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REGULATORY GUIDE

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REGULATORY GUIDE 1.200

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AN APPROACH FOR DETERMINING THE TECHNICAL ADEQUACY OF PROBABILISTIC RISK ASSESSMENT RESULTS FOR RISK-INFORMED ACTIVITIES

A. INTRODUCTION

In 1995, the U.S. Nuclear Regulatory Commission (NRC) issued a Policy Statement (Ref. 1) on the use of probabilistic risk analysis (PRA), encouraging its use in all regulatory matters. That Policy Statement states that "…the use of PRA technology should be increased to the extent supported by the state-of-the-art in PRA methods and data and in a manner that complements the NRC's deterministic approach." Since that time, many uses have been implemented or undertaken, including modification of the NRC's reactor safety inspection program and initiation of work to modify reactor safety regulations. Consequently, confidence in the information derived from a PRA is an important issue, in that the accuracy of the technical content must be sufficient to justify the specific results and insights that are used to support the decision under consideration.

This regulatory guide describes one acceptable approach for determining whether the technical adequacy of the PRA, in total or the parts that are used to support an application, is sufficient to provide confidence in the results, such that the PRA can be used in regulatory decision-making for light-water reactors. This guidance is intended to be consistent with the NRC's PRA Policy Statement. It is also intended to reflect and endorse guidance provided by standards-setting and nuclear industry organizations.

When used in support of an application, this regulatory guide will obviate the need for an in-

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This guide was issued after consideration of comments received from the public.

Regulatory guides are issued in 10 broad divisions—1, Power Reactors; 2, Research and Test Reactors; 3, Fuels and Materials Facilities; 4, Environmental and Siting; 5, Materials and Plant Protection; 6, Products; 7, Transportation; 8, Occupational Health; 9, Antitrust and Financial Review; and 10, General.

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depth review of the base PRA by NRC reviewers, allowing them to focus their review on key assumptions and areas identified by peer reviewers as being of concern and relevant to the application. Consequently, this guide will provide for a more focused and consistent review process. In this regulatory guide, the quality of a PRA analysis used to support an application is measured in terms of its appropriateness with respect to scope, level of detail, and technical acceptability.

This regulatory guide contains information collections that are covered by the requirements of 10 CFR Part 50 which the Office of Management and Budget (OMB) approved under OMB control number 3150-0011. The NRC may neither conduct nor sponsor, and a person is not required to respond to, an information collection request or requirement unless the requesting document displays a currently valid OMB control number.

B. DISCUSSION

Existing Guidance Related to the Use of PRA in Reactor Regulatory Activities

Since the NRC issued its PRA Policy Statement, a number of risk-informed regulatory activities have been implemented and the necessary technical documents are being developed to provide guidance on the use of PRA information. For these activities, the technical adequacy of the base PRA should be sufficient to provide the needed confidence in the results being used in the decision. A list of some of these documents is provided below.

Regulatory Guide 1.174 (Ref. 2) and its associated standard review plan (SRP), Section 19.2 (Ref. 3), provide general guidance on applications that address changes to the licensing basis. Key aspects of this document include the following:

- It describes a "risk-informed integrated decision-making process" that characterizes how risk information is used and, more specifically, it clarifies that such information is one element of the decision-making process. That is, decisions "are expected to be reached in an integrated fashion, considering traditional engineering and risk information, and may be based on qualitative factors as well as quantitative analyses and information."

- It reflects the staff's recognition that the PRA needed to support regulatory decisions can vary (i.e., that the "scope, level of detail, and quality of the PRA is to be commensurate with the application for which it is intended and the role the PRA results play in the integrated decision process"). For some applications and decisions, only particular pieces[1] of the PRA need to be used. In other applications, a full-scope PRA is needed. General guidance regarding scope, level of detail, and quality for a PRA is provided in the application-specific documents.

- While RG 1.174 is written in the context of one reactor regulatory activity (license amendments), the underlying philosophy and principles are applicable to a broad spectrum of reactor regulatory activities.

Regulatory Guide 1.201, "Guidelines for Categorizing Structures, Systems, and Components in Nuclear Power Plants According to Their Safety Significance" (Ref. 4), discusses an approach to support the new rule established as Title 10, Section 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors," of the *Code of Federal Regulations* (10 CFR 50.69) (Ref. 5).

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[1] In this regulatory guide, a piece of a PRA can be understood to be equivalent to that piece of the analysis for which an applicable PRA standard identifies a supporting level requirement.

Regulatory Guide 1.205, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants" (Ref. 6), provides guidance for use in complying with requirements that the NRC has promulgated for risk-informed and performance-based fire protection progress that meet the requirements of 10 CFR 50.48(c) (Ref. 7) and National Fire Protection Association 805, "Performance-Based Standard for Fire Protection for Light-Water Reactor Electric Generating Plants," 2001 Edition (Ref. 8).

Section C.I.19 of Regulatory Guide 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)" (Ref. 9), discusses the requirements in 10 CFR Part 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants" (Ref. 10), for a combined license (COL) applicant to conduct a plant-specific PRA and to describe the plant-specific PRA and its results within its final safety analysis report. The revision to 10 CFR Part 50 included a requirement for the COL holder to maintain and upgrade the PRA periodically throughout the life of the plant, and a requirement to demonstrate PRA technical adequacy.

In addition, there are other regulatory guides that provide guidance for such specific applications as inservice testing (Ref. 11), inservice inspection (Ref. 12), and technical specifications (Ref. 13). The NRC has also prepared SRP sections for each of the application-specific regulatory guides.

PRA standards have also been under development by the American Society of Mechanical Engineers (ASME) and the American Nuclear Society (ANS):

- ASME and ANS jointly issued an at-power Level 1 and limited Level 2 PRA standard for internal and external hazards (requirements for low power shutdown conditions to be added) (Ref. 14).[2]

- ASME is developing PRA standards for new LWRs applying for design certification (DC) and COLs, and for future advanced non-LWRs. ANS is developing a Level 1 and limited Level 2 PRA standard for low-power shutdown operating mode (to be incorporated into the ASME/ANS joint standard), and is also developing Level 2 and Level 3 PRA standards.

Reactor owners' groups have been developing and applying a PRA peer review program for several years. The Nuclear Energy Institute (NEI) has issued several peer review guidance documents:

- NEI 00-02, "Probabilistic Risk Assessment Peer Review Process Guidance." This document provides historical guidance for performing a PRA peer review and a self-assessment of the peer review criteria against PRA standard requirements. (Ref. 15)

- NEI 05-04, "Process for Performing Follow-On PRA Peer Reviews Using the ASME PRA Standard." This document provides guidance for conducting and documenting a follow-on peer review for PRAs using the ASME PRA Standard. (Ref. 16)

- NEI 07-12, "Fire Probabilistic Risk Assessment (FPRA) Peer Review Process Guidelines." This document provides guidance for conducting and documenting a peer review of an internal fire PRA using the ASME/ANS PRA standard. (Ref. 17)

SECY-00-0162, "Addressing PRA Quality in Risk-Informed Activities," (Ref. 18) describes an approach for addressing PRA quality in risk-informed activities, including identification of the scope and minimal functional attributes of a technically acceptable PRA.

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[2] Previous revisions and addendum to this standard are listed in Reference 14.

SECY-04-0118, "Plan for the Implementation of the Commission's Phased Approach to PRA Quality" (Ref. 19), presents the staff's approach to defining the needed PRA quality for current or anticipated applications, as well as the process for achieving this quality, while allowing risk-informed decisions to be made using currently available methods until all of the necessary guidance documents are developed and implemented. SECY-07-0042, "Status of the Plan for the Implementation of the Commission's Phased Approach to Probabilistic Risk Assessment Quality" (Ref. 20), provides an update to the staff plan.

Purposes of this Regulatory Guide

The purpose of this regulatory guide is: a) to provide guidance to licensees for use in determining the technical adequacy of the base PRA used in a risk-informed regulatory activity, and b) to endorse standards and industry peer review guidance. This regulatory guide provides guidance in four areas:

(1) a definition of a technically acceptable PRA

(2) the NRC's position on PRA consensus standards and industry PRA peer review program documents

(3) demonstration that the baseline PRA (in total or specific pieces) used in regulatory applications is of sufficient technical adequacy

(4) documentation to support a regulatory submittal

This regulatory guide provides guidance on the PRA technical adequacy needed for the base PRA that is used in a risk-informed integrated decision-making process. It does not provide guidance on how the base PRA is revised for a specific application or how the PRA results are used in application-specific decision-making processes; that guidance is provided in such documents as References 2, 4, and 6.

The regulatory guides that address specific applications, such as Regulatory Guide 1.201, allow for the use of PRAs that are not full-scope (e.g., they do not include contributions from external initiating events or low-power and shutdown (LPSD) modes of operation). Those regulatory guides do, however, state that the missing scope items are to be addressed in some way, such as by using bounding analyses, or by limiting the scope of the application. This regulatory guide does not address such alternative methods to the evaluation of risk contributions; rather, this guide only addresses PRA methods. NUREG-1855 provides guidance on acceptable bounding analyses and on limiting the scope of the application.[3]

Relationship to Other Guidance Documents

This regulatory guide is a supporting document to other NRC regulatory guides that address risk-informed activities. As such, other regulatory guide invoke Regulatory Guide 1.200. The application-specific regulatory guide will provide the guidance on how the base PRA can be used in the decision under consideration. If the technical adequacy of the base PRA is an issue for the application, the application-specific regulatory guide will reference this regulatory guide for the necessary guidance in determining the technical adequacy of the base PRA. At a minimum, these guides include (1) Regulatory Guide 1.174 and SRP Section 19.2, which provide general guidance on applications that address changes to the licensing basis; (2) the regulatory guides for specific applications such as for inservice testing, inservice inspection, and technical specifications (Refs. 11-13); and (3) regulatory guides associated with implementation of certain regulations, particularly those that rely on a plant-specific PRA to implement

[3] NUREG-1855 is being finalized and is expected to be publicly available in late March 2009.

the rule (e.g., 10 CFR Part 52). In addition, the NRC has prepared corresponding SRP chapters for the application-specific guides.

Figure 1 shows the relationship of this regulatory guide to risk-informed activities, application-specific guidance, consensus PRA standards, and industry programs (e.g., NEI 00-02, 05-04, 07-12).

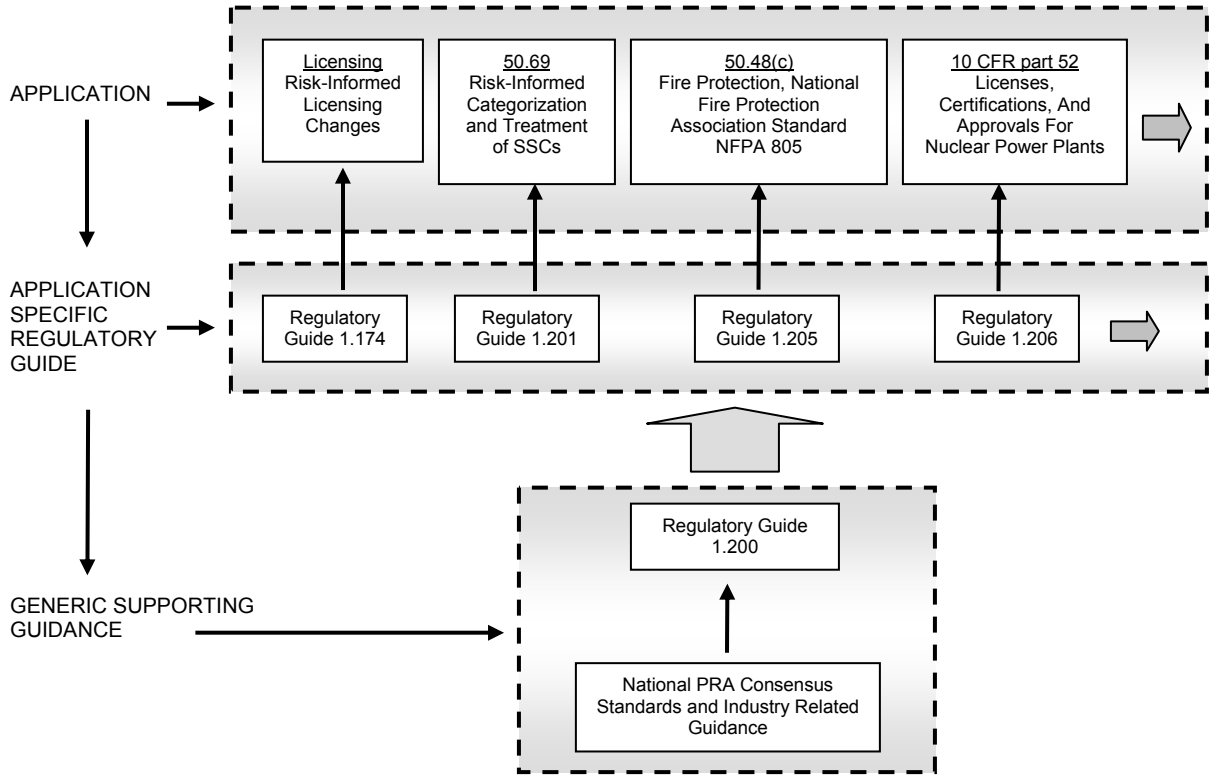

Figure 1. Relationship of Regulatory Guide 1.200 to Other Risk-Informed Guidance

C. REGULATORY POSITION

1. A Technically Acceptable PRA

This section describes one acceptable approach for defining the technical adequacy of an acceptable base PRA of a commercial light water reactor nuclear power plant. However, the term "PRA" needs to be defined. For a method or approach to be considered a PRA, the method or approach (1) provides a quantitative assessment of the identified risk in terms of scenarios that result in undesired consequences (e.g., core damage or a large early release) and their frequencies, and (2) is comprised of specific technical elements in performing the quantification. A method that does not provide a quantified assessment of the defined risk or does not include the technical elements specified in Regulatory Position 1.2 is not considered to be a PRA.

The scope of the PRA is determined by its intended use. It is envisioned, however, that for currently operating reactors and for reactor at the DC or COL application stage, some applications may require a full-scope Level 1 and some aspects of a Level 2 PRA. Consequently, in this section, the guidance provided is for a full-scope Level 1 and Level 2 PRA. The scope is defined in terms of (1) the metrics used to characterize risk, (2) the plant operating states for which the risk is to be evaluated, and (3) the causes of initiating events (hazard groups) that can potentially challenge and disrupt the normal operation of the plant and, if not prevented or mitigated, would eventually result in core damage and/or a large release.

The level of detail of the PRA is also determined by its intended use. Nonetheless, a minimal level of detail is necessary to ensure that the impacts of designed-in dependencies (e.g., support system dependencies, functional dependencies, and dependencies on operator actions) are correctly captured. This minimal level of detail is implicit in the technical elements comprising the PRA and their associated characteristics and attributes.

As noted, PRAs used in risk-informed activities may vary in scope and level of detail, depending on the specific application. However, the PRA results used to support an application must be derived from a baseline PRA model that represents the as-built, as-operated plant[4] to the extent needed to support the application. Consequently, the PRA needs to be maintained and upgraded, where necessary, to ensure it represents the as-built and as-operated plant.

This section provides guidance in four areas:

(1) scope of a PRA

(2) technical elements of a full-scope Level 1 and Level 2 PRA and their associated attributes and characteristics

(3) level of detail of a PRA

(4) development, maintenance, and upgrade of a PRA

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[4] Some applications may involve the plant at the DC or COL application stage, at which point the plant is neither built nor operated. At these stages, the intent is for the PRA model to reflect the as-designed plant.

1.1 Scope of a PRA

The scope of a PRA is defined by the challenges included in the analysis and the level of analysis performed. Specifically, the scope is defined in the following terms:

- metrics used in characterizing the risk,
- plant operating states for which the risk is to be evaluated, and
- causes of initiating events (hazard groups) that can potentially challenge and disrupt the normal operation of the plant.

Risk characterization is typically expressed by metrics of core damage frequency (CDF) and large early release frequency (LERF) (as surrogates for latent and early fatality risks, respectively, for operating light-water reactors). Large release frequency (LRF) is used as a risk metric for LWR DC and COL applicants[5]. These metrics are defined in a functional sense as follows:

- **Core damage frequency** is defined as the sum of the frequencies of those accidents that result in uncovery and heatup of the reactor core to the point at which prolonged oxidation and severe fuel damage are anticipated and involving enough of the core, if released, to result in offsite public health effects.
- **Large early release frequency** is defined as the sum of the frequencies of those accidents leading to rapid, unmitigated release of airborne fission products from the containment to the environment occurring before the effective implementation of offsite emergency response and protective actions such that there is the potential for early health effects. (Such accidents generally include unscrubbed releases associated with early containment failure shortly after vessel breach, containment bypass events, and loss of containment isolation.)

Issues related to the reliability of barriers (in particular, containment integrity and consequence mitigation) are addressed through other parts of the decision-making process, such as consideration of defense-in-depth. To provide the risk perspective for use in decision-making, a Level 1 PRA needs to provide CDF. A limited Level 2 PRA is needed to address LERF and a full Level 2 to address LRF.

Plant operating states (POSs) are used to subdivide the plant operating cycle into unique states, such that the plant response can be assumed to be the same within the given POS for a given initiating event. Operational characteristics (such as reactor power level; in-vessel temperature, pressure, and coolant level; equipment operability; and changes in decay heat load or plant conditions that allow new success criteria or reactor coolant system or containment configuration) are examined to identify those relevant to defining POSs. These characteristics are used to define the states, and the fraction of time spent in each state is estimated using plant-specific information. The risk perspective is based on the total risk associated with the operation of the reactor, which includes not only at-power operation, but also low-power and shutdown conditions. For some applications, the risk impact may affect some modes of operation, but not others.

Initiating events are the plant system perturbations to the steady state of the plant that challenge plant control and safety systems whose failure could lead to core damage and or radioactivity release. These initiating events include failure of equipment from either internal

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[5] The Commission staff requirements memorandum (SRM dated June 26, 1990, in response to SECY-90-016 established the identified goals.

plant causes (such as hardware faults, operator actions, floods, or fires), or external plant causes (such as earthquakes or high winds). These are referred to as internal hazards and external hazards, respectively. The risk perspective is based on a consideration of the total risk, which includes contributions from initiating events whose causes are attributable to both internal and external hazards.

A hazard group is a group of similar causes of initiating events that are assessed in a PRA using a common approach, methods, and likelihood data for characterizing the effect on the plant. The hazard groups addressed in this regulatory guide include the following:

Internal Hazards	External Hazards
-- Internal Events	-- Seismic Events
-- Internal Floods	-- High Winds
-- Internal Fires	-- External Floods
	-- Other External Hazards

1.2 Technical Elements of a PRA and Associated Characteristics and Attributes

Table 1 provides the list of general technical elements that are necessary for a Level 1 and Level 2 PRA. A PRA that is missing one or more of these elements would not be considered a complete PRA.

Table 1. Technical Elements of a PRA

SCOPE OF ANALYSIS	TECHNICAL ELEMENT	
Level 1	• Initiating event analysis • Success criteria analysis • Accident sequence analysis • Systems analysis	• Parameter estimation analysis • Human reliability analysis • Quantification
Level 2	• Plant damage state analysis • Accident progression analysis	• Quantification • Source term analysis
Interpretation of results and documentation are technical elements of both Level 1 and Level 2 PRAs.		

These technical elements are applicable to the PRA models constructed to address each of the contributors (hazard groups) to risk for each of the POSs. Because additional analyses are required to characterize their impact on the plant in terms of causing initiating events and mitigating equipment failures, internal floods, internal fires, and external hazards are discussed separately in Regulatory Positions 1.2.3 through 1.2.9, respectively. Further, to understand the results, it is important to examine the different contributors on both an individual and relative basis. Therefore, this element, interpretation of results, is discussed separately in Regulatory Position 1.2.10. Another major element that is common to all of the technical elements is documentation; it is discussed separately in Regulatory Position 1.2.11. While the technical elements are the same for each POS, other considerations, within a specific technical element, may need to be addressed for LPSD conditions. Table 2 discusses these considerations.

1.2.1 Level 1 Technical Elements for Internal Events

The following briefly discusses the objective of each technical element, and, for each element, provides the technical characteristics and attributes for accomplishing the objective. The objective and characteristics and attributes are given within the context of internal events.

Initiating event analysis identifies and characterizes the events that both challenge normal plant operation during power or shutdown conditions and require successful mitigation by plant equipment and personnel to prevent core damage from occurring. Events that have occurred at the plant and those that have a reasonable probability of occurring are identified and characterized. An understanding of the nature of the events is performed such that a grouping of the events, with the groups defined by similarity of system and plant responses (based on the success criteria), may be performed to manage the large number of potential events that can challenge the plant.

Success criteria analysis determines the minimum requirements for each function (and ultimately the systems used to perform the functions) to prevent core damage (or to mitigate a release) given an initiating event. The requirements defining the success criteria are based on acceptable engineering analyses that represent the design and operation of the plant under consideration. For a function to be successful, the criteria are dependent on the initiator and the conditions created by the initiator. The computer codes used to perform the analyses for developing the success criteria are validated and verified for both technical integrity and suitability to assess plant conditions for the reactor pressure, temperature, and flow range of interest, and they accurately analyze the phenomena of interest. Calculations are performed by personnel who are qualified to perform the types of analyses of interest and are well trained in the use of the codes.

Accident sequence analysis models, chronologically (to the extent practical), the different possible progressions of events (i.e., accident sequences) that can occur from the start of the initiating event to either successful mitigation or core damage. The accident sequences account for the systems that are used (and available) and operator actions performed to mitigate the initiator based on the defined success criteria and plant operating procedures (e.g., plant emergency and abnormal operating procedures) and training. The availability of a system includes consideration of the functional, phenomenological, and operational dependencies and interfaces between the various systems and operator actions during the course of the accident progression.

Systems analysis identifies the various combinations of failures that can prevent the system from performing its function as defined by the success criteria. The model representing the various failure combinations includes, from an as-built and as-operated perspective, the system hardware and instrumentation (and their associated failure modes) and human failure events that would prevent the system from performing its defined function. The basic events representing equipment and human failures are developed in sufficient detail in the model to account for dependencies among the various systems and to distinguish the specific equipment or human events that have a major impact on the system's ability to perform its function.

Parameter estimation analysis quantifies the frequencies of the initiating events, as well as the equipment failure probabilities and equipment unavailabilities of the modeled systems. The estimation process includes a mechanism for addressing uncertainties and has the ability to combine different sources of data in a coherent manner, including the actual operating history and experience of the plant when it is of sufficient quality, as well as applicable generic experience.

Human reliability analysis identifies and provides probabilities for the human failure events that can negatively impact normal or emergency plant operations. The human failure events associated with normal plant operation include the events that leave the system (as defined by the success criteria) in an unrevealed, unavailable state. The human failure events associated with emergency plant operation represent those human actions that, if not performed, do not allow the needed system to function. Quantification of the probabilities of these human failure events is based on plant- and accident-specific conditions, where applicable, including any dependencies among actions and conditions.

Quantification provides an estimation of the CDF given the design and/or operation the plant (depending whether the plant is in the design or operating stage). Regardless of the plant stage, the CDF is based on the summation of the estimated CDF from each accident sequence for each initiator group. If truncation of accident sequences and cutsets is applied, truncation limits are set so that the overall model results are not impacted in such a way that significant accident sequences or contributors[6] are eliminated. Therefore, the truncation value is selected so that the required results are stable with respect to further reduction in the truncation value.

Table 2 provides a summary of the needed characteristics and attributes for the technical elements for a Level 1 PRA for internal events. The characteristics and attributes are provided for both at-power conditions and for low power and shutdown (LPSD) conditions.

Table 2. Summary of Technical Characteristics and Attributes of a Level 1 PRA for Internal Events

Element	Technical Characteristics and Attributes
PRA At-Power	
Initiating Event Analysis	• Sufficiently detailed identification and characterization of initiating events • Grouping of individual events according to plant response and mitigating requirements • Proper screening of any individual or grouped initiating events Note: It is recognized that for those new reactor designs with substantially lower risk profiles (e.g., internal events CDF below 10^{-6}/year) that the quantitative screening value should be adjusted according to the corresponding baseline risk value.
Success Criteria Analysis	• Based on best-estimate engineering analyses applicable to the actual plant design and operation, as available • Codes developed in sufficient detail to: – analyze the phenomena of interest – be applicable in the pressure, temperature, and flow range of interest
Accident Sequence Development Analysis	• Defined in terms of hardware, operator action, and timing requirements and desired end states (e.g., core damage or plant damage states) • Includes necessary and sufficient equipment (safety and non-safety) reasonably expected to be used to mitigate initiators • Includes functional, phenomenological, and operational dependencies and interfaces

[6] The determination of significance is a function of how the PRA is being, or is intended to be, used. When a PRA is being used to support an application, the significance of an accident sequence or contributor is measured with respect to whether its consideration has an impact on the decision being made. For the base PRA model, significance can be measured with respect to the contribution to the total CDF or LERF, or it can be measured with respect to the contribution to the CDF or LERF/LRF for a specific hazard group or POS, depending on the context. For example, for the purposes of defining capability categories, the ASME/ANS PRA Standard, defines significance at the hazard group level. Whatever the context, the following numerical criteria are recommended:

Significant accident sequence: A significant sequence is one of the set of sequences, defined at the functional or systemic level that, when ranked, compose 95% of the CDF or the LERF/LRF, or that individually contribute more than ~1% to the CDF or LERF/LRF.

Significant basic event/contributor: The basic events (i.e., equipment unavailabilities and human failure events) that have a Fussell-Vesely importance greater than 0.005 or a risk-achievement worth greater than 2.

Table 2. Summary of Technical Characteristics and Attributes of a Level 1 PRA for Internal Events

Element	Technical Characteristics and Attributes
Systems Analysis	Models developed in sufficient detail to achieve the following purposes: • Reflect the as-designed, as-built, as-operated plant (as applicable) including how it has performed during the plant history for operating plants • Reflect the success criteria for the systems to mitigate each identified accident sequence • Capture impact of dependencies, including support systems and harsh environmental impacts • Include both active and passive components and failure modes that impact the function of the system • Include common-cause failures, human errors, unavailability resulting from test and maintenance, etc.
Parameter Estimation Analysis	• Estimation of parameters associated with initiating event, basic event probability models, recovery actions, and unavailability events using plant-specific and generic data as applicable • Estimation is consistent with component boundaries • Estimation includes a characterization of the uncertainty
Human Reliability Analysis	• Identification and definition of the human failure events that would result in initiating events or pre- and post-accident human failure events that would impact the mitigation of initiating events • Quantification of the associated human error probabilities taking into account scenario (where applicable) and plant-specific factors (as available) and including appropriate dependencies (both pre- and post-accident) • NUREG-1792 (Ref. 21) and NUREG-1842 (Ref. 22) provide good practices for meeting the above attribute and characteristics
Quantification	• Estimation of the CDF for modeled sequences that are not screened as a result of truncation, given as a mean value • Estimation of the accident sequence CDFs for each initiating event group • Truncation values set relative to the total plant CDF such that the CDF is stable with respect to further reduction in the truncation value
PRA Low Power and Shutdown	
Plant Operating States	• The Level 1 PRA involves identification and characterization of a set of plant operational states during LPSD operations that are representative of all the plant states not covered in the full-power PRA • The LPSD evolution is divided into POSs based on the unique impact on plant response to facilitate the practicality and efficiency of the PRA • Each LPSD POS required to be considered for the specific application is identified and characterized as to all important conditions affecting the delineation and evaluation of core damage and large early release • The conditions include decay heat level, reactor coolant system configuration, reactor level, pressure and temperature, containment configuration, and the assumed representative plant system configurations within the POS • LPSD POSs that are subsumed into each other are shown to be represented by the characteristics of the subsuming group • The duration and number of entries into each POS are determined • The development, grouping, and quantification of the POSs are documented in a manner that facilitates PRA applications, updates, and peer review

Table 2. Summary of Technical Characteristics and Attributes of a Level 1 PRA for Internal Events

Element	Technical Characteristics and Attributes
Initiating Event Analysis	• The initiating event analysis includes the same attributes and characteristics as for at-power, as well as the following: – examination of human-induced initiating events, for example, those resulting from maintenance activities, including different types of LOCAs (e.g., drain-down events as opposed to pipe breaks) – review of plant operational practices in grouping of events
Success Criteria Analysis	• The success criteria analysis includes the same attributes and characteristics as for at-power, as well as an analysis appropriate to the POS definition and characterization
Accident Sequence Development Analysis	• The accident sequence development analysis includes the same attributes and characteristics as for at-power, as well as an accounting for changing plant conditions within a POS
Systems Analysis	• The systems analysis includes the same attributes and characteristics as for at-power, as well as the identification of conditions varying from POS to POS for spatial and environmental hazards, systems actuation signals, system inventories (e.g., air)
Parameter Estimation Analysis	• The parameter estimation analysis includes the same attributes and characteristics as for at-power, as well as the following: – performance of estimation on a POS-specific basis, when necessary – consideration of plant-specific data unique to POS (i.e., not applicable to at-power)
Human Reliability Analysis	• The human reliability analysis includes the same attributes and characteristics as for at-power, as well as the following: – differentiation between calibration errors that may impact equipment performance at-power versus low-power and shutdown POSs – increased emphasis on contributions to initiating events – performance of the analysis on a POS basis – identification of dependent human failure events, particularly between those resulting in initiating events and those associated with responses to the initiating events – justification for credit of operator actions credited for recovery in slowly developing scenarios (e.g., recovery times greater than 24 hours)
Quantification	• Quantification includes the same attributes and characteristics for at-power, as well as the estimation of CDF and LERF/LRF for each POS

1.2.2 Level 2 Technical Elements for Internal Events

The following briefly discusses the objective of each technical element, and for each element, provides the technical characteristics and attributes for accomplishing the objective. The objective and characteristics and attributes are given in the context of internal events

Plant damage state analysis groups similar core damage scenarios together to allow a practical assessment of the severe accident progression and containment response resulting from the full spectrum of core damage accidents identified in the Level 1 analysis. The plant damage state analysis defines the attributes of the core damage scenarios that represent boundary conditions to the assessment of severe accident progression and containment response that ultimately affect the resulting radionuclide releases.

The attributes address the dependencies between the containment systems modeled in the Level 2 analysis with the core damage accident sequence models to fully account for mutual dependencies. Core damage scenarios with similar attributes are grouped together to allow for efficient evaluation of the Level 2 response.

Accident progression analysis models the different series of events that challenge containment integrity for the core damage scenarios represented in the plant damage states. The accident progressions account for interactions among severe accident phenomena and system and human responses to identify credible containment failure modes, including failure to isolate the containment. The timing of major accident events and the subsequent loadings produced on the containment are evaluated against the capacity of the containment to withstand the potential challenges. The containment performance during the severe accident is characterized by the timing (e.g., early versus late), size (e.g., catastrophic versus bypass), and location of any containment failures. The codes used to perform the analysis are validated and verified for both technical integrity and suitability. Calculations are performed by personnel qualified to perform the types of analyses of interest and well-trained in the use of the codes.

Source term analysis characterizes the radiological release to the environment resulting from each severe accident sequence leading to containment failure or bypass. The characterization includes the time, elevation, and energy of the release and the amount, form, and size of the radioactive material that is released to the environment. The source term analysis is sufficient to determine whether a large early release or a large late release occurs. A large early release is one involving the rapid, unmitigated release of airborne fission products from the containment to the environment occurring before the effective implementation of offsite emergency response and protective actions such that there is a potential for early health effects. Such accidents generally include unscrubbed releases associated with early containment failure at or shortly after vessel breach, containment bypass events, and loss of containment isolation. With large late release, unmitigated release from containment occurs in a timeframe that allows effective evacuation of the close-in population making early health effects are unlikely.

Quantification integrates the accident progression models and source term evaluation to provide estimates of the frequency of radionuclide releases that could be expected following the identified core damage accidents. This quantitative evaluation reflects the different magnitudes and timing of radionuclide releases and specifically allows for identification of LERF or LRF.

Table 3 provides a summary of the needed characteristics and attributes for the technical elements for a Level 2 PRA for internal events. The characteristics and attributes are provided for both at-power conditions and for LPSD conditions.

Table 3. Summary of Technical Characteristics and Attributes of a Level 2 PRA for Internal Events

Element	Technical Characteristics and Attributes
PRA At-Power	
Plant Damage State Analysis	• Identification of the attributes of the core damage scenarios that influence severe accident progression, containment performance, and any subsequent radionuclide releases • Grouping of core damage scenarios with similar attributes into plant damage states • Carryover of relevant information from Level 1 to Level 2
Severe Accident Progression Analysis	• Use of appropriate codes by qualified trained users with an understanding of the code limitations and the means for addressing the limitations • Assessment of the credible severe accident phenomena via a structured process • Assessment of containment system performance including linkage with failure modes on non-containment systems • Establishment of the capacity of the containment to withstand severe accident environments • Assessment of accident progression timing, including timing of loss of containment failure integrity
Quantification	• Estimation of the frequency of different containment failure modes and resulting radionuclide source terms
Source Term Analysis	• Assessment of radionuclide releases including appreciation of timing, location, amount, and form of release • Grouping of radionuclide releases into smaller subsets of representative source terms with emphasis on large early release and large late release
PRA Low Power and Shutdown	
Plant Damage State Analysis	• The plant damage state analysis includes the same attributes and characteristics as for at-power
Severe Accident Progression Analysis	• The severe accident progression analysis includes the same attributes and characteristics as for at-power, as well as the following: – estimation of containment capacity based on the capacity of temporary closure, although for some POSs, containment may be open or have a reduced pressure capability – assessment of the feasibility of the ability of operators to close containment before adverse environmental conditions (e.g., temperature, radiation, humidity, noise) prevent closure
Quantification	• Quantification includes the same attributes and characteristics as for at-power.
Source Term Analysis	• The source term analysis includes the same attributes and characteristics as for at-power.

1.2.3 Internal Floods Technical Elements

PRA models of internal floods are based on the internal events PRA model, modified to include the impact of the identified flood scenarios in terms of causing initiating events, and failing equipment used to respond to initiating events. An important step in this process is to define flood areas which is done in the **flood area partitioning**. Flood scenarios are developed by the process of **flood source**

analysis, **flood scenario analysis,** and subsequent **flood scenario delineation and quantification**. The quantification task specific to internal floods is similar in nature to that for the internal events. Because of its dependence on the internal events model, the flooding analysis incorporates the elements of Sections 1.2.1 and 1.2.2, as necessary.

Flood area partitioning divides the plant into flood areas that are used as the basis for the flood analysis. Flooding areas are defined on the basis of physical barriers, mitigation features, and propagation pathways.

Flood source analysis identifies the flood sources in each flood area that are attributable to equipment (e.g., piping, valves, pumps) and other sources internal to the plant (e.g., tanks) along with the affected structures, systems, and components (SSCs). Flooding mechanisms examined include failure modes of components, human-induced mechanisms, and other water-releasing events. Flooding types (e.g., leak, rupture, spray) and flood sizes are determined. Plant walkdowns are performed to verify the accuracy of the information. It is recognized that at the design and initial licensing stage, plant walkdowns are not possible.

Flood scenario analysis identifies the potential flooding scenarios for each flood source by identifying flood propagation paths of water from the flood source to its accumulation point (e.g., pipe and cable penetrations, doors, stairwells, failure of doors or walls). Plant design features or operator actions that have the ability to terminate the flood are identified. The susceptibility of each SSC in a flood area to flood-induced mechanisms is examined (e.g., submergence, spray, pipe whip, and jet impingement). Flood scenarios are developed by examining the potential for propagation and giving credit for flood mitigation. Flood scenarios can be eliminated on the basis of screening criteria. The screening criteria used are well-defined and justified.

Flood scenario delineation and quantification provide an estimation of the CDF of the plant that includes internal floods. The frequency of flooding-induced initiating events that represent the design, operation, and experience of the plant are quantified. The Level 1 models are modified and the internal flood accident sequences quantified to (1) modify accident sequence models to address flooding phenomena, (2) perform necessary calculations to determine success criteria for flooding mitigation, (3) perform parameter estimation analysis to include flooding as a failure mode, (4) perform human reliability analysis to account for performance shaping factors that are attributable to flooding, and (5) quantify internal flood accident sequence CDF.

Table 4 summarizes the needed characteristics and attributes for the technical elements of an internal flood analysis.

Table 4. Summary of Technical Characteristics and Attributes of an Internal Flood Analysis

Element	Technical Characteristics and Attributes
Flood Area Partioning	• Flood areas defined based on plant features that can restrict flooding • Verification of area definitions through plant walkdowns
Flood Source Analysis	• Sufficiently detailed identification and characterization of the following: – SSCs located within each area – flood sources and flood mechanisms – type of water release and capacity • Elimination of flood sources and areas uses well-defined and justified screening criteria • Verification of the information through plant walkdowns for as-built plants
Flood ScenarioAnalysis	• Identification and evaluation of the following: – flood propagation paths – flood mitigating plant design features(e.g., drains and sumps) and operator actions – the susceptibility of SSCs in each flood area to the different types of floods • Elimination of flood scenarios uses well-defined and justified screening criteria
Flood Scenario Delineation and Quantification	• Identification and grouping of flooding-induced initiating events on the basis of a structured and systematic process • Estimation of flooding initiating event frequencies • Modification of the Level 1 models to account for flooding effects including uncertainties • Estimation of CDF for chosen flood sequences • Elimination of flood scenarios uses well-defined and justified screening criteria

NOTE:

(1) For low-power and shutdown conditions, the following attributes and characteristics are also needed:
- verification of temporary alignments for the specific outage or average modeled outage for data collection
- identification of existing flood barriers that may be impaired or disabled that could impact the flood zone
- consideration of automatic responses that may differ from at-power conditions

1.2.4 Internal Fire Technical Elements

PRA models of internal fires are based on the internal events PRA model, modified to include the impact of the identified fire scenarios in terms of causing initiating events (plant transients and loss-of-coolant accidents (LOCAs)) and the failing equipment used to respond to initiating events. The incorporation of the set of fire scenarios into a fire PRA model is performed using a number of technical elements discussed below. Because of its dependence on the internal events model, the internal fire analysis incorporates the elements of Sections 1.2.1 and 1.2.2 of this guide as necessary.

Plant boundary definition and partitioning establish the overall boundaries of the fire PRA and divides the area within that boundary into smaller regions (i.e., physical analysis units), commonly known as fire areas or compartments. The entire fire PRA is generally organized according to these physical analysis units.

Equipment selection identifies the equipment to be included in the fire PRA model. This equipment is selected from the equipment included in the internal events PRA and in the plant's fire protection program and analysis (i.e., the postfire safe-shutdown analysis) that, if failed by a fire, could produce a plant initiator or affect the plant response. Fire-induced spurious actuations are of particular interest. The selected equipment is mapped to the physical analysis units.

Cable selection identifies those cables associated with the equipment identified in the equipment selection technical element. The selected cables are mapped to the physical analysis units.

Qualitative screening is an optional element that may be used to eliminate certain physical analysis units defined in the plant boundary definition and partitioning element that can be shown to be unimportant to fire risk. General, qualitative criteria are typically applied. Those physical analysis units screened out in this technical element play no role in the more detailed quantitative assessment.

Fire PRA plant response model develops a logic model that represents the plant response following a fire. This model is based upon the internal events PRA model which is modified to account for fire effects. These modifications include system, structure, and component failures that specifically result from fires and consider of fire-specific procedures. The latter are processed through the human reliability analysis technical element.

Fire scenario selection and analysis defines and analyzes fire event scenarios that capture the plant fire risk associated with each physical analysis unit. Fire scenarios are defined in terms of ignition sources, fire growth and propagation, fire detection, fire suppression, and cables and equipment ("targets") damaged by the fire. Main control room fire scenarios, including control room abandonment, are analyzed explicitly. Multicompartment fire propagation scenarios, including scenarios from all screened physical analysis units, are also assessed.

Fire ignition frequencies are estimated for the ignition sources postulated for the fire scenarios. Ignition sources consist of in situ sources, such as electrical cabinets or batteries, and other sources such as transient fires. U.S. nuclear power industry fire event frequencies, possibly augmented with plant-specific experience, are used where available to establish the fire ignition frequencies. Other sources are generally used only for cases when the U.S. nuclear power industry does not provide the representative frequency.

Quantitative screening involves eliminating physical analysis units from further quantitative analysis based on their quantitative contribution to fire risk. Quantitative screening criteria are established in terms of fire-induced CDF and LERF/LRF. This element is not required, although it is expected to be used in most applications. Note that, unlike the physical analysis units screened during qualitative screening, the CDF and LERF/LRF contributions of each of these quantitatively screened units are retained and reported as a part of the total plant fire risk in the fire risk quantification element. All physical analysis units are reconsidered as a part of the multicompartment fire scenario analysis, regardless of the quantitative screening results.

Circuit failure analysis treats the impact of fire-induced circuit failures upon the plant response. In particular, spurious actuations from hot shorts (inter-cable and intra-cable) are analyzed. The conditional probability of the particular circuit failure is identified and assigned.

Post-fire human reliability analysis is conducted to identify operator actions and related human failure events (HFEs), both within and outside the main control room, for inclusion in the plant response model. This element also includes quantification of human error probabilities for the modeled actions. Modeled operator actions include those introduced into the plant response model resulting strictly from

fire-related emergency procedures and those actions retained from the internal events PRA. The latter HFEs are modified to account for fire effects.

Fire risk quantification calculates the fire-induced CDF and LERF/LRF contributions to plant risk and identifies significant contributors to each. In this element, the plant response model is quantified for the set of fire scenarios to produce conditional core damage probability and conditional large early release probability (CLERP) or conditional large release probability (CLRP) values. The conditional core damage probability and CLERP/CLRP values are mathematically combined with the corresponding fire ignition frequencies and the conditional probabilities of fire damage for the appropriate fire scenario to yield fire-induced CDF and LERF/LRF.

Seismic/fire interactions is a qualitative review of the plant fire risk caused by a potential earthquake. This element seeks to ensure that such seismic/fire interactions have been considered and their impacts assessed.

Uncertainty and sensitivity analysis identifies and characterizes sources of uncertainty as well as the potential sensitivities of the results to related assumptions and modeling approximations. The impact of parameter uncertainties on the quantitative results is assessed.

Table 5 summarizes the needed characteristics and attributes for the technical elements of an internal fire analysis.

Table 5. Summary of Technical Characteristics and Attributes of an Internal Fire Analysis

Element	**Technical Characteristics and Attributes**
Plant Boundary Definition and Partitioning	• Global analysis boundary captures all plant locations relevant to the fire PRA. • Physical analysis units are identified by credited partitioning elements that are capable of substantially confining fire damage behaviors.
Equipment Selection	• Equipment is selected for inclusion in the plant response model that will lead to a fire-induced plant initiator, or that is needed to respond to such an initiator (including equipment subject to fire-induced spurious actuation that affects the plant response). • The number of spurious actuations to be addressed increases according to the significance of the consequence (e.g., interfacing systems LOCA). • Instrumentation and support equipment are included.
Cable Selection	• Cables that are required to support the operation of fire PRA equipment (defined in the equipment selection element) are identified and located.
Qualitative Screening (Optional Element)	• Screened out physical analysis units represent negligible contributions to risk and are considered no further.
Fire PRA Plant Response Model	• Based upon the internal events PRA, the logic model is adjusted to add new fire-induced initiating events and modified or new accident sequences, operator actions, and accident progressions (in particular those from spurious actuations). • Inapplicable aspects of the internal events PRA model are bypassed.

Table 5. Summary of Technical Characteristics and Attributes of an Internal Fire Analysis

Element	Technical Characteristics and Attributes
Fire Scenario Selection and Analysis	• Fire scenarios are defined in terms of ignition sources, fire growth and propagation, fire detection, fire suppression, and cables and equipment ("targets") damaged by fire. • The effectiveness of various fire protection features and systems is assessed (e.g., fixed suppression systems). • Appropriate fire modeling tools are applied. • The technical basis is established for statistical and empirical models in the context of the fire scenarios (e.g., fire brigade response). • Scenarios involving the fire-induced failure of structural steel are identified and assessed (at least qualitatively).
Fire Ignition Frequencies	• Frequencies are established for ignition sources and consequently for physical analysis units. • Transient fires should be postulated for all physical analysis units regardless of administrative controls. • Appropriate justification must be provided to use nonnuclear experience to determine fire ignition frequency.
Quantitative Screening	• Physical analysis units that are screened out from more refined quantitative analysis are retained to establish CDF and LERF/LRF. • Typically, those fire PRA contributions to CDF and LERF/LRF that are established in the quantitative screening phase are conservatively characterized.
Circuit Failure Analysis	• The conditional probability of occurrence of various circuit failure modes given cable damage from a fire is based upon cable and circuit features.
Postfire Human Reliability Analysis	• Operator actions and related post-initiator HFEs, conducted both within and outside of the main control room, are addressed. • The effects of fire-specific procedures are identified and incorporated into the plant response model. • Plausible and feasible recovery actions, assessed for the effects of fire, are identified and quantified. • Undesired operator actions resulting from spurious indications are addressed. • Operator actions from the internal events PRA that are retained in the fire PRA are assessed for fire effects.
Fire Risk Quantification	• For each fire scenario, the fire risk results are quantified by combining the fire ignition frequency, the probability of fire damage and the conditional core damage probability (and CLRP/CLERP) from the fire PRA plant response model • Total fire-induced CDF and LERF/LRF are calculated for the plant and significant contributors identified • The contribution of quantitatively screened scenarios (from the quantitative screening element) is added to yield the total risk values

Table 5. Summary of Technical Characteristics and Attributes of an Internal Fire Analysis

Element	Technical Characteristics and Attributes
Seismic Fire Interactions	• Potential interactions resulting from an earthquake and a resulting fire that might contribute to plant risk are reviewed qualitatively • Qualitative assessment verifies that such interactions have been considered and that steps are taken to ensure that the potential risk contributions are mitigated
Uncertainty and Sensitivity	• Uncertainty in quantitative fire PRA results because of parameter uncertainties are evaluated • Model uncertainties as well as the potential sensitivities of the results to associated assumptions are identified and characterized

1.2.5 Screening and Conservative Analysis of Other External Hazards Technical Elements

Screening methods can often be employed to show that the contribution of many external events to CDF and/or LERF/LRF is insignificant. The fundamental criteria that have been recognized for screening-out events are the following: an event can be screened out either (1) if it meets the criteria in the NRC's 1975 Standard Review Plan (SRP) or a later revision; or (2) if it can be shown using a demonstrably conservative analysis that the mean value of the design-basis hazard used in the plant design is less than 10^{-5} per year and that the conditional core damage probability is less than 10^{-1}, given the occurrence of the design-basis-hazard event; or (3) if it can be shown using a demonstrably conservative analysis that the CDF is less than 10^{-6} per year. It is recognized that for those new reactor designs with substantially lower risk profiles (e.g., internal events CDF below 10^{-6}/year), the quantitative screening value should be adjusted according to the relative baseline risk value.

Screening and Conservative Analysis is usually the first task an analyst performs when conducting an external events PRA. All natural hazards and man-made events that apply to the site under consideration are first identified. A preliminary screening, using a defined set of screening criteria, is used to eliminate events matching the criteria from further consideration. Further screening can be performed by using a bounding or demonstrably conservative analysis with defined quantitative screening criteria to demonstrate that the risk from some external events is sufficiently low to eliminate them from additional consideration. Walkdowns of the plant site and plant buildings are used to confirm the assumptions used for the screening basis.

Table 6 summarizes the needed characteristics and attributes for the technical elements of an external hazard screening analysis.

Table 6. Summary of Technical Characteristics and Attributes of Screening and Conservative Analysis of Other External Hazard

Element	Technical Characteristics and Attributes
Screening and Conservative Analysis	• All potential external events that can affect the site identified. • Preliminary screening performed using a defined set of criteria. • Bounding or conservative analysis performed using defined quantitative screening criteria. • Basis for screening confirmed with walkdown.

1.2.6 Seismic Events Technical Elements

Earthquakes can cause different initiating events than those considered in an internal-event PRA, and can cause simultaneous failures of multiple redundant components, an important common-cause

effect that needs to be included in a probabilistic seismic analysis. All possible levels of earthquakes along with their frequencies of occurrence and consequential damage to plant systems and components are considered in a probabilistic seismic analysis. The key elements of a seismic PRA are (1) the seismic hazard analysis used to estimate the frequencies of occurrence of different levels of ground motion at the site, (2) the seismic-fragility evaluation used to estimate the conditional probability of failure of important SSCs whose failure may lead to core damage and/or a large release, and (3) the plant response analysis. The latter involves modeling and quantification of the various combinations of structural and equipment failures that can lead to a seismic induced core damage event, and the integration of these results to quantify the risk.

Seismic Hazard Analysis is used to express the seismic hazard in terms of the frequency of exceedance for selected ground motion parameters during a specified time interval. The analysis involves identification of earthquake sources, evaluation of the regional earthquake history, and an estimate of the intensity of the earthquake-induced ground motion at the site. At most sites the objective is to estimate the probability or frequency of exceeding different levels of vibratory ground motion. However, in some cases other seismic hazards are included, such as fault displacement, soil liquefaction, soil settlement, and earthquake-induced external flooding. For all the various hazards the objective is to estimate the probability or frequency of the hazard as a function of its intensity. The complexity of the hazard analysis depends on the complexity of the seismic situation at the site, as well as the ultimate intended use of the seismic PRA. Where no prior study exists, the site-specific probabilistic seismic hazard needs to be generated, however, in many cases an existing study can be used for a site-specific assessment. For example, the Lawrence Livermore National Laboratory (LLNL) and the Electric Power Research Institute (EPRI) have developed regional hazard studies for east of the Rocky Mountains that can be used to develop a site-specific PSHA for most of the central and eastern U.S. sites after certain checks or updates are made. In a probabilistic seismic hazard analysis, an essential part of the methodology is the consideration of both aleatory and epistemic uncertainties, and typically results in generating a set of hazard curves, defined at specified fractile (confidence) levels and a mean hazard curve.

Seismic Fragility Analysis estimates the conditional probability of SSC failures at a given value of a seismic motion parameter such as peak ground acceleration, peak spectral acceleration, floor spectral acceleration, etc. Seismic fragilities used in a seismic PRA are realistic and plant-specific based on actual current conditions of the SSCs in the plant, as confirmed through a detailed walkdown of the plant. The fragilities of all the systems that participate in the accident sequences are included.

Seismic Plant Response Analysis calculates the frequencies of severe core damage and radioactive release to the environment by combining the plant logic model with component fragilities and seismic hazard estimates. The analysis is usually carried out by adding some earthquake-related basic events to the PRA internal events model, as well as eliminating some parts of the internal events model that do not apply or that can be screened out. For example, recovery of off-site power is highly unlikely after a large earthquake and therefore parts of the internal events model related to power recovery can often be eliminated. Further screening of out of low-probability, non-seismic failures and human-error events may also be possible, although significant non-seismic failures and human errors must be included. Therefore the seismic PRA model is usually adapted from the internal events, at-power PRA model to incorporate unique seismic related aspects that are different from the at-power, internal events PRA model. In some cases, instead of starting with the internal events model and adapting it, a special seismic model is created from scratch. In this case it is especially important to check for consistency with the internal events model regarding plant response and the cause-effect relationships of the failures. In any case, the seismic PRA model includes all significant seismic causes initiating events and seismic induced SSC failures, as well as significant non-seismic failures and human errors. The model reflects the as-built and as-operated plant.

Table 7 provides a summary of the needed characteristics and attributes for the technical elements for a seismic event analysis.

Table 7. Summary of Technical Characteristics and Attributes of Seismic PRA (See Note)

Element	Technical Characteristics and Attributes
Probabilistic Seismic Analysis	• Seismic hazard analysis - establishes the frequency of earthquakes at the site - site-specific - examines all credible sources of damaging earthquakes - includes current information - based on comprehensive data, including - geological, seismological, and geophysical data - local site topography - historical information - reflects the composite distribution of the informed technical community. - level of analysis depends on application and site complexity • Aleatory and epistemic uncertainties in the hazard analysis (in characterizing the seismic sources and the ground motion propagation) - properly accounted for - fully propagated - allow estimates of fractile hazard curves, median and mean hazard curves, uniform hazard response spectra • Spectral shape used in the seismic PRA - based on a site-specific evaluation - broad-band, smooth spectral shapes for lower-seismicity sites acceptable if shown to be appropriate for the site - uniform hazard response spectra acceptable if it reflects the site-specific shape • Need to assess whether for the specific application, other seismic hazards need to be included in the seismic PRA, such as - fault displacement - landslide, - soil liquefaction - soil settlement
Seismic Fragility Analysis	• Seismic fragility estimate - plant-specific - realistic - includes all systems that participate in accident sequences included in the seismic-PRA systems model - basis for screening of high capacity components is fully described • Seismic fragility evaluation performed for critical SSCs based on - review of plant design documents - earthquake experience data - fragility test data - generic qualification test data (use is justified) - walkdowns • walkdowns focus on - anchorage - lateral seismic support

Table 7. Summary of Technical Characteristics and Attributes of Seismic PRA (See Note)

Element	Technical Characteristics and Attributes
	- potential systems interactions
Seismic Plant Response Analysis	• The seismic PRA models include - seismic-caused initiating events - seismically induced SSC failures - nonseismically induced unavailabilities, - other significant failures (including human errors) that can lead to CDF or LERF • The seismic PRA models - adapted to incorporate seismic-analysis aspects that are different from corresponding aspects found in the at-power, internal events PRA model - reflects the as-built and as-operated plant being analyzed • Quantification of CDF and LERF integrates - the seismic hazard - the seismic fragilities - the systems analysis
In meeting the attributes and characteristics for the seismic portion of an external hazard PRA, a seismic margins method is not an acceptable approach because it does not result in the definition and quantification of seismically induced accident sequences.	

1.2.7 High Winds Technical Elements

Screening methods can often be used to show that the contribution of high winds to CDF and/or LERF/LRF is insignificant. The considerations in this section apply to those high-wind phenomena that have not been screened out. The technical elements for a high-winds PRA are similar to those for a seismic PRA. The major elements are wind hazard analysis, wind fragility analysis, and the plant response analysis, which produces the quantified results. The types of high-wind events that need to be considered in the analysis are site dependent. These can include tornados and their effects, cyclones, hurricanes, and typhoons, as well as thunderstorms, squall lines, and other weather fronts. It is assumed that the high-winds-PRA is based on modifications made to an existing up-to-date internal events, at-power Level 1 and Level 2 /LERF PRA.

High Wind Hazard Analysis estimates the frequency of high winds at the site using a site-specific probabilistic wind hazard analysis that incorporates the available recent regional and site-specific information and uses up-to-date databases. Uncertainties in the models and parameter values are properly accounted for and fully propagated to allow the derivation of a mean hazard curve from the family of hazard curves obtained.

High Wind Fragility Analysis is an evaluation that is performed to estimate plant-specific, realistic wind fragilities for those structures, or systems, or components (or their combination) whose failure contributes to core damage or large early release.

High Wind Plant Response Analysis uses a wind-PRA systems model that includes all significant wind-caused initiating events and other failures that can lead to core damage or large early release. The model is adapted from the internal events, at-power PRA model to incorporate unique wind-analysis aspects that are different from the at-power, internal events PRA model.

Table 8 summarizes the needed characteristics and attributes for the technical elements of a high winds analysis.

Table 8. Summary of Technical Characteristics and Attributes of High Winds

Element	Technical Characteristics and Attributes
High Wind Hazard Analysis	• Probabilistic wind hazard analysis - results in frequency of high winds at the site - based on site-specific data - reflects recent information • Uncertainties in the models and parameter values - properly accounted for - fully propagated - allow estimate of mean hazard curve
High Wind Fragility Analysis	• Wind fragility estimate - plant-specific, - realistic - all SSCs whose failure contributes to core damage or large early release included
High Wind Plant Response Analysis	• Wind-PRA model - includes all significant wind-caused initiating events - includes other significant failures (both those that are wind-caused and those that are random failures) that can lead to CDF or LERF/LRF. - adapted from the internal events, at-power PRA model - incorporates unique wind-analysis aspects that are different from the at-power, internal events PRA model.

1.2.8 External Flood Technical Elements

Screening methods can often be employed to show that the contribution of some external flood events to core damage frequency and/or large release frequency is insignificant. The considerations in this section apply to those flooding phenomena that have not been screened out. The technical elements for an external flooding PRA are similar to those for an internal flooding PRA and seismic PRA. The major elements of the PRA methodology are flooding hazard analysis, flooding fragility analysis, and the plant response analysis, which produces the quantified results. The analysis of how the flooding pathways and water levels cause the failure of SSCs following ingress into the plant structures is similar to the analysis in the internal flooding PRA. The types of external flooding phenomena that need to be considered in the analysis are dependent on the site. Both natural phenomena, such as river or lake flooding, ocean flooding from high tides or storm surges, unusually high precipitation, tsunamis, seiches, etc., as well as man-made events such as failures of dams, levees, and dikes, are considered. It is assumed that the external flooding PRA is based on modifications made to an existing up-to-date internal events, at-power PRA.

External Flood Hazard Analysis estimates the frequency of external flooding at the site using a site-specific probabilistic hazard analysis that incorporates the available recent site-specific information and uses up-to-date databases. Uncertainties in the models and parameter values are properly accounted for and fully propagated to allow the derivation of a mean hazard curve from the family of hazard curves obtained.

External Flood Fragility Analysis is an evaluation that is performed to estimate plant-specific, realistic flooding fragilities for those structures, or systems, or components (or their combination) whose failure contributes to core damage or large early release.

External Flood Plant Response Analysis uses an external flooding-PRA model that includes all significant flood-caused initiating events and other failures that can lead to core damage or large early release. The model is adapted from the internal events, at-power PRA model to incorporate unique flood-analysis aspects that are different from the at-power, internal events PRA model.

Table 9 summarizes the needed characteristics and attributes for the technical elements of an external flood analysis.

Table 9. Summary of Technical Characteristics and Attributes of External Floods

Element	Technical Characteristics and Attributes
External Flood Hazard Analysis	• Probabilistic flood hazard analysis - results in frequency of external flooding at the site - based on site-specific data - reflects recent information • Uncertainties in the models and parameter values - properly accounted for - fully propagated - allow estimate of mean hazard curve
External Flood Fragility Analysis	• Flooding fragility estimate - plant-specific, - realistic - all SSCs whose failure contributes to core damage or large early release included
External Flood Plant Response Analysis	• External flooding-PRA model - includes all significant flood-caused initiating events - includes other significant failures (both those that are caused by the flooding and those that are random failures) that can lead to CDF or LERF/LRF - adapted from the internal events, at-power PRA model - incorporates unique flood-analysis aspects that are different from the at-power, internal events PRA model.

1.2.9 Other External Hazards Technical Elements

Screening methods can often be employed to show that the contribution of many external hazards to CDF and/or LERF/LRF is insignificant. The considerations in this section apply to those other external hazards that have not been screened out. Therefore, this set of technical elements applies to a detailed PRA analysis of an external hazard category. The structure of the PRA of any external hazard is based on the following technical requirements: external hazard analysis, external hazard fragility analysis, and the plant response analysis, which produces the quantified results. It should be noted that because of the limited collective experience of the analysis community in the area of other external events PRA, an extensive peer review is particularly important for such an analysis.

External Hazards Analysis establishes the frequency of occurrence of different intensities of the external hazard being analyzed and uses a site-specific probabilistic evaluation that is based on recent available data and site-specific information. Historical data or a phenomenological model, or a mixture of the two is used in the analysis.

External Hazard Fragility Analysis is an evaluation that is performed to estimate the fragility or vulnerability of a structure, or system, or component (or their combination) whose failure contributes to core damage or large early release. The fragility analysis uses plant-specific information and an accepted engineering method for evaluating failures.

External Hazard Plant Response Analysis uses a model that includes all important initiating events and other important failures caused by the effects of the external event that can lead to core damage or large early release. The model is adapted from the internal events, at-power PRA model to incorporate unique aspects related to the hazard analyzed that are different from the at-power, internal events PRA model.

Table 10 summarizes the needed characteristics and attributes for the technical elements of other external hazards analysis.

Table 10. Summary of Technical Characteristics and Attributes of Other External Hazards

Element	Technical Characteristics and Attributes
External Hazard Analysis	• Other hazard analysis - results in frequency of occurrence of other hazards at site - based on site-specific data - reflects recent information - uses historical data or a phenomenological model, or a mixture of the two
External Hazard Fragility Analysis	• Fragility estimate - plant-specific, - SSC-specific information - uses accepted engineering methods
External Hazard Plant Response Analysis	• Hazard model - includes all important initiating events related to hazard analyzed - includes other significant failures (both those that are caused by the external hazard and those that are not) that can lead to CDF or LERF/LRF - adapted from the internal events, at-power PRA model - incorporates unique aspects related to hazard analyzed that are different from the at-power, internal events PRA model.

1.2.10 Interpretation of Results Technical Elements

The results of the Level 1 PRA are examined to identify the contributors sorted by hazard group, initiating events (e.g., transients, LOCAs) or specific hazard plant damage states (e.g., fire scenarios, internal flood scenarios, seismic plant damage states), accident sequences, equipment failures, and human errors. Methods such as importance measure calculations (e.g., Fussell-Vesely Importance, risk achievement worth, risk reduction worth, and Birnbaum Importance) are used to identify the contributions of various events to the estimation of CDF for both individual sequences and the total CDF [i.e., both contributors to the total CDF, including the contribution from the different hazard groups and different operating modes (i.e., full- and low-power and shutdown) and contributors to each contributing sequence are identified].

The results of the Level 2 PRA are examined to identify the contributors (e.g., containment failure mode, physical phenomena) to the model estimation of LERF or LRF for both individual sequences and the model as a whole, using such tools as importance measure calculations (e.g., Fussell-Vesely Importance, risk achievement worth, risk reduction worth, and Birnbaum Importance).

For many applications, it is necessary to combine the PRA results from different hazard groups (e.g., from internal events, internal fires, and seismic events). For this reason, an important aspect in interpreting the PRA results is understanding both the level of detail associated with the modeling of each of the hazard groups, and the hazard group-specific model uncertainties. With respect to the level of detail, for example, the analysis of specific scope items such as internal fire, internal flooding, or seismic events typically involves a successive screening approach, so that more detailed analysis can focus on the more significant contributions. The potential conservatism associated with the evaluation of the less significant contributors using this approach is assessed for each hazard group. In addition, each of the hazard groups has unique sources of model uncertainty. The assumptions made in response to these sources of model uncertainty and any conservatisms introduced by the analysis approaches can bias the assessment of importance measures with respect to the combined risk assessment and the relative contributions of the hazard groups to the various risk metrics. Therefore, the sources of model uncertainty are identified and their impact on the results analyzed for each hazard group individually, so that, when it is necessary to combine the PRA results, the overall results can be characterized appropriately. The sensitivity of the model results to model boundary conditions and other assumptions is evaluated, using sensitivity analyses to look at assumptions both individually and in logical combinations. The combinations analyzed are chosen to account for interactions among the variables. NUREG-1855 provides guidance on the treatment of uncertainties associated with PRA.[7] The understanding gained from these analyses is used to appropriately characterize the relative significance of the contributions from each hazard group.

Table 11 summarizes the needed characteristics and attributes for the technical elements of interpretation of results.

Table 11. Summary of Technical Characteristics and Attributes for Interpretation of Results

Element	Technical Characteristics and Attributes
Level 1 PRA	
Interpretation of Results	• Identification of the significant contributors to CDF (hazard groups, initiating events, specific hazard plant damage states, accident sequences, equipment failures and human errors) • Identification of sources of uncertainty and their potential impact on the PRA model • Understanding of the impact of the assumptions on the CDF and the identification of the accident sequence and their contributors
Level 2 PRA	
Interpretation of Results	• Identification of the contributors to containment failure, resulting source terms, LERF and LRF • Identification of sources of uncertainty and their impact on the PRA model • Understanding of the impact of the assumptions on Level 2 results

1.2.11 Documentation Technical Elements

The documentation of the PRA model needs to provide the necessary information so that the results can easily be reproduced and justified. The sources of information used in the PRA also need to be referenced and retrievable. The methodology used to perform each aspect of the work is described

[7] This NUREG also provides guidelines with regard to defining, identifying and characterizing the different sources of uncertainty.

either through documenting the actual process or through reference to existing methodology documents. Sources of uncertainty (both parameter and model) are identified and their impact on the results assessed. A source of model uncertainty is one that is related to an issue for which there is no consensus approach or model (e.g., choice of data source, success criteria, reactor coolant pressure seal LOCA model, human reliability model) and where the choice of approach or model is known to have an impact on the PRA results in terms of introducing new accident sequences, changing the relative importance of sequences, or significantly affecting the overall CDF, LERF, or LRF estimates that might have an impact on the use of the PRA in decision-making. Assumptions made in performing the analyses are identified and documented along with their justification to the extent that the context of the assumption is understood. The results (e.g., products and outcomes) from the various analyses are documented.

Table 12 summarizes the needed characteristics and attributes for the technical elements of other external hazards analysis.

Table 12. Summary of Technical Characteristics and Attributes for Documentation

Element	Technical Characteristics and Attributes
Traceability and Justification	• The documentation is sufficient to facilitate independent peer reviews. • The documentation describes the interim results (sufficient to provide traceability and defensibility of the final results) and the final results, insights, and sources of uncertainties. • Walkdown process, where applicable, and results are fully described.

1.3 Level of Detail of a PRA

For each given technical element, the level of detail may vary. The detail may vary from the degree to which (1) plant design and operation is modeled, (2) specific plant experience is incorporated into the model, and (3) realism is incorporated into the analyses that reflect the expected plant response. Regardless of the level of detail developed in the PRA, the characteristics and attributes provided below are addressed. That is, each characteristic and attribute is always addressed, but the degree to which it is addressed may vary. In general, the level of detail for the base PRA needs to be consistent with current good practice[8].

The level of detail needed is dependent on the application. The application may involve using the PRA during different plant "stages" (i.e., design, construction, and operation). Consequently, a PRA used to support a design certification will not have the same level of detail as a PRA of a plant that has years of operating experience. While it is recognized that the same level of detail is not needed, each of the technical elements and its attributes has to be addressed.

[8] Current good practices are those practices that are generally accepted throughout the industry and have shown to be technically acceptable in documented analyses or engineering assessments.

1.4 PRA Development, Maintenance, and Upgrade

The PRA results used to support an application are derived from a PRA model that represents the as-designed, as-built, as-operated plant[9] to the extent needed to support the application.[10] Therefore, a process for developing, maintaining, and upgrading a PRA is established. This process involves identifying and using plant information to develop the original PRA and to modify the PRA. The process is performed such that the plant information identified and used in the PRA in reflecting the as-designed, as-built, as-operated plant, is as realistic as possible in assessing the risk. The information sources include the applicable design, operation, maintenance, and engineering characteristics of the plant.

For those SSCs and human actions used in the development of the PRA, the following information is identified, integrated, and used in the PRA:

- **plant design information** reflecting the normal and emergency configurations of the plant
- **plant operational information** with regard to plant procedures and practices
- **plant test and maintenance** procedures and practices
- **engineering aspects** of the plant design

Further, plant walkdowns are conducted to ensure that information sources being used actually reflect the plant's as-built, as-operated condition. In some cases, corroborating information obtained from the documented information sources for the plant and other information may only be gained by direct observations. It is recognized that at the design and initial licensing stages, plant walkdowns are not possible.

Table 13 describes the characteristics and attributes that need to be included for the above types of information.

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[9] As-built, as-operated is a conceptual term that reflects the degree to which the PRA matches the current plant design, plant procedures, and plant performance data, relative to a specific point in time. At the DC or AOL stage, the plant is neither built nor operated. For these situations, the intent of the PRA model is to reflect the "as-designed, as-to-be-built, and as-to-be-operated."

[10] It is recognized that at the design certification or combined operating license stage where the plant is not built or operated, the term "as-built, as-operated" is meant to reflect the as-designed plant assuming site and operational conditions for the given design.

Table 13. Summary of Attributes and Characteristics for Information Sources Used in PRA Development

Type Of Information	**Attributes and Characteristics** (See Note)
Design	• The safety functions required to maintain the plant in a safe stable state and prevent core or containment damage • Identification of those SSCs that are credited in the PRA to perform the above functions • The functional relationships among the SSCs including both functional and hardware dependencies • The normal and emergency configurations of the SSCs • The automatic and manual (human interface) aspects of equipment initiation, actuation, operation, as well as isolation and termination • The SSC's capabilities (flows, pressures, actuation timing, environmental operating limits) • Spatial layout, sizing, and accessibility information related to the credited SSCs • Other design information needed to support the PRA modeling of the plant
Operational	• That information needed to reflect the actual operating procedures and practices used at the plant including when and how operators interface with plant equipment as well as how plant staff monitor equipment operation and status • That information needed to reflect the operating history of the plant as well as any events involving significant human interaction
Maintenance	• That information needed to reflect planned and typical unplanned tests and maintenance activities and their relationship to the status, timing, and duration of the availability of equipment • Historical information related to the maintenance practices and experience at the plant
Engineering	• The design margins in the capabilities of the SSCs • Operating environmental limits of the equipment • Expected thermal hydraulic plant response to different states of equipment (such as for establishing success criteria) • Other engineering information needed to support the PRA modeling of the plant
It is recognized that for reactors in the design or construction stage, the level of operational and maintenance information may vary.	

As a plant operates over time, its associated risk may change. This change may occur for the following reasons:

- The PRA model may change as a result of improved methods or techniques.
- Operating data may change the availability or reliability of the plant's structures, systems, and components.
- Plant design or operation may change.

Therefore, to ensure that the PRA represents the risk of the current as-built and as-operated plant, the PRA needs to be maintained and upgraded over time. Table 14 provides the attributes and characteristics of an acceptable process.

Table 14. Summary of Characteristics and Attributes for PRA Maintenance and Upgrade

Characteristics and Attributes
• Monitor PRA inputs and collect new information • Ensure cumulative impact of pending plant changes are considered • Maintain configuration control of the computer codes used in the PRA • Identify when PRA needs to be updated based on new information or new models/techniques/tools • Ensure peer review is performed on PRA upgrades

2. Consensus PRA Standards and Industry PRA Programs

One acceptable approach to demonstrate conformance with Regulatory Position 1 is to use a national consensus PRA standard or standards that address the scope of the PRA used in the decision-making. ASME and ANS have issued a PRA standard that provides both process and technical requirements for an at-power Level 1 and limited Level 2 PRA for internal events, internal flood, internal fire, seismic, wind, external flood and other external events (Ref. 14). This standard is not prescriptive in that it only establishes what a technically acceptable PRA needs to include, but it does not detail the requirements for performing a technically acceptable PRA.[11] A peer review is needed to determine if the intent of the requirements in the standard is met.

2.1 Consensus PRA Standards

In general, if a PRA standard is used to demonstrate conformance with Regulatory Position 1, the standard should be based on a set of principles and objectives. Table 15 provides an acceptable set of principles and objectives that were established and used by ASME/ANS in development of their Level 1/LERF PRA standard. Principle 3 recognizes that the technical requirements of a PRA can be, and generally are, performed to different "capabilities." In developing the various models in the PRA, the different capabilities are distinguished by three attributes, determined by the degree to which the following criteria are met:

- The scope and level of detail that reflects the plant design, operation, and maintenance.
- Plant-specific information versus generic information to represent the as-designed, as-built and as-operated plant.
- Realism is incorporated in the expected response of the plant.

[11] The standards are written in terms of "requirements." Therefore, the use of this work in this regulatory guide is standards language (e.g., in a standard, it states the standards "sets forth requirements") and is not meant to imply a regulatory requirement.

Table 15. Principles and Objectives of a Standard

1. The PRA standard provides well-defined criteria against which the strengths and weaknesses of the PRA may be judged so that decision-makers can determine the degree of reliance that can be placed on the PRA results of interest.
2. The standard is based on current good practices as reflected in publicly available documents. The need for the documentation to be publicly available follows from the fact that the standard may be used to support safety decisions.
3. To facilitate the use of the standard for a wide range of applications, categories can be defined to aid in determining the applicability of the PRA for various types of applications.
4. The standard thoroughly and completely defines what is technically required and should, where appropriate, identify one or more acceptable methods.
5. The standard requires a peer review process that identifies and assesses where the technical requirements of the standard are not met. The standard needs to ensure that the peer review process meets the following criteria:
   - determines whether methods identified in the standard have been used appropriately
   - determines that, when acceptable methods are not specified in the standard, or when alternative methods are used in lieu of those identified in the standard, the methods used are adequate to meet the requirements of the standard
   - assesses the significance of the results and insights gained from the PRA of not meeting the technical requirements in the standard
   - highlights assumptions that may significantly impact the results and provides an assessment of the reasonableness of the assumptions
   - is flexible and accommodates alternative peer review approaches
   - includes a peer review team that is composed of members who are knowledgeable in the technical elements of a PRA, are familiar with the plant design and operation, and are independent with no conflicts of interest *that may influence the outcome of the peer review* [this clause was not in the ASME definition]
6. The standard addresses the maintenance and update of the PRA to incorporate changes that can substantially impact the risk profile so that the PRA adequately represents the current as-designed [added], as-built and as-operated plant.
7. The standard is a living document. Consequently, it should not impede research. It is structured so that, when improvements in the state of knowledge occur, the standard can easily be updated.

It is recognized that a PRA may not satisfy each technical requirement to the same degree (i.e., capability category as used in the ASME/ANS PRA standard); that is, the capability category achieved for the different technical requirements may vary. This variation can range from (1) the minimum needed to meet the attributes and characteristics for each technical element, to (2) the minimum to meet current good practice for each technical element, to (3) the minimum to meet the state-of-the-art for each technical element. Further, which capability category is needed to be met for each technical requirement is dependent on the specific application. In general, the staff anticipates that current good practice, i.e., Capability Category II of the ASME/ANS standard, is the level of detail that is adequate for the majority of applications. However, for some applications, Capability Category I may be sufficient for

some requirements, whereas for other applications it may be necessary to achieve Capability Category III for specific requirements.

These requirements are either "process" in nature, or "technical" in nature. The process type requirements address the process for application, development, maintenance and upgrade, and peer review. The technical requirements address the technical elements of the PRA and what is necessary to adequately perform that element.

For process requirements, the intent is generally straightforward and the requirement is either met or not met. For the technical requirements, it is not always as straightforward. Many of the technical requirements in a standard are applied more than once in developing the PRA model. For example, the requirements for systems analysis apply to all systems modeled, and certain of the data requirements apply to all parameters for which estimates are provided. If among these systems or parameter estimates there are a few examples in which a specific requirement has not been met, it is not necessarily indicative that this requirement has not been met. If the requirement has been met for the majority of the systems or parameter estimates, and the few examples can be put down to mistakes or oversights, the requirement would be considered to be met. If, however, there is a systematic failure to address the requirement (e.g., component boundaries have not been defined anywhere), then the requirement has not been met. In either case, the instances of noncompliance are to be (1) rectified or demonstrated not to be relevant to the application and (2) documented.

Further, the technical requirements may be defined at two different levels: (1) high-level requirements and (2) supporting requirements. High-level requirements are defined for each technical element and capture the objective of the technical element. These high-level requirements are defined in general terms, need to be met regardless of the capability category, and accommodate different approaches. Supporting requirements are defined for each high-level requirement. These supporting requirements are those minimal requirements needed to satisfy the high-level requirement. Consequently, determination of whether a high-level requirement is met, is based on whether the associated supporting requirements are met. Whether or not every supporting requirement is needed for a high-level requirement is application dependent and is determined by the application process requirements.

The ASME/ANS standard is one example of a national consensus PRA standard; its scope encompasses a PRA for Level 1 and limited Level 2 (LERF) for at-power operation and internal and external hazards. Appendix A to this regulatory guide provides the staff regulatory position regarding this document. If it is demonstrated that the parts of a PRA that are used to support an application comply with the ASME/ANS standard, when supplemented to account for the staff's regulatory positions contained in Appendix A, it is considered that the PRA is considered to be adequate to support that risk-informed regulatory application.

2.2 Industry Peer Review Program

A peer review of the PRA is performed to determine whether the requirements established in the standard (as endorsed by the NRC in the appendices to this guide) have been met. An acceptable peer review approach is one that is performed according to an established process and by qualified personnel and documents the results and identifies both strengths and weaknesses of the PRA.

The **peer review process** includes a documented procedure used to direct the team in evaluating the adequacy of a PRA. The review process compares the PRA against established criteria (e.g., technical requirements defined in a PRA standard that conforms to the PRA characteristics and attributes such as those provided in Regulatory Position 1.2). In addition to reviewing the methods used in the PRA, the peer review determines whether the methods were applied correctly. The PRA models are compared

against the plant design and procedures to validate that they reflect the as-designed, or the as-built and as-operated plant. Assumptions are reviewed to determine if they are appropriate and to assess their impact on the PRA results. The PRA results are checked for fidelity with the model structure and for consistency with the results from PRAs for similar plants based on the peer reviewer's knowledge. Finally, the peer review process examines the procedures or guidelines in place for updating the PRA to reflect changes in plant design, operation, or experience. The process also needs to provide criteria ensuring that the peer review is current. That is, (1) the peer review needs to address the modifications made to the PRA since any previous peer reviews, and (2) the peer review needs to address modifications made to the standard since any previous peer reviews.

The **team qualifications** determine the credibility and adequacy of the peer reviewers. To avoid any perception of a technical conflict of interest, the peer reviewers will not have performed any actual work on the PRA. Each member of the peer review team must have technical expertise in the PRA elements he or she reviews, including experience in the specific methods that are used to perform the PRA elements. This technical expertise includes experience in performing (not just reviewing) the work in the element assigned for review. Knowledge of the key features specific to the plant design and operation is essential.[12] Finally, each member of the peer review team needs to be knowledgeable about the peer review process, including the desired characteristics and attributes used to assess the adequacy of the PRA.

Documentation provides the necessary information to ensure that the peer review process and the findings are traceable and the bases of the findings are defensible. Descriptions of the qualifications of the peer review team members and the peer review process are documented. The results of the peer review for each technical element and the PRA update process are described, including the areas in which the PRA does not meet or exceed the desired characteristics and attributes used in the review process. This includes an assessment of the importance of any identified deficiencies on the PRA results and potential uses and how these deficiencies were addressed and resolved.

Table 16 summarizes the characteristics and attributes of a peer review.

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[12] For new reactor designs that have not yet gone into commercial operation, it is recognized that a peer reviewer will not have knowledge of plant operation, and familiarity with some plant features (e.g., passive mitigation systems) may be limited. This is not to be construed as a limitation for performing a peer review using personnel who are otherwise qualified and generally familiar with the design and operation of similar plant types (e.g., pressurized-water reactors).

Table 16. Summary of the Characteristics and Attributes of a Peer Review

Element	Characteristics and Attributes
Peer Review Process	• Uses documented process • Uses as a basis for review a set of desired PRA characteristics and attributes • Uses a minimum list of review topics to ensure coverage, consistency, and uniformity • Reviews PRA methods • Reviews application of methods • Reviews assumptions and assesses their validity and appropriateness • Determines if PRA represents as-built and as-operated plant • Reviews results of each PRA technical element for reasonableness • Reviews PRA maintenance and update process • Reviews PRA modification attributable to use of different model, techniques, or tools • Reviews against modifications to the standard
Team Qualifications	• Independent with no conflicts of interest (i.e., have not performed any work on the PRA) • Collectively represent expertise in all the technical elements of a PRA including integration • Expertise in the technical element assigned to review • Knowledge of the plant design and operation • Knowledge of the peer review process
Documentation	• Describes the peer review team qualifications • Describes the peer review process • Documents where PRA does not meet desired characteristics and attributes • Assesses and documents significance of deficiencies • Describes the scope of the peer review performed (i.e., what was reviewed by the peer review team)

The ASME/ANS standard requires a peer review to be performed. The peer review, per ASME/ANS, requires that (1) a peer review process be established, and (2) provides requirements for team qualifications and documentation. A peer review methodology (i.e., process) is provided in the industry-developed peer review programs (i.e., Refs. 15–17), and noted in the ASME/ANS standard as an acceptable process. Appendices A, B, C and D to this regulatory guide the staff regulatory position on the peer review requirements in the ASME/ANS PRA standard and the peer review process in NEI 00-02, 05-04, and 07-12 (Refs. 15–17). When the staff's regulatory positions contained in the appendices are taken into account, use of a peer review can be used to demonstrate that the PRA [with regard to an at-power Level 1/LERF PRA for internal events (excluding external hazards)] is adequate to support a risk-informed application.

As stated earlier, the peer review is to be performed against established standards (e.g., the ASME/ANS PRA standard). If different criteria are used than those in the established standard, then it needs to be demonstrated that these different criteria are consistent with the established standards, as endorsed by the NRC. NEI 00-02 (Ref. 15) provides separate criteria for a peer review of an at-power Level 1 LERF PRA for internal events, excluding internal flood and fire and external hazards. NEI 00-02 also provides guidance for resolving the differences between a prior version of the internal events standard (ASME Ra Sb-2005) (Ref. 14), as endorsed by the NRC in Revision 1 of this regulatory guide, and its peer review criteria. Appendix B to this guide provides the staff position on this guidance

(referred to as the "Licensee Self-Assessment Guidance"). The NRC expects that, if the results of this self-assessment are used to demonstrate the technical adequacy of a PRA for an application, differences between the current version of the standard as endorsed in Appendix A and the earlier version be identified and addressed. In addition, future peer reviews should be performed against the established standards, as endorsed in this guide.

3. Demonstrating the Technical Adequacy of a PRA Used to Support a Regulatory Application

This section of the regulatory guide addresses the third purpose identified above, namely, to provide guidance to licensees on an approach acceptable to the NRC staff to demonstrate that the technical adequacy of the PRA used, in total or the pieces that are used to support a regulatory application, is sufficient to support the analysis.

The application-specific regulatory guides identify the specific PRA results to support the decision-making and the analysis needed to provide those results. The pieces of the PRA to support that analysis need to be identified and the guidance in this regulatory guide applies to those pieces. Regulatory Positions 3.1 and 3.2 summarize the expected outcome of the application of the application-specific regulatory guides in determining the scope of application of this regulatory guide. One acceptable approach to demonstrate conformance with Regulatory Positions 3.1 and 3.2 is to use a national consensus standard. The ASME/ANS PRA standard provides the technical requirements for achieving such a process. If the ASME/ANS PRA standard is implemented, supplemented to account for the staff's regulatory positions contained in Appendix A, it is considered that Regulatory Positions 3.1 and 3.2 are met.

When using this regulatory guide, it is anticipated that the licensee's description of the application will include the following:

- SSCs, operator actions, and plant operational characteristics affected by the application
- a description of the cause-effect relationships among the change and the above SSCs, operator actions, and plant operational characteristics
- mapping of the cause-effect relationships onto PRA model elements
- identification of the PRA results that will be used to compare against the applicable acceptance criteria or guidelines and how the comparison is to be made
- the scope of risk contributors (hazard groups and modes of operation) included in the PRA to support the decision

3.1 <u>Scope of Risk Contributors Addressed by the PRA Model</u>

Based on the definition of the application, and in particular the acceptance criteria or guidelines, the scope of risk contributors (internal and external hazard events and modes of plant operation) for the PRA is identified. For example, if the application is designed around using the acceptance guidelines of Regulatory Guide 1.174, the evaluations of CDF, ΔCDF, LERF, and ΔLERF should be performed with a full-scope PRA, including all hazard groups and all modes of operation. However, since many PRAs do not address this full scope, the decision-makers need to allow for these omissions. Examples of approaches to making allowances may in some cases include the introduction of compensatory measures, restriction of the implementation of the proposed change to those aspects of the plant covered by the risk

model, and use of bounding arguments to cover the risk contributions not addressed by the model. However, it should be noted, that consistent with the Commission endorsed phased PRA quality initiative, all risk contributors that cannot be shown as insignificant to the decision, should be assessed through quantitative risk assessment methods to support risk-informed licensing actions. This regulatory guide does not address this aspect of decision-making, but it is focused specifically on the quality of the PRA information used. As noted elsewhere in this guide, a PRA is considered a quantitative risk assessment method.

The PRA standards and industry PRA programs that have been developed, or are in the process of being developed, address a specific scope. For example, the ASME/ANS PRA standard addresses internal events, internal flood, internal fire, seismic, wind, external flood and other external hazards, at-power for a limited Level 2 PRA analysis. NEI 00-02 is a peer review process for internal events (note that the internal flooding is only addressed in the self-assessment portion of NEI 00-02 (Appendix D)). Neither addresses internal fire, external hazards, or the LPDS modes of operation. The appendices to this regulatory guide address the different PRA standards or industry PRA programs separately. In using this regulatory guide, the applicant will identify which of these appendices is applicable to the PRA analysis.

3.2 Identification of Pieces of a PRA Used To Support the Application

Based on an understanding of how the PRA model is to be used to achieve the desired results, the licensee will have identified the pieces of the PRA for each hazard group required to support a specific application. These include: (1) the logic model events elements onto which the cause-effect relationships are mapped (i.e., those directly affected by the application), and (2) all the events that appear in the accident sequences in which the first group of logic model elements appear. For some applications, this may be a limited set, but for others (e.g., risk-informing the scope of special treatment requirements), all pieces of the PRA model are relevant.

3.3 Demonstration of Technical Adequacy of the PRA

There are two aspects to demonstrating the technical adequacy of the pieces of the PRA to support an application. The first aspect is the assurance that the pieces of the PRA used in the application have been performed in a technically correct manner. The second aspect is the assurance that the assumptions and approximations used in developing the PRA are appropriate.

For the first, assurance that the pieces of the PRA used in the application have been performed in a technically correct manner implies that (1) the PRA model, or those pieces of the model required to support the application, represents the as-designed or as-built and as-operated plant, which, in turn, implies that the PRA is up to date and reflects the current design and operating practices, where appropriate, (2) the PRA logic model has been developed in a manner consistent with industry good practice (see footnote in Section 1.3 that defines good practice) and that it correctly reflects the dependencies of systems and components on one another and on operator actions, and (3) the probabilities and frequencies used are estimated consistently with the definitions of the corresponding events of the logic model.

For the second, the current state-of-the-art in PRA technology is that there are issues for which there is no consensus on methods of analysis. Furthermore, PRAs are models, and in that sense the developers of those models rely on certain approximations to make the models tractable and on certain assumptions to address uncertainties as to how to model specific issues. Regulatory Guide 1.174, and, in more detail, NUREG-1855 provide guidance on how to address and treat the uncertainties associated with a PRA. In accordance with that guidance, the impact of these assumptions and approximations on the results of interest to the application needs to be understood.

3.3.1 Assessment That the PRA Model is Technically Correct

When using risk insights based on a PRA model, the applicant must ensure that the PRA model, or at least those pieces of it needed to provide the results, is technically correct as discussed above.

The licensee is to demonstrate that the model is up-to-date in that it represents the current plant design and configuration and represents current operating practices to the extent required to support the application. This demonstration can be achieved through a PRA maintenance plan that includes a commitment to update the model periodically to reflect changes that impact the significant accident sequences.

The various consensus PRA standards and industry PRA programs that provide guidance on the performance of, or reviews of, PRAs are addressed individually in the appendices to this regulatory guide. These appendices document the staff's regulatory position on each of these standards or programs.

When the issues raised by the staff are taken into account, the standard or program in question may be interpreted to be adequate for the purpose for which it was intended. If the pieces of the PRA can be shown to have met the requirements of these documents, with attention paid to the NRC's objections, it can be assumed that the analysis is technically correct. Therefore, other than an audit, a detailed review by NRC staff of the base model PRA will not be necessary. When deviations from these documents exist, the applicant must demonstrate either that its approach is equivalent or that the influence on the results used in the application are such that no changes occur in the significant accident sequences or contributors.

3.3.2 Assessment of Assumptions and Approximations

Since the standards and industry PRA programs are not (or are not expected to be) prescriptive, there is some freedom on how to model certain phenomena or processes in the PRA; different analysts may make different assumptions and still be consistent with the requirements of the standard or the assumptions may be acceptable under the guidelines of the peer review process. The choice of a specific assumption or a particular approximation may, however, influence the results of the PRA. For each application that calls upon this regulatory guide, the applicant identifies the key assumptions[13] and approximations relevant to that application. This will be used to identify sensitivity studies as input to the decision-making associated with the application. Each of the documents addressed in the appendices either requires, or represents (in the case of the industry peer review program) a peer review. One of the functions of the peer review is to address the assumptions and make judgments as to their appropriateness.

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[13] *A key assumption* is one that is made in response to a key source of model uncertainty in the knowledge that a different reasonable alternative assumption would produce different results, or an assumption that results in an approximation made for modeling convenience in the knowledge that a more detailed model would produce different results. For the base PRA, the term "different results" refers to a change in the risk profile (e.g., total CDF and total LERF, the set of initiating events and accident sequences that contribute most to CDF and to LERF) and the associated changes in insights derived from the changes in the risk profile. A "reasonable alternative" assumption is one that has broad acceptance within the technical community and for which the technical basis for consideration is at least as sound as that of the assumption being challenged.

A key source of uncertainty is one that is related to an issue in which there is no consensus approach or model and where the choice of approach or model is known to have an impact on the risk profile (e.g., total CDF and total LERF, the set of initiating events and accident sequences that contribute most to CDF and to LERF) such that it influences a decision being made using the PRA. Such an impact might occur, for example, by introducing a new functional accident sequence or a change to the overall CDF or LERF estimates significant enough to affect insights gained from the PRA.

4. Documentation to Support a Regulatory Submittal

The licensee develops documentation of the PRA model and the analyses performed to support the risk-informed regulatory activity. This documentation comprises both archival (i.e., available for audit) and submittal (i.e., submitted as part of the risk-informed request) documentation. The former may be required on an as needed basis to facilitate the NRC staff's review of the risk-informed submittal.

4.1 Archival Documentation

Archival documentation associated with the base PRA includes the following:

- A detailed description of the process used to determine the adequacy of the PRA is provided.
- The results of the peer review and/or self-assessment[14], and a description of the resolution of all the peer review or self-assessment findings and observations are included. The results are documented in such a manner that it is clear why each requirement is considered to have been met. This can be done, for example, by providing a reference to the appropriate section of the PRA model documentation.
- The complete documentation of the PRA model is included. If the staff elects to perform an audit on all or any parts of the PRA used in the risk-informed application, the documentation maintained by the licensee must be legible, retrievable (i.e., traceable), and of sufficient detail that the staff can comprehend the bases supporting the results used in the application. Regulatory Position 1.3 of this guide provides the attributes and characteristics of archival documentation associated with the base PRA.
- A description of the process for maintenance and upgrade of the PRA is provided. The history is maintained of the maintenance and upgrade activities, and the history includes the results of any peer reviews that were performed as a result of an upgrade.

The archival documentation associated with a specific application is expected to include enough information to demonstrate that the scope of the review of the base PRA is sufficient to support the application. This includes the following information:

- the impact of the application on the plant design, configuration, or operational practices
- the risk assessment, including a description of the methodology used to assess the risk of the application, how the base PRA model was modified to appropriately model the risk impact of the application, and details of quantification and the results
- the acceptance guidelines and method of comparison
- the scope of the risk assessment in terms of hazard groups and specific accident scenarios and operating modes modeled
- the parts of the PRA required to provide the results needed to support comparison with the acceptance guidelines

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[14] When referring to "self-assessment," this term is meant to refer to the self-assessment process in NEI 00-02 for at-power Level 1/LERF PRA for internal events and internal flood.

4.2 Licensee Submittal Documentation

To demonstrate that the technical adequacy of the PRA used in an application is of sufficient quality, the staff expects the following information will be submitted to the NRC. Previously submitted documentation may be referenced if it is adequate for the subject submittal:

- To address the need for the PRA model to represent the as-designed or as-built, as-operated plant,

- Identification of permanent plant changes (such as design or operational practices) that have an impact on those things modeled in the PRA but have not been incorporated in the baseline PRA model. If a plant change has not been incorporated, the licensee provides a justification of why the change does not impact the PRA results used to support the application. This justification should be in the form of a sensitivity study that demonstrates the accident sequences or contributors significant to the application decision were not adversely impacted (remained the same).

- Documentation that the parts of the PRA required to produce the results used in the decision are performed consistently with the standard as endorsed in the appendices of this regulatory guide. If a requirement of the standard (as endorsed in the appendix to this guide) has not been met, the licensee is to provide a justification of why it is acceptable that the requirement has not been met. This justification should be in the form of a sensitivity study that demonstrates the accident sequences or contributors significant to the application were not impacted (remained the same).

- A summary of the risk assessment methodology used to assess the risk of the application, including how the base PRA model was modified to appropriately model the risk impact of the application and results. (Note that this is the same as that required in the application-specific regulatory guides.)

- Identification of the key assumptions and approximations relevant to the results used in the decision-making process. Also, include the peer reviewers' assessment of those assumptions. These assessments provide information to the NRC staff in their determination of whether the use of these assumptions and approximations is appropriate for the application, or whether sensitivity studies performed to support the decision are appropriate.

- A discussion of the resolution of the peer review (or self-assessment, for peer reviews performed using the criteria in NEI 00-02) findings and observations that are applicable to the parts of the PRA required for the application. This decision should take the following forms:
  - a discussion of how the PRA model has been changed
  - a justification in the form of a sensitivity study that demonstrates the accident sequences or contributors significant to the application decision were not adversely impacted (remained the same) by the particular issue

- The standards or peer review process documents may recognize different capability categories or grades that are related to level of detail, degree of plant specificity, and degree of realism. The licensee's documentation is to identify the use of the parts of the PRA that conform to capability categories or grades lower than deemed required for the given application (Section 1-3 of ASME/ANS RA-Sa-2009).

D. IMPLEMENTATION

The purpose of this section is to provide information to applicants and licensees regarding the NRC's plans for using this regulatory guide. The NRC does not intend or approve any imposition or backfit in connection with its issuance.

In some cases, applicants or licensees may propose an alternative or use a previously established acceptable alternative process or method. Otherwise, the methods described in this guide will be used in evaluating license applications, license amendment applications, and amendment requests.

REFERENCES

1. 60 FR 42622, "Use of Probabilistic Risk Assessment Methods in Nuclear Activities: Final Policy Statement," *Federal Register*, Volume 60, Number 42622, August 16, 1995.

2. Regulatory Guide 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.

3. NUREG-0800, "Standard Review Plan for the Review of the Safety Analysis Reports for Nuclear Power Plants," Section 19, "Use of Probabilistic Risk Assessment in Plant-Specific, Risk-Informed Decisionmaking: General Guidance," U.S. Nuclear Regulatory Commission, Washington, DC.

4. Regulatory Guide 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.

5. 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," 10 CFR 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems and Components for Nuclear Power Reactors," U.S. Nuclear Regulatory Commission, Washington, DC.

6. Regulatory Guide 1.205, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants," U.S. Nuclear Regulatory Commission, Washington, DC.

7. 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," 10 CFR 50.48(c), "Fire Protection -- National Fire Protection Association Standard NFPA 805," U.S. Nuclear Regulatory Commission, Washington, DC.

8. National Fire Protection Association Standard 805, "Performance-Based Standard for Fire Protection for Light-Water Reactor Electric Generating Plants," 2001 Edition, Quincy, MA.

9. Regulatory Guide 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)," U.S. Nuclear Regulatory Commission, Washington, DC.

10. 10 CFR Part 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants," U.S. Nuclear Regulatory Commission, Washington, DC.

11. Regulatory Guide 1.175, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Inservice Testing," U.S. Nuclear Regulatory Commission, Washington, DC.

12. Regulatory Guide 1.178, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Inservice Inspection of Piping," U.S. Nuclear Regulatory Commission, Washington, DC.

13. Regulatory Guide 1.177, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications," U.S. Nuclear Regulatory Commission, Washington, DC.

14. ASME/ANS RA-Sa-2009, "Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications," Addendum A to RA-S-2008, ASME, New York, NY, American Nuclear Society, La Grange Park, Illinois, February 2009.

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ASME RA-Sb-2005, "Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications," Addendum B to ASME RA-S-2002, ASME, New York, NY, December 30, 2005.

ASME RA-Sc-2007, "Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications," Addendum C to ASME RA-S-2002, ASME, New York, NY, July 6, 2007.

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15. NEI 00-02, "Probabilistic Risk Assessment Peer Review Process Guidance," Revision A3, Nuclear Energy Institute, Washington, DC, March 20, 2000.

Nuclear Energy Institute, Letter from Anthony Pietrangelo, Director of Risk- and Performance-Based Regulation Nuclear Generation, Nuclear Energy Institute, to Mary Drouin, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, Washington, DC, "NEI 00-02, 'Probabilistic Risk Assessment Peer Review Process Guidance,' Revision 1," May 19, 2006.

Nuclear Energy Institute, Letter from Biff Bradley, Manager of Risk Assessment, Nuclear Energy Institute, to Mary Drouin, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, Washington, DC, " Update of Appendix D to Revision 1 of NEI-00-02, Probabilistic Risk Assessment Peer Review Process Guidance," November 15, 2006.

16. NEI 05-04, "Process for Performing Follow-On PRA Peer Reviews Using the ASME PRA Standard," Revision 2, Nuclear Energy Institute, Washington, DC, November 2008.

17. NEI 07-12, "Fire Probabilistic Risk Assessment (FPRA) Peer Review Process Guidelines," Draft Version H, Revision 0, Nuclear Energy Institute, Washington, DC, November 2008.

18. SECY-00-0162, "Addressing PRA Quality In Risk-Informed Activities," U.S. Nuclear Regulatory Commission, Washington, DC, July 28, 2000.

19. SECY-04-0118, "Plan for the Implementation of the Commission's Phased Approach to Probabilistic Risk Assessment Quality," U.S. Nuclear Regulatory Commission, Washington, DC, July 13, 2004.

20. SECY-07-0042, Status of the Plan for the Implementation of the Commission's Phased Approach to Probabilistic Risk Assessment Quality," U.S. Nuclear Regulatory Commission, Washington, DC, March 7, 2007.

21. NUREG-1792, "Good Practices for Implementing Human Reliability Analysis (HRA)," U.S. Nuclear Regulatory Commission, Washington, DC, April 2005.

22. NUREG-1842, "Evaluation of Human Reliability Analysis Methods Against Good Practices," U.S. Nuclear Regulatory Commission, Washington, DC, September 2006.

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APPENDIX A

NRC REGULATORY POSITION ON ASME/ANS PRA STANDARD

Introduction

The American Society of Mechanical Engineers (ASME) and the American Nuclear Society (ANS) has published ASME RA-Sa-2009, "Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications" (Ref. 14)). The standard states that it "sets forth requirements for probabilistic risk assessments (PRAs) used to support risk-informed decision for commercial nuclear power plants, and describes a method for applying these requirements for specific applications." The NRC staff has reviewed ASME/ANS RA-Sa-2009 against the characteristics and attributes for a technically acceptable PRA as discussed in Regulatory Positions 1 and 2 of this regulatory guide. The staff's position on each requirement (referred to in the standard as a requirement, a high-level requirement, or a supporting requirement) in ASME/ANS RA-Sa-2009 is categorized as "no objection," "no objection with clarification," or "no objection subject to the following qualification," and defined as follows:

- **No objection**. The staff has no objection to the requirement.

- **No objection with clarification**. The staff has no objection to the requirement. However, certain requirements, as written, are either unclear or ambiguous, and therefore the staff has provided its understanding of these requirements.

- **No objection subject to the following qualification**. The staff has a technical concern with the requirement and has provided a qualification to resolve the concern.

ASME/ANS RA-Sa-2009 PRA standard is divided into ten parts:

- Part 1 — general requirements
- Part 2 — technical and peer review requirements for internal events
- Part 3 — technical and peer review requirements for internal flood
- Part 4 — technical and peer review requirements for internal fire events
- Part 5 — technical and peer review requirements for seismic events
- Part 6 — technical and peer review requirements for screening of other external hazards
- Part 7 — technical and peer review requirements for high winds
- Part 8 — technical and peer review requirements for external floods
- Part 9 — technical and peer review requirements for other external hazards
- Part 10 — technical and peer review requirements for seismic margins

Tables A-1 through A-10 provides the staff's position on each requirement in Parts 1 thru 10, respectively. A discussion of the staff's concern (issue) and the staff proposed resolution is provided. In the proposed staff resolution, the staff clarification or qualification to the requirement is indicated in either bolded text (i.e., **bold**) or strikeout text (i.e., ~~strikeout~~); that is, the necessary additions or deletions to the requirement (as written in the ASME/ANS standard) for the staff to have no objection are provided.

Table A-1. Staff Position on ASME/ANS RA-Sa-2009 Part 1, General Requirements for an At-Power Level 1 and LERF PRA

Index No	Issue	Position	Resolution
Global			
References	Use of references: the various references, may be acceptable, in general; however, the staff has not reviewed the references, and there may be aspects that are not applicable or not acceptable.	Clarification	For every reference cited in the standard (except NEI 00-02): **No staff position is provided on this reference. The staff neither approves nor disapproves of information contained in the referenced document.**
Section 1-1			
1-1.1 thru 1-1.7	----------	No objection	----------
Section 1-2			
1-2.1	Acronyms		
COL	Acronym is needed	Clarification	***COL*: Combined License**
Other acronyms	----------	No objection	----------
1-2.2	Definitions		
Definitions	----------	No objection	----------
Section 1-3			
1-3.1 thru 1-3.4, 1-3.6	----------	No objection	----------
1-3.5, 2nd paragraph	Use of the word "significant" should match definitions provided in Section 2.2.	Clarification	(b) The difference is not significant if the modeled accident sequences accounting for at least ~~90%~~ **95%** of CDF/LERF for the hazard group ….

Table A-1. Staff Position on ASME/ANS RA-Sa-2009 Part 1, General Requirements for an At-Power Level 1 and LERF PRA

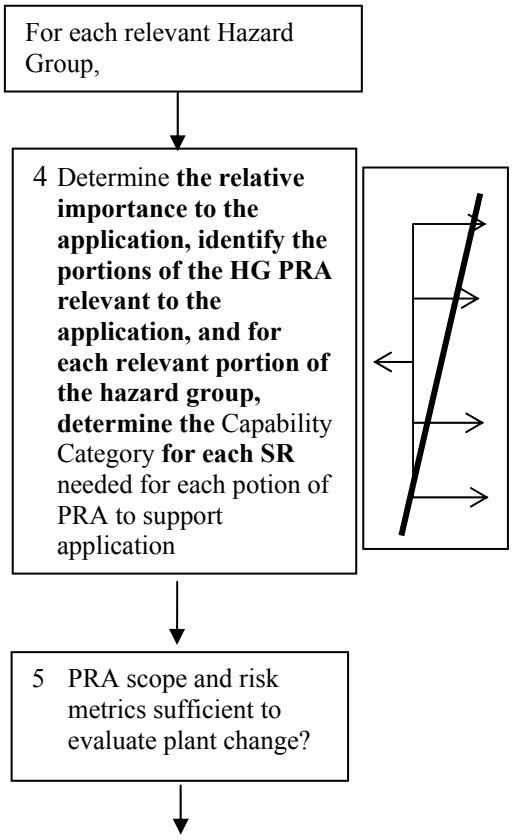
Index No	Issue	Position	Resolution
Figure 1-3-1	See staff proposed resolution for Section 1-1.4.2, text in Box 4 of Figure 1-3.1-1 needs to be modified be consistent with the text.	Clarification	
Section 1-4			
1-4.1 thru 1-4.3.2, 1-4.3.4 thru 1-4.5	----------	No objection	----------
1-4.3.3, 2nd paragraph	The intent of this statement/requirement is for the use of outside expert, as such the use of the word "should" does not provide a minimum requirement.	Clarification	…The PRA analysis team **shall** ~~should~~ use outside experts, even when….
Section 1-5			
1-5.1 thru 1-5.7	----------	No objection	----------

Table A-1. Staff Position on ASME/ANS RA-Sa-2009 Part 1, General Requirements for an At-Power Level 1 and LERF PRA

Index No	Issue	Position	Resolution
Section 1-6			
1-6.1.1, 1-6.1.2, 1-6.2, 1-6.4, 1-6.5, 1-6.6.2	----------	No objection	----------
1-6.1	The purpose, as written, implies that it is solely an audit against the requirements of Section 4. A key objective of the peer review is to ensure when evaluating the PRA against the technical requirements, the "quality" (i.e., strengths and weaknesses) of the PRA; this goal is to be clearly understood by the peer review team. Further, the statement that "the peer review need not assess all aspects of the PRA against all requirements" could be taken to imply that some of the requirements could be skipped.	Clarification	…another purpose of the peer review is to determine the strengths and weaknesses in the PRA. **Therefore, the peer review shall also assess the appropriateness of the assumptions.** The peer review need not assess all aspects of the PRA against all requirements in the Technical Requirements Section of each respective Part of this Standard; however, enough aspects of the PRA shall be reviewed for the reviewers to achieve consensus on the **assessment of each applicable supporting requirement, as well as on the** adequacy of methodologies and their implementation for each PRA Element.
1-6.3	As written, there does not appear to be a minimum set. The requirement as written provides "suggestions." A minimal set of items is to be provided; the peer reviewers have flexibility in deciding on the scope and level of detail for each of the minimal items.	Clarification	The peer review team shall use the requirements… of this Standard. **For each PRA element, a set of review topics required for the peer review team are provided in the subparagraphs of para. 6.3.** Additional material for those Elements may be reviewed depending on the results obtained. ~~These suggestions are not intended to be a minimum or comprehensive list of requirements.~~ The judgment of the reviewer shall be used to determine the specific scope and depth ~~of the review in each~~ **of each review topic for each** PRA element.

Table A-1. Staff Position on ASME/ANS RA-Sa-2009 Part 1, General Requirements for an At-Power Level 1 and LERF PRA

Index No	Issue	Position	Resolution
1-6.6.1	The specific SRs addressed in the peer review need to be documented. As written it is not clear whether certain essential items are included in the documentation requirements that are necessary to accomplish the goal of the peer review.	Clarification	(e) a discussion of the extent to which each PRA Element was reviewed, **including a list of SRs that were reviewed**
Section 1-7			
References	See global comment on references at start of Table A-1.		
Appendix 1-A			
Global	The word "significant" is used in many places throughout the Appendix. For example, the term "significant changes in scope or capability" is used to classify a change as a PRA upgrade, rather than a PRA maintenance. The term "significant change in risk insights" is used to indicate when a focused peer review is suggested even for what is nominally classified as a PRA maintenance. While what is meant by the former is clarified in the examples, what constitutes a "significant change in risk insights" needs to be defined and added to the defined terms in Section 1-2.	Clarification	Add to list of definitions -- ***Significant change in risk insights:*** **Whether a change is considered significant is dependent on the context in which the insights are used. A change in the risk insights is considered significant when it has the potential to change a decision being made using the PRA.**

Table A-1. Staff Position on ASME/ANS RA-Sa-2009 Part 1, General Requirements for an At-Power Level 1 and LERF PRA

Index No	Issue	Position	Resolution
1-A.3, Examples 1 thru 7, 9, 11-16, 19, 20, 22 thru	----------	No objection	----------
1-A.1, 4th paragraph	As written, it could be inferred that a newly developed method would not be considered an upgrade.	Clarification	. . . "new" should be interpreted as new to the subject PRA even though the methodology in question has been applied in other PRAs **and includes newly developed methods that have been used in the base PRA by the analyst**. ~~It is not intended to imply a newly developed method~~. This interpretation . . .
1-A.2	An "internal review" is recommended in several places. This recommendation is made instead of an "outside" peer review. It needs to be made clear that this internal review is a type of "peer review" and **should** follow the process and requirements for the peer review requirements.	Clarification	(d) In the context . . . A focused review would be warranted. **(e) When performing an internal review, the objective is to assess that the change to the PRA was correctly performed. In performing this assessment, the reviewer should use as guidance those applicable requirements in the standard.**
1-A.3, Examples 8, 10, 17	It is assumed that a change to the base PRA that involves a calculation using the same computer code is a PRA maintenance type change rather than a PRA upgrade type change. This assumption would only be valid if the calculation does not involve any new assumptions and the same analyst is performing the calculation.	Clarification	*Change:* . . . . using the same computer code that was used for the prior calculations**, given the calculation does not involve any new assumptions and the calculation is performed using the same guidance.** **NOTE: the words "that was used for the prior calculations" do not appear in Example #8, staff clarification includes these words in Example #8.**

Table A-1. Staff Position on ASME/ANS RA-Sa-2009 Part 1, General Requirements for an At-Power Level 1 and LERF PRA

Index No	Issue	Position	Resolution
1-A.3, Example 18	Changing the definition of core damage without changing the thermal-hydraulic methodology may result in changed success criteria which could change the accident progression delineated by the accident sequences. It is not a foregone conclusion that this is a simple change to the PRA model. It needs to be reviewed to ensure that the resulting changes are appropriate. Further, what would be a significant change is open to interpretation, and "would be prudent" is not as strong as "should."	Clarification	*Discussion and/or Alternative Recommendation:* **While this change may not be a "new methodology," it could result in changing the success criteria with implications for the development of accident sequences, and potentially on the HRA (through timing), data, and quantification.** If this change leads to a significant change in risk insights, a focused peer review should be performed
1-A.3, Example 21	This assumes that the "important" human actions are of the same nature as the new ones being added and utilize the ASEP method in the exact same manner. This cannot be assumed.	Clarification	*Rationale:* **If it can be shown that the previous "important" human actions fully utilized the ASEP method, and that any deficiencies by the analyst were corrected, then, if** there is no significant impact on risk insights, this change falls into .....
1-A.4	References	Clarification	See global comment on references at start of Table A-1.

Table A-2. Staff Position on ASME/ANS RA-Sa-2009 Part 2, Technical and Peer Review Requirements for At-Power Internal Events

Index No	Issue	Position	Resolution
Section 2-1			
2-1.1 thru 2-1.3	----------	No objection	----------
Section 2-2			
2-2.1	----------	No objection	----------
2-2.1 – IE			
2-2.1.1	----------	No objection	----------
Table 2-2.1-1	----------	No objection	----------
Tables 2-2.1-2(a) thru 2-2.1-5(d)			
IE-A1 thru IE-A4, IE-A7 thru IE-A10	----------	No objection	----------
IE-A5	The search for initiators should go down to the subsystem/train level. Capability Category III should consider the use of "other systematic processes."	Clarification	Cat I and II: PERFORM a systematic evaluation of each system **and where necessary down to the subsystem or train level**, including support systems…. Cat III: PERFORM a systematic evaluation of each system **down to the subsystem or train level**, including support systems…. PERFORM an FMEA (failure modes and effects analysis) **or other systematic process** to assess….

Table A-2. Staff Position on ASME/ANS RA-Sa-2009 Part 2, Technical and Peer Review Requirements for At-Power Internal Events

Index No	Issue	Position	Resolution
IE-A6	Initiating events from common cause or from both routine and non-routine system alignments should be considered.	Clarification	Cat II: …resulting from multiple failures~~,~~ if the equipment failures result from a common cause, ~~and~~ **or** from routine system alignments **resulting from preventive and corrective maintenance**. Cat III: …resulting from multiple failures, including equipment failures resulting from random and common causes, ~~and~~ **or** from ~~routine~~ system alignments **resulting from preventive and corrective maintenance**.
IE-B1 thru IE-B5	----------	No objection	----------
IE-C1 thru IE-C11, IE-C13 thru IE-C15	----------	No objection	----------
IE-C12	Providing a list of generic data sources would be consistent with other SRs related to data.	Clarification	COMPARE results and EXPLAIN differences in the initiating event analysis with generic data sources to provide a reasonable check of the results. **An example of an acceptable generic data sources is NUREG/CR-6928 [Note (1)].**
Footnote (1)(a) to Table 2-2.1-4(c)	The first example makes an assumption that the hourly failure rate is applicable for all operating conditions.	Clarification	…Thus, $f_{bus\ at\ power} = 1\times10^{-7}$/hr * 8760 hrs/yr * 0.90 = 7.9×10^{-4}/reactor year. **In the above example, it is assumed the bus failure rate is applicable for at-power conditions. It should be noted that initiating event frequencies may be variable from one operating state to another due to various factors. In such cases, the contribution from events occurring only during at-power conditions should be utilized.**
IE-D1 thru IE-D3	----------	No objection	----------

Table A-2. Staff Position on ASME/ANS RA-Sa-2009 Part 2, Technical and Peer Review Requirements for At-Power Internal Events

Index No	Issue	Position	Resolution
2-2.2 – AS			
2-2.2.1	The HLR and associated SRs are written for CDF and not LERF; therefore, references to LERF are not appropriate.	Clarification	2-2.2.1 Objectives. The objectives… reflected in the assessment of CDF ~~and LERF~~ is such a way that….
Table 2-2.2-1	----------	No objection	----------
Tables 2-2.2-2(a) thru 2-2.2-4(c)			
AS-A1 thru AS-A8, AS-A10, AS-A11	----------	No objection	----------
AS-A9	The code requirements for acceptability need to be stated.	Clarification	Cat II and III: …affect the operability of the mitigating systems. **(See SC-B4.)**
AS-B1 thru AS-B7	----------	No objection	----------
AS-C1 thru AS-C3	----------	No objection	----------
2-2.3 – SC			
2-2.3.1	The HLR and associated SRs are written for CDF and not LERF; therefore, references to LERF are not appropriate.	Clarification	(a) overall success criteria are defined (i.e., core damage ~~and large early release~~)
Table 2-2.3-1	----------	No objection	----------
Tables 2-2.3-2(a) thru 2-2.3-4(c)			
SC-A1 thru SC-A6	---------- Note: SC-A3 was deleted in Addendum B.	No objection	----------
SC-B1 thru SC-B5	----------	No objection	----------
SC-C1 thru SC-C3	----------	No objection	----------

Table A-2. Staff Position on ASME/ANS RA-Sa-2009 Part 2, Technical and Peer Review Requirements for At-Power Internal Events

Index No	Issue	Position	Resolution
2-2.4 – SY			
2-2.4.1	----------	No objection	----------
Table 2-2.4-1	----------	No objection	----------
Tables 2-2.4-2(a) thru 2-2.4-4(c)			
SY-A1 thru SY-A23	----------	No objection	----------
SY-A24	There are no commonly used analysis methods for recovery in the sense of repair, other than use of actuarial data.	Clarification	…is justified through an adequate analysis or examination of data **collected in accordance with DA-C15 and estimated in accordance with DA-D9.** ~~(See DA-C15.)~~
SY-B1 thru SY-B13, SY-B15	----------	No objection	----------
SY-B14	Containment vent and failure can cause more than NPSH problems (e.g., harsh environments).	Clarification	Examples of degraded environments include: **(h) harsh environments induced by containment venting, failure of the containment venting ducts, or failure of the containment boundary that may occur prior to the onset of core damage**
SY-C1 thru SY-C3	----------	No objection	----------
2-2.5 – HR			
2-2.5.1	----------	No objection	----------
Table 2-2.5-1	----------	No objection	----------
Tables 2-2.5-2(a) thru 2-2.5-10(i)			
HR-A1 thru HR-A3	----------	No objection	----------
HR-B1, HR-B2	----------	No objection	----------
HR-C1 thru HR-C3	----------	No objection	----------

Table A-2. Staff Position on ASME/ANS RA-Sa-2009 Part 2, Technical and Peer Review Requirements for At-Power Internal Events

Index No	Issue	Position	Resolution
HR-D1, HR-D2HR-D4, HR-D5, HR-D7	----------	No objection	----------
HR-D3	Add examples for what is meant by quality in items (a) and (b) of Cat II, III.	Clarification	Cat II, III: (a) the quality **(e.g., format, logical structure, ease of use, clarity, and comprehensiveness)** of written procedures (for performing tasks) **and the type of administrative controls that support independent review (e.g., configuration control process, technical review process, training processes, and management emphasis on adherence to procedures).** ~~of administrative controls (for independent review)~~ (b) the quality of the human-machine interface **(e.g., adherence to human factors guidelines [Note (3)] and results of any quantitative evaluations of performance per functional requirements)**, including both the equipment configuration, and instrumentation and control layout **(3) NUREG-0700, Rev. 2, Human-System Interface Design Review Guidelines; J.M. O'Hara, W.S. Brown, P.M. Lewis, and J.J. Persensky, May 2002.**
HR-D6	This SR should be written similarly to HR-G9	Clarification	~~PROVIDE an assessment of the uncertainty in the …. point estimates of HEPs~~. **CHARACTERIZE the uncertainty in the estimates of the HEPs consistent with the quantification approach, and PROVIDE mean values for use in the quantification of the PRA results.**
HR-E1 thru HR-E4	----------	No objection	----------
HR-F1, HR-F2	----------	No objection	----------

Table A-2. Staff Position on ASME/ANS RA-Sa-2009 Part 2, Technical and Peer Review Requirements for At-Power Internal Events

Index No	Issue	Position	Resolution
HR-G1, HR-G2, HR-G5 thru HR-G7	----------	No objection	----------
HR-G3	In item (d) of CC II, III, clarify that "clarity" refers the meaning of the cues, etc. In item (a) of CC I and item (g) of CC II, III, clarify that complexity refers to both determining the need for and executing the required response.	Clarification	Cat I: … (a) the complexity of **detection, diagnosis, decision-making and executing** the **required** response (b) … Cat II, and III: (d) degree of clarity of the cues/indications **in supporting the detection, diagnosis, and decision-making give the plant-specific and scenario-specific context of the event.** (g) complexity of **detection, diagnosis and decision-making, and executing** the required response.
HR-G4	Requirements concerning the use of thermal/hydraulic codes should be cross-referenced.	Clarification	Cat I, II, and III: BASE…. **(See SC-B4.)** SPECIFY the point in time….
HR-G8	Action verb should be capitalized	Clarification	**CHARACTERIZE** ~~Characterize~~ the uncertainty …..
HR-H1 thru HR-H3	----------	No objection	----------
HR-I1 thru HR-I3	----------	No objection	----------
2-2.6 - DA			
2-2.6.1	----------	No objection	----------
Table 2-2.6-1	----------	No objection	----------
Tables 2-2.6-2(a) thru 2-2.6-6(e)			
DA-A1 thru DA-A4	----------	No objection	----------

Table A-2. Staff Position on ASME/ANS RA-Sa-2009 Part 2, Technical and Peer Review Requirements for At-Power Internal Events

Index No	Issue	Position	Resolution
DA-B1, DA-B2	----------	No objection	----------
DA-C1 thru DA-C14, DA-C16	----------	No objection	----------
DA-C15	This SR provides a justification for crediting equipment repair (SY-A24). As written, it could be interpreted as allowing plant-specific data to be discounted in favor of industry data. In reality, for such components as pumps, plant-specific data is likely to be insufficient and a broader base is necessary.	Qualification	…IDENTIFY instances of plant-specific **experience** ~~or~~ **and, when that is insufficient to estimate failure to repair consistent with DA-D9,** applicable industry experience and for each repair, COLLECT….
DA-D2 thru DA-D8	----------	No objection	----------
DA-D1	Other approved statistical processes for combining plant-specific and generic data are not available.	Clarification	CC II and III: …USE a Bayes update process ~~or equivalent statistical process that assigns that assigns appropriate weight to the statistical significance of the generic and plant specific evidence and provides an appropriate characterization of the uncertainty.~~ CHOOSE….
DA-D9	New requirement needed, DA-C15 was incomplete, only provided for data collection, not quantification of repair. (See SY-A24.)	Qualification	Cat I, II, and III: **For each SSC for which repair is to be modeled, ESTIMATE, based on the data collected in DA-C15, the probability of failure to repair the SSC in time to prevent core damage as a function of the accident sequence in which the SSC failure appears.**
DA-E1 thru DA-E3	----------	No objection	----------

Table A-2. Staff Position on ASME/ANS RA-Sa-2009 Part 2, Technical and Peer Review Requirements for At-Power Internal Events

Index No	Issue	Position	Resolution
2-2.7 - QU			
2-2.7.1	SRs for LERF quantification reference the SRs in 2-2.8, and therefore, need to be acknowledged in 2-2.8.	Clarification	The objectives of the quantification element are to provide an estimate of CDF **(and support the quantification of LERF)** based upon the plant-specific… (b) significant contributors to CDF **(and LERF)** are identified such as initiating events…
Table 2-2.7-1 HLR-QU-A, HLR-QU-B, HLR-QU-C, HLR-QU-E, HLR-QU-F	----------	No objection	----------
Table 2-2.7-1 HLR-QU-D	SRs for LERF quantification reference the SRs in 2-2.8 and, therefore, need to be acknowledged in 2-2.8.	Clarification	…significant contributors to CDF **(and LERF)**, such as initiating events, accident sequences…
Tables 2-2.7-2(a) thru 2-2.7-7(f)			
QU-A1, QU-A4, QU-A5	----------	No objection	----------
QU-A2	Need to acknowledge LERF quantification	Clarification	…consistent with the estimation of total CDF **(and LERF)** to identify significant accident…
QU-A3	The state-of-knowledge correlation should be accounted for all event probabilities. Left to the analyst to determine the extent of the events to be correlated. Need to also acknowledge LERF quantification	Clarification	Cat I: ESTIMATE the point estimate CDF **(and LERF)** Cat II: ESTIMATE the mean CDF **(and LERF),** accounting for the "state-of-knowledge" correlation between event probabilities ~~when significant~~ (see NOTE 1). Cat III: CALCULATE the mean CDF **(and LERF)** by …

Table A-2. Staff Position on ASME/ANS RA-Sa-2009 Part 2, Technical and Peer Review Requirements for At-Power Internal Events

Index No	Issue	Position	Resolution
QU-B1 thru, , QU-B5, QU-B7 thru QU-B10	----------	No objection	----------
QU-B6	Need to acknowledge LERF quantification	Clarification	ACCOUNT for … realistic estimation of CDF **or LERF.** This accounting …
QU-C1 thru QU-C3	----------	No objection	----------
Table 2-2.7-5(d)	HLR-QU-D and Table 2-2.7-2(d) objective statement just before table need to agree; SRs for LERF quantification reference the SRs in 2-2.7 and, therefore, need to be acknowledged in 2-2.7.	Clarification	…significant contributors to CDF **(and LERF)**, such as initiating events, accident sequences…
QU-D1 thru QU-D7	----------	No objection	----------
QU-E1, QU-E2	----------	No objection	----------
QU-E3	Need to acknowledge LERF quantification	Clarification	<u>Cat I and II</u>: ESTIMATE the uncertainty interval of the CDF **(and LERF)** results.
QU-E4	The note has no relevance to the base model and could cause confusion; it should be deleted.	Clarification	For each source of model uncertainty … introduction of a new initiating event) ~~[Note (1)].~~ ~~NOTE: For specific applications, … And in logical combinations.~~
QU-F1, QU-F3 thru QU-F6	----------	No objection	----------

Table A-2. Staff Position on ASME/ANS RA-Sa-2009 Part 2, Technical and Peer Review Requirements for At-Power Internal Events

Index No	Issue	Position	Resolution
QU-F2	SR needs to use defined term "significant" instead of "dominant." In addition, there is no requirement to perform sensitivity studies, and therefore, requirement is not needed for documentation.	Clarification	(g) equipment or human actions that are the key factors in causing the accident~~s~~ **sequences** to be ~~non-dominant~~ **nonsignificant.** ~~(h) the results of all sensitivity studies~~
2-2.8 – LE			
2-2.8.1	----------	No objection	----------
Table 2-2.8-1	----------	No objection	----------
Tables 2-2.8-2(a) thru 2-2.8-8(g)			
LE-A1 thru LE-A5	----------	No objection	----------
LE-B1 thru LE-B3	----------	No objection	----------
LE-C1 thru LE-C13	----------	No objection	----------
LE-D1 thru LE-D7	----------	No objection	----------
LE-E1 thru LE-E4	----------	No objection	----------
LE-F1 thru LE-F3	----------	No objection	----------
LE-G1, LE-G3 thru LE-G6	----------	No objection	----------
LE-G2	There is no requirement to perform sensitivity studies.	Clarification	(h) the model integration … quantification ~~including uncertainty and sensitivity analyses, as appropriate for the level of analysis~~
Table 2-2.8-9	----------	No objection	----------

Table A-2. Staff Position on ASME/ANS RA-Sa-2009 Part 2, Technical and Peer Review Requirements for At-Power Internal Events

Index No	Issue	Position	Resolution
Section 2-3			
2-3.1 thru 2-3.3.8.2	----------	No objection	----------
Section 2-4			
References	----------	Clarification	See global comment on references at start of Table A-1.

Table A-3. Staff Position on ASME/ANS RA-Sa-2008 Part 3, Technical and Peer Review Requirements for At-Power Internal Flood

Index No	Issue	Position	Resolution
Section 3-1			
3-1.1 thru 3-1.3	----------	No objection	----------
Section 3-2			
3-2	----------	No objection	----------
3-2.1 – IFPP			
3-2.1.1	----------	No objection	----------
Table 3-2.1-1	----------	No objection	----------
Tables 3-2.1-2(a) thru 3-2.1-3(b)			
IFPP-A1 thru IFPP-A5	----------	No objection	----------
IFPP-B1 thru IFPP-B3	----------	No objection	----------
3-2.2 – IFSO			
3-2.2.1	----------	No objection	----------
Table 3-2.2-1	----------	No objection	----------
Tables 3-2.2-2(a) thru 3-2.2-3(b)			
IFSO-A2 thru IFSO-A4, IFSO-A6	----------	No objection	----------
IFSO-A1	The list of fluid systems should be expanded to include fire protection systems.	Clarification	For each flood area ... INCLUDE: (a) equipment (e.g., piping, valves, pumps) located in the area that are connected to fluid systems (e.g., circulating water system, service water system, …~~and~~ reactor coolant system, **and fire protection system**) …

Table A-3. Staff Position on ASME/ANS RA-Sa-2008 Part 3, Technical and Peer Review Requirements for At-Power Internal Flood

Index No	Issue	Position	Resolution
IFSO-A5	It is necessary to consider a range of flow rates for identified flooding sources, each having a unique frequency of occurrence. For example, small leaks that only cause spray are more likely than large leaks that may cause equipment submergence.	Clarification	(b) **range of** flow rate**s**
IFSO-B1 thru IFSO-B3	----------	No objection	----------
3-2.3 – IFSN			
3-2.3.1	----------	No objection	----------
Table 3-2.3-1	----------	No objection	----------
Tables 3-2.3-2(a) thru 3-2.3-3(b)			
IFSN-A1 thru IFSN-A5, IFSN-A-7 thru IFSN-A17	----------	No objection	----------

Table A-3. Staff Position on ASME/ANS RA-Sa-2008 Part 3, Technical and Peer Review Requirements for At-Power Internal Flood

Index No	Issue	Position	Resolution
IFSN-A6	For Cat II, it is not acceptable to just note that a flood-induced failure mechanism is not included in the scope of the internal flooding analysis. Some level of assessment is required.	Qualification	Cat I: For the SSCs identified in IFSN-A5, IDENTIFY the susceptibility of each SSC in a flood area to flood-induced failure mechanisms. INCLUDE failure by submergence and spray in the identification process. EITHER: (a) ASSESS… by using conservative assumptions; OR (b) NOTE that these mechanisms are not included in the scope of the evaluation. **Cat II:** **For the SSCs identified in IFSN-A5, IDENTIFY the susceptibility of each SSC in a flood area to flood-induced failure mechanisms. INCLUDE failure by submergence and spray in the identification process.** **ASSESS qualitatively the impact of flood-induced mechanisms that are not formally addressed (e.g., using the mechanisms listed under Capability Category III of this requirement), by using conservative assumptions.**
IFSN-B1 thru IFSN-B3	----------	No objection	----------
3-2.4 – IFEV			
3-2.4.1	----------	No objection	----------
Table 3-2.4-1	----------	No objection	----------
Tables 3-2.4-2(a) thru 3-2.4-3(b)			
IFEV-A1 thru IFEV-A8	----------	No objection	----------
IFEV-B1 thru IFEV-B3	----------	No objection	----------
3-2.5 – IFQU			

Table A-3. Staff Position on ASME/ANS RA-Sa-2008 Part 3, Technical and Peer Review Requirements for At-Power Internal Flood

Index No	Issue	Position	Resolution
3-2.5.1	----------	No objection	----------
Table 3-2.5-1	----------	No objection	----------
Tables 3-2.5-2(a) thru 3-2.5-3(b)			
IFQU-A1 thru IFQU-A7, IFQU-A9 thru IFQU-A11	----------	No objection	----------
IFQU-A8	The quantification also needs to include the effect of common-cause failure.	Clarification	INCLUDE, in the quantification, the combined effects of … including equipment failures, unavailability due to maintenance, **common-cause failures** and other credible causes.
IFQU-B1 thru IFQU-B3	----------	No objection	----------
Section 3-3			
3-3.1 thru 3-3.3	----------	No objection	----------
Section 3-4			
References	----------	Clarification	See global comment on references at start of Table A-1.

Table A-4. Staff Position on ASME/ANS RA-Sa-2009 Part 4, Technical and Peer Review Requirements for At-Power Internal Fire

Index No	Issue	Position	Resolution
Section 4-1			
4-1.1 thru 4-1.6	----------	No objection	----------
Section 4-2			
4-2	----------	No objection	----------
4-2.1 – PP			
4-2.1.1, 4-2.1.2	----------	No objection	----------
Table 4-2.1-1	----------	No objection	----------
Tables 4-2.1-2(a) thru 4-2.1-4(c)			
PP-A1	----------	No objection	----------
PP-B1 thru PP-B7	----------	No objection	----------
PP-C1 thru PP-C4	----------	No objection	----------
4-2.2 – ES			
4-2.2	----------	No objection	----------
Table 4-2.2-1 HLR-ES-A	Grammatical change for clarity	Clarification	...identify equipment whose failure, **including spurious operation,** caused by an initiating fire, ~~including spurious operation will~~ **would** contribute …
Tables 4-2.2-2(a) thru 4-2.2.5(d)			
Table 4-2.2-2(a) HLR-ES-A	Conforming change to HLR-ES-A	Clarification	…identify equipment whose failure, **including spurious operation,** caused by an initiating fire, ~~including spurious operation will~~ **would** contribute …
ES-A2 thru ES-A6	----------	No objection	----------

Table A-4. Staff Position on ASME/ANS RA-Sa-2009 Part 4, Technical and Peer Review Requirements for At-Power Internal Fire

Index No	Issue	Position	Resolution
ES-A1	Conforming change to HLR-ES-A	Clarification	IDENTIFY equipment whose failure, **including spurious operation,** caused by an initiating fire, ~~including spurious operation~~ would contribute …
ES-B2, ES-B3, ES-B5	----------	No objection	----------
ES-B1	The notes states this requirement is a starting point for selection of mitigating equipment, and that an iterative process will provide the completeness with respect to Table 1-1.3-1, which specifies that the significant contributors be included in the model. The requirement should represent the end result, not the beginning point. Although the definition of failure mode in Part 1 includes spurious operation, it is worth explicitly including since it is an important issue.	Qualification	Cat II: IDENTIFY Fire … and INCLUDE **fire** risk-significant equipment ~~from the internal events PRA~~. NOTE-ES-B1-7: The gradation across … the Fire PRA (other equipment can be assumed failed in the worst possible failure mode**, including spurious operation**). This will tend …
ES-B4	SR refers to incorrect SR	Clarification	… equipment identification per SRs ES-B1 through ES-**B3**~~B4~~.

Table A-4. Staff Position on ASME/ANS RA-Sa-2009 Part 4, Technical and Peer Review Requirements for At-Power Internal Fire

Index No	Issue	Position	Resolution
ES-C1	There is a concern with the way in which the term "significant' has been used. It is ambiguous as to whether the reference is to the total CDF, the internal events CDF, or the fire CDF. In order to avoid ambiguity, it is necessary to have a definition of the term "significant." The terms "significant accident sequence," "significant accident progression sequence," "significant basic event," "significant cutset," and "significant contributor" are defined in Part 1 within the context of the hazard group, so that in Part 3, they should be interpreted as being measured with respect to the fire risk.	Clarification	NOTE-ES-C1-3: … is not a significant contributor **(as defined in Part 1),** …
ES-C2	----------	No objection	----------
ES-D1	----------	No objection	----------
4-2.3 – CS			
4-2.3	----------	No objection	----------
Table 4-2.3-1	----------	No objection	----------
Tables 4-2.3-2(a) thru 4-2.3-4(c)			
CS-A1 thru CS-A9, CS-A11	----------	No objection	----------

Table A-4. Staff Position on ASME/ANS RA-Sa-2009 Part 4, Technical and Peer Review Requirements for At-Power Internal Fire

Index No	Issue	Position	Resolution
CS-A10	PP-B1 already allows physical analysis units to be defined in terms of fire areas. As such the distinction between CCI and CCII is unnecessary.	Clarification	~~Cat I:~~ ~~IDENTIFY the fire areas … and CONFIRM … terminal end locations.~~ ~~Cat II:~~ ~~IDENTIFY … and CONFIRM … terminal end locations.~~ **<u>Cat I and II</u>:** **IDENTIFY the physical analysis units, consistent with the plant partitioning analysis, through which each cable associated with a credited Fire PRA function passes *and* CONFIRM that the information includes treatment of cable terminal end locations.**
CS-B1	----------	No objection	----------
CS-C1 thru CS-C4	----------	No objection	----------
4-2.4 – QLS			
4-2.4	----------	No objection	----------
Table 4-2.4-1	----------	No objection	----------
Tables 4-2.4-2(a) thru 4-2.4-3(b)			
QLS-A1 thru QLS-A4	----------	No objection	----------
QLS-B1 thru QLS-B3	----------	No objection	----------
4-2.5 – PRM			
4-2.5	----------	No objection	----------
Table 4-2.5-1	----------	No objection	----------
Tables 4-2.5-2(a) thru 4-2.5-4(c)			
PRM-A1 thru PRM-A4	----------	No objection	----------

Table A-4. Staff Position on ASME/ANS RA-Sa-2009 Part 4, Technical and Peer Review Requirements for At-Power Internal Fire

Index No	Issue	Position	Resolution
PRM-B1 thru PRM-B15	----------	No objection	----------
PRM-C1	----------	No objection	----------
4-2.6 – FSS			
4-2.6	----------	No objection	----------
Table 4-2.6-1	----------	No objection	----------
Tables 4-2.6-2(a) thru 4-2.6-9(h)			
FSS-A1, FSS-A3, FSS-A6	----------	No objection	----------
FSS-A2	Need to clarify that spurious operation is a failure mode.	Clarification	…For each target set, SPECIFY …including specification of the failure modes**, including spurious operation**.
FSS-A4	Use of language, "one or more," is problematic, since it does not specify a minimum requirement.	Clarification	IDENTIFY **sufficient** ~~one or more~~ combinations of target sets ... has been represented.
FSS-A5	The number of individual fire scenarios and level of detail should be commensurate with the relative risk importance of the physical analysis unit.	Clarification	<u>Cat I and II</u>: For each unscreened … can be characterized **commensurate with its risk significance**. NOTE FSS-A5-5: It is expected … will be commensurate with ~~the capability category and~~ the fire relative risk importance …
FSS-B1, B2	----------	No objection	----------
FSS-C1, FSS-C3 thru FSS-C8	----------	No objection	----------

Table A-4. Staff Position on ASME/ANS RA-Sa-2009 Part 4, Technical and Peer Review Requirements for At-Power Internal Fire

Index No	Issue	Position	Resolution
FSS-C2	See Issue for ES-C1	Clarification	Cat II and III: For those scenarios that represent significant contributors to ~~a physical analysis unit's~~ fire risk, CHARACTERIZE … NOTE FSS-C3-3: … are not significant contributors **(as defined in Part 1),** …
FSS-D1, FSS-D2, FSS-D4 thru FSS-D11	----------	No objection	----------
FSS-D3	Again the "either bounded or accurately characterized" issue for CC II and CC III.	Clarification	Cat I: …in the analysis of each fire scenario **such that the fire risk contribution of each unscreened physical analysis unit is bounded**. Cat II: …the fire risk contribution of each unscreened physical analysis unit can be ~~either bounded or~~ accurately characterized. Cat III: …the fire risk contribution of each unscreened physical analysis unit can be ~~either bounded or~~ accurately characterized and such that the risk…
FSS-E1 thru FSS-E4	----------	No objection	----------
FSS-F1	Use of the term "SELECT one or more"	Clarification	Cat II and II: …SELECT ~~one or more fire scenarios(s)~~ **a sufficient number of fire scenarios to characterize** ~~could~~ damage, including collapse, **of** the exposed structural steel…
FSS-F2, FSS-F3	----------	No objection	----------
FSS-G1 thru FSS-G6	----------	No objection	----------

Table A-4. Staff Position on ASME/ANS RA-Sa-2009 Part 4, Technical and Peer Review Requirements for At-Power Internal Fire

Index No	Issue	Position	Resolution
FSS-H1 thru FSS-H10	----------	No objection	----------
4-2.7 – IGN			
4-2.7	----------	No objection	----------
Table 4-2.7-1	----------	No objection	----------
Tables 4-2.7-2(a) thru 4-2.7-3(b)			
IGN-A1	The note, IGN-A1-1, appears to be more relevant to IGN-A2 than it is for IGN-A1. Item (e) only makes sense when there is equivalent nuclear experience.	Clarification	NOTE IGN-A1-1…(e) **if being used as a supplement to, rather than in lieu of, nuclear data,** that the fire frequencies calculated are consistent with those derived from nuclear experience ; …
IGN-A2 thru IGN-A10	----------	No objection	----------
IGN-B1 thru IGN-B5	----------	No objection	----------
4-2.8 – QNS			
4-2.8	----------	No objection	----------
Table 4-2.8-1	----------	No objection	----------
Tables 4-2.8-2(a) thru 4-2.8-5(d)			
QNS-A1	----------	No objection	----------
QNS-B1, QNS-B2	----------	No objection	----------

Table A-4. Staff Position on ASME/ANS RA-Sa-2009 Part 4, Technical and Peer Review Requirements for At-Power Internal Fire

Index No	Issue	Position	Resolution
QNS-C1	The screening criteria in Capability Categories II and III should relate to the total CDF and LERF for the fire risk, not the internal events risk. See Issue for 4-2.2-2(c). NOTE ES-C1	Clarification	Cat II: …and • the sum of the CDF contribution for all screened fire compartments is <10% of the estimated total CDF for ~~internal~~ **fire** events and • the sum of the LERF contributions for all screened fire compartments is <10% of the estimated total LERF for ~~internal~~ **fire** events Cat III: …and • the sum of the CDF contributions for all screened fire compartments is <1% of the estimated total CDF for ~~internal~~ **fire** events and • the sum of the LERF contributions for all screened fire compartments is <1% of the estimated total LERF for ~~internal~~ **fire** events
QNS-D1, QNS-D2	----------	No objection	----------
4-2.9 – CF			
4-2.9	----------	No objection	----------
Table 4-2.9-1	----------	No objection	----------
Tables 4-2.9-2(a) thru 4-2.9-5(d)			
CF-A1	See Issue for ES-C1	Clarification	NOTE CF-A1-1: … for non-risk significant contributors **(as defined in Part 1),** …

Table A-4. Staff Position on ASME/ANS RA-Sa-2009 Part 4, Technical and Peer Review Requirements for At-Power Internal Fire

Index No	Issue	Position	Resolution
CF-A2	----------	No objection	----------
CF-B1	----------	No objection	----------
4-2.10 – HRA			
4-2.10	----------	No objection	----------
Table 4-2.10-1	----------	No objection	----------
Tables 4-2.10-2(a) thru 4-2.10-6(e)			
HRA-A1 thru HRA-A4	----------	No objection	----------
HRA-B1 thru HRA-B4	----------	No objection	----------
HRA-C1	----------	No objection	----------
HRA-D1	----------	No objection	----------
HRA-D1 [Note (1)]	This SR has the same index number as the previous SR.	Clarification	HRA-D~~1~~**2** [Note (1)]
HRA-E1	----------	No objection	----------
4-2.11 – SF			
4-2.11	----------	No objection	----------
Table 4-2.11-1	----------	No objection	----------
Tables 4-2.11-2(a) thru 4-2.11-3(e)			
SF-A1 thru SF-A5	----------	No objection	----------
SF-B1	----------	No objection	----------

Table A-4. Staff Position on ASME/ANS RA-Sa-2009 Part 4, Technical and Peer Review Requirements for At-Power Internal Fire

Index No	Issue	Position	Resolution
4-2.12 – FQ			
4-2.12	----------	No objection	----------
Table 4-2.12-1 HLR-FQ-E	See Issue for ES-C1	Clarification	HLR-FQ-E: … and significant contributors **(as defined in Part 1)** to CDF and LERF …
Tables 4-2.12-2(a) thru 4-2.12-7(f)			
FQ-A1 thru FQ-A4	----------	No objection	----------
FQ-B1	----------	No objection	----------
FQ-C1	----------	No objection	----------
FQ-D1	----------	No objection	----------
FQ-E1	See Issue for ES-C1	Clarification	IDENTIFY significant contributors **(as defined in Part 1)** …
FQ-F1	See Issue for ES-C1	Clarification	DOCUMENT the CDF and LERF … • SRs QU-F2 and QU-F3 … are significant contributors **(as defined in Part 1);** …
FQ-F2	----------	No objection	----------
4-2.13 -- UNC			
4-2.13	----------	No objection	----------
Table 4-2.13-1	----------	No objection	----------
UNC-A1, UNC-A2	----------	No objection	----------

Table A-4. Staff Position on ASME/ANS RA-Sa-2009 Part 4, Technical and Peer Review Requirements for At-Power Internal Fire

Index No	Issue	Position	Resolution
Section 4-3			
4-3.1	----------	No objection	----------
4-3.2	Expertise in Fire HRA is needed for the peer review	Clarification	…fire modeling, ~~and~~ fire protection programs and their elements**, and Fire HRA**.
4-3.3	----------	No objection	----------
4-3.3.1 thru 4-3.3.13	----------	No objection	----------
Section 4-4			
References	----------	Clarification	See global comment on references at start of Table A-1.
Appendix 4-A FPRA Methodology (Nonmandatory)			
The staff does not endorse the material in this appendix, and as such, does not have a position (i.e., no objections, no objection with clarification, or no objection with qualification) on any of the material contained in this appendix. However, it should be noted, that consistent with the Commission endorsed phase PRA Quality Initiative, all risk contributors that cannot be shown as insignificant, should be assessed through quantitative risk assessment methods to support risk informed licensing actions.			

Table A-5. Staff Position on ASME/ANS RA-Sa-2009 Part 5, Technical and Peer Review Requirements for At-Power Seismic Events

Index No	Issue	Position	Resolution
Section 5-1			
5-1	----------	No objection	----------
Section 5-2			
5-2	----------	No objection	----------
5-2.1 – SHA			
5-2.1	----------	No objection	----------
Table 5-2.1.1, HLR-SHA-A thru HLR-SHA-F, HLR-SHA-J	----------	No objection	----------
Table 5-2.1-1, HLR-SHA-G	Much of the HLR is more how to meet the HLR and should be a SR. Further, the SRs provide the requirements needed in order to meet the HLR. This relationship does not exist here. In addition, this information is also duplicated in the accompanying note. At the least, this text should be removed from the HLR.	Clarification	For further use in the SPRA, the spectral shape SHALL be based on a site-specific evaluation taking into account the contributions of deaggregated magnitude-distance results of the probabilistic seismic hazard analysis. ~~Broad-band, smooth spectral shapes, ... that would challenge these uniform hazard spectral shapes~~.
Table 5-2.1-1, HLR-SHA-H	Much of the HLR is more how to meet the HLR and should be a SR. Further, the SRs provide the requirements needed in order to meet the HLR. This relationship does not exist here.	Clarification	~~When use ... for the intended application.~~ **It shall be confirmed that the basic data and interpretations from an existing study are valid.**
Table 5-2.1-1, HLR-SHA-I	Much of the HLR is more how to meet the HLR and should be a SR. Further, the SRs provide the requirements needed in order to meet	Clarification	~~A screening analysis ... or the magnitude of hazard consequences, or both.~~ **The hazard analysis shall include hazards other than vibratory ground motion if necessary.**

Table A-5. Staff Position on ASME/ANS RA-Sa-2009 Part 5, Technical and Peer Review Requirements for At-Power Seismic Events

Index No	Issue	Position	Resolution
	the HLR. This relationship does not exist here.		
Tables 5-2.1-2(a) to 5-2.1-10(j)			
SHA-A1 thru SHA-A5	----------	No objection	----------
SHA-B1 thru SHA-B3	----------	No objection	----------
SHA-C1 thru SHA-C4	----------	No objection	----------
SHA-D1 thru SHA-D4	----------	No objection	----------
SHA-E1, SHA-E2	----------	No objection	----------
SHA-F1 thru SHA-F3	----------	No objection	----------
Table 5-2.1-8(g)	See issue for Table 5-2.1-1, HLR-SHA-G	Clarification	For further use in the SPRA, the spectral shape SHALL be based on a site-specific evaluation taking into account the contributions of deaggregated magnitude-distance results of the probabilistic seismic hazard analysis. ~~Broad-band, smooth spectral shapes, ... that would challenge these uniform hazard spectral shapes~~.
SHA-G1	Spectral shapes used to evaluate in-structure SSC's must include the effects of amplification from both local site conditions and SSI. Based on IPEEE reviews, certain UHS shapes used for CEUS were not appropriate for the screening purpose.	Clarification	**NOTE HA-G1**: The issue of which spectral shape should be used in the screening of structures, systems, and components (SSCs) and in quantification of SPRA results requires careful consideration. For screening purposes, the spectral shape used should have amplification factors**, including effects from both local site conditions as well as soil-structure interaction,** such that the demand resulting from the use of this shape is higher than that based on the design spectra. This will preclude premature screening of components and will avoid anomalies such as the screened components (e.g., surrogate elements) being the ~~dominant~~ **significant** risk contributing

Table A-5. Staff Position on ASME/ANS RA-Sa-2009 Part 5, Technical and Peer Review Requirements for At-Power Seismic Events

Index No	Issue	Position	Resolution
			components. Additional discussion on this issue can be found in Ref. 17. In the quantification of fragilities and of final risk results, it is important to use as realistic a shape as possible. Semi-site specific shapes, such as those given in NUREG-0098, have been used in the past and ~~are considered~~ **may be** adequate for this purpose**, provided that they are shown to be reasonably appropriate for the site [42]**. The uniform hazard response spectrum (UHS) is acceptable for this purpose **if it can be shown that the UHS shape is appropriate for the site.**~~ unless evidence comes to light (e.g., within the technical literature) that these UHS do not reflect the spectral shape of the site-specific events.~~ **Recent developments [42] indicate that these spectral shapes are not appropriate for CEUS sites where high frequency content is dominant at hard rock sites.**
Table 5-2.1-9(h)	See issue for Table 5-2.1-1, HLR-SHA-H	Clarification	~~When use ... for the intended application.~~ **It shall be confirmed that the basic data and interpretations from an existing study are valid.**
SHA-H	See issue for Table 5-2.1-1, HLR-SHA-H	Clarification	SHA-H**1** Cat I and II: ~~Use of existing studies~~ **ENSURE, in light of established current information, the study meets the requirements in HLR-SHA-A thru HLR-SHA-G**. Cat III: ~~Use of existing studies not allowed~~. **DO NOT USE existing studies.**
Table 5-2.1-10(i)	See issue for Table 5-2.1-1, HLR-SHA-I	Clarification	~~A screening analysis ... or the magnitude of hazard consequences, or both.~~ **The hazard analysis shall include hazards other than vibratory ground motion if necessary.**

Table A-5. Staff Position on ASME/ANS RA-Sa-2009 Part 5, Technical and Peer Review Requirements for At-Power Seismic Events

Index No	Issue	Position	Resolution
SHA-I	See issue for Table 5-2.1-1, HLR-SHA-I	Clarification	~~SHA-I~~ ~~There are no supporting requirements here.~~ **SHA-I1** **<u>Cat I, II and III</u>:** **PERFORM a screening to determine whether to include other seismic hazards such as fault displacement, landslide, soil liquefaction, or soil settlement in the seismic PRA.** **SHA-I2** **<u>Cat I, II and III</u>:** **ADDRESS the effect of these other seismic hazards through assessment of the frequency of hazard occurrence or the magnitude of hazard consequences, or both.**
SHA-J1, thru SHA-J3	----------	No objection	----------
5-2.2 – SFR			
5-2.2	----------	No objection	----------
5-2.2 Table 5-2.2-1	----------	No objection	----------
Table 5-2.2-2(a) thru 5-2.2-8(g)			
SFR-A1, SFR-A2	----------	No objection	----------
SFR-B1, SFR-B2	----------	No objection	----------
SFR-C1 thru SFR-C6	----------	No objection	----------
SFR-D1, SFR-D2	----------	No objection	----------
SFR-E1 thru SFR-E5	----------	No objection	----------
SFR-F1 thru SFR-F4	----------	No objection	----------
SFR-G1 thru SFR-G3	----------	No objection	----------
5-2.3 – SPR			
5-2.3	----------	No objection	----------

Table A-5. Staff Position on ASME/ANS RA-Sa-2009 Part 5, Technical and Peer Review Requirements for At-Power Seismic Events

Index No	Issue	Position	Resolution
5-2.3 Table 5-2.3-1	----------	No objection	----------
Tables 5-2.3-2(a) thru 5-2.3-7(f)			
SPR-A1 thru SPR-A4	----------	No objection	----------
SPR-B1 thru SPR-B11	----------	No objection	----------
SPR-C1	----------	No objection	----------
SPR-D1	----------	No objection	----------
SPR-E1 thru SPR-E6	----------	No objection	----------
SPR-F1 thru SPR-F3	----------	No objection	----------
Section 5-3			
5-3	----------	No objection	----------
Section 5-4			
	References	Clarification	See global comment on references at start of Table A-1.
Appendix 5-A			
5-A.1 thru 5-A.3	----------	No objection	----------
5-A.4	References	Clarification	See global comment on references at start of Table A-1.

Table A-6. Staff Position on ASME/ANS RA-Sa-2009 Part 6, Technical and Peer Review Requirements for At-Power Screening and Conservative Analysis of Other External Hazards

Index No	Issue	Position	Resolution
Section 6-1			
6-1	----------	No objection	----------
Section 6-2			
6-2.1 thru 6-2.3	----------	No objection	----------
Table 6-2-1	----------	No objection	----------
Tables 6-2-2(a) to 6-2-6(e)			
EXT-A1, EXT-A2	----------	No objection	----------
EXT-B1 thru EXT-B4	----------	No objection	----------
EXT-C1 thru EXT-C7	----------	No objection	----------
EXT-D1, EXT-D2	----------	No objection	----------
EXT-E1, EXT-E2	----------	No objection	----------
Section 6-3			
6-3.1 thru 6-3.3	----------	No objection	----------
Section 6-4			
	References	Clarification	See global comment on references at start of Table A-1.
Appendix 6-A			
	----------	No objection	----------
6-A-1	References	Clarification	See global comment on references at start of Table A-1.

Table A-7. Staff Position on ASME/ANS RA-Sa-2009, Part 7, Technical and Peer Review Requirements for At-Power High Wind Events

Index No	Issue	Position	Resolution
Section 7-1			
7-1	----------	No objection	----------
Section 7-2			
7-2	----------	No objection	----------
7-2.1 – WHA			
7-2.1	----------	No objection	----------
Table 7-2.1-1	----------	No objection	----------
Tables 7-2.1-2(a) and 7-2.1-2(b)			
WHA-A1	The six elements described in NOTE WIND-A1 provide the details required for the tornado wind hazard analysis and should be included in WIND-A1 as requirements.	Qualification	Cat II and III: In the tornado wind hazard analysis, USE … a mean hazard curve can be derived. **INCLUDE the following elements in the tornado wind hazard analysis:** **(1) Variation of tornado intensity with occurrence frequency (The frequency of tornado occurrence decreases rapidly with increased Intensity);** **(2) Correlation of tornado width and length of damage area; longer tornadoes are usually wider;** **(3) Correlation of tornado area and intensity; stronger tornadoes are usually larger than weaker tornadoes;** **(4) Variation in tornado intensity along the damage path length; tornado intensity varies throughout its life cycle;** **(5) Variation of tornado intensity across the tornado path width.** **(6) Variation of tornado differential pressure across the tornado path width.** **NOTE WIND-A1:** State-of-the-art methodologies are given ... can be

Table A-7. Staff Position on ASME/ANS RA-Sa-2009, Part 7, Technical and Peer Review Requirements for At-Power High Wind Events

Index No	Issue	Position	Resolution
			found in Refs. 13, 56, and 57. ~~Tornado wind hazard analysis SHOULD include the following elements:~~ ~~(a) variation of tornado intensity with occurrence …~~ ~~(f) variation of tornado differential pressure across the tornado path width.~~
WHA-A2 thru WHA-A5	----------	No objection	----------
WHA-B1 thru WHA-B3	----------	No objection	----------
7-2.2 – WFR			
7-2.2	----------	No objection	----------
Table 7-2.2-1	----------	No objection	----------
Tables 7-2.2-2(a thru 7-2.2-3(b))			
WFR-A1, WFR-A2	----------	No objection	----------
WFR-B1 thru WFR-B3	----------	No objection	----------
7-2.3 – WPR			
7-2.3	----------	No objection	----------
Table 7-2.3-1 HLR-WPR-A	The word 'significant' should be added in this HLR in Table 7-2.3 and in the HLR statement in Table 7-2.3-2(a)	Clarification	The wind-PRA systems model shall include wind-caused **significant** initiating events and other failures **that are significant contributors** that can …
Table 7-2.3-1 HLR-WPR-B and HLR-WPR-C	----------	No objection	----------
Tables 7-2.3-2(a) thru 7-2.3-4(c)			
Table 7-2.3-2(a)	The word 'significant' should be added in the	Clarification	The wind-PRA systems model shall include wind-caused **significant**

Table A-7. Staff Position on ASME/ANS RA-Sa-2009, Part 7, Technical and Peer Review Requirements for At-Power High Wind Events

Index No	Issue	Position	Resolution
	HLR statement in Table 7-2.3-2(a)		initiating events and other failures **that are significant contributors** that can …
WPR-A1thru WPR- A11	----------	No objection	----------
WPR-B1, WPR- B2	----------	No objection	----------
WPR-C1 thru WPR- C3	----------	No objection	----------
Section 7-3			
7-3 thru 7-3.3.5	----------	No objection	----------
Section 7-4			
	References	Clarification	See global comment on references at start of Table A-1.

Table A-8. Staff Position on ASME/ANS RA-Sa-2009, Part 8, Technical and Peer Review Requirements for At-Power External Flood Events

Index No	Issue	Position	Resolution
Section 8-1			
8-1	----------	No objection	----------
Section 8-2			
8-2	----------	No objection	----------
8-2.1 – XFHA			
8-2.1			
Table 8-2.1-1	----------	No objection	----------
Tables 8-2-2(a) and 8-2.1-3(b)			
Table 8-2-2(a)	Incorrect table number	Clarification	Table ~~8-2-2(a)~~ **8-2.1-2(a)**
XFHA-A1 thru XFHA-A6	----------	No objection	----------
XFHA-B1 thru XFHA-B3	----------	No objection	----------
8-2.2 – XFFR			
8-2.2			
Table 8-2.2-1	----------	No objection	----------
Tables 8-2-2(a) and 8-2.2-3(b)			
Table 8-2-2(a)	Incorrect table number	Clarification	Table ~~8-2-2(a)~~ **8-2.2-2(a)**
XFFR-A1, XFFR-A2	----------	No objection	----------
XFFR-B1 thru XFFR-B3	----------	No objection	----------
8-2.3			
8-2.3	----------	No objection	----------
Table 8-2.3-1 HLR-XFPR-A	The word 'significant' needs to be added in this HLR in Table 8-2.3 and in the HLR statement in Table 8-2.3-2(a)	Clarification	The external flooding-PRA systems model shall include wind-caused **significant** initiating events and other failures **that are significant contributors** that can …
Tables 8-2.3-2(a) and 8-2.3-4(c)			
Table 8-2.3-2(a)	The word 'significant' needs to be added the HLR statement in Table 8-2.3-2(a)	Clarification	The external flooding-PRA systems model shall include wind-caused **significant** initiating events and other failures **that are significant contributors** that can …

Table A-8. Staff Position on ASME/ANS RA-Sa-2009, Part 8, Technical and Peer Review Requirements for At-Power External Flood Events

Index No	Issue	Position	Resolution
XFPR-A thru XFPR-A11	----------	No objection	----------
XFPR-B1, XFPR-B2	----------	No objection	----------
XFPR-C1 thru XFPR-C3	----------	No objection	----------
Section 8-3			
8-3 thru 8-3.3.5	----------	No objection	----------
Section 8-4			
	References	Clarification	See global comment on references at start of Table A-1.

Table A-9. Staff Position on ASME/ANS RA-Sa-2009, Part 9, Technical and Peer Review Requirements for At-Power Other External Hazards

Index No	Issue	Position	Resolution
Section 9-1			
9-1	----------	No objection	----------
Section 9-2			
9-2	----------	No objection	----------
9-2.1 – XHA			
9-2.1			
Table 9-2.1-1	----------	No objection	----------
Tables 9-2.1-2(a) and 9-2.1-3(b)			
XHA-A1 thru XFHA-A4	----------	No objection	----------
XHA-B1 thru XHA-B3	----------	No objection	----------
9-2.2 – XFR			
9-2.2			
Table 9-2.2-1	----------	No objection	----------
Tables 9-2.2-2(a) and 9-2.2-3(b)			
XFR-A1, thru XFFR-A4	----------	No objection	----------
XFR-B1 thru XFR-B3	----------	No objection	----------
9-2.3 – XPR			
9-2.3	----------	No objection	----------
Table 9-2.3-1 HLR-XPR-A	The word 'significant' should be added in this HLR in Table 9-2.3-1 and in the HLR statement in Table 9-2.3-2(a)	Clarification	The external hazard PRA plant model shall include wind-caused **significant** initiating events and other failures **that are significant contributors** that can … shall include wind-caused **significant** initiating events and other failures **that are significant contributors** that can …
Tables 9-2.3-2(a) and 9-2.3-4(c)			
Table 9-2.3-2(a)	The word 'significant' should be added in the HLR statement in Table	Clarification	The external hazard PRA plant model shall include wind-caused **significant** initiating events and other failures

Table A-9. Staff Position on ASME/ANS RA-Sa-2009, Part 9, Technical and Peer Review Requirements for At-Power Other External Hazards

Index No	Issue	Position	Resolution
	9-2.3-2(a)		**that are significant contributors** that can …
XPR-A thru XPR-A11	----------	No objection	----------
XPR-B1 thru XFPR-B2	----------	No objection	----------
XPR-C1 thru XPR-C3	----------	No objection	----------
Section 9-3			
9-3.1 thru 9-3.4.5	----------	No objection	----------
Section 9-4			
	References	Clarification	See global comment on references at start of Table A-1.

Table A-10. Staff Position on ASME/ANS RA-Sa-2009 Part 10, Technical and Peer Review Requirements for At-Power Seismic Margins Assessment

The staff does not endorse the material in this Part of the standard, and as such, does not have a position (i.e., no objections, no objection with clarification, or no objection with qualification) on any of the material contained in Part 10 of the standard. However, it should be noted, that consistent with the Commission endorsed phase PRA Quality Initiative, all risk contributors that cannot be shown as insignificant, should be assessed using a PRA (as defined in Section C.1) to support risk-informed licensing actions.

APPENDIX B

NRC POSITION ON THE NEI PEER REVIEW PROCESS (NEI 00-02)

Introduction

The Nuclear Energy Institute (NEI) Peer Review Process is documented in NEI 00-02, Revision 1 (Ref. 15). It provides guidance for the peer review of probabilistic risk assessments (PRAs) and subtier criteria for assigning a grade (i.e., Grade 1, 2, 3 or 4) to each PRA sub-element. The ASME PRA Standard provides requirements for three capability categories (i.e., Category I, II or III).

The NEI subtier criteria for a Grade 3 PRA have been compared by NEI to the requirements in the ASME PRA Standard (ASME RA-Sb-2005) (Ref. 19) listed for a Capability Category II PRA. The comparison of the NEI subtier criteria with the ASME PRA Standard has indicated that some of the Capability Category II ASME PRA Standard requirements are not addressed in the NEI Grade 3 PRA subtier criteria. Thus, NEI 00-02 also provides guidance for performing a self-assessment of a PRA against the requirements in the ASME PRA Standard (ASME RA-Sb-2005) that were not addressed during the NEI peer review.

A comparison of the criteria for other grades against the other categories in the standard was not performed since NEI contends that the results of the peer review process generally indicate the reviewed PRAs are consistent with the Grade 3 criteria in NEI 00-02. However, the PRAs reviewed have contained a number of Grade 2, and even Grade 4 elements.

Since the issuance of ASME RA-Sb-2005, addenda and a major revision have been issued (Ref. 14). These documents contain requirements that were either revised or added, as compared to RA-Sb-2005. Consequently, the comparison of the NEI subtier criteria is not complete because there may still exist requirements in ASME/ANS RA-Sa-2009 not addressed by the subtier criteria.

This appendix provides the staff's position on NEI 00-02, Revision 1. The staff's positions are categorized as following:

- **No objection.** The staff has no objection to the requirement.
- **No objection with clarification.** The staff has no objection to the requirement. However, certain requirements, as written, are either unclear or ambiguous, and therefore the staff has provided its understanding of these requirements.
- **No objection subject to the following qualification**. The staff has a technical concern with the requirement and has provided a qualification to resolve the concern.

In the proposed staff resolution, the staff clarification or qualification that is needed for the staff to have no objection are provided.

NEI 00-02, Revision 1 report contains guidance in four areas:

- Peer review process,
- Self-assessment process,
- Actions users need to take in self-assessment actions, and
- Comparison of peer review subtier criteria to ASME standard.

In general, the guidance in NEI 00-02 is historical. However, if the peer review **process guidance** in NEI 00-02 (documented in Section 1 through 4 and Appendices A through C) is used in the future and supplemented with the staff's regulatory position contained in this appendix, then it is considered adequate to support the risk-informed application under consideration.

Tables B-1 through B-4 provide the NRC position of the four areas addressed in NEI 00-02, respectively. Moreover, the staff has the following global objection (in the form of a **qualification**):

The peer review process and self-assessment process in NEI 00-02 is based on Addendum B to the ASME PRA standard (RA-Sb-2005).

The staff position on ASME PRA standard RA-Sb-2005 is documented in Appendix A of Revision 1 of Regulatory Guide 1.200.

The staff position on NEI 00-02 (both the process and self-assessment portions of the guidance) is based on the staff position of RA-Sb-2005 as documented in Appendix A of Revision 1 of Regulatory Guide 1.200.

The staff's position on NEI 00-02 was originally documented in Appendix B of Revision 1 of Regulatory Guide 1.200. The staff position documented in Appendix B of Revision 2 of Regulatory Guide repeats what is documented in Appendix B of Revision 1 of Regulatory Guide 1.200.

Since RA-Sb-2005 was issued, ASME has issued Addendum C (RA-Sc-2007) and ASME and ANS have issued both a revision and an addendum (ASME/ANS RA-S-2008 and ASME/ANS RA-Sa-2009, respectively).

The subsequent versions of the PRA standard (i.e., ASME RA-Sc-2007, ASME/ANS RA-S-2008, and ASME/ANS RA-Sa-2009), as compared to ASME RA-Sb-2005, contain either requirements that were revised or new requirements that were added.

There may be requirements in ASME/ANS RA-Sa-2009 that were not addressed by the criteria in NEI 00-02, and not identified in the self-assessment. This potential discrepancy becomes important if licensees plan to use the self-assessment performed under NEI 00-02.

<u>Staff Position</u>:

It is NRC's expectation that, if the results of the self-assessment are used to demonstrate the technical adequacy of a PRA for an application, differences between the current version of the Standard (as endorsed in Appendix A of Revision 2 of this Regulatory Guide), and the earlier version of the ASME PRA Standard (i.e., ASME RA-Sb-2005) be identified and addressed.

Table B-1. NRC Regulatory Position on NEI 00-02

Section	Position	Commentary/Resolution
Section 1. Introduction		
1.1	Clarification	The NEI process uses "a set of checklists as a framework within which to evaluate the scope, comprehensiveness, completeness, and fidelity of the PRA being reviewed." The checklists by themselves are insufficient to provide the basis for a peer review since they do not provide the criteria that differentiate the different grades of PRA. The NEI subtier criteria provide a means to differentiate between grades of PRA.
	Clarification	Part 2 of the ASME/ANS PRA Standard (with the staff's position provided in Appendix A to this regulatory guide) can provide an adequate basis for a peer review of an at-power, internal events PRA (including internal flooding) that would be acceptable to the staff. Since the NEI subtier criteria do not address all of the requirements in Part 2 of the ASME/ANS PRA Standard, the staff's position is that a peer review based on these criteria is incomplete. The PRA standard requirements that are not included in the NEI subtier criteria (identified for a Grade 3 PRA in Table B-3) need to be addressed in the NEI self-assessment process as endorsed by the staff in this appendix.
1.1	Clarification	This section states that the NEI peer review process is a one-time evaluation process but indicates that additional peer review may be required if substantial changes are made to the PRA models or methodology. The staff position on additional peer reviews is to follow the guidance in Section 1-5 of Part 1 of the ASME/ANS PRA Standard which requires a peer review for PRA upgrades (PRA methodology changes).
1.2	No objection	----------
1.3	Clarification	Figure 1-3 indicates in several locations that the checklists included in NEI 00-02 are used in the peer review process. As indicated in the comment on Section 1.1 of NEI 00-02, the staff's position is that a peer review based on the checklists and supplemental subtier criteria is incomplete. The NEI self-assessment process, as endorsed by the staff in this appendix, is needed.
1.4	Clarification	The NEI peer review process provides a summary grade for each PRA element. The use of a PRA for risk-informed applications needs to be determined at the sub-element level. The staff does not agree with the use of an overall PRA element grade in the assessment of a PRA.

Table B-1. NRC Regulatory Position on NEI 00-02

Section	Position	Commentary/Resolution
	Clarification	This section indicates that "the process requires that the existing PRA meet the process criteria or that enhancements necessary to meet the criteria have been specifically identified by the peer reviewers and committed to by the host utility." Thus, the assigned grade for a sub-element can be contingent on the utility performing the prescribed enhancement. An application submittal that utilizes the NEI peer review results needs to identify any of the prescribed enhancements that were not performed.
	Clarification	The staff believes that the use of PRA in a specific application should be of sufficient quality to support its use by the decision-makers for that application. The NEI peer review process does not require the documentation of the basis for assigning a grade for each specific subtier criterion. However, the staff position is that assignment of a grade for a specific PRA sub-element implies that all of the requirements listed in the NEI subtier criteria have been met.
1.5	No Objection	----------
Section 2. Peer Review Process		
2.1	Clarification	See comment for Section 1.1.
2.2	Clarification	Part 2 of the ASME/ANS PRA Standard (with the staff's position provided in Appendix A to this regulatory guide) can provide an adequate basis for a peer review of an at-power, internal events PRA (including internal flooding) that would be acceptable to the staff. Since the NEI subtier criteria do not address all of the requirements in Part 2 of the ASME/ANS PRA Standard, the staff's position is that a peer review based on these criteria is incomplete. The PRA standard requirements that are not included in the NEI subtier criteria (identified for a Grade 3 PRA in Table B-3) need to be addressed in the NEI self-assessment process as endorsed by the staff in this appendix.
2.2 Steps 4, 7, & 8	Clarification	See previous comment.

Table B-1. NRC Regulatory Position on NEI 00-02

Section	Position	Commentary/Resolution
2.3	Clarification	The peer reviewer qualifications do not appear to be consistent with the following requirements specified in Part 1, Section 1-6.2 of the ASME/ANS PRA Standard: • the need for familiarity with the plant design and operation • the need for each person to have knowledge of the specific areas assigned for review • the need for each person to have knowledge of the specific methods, codes, and approaches used in the PRA element assigned for review The NEI self-assessment process needs to address the peer reviewer qualifications with regard to these factors.
2.4 and 2.5	No objection	----------
Section 3. Pra Peer Review Process Elements and Guidance		
3.1	No objection	----------
3.2, 3.3	Clarification	See comment for Section 1.1.
3.3	Clarification	The NEI peer review process grades each PRA element from 1 to 4, while the ASME/ANS PRA Standard uses Capability Categories I, II, and III. The staff interpretation of Grades 2, 3, and 4 is that they correspond broadly to Capability Categories I, II, and III, respectively. This statement is not meant to imply that the supporting requirements, for example, for Category I are equally addressed by Grade 2 of NEI-00-02. The review of the supporting requirement for Category II against Grade 3 of NEI-00-02 indicated discrepancies and consequently the need for a self-assessment. The existence of these discrepancies would indicate that it would not be appropriate to assume that there are not discrepancies between Category I and Grade 2. A comparison between the other grades and categories has not been performed. The implications of this are addressed in item 7a on Table B-2.
	Qualification	The staff believes that different applications of a PRA can require different PRA sub-element grades. The NEI peer review process is performed at the sub-element level and does not provide an overall PRA grade. Therefore, it is inappropriate to suggest an overall PRA grade for the specific applications listed in this section. The staff does not agree with the assigned overall PRA grades provided for the example applications listed in this section of NEI 00-02.

Table B-1. NRC Regulatory Position on NEI 00-02

Section	Position	Commentary/Resolution
3.4	Clarification	The general use and interpretation of the checklists in the grading of PRA sub-elements is addressed in this section. The subtier criteria provide a more substantial documentation of the interpretations of the "criteria" listed in the checklists. However, as previously indicated, the subtier criteria do not fully address all of the PRA standard requirements. The PRA standard requirements that are not included in the NEI subtier criteria (identified for a Grade 3 PRA in Table B-3) need to be addressed in the NEI self-assessment process as endorsed by the staff in this appendix.
Section 4. Peer Review Process Results and Documentation		
4.1	Clarification	A primary function of a peer review is to identify those assumptions and models that have a significant impact on the results of a PRA and to pass judgment on the validity and appropriateness of the assumptions. A review of the NEI 00-02 and the subtier criteria section on quantification and results interpretation failed to identify specific wording in any requirements to review the impact of assumptions on the results. However, there are requirements to "identify unique or unusual sources of uncertainty not present in typical or generic plant analyses." Since the evaluation of the impact of assumptions is critical to the evaluation of a PRA and its potential uses, the NEI peer review process needs to address assumptions, not just those that are unique or unusual. The NEI self-assessment process needs to address those assumptions not reviewed in the NEI peer review process. See staff position in Appendix A on Section 1-6.1 of Part 1 of the ASME/ANS PRA standard.
	Qualification	The NEI peer review report provides a summary grade for each PRA element. The use of a PRA for risk-informed applications needs to be determined at the sub-element level. The staff does not agree with the use of an overall PRA element grade in the assessment of a PRA.
4.2, 4.3	No objection	----------
Appendix A. Preparation Material for the Peer Team Review		
A.1 thu A.6	No objection	----------
A.7	Clarification	A list of sensitivity calculations that a utility can perform prior to the peer review is provided. Additional or alternative sensitivities can be identified by the utility. Sensitivity calculations that address key assumptions that may significantly impact the risk-informed applications results need to be considered in the NEI self-assessment process.

Table B-1. NRC Regulatory Position on NEI 00-02

Section	Position	Commentary/Resolution
A.8 thu A.10	No objection	----------
Appendix B. Technical Element Checklists		
Checklist tables	No objection	As previously stated, the staff position is that the checklists by themselves are insufficient to provide the basis for a peer review. (See the comment for Section 1.1.) Because of this, the staff has not reviewed the contents or the assigned grades in these checklists. However, the staff position on the comparison of the Grade 3 NEI subtier criteria to the Capability Category II requirements in the ASME/ANS PRA Standard is documented in Table B-3.
Appendix C. Guidance for the Peer Review Team		
C.1	No objection	----------
C.2	No objection	----------
C.3	Clarification	See comment for Section 4.1.
C.4	Clarification/ Qualification	See the two comments on Section 3.3.
C.5	No objection	----------
C.6	Qualification	See the comments on Section 4.1.
C.7	Clarification	The staff does not agree with the use of an overall PRA element grade (documented in Tables C.7-5 & C.7-6) in the assessment of a PRA.

Table B-2. NRC Regulatory Position on NEI Self-Assessment Process

Section	Position	Commentary/Resolution
Summary	No objection	----------
Regulatory Framework	No objection	----------
Industry PRA Peer Review Process	Clarification	See the staff comments on the NEI peer review process provided in Table B-1.
ASME PRA Standard	Clarification	See the staff comments on the ASME/ANS PRA Standard provided in Appendix A to this regulatory guide.
Comparison of NEI 00-02 and ASME Standard	Clarification	The NRC position is that the performance of the existing peer reviews as supplemented by the NEI self-assessment process, as clarified in Regulatory Guide 1.200, meets the NRC requirements for a peer review. The staff does not agree or disagree with the number of supporting requirements of the ASME PRA Standard that are addressed (completely or partially) in the NEI subtier criteria. The staff's focus is on ensuring that the self-assessment addresses important aspects of a PRA that are not explicitly addressed in the NEI subtier criteria. [See Note (1) at end of Table B-2.]
	Clarification	It is stated that "…If, … the PRA is upgraded…, new peer reviews may be required to meet paragraph 5.4 of the ASME standard… NEI-05-04, "Process for Performing Follow-on PRA Peer Reviews Using the ASME PRA Standard," provides guidance in this regard. NRC has not endorsed NEI-05-04." The staff has reviewed NEI-05-04, and the staff's position is provided in Appendix C of this regulatory guide. [See Note (1) at end of Table B-2.].
General Notes for Self-Assessment Process		
1	No objection	----------
2	Clarification	Certain ASME PRA Standard requirements, although not explicitly listed in the NEI subtier criteria, may generally be included as good PRA practice. Credit may be taken for meeting these ASME requirements subject to confirmation in the self-assessment that the requirements were in fact addressed by the peer review. Table B-4 identifies the ASME PRA Standard requirements not explicitly addressed in the NEI subtier criteria that the staff believes need to be addressed in the NEI self-assessment process. [See Note (1) at end of Table B-2.].

Table B-2. NRC Regulatory Position on NEI Self-Assessment Process

Section	Position	Commentary/Resolution
3	Clarification	The self-assessment process should consider the clarifications and qualifications on Addendum B that will be provided in Appendix A. [See Note (1) at end of Table B-2.]
Self-Assessment Process Attributes	No objection	----------
Overall Peer Review Process and Decision	No objection	----------
Self-Assessment Process Steps		
1. thru 6.	No objection	----------
7.a	Clarification	For the PRA sub-elements assigned a grade other than a Grade 3 in the NEI peer review (i.e., Grade 1, 2, or 4), a self-assessment of those PRA sub-elements required for the application against the Capability Category requirements (of the ASME PRA Standard as qualified in Appendix A to this regulatory guide) determined to be applicable for the application needs to be performed and documented. However, it is reasonable to assign an SR that requires that no Appendix B self-assessment received an NEI Grade 4 for Capability Category II without further review. [See Note (1) at end of Table B-2.].
7.b thru 8.	No objection	----------
9.	No objection	----------
10. thru 13.	No objection	----------
14.	Clarification	The staff's comments on which ASME PRA requirements need to be addressed in the self-assessment, and on the suggested actions (Appendix D2 to NEI 00-02, Rev. 1) are provided in Table B-3. In addition, the staff's position on the ASME PRA Standard, as documented in Appendix A to this regulatory guide, needs to be included in the self-assessment of the PRA sub-elements.

Table B-3. NRC Regulatory Positions on Actions Utilities Need to Take in Self-Assessment Actions

Text	Utility Actions	Regulatory Position	Comment/Resolution
YES and NONE in Action column	None	No objection	----------
YES and clarifications included in Action column	Take action(s) specified in the comments column.	No objection	----------
PARTIAL	Take action(s) specified in Comments column.	No objection	----------
NO	Take action(s) specified in Comments column.	No objection	----------

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
Global				
The self-assessment was performed against the ASME PRA Standard RA-Sb-2005, and was originally endorsed by the staff in Revision 1 to Regulatory Guide 1.200. The staff position is based on staff review of the ASME PRA Standard RA-Sb-2005. However, since that time, the PRA standard has been revised. In performing the self-assessment action, • the action has to conform with the staff position in Appendix A of this document for the action to be acceptable • the self-assessment has to account for the differences between the NEI subties criteria with the requirements in Part 2 of the ASME/ANS PRA standard (as endorsed in Appendix A of this document) as opposed to the ASME standard (RA-Sb-2005).				
Initiating Events				
IE-A1	Yes	IE-7, IE-8, IE-9, IE-10	None	No objection
IE-A2	Yes	IE-5, **IE-7**, IE-9, IE-10	Confirm that the initiators [including human-induced initiators, and steam generator tube rupture (PWRs)] were included. This can be done by citing either peer review documentation/conclusions or examples from your model. NEI 00-02 does not explicitly mention human-induced initiators; however, in practice, peer reviews have addressed this; the definition of active component provided in the Addendum B of the ASME standard needs to be used when verifying ISLOCAs were modeled.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
IE-A3	Yes	**IE-8**, IE-9	None	No objection
IE-A3a[(1)]	Yes	**IE-8**, IE-9	None	No objection
IE-A4	Partial	IE-5, IE-7, IE-9, **IE-10**	Check for initiating events that can be caused by a train failure or a system failure.	No objection
IE-A4a[(1)]	Partial	IE-5, IE-7, IE-9, **IE-10**	Check for initiating events that can be caused by multiple failures, if the equipment failures result from a common cause or from routine system alignments.	No objection
IE-A5	Yes	IE-8	Confirm requirement met. Identification of low-power and shutdown events not explicitly addressed in NEI 00-02, but in practice, the peer reviews have addressed events resulting in a controlled shutdown that include a scram prior to reaching low power.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
IE-A6	No	---	Confirm requirement met. Specifying plant operations (etc.) review and participation is not explicitly addressed in NEI 00-02, but in practice, the peer reviews have addressed the need for examination of plant experience (e.g., LERs), and input from knowledgeable plant personnel. Interviews conducted at similar plants are not acceptable.	No objection
IE-A7	Yes	IE-16, **IE-10**	None	No objection
IE-A8	Deleted from ASME PRA Standard	---	---	---
IE-A9	Deleted from ASME PRA Standard	---	---	---
IE-A10	Yes	IE-6	None	No objection
IE-B1	Yes	AS-4, IE-4	None	No objection
IE-B2	Yes	IE-4, IE-7	None	No objection
IE-B3	Yes	IE-4, IE-12	Confirm that the grouping does not impact significant accident sequences.	No objection
IE-B4	Yes	IE-4	None	No objection
IE-B5[(3)]	Yes	IE-6	None	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
IE-C1	Yes	IE-13, IE-15, IE-16, IE-17	None	No objection; IE-16 is the applicable NEI 00-02 element.
IE-C1a(1)	Yes	IE-13, IE-15, IE-16, IE-17	None	No objection; IE-16 is the applicable NEI 00-02 element.
IE-C1b(1)	Yes	IE-13, IE-15, IE-16, IE-17	Justify recovery credit as evidenced by procedures or training.	No objection
IE-C2	Yes	IE-13, IE-16	Justify informative priors used in Bayesian update.	No objection
IE-C3	No	---	Document that the ASME standard requirements were met. NEI 00-02 does not address this supporting requirement.	No objection
IE-C4	No	---	Document that the ASME standard requirements were met. Specific screening criteria were not used in NEI 00-02, but bases for screening of events were examined in the peer reviews. The text of the ASME standard needs to be assessed. Acceptable criteria for dismissing IEs are listed in IE-C4 in the ASME PRA Standard.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
IE-C5	No requirement for Category II	N/A		No objection; the ASME PRA Standard only requires time trend analysis for a Category III PRA.
IE-C6	Yes	IE-15, IE-17	Check that fault tree analysis, when used to quantify IEs, meets the appropriate systems analysis requirements.	No objection
IE-C7	No	---	Document that the ASME standard requirements were met. NEI 00-02 does not address this supporting requirement.	No objection
IE-C8	No	---	Document that the ASME standard requirements were met. NEI 00-02 does not address this supporting requirement.	No objection
IE-C9	Yes	IE-15, IE-16	Check that the recovery events included in the IE fault trees meet the appropriate recovery analysis requirements. This can be done by citing either peer review documentation/conclusions or examples from your model.	No objection
IE-C10	Yes	IE-13	None	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
IE-C11	Yes	IE-12, IE-13, **IE-15**	Check that the expert elicitation requirements in the ASME PRA Standard were used when expert judgment was applied to quantifying extremely rare events.	No objection
IE-C12	Yes	IE-14	Confirm that secondary pipe system capability and isolation capability under high flow or differential pressures are included.	No objection
IE-C13[(3)]	No	None	Confirm IE-C13 is met.	No objection
IE-D1	Partial	IE-9, IE-18, IE-19, IE-20	Action is to confirm availability of documentation. In general, specified documentation items not explicitly addressed in NEI 00-02 checklists were addressed by the peer review teams. If not available, documentation may need to be generated to support particular applications or respond to NRC requests for additional information (RAIs) regarding applications.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
IE-D2	Partial	IE-9, IE-18, IE-19, IE-20	Action is to confirm availability of documentation. In general, specified documentation items not explicitly addressed in NEI 00-02 checklists were addressed by the peer review teams. If not available, documentation may need to be generated to support particular applications or respond to NRC RAIs regarding applications.	No objection
IE-D3	Partial	QU-27, QU-28, QU-29, QU-34	Confirm that the key assumptions and key sources of uncertainty consistent with the definitions of the ASME PRA Standard are documented.	No objection with Clarification: See staff position on definition of key assumption and key source of uncertainty in Appendix A.
IE-D4	Deleted from ASME PRA Standard	---	---	---
Accident Sequence Analysis				
AS-A1	Yes	AS-4, AS-8	None	No objection
AS-A2	Yes	**AS-6**, AS-7, AS-8, AS-9, AS-17	None	No objection
AS-A3	Yes	AS-7, SY-17, **AS-17**	None	No objection
AS-A4	Yes	**AS-19**, SY-5	None	No objection
AS-A5	Yes	AS-5, AS-18, AS-19, SY-5	None	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
AS-A6	Yes	AS-8, AS-13, AS-4	None	No objection
AS-A7	Yes	AS-4, AS-5, AS-6, AS-7, AS-8, AS-9	None	No objection
AS-A8	Partial	AS-20, AS-21, AS-22, AS-23	Since there is no explicit requirement for steady-state condition for end state in NEI 00-02 checklists, this should be evaluated even though this was an identified issue in some reviews. This can also be done by citing either peer review documentation/conclusions or examples from your model. Refer to SC-A5.	No objection
AS-A9	Yes	AS-18, TH-4	Verify AS-A9 is met. Note that AS-A9 is related to the environmental conditions challenging the equipment during the accident sequence, AS-18 and TH-4 are focused on the initial success criteria.	No objection
AS-A10	Yes	**AS-4**, AS-5, AS-6, **AS-7**, AS-8, AS-9, AS-19, SY-5, SY-8, HR-23	None	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
AS-A11	Yes	AS-8, AS-10, AS-15, DE-6, AS Checklist Note 8	The guidance in AS-15 must be followed. AS-8 states that transfers may be treated quantitatively or qualitatively while AS-15 states that transfers between event trees should be explicitly treated in the quantification.	No objection
AS-B1	Yes	IE-4, IE-5, IE10, **AS-4**, AS-5, AS-6, AS-7, AS-8, AS-9, AS-10, AS-11, DE-5	None	No objection
AS-B2	Yes	AS-10, AS-11, DE-4, DE-5, DE-6	None	No objection; AS-10 and AS-11 are the applicable NEI 00-02 elements.
AS-B3	Yes	DE-10, SY-11, TH-8, AS-10	None	No objection; AS-10 and SY-11 are the applicable NEI 00-02 elements.
AS-B4	Yes	AS-8, AS-9, AS-10, AS-11	Confirm requirement met.	No objection
AS-B5	Yes	DE-4, DE-5, **DE-6, AS-10, AS-11, QU-25**	None	No objection elements.
AS-B5a(1)	Yes	DE-4, DE-5, **DE-6, AS-10, AS-11, QU-25**	Confirm that system alignments that may affect dependencies among systems or functions are modeled.	No objection
AS-B6	Yes	AS-13	None	No objection
AS-C1(2)	Yes	AS-11, AS-24, AS-25, AS-26	None	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
AS-C2(2)	Partial	AS-11, AS-24, AS-25, **AS-26**	Action is to confirm availability of documentation. In general, specified documentation items not explicitly addressed in NEI 00-02 checklists were addressed by the peer review teams. If not available, documentation may need to be generated to support particular applications or respond to NRC RAIs regarding applications.	No objection
AS-C3(2)	Partial	QU-27, QU-28, QU-29, QU-34	Confirm that the key assumptions and key sources of uncertainty consistent with the definitions of the ASME PRA Standard are documented.	No objection with Clarification: See staff position on definition of key assumption and key source of uncertainty in Appendix A.
AS-C4	Deleted from ASME PRA Standard	---	---	---
Success Criteria				
SC-A1	Yes	AS-20, AS-22, AS Footnote 4	None	No objection
SC-A2	Yes	TH-4, TH-5, TH-7, AS-22, AS Footnote 4	None	No objection
SC-A3	Deleted from ASME PRA Standard	---	---	---

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
SC-A4	Yes	AS-7, AS-17, AS-18, SY-17, TH-9, IE-6, DE-5, SY-8	None	No objection
SC-A4a[(1)]	Yes	IE-6, DE-5	Confirm that this requirement is met. This can be done by citing either peer review documentation conclusions or examples from your model. Although there is no explicit requirement in NEI 00-02 that mitigating systems shared between units be identified, in practice, review teams have evaluated this.	No objection
SC-A5	Partial	AS-21, AS-23, AS-20	Ensure mission times are adequately discussed as per the ASME PRA Standard. Since there are no explicit requirements for steady-state condition for end state, refer to the ASME PRA Standard for requirements or cite peer review documentation/ conclusions or examples from your model. Refer to AS-A8.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
SC-A6	Yes	AS-5, AS-18, AS-19, TH-4, **TH-5**, TH-6, TH-8, ST-4, ST-5, ST-7, ST-9, SY-5	None	No objection
SC-B1	Yes	AS-18, SY-17, TH-4, TH-6, TH-7	None	No objection
SC-B2	No	TH-4, TH-8	NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements. Refer to SC-C2.	No objection
SC-B3	Yes	AS-18, TH-4, TH-5, TH-6, TH-7	None	No objection
SC-B4	Yes	AS-18, TH-4, TH-6, TH-7	None	No objection
SC-B5	Yes	TH-9, **TH-7**	None	No objection
SC-B6	Deleted from ASME PRA Standard	---	---	---
SC-C1[(2)]	Yes	ST-13, SY-10, SY-17, SY-27, TH-8, TH-9, TH-10, AS-17, AS-18, AS-24, HR-30	None	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
SC-C2(2)	Partial	ST-13, SY-10, SY-17, SY-27, TH-8, **TH-9, TH-10**, AS-17, AS-18, AS-24, HR-30	Action is to confirm availability of documentation. In general, specified documentation items not explicitly addressed in NEI 00-02 checklists were addressed by the peer review teams. If not available, documentation may need to be generated to support particular applications or respond to NRC RAIs regarding applications.	No objection
SC-C3(2)	Partial	QU-27, QU-28, QU-29, QU-34	Confirm that the key assumptions and key sources of uncertainty consistent with the definitions of the ASME PRA Standard are documented.	No objection with Clarification: See staff position on definition of key assumption and key source of uncertainty in Appendix A.
SC-C4	Deleted from ASME PRA Standard	---	---	---
Systems Analysis				
SY-A1	Yes	SY-4, **SY-19**	None	No objection
SY-A2	Yes	AS-19, **SY-5**, SY-13, **SY-16**	None	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
SY-A3	Yes	SY-5, SY-6, SY-8, SY-12, SY-14	None. Although there are no explicit requirements in NEI 00-02 that match SY-A3, performance of the systems analysis would require a review of plant-specific information sources.	No objection
SY-A4	Partial	DE-11, SY-10, SY Footnote 5	Confirm that this requirement is met. This can be done by citing either peer review results or example documentation. NEI 00-02 does not address interviews with system engineers and plant operators to confirm that the model reflects the as-built, as-operated plant.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
SY-A5	Partial	QU-12, QU-13, SY-8, SY-11	Confirm this requirement is met, and that the PRA considered both normal and abnormal system alignments. This can be done by citing either peer review results or example documentation. Although NEI 00-02 does not explicitly address both normal and abnormal alignments, their impacts are generally captured in the peer review of the listed elements.	No objection
SY-A6	Yes	SY-7, SY-8, SY-12, SY-13, SY-14	None	No objection
SY-A7	Yes	SY-6, SY-7, SY-8, SY-9, SY-19	Check for simplified system modeling as addressed in SY-A7.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
SY-A8	Partial	SY-6, SY-9	Check to ensure boundaries are properly established. This can be done by citing either peer review results or example documentation. NEI 00-02 does not address component boundaries except for EDGs. There is no explicit requirement that addresses modeling shared portions of a component boundary. In practice, the peer reviews have examined consistency of component and data analysis boundaries.	No objection
SY-A9	Deleted from ASME PRA Standard	---	---	---
SY-A10	Partial	SY-9	Action is to determine if the requirements of the ASME standard are met. NEI 00-02 does not address all aspects of modularization.	No objection
SY-A11	Yes	AS-10, AS-13, AS-16, AS-17, AS-18, SY-12, SY-13, SY-17, SY-23	None	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
SY-A12	Partial	SY-6, SY-7, SY-8, SY-9, SY-12, SY-13, SY-14	Document that modeling is consistent with exclusions provided in SY-A14. Consistent with sub-element SY-A12 of the ASME PRA Standard, critical passive components whose failure affects system operability should be included in system models.	No objection
SY-A12a(1)	Partial	SY-6, SY-7, SY-8, SY-9, SY-12, SY-13, SY-14	Document that modeling is consistent with exclusions provided in SY-A12a.	No objection
SY-A12b(3)	Partial	SY-15, SY-17	Document that modeling incorporates flow diversion failure modes.	No objection
SY-A13	Yes	DA-4, SY-15, SY-16	None	No objection
SY-A14	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
SY-A15	Yes	**SY-8, HR-4**, HR-5, HR-7	None	No objection
SY-A16	Yes	**SY-8, HR-8**, HR-9, HR-10	None	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
SY-A17	Yes	AS-13, SY-10, SY-11, SY-13, SY-17	None. SY-A17 is evaluated in the NEI 00-02 PRA peer review as follows: SY-10 Failures or system termination (trip) due to spatial or environmental effects. SY-11 Failure modes induced by accident conditions. SY-13 System Termination (failure or trip) due to exhaustion of inventory (water, air). SY-17 Success Criteria evaluation determined by plant-specific analysis that includes system trips or isolations on plant parameters. AS-13 Failure of systems due to time phased effects such as loss of battery voltage.	No objection
SY-A18	Yes	**DA-7**, SY-8, SY-22	None	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
SY-A18a[(3)]	No		Confirm this is accounted for in the PRA. NEI 00-02 does not explicitly identify the criteria for tracking and modeling of coincident maintenance actions that may lead to unavailability of multiple redundant trains or systems.	No objection
SY-A19	Yes	AS-18, DE-10, SY-11, SY-13, SY-17, TH-8	Verify SY-A19 has been met. Ensure there is a documented basis (engineering calculations are not necessary) for modeling of the conditions addressed. NEI 00-02 focuses on environmental limitations.	No objection
SY-A20	Partial	AS-19, SY-5, **SY-11**, SY-13, SY-22, TH-8	Document component capabilities where applicable. NEI 00-02 does not explicitly require a check for crediting components beyond their design basis.	No objection
SY-A21	Yes	SY-18	None. Comment: Footnote to SY-18 explains lack of Grade provision for this sub-element.	No objection
SY-A22	Yes	SY-24, DA-15, QU-18, **SY-12**	None	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
SY-A23	Deleted from ASME PRA Standard	---	---	---
SY-B1	Yes	DA-8, DA-14, DE-8, DE-9, SY-8	None	No objection
SY-B2	Not required for Capability Category II		None	No objection
SY-B3	Yes	DE-8, DE-9, DA-10, DA-12	None	No objection
SY-B4	Yes	**DA-8**, DA-10, DA-11, DA-12, DA-13, DA-14, DE-8, DE-9, QU-9, SY-8	None	No objection
SY-B5	Yes	DE-4, DE-5, DE-6, SY-12,	None	No objection
SY-B6	Yes	SY-12, SY-13	Self-assessment needs to confirm that the support system success criteria reflect the variability in the conditions that may be present during postulated accidents.	No objection
SY-B7	Yes	AS-18, SY-13, SY-17, TH-7, TH-8	None	No objection
SY-B8	Yes	DE-11, **SY-10**	None	No objection
SY-B9	Deleted from ASME PRA Standard	---	---	---
SY-B10	Yes	SY-12, SY-13	None	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
SY-B11	Yes	SY-8, SY-12, SY-13	Confirm by citing either peer review documentation/conclusions or examples from your model. NEI 00-02 does not explicitly address permissives and control logic. In practice, the items in SY-B11 have generally been examined in the peer reviews.	No objection
SY-B12	Yes	SY-13	None	No objection
SY-B13	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
SY-B14	Partial	DE-6, AS-6	Confirm by citing either peer review documentation/conclusions or examples from your model. Ensure that modeling includes situations where one component can disable more than one system.	No objection
SY-B15	Yes	SY-11	None	No objection
SY-B16	Yes	SY-8	None	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
SY-C1[(2)]	Yes	SY-5, SY-6, SY-9, SY-18, SY-23, SY-25, SY-26, SY-27	None	No objection
SY-C2[(2)]	Partial	SY-5, SY-6, SY-9, SY-18, SY-23, SY-25, SY-26, SY-27	Action is to confirm availability of documentation. In general, specified documentation items not explicitly addressed in NEI 00-02 checklists were addressed by the peer review teams. If not available, documentation may need to be generated to support particular applications or respond to NRC RAIs regarding applications. Comment: Footnote to SY-18 explains lack of Grade provision for this sub-element.	No objection
SY-C3[(2)]	Partial	QU-27, QU-28, QU-29, QU-34	Confirm that the key assumptions and key sources of uncertainty consistent with the definitions of the ASME PRA Standard are documented.	No objection with Clarification: See staff position on definition of key assumption and key source of uncertainty in Appendix A.
Human Reliability Analysis				
HR-A1	Yes	HR-4, HR-5	Determine if analysis has included and documented failure to restore equipment following test or maintenance.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
HR-A2	Yes	HR-4, HR-5	None	No objection
HR-A3	Yes	DE-7, HR-5	None	No objection
HR-B1	Yes	HR-5, **HR-6**	None	No objection
HR-B2	Partial	HR-5, HR-6, HR-7, HR-26, DA-5, DA-6	Ensure single actions with multiple train consequences are evaluated in pre-initiators, since the screening rules in HR-6 do not preclude screening of activities that can affect multiple trains of a system.	No objection
HR-C1	Yes	HR-27, SY-8, SY-9	None	No objection
HR-C2	Yes	HR-7, HR-27, SY-8, SY-9	Confirm that this requirement is met. The specific list of impacts in HR-C2 is not included in NEI 00-02; however, in practice, the peer reviewers (in reviewing sub-elements HR-7 and related sub-elements) addressed these items.	No objection
HR-C3	Yes	HR-5, HR-27, SY-8, SY-9	None	No objection
HR-D1	Yes	HR-6	None	No objection
HR-D2	Yes	HR-6	None	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
HR-D3	No		Action is to confirm that HR-D3 is met. This item is implicitly included in the peer review of HRA by virtue of the assessment of the crew's ability to implement the procedure in an effective and controlled manner. The pre-initiator HRA adequacy is determined reasonable and representative considering the procedure quality.	No objection
HR-D4	Partial	HR-6	Use the ASME standard for requirements. NEI 00-02 does not explicitly cite the treatment of recovery actions for pre-initiators. PRA implementation varied among utilities with some using screening values and others incorporating recovery. The peer review team examines this treatment.	No objection
HR-D5	Yes	DE-7, **HR-26**, HR-27	None	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
HR-D6	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
HR-D7	Not required for Capability Category II		None	No objection
HR-E1	Yes	AS-19, HR-9, **HR-10**, HR-16, SY-5	None	No objection; the example process in HR-9 for a Grade 3 PRA (i.e., identify those operator actions identified by others) is not good practice and contrary to HR-10, which is the process recommended in HR-E1.
HR-E2	Yes	**HR-8**, HR-9, HR-10, HR-21, HR-22, HR-23, HR-25	None	No objection (HR-9 and HR-10 do not appear to match subject matter but HR-8 does).

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
HR-E3	Partial	HR-10, HR-14, HR-20	The ASME standard supporting requirements are to be used during the self-assessment to confirm that the ASME intent is met for this requirement. NEI 00-02 does not explicitly specify the same level of detail that is included in the ASME standard. The peer review team experience is relied upon to investigate the PRA given general guidance and criteria.	No objection
HR-E4	Partial	HR-14, HR-16	The ASME standard supporting requirements are to be used during the self-assessment to confirm that the ASME intent is met for this requirement. NEI 00-02 does not explicitly specify the same level of detail that is included in the ASME standard. The peer review team experience is relied upon to investigate the PRA given general guidance and criteria.	No objection
HR-F1	Yes	AS-19, HR-16, SY-5	None	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
HR-F2	Partial	AS-19, HR-11, HR-16, HR-17, HR-19, HR-20, SY-5	Determine whether the requirements of the ASME standard are met. HR-F2 is generally addressed by NEI 00-02 and the PRA Peer Review. One additional item is highlighted to be checked. NEI 00-02 does not explicitly cite indication for detection and evaluation. However, by invoking the standard HRA methodologies the treatment of cues and other indications for detecting the need for action are included.	No objection
HR-G1	Yes	HR-15, HR-17, HR-18	None	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
HR-G2	Yes	HR-2, HR-11	None. NEI 00-02 criteria for Grade 3 require a methodology that is consistent with industry practice. This includes the incorporation of both the cognitive and execution (human error probabilities) in the HEP assessment. HR-11 provides further criteria to ensure that the cognitive portion of the HEP uses the correct symptoms to formulate the crew's response. Self-assessment needs to document if both cognitive and execution errors are included in the evaluation of HEPs.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
HR-G3	Partial	HR-17, HR-18	The ASME standard supporting requirements are to be used during the self-assessment to confirm that the ASME intent is met for this requirement. NEI 00-02 does not explicitly enumerate the same level of detail that is included in the ASME standard. However, by invoking the standard HRA methodologies the performance shape factors are necessarily evaluated. The peer review team experience is relied upon to investigate the PRA given general guidance and criteria.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
HR-G4	Partial	AS-13, HR-18, **HR-19**, HR-20	The ASME standard supporting requirements are to be used during the self-assessment to confirm that the ASME intent is met for this requirement. NEI 00-02 does not explicitly cite the necessity to define the time at which operators are expected to receive indications. However, invoking the standard HRA methods leads to the necessity for the analysts to define this input to the HRA. The peer review team experience is relied upon to investigate the PRA given general guidance and criteria.	No objection
HR-G5	Partial	HR-16, HR-18, HR-20	Evaluate proper inputs per the ASME standard or cite peer review documentation/conclusions or examples from your model. NEI 00-02 explicitly addresses observations and operations staff input for time required. ASME PRA Standard requires time measurements.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
HR-G6	Yes	HR-12	Check to ensure they are met by citing peer review documentation/conclusions or examples from your model. HR-12 does not explicitly address all the items of the ASME standard list. In practice, peer reviews addressed these items.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
HR-G7	Partial	DE-7, HR-26	Check to see if factors that are typically assumed to lead to dependence were included (e.g., use of common indications and/or cues to alert control room staff to need for action), and a common procedural direction that leads to the actions. This can also be done by citing either peer review documentation/ conclusions or examples from your model. NEI 00-02 does not provide explicit criteria that address the degree of dependence between HFEs that appear in the same accident sequence cutset. However, invoking the standard HRA methods leads to the necessity for the analysts to define this input to the HRA. In general, the peer reviews addressed this. See also QU-C2.	No objection
HR-G8	Not required for Capability Category II	---	---	---

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
HR-G9	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
HR-H1	Yes	**HR-21**, HR-22, HR-23	The self-assessment needs to confirm that the requirements in HR-H1 in the ASME standard were addressed in the HRA.	No objection
HR-H2	Yes	HR-22, HR-23	The self-assessment needs to confirm that all the requirements of HR-H2 in the ASME standard were included in the HRA.	No objection
HR-H3	Yes	HR-26	None	No objection
HR-I1(2)	Partial	HR-28, HR-30	None	No objection
HR-I2(2)	Partial	HR-28, HR-30	Action is to confirm availability of documentation. In general, specified documentation items not explicitly addressed in NEI 00-02 checklists were addressed by the peer review teams. If not available, documentation may need to be generated to support particular applications or respond to NRC RAIs regarding applications.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
HR-I3[(2)]	Partial	QU-27, QU-28, QU-29, QU-34	Confirm that the key assumptions and key sources of uncertainty consistent with the definitions of the ASME PRA Standard are documented.	No objection with Clarification: See staff position on definition of key assumption and key source of uncertainty in Appendix A.
Data Analysis				
DA-A1	Yes	DA-4, DA-5, DA-15, SY-8, SY-14	None	No objection
DA-A1a[(1)]	No		Confirm that the component boundary is consistent with the data applied.	No objection
DA-A2	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
DA-A3	Yes	DA-4, DA-5, DA-6, DA-7, SY-8	None	No objection with Qualification: The subject matter in DA-A3 is not explicitly addressed in NEI 00-02 (not a critical requirement since identification of the needed parameters would be a natural part of the data analysis).
DA-B1	Yes	DA-5	None	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
DA-B2	Yes	DA-5, DA-6	Confirm that this requirement is met. NRC comment: Grouping criteria listed in DA-5 should be supplemented with a caution to look for unique components and/or operating conditions and to avoid grouping them. Peer review teams were careful to assess plant-specific data evaluations to identify cases where outlier data values or components were not properly accounted for.	No objection
DA-C1	Yes	DA-4, DA-7, DA-9, DA-19, DA-20	None	No objection
DA-C2	Yes	DA-4, DA-5, DA-6, DA-7, DA-14, DA-15, DA-19, DA-20, MU-5	None	No objection
DA-C3	Partial	DA-4, DA-5, DA-6, DA-7, MU-5	Use the ASME standard for requirements. NEI 00-02 does not enumerate the items considered appropriate in a plant-specific data analysis.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
DA-C4	No		NEI 00-02 does not explicitly cite this definition of failure and degraded state. Use the ASME standard for requirements.	No objection
DA-C5	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
DA-C6	Yes	DA-6, DA-7	Confirm that this requirement is met. NEI 00-02 addresses data needs when the standby failure rate model is used for demands. There are no stated criteria for the demand failure model; however, in practice, this was addressed during peer reviews.	No objection
DA-C7	Yes	DA-6, DA-7	None	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
DA-C8	Yes		Confirm that this requirement is met. Although there are no specific criteria for determining operational time of components in operation or in standby, the development needs to include these times. These issues were addressed during peer reviews.	No objection
DA-C9	Yes	DA-4, DA-6, DA-7	Confirm that this requirement is met. Although there are no specific criteria for determining operational time of components in operation or in standby, the development needs to include these times. These issues were addressed during peer reviews.	No objection
DA-C10	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection

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NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
DA-C11	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
DA-C11a(3)	No		Use the ASME PRA Standard for requirements. PRA peer review teams found that support system unavailabilities are treated within the support system and not within the associated frontline system.	No objection
DA-C12	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
DA-C13	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
DA-C14	Yes	**DA-15**, AS-16, SY-24	None	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
DA-C15	Yes	IE-13, IE-15, IE-16, AS-16, DA-15, SY-24, QU-18	Confirm that this requirement is met. Although it is relatively rare to see credit taken for repair of failed equipment in PRAs (except in modeling of support system initiating events), any credit taken for repair should be well-justified, based on ease of diagnosis, the feasibility of repair, ease of repair, and availability of resources, time to repair and actual data. This can be done by citing either peer review results or example documentation.	No objection
DA-D1	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
DA-D2	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
DA-D3	Partial	QU-30	Verify that SR DA-D3 has been met. A requirement for establishing the parameter distributions is not in the data analysis section but could be inferred from QU-30. QU-30 does not provide guidance on which events to include in the uncertainty analysis.	No objection
DA-D4	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement. This was performed as part of the peer review team implementation of NEI 00-02. (See DE-9.)	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
DA-D5	Partial	DE-9, DA-8, DA-9, DA-10, DA-11, DA-12, DA-13, DA-14	Check for acceptable common-cause failure models. This can be done by citing either peer review documentation/conclusions or example documentation. This was performed as part of the peer review team implementation of NEI 00-02. (See DE-9.) The criteria for NEI 00-02 elements DA-13 and DA-14 only apply to Grade 4.	No objection
DA-D6	Partial	DE-9, **DA-8, DA-9,** DA-10, DA-11, DA-12, DA-13, DA-14	None	No objection
DA-D6a[(3)]	Partial (see Self-Assessment Action)	DA-14	Plant-specific screening and mapping of industry-wide data is not required for Capability Category II. However, if this approach is used, DA-D6a should be confirmed to be met. If it is performed, see DE-9 from NEI 00-02.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
DA-D7	No		Use the ASME standard for requirements. NEI 00-02 does not specifically address how to deal with data for equipment that has been changed.	No objection
DA-E1(2)	Partial	DA-1, DA-19, DA-20, DE-9	None	No objection
DA-E2(2)	Partial	DA-1, DA-19, DA-20, DE-9	Action is to confirm availability of documentation. In general, specified documentation items not explicitly addressed in NEI 00-02 checklists were addressed by the peer review teams. If not available, documentation may need to be generated to support particular applications or respond to NRC RAIs regarding applications.	No objection
DA-E3(2)	Partial	QU-27, QU-28, QU-29, QU-34	Confirm that the key assumptions and key sources of uncertainty consistent with the definitions of the ASME PRA Standard are documented.	No objection with Clarification: See staff position on definition of key assumption and key source of uncertainty in Appendix A.
Internal Flooding				

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
IF-A1	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-A1a(1)	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-A1b(1)	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-A2	ASME PRA Deleted from Standard	---	---	---
IF-A3	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-A4	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
IF-B1	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-B1a(4)	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-B1b(3)	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-B2	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-B3	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
IF-B3a(3)	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-B4	Deleted from ASME PRA Standard	---	---	---
IF-C1	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-C2	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-C2a(1)	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-C2b(2)	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
IF-C2c(5)	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-C3	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-C3a(1)	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-C3b(3)	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-C3c(6)	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
IF-C4	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-C4a[(4)]	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-C5	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-C5a[(1)]	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-C6	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
IF-C7(3)	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-C8(3)	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-C9(3)	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-D1	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-D2	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
IF-D3	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-D3a(3)	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-D4	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-D5	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-D5a(1)	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
IF-D6(3)	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-D7(3)	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-E1	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-E2	Deleted from ASME PRA Standard	---	---	---
IF-E3	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-E3a(3)	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
IF-E4	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-E5	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-E5a(1)	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-E6	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-E6a(1)	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
IF-E6b(1)	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-E7	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-E8(3)	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-F1(2)	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
IF-F2(2)	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
IF-F3[(2)]	No		Use the ASME standard for requirements. NEI 00-02 does not address this supporting requirement.	No objection
Quantification Analysis				
QU-A1	Yes	AS-4, AS-5, AS-6, AS-7, AS-8, AS-9, AS-10, AS-19	The requirement in QU-A1 is not explicitly stated in any element, but is achieved through compliance with the identified NEI 00-02 elements and others that support complying with those elements.	No objection
QU-A2a	Yes	QU-8	None	No objection
QU-A2b[(1)]	No		ASME PRA Standard SR should be addressed. "State of knowledge correlation" is not explicitly cited in NEI 00-02 to be checked.	No objection
QU-A3	Yes	QU-4, QU-8, QU-9, QU-10, QU-11, QU-12, QU-13	The requirement in QU-A3 is not explicitly stated in any element, but is achieved through compliance with the identified NEI 00-02 elements and others that support complying with those elements.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
QU-A4	Yes	QU-18, QU-19	None	No objection
QU-B1	Yes	QU-6	None	No objection
QU-B2	Yes	**QU-21**, QU-22, **QU-23**, QU-24	Confirm that this requirement is met. In practice, the industry peer reviews have generally used the stated guidance as a check on the final cutset level quantification truncation limit applied in the PRA.	No objection; QU-21 and QU-23 are the relevant elements that address the requirements in QU-B2 while the remaining NEI 00-02 elements provide additional guidance on truncation. It is not clear what events and failure modes are being addressed in QU-22. If the element is referring to a cutset truncation limit, then the values presented are reasonable.
QU-B3	Partial	QU-21, QU-22, QU-23, **QU-24**	The self-assessment should confirm that the final truncation limit is such that convergence toward a stable CDF is achieved.	No objection
QU-B4	Yes	QU-4	None	No objection. Although the stated purpose of the criterion for QU-4 is to verify that "the base computer code and its inputs have been tested and demonstrated to produce reasonable results," the subtier criteria do not address this criterion, but instead provide some do's and don'ts for quantification.
QU-B5	Yes	QU-14	None	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
QU-B6	Yes	AS-8, AS-9, QU-4, QU-20, QU-25	Check for proper accounting of success terms. The NEI 00-02 guidance adequately addresses this requirement, but QU-25 should not be restricted to addressing just delete terms.	No objection
QU-B7a	Yes	QU-26	None	No objection
QU-B7b(1)	Yes	QU-26	None	No objection
QU-B8	No		Use the ASME standard for requirements. NEI 00-02 does not explicitly cite the details of Boolean logic code implementation.	No objection
QU-B9	Partial	SY-9	The warnings in SY-A10 must be considered in the modularization process. SYSA addresses the traceability of basic events in modules but does not address the correct formulation of modules that are truly independent.	No objection
QU-C1	Yes	QU-10, QU-17, HR-26, HR-27	None	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
QU-C2	Yes	QU-10, QU-17	Verify dependencies in cutsets/sequences are assessed. Verify that dependence between the HFEs in a cutset or sequence is assessed in accordance with ASME SRs HR-D5 and HR-G7.	No objection
QU-C3	Yes	QU-20	Confirm that this requirement is met. QU-20 does not explicitly require that the critical characteristic, not just the frequency, be transferred; however, in practice, this was addressed during peer reviews.	No objection
QU-D1a	Yes	**QU-8**, QU-9, QU-10, QU-11, QU-12, QU-13, QU-14, QU-15, QU-16, QU-17	None	No objection; the requirements in QU-D1 are addressed primarily in QU-8. The requirements in QU-9, QU-10, QU-14, QU-16, and QU-17 appear to be focused on modeling and not interpretation of results. As such, they are redundant to elements in the data, dependent failure, and HRA sections.

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
QU-D1b[(1)]	Yes	**QU-8**, QU-9, QU-10, QU-11, QU-12, QU-13, QU-14, QU-15, QU-16, QU-17, QU-23	None	No objection; the requirements in QU-D1 are addressed primarily in QU-8. The requirements in QU-9, QU-10, QU-14, QU-16, and QU-17 appear to be focused on modeling and not interpretation of results. As such, they are redundant to elements in the data, dependent failure, and HRA sections.
QU-D1c[(1)]	Yes	**QU-8**, QU-9, QU-10, QU-11, QU-12, QU-13, QU-14, QU-15, QU-16, QU-17	None	No objection; the requirements in QU-D1 are addressed primarily in QU-8. The requirements in QU-9, QU-10, QU-14, QU-16, and QU-17 appear to be focused on modeling and not interpretation of results. As such, they are redundant to elements in the data, dependent failure, and HRA sections.
QU-D2	Deleted from ASME PRA Standard	---	---	---
QU-D3	Yes	QU-8, QU-11, QU-31	None	No objection; consistency with other PRA results is addressed in QU-11 and QU-31.
QU-D4	Yes	QU-15	None	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
QU-D5a	Yes	QU-8, QU-31	Confirm that this requirement is met. The subject matter in QU-D5a is partially addressed in NEI 00-02 in element QU-31 (QU-8 checks the reasonableness of the results). The contributions from IEs, component failures, common-cause failures, and human errors are not addressed. In practice, these were addressed during peer reviews.	No objection
QU-D5b(5)	No		Confirm that this requirement is met.	No objection
QU-E1	Yes	QU-27, QU-28, QU-30	Confirm that QU-E1 is addressed. The definition of the sources of model uncertainty is provided by the ASME PRA Standard Addendum B. This nomenclature was not available when NEI 00-02 was implemented. The PRA Peer Review did examine the PRAs to see if modeling uncertainties were addressed appropriately.	No objection with Clarification: QU-30 does not provide guidance on sources of uncertainty. See staff position on definition of key assumption and key source of uncertainty in Appendix A.

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
QU-E2	Yes	QU-27, QU-28, QU-30	Confirm that this requirement is met. QU-27 and QU-28 focus on the assumptions and unusual sources of uncertainty. Assumptions and unusual sources of uncertainty correspond to plant-specific hardware, procedural, or environmental issues that would significantly alter the degree of uncertainty relative to plants that have previously been assessed, such as NUREG-1150 or the Risk Methodology Integration and Evaluation Program (RMIEP). Unusual sources of uncertainty could also be introduced by the PRA methods and assumptions. In practice, when applying NEI 00-02 sub-elements QU-27 and QU-28, the reviewers considered the appropriateness of the assumptions.	No objection.

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
QU-E3	Partial	QU-30	The uncertainty band associated with each risk metric is to be estimated. The parametric uncertainty band is to be estimated taking into account the "state of knowledge correlation." This was to be checked by the peer review team.	No objection
QU-E4	Partial	QU-28, QU-29, QU-30	Use the ASME standard for requirements. NEI 00-02 does not explicitly specify that sensitivity studies of logical combinations of assumptions and parameters be evaluated.	No objection
QU-F1[(2)]	Partial	QU-31, QU-32, QU-34	None	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
QU-F2(2)	Yes	MU-7, QU-4, QU-12, QU-13, QU-27, QU-28, QU-31, QU-32	No action required for (m). Normal industry practice requires documentation of computer code capabilities. Confirm availability of documentation, or generate as necessary to support applications. Also needed to confirm computer code has been sufficiently verified such that there is confidence in the results.	No objection
QU-F3(2)	Partial	QU-31	Use the ASME standard for requirements at the time of doing an application.	No objection
QU-F4(2)	No	QU-27, QU-28, QU-32	Use the ASME standard for requirements at the time of doing an application. NEI 00-02 does not address this supporting requirement.	No objection
QU-F5(2)	No		Use the ASME standard for requirements at the time of doing an application. NEI 00-02 does not address this supporting requirement.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
QU-F6[3]	No		Use the ASME standard for requirements at the time of doing an application. NEI 00-02 does not address this supporting requirement.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
LERF Analysis				

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
LE-A1	Partial	AS-14, AS-21, AS-23, L2-7	Confirm that the specifics identified in LE-A1 are included in the PRA. NUREG/CR-6595 methodology is not adequate for Capability Category II and III. It is further noted that NEI 00-02 does not address criteria for the grouping into plant damage states (PDSs) (i.e., there are no criteria provided as to what information has to be transferred from the Level 1 to the Level 2 analysis). L2-7 states the transfer from Level 1 to Level 2 should be done to maximize the transfer of relevant information, but does not specifically identify the type of information that must be transferred. L2-7 does refer to grouping sequences with similar characteristics and cautions care in transferring dependencies on accident conditions, equipment status and operator errors. In practice, this step included review of the process for developing and binning the PDSs and ensuring consistency between the PDSs and the plant state.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
LE-A2	Partial	L2-7, L2-8, AS-21	Confirm that the specifics identified in LE-A2 are included in the PRA. NUREG/CR-6595 methodology is not adequate for Capability Category II and III. It is noted that NEI 00-02 does not address criteria for the grouping into PDSs (i.e., there are no criteria provided as to what information has to be transferred from the Level 1 to the Level 2 analysis). L2-7 states the transfer from Level 1 to Level 2 should be done to maximize the transfer of relevant information, but does not identify the type of information that must be transferred.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
LE-A3	Partial	L2-7, L2-8	Confirm that the specifics identified in LE-A3 are included in the PRA. NUREG/CR-6595 methodology is not adequate for Capability Category II and III. It is further noted that NEI 00-02 does not address criteria for the grouping into PDSs (i.e., there are no criteria provided as to what information has to be transferred from the Level 1 to the Level 2 analysis). L2-7 states the transfer from Level 1 to Level 2 should be done to maximize the transfer of relevant information, but does not identify the type of information that must be transferred.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
LE-A4	Partial	L2-7,L2-8, L29, L2-24, L2-25	Confirm that the specifics identified in LE-A4 are included in the PRA. NUREG/CR-6595 methodology is not adequate for Capability Category II and III. It is further noted that NEI 00-02 does not address criteria for the grouping into PDSs (i.e., there are no criteria provided as to what information has to be transferred from the Level 1 to the Level 2 analysis). L2-7 states the transfer from Level 1 to Level 2 should be done to maximize the transfer of relevant information, but does not identify the type of information that must be transferred.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
LE-A5	Partial	L2-7, L2-8, L2-9, L2-24, L2-25	Confirm that the specifics identified in LE-A5 are included in the PRA. NUREG/CR-6595 methodology is not adequate for Capability Category II and III. It is further noted that NEI 00-02 does not address criteria for the grouping into PDSs (i.e., there are no criteria provided as to what information has to be transferred from the Level 1 to the Level 2 analysis). L2-7 states the transfer from Level 1 to Level 2 should be done to maximize the transfer of relevant information, but does not identify the type of information that must be transferred. L2-24 and L2-25 clearly indicate that the dependencies of systems, crew actions, and phenomena in the entire PRA need to be integrated into the model.	No objection
LE-B1	Yes	L2-8, L2-10, L2-15, L2-16, L2-17, L2-19	None	No objection
LE-B2	Yes	L2-13, L2-14	None	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
LE-B3[(3)]	No		NEI 00-02 does not address this supporting requirement. Use the ASME PRA Standard for requirements.	No objection
LE-C1	Yes	L2-24, L2-5, L2-8, L2-13, L2-14, L2-15, L2-16, L2-17, L2-19, L2-20	Confirm that the specifics identified in LE-C1 with regard to the basis for assigning sequences to the LERF and non-LERF category meet the intent of LE-C1.	No objection
LE-C2a	Yes	L2-9, L2-12, L2-25	Confirm that the actions credited are supported by AOPs, EOPs, SAMGs, TSC guidance or other procedural or guidance information as noted in LE-C2a.	No objection
LE-C2b[(1)]	Partial	L2-9, L2-12, L2-25	Confirm that the specifics identified in LE-C2b are included in the PRA. Repair of equipment would be subsumed under recovery actions in L2-9 and L2-5. If credit was taken for repair, actual data and sufficient time must be available and justified.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
LE-C3	Partial	L2-8, L2-24, L2-25	Confirm that the justification for inclusion of any of the features listed in LE-C3 meets the revised requirements of LE-C3 in Addendum B of the ASME standard.	No objection
LE-C4	Partial	L2-4, L2-5, L2-6	The self-assessment needs to confirm the revised requirements of LE-C4 in Addendum B of the ASME standard.	No objection
LE-C5	Yes	AS-20, AS-21, L2-7, L2-11, L2-25	None	No objection
LE-C6	Yes	L2-12, L2-24, L2-25	None	No objection
LE-C7	Partial	L2-7, L2-11, L2-12, L2-24	Confirm that the requirements in LE-C7 are included in the PRA.	No objection
LE-C8a	Partial	L2-11, L2-12	Confirm that the treatment of environmental impacts meets the revised requirements in LE-C8a in Addendum B of the ASME standard.	No objection
LE-C8b[(1)]	Partial	L2-11, L2-12	Confirm requirements of LE-C8b are implemented in the PRA.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
LE-C9a	Partial	AS-20, L2-11, L2-12, L2-16, L2-24, L2-25	Confirm that the treatment of environmental impacts meets the revised requirements of LE-C9a in Addendum B of the ASME standard. NEI 00-02 does not differentiate between containment harsh environments and containment failure effects on systems and operators. This was typically addressed during peer reviews.	No objection
LE-C9b[(1)]	Partial	AS-20, L2-11, L2-12, L2-16, L2-24, L2-25	Confirm the treatment of containment failure meets the revised requirements of LE-C9b. NEI 00-02 includes the effects of containment harsh environments and containment failure effects on systems and operators. This was typically verified during peer reviews.	No objection
LE-C10	Partial	L2-7, L2-8, L2-13, L2-24, L2-25	The revised requirements of LE-C10 in Addendum B of the ASME standard need to be considered in the self-assessment. Containment bypass is explicitly identified in the failure modes addressed by the LERF analysis.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
LE-D1a	Partial	L2-14, L2-15, L2-16, L2-17, L2-18, L2-19, L2-20, ST-5, ST-6	Confirm that the containment performance analysis meets the revised requirements of LE-D1a in Addendum B of the ASME standard.	No objection
LE-D1b(1)	Partial	L2-14, L2-15, L2-16, L2-17, L2-18, L2-19, L2-20, ST-5, ST-6	Confirm requirements of LE-D1b are implemented.	No objection
LE-D2	Partial	L2-14, L2-19	Confirm the requirements of LE-D2 are implemented. NEI 00-02 does not explicitly enumerate this supporting requirement. However, the containment failure analysis includes by its nature for Capability Category II the location of the failure mode. Therefore, both the analysis and the peer review have typically addressed this SR.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
LE-D3	Partial	IE-14, ST-9	Confirm the requirements of LE-D3 are implemented in accordance with Addendum B. In practice, peer review teams evaluated the ISLOCA frequency calculation. F&Os under IE and AS would be written if this was not adequate.	No objection
LE-D4	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for Supporting Requirement LE-D4.	No objection
LE-D5	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for Supporting Requirement LE-D5.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
LE-D6	Partial	L2-16, L2-18, L2-19, L2-24, L2-25	Confirm that the containment isolation treatment meets the revised requirements of LE-D6 in Addendum B of the ASME standard. The guidance provided in NEI 00-02 does not explicitly enumerate the requirements in LE-D6. However, the PRAs were constructed to address the requirements of NUREG1335, which explicitly required containment isolation evaluation. Therefore, the PRAs and the Peer Reviews have typically addressed this SR.	No objection
LE-E1	Yes	L2-11, L2-12	None	No objection
LE-E2	Partial	DA-4, HR-15, L2-12, L2-13, L2-17, L2-18, L2-19, L2-20	Confirm that the requirements of LE-E2 of Addendum B are met.	No objection
LE-E3(3)	No		NEI 00-02 does not address this supporting requirement. Use the ASME PRA Standard for Supporting Requirement LE-E3.	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
LE-E4[(7)]	Partial	QU sub-elements applicable to LERF	The self-assessment needs to confirm that the parameter estimation meets the revised requirements of LE-E4 in Addendum B of the ASME standard.	No objection
LE-F1a	Yes	QU-8, QU-9, QU-10, QU-11, QU-31, L2-26	None	No objection
LE-F1b[(1)]	Yes	L2-26	None	No objection
LE-F2	No	QU-27, L2-26	NEI 00-02 does not address this supporting requirement. Use the ASME standard for Supporting Requirement LE-F2.	No objection
LE -F3[(3)]	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for Supporting Requirement LE-F3	No objection
LE-G1[(2)]	Yes	L2-26, L2-27, L2-28	None	No objection

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
LE-G2[(2)]	Partial	L2-26, L2-27, L2-28	In general, specified documentation items not explicitly addressed in NEI 00-02 checklists were addressed by the peer review teams. Action is to confirm availability of documentation. If not available, documentation may need to be generated to support particular applications or respond to NRC RAIs regarding applications.	No objection
LE-G3[(2)]	Partial	L2-26, L2-27, L2-28	In general, specified documentation items not explicitly addressed in NEI 00-02 checklists were addressed by the peer review teams. Action is to confirm availability of documentation. If not available, documentation may need to be generated to support particular applications or respond to NRC RAIs regarding applications.	No objection
LE-G4[(2)]	Partial	QU-27, QU-28, QU-29, QU-34	Confirm that the key assumptions and key sources of uncertainty consistent with the definitions of the ASME PRA Standard are documented.	No objection with Clarification: See staff position on definition of key assumption and key source of uncertainty in Appendix A.

Table B-4. NRC Regulatory Position on Industry Self-Assessment Actions

NEI Assessment				Regulatory Position
ASME Std SR	**Addressed by NEI 00-02?**	**Applicable NEI 00-02 Elements**	**Industry Self-Assessment Actions**	
Note: Index number referenced in "ASME Std SR" column references the index numbers in the ASME PRA Standard RA-Sb-2005. The index numbers have changed in the ASME/ANS PRA Standard RA-Sa-2009.				
LE-G5[(2)]	Partial	L2-26, L2-27, L2-28	In general, specified documentation items not explicitly addressed in NEI 00-02 checklists were addressed by the peer review teams. Action is to confirm availability of documentation. If not available, documentation may need to be generated to support particular applications or respond to NRC RAIs regarding applications.	No objection
LE-G6[(3)]	No		NEI 00-02 does not address this supporting requirement. Use ASME PRA Standard Addendum B SR LE-G6 for requirements.	No objection

Notes from NEI 00-02 Appendix D2:

1 Subdivided from a previous SR in Addendum A of the ASME PRA Standard. It is noted that Addendum B of the ASME PRA Standard has subdivided a number of SRs for the purpose of clarifying and separating the assignment of Capability Category of the SR in a clearly delineated fashion.

2 Revised to reflect new format for documentation section and SRs.

3 New SR added.

4 SR added to address multi-unit sites.

5 Formerly IF-A2.

6 Formerly IF-E2.

7 Formerly LE-E3.

APPENDIX C

NRC POSITION ON THE NEI PROCESS FOR PERFORMING FOLLOW-ON PRA PEER REVIEWS FOR INTERNAL EVENTS (NEI 05-04)

The Nuclear Energy Institute (NEI) Peer Review Process for performing follow-on probabilistic risk assessments (PRAs) peer reviews is documented in NEI 05-04, Revision 1.

This appendix provides the staff's position on the NEI 05-04. The staff's positions are categorized as following:

- **No objection.** The staff has no objection to the guideline.
- **No objection with clarification.** The staff has no objection to the guideline. However, certain guidelines, as written, are either unclear or ambiguous, and therefore the staff has provided its understanding of these guidelines.
- **No objection subject to the following qualification**. The staff has a technical concern with the guidelines and has provided a qualification to resolve the concern.

Table C-1 provides the NRC position on the NEI Follow-on Peer Review Process documented in NEI 05-04, Revision 1. A discussion of the staff's concern (issue) and the staff proposed resolution is provided. In the proposed staff resolution, the staff clarification or qualification is indicated in either bolded text (i.e., **bold**) or strikeout text (i.e., ~~strikeout~~); that is, the necessary additions or deletions to the guidance (as written in NEI 05-04) for the staff to have no objection are provided.

Table C-1. NRC Regulatory Position on NEI 05-04

Section	Issue	Position	Resolution
Global	NEI 05-04 allows the use of a peer review and self assessment performed in accordance with NEI 00-02 as a basis for the demonstration of the technical adequacy of the PRA. The peer review process and self-assessment process in NEI 00-02 is based on Addendum B to the ASME PRA standard (RA-Sb-2005). The staff position on NEI 00-02 documented in Appendix B of Revision 1 of Regulatory Guide 1.200 is based on the staff position of RA-Sb-2005 as documented in Appendix A of Revision 1 of Regulatory Guide 1.200. However, since that time, ASME has issued Addendum C (RA-Sc-2007) and ASME and ANS has issued a revision and an addendum (ASME/ANS RA-S-2008 and RA-Sa-2009, respectively) that incorporates the changes in RA-Sc-2007. These subsequent versions of the PRA standard (e.g., ASME/ANS RA-Sa-2009) contain requirements that were revised or new requirements that were added (as compared to RA-Sb-2005).	Qualification	It is the NRC's expectation that if the results of the self-assessment are used to demonstrate the technical adequacy of a PRA for an application, differences between the current version of the Standard as endorsed in Appendix A and the earlier version of the ASME PRA Standard (i.e., RA-Sb-2005) be identified and addressed.
Section 1.0. Introduction			
1.1 thru 1.3	----------	No objection	----------

Table C-1. NRC Regulatory Position on NEI 05-04

Section	Issue	Position	Resolution
Section 2.0. General Overview Of Peer Review Process			
1st paragraph	A follow-on peer review of an at-power, internal events PRA (including internal flooding) that uses as criteria the supporting requirements of Part 2 of the ASME/ANS PRA Standard needs to address the staff's position provided in Appendix A to this regulatory guide to be acceptable to the staff for a regulatory application.	Clarification	…Follow-on peer review that cover the scope of the ASME/**ANS** PRA Standard will use the supporting requirements (SRs) in ~~Section 4~~ **Part 2** of the ASME/**ANS** PRA standard, supplemented, as appropriate, by the results of the original peer review. **In addition, the NRC's position on Part 2 as provided in Appendix A to Regulatory Guide 1.200, should also be considered**.
4th paragraph	Per Section 1-6.3 of the ASME/ANS PRA Standard, the staff position is that, in addition to the results of the PRA, the follow-on peer review must review the PRA models and assumptions related to the PRA upgrade to determine their reasonableness given the design and operation of the plant.	Clarification	In general, it is essential … of the PRA. **In addition, the follow-on peer review should review the PRA models and assumptions related to the PRA upgrade to determine their reasonableness given the design and operation of the plant.** For example, ...

Section 3.0. Grading Process			
3.0 1st paragraph	NEI 05-04 indicates that one of the outcomes of the follow-on peer review process is the assignment of grades for each SR that are used to indicate the relative capability level of each PRA technical element. However, for any application, a technical element not all the SRs have to be performed to the same capability. What capability is needed for a given SR is application dependent. Further, the next paragraph contradicts. It states that "the … PRA Technical Elements … are assigned an overall Capability Category."	Clarification	One of the outcomes … of Capability Categories~~, which are used to indicate the relative capability level of each technical element based on the SRs as defined in the ASME PRA Standard~~. For follow-on peer reviews against the ASME/**ANS** PRA Standard …
3.0 2nd paragraph	NEI states that it is essential to focus the peer review on the specific conclusions of the PRA to ensure that the review directly addresses intended plant applications. The staff position is that the follow-on peer review must also review the PRA models and assumptions related to the PRA upgrade in addition to the results of the PRA in order to ensure the PRA can be used for specific applications.	Clarification	In general, it is essential … of the PRA. **In addition, the follow-on peer review should also review the PRA models and assumptions related to the PRA upgrade in addition to the results of the PRA in order to ensure the PRA can be used for specific applications**. <u>It is important</u> …

3.1 2nd paragraph	A follow-on peer review of an at-power, internal events PRA (including internal flooding) that uses as criteria the supporting requirements of Part 2, and the requirements of Part 1, Section 1-5 of the ASME/ANS PRA Standard needs to address the staff's position provided in Appendix A to this regulatory guide to be acceptable to the staff for a regulatory application.	Clarification	For a peer review … meets for that SR. **In addition, a follow-on peer review should also address the NRC's position on Parts 1 and 2 of the ASME/ANS standard provided in Appendix A to Regulatory Guide 1.200.**
3.1 5th paragraph	NEI 05-04 indicates that although no grades are assigned to HLRs, a qualitative assessment of the HLRs will be made based on the associated SR grades. The staff's position is consistent with the ASME/ANS PRA Standard, which indicates that a PRA reviewed against the standard must satisfy all HLRs. To meet an HLR, all SRs under that HLR must meet the requirements of one of the three Capability Categories.	Clarification	When the peer review … based on the associated SR Capability Categories**, given that all the SRs for the HLR were met**.

3.2 Comparison Against Grading Process for NEI 00-02	The NEI 00-02 process uses "a set of checklists as a framework within which to evaluate the scope, comprehensiveness, completeness, and fidelity of the PRA being reviewed." The checklists by themselves are insufficient to provide the basis for a peer review since they do not provide the criteria that differentiate the various grades of PRA. The NEI subtier criteria provide a means to differentiate between grades of PRA. However, since the NEI subtier criteria do not address all of the requirements in the ASME/ANS PRA Standard (Parts 1 and 2), the staff's position is that a peer review based on these criteria is incomplete. The PRA standard requirements that are not included in the NEI 00-02 subtier criteria (identified for a Grade 3 PRA in Table B-3) need to be addressed in the NEI 00-02 self-assessment process as endorsed by the staff in this appendix. (Staff comment on Section 1.1 on NEI 00-02)	Clarification	Under the NEI 00-02 grading process … These checklists are contained in Appendix B of NEI 00-02. **However, the checklists by themselves are insufficient to provide the basis for a peer review. The requirements in the ASME/ANS PRA standard (Parts 1 and 2) should serve as the basis for the peer review in using the checklists.**

	The NEI 00-02 peer review process grades each PRA element from 1 to 4, while the ASME/ANS PRA Standard uses Capability Categories I, II, and III. The staff interpretation of Grades 2, 3, and 4 is that they correspond broadly to Capability Categories I, II, and III, respectively. This statement is not meant to imply that the supporting requirements, for example, for Category I are equally addressed by Grade 2 of NEI 00-02. The review of the supporting requirement for Category II against Grade 3 of NEI 00-02 indicated discrepancies and consequently the need for a self-assessment. The existence of these discrepancies would indicate that it would not be appropriate to assume that there are not discrepancies between Category I and Grade 2. A comparison between the other grades and categories has not been performed. The implications of this are addressed in item 7 of Table B-2. (Staff comment on Section 3.3 on NEI 00-02)	Clarification	In general, the following approximate correspondence exists between the two "grading" systems: NEI 00-02 ASME/ANS PRA Standard Grade 1 No equivalent "grade" Grade 2 Capability Category I Grade 3 Capability Category II Grade 4 Capability Category III **The above comparison is not meant to imply that the supporting requirements, for example, for Category I are equally addressed by Grade 2 of NEI 00-02. It would not be appropriate to assume that there are not discrepancies between Category I and Grade 2, Category II and Grade 3, and Category III and Grade 4.**

Section 4.0. Follow-On Peer Review: ASME[/ANS] PRA Standard Scope			
4.1 thru 4.5	----------	No objection	----------
4.6 12th and 13th paragraphs	Section 1-6.1 in Part 1 of the ASME/ANS PRA Standard indicates that the peer review need not assess all aspects of the PRA against all of the Section 4 requirements. The NEI 05-04 process interpretation of this statement allows for skipping review of selected SRs if the reviewers determine they can achieve consensus on the adequacy of the PRA with respect to the HLR associated with the SRs that are not reviewed. The staff's position is that the statement quoted refers to the scope of the models being reviewed and not the scope of the SRs to be reviewed. The staff's position is that all SRs pertinent to the PRA upgrade must be reviewed against a sufficient number and variety of models in the PRA (e.g., selected fault and event trees) to determine the SR capability categories. Without a review, the capability category for skipped SRs cannot be determined.	Clarification	As stated in Section **1-**6.1 **in Part 1** of the ASME/**ANS** PRA Standard, "The peer review … for each PRA element." … Must be addressed. ~~In performing the review of a given technical element, the Lead Reviewer may elect to skip the review of selected SRs … must document their basis fro skipping the given SR.~~
4.7	----------	No objection	----------
APPENDICES			
A , B	----------	No objection	----------

C	Slide 3 states the Appendix A of this regulatory guide must be used to clarify the ASME PRA standard but fails to mention that this appendix must be used for clarifications to NEI 05-04.	Clarification	-- NRC clarifications and qualitifications as provided in Appendi~~x~~**ces** A**, B and C** of RG 1.200~~, Rev.1~~
D	----------	No objection	----------

APPENDIX D

NRC POSITION ON THE NEI INTERNAL FIRE PEER REVIEW PROCESS (NEI-07-12)

The Nuclear Energy Institute (NEI) Peer Review Process for a fire probabilistic risk assessment (PRA) is documented in NEI 07-12, Revision 0, Version H. It provides guidance for the peer review of probabilistic risk assessments (PRAs) and the grading of the PRA sub-elements into one of four capability categories.

This appendix provides the staff's position on the NEI Fire PRA Peer Review Process (i.e., NEI 07-12). The staff's positions are categorized as following:

- **No objection.** The staff has no objection to the guideline.
- **No objection with clarification.** The staff has no objection to the guideline. However, certain guidelines, as written, are either unclear or ambiguous, and therefore the staff has provided its understanding of these guidelines.
- **No objection subject to the following qualification**. The staff has a technical concern with the guidelines and has provided a qualification to resolve the concern.

Table D-1 provides the NRC position on the NEI Fire PRA Peer Review Process documented in NEI 07-12, Revision 0, Version H. A discussion of the staff's concern (issue) and the staff proposed resolution is provided. In the proposed staff resolution, the staff clarification or qualification is indicated in either bolded text (i.e., **bold**) or strikeout text (i.e., ~~strikeout~~); that is, the necessary additions or deletions to the guidance (as written in NEI 07-12) for the staff to have no objection are provided.

Table D-1. NRC Regulatory Position on NEI 07-12

Index No	Issue	Position	Resolution
Global	The peer review should be performed using Addendum A to the ASME/ANS PRA standard, ASME/ANS RA-Sa-2009, as endorsed by this Regulatory Guide. The fire portion of the PRA is in Part 4 of the Addendum.	Qualification	<u>Throughout the guide:</u> Replace references to ASME/ANS RA-S-2008 with ASME/ANS RA-Sa-2009. Replace references to "Section 4 of the ASME/ANS PRA Standard" with "Part 4 of Addendum A to the ASME/ANS PRA standard" Replace references to "ANS Fire PRA Standard" with Part 4 of Addendum A to the ASME/ANS PRA standard"
Section 1.0. Introduction			
Section 1.1, through Section 1.5	----------	No objection	----------

Table D-1. NRC Regulatory Position on NEI 07-12

Index No	Issue	Position	Resolution
1.6, 3rd paragraph	Editorial	Clarification	The major benefits of this review .....adequacy of the base~~d~~ fire PRA...
Section 2.0. Peer Review Process			
2.1 6th paragraph	The staff has a clarification to Section 4-2.2 of ASME/ANS Ra-Sa-2009	Clarification	Selection of a Peer Review Team can also…FPRA information. As discussed in Section 2.2 below, the Peer Review Team should possess sufficient expertise to cover all of the FPRA elements. The utility can request particular expertise beyond the general expertise identified in ~~Section 3-2.1 of the Standard~~ **Section 4-2.2** of the ASME/ANS RA-Sa-2009 standard **(and considering the staff's position in Regulatory Guide 1.200)** for the Peer Review Team, where more specialized skills are needed.
2.2, footnote 5	Education beyond the Bachelor's degree does not necessarily equate to practical experience	Clarification	Additionally, a **directly applicable** advanced degree in Engineering/Science/Mathematics can be counted towards years of experience"
2.3, 2.4	----------	No objection	----------
Section 3.0. FPRA Peer Review Process Elements and Guidance			
3.1	----------	No objection	----------
3.2 12th paragraph	Combining F&Os should be the exception rather than the rule. This could be misinterpreted by the current language as being the reverse.	Clarification	In documenting the F&Os, it is important to note that the reviewers need not **always** match F&Os to SRs one-to-one. **For example,** F&Os on common SRs that cross several PRA Technical Elements should be combined into a single F&O (i.e. uncertainty, ...
3.2 14th paragraph	Some related requirements from the Part 2 of the ASME/ANS PRA standard, are incorporated by reference. Section 1-6.3 of the ASME internal events PRA standard states:	Qualification	~~During the review of a … can be excluded with justification.~~ **While Section 1-6.1 of the ASME/ANS PRA standard states that not all aspects of the PRA need be assessed, this statement is intended to limit how much of the model needs be considered when determining whether an SR or HLR is met. The SRs form the**

Table D-1. NRC Regulatory Position on NEI 07-12

Index No	Issue	Position	Resolution
	"The review team shall use the requirements of the Peer Review Section of each respective Part of this Standard for the PRA Elements being reviewed to determine if the methodology and the implementation of the methodology for each PRA Element meet the requirement of this Standard." Further it states: "The HLRs and the composite of the SRs of the Technical Requirements Section of each respective Part of this Standard shall be used by the peer review team to assess the completeness of a PRA Element." Contrary to this, NEI 07-12 would allow the peer review team to "… elect to skip selected SRs."		**basis for determining whether the related HLR is met, and every SRs in the HLR should be assessed by the review team.**
3.2 15th paragraph	Although the context implies as much, it is only the model uncertainty characterization that should be qualitative. Parameter uncertainty should be quantitative.	Clarification	The host utility's characterization of **model** uncertainty should be qualitative.
3.3, 2nd paragraph	One major benefit of the peer review process is the SR assignments, since these assignments improve the efficiency of NRC's review of a risk-informed submittal.	Qualification	The major benefit of the review process, ~~however, is not~~ are the SR assignments, ~~but rather~~ **as well as** the recommendations for improvements and the acknowledgements...
3.3.1 9th paragraph	Table B-2, not B-1, contains the basis section for references to SRs in Section 2 of the standard	Clarification	For Fire PRA SRs in Table B-2 that refer to SRs in Section 2 of the standard, the Basis in Table B-~~1~~2 provides a reference…
3.4 through	----------	No objection	----------

Table D-1. NRC Regulatory Position on NEI 07-12

Index No	Issue	Position	Resolution
3.5			
Section 4.0. PRA Process Results and Documentation			
4.1 thru 4.4	----------	No objection	----------
Appendix A: Preparation Material			
A.1 through A.10	----------	No objection	----------
Exhibit A-1, Attachment 3	A caveat remains on the Review Schedule and Agenda	Clarification	Delete caveat: "~~**(not sure we can have an accurate... other than uncertainty)**~~"
Appendix B: Sample Summary Tables			
Tables B-1A thru B-2	----------	No objection	----------
Appendix C: Maintenance and update Process review check list			
Table MU	It is noted in Appendix C that the Checklist Criteria were extracted from Table MU in Appendix B of NEI 00-02. In Appendix B of this regulatory guide, the staff position is that the checklists by themselves are insufficient to provide the basis for a peer review.	Clarification	See staff comment on checklist tables in Appendix B of NEI 00-02 in Appendix B of this regulatory guide.
Appendices D through G:			
	----------	No objection	----------