



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

17.4 RELIABILITY ASSURANCE PROGRAM

REVIEW RESPONSIBILITIES

Primary - Quality Assurance and Maintenance Branch (HQMB)

Secondary - Probabilistic Safety Assessment Branch (SPSB)

I. AREAS OF REVIEW¹

A reliability assurance program (RAP) will be required for standard design certifications and combined licenses for nuclear power plants licensed under 10 CFR Part 52.* Design certification (DC) applicants and combined license (COL) applicants and holders that reference standard design certifications will be required to have a staff approved RAP. The RAP applies to those plant structures, systems, and components (SSCs) designated as risk significant (significant contributors to plant safety) based on a combination of probabilistic, deterministic, and other approaches (e.g., a probabilistic risk assessment (PRA) for the standard design, and advice from an expert panel). The objectives of the RAP are to provide reasonable assurance of the following:

- The plant is designed, constructed, and operated consistent with the assumptions and risk insights for risk-significant SSCs;
- Risk-significant SSCs will not degrade to an unacceptable level during plant operations;

*This requirement will be part of the applicable regulations specified in the Appendix to 10 CFR 52 for each certified design.

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USNRC STANDARD REVIEW PLAN

Standard review plans are prepared for the guidance of the Office of Nuclear Reactor Regulation staff responsible for the review of applications to construct and operate nuclear power plants. These documents are made available to the public as part of the Commission's policy to inform the nuclear industry and the general public of regulatory procedures and policies. Standard review plans are not substitutes for regulatory guides or the Commission's regulations and compliance with them is not required. The standard review plan sections are keyed to the Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants. Not all sections of the Standard Format have a corresponding review plan.

Published standard review plans will be revised periodically, as appropriate, to accommodate comments and to reflect new information and experience.

Comments and suggestions for improvement will be considered and should be sent to the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Washington, D.C. 20555.

- The frequency of transients posing challenges to risk-significant SSCs will be minimized; and
- SSCs will function reliably when challenged.

In SECY-95-132 (Reference 8) the staff documented a two-stage approach to the RAP. The first stage is applied before initial fuel load and is referred to as the design reliability assurance program (D-RAP). The second stage applies to reliability assurance activities for the operations phase of the plant life cycle.

Subdivisions of the D-RAP stage are associated with: (1) standard design certification, (2) the COL applicant, and (3) the COL holder. The D-RAP identifies and prioritizes risk-significant SSCs based on probabilistic, deterministic, and other considerations (e.g., the plant-specific PRA).

Specifically, in the final safety evaluation reports, NUREG-1462 for the System 80+ (Reference 11) and NUREG-1503 for the Advanced Boiling Water Reactor (Reference 12), and in SECY 95-132, the Commission approved the following applicable regulation for D-RAP for the DC-applicant and the COL applicant:

An application for advanced reactor design certification or a combined license must contain:

1. A description of the RAP that includes the scope, purpose, and objectives of the D-RAP;
2. The process used to evaluate and prioritize the SSCs in the design, based on their degree of risk significance;
3. A list of SSCs designated as risk significant; and
4. For those SSCs designated as risk significant:
 - (i) a process to determine dominant failure modes that considered industry experience, analytical models, and applicable requirements; and
 - (ii) key assumptions and risk insights from probabilistic, deterministic, or other methods that considered operations, maintenance and monitoring activities.

Each COL holder that references a certified design must implement the D-RAP approved by the NRC.²

1. Design Certification (DC) Application D-RAP Requirements - The D-RAP for the design certification application will include the following:
 - a. The scope, purpose, objectives and essential elements of the D-RAP.

- b. Identification and prioritization of risk-significant SSCs, including anticipated operations, maintenance, and surveillance activities. This process should be based on probabilistic or deterministic considerations, as well as other possible sources of information (e.g., standard design certification PRA, advice from an expert panel). The D-RAP should specify the following:
 - (1) A process for identifying and prioritizing SSCs that is based on risk significance;
 - (2) The list of SSCs designated as risk significant for the standard design certification; and
 - (3) A process for determining dominant failure modes that is based on industry experience, analytical models, and applicable requirements.
- c. The manner in which those portions of the D-RAP that apply to the standard design certification will be implemented.

The staff will limit its review of a standard design certification application to:

(1) developing and implementing the D-RAP within the scope of standard design certification, (2) developing and implementing the D-RAP to be used in a COL application, and (3) providing the information necessary for a COL applicant to develop operational reliability assurance activities for integration into the maintenance and quality assurance programs.

- 2. Combined Operating License (COL) Application D-RAP Requirements - A COL applicant referencing a standard design certification will be responsible for augmenting and completing the remainder of the D-RAP for the standard design certification to include site-specific information and to identify and prioritize the risk-significant SSCs. The D-RAP for a COL application that references a standard design certification should include the following:

- a. The scope, purpose, objectives, and essential elements of the D-RAP.
- b. The remainder of the D-RAP, including site-specific design information and those aspects of reliability assurance that will be accomplished prior to fuel load (i.e., procurement, fabrication, construction, and preoperational testing phases).
- c. Identification and prioritization of risk-significant SSCs, including anticipated operations, maintenance, and surveillance activities. This process should be based on probabilistic or deterministic considerations, as well as other possible sources of information (e.g., standard design certification PRA, advice from an expert panel). The D-RAP should specify the following:
 - (1) A process for identifying and prioritizing SSCs that is based on risk significance;

- (2) The list of SSCs designated as risk significant for the COL; and
 - (3) A process for determining dominant failure modes that is based on industry experience, analytical models, and applicable requirements.
- d. The description of the manner in which the remainder of the D-RAP will be implemented.

The COL applicant's D-RAP will be reviewed and approved by the NRC staff prior to the time the COL is issued.

3. COL Holder D-RAP - Once the site-specific D-RAP has been established and the risk-significant SSCs identified, the staff will verify that procurement, fabrication, construction, and preoperational tests have been conducted in accordance with the D-RAP using the inspections, tests, analyses, and acceptance criteria (ITAAC) process. The staff's verification of D-RAP implementation by a COL holder will include the following:

- a. Verification that the D-RAP evaluated and approved during the construction stage is being/was implemented during procurement, fabrication, construction, and preoperational testing.
- b. Evaluation of modifications to the design of risk-significant SSCs during the construction stage, thereby ensuring that new information is factored into the PRA or other sources to assure risk significance evaluations and prioritizations are maintained.
- c. Evaluation of revisions to the plant- or site-specific PRA; verification that the list of SSCs designated as risk significant for the COL holder during the construction stage is appropriately revised; and verification that dominant failure modes consider any changes to site-specific elements, any new industry experience and analytical models.

The NRC will verify the COL holder's implementation of the D-RAP by conducting NRC inspections and audits of the COL holder's ITAAC process as well as NRC inspections and audits of SSCs during the design, procurement, fabrication, construction and pre-operational testing phases of plant life prior to fuel load.³

4. Reliability Assurance during Operation. Operational reliability assurance activities are integrated into other programs (e.g., maintenance, surveillance, inservice inspection, inservice testing, and quality assurance).

Many operational reliability assurance activities may be integrated into those required by 10 CFR 50.65 ("the maintenance rule"), which includes performance and condition monitoring requirements for safety-related and risk-significant non-safety-related SSCs. Appropriate and effective integration of operational reliability assurance activities

required by the maintenance rule will help to mitigate accidents or transients or prevent inadvertent reactor scrams or safety system actuations.

Other operational reliability assurance activities for safety-related SSCs may be incorporated into the quality assurance program developed to implement Appendix B to 10 CFR Part 50 and into programs for surveillance, inservice inspection, and inservice testing.

The objectives of operational reliability assurance activities will be met if the licensee's administrative processes and procedures include a requirement to determine the cause of failures and to specify corrective actions for non-safety-related, risk-significant SSCs. The COL holder should be given maximum flexibility in seeking the best approach to implement this RAP requirement. The following is one acceptable approach; however, other methods may also be acceptable.⁴

Reliability assurance activities during the operations phase may include the following:

- a. The COL holder incorporates reliability assurance activities related to safety related SSCs into the program required by 10 CFR Part 50, Appendix B.
- b. The COL holder incorporates reliability assurance activities into the program that implements the requirements of 10 CFR 50.65. This includes corrective actions to mitigate maintenance-preventable failures to safety related and risk-significant non-safety-related SSCs.
- c. The COL holder's administrative processes and procedures provide cause determinations and corrective actions for design and operational errors that degrade non-safety-related, risk-significant SSCs.

The NRC will inspect and audit implementation of the operational phase of reliability assurance activities for the duration of the license using maintenance and quality assurance regulations (e.g., 10 CFR 50.65 and 10 CFR Part 50, Appendix B).

Review Interfaces⁵

1. SPSB will provide an evaluation of the adequacy and appropriateness of the following information to HQMB on the basis of its review of the standard design certification or site-specific PRA as part of its primary review responsibility for SRP Section 19.1 (proposed):
 - a. The applicant's process for identifying and prioritizing SSCs that is based on risk significance.
 - b. The applicant's list of SSCs designated as risk significant for the standard design certification.

- c. The applicant's process for determining dominant failure modes that is based on industry experience, analytical models, and applicable requirements.

II. ACCEPTANCE CRITERIA⁶

The D-RAP is described in the standard design certification applicant's standard safety analysis report (SSAR) and the design control document (DCD), including related sections of the PRA. The staff will base its evaluation of each application for a standard design certification or for a COL on the following regulations:

- A. The Commission approved applicable regulation for RAP, as described in SECY 95-132, Appendix E. (The regulation for each certified design is to be included in a standardized design-specific appendix to 10 CFR Part 52.)
- B. 10 CFR 50.65 specifies that operators of nuclear power plants shall monitor the performance and condition of SSCs to provide reasonable assurance that specified SSCs are capable of fulfilling their intended functions.
- C. Appendix B to 10 CFR Part 50 requires that a quality assurance program be provided for the design, construction, and operation of SSCs needed to ensure the safe operation, shutdown, and accident mitigation of a nuclear power plant.

To meet the above requirements, the following specific criteria regulation are used:

- 1. Design Certification D-RAP - The application for Design Certification must contain:
 - a. A description of the RAP used during the design stage, including its scope, purpose, objectives, and essential elements.
 - b. A process for evaluating and prioritizing design structures, systems, and components that is based on risk significance.
 - c. A list of SSCs designated as risk significant.
 - d. For those SSCs designated as risk significant, the following must also be provided:
 - (1) A process for determining dominant failure modes that is based on industry experience, analytical models, and applicable requirements; and
 - (2) Key assumptions and determinations of risk significance that are derived from probabilistic, deterministic, or other methods that consider operations, maintenance, and monitoring activities.

2. COL Application D-RAP - For a COL application that references a standard design certification, the COL applicant will also need to provide the following:
 - a. A proposed D-RAP for that portion of the design for which the applicant is responsible, incorporating the D-RAP from the standard design certification.
 - b. Proposed ITAAC for the D-RAP plan to the extent necessary and sufficient to provide reasonable assurance that (if the tests, inspections, and analyses are performed and the acceptance criteria are met) the plant will operate in accordance with the design bases (and with probabilistic and deterministic assumptions) and that the SSCs will perform their intended function as described in both the standard design certification and the COL.

A COL applicant must augment the standard design certification D-RAP to reflect plant- and site-specific information and to implement those elements applicable during the procurement, fabrication, construction and preoperational testing stages. Acceptance criteria will be similar to those of the standard design certification but will include the site-specific PRA; probabilistic, deterministic, and other approaches to assessing changes in risk-significant SSCs; and site-specific vulnerabilities.

Technical Rationale⁷

The technical rationale for application of these acceptance criteria to reviewing the D-RAP is discussed in the following paragraphs:

1. The Commission approved the D-RAP in SECY 95-132. Examples of an approved D-RAP may also be found in the Standard Safety Analysis Reports for design certification applications for the Advanced Boiling Water Reactor in NUREG-1503 and the System 80+ in NUREG-1462.

The information on performance requirements for certified designs outlined in SECY 95-132 forms the basis for requiring the RAP and is thus directly applicable to this SRP section. In NUREG-1070, "NRC Policy on Future Reactor Designs," issued in 1985, the staff discussed the use of a systems reliability program to ensure that the reliability of components and systems important to safety would remain at a level that would be commensurate with plant safety requirements. To ensure that reliability objectives are met and to prevent degradation of reliability during operation, insights into risk should be obtained from probabilistic and deterministic evaluations performed at the standard design certification application stage and at the COL application and holder stages and then used to make decisions affecting design, procurement, and testing and to formulate operations and maintenance procedures. After the publication of NUREG-1070, the staff worked to develop a coherent program that would ensure a minimum level of reliability for risk-significant SSCs. This effort culminated in the development and approval of SECY 95-132 for certified designs, providing RAP requirements to be included in applications for standard design certifications and in COL applications that reference standard design certifications.

These requirements provide (a) the framework for the RAP and (b) the detailed requirements for contents of an application for a standard design certification or a COL that references a standard design certification. Implementation of a RAP for a standard design certification or a COL that references a standard design certification will enhance safety by concentrating design resources on risk-significant SSCs and on maintaining the reliability of such SSCs during the design and operations stages of the facility.

Meeting the requirements for a RAP as outlined in SECY 95-132 for standard design certifications or for COL applicants that reference a standard design certification provides assurance that the proposed plant will perform with the reliability required to ensure that no undue risk is posed to the health and safety of the public. It will also provide assurance that (a) the plant design is consistent with the assumptions and potential risks associated with risk-significant SSCs, (b) risk-significant SSCs will not degrade to an unacceptable level during their design life, (c) the frequency of transients that challenge these SSCs will be acceptably low, and (d) SSCs will function reliably when challenged.

2. Compliance with 10 CFR 50.65 requires that operators of nuclear power plants monitor the performance and condition of SSCs to provide reasonable assurance that specified SSCs are capable of fulfilling their intended functions.

Requirements specified in 10 CFR 50.65 apply to this SRP section because operational reliability assurance activities should be integrated into such programs (e.g., maintenance, surveillance, inservice inspection, inservice testing, and quality assurance). For maintenance, reliability performance goals for risk-significant SSCs are ensured by using the existing maintenance process. The licensee will establish performance, condition monitoring, and preventive maintenance requirements to provide reasonable assurance that the reliability of risk-significant SSCs is either maintained or is not unacceptably degraded throughout their service life. Regulatory Guide 1.160 provides guidance, acceptable to the staff, for implementation of the maintenance rule.

Meeting the requirements specified in 10 CFR 50.65 provides assurance that plant SSCs will be properly maintained and capable of performing their intended safety function throughout their service life.

3. Compliance with Appendix B to 10 CFR Part 50 requires that a quality assurance program be provided for the design, construction, and operation of SSCs needed to ensure the safe operation, shutdown, and accident mitigation of a nuclear power plant.

Appendix B to 10 CFR Part 50 applies to this SRP section because operational reliability assurance activities should be integrated into such programs (e.g., maintenance, surveillance, inservice inspection, inservice testing, and quality assurance). Operational reliability assurance activities related to safety-related SSCs are included in the quality assurance program required under Appendix B to 10 CFR Part 50 and in programs for surveillance, inservice inspection, and inservice testing.

Meeting the quality assurance requirements specified in Appendix B to 10 CFR Part 50 provides assurance that safety related SSCs will be designed, constructed, and operated in a manner that ensures their capability to perform their intended safety function.

III. REVIEW PROCEDURES⁸

The procedures set forth below are used for review of standard design certification applications and COL applications that reference standard design certifications.

1. D-RAP for Standard Design Certification (DC) - An application for a standard design certification should: (a) include a description of the scope, purpose, objectives, and essential elements of the D-RAP; (b) identify and prioritize risk-significant SSCs based on a plant-specific PRA and supplemented by other sources (e.g., deterministic evaluation, industry experience, or an expert panel); and (c) describe the implementation of those portions of the D-RAP that apply to design certification. The review of the D-RAP for a standard design certification includes the following:
 - a. The HQMB reviewer evaluates the SSAR to determine if: (1) the scope, purpose, objectives, and essential elements of the D-RAP as described in the SAR and the DCD include the information identified in subsection II.1 above; or (2) acceptable alternatives have been proposed.
 - b. The HQMB reviewer determines whether sufficient information is included to establish organizational and administrative structure for implementing the D-RAP.
 - c. SPSB will provide the following input to HQMB on the basis of its evaluation of the plant-specific PRA, as required by 10 CFR 52.47(a)(1)(v):
 1. An evaluation of the DC applicant's process used to identify and prioritize the risk significance and relative importance to safety of the SSCs.
 2. An evaluation of the DC applicant's list of SSCs designated as risk significant, and thus subject to the requirements of the D-RAP.
 3. An evaluation of the DC applicant's process used to determine the dominant failure modes of risk-significant SSCs.
 - d. Using the list of risk-significant SSCs provided by the DC applicant, supplemented by other sources (e.g., deterministic information, industry experience), the HQMB reviewer should verify that the DC applicant has considered anticipated operations, maintenance, and monitoring activities in application of the D-RAP to these SSCs.
2. D-RAP for a COL Application that References a Standard Design Certification - An application for a COL that references a standard design certification should: (a) include a description of the manner in which the scope, purpose, objectives, and essential elements

of the D-RAP for the standard design certification will be supplemented by site-specific elements; (b) identify and prioritize risk-significant SSCs based on a revision of the standard design certification PRA to include site-specific risk insights and that portion of the design for which the COL applicant is responsible; and (c) provide information demonstrating that other programs (e.g., maintenance, surveillance testing, inservice inspection, inservice testing, and quality assurance) can be used to satisfy operational reliability assurance requirements. The review of the D-RAP included in a COL application referencing a standard design certification includes the following:

- a. The HQMB reviewer evaluates the SAR to determine if: (1) the scope, purpose, objectives, and essential elements of the D-RAP described in the SAR and the DCD include the information identified in subsection II.2; or (2) acceptable alternatives have been proposed.
 - b. The HQMB reviewer evaluates the description of the D-RAP to determine whether sufficient information is included to establish organizational and administrative structure for its implementation.
 - c. The SPSB PRA reviewer will provide HQMB the following input on the basis of its evaluation of the plant/site-specific PRA required by 10 CFR 50.34(f)(1)(i) in combination with 10 CFR 52.79(b):
 1. The SPSB evaluation of the COL applicant's process used to evaluate, identify, and prioritize the risk significance and relative importance to safety of SSCs.
 2. The SPSB evaluation of the COL applicant's list of SSCs designated as risk significant, and thus subject to the requirements of the D-RAP.
 3. The SPSB evaluation of the COL applicant's process used to determine the dominant failure modes of risk-significant SSCs.
 - d. Using the list of risk-significant SSCs provided by the COL applicant, supplemented by other sources (e.g., deterministic information and industry experience), the HQMB reviewer should verify that reasonable assurance exists that such activities as procurement, fabrication, construction, and preoperational testing will be conducted in accordance with the D-RAP. The applicant will verify these activities using the ITAAC process.
 - e. The HQMB reviewer verifies that programs are being developed to include operational reliability assurance activities in maintenance, surveillance testing, inservice inspection, inservice testing, and quality assurance programs.
3. D-RAP for the COL Holder - The implementation of the D-RAP by a COL holder will be verified primarily as an inspection activity as outlined in Appendix A to this SRP Section. This activity will serve as verification that the D-RAP approved by the NRC

has been implemented and will continue functioning through the construction stage of plant life.

4. Reliability Assurance During Operations - RAP objectives during the operational phase of the nuclear power plant should be integrated into the licensee's other programs (e.g., maintenance, surveillance, inservice inspection, inservice testing, and quality assurance). The review of the implementation of maintenance requirements as specified in 10 CFR 50.65, quality assurance as specified in Appendix B to 10 CFR Part 50, and technical specification requirements for inservice testing, inservice inspection, and surveillance activities is primarily an inspection activity as described in Appendix A to this SRP Section.

For standard design certification reviews under 10 CFR Part 52, the procedures above should be followed 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.⁹

IV. EVALUATION FINDINGS¹⁰

The reviewer determines whether sufficient information has been provided and whether the review supports conclusions of the following types, to be included in the staff's safety evaluation report (SER):

1. For Standard Design Certification SER:

The standard safety analysis report (SSAR) describes the Design Reliability Assurance Program (D-RAP) for the design phase. The D-RAP is implemented during the detailed design phase and while specific equipment is being selected to ensure that the reliability assumptions of the probabilistic risk assessment (PRA) will be considered throughout the life of the plant.

Based on the review of the D-RAP described in the application for the standard design certification, the staff concludes that the D-RAP meets the requirements set forth by the Commission (in SECY 95-132) for the design phase of the RAP and is therefore acceptable.

This conclusion is based on the following:

- a. A staff review verified that the D-RAP scope, purpose, objectives, and essential elements described in the SSAR include the information required by the Commission.
- b. A staff review verified that the D-RAP described in the SSAR includes sufficient information to establish the organizational and administrative structure needed to implement an effective D-RAP.

- c. A staff review verified the acceptability of the plant-specific PRA required under 10 CFR 52.47(a)(1)(v) and the process used to evaluate, identify, and prioritize the risk significance and relative importance to safety of specific SSCs.
- d. A staff review verified the acceptability of the list of risk significant SSCs that would be subject to D-RAP requirements.
- e. A staff review verified the acceptability of the process used to identify the dominant failure modes of risk-significant SSCs as guided by the PRA and as supplemented by deterministic evaluation and other sources.
- f. A staff review verified the acceptability of anticipated operations, maintenance, and monitoring activities for risk-significant SSCs.

2. For a Combined License (COL) SER that References a Standard Design Certification:

The SAR describes the design reliability assurance program (D-RAP) for the design phase of a COL application. The D-RAP is implemented during the detailed design stage and while specific equipment is being procured, fabricated, constructed and preoperationally tested, to ensure that the reliability assumptions of the PRA will be considered throughout the life of the plant. The applicant for the COL has developed and implemented a process that includes such objectives as monitoring equipment performance and evaluating equipment reliability to provide reasonable assurance that the plant is operated and maintained commensurate with PRA assumptions, thereby ensuring that overall plant safety is not knowingly degraded and remains within acceptable limits.

Based on the review of the D-RAP described in the COL application, the staff concludes that the D-RAP meets the requirements of Appendix _ to 10 CFR Part 52 [enter designated appendix for the certified design] for the design phase of the RAP and is therefore acceptable.

This conclusion is based on the following:

- a. A staff review verified that the D-RAP scope, purpose, objectives, and essential elements described in the SAR include the information required by Appendix _ to 10 CFR Part 52, and to address D-RAP for that portion of the design for which the COL applicant is responsible, .
- b. A staff review verified that the D-RAP includes sufficient information to establish the organizational and administrative structure needed to implement an effective D-RAP.
- c. A staff review verified the acceptability of the plant-specific PRA required under 10 CFR 50.34(f)(1)(i) in combination with 10 CFR 52.79(b) and the process used to evaluate, identify, and prioritize the risk significance and relative importance to safety of specific SSCs.

- d. A staff review verified the acceptability of the list of risk-significant SSCs that would be subject to D-RAP requirements.
- e. A staff review verified the acceptability of the process used to identify the dominant failure modes of risk-significant SSCs as guided by the PRA and as supplemented by deterministic evaluation and other sources.
- f. A staff review verified the acceptability of D-RAP to identify risk significant SSCs from plant- or site-specific information used in the procurement, fabrication, construction, and preoperational testing phases of plant life and from anticipated operations, maintenance and monitoring activities.
- g. The staff has determined that the applicant has committed to develop and implement operational reliability assurance activities by integrating them into maintenance requirements specified in 10 CFR 50.65; quality assurance requirements specified in Appendix B to 10 CFR Part 50; and inservice testing, inservice inspection, and surveillance activities.
- h. The staff has determined that cause determinations and corrective actions for non-safety-related, risk-significant SSC failures resulting from design deficiencies or operational errors can be performed by the COL applicant's processes and procedures.

V. IMPLEMENTATION¹¹

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 52. 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.

VI. REFERENCES¹²

1. 10 CFR 50.34(f), "Additional TMI-related Requirements."
2. 10 CFR 50.65, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants."
3. 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants."

4. 10 CFR Part 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses to Nuclear Power Plants."
5. SECY-89-013, "Design Requirements Related to the Evolutionary Advanced Light-Water Reactors (ALWR)," January 19, 1989.
6. SECY-93-087, "Policy, Technical, and Licensing Issues Pertaining to Evolutionary and Advanced Light-Water Reactor (ALWR) Designs," April 2, 1993.
7. SECY-94-084, "Policy and Technical Issues Associated with Regulatory Treatment of Non-Safety Systems in Passive Plant Designs," March 28, 1994 and related Staff Requirements Memorandum, dated June 30, 1994.
8. SECY-95-132, "Policy and Technical Issues Associated with Regulatory Treatment of Non-Safety Systems (RTNSS) in Passive Plant Designs," May 22, 1995.
9. Regulatory Guide 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," June 1993.
10. NUREG-1070, "NRC Policy on Future Reactor Designs," July 1985.
11. NUREG-1462, "Final Safety Evaluation Report Related to the Certification of the System 80+ Design," August 1994.
12. NUREG-1503, "Final Safety Evaluation Report Related to the Certification of the Advanced Boiling Water Reactor Design," July 1994.

APPENDIX A
TO
SRP SECTION 17.4

DESIGN RELIABILITY ASSURANCE FOR THE COMBINED LICENSE HOLDER
AND RELIABILITY ASSURANCE DURING OPERATIONS¹³

A. Design Reliability Assurance Program (D-RAP) for the COL Holder

Once the COL applicant's D-RAP has been reviewed, approved and documented in the NRC's Safety Evaluation Report (SER) supporting issuance of the combined license, the D-RAP for the COL holder will be implemented during the procurement, fabrication, construction, and preoperational testing stages of plant life.

1. Criteria - The COL holder's D-RAP shall include:
 - a. A description of D-RAP implementation activities to be completed during procurement, fabrication, construction and preoperational testing.
 - b. A process for evaluating modifications to the design of risk significant SSCs during construction that ensures that changes are factored into the PRA or other sources (e.g., deterministic evaluation or industry experience). This includes revising the list of risk significant SSCs under the scope of RAP on the basis of design modifications during construction.
 - c. The Inspection, Tests Analysis and Acceptance Criteria (ITAAC) process is used to verify the adequacy of D-RAP implementation.
 - d. A process is developed to integrate operational reliability assurance activities with other required programs (e.g., maintenance, surveillance testing, inservice testing, inservice inspection and quality assurance).
2. Reviews - The activities described above are verified through the NRC inspection program (i.e., 2512 through 2514 inspection programs). The review of the D-RAP for a COL holder includes NRC inspector verification that the D-RAP approved by the NRC has been implemented and will continue functioning through the construction stage of plant life, as follows:
 - a. The inspector verifies that the COL holder has augmented and completed the D-RAP to include new design information based on site-specific considerations.
 - b. The inspector verifies that risk-significant SSCs have been identified and prioritized; that procurement, fabrication, construction, and preoperational testing have been implemented in accordance with the D-RAP approved for the COL; and that implementation of the design is verified using the inspections, tests, analyses, and acceptance criteria (ITAAC) process.

- c. Based on site-specific information, the inspector verifies that the COL holder has reevaluated and completed the processes used during the standard DC and COL applicant reviews to evaluate, identify, and prioritize the risk significance and relative importance to safety of specific SSCs.
- d. Based on site-specific information, the inspector verifies that the COL holder has reevaluated the list of risk-significant SSCs that are subject to the requirements of the D-RAP.
- e. Based on site-specific information, the inspector verifies that the COL holder reevaluated the process used to determine the dominant failure modes of risk-significant SSCs as determined by the PRA and as supplemented by deterministic evaluation and other sources.
- f. Based on the plant- or site-specific PRA and supplemented by deterministic information, the inspector verifies that the COL holder evaluated the D-RAP for insights into risk associated with anticipated operations, maintenance, procurement, and monitoring activities for risk-significant SSCs.
- g. The inspector verifies that the COL holder develops and implements operational reliability assurance activities by integrating these requirements with maintenance requirements specified in 10 CFR 50.65; quality assurance requirements specified in Appendix B to 10 CFR Part 50; and inservice testing, inservice inspection, and surveillance activities.
- h. The inspector verifies that the COL holder's cause determination and corrective action process for non-safety-related, risk-significant SSC failures resulting from design deficiencies or operational errors can be performed as part of the COL holder's other processes and procedures (e.g., maintenance and quality assurance programs).

B. Reliability Assurance During Operations

RAP objectives during the operational phase of the nuclear power plant should be integrated into the licensee's programs such as: maintenance, quality assurance, inservice testing, inservice inspection and surveillance.

- 1. Criteria - The programs established to implement 10 CFR 50.65, Appendix B to 10 CFR 50, and plant technical specification requirements for inspections, tests and surveillance should accomplish the following objectives:
 - a. Monitoring and corrective action prevent or mitigate failures of safety-related, risk-significant SSCs caused by deficiencies in the maintenance process. Regulatory Guide 1.160 describes a method, acceptable to the staff, for implementation of such programs required by 10 CFR 50.65.

- b. Cause determinations and corrective actions should address consequences of non-safety-related, risk-significant SSC failures caused by design deficiencies or operational errors should be performed by the licensee as part of operational reliability assurance activities. The cause determinations and corrective actions should be commensurate with the safety significance of the failure and should follow the objectives of the quality assurance program. The evaluation should consider the licensee's existing processes and procedures to determine whether operational reliability assurance objectives have been adequately incorporated and implemented.
2. Reviews - This review is performed in accordance with the NRC inspection procedure used to verify compliance with the maintenance rule (i.e., Inspection Procedure 62706) and NRC inspection procedures for quality assurance (i.e., 2515 Inspection Program).
- a. The inspector verifies that the COL holder has developed and implemented operational reliability assurance activities by integrating these activities with maintenance requirements specified in 10 CFR 50.65; quality assurance requirements specified in Appendix B to 10 CFR Part 50; and inservice testing, inservice inspection, and surveillance activities.
 - b. The inspector verifies that cause determinations and corrective actions for non-safety-related, risk-significant SSC failures resulting from design deficiencies or operational errors are performed by the COL holder's processes and procedures.

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SRP Draft Section 17.4
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. | Integrated Impact No. 1515; SECY-95-132, Section E | Developed Areas of Review subsection to outline the requirements for reliability assurance programs and scope of staff review of such programs under this SRP section. |
| 2. | Integrated Impact No. 1515; SECY-95-132, Section E; SRM dated June 30, 1994 | The SRM provided the Commission response to the RAP proposed by the staff, and SECY-95-132 codified the requirements specified by the Commission. |
| 3. | Integrated Impact No. 1515; SECY-95-132, Section E | Identified the NRC review and inspection components of the D-RAP and operational reliability assurance activities as approved by the Commission. |
| 4. | Integrated Impact No. 1515; SECY-95-132, Section E | Identified the review requirement for non-safety-related, risk-significant SSCs under scope of RAP which experience failures during the operations phase of plant life in AREAS OF REVIEW. |
| 5. | Integrated Impact 1515 | Developed Review Interfaces subsection, primarily addressing coordination with the secondary review branch to support the conclusions for this SRP section. |
| 6. | Integrated Impact No. 1515; SECY-95-132, Section E | Included the acceptance criteria approved by the Commission and incorporated by rulemaking into Appendices A and B to 10 CFR Part 52 in ACCEPTANCE CRITERIA. |
| 7. | SRP-UDP format item/Develop technical rationale | Developed "Technical Rationale" subsection within ACCEPTANCE CRITERIA and arranged in numbered paragraph form to describe the bases for citing SECY 95-132, 10 CFR 50.65, and Appendix B to 10 CFR Part 50 as Acceptance Criteria. |
| 8. | Integrated Impact 1515 | Developed Review Procedures for review of applications against the requirements and guidelines outlined in Acceptance Criteria. |
| 9. | SRP-UDP Guidance | Included standard paragraph to address application of the Review Procedures to design certification reviews. |
| 10. | Integrated Impact 1515 | Developed Evaluation Findings for review of applications against the requirements and guidelines outlined in Acceptance Criteria. |
| 11. | SRP-UDP Format | Included Implementation subsection containing standard guidance on implementation of this SRP section. |
| 12. | Integrated Impact 1515 | Developed References subsection to support citation of regulations and other documents in previous subsections. |

SRP Draft Section 17.4
Attachment A - Proposed Changes in Order of Occurrence

| Item | Source | Description |
|-------------|------------------------|--|
| 13. | Integrated Impact 1515 | Developed Appendix with guidance for reviews of D-RAP implementation by a COL holder and of integration of operational reliability activities into other required programs. This guidance was separated from the rest of the section since the reviews are expected to be performed as an inspection activity. |

SRP Draft Section 17.4
Attachment B - Cross Reference of Integrated Impacts

| Integrated Impact No. | Issue | SRP Subsections Affected |
|------------------------------|---|---------------------------------|
| 1515 | Consider developing SRP Section 17.4 to reflect the Commission approved approach to NRC staff review of Reliability Assurance Program requirements. | All |