U.S. NUCLEAR REGULATORY COMMISSION

STANDARD REVIEW PLAN

17.4 RELIABILITY ASSURANCE PROGRAM

REVIEW RESPONSIBILITIES

Primary - Organization responsible for probabilistic risk assessment

Secondary - Technical organizations identified in the review procedures section of this Standard Review Plan (SRP) may be consulted, as needed

I. AREAS OF REVIEW

This SRP section provides the staff guidance on how to perform safety reviews of the reliability assurance program (RAP) description in design certification (DC) and combined license (COL) applications.

The RAP should be implemented according to the recommendations of SECY-95-132, "Policy and Technical Issues Associated with the Regulatory Treatment of Non-safety Systems (RTNSS) in Passive Plant Designs," Item E, "Reliability Assurance Program" (May 22, 1995),approved by the Commission in the staff requirements memorandum (SRM) to SECY-95-132 (June 28, 1995). The RAP applies to those systems, structures, and components (SSCs), both safety-related and nonsafety-related, identified as risk-significant (or significant

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contributors to plant safety). The SSCs within the scope of the RAP (referred to hereafter as "RAP SSCs") are identified by using a combination of probabilistic, deterministic, and other methods of analysis to identify and quantify risk, including probabilistic risk assessment (PRA), severe accident evaluation, assessment of industry operating experience, and expert panel deliberation.

The purpose of the RAP is to provide reasonable assurance of the following:

- A plant is designed, constructed, and operated in a manner that is consistent with the risk insights and key assumptions (e.g., SSC design, reliability, and availability) from the probabilistic, deterministic, and other methods of analysis used to identify and quantify risk.
- The RAP SSCs do not degrade to an unacceptable level of reliability, availability, or condition during plant operations.
- The frequency of transients that challenge these SSCs is minimized.
- These SSCs will function reliably when challenged.

The RAP is implemented in two stages. The first stage, the design reliability assurance program (D-RAP), encompasses reliability assurance activities that occur before initial fuel load. The second stage comprises the reliability assurance activities conducted during the operations phase of the plant's license.

The objective of the D-RAP is to ensure that the plant is designed and constructed in a manner that is consistent with the risk insights and key assumptions (e.g., SSC design, reliability, and availability) from the probabilistic, deterministic, and other methods of analysis used to identify and quantify risk.[1] Therefore, the key features of the D-RAP include the following:

- Programmatic controls[2] that ensure the risk insights and key assumptions are consistent with the plant design and construction. These programmatic controls address organization responsibilities, design control activities, procedures and instructions, records, corrective action and assessment plans, and that the list of RAP SSCs is appropriately developed, maintained, and communicated to the appropriate organizations.
- Quality assurance (QA) programs related to design and construction activities (e.g., design, procurement, fabrication, construction, inspection, and testing activities) to

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[1] D-RAP should not be interpreted as a numerical analysis that would require the estimated reliability of each as-built RAP SSC to be at least equal to the reliability assumed in the PRA. D-RAP should not be based solely on numerical values. For one reason, the estimated reliability of each as-built RAP SSC and the reliability assumed in the PRA may be highly uncertain. For another, the basis for the estimated reliability of each as-built RAP SSC may be the same as, or very similar to, the basis for the reliability assumed in the PRA. Therefore, only calculating and comparing numerical values may not be useful. Finally, additional aspects of D-RAP should be considered in order to address other risk insights and key assumptions, which are not reliability values, from probabilistic, deterministic, and other methods of analysis used to identify and quantify risk (e.g., a PRA key assumption that room temperature will not exceed the limit of the safety injection pumps during the mission time regardless of room cooling availability). Implementation of D-RAP should be a process that ensures the plant is designed and constructed in a manner that is consistent with the risk insights and key assumptions from the analyses used to identify and quantify risk. The RAP provides controls to maintain the reliability and availability of RAP SSCs.

[2] The text "programmatic controls" is synonymous with and replaces the term "essential elements" as described in SECY-95-132.

provide control over activities affecting the quality of the RAP SSCs. The QA controls for safety-related SSCs are established through Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, “Domestic Licensing of Production and Utilization Facilities.” The QA requirements are specified in Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants.” SRP Section 17.5, Part V, "Nonsafety-Related SSC Quality Controls," addresses QA controls for RAP SSCs that are not safety-related.

D-RAP should be implemented through the following phases:

- During the DC phase, the DC applicant is responsible for developing and implementing those portions of the D-RAP that apply to the DC. This effort consists of:

  (1) developing the details of the D-RAP (e.g., scope, purpose, objectives, framework, and phases of the D-RAP) that will be implemented during the DC and COL phases,

  (2) establishing and applying the programmatic controls of D-RAP during DC design activities,

  (3) developing a comprehensive list of RAP SSCs (within the scope of the DC application) using a combination of probabilistic, deterministic, and other methods of analysis used to identify and quantify risk,

  (4) implementing the appropriate QA controls for DC design activities for the nonsafety-related RAP SSCs in accordance with Part V of SRP Section 17.5, and

  (5) proposing a Tier 1 inspections, tests, analyses, and acceptance criteria (ITAAC) for the COL D-RAP.

The Nuclear Regulatory Commission (NRC) verifies the adequacy of the DC applicant’s D-RAP, including its implementation during the DC application phase, through the agency’s review processes for design certification and licensing, which may include audits.

- During the COL application phase, the COL applicant is responsible for developing and implementing those portions of the D-RAP that apply to the COL. This effort consists of:

  (1) establishing and applying the programmatic controls of D-RAP during COL design activities,

  (2) developing a comprehensive list of SSCs within the scope of the COL’s plant-specific D-RAP (i.e., the RAP SSCs identified in the DC, updated using COL plant-specific information) by introducing plant-specific information into the probabilistic, deterministic, and other methods of analysis, and

  (3) implementing the appropriate QA controls for COL design activities for the nonsafety-related RAP SSCs in accordance with Part V of SRP Section 17.5.

  The NRC verifies the adequacy of the COL applicant’s D-RAP, including its implementation during the COL application phase, through the agency’s safety evaluation review process, which may include audits.

In addition, the COL applicant proposes in its application a process for integrating the RAP into operational programs to meet the objectives of the RAP during the operations phase of the plant's license (see discussion below).

- Prior to initial fuel load, the COL licensee is responsible for implementing the D-RAP, which consists of:

  (1) applying the programmatic controls of D-RAP during COL design and construction activities (which includes updating or maintaining the list of RAP SSCs as changes are made to the plant-specific design and PRA),

  (2) implementing the appropriate QA controls for COL design and construction activities for the nonsafety-related RAP SSCs in accordance with Part V of SRP Section 17.5, and

  (3) completing the ITAAC for the D-RAP.

The objective of the RAP during the operations phase of the plant's license is to ensure that the reliability and availability of RAP SSCs are maintained commensurate with their risk significance. The RAP during the operations phase is implemented through regulatory requirements for SSCs, including the areas of: (1) the maintenance rule program established through 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," (2) the QA program for safety-related SSCs established through Appendix B to 10 CFR Part 50, (3) QA controls for nonsafety-related RAP SSCs established in accordance with Part V of SRP Section 17.5, and (4) the inservice inspection, inservice testing, surveillance testing, and maintenance programs. Prior to initial fuel load, the COL licensee identifies dominant failure modes and integrates RAP into operational programs. During the operations phase of the plant, performance and condition monitoring is implemented to provide reasonable assurance that these RAP SSCs do not degrade to an unacceptable level of reliability, availability, or condition.

The specific areas of review are as follows:

- The PRA staff is responsible for reviewing all areas of the RAP associated with the acceptance criteria provided in Subsection II of this SRP section. In addition, while conducting regulatory audits in accordance with Office Instruction NRO-REG-108, "Regulatory Audits," the PRA staff may identify quality-related issues. If this occurs, then the PRA staff should contact the organization responsible for quality assurance to determine if an inspection should be conducted. Technical organizations identified in the review procedures section of this SRP may be consulted as needed.

- Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC). For DC and COL reviews, the staff reviews the applicant's proposed ITAAC associated with the D-RAP related to this SRP section in accordance with SRP Section 14.3, "Inspections, Tests, Analyses, and Acceptance Criteria." The staff recognizes that they cannot complete the review of ITAAC until after the rest of this portion of the application has been reviewed against acceptance criteria contained in this SRP section.

- COL Action Items and Certification Requirements and Restrictions. For a DC application, the review will also address COL action items and requirements and restrictions (e.g., interface requirements and site parameters).

  For a COL application referencing a DC, a COL applicant must address COL action items (referred to as COL license information in certain DCs) included in the referenced DC. Additionally, a COL applicant must address requirements and restrictions (e.g., interface requirements and site parameters) in the referenced DC.

Review Interfaces

Other SRP sections interface with this section as follows:

1. The following aspects of the risk evaluations and severe accident evaluations are reviewed in SRP Section 19.0:

   - the probabilistic and severe accident evaluation methods
   - the risk insights and key assumptions
   - quality control, technical adequacy, and maintaining or upgrading of the PRA

2. The applicant's program for RTNSS, which is reviewed under SRP Section 19.3, identifies RTNSS SSCs for passive plant designs. These RTNSS SSCs are within the scope of the RAP.

3. The applicant's QA program description, which is reviewed under SRP Section 17.5, and maintenance rule program, which is reviewed under SRP Section 17.6, address reliability assurance activities associated with reactor design, construction, and operation.

4. Additional guidance on ITAAC is provided in SRP Section 14.3.

II. ACCEPTANCE CRITERIA

Requirements

Acceptance criteria are based on meeting the relevant requirements of the following Commission regulations:

1. Each design-specific rulemaking incorporates a requirement to provide a RAP. This becomes part of an application for a COL that references a certified design. The staff will verify the D-RAP using the ITAAC process. This is in accordance with Commission policy documented in the SRM for SECY-95-132, "Policy and Technical Issues Associated with the Regulatory Treatment of Non-Safety Systems (RTNSS) in Passive Plant Designs," Item E, “Reliability Assurance Program.”

2. 10 CFR 52.47(b)(1), which requires that a DC application contain the proposed ITAAC that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a facility that incorporates the design certification has been constructed and will be operated in

conformity with the design certification, the provisions of the Atomic Energy Act (AEA) and NRC regulations.

3. 10 CFR 52.80(a), which requires that a COL application contain the proposed inspections, tests, and analyses, including those applicable to emergency planning, that the licensee shall perform, and the acceptance criteria that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, the facility has been constructed and will be operated in conformity with the COL, the provisions of the AEA, and NRC regulations.

SRP Acceptance Criteria

Specific SRP acceptance criteria acceptable to meet the relevant requirements of the NRC regulations identified above are as follows for the review described in this SRP section. The SRP is not a substitute for the NRC regulations, and compliance with it is not required. However, an applicant is required to identify differences between the design features, analytical techniques, and procedural measures proposed for its facility and the SRP acceptance criteria and evaluate how the proposed alternatives to the SRP acceptance criteria provide acceptable methods of compliance with the NRC regulations.

Section A below applies to a DC application, and Section B applies to a COL application referencing a certified design. The staff will review an application for a COL that does not reference a certified design against the criteria in both sections.

A. DESIGN CERTIFICATION APPLICATION

A.1 Description of Design Reliability Assurance Program

The application should describe the details of the D-RAP that will be implemented during the DC and COL design and construction activities preceding initial fuel load. This description should include a discussion of the scope, purpose, objectives, framework, and phases of the D-RAP.

In addition, the application should describe who is responsible for implementing the various phases of the D-RAP. The staff should confirm that the scope, purpose, and objectives of the applicant's D-RAP are consistent with those described in Subsection I of this SRP section. The staff should use the information provided in Subsection I of this SRP section to facilitate the acceptability determination of the D-RAP description.

A.2 Programmatic Controls of Design Reliability Assurance Program

The objective of this review is to verify that the applicant has established and applied the appropriate D-RAP programmatic controls to support DC design activities. These programmatic controls are processes that ensure the risk insights and key assumptions from probabilistic, deterministic, and other methods of analysis used to identify and quantify risk are consistent with the plant design. These programmatic controls address organization responsibilities, design control activities, procedures and instructions, records, corrective action and assessment plans, and that the list of RAP SSCs is appropriately developed, maintained, and communicated to the appropriate organizations. The staff

should verify that the application adequately addresses the following programmatic controls of D-RAP. If needed, the staff can perform one or more audits to verify that the applicant appropriately applied these programmatic controls during DC design activities.

1. Organizations

   - The application should identify the organizations responsible for establishing the scope of the D-RAP, as well as those that develop, coordinate, or implement D-RAP activities (e.g., those organizations associated with design, PRA, and QA). These include supporting organizations such as architect-engineers, if any are involved.

   - The application should describe how these organizations interface to ensure that the plant will be designed in a manner that is consistent with the risk insights and key assumptions from probabilistic, deterministic, and other methods of analysis used to identify and quantify risk.

2. Design Control

   - The application should describe how the design change control process provides a mechanism to notify the appropriate organizations of plant changes (e.g., changes to the design, programs, and procedures) that could affect the RAP SSCs (e.g., the design, operation, testing, and maintenance of these SSCs) or relevant D-RAP inputs (e.g., the list of RAP SSCs, PRA models, risk insights, and key assumptions).

   - The application should describe how the design change control process provides a mechanism to update relevant D-RAP inputs to account for these plant changes.

   - The application should describe how the design change control process provides a mechanism to notify the appropriate organizations of changes to relevant D-RAP inputs.

   - The application should describe the quality controls that ensure relevant D-RAP inputs (e.g., list of RAP SSCs, PRA models, risk insights, and key assumptions) meet the predetermined requirements, recommendations, or specifications. It would be acceptable for the application to cite the specific sections or chapters of the application where the quality controls for D-RAP inputs are described (e.g., describing the quality controls of the PRA in Chapter 19 of the application in accordance with the provisions in SRP Section 19.0, “Probabilistic Risk Assessment and Severe Accident Evaluation for New Reactors,” and citing the description in SRP Section 17.4 of the application).

   - The application should describe the configuration control process for maintaining the list of RAP SSCs.

3. The application should describe the controls for procedures and instructions used for developing, coordinating, and implementing D-RAP activities. The applicant should prescribe D-RAP activities by detailed procedures or instructions to direct the performance of these activities.

4. The application should describe the corrective action process applied to D-RAP activities. The applicant should establish corrective action measures to ensure that D-RAP activities determined to be in error, deficient, or nonconforming are promptly identified, reported, and corrected. For example, information used to identify RAP SSCs may be determined to be incorrect, or there may be a failure to communicate a key assumption to the design organization.

5. The application should describe the controls for records associated with D-RAP activities. The applicant should prepare and maintain records to demonstrate that all requirements for D-RAP activities have been met.

6. The application should describe the audit plans for D-RAP activities.

A.3 Methodology for Identifying Systems, Structures, and Components within the Scope of the Reliability Assurance Program

The scope of the RAP includes safety-related and nonsafety-related SSCs identified as risk-significant (or significant contributors to plant safety). Therefore, the application should describe the methodology for identifying the SSCs within the scope of the RAP. This methodology should be based on a combination of probabilistic, deterministic, and other methods of analysis used to identify and quantify risk and include, but not be limited to, the use of information obtained from the following sources:

- quantitative risk evaluations based on fault trees and event trees
- other forms of risk evaluation, which may be quantitative or qualitative (e.g., fire-induced vulnerability evaluation or seismic margins analysis)
- severe accident evaluations
- industry wide operating experience
- expert panel(s)

For example, the applicant may identify the RAP SSCs based on: risk insights and key assumptions from severe accident evaluations; risk insights, importance measures and key assumptions from full power and low-power/shutdown risk evaluations for internal events, fire, seismic, flooding and other external events; consideration of SSCs implicitly assumed in important operator actions or initiating events that are significant contributors to risk; consideration of industry operating experience; and use of expert panels in reviewing the information associated with risk significance determinations.

Risk evaluations should cover the full spectrum of potential events and the range of plant operating modes considered in SRP Section 19.0. This ranges from full power to shutdown and all anticipated maintenance conditions. The applicant should consider beyond-design-basis accidents resulting in core damage and large releases of radioactivity into containment and the environment.

The applicant should also evaluate for inclusion in the RAP those SSCs that are not modeled in the PRA (e.g., by using deterministic or other methods of analysis). For passive plant designs, the applicant should include within the scope of the RAP all SSCs subject to RTNSS.

If the applicant excludes certain types of risk-significant SSCs from the RAP (e.g., passive SSCs such as pipes, ducts, electrical cables), then the application should provide a rationale for excluding these SSCs and address how other programs and requirements ensure that these SSCs do not degrade to an unacceptable level of reliability, availability, or condition during plant operations and will function reliably when challenged.

A.4 Expert Panels

The application should describe the roles and responsibilities of any expert panels used because they play an important role in reviewing the information associated with risk-significance determinations and could compensate for the limitations of the PRA.

The application should describe the qualification requirements for members of expert panels used. To evaluate and review information associated with determinations of risk significance, an expert panel should comprise members knowledgeable of the plant and whose collective expertise includes, at a minimum, PRA, safety analysis, plant operations, maintenance, design engineering, and system engineering. Expert panel members should have a level of knowledge sufficient to evaluate and approve risk significance determinations using both probabilistic and deterministic information.

A.5 Systems, Structures, and Components within the Scope of the Reliability Assurance Program

The application should contain a comprehensive list of RAP SSCs, within the scope of the DC application, based on the methodology that meets acceptance criterion A.3 of this SRP section. In addition, the following should be included:

- A description of the basis or bases for including each RAP SSC.

- Clear identification of the RAP SSCs, including text descriptions and specific SSC identification numbers when applicable, to communicate the RAP SSCs effectively and accurately to the organizations that implement the D-RAP.

- Clear identification of the boundaries of the RAP SSCs (e.g., electrical, mechanical, and instrumentation and control boundaries) to provide a common basis for understanding the RAP SSCs (this is important

because RAP SSCs are subject to QA controls). It would be acceptable for the application to cite the specific documents where these SSC boundaries are defined (e.g., the section of the application that meets the provisions of SRP Section 3.2.2, “System Quality Group Classification,” may describe these boundaries for some RAP SSCs).

A.6 Process for Determining Dominant Failure Modes

The application should propose a process for determining dominant failure modes of RAP SSCs. This process should incorporate industry experience, analytical models, and applicable requirements (e.g., operating experience, PRA importance analyses, root cause analyses, failure modes and effects analyses).

A.7 Quality Assurance Associated with Design Activities

For nonsafety-related RAP SSCs, the application should specify the QA controls for DC design activities in accordance with the provisions in Part V, "Nonsafety-Related SSC Quality Controls," of SRP Section 17.5. The staff will conduct the review of these QA controls under Part V of SRP Section 17.5. The staff should ensure that SRP Section 17.4 of the application cites the specific sections or chapters of the application where these QA controls are described.

A.8 ITAAC for Design Reliability Assurance Program

The application should specify an ITAAC for the D-RAP to ensure that appropriate controls are applied to the RAP SSCs early in the COL design phase. This ITAAC ensures that the design bases and other requirements have been correctly translated into the detailed design documents used for procurement and construction of every RAP SSC. The D-RAP ITAAC provides assurance to the staff that appropriate controls were imposed during the development of design products for RAP SSCs. Subsequent activities, including system ITAAC, are predicated on the assumption that those products are correct.

This ITAAC should include all RAP SSCs so that no RAP SSC is overlooked. The staff considers the scope of this ITAAC fixed when the COL is issued. Subsequent changes to the list can only occur through D-RAP activities, providing reasonable assurance that appropriate controls are applied to SSCs that are added to the scope of RAP. Such modifications may change the particular reliability assurance activities that apply to a particular SSC (e.g., a change in safety classification); in that case, the acceptance criterion would simply be met by a different D-RAP activity.

Other staff inspections are relied upon to provide ongoing confidence that the D-RAP activities are effective (e.g., staff inspections to verify implementation of 10 CFR Part 50, Appendix B requirements and staff inspections of quality controls applied to SSCs that are not safety-related). These obviate the need for an ITAAC to confirm that the programmatic controls of D-RAP are accomplished. Other ITAAC will confirm that the construction is correct and the as-built configuration is consistent with the approved design documents.

An acceptable D-RAP ITAAC would include a design commitment that the design of RAP SSCs is consistent with the risk insights and key assumptions from

probabilistic, deterministic, and other methods of analysis used to identify and quantify risk (e.g., SSC design, reliability, and availability). An analysis would demonstrate that the initial design of all RAP SSCs has been completed in accordance with the D-RAP. The staff considers the initial design to be complete when approved for procurement or for construction by the responsible design organization of a COL licensee. The acceptance criterion for the D-RAP ITAAC should ensure that the initial design of all RAP SSCs identified at the time of the COL issuance has been subject to the applicable reliability assurance activities of the D-RAP.

A.9 Combined License Applicant Action Items

The DC application should include the following COL action items:

1. A COL applicant referencing a certified design should update the description of the D-RAP to include relevant site- and plant-specific information (e.g., design, program, procedural, and organizational information). This includes identifying the SSCs within the scope of the plant-specific RAP (i.e., the RAP SSCs identified in the DC, updated using COL site- and plant-specific information) and establishing the programmatic controls of D-RAP to be applied during the COL design and construction activities prior to initial fuel load.

2. A COL applicant referencing a certified design should specify appropriate QA controls for the nonsafety-related RAP SSCs in accordance with the provisions in Part V, "Nonsafety-Related SSC Quality Controls," of SRP Section 17.5. This includes providing corrective actions for potential design and pre-operational errors that could degrade nonsafety-related RAP SSCs.

3. A COL applicant referencing a certified design should propose a process for integrating the RAP into operational programs (e.g., maintenance rule program, QA program, inservice inspection, inservice testing, surveillance testing, and maintenance programs). The process should also address the (1) establishment of reliability, availability, or condition performance goals for the RAP SSCs, (2) establishment of performance and condition monitoring requirements to provide reasonable assurance that RAP SSCs do not degrade to an unacceptable level of reliability, availability, or condition during plant operations, (3) for nonsafety-related RAP SSCs, establishment of QA controls for activities during the operations phase in accordance with the provisions in Part V of SRP Section 17.5, and (4) consideration of dominant failure modes of RAP SSCs in meeting the objectives of the RAP during plant operation.

B. COMBINED LICENSE APPLICATION

B.1 Plant-Specific Reliability Assurance Program

The applicant should appropriately update the description of the D-RAP to include relevant COL site- and plant-specific information (e.g., design, program,

procedural, and organizational information). This includes (1) identifying the SSCs within the scope of the plant-specific RAP (i.e., the RAP SSCs identified in the DC, updated using COL site- and plant-specific information), and (2) establishing the programmatic controls of D-RAP (see Section A.2) that are applied during the COL design and construction activities prior to initial fuel load. These programmatic controls are processes that ensure the plant will be designed and constructed in a manner that is consistent with the risk insights and key assumptions from probabilistic, deterministic, and other methods of analysis used to identify and quantify risk. If needed, the staff can perform one or more audits to verify that the applicant appropriately applied the programmatic controls of D-RAP during design activities in the COL application phase.

B.2 Quality Assurance Associated with Design and Construction Activities

For the nonsafety-related RAP SSCs, the application should specify the QA controls for COL design and construction activities (which include establishing appropriate corrective actions for potential design and pre-operational errors that could degrade these SSCs) in accordance with the provisions in Part V, "Nonsafety-Related SSC Quality Controls," of SRP Section 17.5. The staff will conduct the review of these QA controls under Part V of SRP Section 17.5. The staff should ensure that SRP Section 17.4 of the application cites the specific sections or chapters of the application where these QA controls are described.

B.3 Integration of Reliability Assurance Program into Operational Programs

The application should propose a process for integrating the RAP into operational programs. The application should cite the specific sections or chapters of the application where applicable operational programs are described (including the proposed implementation milestones) and may also identify other applicable programs, if any (e.g., a RTNSS availability controls program).

The process proposed by the applicant should also address the following:

1. Establishment of reliability, availability, or condition performance goals for the RAP SSCs. One acceptable method for establishing these performance goals is by implementation of the maintenance rule following the guidance contained in Regulatory Guide (RG) 1.160, “Monitoring the Effectiveness of Maintenance at Nuclear Power Plants” (RG 1.160), provided that all RAP SSCs are included in the scope of maintenance rule and categorized as having high safety significance (HSS).

2. Establishment of performance and condition monitoring requirements to provide reasonable assurance that RAP SSCs do not degrade to an unacceptable level of reliability, availability, or condition during plant operations.[3]

[3] The reliability performance monitoring does not need to statistically verify the numerical values used in the PRA. However, it should provide a feedback mechanism for periodically evaluating equipment reliability and risk significance based on actual equipment, train, or system performance and other operational history.

3. For the nonsafety-related RAP SSCs, establishment of QA controls for activities during the operations phase (which include establishing appropriate corrective actions for potential design and operational errors that could degrade these SSCs) in accordance with the provisions in Part V, "Nonsafety-Related SSC Quality Controls," of SRP Section 17.5. The staff will conduct the review of these QA controls under Part V of SRP Section 17.5.

4. Consideration of dominant failure modes of RAP SSCs, which are determined in accordance with the process established under the referenced DC, as it relates to maintaining the reliability and availability of RAP SSCs commensurate with their risk significance. For example, dominant failure modes could be used to facilitate the identification of specific reliability assurance activities or strategies (e.g., inservice inspection, inservice testing, surveillance testing, monitoring, and maintenance) to maintain equipment performance consistent with the risk insights and key assumptions for the RAP SSCs.

   One acceptable method for integrating the RAP into operational programs is by implementation of the following operational programs: (1) maintenance rule program consistent with RG 1.160, with all RAP SSCs being included in the scope of maintenance rule and categorized as HSS, (2) QA program for safety-related SSCs established through Appendix B to 10 CFR Part 50 requirements, (3) QA controls for nonsafety-related RAP SSCs established in accordance with Part V of SRP Section 17.5 and (4) inservice inspection, inservice testing, surveillance testing, and maintenance programs for the RAP SSCs to maintain equipment performance consistent with risk insights and key assumptions and to address dominant failure modes.

B.4 ITAAC for Design Reliability Assurance Program

In accordance with SRP Section 14.3, “Inspections, Tests, Analyses, and Acceptance Criteria,” for a COL application referencing a DC, the staff should confirm that the application specifies the D-RAP ITAAC as approved in the DC (see Section A.8 of this SRP section).

Technical Rationale

The technical rationale for application of these acceptance criteria to the areas of review addressed by this SRP section is discussed in the following paragraphs.

The RAP is implemented in accordance with the Commission policy described in SECY-95-132, Item E. The requirement to provide a RAP is codified by incorporation within the design-specific rulemaking for a DC applicant. Meeting this requirement provides assurance that (1) the plant is designed, constructed, and operated in a manner that is consistent with the risk insights and key assumptions from the probabilistic, deterministic, and other methods of analysis used to identify and quantify risk, (2) the RAP SSCs do not degrade to an unacceptable level of reliability, availability, or condition during plant operations, (3) the frequency of transients that challenge these SSCs is minimized, and (4) these SSCs will function reliably when challenged.

SECY-95-132 describes the details of RAP, such as the scope and purposes of RAP, the different stages of RAP, and the RAP information to be included in an application for a new reactor and provides guidance for developing an effective RAP. The acceptance criteria and review process presented in this SRP section are developed primarily from the guidance contained in SECY-95-132. The acceptance criteria for the methodology that is used to identify the RAP SSCs is developed from guidance in SECY-95-132 and SRP Section 19.0.

III. REVIEW PROCEDURES

For review of a DC or COL application, the staff should use the following procedures, as appropriate, to verify the acceptability of the applicant's RAP description. For review of a COL application, the scope of the review is dependent on whether the COL applicant references a DC. These review procedures are based on the identified SRP acceptance criteria. For deviations from these acceptance criteria, the staff should review the applicant's evaluation of how the proposed alternatives provide an acceptable method of meeting the relevant acceptance criteria identified in Subsection II of this SRP section.

The staff should also consider the appropriateness of the identified COL action items. The staff may identify additional COL action items; however, to ensure these COL action items are addressed during a COL application, they should be added to the DCD. The staff should document any NRC audits performed in audit reports so that they may be referenced in the staff's Safety Evaluation Report (SER). For additional information, the staff should consider the information provided in SRP Section 17.4 of previous SERs for advanced reactors. Through the review of information provided by the applicant and of applicable NRC audit reports, a conclusion is made regarding the acceptability of the applicant's RAP.

The following regulatory guides provide information on categorizing risk significance of SSCs and can facilitate the review of the methodology for identifying SSCs within the scope of the RAP under acceptance criteria A.3 in Subsection II of this SRP section:

- RG 1.174, "An Approach for using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," and

- RG 1.201, "Guidelines for Categorizing Structures, Systems, and Components in Nuclear Power Plants According to Their Safety Significance."

The PRA staff should request assistance from other technical organizations, as necessary, to participate in the review of the list of RAP SSCs and the evaluation methodology (e.g., review of RAP SSCs identified from deterministic methods).

To facilitate the review of the process for integrating the RAP into operational programs, the PRA staff should interface, as necessary, with the organizations responsible for reviewing these operational programs.

For review of both DC and COL applications, SRP Section 14.3 should be followed for the review of the proposed D-RAP ITAAC. SRP Section 14.3 references SRP Section 17.4 for specific review guidance on D-RAP ITAAC. Therefore, the proposed D-RAP ITAAC should be consistent with the discussion of D-RAP ITAAC in Subsection II of SRP Section 17.4. The review of the proposed D-RAP ITAAC cannot be completed until after completing the review of RAP in accordance with this document. It should be noted that SRP Section 14.3 provides general guidance for reviewing both system and non-system based ITAAC. As such, the staff

should select material from SRP Section 14.3 as may be appropriate to support the review of the D-RAP ITAAC.

IV. EVALUATION FINDINGS

The staff should provide a summary description of the applicant's RAP. The staff should also identify the RAP information docketed by the applicant and related NRC audit reports.

The staff verifies that the applicant has provided sufficient information and that the review and calculations (if applicable) support conclusions of the following type to be included in the staff's SER. The staff also states the bases for those conclusions. The conclusion in the SER should include the following:

1. All SRP acceptance criteria are satisfied, using the methods described in this SRP section.

2. Alternative means of satisfying SRP acceptance criteria, if used, are acceptable.

3. Justifications for deviations from SRP acceptance criteria, if used, are acceptable.

For COL reviews, the findings will summarize the staff's evaluation of the process for integrating RAP into operational programs and include a description of those operational programs that are not fully described in other sections or chapters of the SER.

For DC and COL reviews, the findings will also summarize the staff's evaluation of requirements and restrictions (e.g., interface requirements and site parameters) and COL action items relevant to this SRP section.

In addition, to the extent that the review is not discussed in other SER sections, the findings will summarize the staff's evaluation of the ITAAC for D-RAP, including design acceptance criteria, as applicable.

V. IMPLEMENTATION

The staff will use this SRP section in performing safety evaluations of the RAP description in DC and COL applications submitted by applicants pursuant to 10 CFR Part 52. Except when the applicant proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the staff will use the method described herein to evaluate conformance with Commission regulations.

The provisions of this SRP section apply to reviews of applications submitted six months or more after the date of issuance of this SRP section, unless superseded by a later revision.

VI. REFERENCES

1. 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants."

2. 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants."

3. 10 CFR Part 52, “Licenses, Certifications, and Approvals for Nuclear Power Plants.”

4. 10 CFR 50.65, “Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants.”

5. 10 CFR Part 50, Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants.”

6. Nuclear Management and Resources Council, Inc. (NUMARC) 93-01, “Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants.” Washington, DC, August 1991, (ADAMS Accession No. 07157052500), May 2007.

7. RG 1.206, “Combined License Applications for Nuclear Power Plants (LWR Edition),” U.S. Nuclear Regulatory Commission, Washington, DC.

8. RG 1.160, “Monitoring the Effectiveness of Maintenance at Nuclear Power Plants,” U.S. Nuclear Regulatory Commission, Washington, DC.

9. RG 1.174, “An Approach for using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis,” U.S. Nuclear Regulatory Commission, Washington, DC.

10. RG 1.201, “Guidelines for Categorizing Structures, Systems, and Components in Nuclear Power Plants According to Their Safety Significance,” U.S. Nuclear Regulatory Commission, Washington, DC.

11. SECY-95-132, “Policy and Technical Issues Associated with the Regulatory Treatment of Non-safety Systems (RTNSS) in Passive Plant Designs,” (ADAMS Accession No. ML003708005), U.S. Nuclear Regulatory Commission, Washington, DC, dated May 22, 1995.

12. SRM on SECY-95-132, “Policy and Technical Issues Associated with the Regulatory Treatment of Non-safety Systems (RTNSS) in Passive Plant Designs,” (ADAMS Accession No. ML003708019), U.S. Nuclear Regulatory Commission, Washington, DC, dated June 28, 1995.

PAPERWORK REDUCTION ACT STATEMENT

The information collections contained in the Standard Review Plan are covered by the requirements of 10 CFR Part 50 and 10 CFR Part 52, and were approved by the Office of Management and Budget, approval numbers 3150-0011 and 3150-0151.

PUBLIC PROTECTION NOTIFICATION

The NRC may not conduct or sponsor, and a person is not required to respond to, a request for information or an information collection requirement unless the requesting document displays a currently valid OMB control number.

SRP Section 17.4
Description of Changes

Section 17.4 "Reliability Assurance Program"

Standard Review Plan (SRP), Section 17.4, "Reliability Assurance Program," of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," provides guidance to the NRC staff in performing design certification (DC) and combined license (COL) application reviews of the RAP. Based on the lessons learned and insights gained from the reviews of DC and COL applications, the NRC staff issued DC/COL-ISG-018, "Interim Staff Guidance on Standard Review Plan, Section 17.4 - Reliability Assurance Program" (ADAMS Accession No. ML103010113), to revise the review responsibilities and further clarify the acceptance criteria and evaluation findings contained in SRP Section 17.4, Revision 0, dated March 2007 (ADAMS Accession No. ML063190018). Revision 1 of SRP Section 17.4 incorporates the contents of DC/COL-ISG-018 into the guidance previously provided in Revision 0 of this SRP and further clarifies the "Review Procedures" subsection of this SRP. More specifically, the following summarizes the changes incorporated in SRP Section 17.4, Revision 1.

(a) The text in the "Review Responsibilities" subsection of SRP Section 17.4, Revision 0 is replaced by the review responsibilities in DC/COL-ISG-018. In addition, the technical organizations identified in the "Review Procedures" subsection of SRP Section 17.4, Revision 1 may be consulted, as needed, and therefore are listed as a secondary reviewers.

(b) The text in the "Areas of Review" subsection of SRP Section 17.4, Revision 0 is replaced by the areas of review in DC/COL-ISG-018.

(c) The text in the "Acceptance Criteria" subsection of SRP Section 17.4, Revision 0 is replaced by the acceptance criteria in DC/COL-ISG-018.

(d) Discussion of the following areas is added to the "Review Procedures" subsection of SRP Section 17.4:

- Documentation of NRC audits.
- Regulatory guides that provide information on categorizing risk significance of systems, structures, and components (SSCs) which can facilitate the review of the methodology for identifying SSCs within the scope of the RAP.
- Participation of other technical organizations in the review of the list of RAP SSCs and the evaluation methodology.
- Interfacing with other organizations to review the process for integrating RAP into operational programs.
- Procedure for reviewing the proposed Tier 1 inspections, tests, analyses, and acceptance criteria for RAP.

(e) The text in the "Evaluation Findings" subsection of SRP Section 17.4, Revision 0 is replaced by the evaluation findings in DC/COL-ISG-018.

(f) The text in the “References” subsection of SRP Section 17.4, Revision 0 is replaced by the references in DC/COL-ISG-018, and several additional references are included.

(g) The term “programmatic controls” in SRP Section 17.4, Revision 1 is synonymous with and replaces the terms “quality elements” in SRP Section 17.4, Revision 0 and “essential elements” in SECY-95-132 and DC/COL-ISG-018.

(h) Editorial changes are made throughout SRP Section 17.4, where necessary, to provide additional clarity.

The NRC staff has determined that SRP Section 17.4, Revision 1 does not reflect any new NRC staff positions and should not impose any new requirements on the RAP contained in DC and COL application submittals.