB~~ SPLB will accept systems that have adequate capacity to process the anticipated wastes and that are capable of operating within the design objectives during normal operation, including anticipated operational occurrences. To meet these processing demands, ~~ETSB~~ SPLB will consider interconnections between subsystems, redundant equipment, and reserve storage capacity.

3. The seismic design of structures housing liquid ~~rad~~waste management system~~s~~, the quality group classification of liquid radwaste treatment equipment, and provisions to prevent and collect spills from indoor and outdoor storage tanks should conform to the guidelines of Regulatory Guide 1.143.

4. ~~ETSB~~ SPLB will accept system designs that contain provisions to control leakage and facilitate operation and maintenance in accordance with the guidelines of Regulatory Guide 1.143.

Technical Rationale[36]

The technical rationale for application of these acceptance criteria to reviewing the liquid radwaste treatment system is discussed in the following paragraphs:[37]

1. 10 CFR Part 20, § 1302, requires that surveys of radiation levels in unrestricted areas and radioactive materials in effluents released to unrestricted areas be performed to demonstrate system compliance with the dose limits to individual members of the public, as specified in 10 CFR Part 20, § 20.1301.

10 CFR Part 20, § 20.1302, identifies two approaches, either of which can demonstrate compliance with the dose limits of 10 CFR Part 20, § 1301. The requirements for one of these approaches are as follows:

a. Demonstrate that the annual average concentrations of radioactive material released in gaseous and liquid effluents at the boundary of the unrestricted area do not exceed the effluent concentration limits specified in Table 2 of Appendix B to 10 CFR part 20; and

b. Demonstrate that the annual and hourly doses from external sources to an individual continuously present in an unrestricted area will not exceed 0.5 mSv (0.05 rem) and 0.02 mSv (0.002 rem), respectively.

Meeting the above requirements provides assurance that the dose limits to individual members of the public specified in 10 CFR Part 20, § 1301, will not be exceeded. Meeting the requirement on doses identified above will be reviewed by PERB as part of its primary review responsibility for SRP Section 12.1. Meeting the requirement on liquid effluent concentration limits in unrestricted areas is identified as an acceptance criterion in this SRP section.[38]

2. Acceptance Criterion II.2 gives the technical rationale for 10 CFR Part 50, § 50.34a, requirement.

   Meeting the requirement of 10 CFR 50, § 50.34a, as it relates to a liquid waste management system provides assurance that the nuclear power reactors will have the necessary design features and equipment to control releases of radioactive liquid effluent to the environment in accordance with the requirements of 10 CFR Part 20, § 1302; 10 CFR Part 50, Appendix I, and GDC 60 and GDC 61.[39]

3. Appendix I to 10 CFR Part 50 provides numerical guidance on design objectives to meet the requirements that radiation doses due to radioactive material in effluents released to unrestricted areas be kept as low as is reasonable achievable. Sections II.A and II.D of Appendix I relate to the numerical guides for dose design objectives and limiting conditions for operation to meet the "as low as is reasonably achievable" criterion for liquid effluents.

   Regulatory Guide 1.110 provides an acceptable method of performing cost-benefit analysis to demonstrate that the liquid waste management system design includes all items of reasonably demonstrated technology for reducing the cumulative population dose due to releases of radioactive materials from the reactor to levels as low as is reasonably achievable.

   Meeting the requirements of Sections II.A and II.D of Appendix I to 10 CFR Part 50 provides assurance that the limits for radiation doses to a maximally exposed offsite individual due to liquid effluents specified in Section II.A and the acceptance criterion for cost-benefit analysis specified in Section II.D for meeting the "as low as is reasonably achievable" objective will be met.[40]

4. Compliance with GDC 60 requires that the nuclear power unit design shall include means to control suitably 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 specifies that the waste management systems provide for a holdup capacity sufficient to retain the radioactive waste particularly where unfavorable site environmental conditions may impose unusual operational limitations upon the release of the effluent. The holdup capacity also provides decay time for the shorter lived isotopes before they are processed further or released to the environment. The holdup times are used in the source term calculations provided for in NUREG-0016 and NUREG-0017.

Meeting the requirement of GDC 60 provides assurance that releases of radioactive materials in liquid effluents to unrestricted areas during normal operation of the plant and during anticipated operational occurrences will not result in offsite radiation doses exceeding the limits specified in 10 CFR Part 50, Appendix I, and concentrations of radioactive material in liquid effluents in any unrestricted area exceeding the limits specified in 10 CFR Part 20, Appendix B, Table 2, Column 2.[41]

5. Compliance with GDC 61 requires that the liquid radioactive waste treatment system and other systems which may contain radioactivity shall be designed to ensure adequate safety under normal and postulated accident conditions. This criterion specifies that such facilities shall be designed with a capability to permit inspection and testing of components important to safety and with suitable shielding for radiation protection.

Regulatory Guide 1.143 furnishes design guidance acceptable to the NRC staff related to seismic and quality group classification and quality assurance provisions for the subsystems, structures, and components of the liquid waste management system.

Meeting the requirement of GDC 61 provides assurance that releases of radioactive materials during normal operation and anticipated operational occurrences, including adverse vacuum conditions, will not result in radiation doses that exceed the limits specified in 10 CFR Part 20. In addition, meeting the requirement will help ensure that the system will continue to perform its safety function(s) under postulated accident conditions.[42]

III. REVIEW PROCEDURES

~~ETSB~~ SPLB reviews the applicants submittal in the following manner:

1. The P&IDs and system process flow diagrams are reviewed to determine all sources of liquid input volumes, the points of collection of liquid waste, the flow paths of liquids through the system including all bypasses, the treatment provided, and the points of release of liquid effluents to the environment.

   This information is used to calculate the quantity of radioactive materials released annually in liquid effluents during normal operation, including anticipated operational

occurrences, using the parameters given, the GALE Code, and calculational techniques given in NUREG-0016 and NUREG-0017. The results of this calculation will be used to determine whether the proposed treatment system design meets the acceptance criterion of subsection II.1.c and in review of SRP Section 11.1.

Compliance with the acceptance criteria given in subsection II.1.a concerning exposures to the total body or critical organ of an individual in an unrestricted area will be determined based on ~~RAB~~ PERB dose calculations using the ~~ETSB~~ SPLB calculated source term.

Compliance with the acceptance criterion given in subsection II.1.b concerning the cost-benefit analysis will be determined based on ~~RAB~~ PERB man-rem dose calculations in conjunction with ~~ETSB~~ SPLB cost-benefit studies.[43]

2. The ~~ETSB~~ SPLB review of the liquid waste ~~treatment~~ management system design capacity will encompass three major areas:

   a. The system capability to process wastes in the event of a single major equipment item failure, e.g., an evaporator outage.

   b. The system capability to accept additional wastes during operations which result in excessive liquid waste generation.

   c. The system capability to process wastes at design basis fission product leakage levels, i.e., from 1% of the fuel producing power in a PWR or, in a BWR, consistent with a noble gas release of 3.7 MBq/sec/MWt (100 µCi/sec/MWt)[44] measured after 30 minutes delay.

   ~~ETSB~~ SPLB will compare the average input flows ~~to~~with[45] the design flows to determine the fraction of time individual subsystems must be online to process normal waste inputs. ~~ETSB~~ SPLB will review the operational flexibility designed into the system, i.e., cross connections between subsystems, redundant or reserve processing equipment, and reserve storage capacity. Based on the usage factors and operational flexibilities, ~~ETSB~~ SPLB will evaluate the overall system capability to process wastes in the event of (a), (b), or (c), above, by comparing the design flows ~~to~~with the potential process routes and equipment capacities.

   ~~ETSB~~ SPLB will assume evaporators are unavailable for 2 consecutive days per week for maintenance. If two days holdup capacity or an alternative evaporator are not available for the process stream, ~~ETSB~~ SPLB will assume the stream is processed by an alternate route or discharged to the environment, consistent with the guidelines of NUREG-0016 and NUREG-0017.

3. ~~ETSB~~ SPLB compares the seismic and quality group classification for ~~rad~~waste management systems with the guidelines of Regulatory Guide 1.143. Exceptions are transmitted to EMEB in accordance with the coordinated review responsibility given in subsection I, above. ~~ETSB~~ SPLB ~~assures~~ensures that the design includes provisions to

prevent and collect leakage due to overflows and spillage from indoor and outdoor storage tanks, and are in conformance with the guidelines of Regulatory Guide 1.143.

~~ETSB~~ SPLB reviews the seismic design criteria of structures housing the liquid ~~rad~~waste management system in accordance with the design guidance identified in Regulatory Guide 1.143. Exceptions are transmitted to ~~SEB~~ ECGB[46] in accordance with the coordinated review responsibility given in subsection I, above.

4. ~~ETSB~~ SPLB compares the system design, system and building layout, equipment design, method of operation, and provisions to reduce leakage and facilitate operations and maintenance with the guidelines of Regulatory Guide 1.143. ~~ETSB will evaluate special design features provided to control leakage from system components and topical reports on systems designed on a case-by-case basis.~~ SPLB will, on a case-by-case basis, evaluate topical reports on system design including design features provided to control leakage from system components or to prevent placing or operating the system under adverse vacuum conditions.[47]

5. ~~ETSB~~ SPLB reviews the technical specifications (TS) (i.e., Administrative Controls Section) proposed by the applicant for process and effluent control for input into SRP Section 16.0. ~~RAB~~ PERB reviews the dose calculation portions of the ~~technical specifications~~ ODCM for input into SRP Section 16.0. The reviewer will determine that the content, ~~and~~ intent, and scope of the ~~technical specifications~~ programs identified in the Administrative Controls Section of the TS[48] are in agreement with the requirements developed as a result of the staff's review. The review will include the evaluation or development of appropriate limiting conditions for operation and their bases consistent with the plant design. The technical specifications are reviewed with respect to the requirements of 10 CFR Part 50, § 50.3~~4~~6a.[49]

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.[50]

IV. EVALUATION FINDINGS

~~ETSB~~ SPLB 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 (SER):

The liquid ~~rad~~waste management systems includes the equipment necessary to control the releases of radioactive materials in liquid effluents in accordance with General Design Criteria 60 and 61 of Appendix A of 10 CFR Part 50 and 10 CFR Part 50, § 50.34a. The staff concludes that the design of the liquid waste management system~~s~~ is acceptable and meets the requirements of 10 CFR Part 20, ~~§20.106~~ § 20.1302,[51] 10 CFR Part 50,

§ 50.34a, General Design Criteria 60 and 61 and 10 CFR Part 50, Appendix I. This conclusion is based on the following:

1. The applicant has met the requirements of Section II.A of Appendix I of 10 CFR Part 50 with respect to dose limiting objectives by proposing a liquid ~~rad~~waste ~~treatment~~ management system~~s~~ that is capable of maintaining releases of radioactive materials in liquid effluents such that the calculated individual doses in an unrestricted area from all pathways of exposure are less than ~~3 millirems~~0.03 mSv (3 mrem)[52] to the total body and ~~10 millirems~~0.1 mSv (10 mrem)[53] to any organ. The staff's evaluation has considered releases of radioactive materials in liquid effluents for normal operation including anticipated operational occurrences based on expected radwaste inputs over the life of the plant for each reactor on the site in accordance with SRP Section 11.1.

2. The applicant has met the requirements of Section II.D of Appendix I of 10 CFR Part 50 with respect to meeting the "as low as reasonably achievable" criterion as the staff has considered the potential effectiveness of augmenting the proposed liquid ~~rad~~waste ~~treatment~~ management system~~s~~ using items of reasonably demonstrated technology and has determined that further effluent treatment will not effect reductions in the cumulative population dose reasonably expected within a~~50 mile~~80-km (50-mi)[54] radius of the reactor at a cost of less than $1000 per man-rem[55] or man-thyroid-rem.[56]

3. ~~The applicant has met the requirements of 10 CFR Part 20, §20.106 as the staff has considered the potential consequences resulting from reactor operation, and has determined the concentrations of radioactive materials in liquid effluents in unrestricted areas will be a small fraction of the limits in 10 CFR Part 20, Appendix B, Table 2, Column 2.~~ The applicant has met the requirements of 10 CFR Part 20, § 20.1302,[57] as the staff has considered the potential consequences resulting from reactor operation with 1% of the operating fission product inventory in the core being released to the primary coolant for a PWR or "a fission product release rate consistent with a noble gas release rate to the reactor coolant of 3.7 MBq/Mwt-sec (100 μCi/Mwt-sec)[58] at 30 minutes decay" for a BWR and has determined that under these conditions the concentrations of radioactive materials in liquid effluents in unrestricted areas will be a small fraction of the limits specified in 10 CFR Part 20, Appendix B, Table 2, Column 2. In making the above determination for iodine isotopes, however, the staff has considered technical specification limits for Iodine-131 dose equivalent concentration in the primary coolant for PWRs.[59]

4. The applicant has met the requirements of General Design ~~Criterion~~Criteria[60] 60 and 61 with respect to controlling releases of radioactive material to the environment as the staff has considered the capabilities of the proposed liquid ~~rad~~waste ~~treatment~~ management system to meet the demands of the plant due to anticipated operational occurrences and has concluded that the system capacity and design flexibility are adequate to meet the anticipated needs of the plant. The staff has reviewed the applicant's vacuum mitigating provisions for the liquid

waste management system and found these features to be in compliance with GDC 61.[61] The staff has reviewed the applicant's quality assurance provisions for the liquid ~~rad~~waste management system~~s~~, the quality group classifications used for system components, and the seismic design applied to structures housing these systems. The design of the systems and structures housing these systems meet the criteria as set forth in Regulatory Guide 1.143. The staff has reviewed the provisions incorporated in the applicant's design to control the release of radioactive materials in liquids due to inadvertent tank overflows and conclude that the measures proposed by the applicant are consistent with the criteria as set forth in Regulatory Guide 1.143.

~~5. The applicant has met the requirements of 10 CFR Part 50, §50.36a with respect to providing technical specifications pertaining to the liquid radwaste systems so that the provisions of the specifications are sufficient to insure that they fulfill the requirement of the regulation.[62]~~

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.[63]

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.[64] 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.[65]

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

VI. REFERENCES

1. 10 CFR Part 20, § 20.1302, "~~Standards for Protection Against Radiation -~~ Compliance with Dose Limits for Individual Members of the Public," ~~and Appendix B. "Concentration in Air and Water Above Natural Background~~[66]."

2. 10 CFR Part 20, Appendix B, "Annual Limits on Intake and Derived Air Concentrations of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage."[67]

3. 10 CFR Part 50, § 50.34a, "Design Objectives for Equipment to Control Releases of Radioactive Material in Effluents - Nuclear Power Reactors."

4. 10 CFR Part 50, § 50.36a, "Technical Specifications on Effluents from Nuclear Power Reactors."

5. 10 CFR Part 50, Appendix A, GDC 60, "Control of Releases of Radioactive Materials to the Environment."[68]

6. 10 CFR Part 50, Appendix A, GDC 61, "Fuel Storage and Handling and Radioactivity Control."[69]

7. 10 CFR Part 50, Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion `As Low As Practicable' for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents."

8. NUREG-0016, "Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Boiling Water Reactors (BWRs)," current revision.[70]

9. NUREG-0017, "Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Pressurized Water Reactors (PWRs)," current revision.[71]

10. Regulatory Guide 1.110, "Cost Benefit Analysis for Radwaste Systems for Light-Water-Cooled Nuclear Power Reactors."

11. Regulatory Guide 1.143, "Design Guidance for Radioactive Waste Management Systems, Structures and Components in Light-Water-Cooled Nuclear Reactor Power Plants."

SRP Draft Section 11.2
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 acronym	Changed PRB to Plant Systems Branch (SPLB).
2.	Current SRB name and acronym	Changed SRB to Emergency Preparedness and Radiation Protection Branch (PERB).
3.	Current PRB acronym	Changed PRB to SPLB (global change for this section).
4.	SRP-UDP format item	Added reference to standard design certification stage of review.
5.	SRP-UDP format item	Added combined license (COL) review.
6.	SRP-UDP format item	Added reference to standard design certification stage of review.
7.	PRB request	Standardized on the wording "liquid waste management system." (Global change for this section.)
8.	Integrated Impact No. 451	Added reference to adverse vacuum conditions and renumbered subsequent items.
9.	SRP-UDP format item	Added recommendation that Regulatory Guide 1.143 should be updated in accordance with PNL IPD 11.2-1 and INEL IPD 11.2-2.
10.	SRP-UDP format item	Added "Review Interfaces" to organize secondary review branches and other SRP sections supporting the review of SRP Section 11.2.
11.	SRP-UDP format item	Reorganized to specify review tasks assigned to SPLB's area of responsibility.
12.	SRP-UDP format item	Reorganized to specify tasks assigned to the SRB and coordinating review branches.
13.	Current review branch	Changed review branch to PERB (global change for this section).
14.	Current review branch	Changed SRB to PERB.
15.	Old review branch acronym	Removed obsolete review branch acronym (RAB).
16.	Old review branch acronym	Removed obsolete review branch acronym (RAB).
17.	PRB request	Modified sentence to allow dose calculation portions of the radiological effluent technical specifications (RETS) to be relocated to the ODCM in accordance with Generic Letter 89-01, Supplement 1.
18.	SRP-UDP format item	Deleted redundant statement.

Item	Source	Description
19.	SRP-UDP format item/ Current review branch	Changed review branch for selected sections of SRP Chapter 3 to Civil Engineering and Geosciences Branch (ECGB).
20.	SRP-UDP format item/ Current review branch	Added area of review under Technical Specifications Branch (TSB) for SRP Section 16.0.
21.	SRP-UDP format item/ Current review branch	Added area of review under Quality Assurance and Maintenance Branch (HQMB) for SRP Chapter 17.
22.	PRB direction	Deleted paragraph for subject that is adequately covered in BTP ETSB 11-5.
23.	SRP-UDP format item	Relocated paragraphs referencing SRP Section 16.0 and Chapter 17 to reflect current SRP format.
24.	Editorial	Simplified for clarity and readability.
25.	Integrated Impact No. 449	Changed to indicate the new section number in 10 CFR Part 20 - § 20.1302.
26.	SRP-UDP format item	Added abbreviation for GDC 60.
27.	SRP-UDP format item	Added abbreviation for GDC 61.
28.	PRB direction – editorial	Reworded sentence for consistency and clarity.
29.	Editorial	Changed "assure" to "ensure" (global change for this section).
30.	PRB direction – editorial	Reworded sentence for consistency and clarity.
31.	Integrated Impact No. 449	Changed to indicate the new section number in 10 CFR Part 20 - § 20.1302.
32.	Conversion to SI units	Converted 3 millirem to 0.03 mSv.
33.	Conversion to SI units	Converted 10 millirem to 0.1 mSv.
34.	Conversion to SI units	Converted 50 miles to 80 km.
35.	PRB correction	Corrected "Table II" to read "Table 2."
36.	SRP-UDP format item	Added "Technical Rationale" to ACCEPTANCE CRITERIA and organized in numbered form to incorporate the bases for the acceptance criteria.
37.	SRP-UDP format item	Added lead-in statement for "Technical Rationale."
38.	SRP-UDP format item	Added technical rationale for 10 CFR Part 20, § 20.1302.
39.	SRP-UDP format item	Added technical rationale for 10 CFR Part 50, § 50.34a.
40.	SRP-UDP format item	Added technical rationale for 10 CFR Part 50, Appendix I, and Regulatory Guide 1.110 (last paragraph was provided by the PRB reviewer).

Item	Source	Description
41.	SRP-UDP format item	Added technical rationale for GDC 60, and revised last paragraph as requested by the PRB reviewer.
42.	SRP-UDP format item	Added technical rationale for GDC 61 and RG 1.143.
43.	SRP-UDP format item	With respect to the cost-benefit analysis, the metric conversion of rem to Sv should be postponed pending metrication of the source document, 10 CFR Part 50, Appendix I.
44.	Conversion to SI units	Converted 100 µCi/sec/MWt to 3.7 MBq/sec/MWt.
45.	Editorial	Corrected "compare . . . to" to "compare . . . with" to accommodate scientific/technical usage.
46.	Current review branch	Changed review branch to ECGB.
47.	Integrated Impact No. 451	Added reference to adverse vacuum conditions in REVIEW PROCEDURES.
48.	SRP-UDP format item/ Comments from the PRB reviewer	Changed review branch to PERB. Made other editorial changes at the request of the PRB reviewer.
49.	Technical specification review requirement	Corrected § 50.34a to § 50.36a.
50.	SRP-UDP Guidance, Implementation of 10 CFR 52	Added standard paragraph to address application of Review Procedures in design certification reviews.
51.	Integrated Impact No. 449	Changed to indicate the new section number in 10 CFR Part 20 - § 20.1302.
52.	Conversion to SI units	Converted 3 millirem to 0.03 mSv.
53.	Conversion to SI units	Converted 10 millirem to 0.1 mSv.
54.	Conversion to SI units	Converted 50 miles to 80 km.
55.	SRP-UDP format item	With respect to the cost-benefit analysis, the metric conversion of rem to Sv should be postponed pending metrication of the source document, 10 CFR Part 50, Appendix I.
56.	SRP-UDP format item	With respect to the cost-benefit analysis, the metric conversion of rem to Sv should be postponed pending metrication of the source document, 10 CFR Part 50, Appendix I.
57.	Integrated Impact No. 449	Changed to indicate the new section number in 10 CFR Part 20 - § 20.1302.
58.	Conversion to SI units	Converted 100 µCi/sec/MWt to 3.7 MBq/sec/MWt.
59.	PRB direction	Replaced paragraph as directed by the PRB.
60.	Integrated Impact No. 451	Added reference to vacuum mitigating provisions in EVALUATION FINDINGS.

Item	Source	Description
61.	Editorial	Changed "Criterion" to "Criteria" to accommodate plural usage.
62.	PRB direction	Deleted paragraph at the direction of PRB reviewer because 10 CFR 50.36a is not an acceptance criterion. It should be included in SRP Section 11.5.
63.	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.
64.	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.
65.	SRP-UDP Guidance	Added standard paragraph to indicate applicability of this section to reviews of future applications.
66.	SRP-UDP format item	Changed to clarify the reference item.
67.	SRP-UDP format item	Added 10 Part 20, Appendix B, as a reference item.
68.	SRP-UDP format item	Added title of reference document.
69.	SRP-UDP format item	Added title of reference document.
70.	SRP-UDP format item	Changed to indicate that current revision should be used.
71.	SRP-UDP format item	Changed to indicate that current revision should be used.

SRP Draft Section 11.2
Attachment B - Cross Reference of Integrated Impacts

Integrated Impact No.	Issue	SRP Subsections Affected
448	Consider adding RGs 1.113 and 1.109 to Acceptance Criteria as specific guidance for assessing compliance with the guidelines of Appendix I to 10 CFR Part 50.	Not incorporated in the SRP as RG 1.109 and RG 1.113 do not address the source terms used in the design of the system
449	Consider revising the Acceptance Criteria, Review Procedures, and Evaluation Findings to replace citations of superseded sections in 10 CFR Part 20.	Incorporated in Sections II.1, II.5, and IV.3
450	Consider modifying Review Procedures to address the content of the Offsite Dose Calculation Manual as it relates to control of radioactive liquid effluents.	Not incorporated in the SRP as the ODCM and PCP are associated with the RETS
451	Consider developing Review Procedures to address tank failure concerns identified in IEB 80-05 and Generic Letter 80-21 (vacuum breakers).	Incorporated in Sections I.8, III.4 and IV.4
452	Develop a revision to Reg. Guide 1.143 to provide an alternate method for defining seismic criteria and should be considered a candidate for future work.	Not incorporated in the SRP as IPD-7.0 Form No. PNL 11.2-1 needs to be completed