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Risk-Informed Decisionmaking: Technical Specifications

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STANDARD REVIEW PLAN

RISK-INFORMED DECISION MAKING: TECHNICAL SPECIFICATIONS

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STANDARD REVIEW PLAN

16.1 RISK-INFORMED DECISION MAKING: TECHNICAL SPECIFICATIONS

INTRODUCTION

Section 182a of the Atomic Energy Act requires that applicants for nuclear power plant operating licenses shall state:

[S]uch technical specifications, including information of the amount, kind, and source of special nuclear material required, the place of the use, the specific characteristics of the facility, and such other information as the Commission may, by rule or regulation, deem necessary in order to enable it to find that the utilization . . . of special nuclear material will be in accord with the common defense and security and will provide adequate protection to the health and safety of the public. Such technical specifications shall be a part of any license issued.

In 10 CFR 50.36, the Commission established its regulatory requirements related to the content of technical specifications (TS). In doing this, the Commission placed emphasis on those matters related to the prevention of accidents and the mitigation of accident consequences; the Commission noted that applicants were expected to incorporate into their TS "those items that are directly related to maintaining the integrity of the physical barriers designed to contain radioactivity" (33 FR 18610). Pursuant to 10 CFR 50.36, TS are required to contain items in the following five specific categories: (1) safety limits, limiting safety system settings and limiting control settings; (2) limiting conditions for operation; (3) surveillance requirements; (4) design features; and (5) administrative controls.

Since the mid-1980s, the NRC has been reviewing and granting improvements to TS based, at least in part, on probabilistic risk assessment (PRA) insights. Some of these improvements have been proposed by the Nuclear Steam Supply System (NSSS) owners groups to apply to an entire class of plants. Many others have been proposed by individual licensees. Typically, the proposed improvements involved a relaxation of one or more allowed outage times (AOTs) or surveillance test intervals (STIs) in the TS.

In its July 22, 1993, final policy statement on TS improvements, the Commission stated that it:

* . . . expects that licensees, in preparing their Technical Specification related submittals, will utilize any plant-specific PSA or risk survey and any available literature on risk insights and PSAs . . . Similarly, the NRC staff will also employ

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risk insights and PSAs in evaluating Technical Specifications related submittals. Further, as a part of the Commission's ongoing program of improving Technical Specifications, it will continue to consider methods to make better use of risk and reliability information for defining future generic Technical Specification requirements."

The Commission reiterated this point when it issued the revision to 10 CFR 50.36 in July 1995.

Risk-informed TS submittals primarily deal with permanent changes to TS requirements, i.e., as the name suggests, the requirement is permanently changed when approved, and is applicable for all future occurrences. A one-time change to a TS requirement, where a different requirement is requested for a particular incident, also can use risk-informed evaluations, but it involves slightly different considerations. This Standard Review Plan section focuses on permanent risk-informed changes to TS involving changes in AOTs or STIs. In addition, general guidance for reviewing risk-informed regulatory applications can be found in SRP Chapter 19.0, "Use of Probabilistic Risk Assessment in Plant-Specific, Risk-Informed Decision Making: General Guidance."

REVIEW RESPONSIBILITIES

Primary responsibility for evaluating the technical bases for TS modifications resides with the lead technical branch, as specified in SRP Chapter 16.0, "Technical Specifications." Other branches with review responsibility for risk-informed TS change requests include the Probabilistic Safety Assessment Branch, the Technical Specifications Branch, and the appropriate Project Directorate.

I AREAS OF REVIEW

NRC Regulatory Guide DG-1061, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Current Licensing Basis," (Reference 15) describes a four-element approach for evaluating risk-informed regulatory changes. The individual elements are described in detail in Chapter 2 of Regulatory Guide DG-1061. The areas of review for each of these elements for risk-informed TS are discussed below.

Element 1: Define the Proposed Change

The licensee needs to explicitly identify the particular technical specifications that are affected by the proposed change, and identify available engineering studies, methods, codes, and PRA studies that are related to the proposed change. The licensee should consider how such changes will affect conformance with the plant's current licensing basis (CLB)¹. The licensee should also determine how the affected systems, components, or parameters are modeled in the PRA and should identify all elements of the PRA that the change impacts. The licensee should utilize PRA insights to both determine the impact of the change on plant safety and to understand the impact on the licensing basis. Section III.A provides a description of the review process for Element 1.

Element 2: Conduct Engineering Evaluations

The licensee should examine the proposed change to verify that it does not compromise the intent of existing applicable rules and regulations. In addition, the licensee should determine how the change impacts defense in depth aspects of the plant's design and operation, and should determine the adequacy of safety margins following the proposed change. Finally, the licensee should consider how plant and industry operating experience relates to the proposed change, and what potential compensatory measures could be taken to offset any negative impact from the proposed change.

The licensee should also perform risk-informed evaluations of the proposed change to determine the impact on plant risk. The evaluation should explicitly consider the specific plant equipment affected by the proposed TS changes and the effects of the proposed change on the functionality,

¹This SRP adopts the 10 CFR Part 54 definition of current licensing basis. That is, "Current Licensing Basis (CLB) is the set of NRC requirements applicable to a specific plant and a licensee's written commitments for ensuring compliance with and operation with in applicable NRC requirements and the plant-specific design basis (including all modifications and additions to such commitments over the life of the license) that are docketed and in effect. The CLB includes the NRC regulations contained in 10 CFR Parts 2, 19, 20, 21, 26, 30, 40, 51, 54, 55, 70, 72, 73, 100 and appendices thereto; orders, license conditions, exemptions; and technical specifications. It also includes the plant-specific design-basis information defined in 10 CFR 50.2 as documented in the most recent final safety analysis report (FSAR) as required by 10 CFR 50.71 and the licensee's commitments remaining in effect that were made in docketed licensing correspondence such as licensee responses to NRC bulletins, generic letters, and enforcement actions, as well as licensee commitments documented in NRC safety evaluations or licensee event reports."

reliability, and availability of the affected equipment. The necessary scope and level of detail of the analysis depends upon the particular systems and functions that are affected, and it is recognized that there will be cases for which a qualitative, rather than quantitative, risk analysis is acceptable.

The licensee should provide the rationale that supports the acceptability of the proposed changes by integrating probabilistic insights with traditional considerations to arrive at final determination of risk. The determination should consider the continued conformance to existing applicable rules and regulations, the adequacy of the traditional engineering evaluation of the proposed change, and the change in plant risk relative to the acceptance guidelines. All of these areas should be adequately addressed before the change is considered acceptable. Section III.B provides a description of the review process for Element 2.

Element 3: Develop Implementation and Monitoring Program

The licensee should develop an implementation and performance monitoring program formulated to confirm the assumptions and analyses that were conducted to justify the CLB change, to ensure that plant operational safety can be maintained consistent with the assumptions in the PRA analysis of Element 2, and to ensure that the process provides criteria for taking actions based on the results of the monitoring efforts. Section III.C provides a description of the review process for Element 3.

Element 4: Submit Proposed Change

The final element involves the licensee's documentation of the analyses and submittal of the request. The submittal will be reviewed by NRC according to this standard review plan. Section III.D provides a description of the documentation guidelines for Element 4.

II. ACCEPTANCE GUIDELINES

For each TS application, the reviewers should ensure that each of the five key principles of the staff's philosophy of risk-informed decision making is met. These principles are described in Chapter 2 of Regulatory Guide DG-1065, "An Approach For Plant-Specific, Risk-Informed Decision Making: Technical Specifications." The following sections provide more specific guidelines on meeting these principles.

A. Traditional Engineering Guidelines

General traditional engineering acceptance guidelines can be found in SRP Chapter 19.0, Section II.3.1, "Evaluation of Defense-in-Depth Attributes and Safety Margins." Additional guidance as to how these acceptance guidelines relate to TS change requests is provided here.

1. Defense-in-Depth

The licensee should assess whether the proposed TS change meets the defense-in-depth principle (principle #2). Defense-in-depth consists of a number of elements as summarized below. These elements can be used as guidelines for making that assessment. Other equivalent acceptance guidelines are acceptable.

Defense-in-depth is maintained:

- a reasonable balance among prevention of core damage, prevention of containment failure, and consequence mitigation is preserved, e.g., the proposed change in a TS AOT or STI has not significantly changed the balance among these principles of prevention and mitigation. TS change requests should consider whether the anticipated operation changes associated with a change in an AOT or STI could introduce new accidents or transients or could increase the likelihood of an accident or transient.
- over-reliance on programmatic activities to compensate for weaknesses in plant design is avoided, e.g., a programmatic configuration control process should not be relied upon to account for a large risk increase associated with a TS AOT extension.
- system redundancy, independence, and diversity are maintained commensurate with the expected frequency and consequences of challenges to the system, e.g., there are no risk outliers (the following items should be considered):
 - there are appropriate restrictions in place to preclude simultaneous equipment outages that would erode the principles of redundancy and diversity;

- compensatory actions to be taken when entering the extended AOT for pre-planned maintenance are identified;
 - voluntary removal of equipment from service during plant operation should not be scheduled when adverse weather conditions are predicted or at times when the plant may be subjected to other abnormal conditions;
 - the impact of the TS change on the safety function should be considered. For example, what is the impact of a change in the AOT for the low pressure safety injection system on the overall availability and reliability of the low pressure injection function?
- defenses against potential common cause failures are maintained and the potential for introduction of new common cause failure mechanisms is assessed, e.g., TS change requests should consider whether the anticipated operational changes associated with a change in an AOT or STI could introduce any new common cause failure modes not previously considered.
 - independence of barriers is not degraded, e.g., TS change requests should address the licensee's overall configuration risk management system which will provide a means of ensuring that the independence of barriers has not been degraded by the TS change.
 - defenses against human errors are maintained, e.g., TS change requests should consider whether the anticipated operation changes associated with a change in an AOT or STI could change the expected operator response or introduce any new human errors not previously considered.

2. Safety Margins

The engineering evaluation conducted should assess whether the impact of the proposed TS change is consistent with the principle that sufficient safety margins are maintained (principle #3). An acceptable set of guidelines for making that assessment are summarized below. Other equivalent decision guidelines are acceptable.

Sufficient safety margins are maintained:

- codes and standards or alternatives approved for use by the NRC are met, e.g., the proposed TS AOT or STI change is not in conflict with approved codes and standards relevant to the subject system.

- safety analysis acceptance criteria in the FSAR are met, or proposed revisions provide sufficient margin to account for analysis and data uncertainty, e.g., the proposed TS AOT or STI change does not adversely affect any assumptions or inputs to the safety analysis, or, if such inputs are affected, justification is provided to ensure sufficient safety margin will continue to exist. For TS AOT changes, an assessment should be made of the affect on the FSAR acceptance criteria assuming the plant is in the AOT (i.e., the subject equipment is inoperable), and there are no additional failures. Such an assessment should result in the identification of all situations where entry into the proposed AOT could result in failure to meet an intended safety function.
- 3. The licensee has demonstrated that the modification is needed and will ensure adequate reliability and availability of significant safety systems.
- 4. The licensee has provided the justification for the modification based on the guidance in Section III.A.

B. Probabilistic Guidelines

The guidelines discussed in Regulatory Guide DG-1061, Section 2.4.2, "Evaluation of Risk Impact, Including Treatment of Uncertainties" are applicable to TS change requests. General guidelines for evaluating the risk impact from changes to the current licensing basis can be found in SRP Chapter 19.0, Section II.3.2, "Risk Assessment." It should be noted that these guidelines apply only to permanent changes to TS requirements. TS AOT changes are permanent changes, but, because AOTs are entered infrequently and are temporary by their very nature, the following additional guidelines are provided for TS AOT modifications:

1. The licensee has demonstrated that the TS AOT modification has only a very small quantitative impact on plant risk. An incremental conditional core damage probability (ICCDP)² of $5.0\text{E-}7$ is considered very small for a single TS AOT modification. Also, the ICCDP contribution should be distributed in time such that any increase in the associated instantaneous risk is very small and within the normal operating background (risk fluctuations) of the plant. A incremental conditional large early release probability (ICLERP) of $5.0\text{E-}8$ or less is also considered very small. (Tier 1)
2. The licensee has demonstrated that there are appropriate restrictions on dominant risk-significant configurations associated with the modification. (Tier 2)

²ICCDP = [(conditional CDF with the subject equipment out of service) - (baseline CDF with nominal expected equipment unavailabilities)] X (single AOT duration under consideration).

3. The licensee has implemented a risk-informed plant configuration control program. The licensee has implemented procedures to utilize, maintain, and control such a program.

In addition, if multiple TS changes are proposed, the cumulative impact of the proposed TS changes should be calculated and presented, in addition to the individual impacts. The total, cumulative impact should be estimated using the average value of the calculated risk metrics (e.g., CDF, LERF). The conditional measures (i.e., ICCDP and ICLERP) do not directly apply in evaluating the total impact from multiple changes.

In presenting the cumulative risk impact, the base case PRA model should be used consistently. It should not contain any of the proposed changes, but should reflect any other recent changes to the plant. The same model used for evaluating the individual changes should be used for assessing cumulative impact. Plant practices proposed for implementation as part of the TS changes should not be credited in the base case.

III. REVIEW PROCESS

Licensees are expected to provide strong technical bases for any TS change. The technical bases should be rooted in traditional engineering and system analyses. TS change requests based on PRA results alone should not be submitted for review. TS change requests should give proper attention to the integration of considerations such as conformance to Standard Technical Specifications, generic applicability of the requested change if it is different from Standard Technical Specifications, operational constraints, manufacturer recommendations, and practical considerations for test and maintenance. Standard practices used in setting AOTs and STIs should be followed, e.g., AOTs nominally used are 8 hours, 12 hours, 24 hours, 72 hours, 7 days, 14 days, etc. STIs nominally used are 12 hours, 7 days, 1 month, 3 months, etc. Using such standards greatly simplifies implementation, scheduling, monitoring, and auditing. Logical consistency among the requirements should be maintained, e.g., AOT requirements for multiple trains out of service should not be longer than that for one of the constituent trains.

A. Definition of Proposed Change

The licensee should include the reasons for requesting the TS change or changes in the submittal and should demonstrate the need for the requested change. Acceptable reasons for requesting TS modifications will most likely fall into one or more of the categories below.

1. Improvement in Operational Safety

The reason for TS modification may be to improve operational safety, that is, an improvement or reduction in the plant risk, or a reduction in occupational exposure of plant personnel in complying with the requirements.

2. Consistency of Risk Basis in Regulatory Requirements

The TS modifications requested can be supported by their risk implications. TS requirements can be changed to reflect improved design features in a plant or to reflect equipment reliability improvements that make a previous requirement unnecessarily stringent or ineffective. TS may be changed to establish consistently based requirements across the industry or across an industry group. It must be ensured that the risk following the change remains acceptable.

3. Reduce Unnecessary Burdens

The change may be needed to reduce unnecessary burdens in complying with current TS requirements, based on the operating history of the plant or industry in general. For example, in specific instances, the usual repair time needed may be longer than the AOT defined in the TS. The required surveillance may lead to plant transients, result in unnecessary equipment wear, result in excessive radiation exposure to plant personnel, or place unnecessary administrative burdens on plant personnel that are not justified by the safety significance of the surveillance. In some cases, the change may provide operational flexibility, and in those cases, the change may increase the allocation of plant personnel's time to more safety-significant aspects of plant operation.

The reasons for requesting changes can form an important input in the decision to seek the requested changes and define the evaluations necessary to justify the modifications.

B. Engineering Evaluations

1. Traditional Engineering Evaluation

a. Compliance With Current Regulations

In evaluating proposed changes to TS, the licensee must ensure that current regulations are being followed (principle #1). The NRC regulations specific to TS requirements are stated in 10 CFR 50.36, "Technical Specifications." Additional information with regard to the NRC's policies on TS is contained in the NRC Final Policy Statement on Technical Specifications Improvements for Nuclear Power Reactors (58 FR 39132). These documents define the main elements of TS and provide criteria for items to be included in the TS. The final policy statement and the statement of consideration for 10 CFR 50.36 (60 FR 36953) also discuss the use of risk-informed approaches to improve TS. Regulations regarding application for and issuance of license amendments are found in 10 CFR 50.90, 50.91, and 50.92. In addition, the licensee should ensure that the TS change does not result in non-compliance with any other portion of the current licensing basis.

b. Evaluation of Defense-in-Depth Attributes & Safety Margins

One aspect of the engineering evaluations is to show that the fundamental safety principles on which the plant design was based are not compromised. Design basis accidents (DBAs) play a central role in nuclear power plant design. DBAs are a combination of postulated challenges and failure events against which plants are designed and design features that ensure adequate and safe plant response. During the design process, plant response and associated safety margins are evaluated using assumptions which are intended to be conservative. National standards and other

considerations such as defense-in-depth attributes and the single failure criterion constitute additional engineering considerations that influence plant design and operation. Margins and defenses associated with these considerations may be affected by the licensee's proposed TS change and, therefore, should be reevaluated to support a requested TS change. As part of this evaluation, the impact of the proposed TS change on affected equipment functionality, reliability, and availability will be determined. The engineering evaluation conducted should evaluate whether the impact of the proposed TS change is consistent with the principle that adequate defense-in-depth is maintained. In addition, the engineering evaluation conducted should assess whether the impact of the proposed TS change is consistent with the principle that adequate safety margins are maintained. The reviewers should confirm that the acceptance guidelines in Section II.A of this SRP are met with respect to the maintenance of defense-in-depth and safety margins.

c. Additional Engineering Considerations

Traditional engineering considerations that are unique to TS risk-informed techniques should also be taken into account in an engineering evaluation. These items can be summarized as follows:

- i. TS AOT and STI modifications should be supported by the overall safety benefit.
- ii. Justification for TS AOT modifications should be based on the need for extended equipment outage time and the demonstrated availability of redundant equipment. The AOT defined should be adequate to complete the majority of the component repairs or post-maintenance activities intended to be performed during power operation; however, AOTs should not be based solely on preventative maintenance activities that require long outage times but occur infrequently (e.g., once every five years). In addition, the AOT should be adequate to conduct any required surveillance tests that render the component or system inoperable. The burden of testing and maintenance can place a stress on the crew, which can affect the quality of the testing or maintenance and thereby the component reliability. Crew burden should be part of the consideration in deciding changes to requirements.
- iii. Regardless of the AOT, the actual time equipment is removed from service should be minimized. The removal should be performed during stable plant conditions and repeated TS entries should be avoided.
- iv. TS change requests should consider both plant-specific and industry-wide operational experience on systems important for coping with transients or accidents.
- v. Some systems may not be modeled by the plant's PRA but could affect the best estimate of

the performance or availability of systems that might provide a backup function for the system for which the TS change is being requested (this could change the required performance or availability of the system for which the TS change is being sought). The review should, therefore, consider systems beyond those modeled in the PRA.

2. Probabilistic Engineering Evaluation

The staff uses a three-tiered approach in its evaluation of the risk associated with proposed TS changes. The first tier is an evaluation of the impact on plant risk as expressed by the change in core damage frequency (Δ CDF), the incremental conditional core damage probability and the incremental conditional large early release probability resulting from the TS change. The second tier is an evaluation of the licensee's process used to address potentially high risk configurations that could exist if equipment in addition to that associated with the change were to be taken out of service simultaneously, or other risk significant operational factors such as concurrent system or equipment testing were also involved. The objective of this part of the staff's review is to ensure that appropriate restrictions on dominant risk-significant configurations associated with the change are in place. The third tier is an evaluation of the licensee's overall configuration risk management system to ensure that adequate programs and procedures are in place to identify and compensate for other potentially lower probability, but none the less risk significant, configurations resulting from maintenance and other operational activities.

a. Tier 1: PRA Capability and Insights

The first tier assesses the impact of the proposed TS modification on conditional core damage frequency (CCDF), incremental conditional core damage probability, and incremental conditional large early release probability. Two aspects need to be considered: 1) the validity of the PRA, and 2) the PRA insights and findings. The depth of the staff review at this stage will depend on the extent to which the licensee has demonstrated that its PRA is valid for assessing the proposed TS modifications and the overall impact of the TS change on plant risk. The key areas for review of Tier 1 considerations are discussed in the following sections.

I. Breadth and Depth of PRA Review

The breadth and depth of the PRA review should be addressed in the review for TS changes. The breadth and depth of the review will depend on several factors:

- a) The emphasis placed on traditional analysis as opposed to PRA in establishing the basis for the TS modification.

If the justification for the modification is based on well founded traditional arguments

that are easily supported by PRA insights, then only a limited PRA review may be warranted. However, if a TS change is primarily based on complex PRA arguments with a limited traditional basis, then the breadth and depth of the PRA review will be substantially greater.

- b) The safety significance of the structure, system or component under consideration.

The level of redundancy, diversity and need for operator recovery actions will impact the safety significance of any proposed TS modification. The reliance on operator actions to perform a safety function under high stress conditions will, for example, require greater scrutiny of the human reliability analysis than of automatic systems.

- c) The validity of the PRA.

An initial evaluation of the PRA will be needed to obtain a degree of confidence in the validity of the PRA. The necessary level of confidence will depend on the application. Validity of the PRA with respect to the decision making process can be established by evaluating:

- i) consistency of the PRA methodology with acceptable methods and practices
- ii) robustness of the results through sensitivity studies
- iii) consistency of the PRA findings with respect to the plant's design and operational characteristics
- iv) modeling detail and scope necessary to support the decision making activity
- v) representation of the as-built, as-operated plant

- d) The consistency of the TS modification to other TS proposals approved by the NRC.

If there is a baseline for approving similar TS modifications for similar type plants, then only differences between previously accepted submittals and the one under review would need to be assessed.

The need to independently validate the PRA in the context of the TS proposal is based on the need to establish a defensible probabilistic basis for approving the TS modification. The basis will depend on the extent to which PRA plays a role in the decision making process.

ii. PRA Review Considerations

The Tier 1 PRA review will cover the items presented below. Therefore the licensee's application must contain sufficient detail to evaluate these items. General guidance for reviewing these items

can be found in SRP Chapter 19.0, Section II.3.2, "Risk Assessment." Additional guidance specific to the review of TS modifications is provided here.

a) Quality of the PRA

The reviewer should consider the quality and validity of the PRA during the review of the licensee's submittal for the TS modification.

Has the PRA been previously reviewed by the NRC? Did the NRC SER on the IPE or other NRC reviews of the PRA identify any shortcomings? Have any identified shortcomings been addressed and satisfactorily resolved by the licensee, if they are relevant to the proposed TS modification?

Appendix X of Regulatory Guide DG-1061 and Section 4.3.1 of Regulatory Guide DG-1065 provides additional guidance on PRA quality.

b) Scope

A full scope PRA (Level 3) is not needed for TS evaluations. Also, in most cases, a Level 2 PRA with external events for all modes of operation will not be required for TS modification applications. If, for example, a system in question is only used at full power, no low-power or shutdown PRA is needed. The review of the scope of the PRA used in evaluating a TS modification should ensure that the guidance contained in Section 4.3.2 of Regulatory Guide DG-1065 is met.

c) Modeling Level of Detail

The review of the level of detail of the PRA used in evaluating a TS modification should ensure that the guidance contained in Section 4.4.3.1 of Regulatory Guide DG-1065 is met.

d) Modeling of Initiating Events

The review of initiating event modeling of the PRA used in evaluating a TS modification should ensure that the guidance contained in Section 4.3.3.2 of Regulatory Guide DG-1065 is met.

e) Screening Criteria and Truncation Limits

The review of the PRA screening criteria and truncation limits used in evaluating a TS modification should ensure that the guidance contained in Sections 4.3.3.3 and 4.3.3.4 of Regulatory Guide DG-1065 is met.

f) Assumptions in Applying PRA for TS Modifications

The review of the assumptions in applying the PRA to a TS modification should ensure that the guidance contained in Section 4.3.3.5 of Regulatory Guide DG-1065 is met.

g) PRA Assumptions

The review of the PRA assumptions used in evaluation a TS modification should ensure that the guidance contained in Section 4.3.4 of Regulatory Guide DG-1065 is met.

h) Sensitivity and Uncertainty Analyses

The review of any sensitivity and uncertainty analyses used in evaluating a TS modification should ensure that the guidance contained in Section 4.3.5 of Regulatory Guide DG-1065 is met.

b. Tier 2: Avoidance of Risk Significant Plant Configurations

The licensee's assessment should also provide reasonable assurance that risk-significant plant equipment outage configurations will not occur when specific plant equipment is out of service consistent with the proposed TS AOT modification. An effective way to perform such an assessment is to evaluate systems and/or components while in a LCO (equipment AOT) condition. Once system equipment is evaluated (by CCDF with LERF correlation), an assessment can be made as to whether certain enhancements to the TS, or procedures, are required to avoid risk-significant situations. In addition, compensatory actions that can mitigate any corresponding increase in risk, i.e., backup equipment, increased surveillance frequency, or upgrading procedures and training can be used to offset the risk associated with certain configurations. These compensatory actions should have been evaluated and incorporated into the first tier where practical to do so. In addition, the review of Tier 2 for TS modifications should ensure that the guidance contained in Section 4.3.6 of Regulatory Guide DG-1065 is met.

c. Tier 3: Risk Informed Plant Configuration Control/Management

The third tier focuses on licensee programs that ensure that the risk impact of out-of-service

equipment is appropriately evaluated prior to and while performing any maintenance activity. A viable program is able to uncover risk-significant plant equipment outage configurations as they evolve during normal plant operation. This can be accomplished by quantitatively evaluating the impact of equipment unavailability, operational activities like testing or load dispatching, or weather conditions on plant risk. The need for a third tier stems from the difficulty in identifying all possible risk-significant configurations under Tier 2. Tier 2 programs typically result in a table or set of tables that assume certain systems are unavailable and specify other systems that cannot be out of service under the assumed conditions. This third tier is needed because of the difficulty of providing a set of tables under Tier 2 that cover all plant configurations that will ever be encountered over extended periods of plant operation. In addition, the review of Tier 3 for TS modifications should ensure that the guidance contained in Section 4.3.7 of Regulatory Guide DG-1065 is met.

C. Implementation and Monitoring Program

Application of the three-tiered approach described below is in keeping with the fundamental principle that performance-based implementation and monitoring strategies be employed to account for uncertainties in analysis models and data (principle #5). Because of such uncertainties, these methods are used to avoid, or severely limit, the time durations during which plant operation is allowed with high-risk configurations of plant equipment (i.e., with excessive unavailability of critical safety equipment).

1. Three-Tiered Implementation Approach

As described in Section III.B.2 of this SRP, the staff has identified a three-tiered approach to evaluating the risk associated with proposed TS changes. The first tier is an evaluation of the impact on plant risk as expressed by the change in core damage frequency (Δ CDF), the incremental conditional core damage probability and the incremental conditional large early release probability resulting from the TS change. The second tier is an evaluation of the process used to address potentially high risk configurations that could exist if equipment in addition to that associated with the change were to be taken out of service simultaneously, or other risk significant operational factors such as concurrent system or equipment testing were also involved. The objective of this part of the review is to ensure that appropriate restrictions on dominant risk-significant configurations associated with the change are in place. The third tier is an evaluation of the overall configuration risk management system to ensure that adequate programs and procedures are in place to identify and compensate for other potentially lower probability, but none the less risk significant, configurations resulting from maintenance and other operational activities.

2. Maintenance Rule Control

In order to ensure that extension of a TS AOT or STI does not degrade operational safety over time, the licensee should ensure performance monitoring mechanisms are in place to identify negative trends in availability or reliability of equipment impacted by TS changes. As part of implementing the maintenance rule (10 CFR 50.65), each licensee most likely will have developed availability and reliability goals for the majority of TS equipment which could provide such a performance monitoring mechanism. The effect of TS changes should be considered if any adverse trends in meeting established goals are identified through implementation of the maintenance rule. If the licensee concludes that the performance or condition of a TS system or component affected by a TS change **does not meet** established goals, appropriate corrective action shall be taken to reverse the trend, in accordance with the maintenance rule. Such corrective action may include submittal of another TS change to shorten the revised AOT or STI, if the licensee determines this is an important factor in reversing the negative trend.

D. Documentation

The evaluations performed to justify the proposed TS changes should be documented and included in the license amendment request submittal. The documentation should include the following:

1. A description of the TS changes being proposed and the reasons for seeking the changes,
2. A description of the process used to arrive at the proposed changes,
3. Traditional engineering evaluations performed,
4. Changes made to the PRA for use in the TS change evaluation,
5. Review of the applicability and quality of the PRA models for TS evaluations,
6. Discussion of the risk measures used in the evaluating the changes,
7. Data additional to the plant's PRA database developed and used,
8. Summary of the risk measures calculated including intermediate results,

9. Sensitivity and uncertainty analyses performed,
10. Summary of the risk impacts of the proposed changes and any compensating actions proposed,
11. A tabulation of equipment outage configurations that could threaten the integrity of important safety functions and that are prohibited by TS or plant procedures (Tier 2).
12. A description of the capability to perform a contemporaneous assessment of the overall impact on safety of proposed plant configurations including an explanation of how these tools will be used to ensure that risk-significant plant configurations will not be entered and that appropriate actions will be taken when unforeseen events put the plant in a risk-significant configuration (Tier 3).
13. A marked up copy of the relevant TS and Bases. The level of detail provided in the TS Bases should include adequate information to provide the technical basis for the revised AOT or STI.
14. All other documentation required to be submitted with a license amendment request.

IV. EVALUATION FINDINGS

Refer to SRP Chapter 19.0, "Use of Probabilistic Risk Assessment in Plant-Specific, Risk-Informed Decisionmaking: General Guidance," Section III, "Evaluation Findings," for guidance on this topic. In addition, the following items should be addressed in safety evaluations for TS changes.

- Background and NRC review objectives (Input from PRA Policy statement and other Commission documents).
- Breadth and depth of the review

The discussion of the breadth and depth of the review should consider the following factors:

- The emphasis placed on traditional analysis as opposed to PRA in establishing the basis for the TS modification.
- The safety significance of the structure, system or component under consideration.
- The validity of the PRA.
- The consistency of the TS modification to other TS proposals approved by the NRC.

V. IMPLEMENTATION

The following is intended to provide guidance to applicants and licensees regarding the NRC staff's plans for using this SRP section.

Except for those cases in which the applicant proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the methods described herein will be used by the staff in its evaluation of conformance with Commission regulations.

VI. REFERENCES

1. Atomic Safety and Licensing Appeal Board, *Portland General Electric Company*. (Trojan Nuclear Plant), ALAB-531, 9 NRC 263 (1979).
2. *Codes of Federal Regulations*, Title 10, "Energy":
10 CFR 50.36, "Technical Specifications."
10 CFR 50.90 "Application for amendment of license or construction permit."
10 CFR 50.91 "Notice for public comment; State consultation."
10 CFR 50.92 "Issuance of amendment."
3. U.S. Nuclear Regulatory Commission, 33 FR 18612, Statement of Considerations, "Technical Specifications for Facility Licensees; Safety Analyses Reports," *Federal Register*, December 17, 1968.
4. U.S. Nuclear Regulatory Commission, 58 FR 39132, "Final Policy Statement on Technical Specifications Improvements for Nuclear Power Reactors," *Federal Register*, July 22, 1993
5. U.S. Nuclear Regulatory Commission, Final Rule, 10 CFR 50.36; 60 FR 36953, "Technical Specifications," *Federal Register*, July 19, 1995.
6. U.S. Nuclear Regulatory Commission Regulatory Guide DG-1065, "An Approach For Plant-Specific, Risk-Informed Decision Making: Technical Specifications", December 1997.
7. NUREG-1430, "Standard Technical Specifications, Babcock and Wilcox Plants" (latest revision).
8. NUREG-1431, "Standard Technical Specifications, Westinghouse Plants" (latest revision).
9. NUREG-1432, "Standard Technical Specifications, Combustion Engineering Plants" (latest revision).
10. NUREG-1433, "Standard Technical Specifications, General Electric Plants, BWR/4" (latest revision).
11. NUREG-1434, "Standard Technical Specifications, General Electric Plants, BWR/6" (latest revision).

12. U.S. Nuclear Regulatory Commission, NUREG-CR-6141, "Handbook of Methods for Risk-Based Analyses of Technical Specifications," December 1994
13. Electric Power Research Institute TR-105867, "Guidelines for Preparing Risk-Based Technical Specifications Change Request Submittals," December 1995.
14. Electric Power Research Institute TR-105987, "Template for the Submission of Revised Risk-Based Technical Specifications," December 1995.
15. U.S. Nuclear Regulatory Commission Regulatory Guide DG-1061, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Current Licensing Basis," December 1997.
16. U.S. Nuclear Regulatory Commission, NUREG-0800, Chapter 19.0, "Standard Review Plan for Use of Probabilistic Risk Assessment in Plant-Specific, Risk-Informed Decisionmaking: General Guidance," December 1997.