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REGULATORY GUIDE

OFFICE OF NUCLEAR REGULATORY RESEARCH

REGULATORY GUIDE1.200

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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 quality 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 and subsequent, more detailed, guidance in Regulatory Guide 1.174 (RG) (Ref. 2). 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-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, as in RG 1.174, 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.

The NRC issued this regulatory guide for trial use in February 2004, and five trial applications were conducted. The NRC subsequently revised this guide to incorporate the lessons learned from those pilot applications (Ref. 3). The NRC also revised the appendices to this regulatory guide to address the changes made in the professional society PRA standards and industry PRA guidance documents. The NRC then issued the revised guide (including its associated appendices) for public review and comment as Draft Guide-1161 in September 2006. The staff subsequently reviewed the stakeholder comments and, where appropriate, revised the guide accordingly. (See Ref. 4 for a list of stakeholder comments and the related staff resolutions).

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.

One specific regulatory guide and its associated standard review plan (SRP) is RG 1.174 and SRP Section 19 (Ref. 5), which 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 parts[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 this document 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.

In addition, separate regulatory guides provide guidance for such specific applications as inservice testing (Ref. 6), inservice inspection (Ref. 7), quality assurance (Ref. 8), and technical specifications (Ref. 9). The NRC has also prepared SRP sections for each of the application-specific regulatory guides, with the exception of quality assurance.

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

- On April 5, 2002, ASME issued a standard for a full-power, internal events (excluding fire) Level 1 PRA and a limited Level 2 PRA, and subsequently issued Addenda A and B to that standard on December 5, 2003, and December 30, 2005, respectively (Ref. 10). ASME issued Addendum B in response to the NRC staff’s position on Addendum A, lessons learned from the pilots, and other public comments provided to ASME.
- In December 2003, ANS issued a standard for external events (Ref. 11).
- ASME and ANS are developing Level 1 PRA standards for internal fire, external events, and low-power shutdown operating mode, as well as Level 2 and Level 3 PRA standards.

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[1] In this regulatory guide, a part 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.

Reactor owners' groups have been developing and applying a PRA peer review program for several years. The Nuclear Energy Institute (NEI) issued NEI-00-02 (Ref. 12), which documents one such process:

- On August 16, 2002, NEI submitted draft industry guidance for self-assessments (Ref. 12) to address the use of industry peer review results in demonstrating conformance with the ASME PRA Standard. This additional guidance, which is intended to be incorporated into a revision of NEI-00-02 (per NEI, Ref. 12), contains the following:
  - Self-assessment guidance document
  - Appendix 1 — actions for industry self-assessment
  - Appendix 2 — industry peer review subtier criteria
- On May 19, 2006, NEI issued a revision to the self-assessment guidance incorporated in NEI-00-02, to satisfy the peer review requirement(s) of the ASME PRA Standard (ASME-RA-Sa-2003) as endorsed/modified by the NRC and updated by Addendum B of the ASME PRA Standard (Ref. 12).
- In August 2006, NEI issued 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. 13).
- In November 2006, NEI updated the self-assessment guidance in Revision 1 of NEI 00-02 to address the staff objections raised in Appendix B of DG-1161 (Ref. 12).

SECY-00-0162 (Ref. 14) 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.

Regulatory Guide 1.201, "Guidelines for Categorizing Structures, Systems, and Components in Nuclear Power Plants According to their Safety Significance" (Ref. 15), discusses an approach, along with References 9 and 12, to support the new rule established as Title 10, Section 50.69, of the *Code of Federal Regulations* (10 CFR 50.69), "Risk-informed categorization and treatment of structures, systems, and components for nuclear power reactors" (Ref. 16).

SECY-04-0118, "Plan for the Implementation of the Commission's Phased Approach to PRA Quality" (Ref. 17), 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.

Purposes of this Regulatory Guide

The purposes of this regulatory guide are to provide guidance to licensees for use in determining the technical adequacy of the base PRA used in a risk-informed regulatory activity, and to endorse standards and industry guidance. Toward that end, 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 program documents

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

(4) documentation to support a regulatory submittal

This regulatory guide provides guidance on 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 5 – 8.

The regulatory guides that address specific applications, such as RG 1.201, allow for the use of PRAs that are not full-scope (e.g., do not include contributions from external initiating events or low-power and shutdown 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. This regulatory guide does not address such alternative methods to the evaluation of risk contributions; rather, this guide only addresses PRA methods.

Relationship to Other Guidance Documents

This regulatory guide is a supporting document to other NRC regulatory guides that address risk-informed activities. At a minimum, these guides include (1) RG 1.174 and SRP Section 19, 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, quality assurance, and technical specifications (Refs. 4–7); and (3) regulatory guides associated with implementation of certain regulations, particularly those that rely on a plant-specific PRA to implement 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 new regulatory guide and risk-informed activities, application-specific guidance, consensus PRA standards, and industry programs (e.g., NEI-00-02).

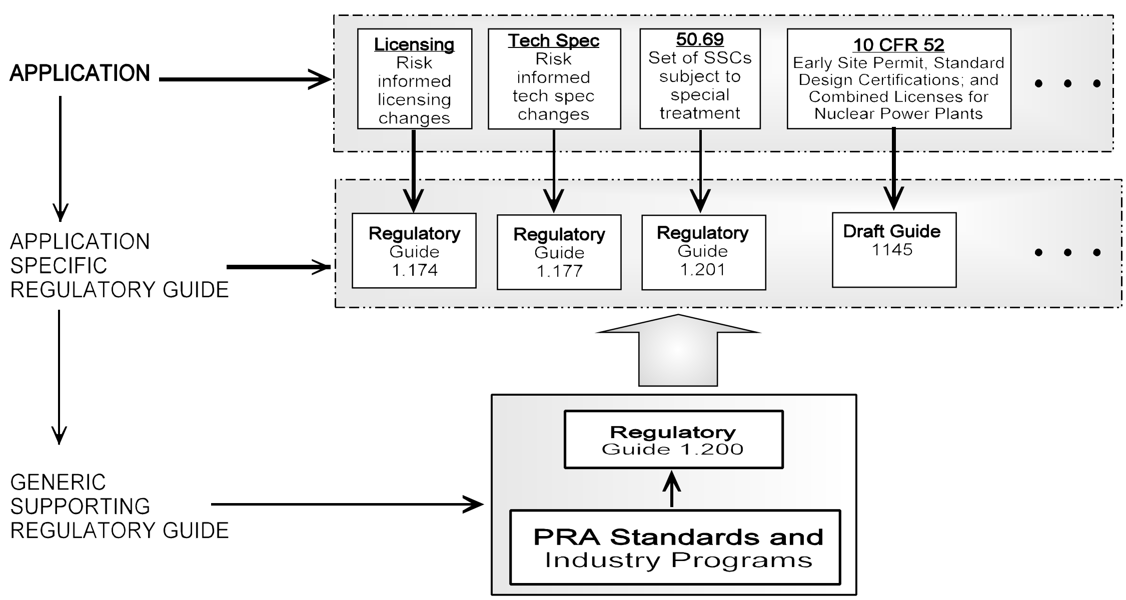

Figure 1. Relationship of Regulatory Guide 1.200 to Other Risk-Informed Guidance

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 nuclear power plant. 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[2] to the extent needed to support the application

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 types of initiating events 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 required of the PRA model is ultimately 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 and the PRA represents the as-built, as-operated plant. This minimal level of detail is implicit in the technical characteristics and attributes discussed in this section. Consequently, this section provides guidance in four areas, in accordance with SECY-00-0162:

(1) definition of the scope of a PRA
(2) technical elements of a full-scope PRA
(3) attributes and characteristics for technical elements of a PRA
(4) development, maintenance, and upgrade of a PRA

1.1 <u>Scope of PRA</u>

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
- types of initiating events that can potentially challenge and disrupt the normal operation of the plant

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2 Some applications may involve the plant at the design certification or combined operating license stage, where the plant is not built or operated. At these stages, the intent is for the PRA model to reflect the as-designed 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 light-water reactors). These 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 involving a large fraction of the core (i.e., sufficient, if released from containment, to have the potential for causing offsite health effects) is anticipated.
- **Large early release frequency** is defined as the frequency 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 is required to provide CDF. A limited Level 2 PRA is needed to address LERF.[3]

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) 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 full-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 events that have the ability to challenge the condition of the plant. These events include failure of equipment from either internal plant causes (such as hardware faults, operator actions, floods, or fires), or external plant causes (such as earthquakes or high winds). The risk perspective is based on a consideration of the total risk, which includes events attributable to both internal and external sources.

1.2 Technical Elements of PRA

Table 1 provides the list of general technical elements that are necessary for a PRA. A PRA that is missing one or more of these elements would not be considered a complete PRA. The following briefly discusses the objective of each element.

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[3] CDF and LERF are generally the metrics used in risk-informed decision-making for operating reactors licensed under Part 50. Large release is defined as the frequency of those accidents leading to rapid, unmitigated release of airborne fission products from the containment to the environment.

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 elements of both Level 1 and Level 2 PRAs.	

These technical elements are equally applicable to the PRA models constructed to address each of the contributors to risk (i.e., internal and external initiating events) 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, 1.2.4, and 1.2.5, 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 1.2.6. Another major element that is common to all of the technical elements is documentation; it is also discussed separately in Regulatory Position 1.2.7.

1.2.1 *Level 1 Technical Elements*

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 into event classes, with the classes 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, operation, and maintenance of the plant. This CDF is based on the summation of the estimated CDF from each accident sequence for each initiator class. 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[4] are eliminated. Therefore, the truncation limit can vary for each accident sequence. Consequently, the truncation value is selected so that the accident sequence CDF is stable with respect to further reduction in the truncation value.

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[4] *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, ***or*** that individually contribute more than ~1% to the CDF or LERF.

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.

1.2.2 *Level 2 Technical Elements*

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 accidents 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 time frame that allows effective evacuation of the close-in population such that early fatalities 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 the LERF and the probability of a large late release.

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. These flood scenarios are developed during the **flood identification analysis** and the **flood evaluation analysis**. 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 identification analysis identifies the plant areas where flooding could result in significant accident sequences. Flooding areas are defined on the basis of physical barriers, mitigation features, and propagation pathways. For each flooding area, flood sources that are attributable to equipment (e.g., piping, valves, pumps) and other sources internal to the plant (e.g., tanks) are identified 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 evaluation 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., submerge, 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.

Quantification provides 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.

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 failing equipment used to respond to initiating events. These fire scenarios are developed during the **screening analysis, fire initiation analysis,** and the **fire damage analysis**. The **plant response and quantification** that is specific to internal fires is similar in nature to that for the internal events. 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 as necessary.

Screening analysis identifies fire areas where fires could result in significant accident sequences. Fire areas that cannot result in significant accident sequences can be "screened out" from further consideration in the PRA analysis. Both qualitative and quantitative screening criteria can be used. The former address whether an unsuppressed fire in the area poses a nuclear safety challenge; the latter are compared against a bounding assessment of the fire-induced core damage frequency for the area. Plant walkdowns are performed where possible to verify the accuracy of the information used in the screening analysis. It is recognized that at the design and initial licensing stage, plant walkdowns are not possible. Screening analysis assumptions and results [e.g., the area-specific conditional core damage probabilities (assuming fire-induced loss of all equipment in the area)] are documented.

Fire initiation analysis determines the frequency and physical characteristics of the detailed (within-area) fire scenarios analyzed for the unscreened fire areas. The analysis identifies a range of scenarios that will be used to represent all possible scenarios in the area. The possibility of seismically induced fires is considered. The scenario frequencies reflect plant-specific experience, to the extent available and supplemented with industry fire information, and quantified in a manner that is consistent with its use in the subsequent fire damage analysis (discussed below). Each scenario is physically characterized in terms that will support the fire damage analysis (especially with respect to fire modeling).

Fire damage analysis determines the conditional probability that sets of potentially significant contributors (i.e., components including cables) will be damaged in a particular mode, given a specified fire scenario. The analysis addresses components whose failure will cause an initiating event, affect the plant's ability to mitigate an initiating event, or affect potentially significant contributors (i.e., equipment), such as through suppression system actuation. Damage from heat, smoke, and exposure to suppressants is considered. If fire models are used to predict fire-induced damage, compartment-specific features (e.g., ventilation, geometry) and target-specific features (e.g., cable location relative to the fire) are addressed. The fire suppression analysis accounts for the scenario-specific time to detect, respond to, and suppress the fire. The models and data used to analyze fire growth, fire suppression, and fire-induced component damage are consistent with experience from actual nuclear power plant fires, as well as experiments.

Plant response analysis and quantification involves the modification of appropriate plant transient and LOCA PRA models to determine the conditional core damage probability, given damage to the sets of components defined in the fire damage analysis. All potentially fire-induced initiating events that can result in significant accident sequences, including such "special" events as loss of plant support systems and interactions between multiple nuclear units during a fire event, are addressed. The analysis addresses the availability of non-fire-affected equipment (including control) and any required manual actions. The human reliability analysis of operator actions addresses fire effects on operators (e.g., heat, smoke, loss of lighting, effect on instrumentation) and fire-specific operational issues (e.g., fire response operating procedures, training on these procedures, potential complications in coordinating activities).

1.2.5 *External Hazards Technical Elements*

PRA models of external hazards, when required, are based on the internal events PRA model, which are modified to include the impact of the identified external event scenarios in terms of causing initiating events(plant transients and LOCAs), and failing equipment used to respond to initiating events. However, it is prudent to perform a **screening and bounding analysis** to screen out those external events that have an insignificant impact on risk. When external events are modeled in detail, the external event scenarios are developed during the **hazard analysis** and the **fragility analysis** as discussed below. The quantification task specific to external events is similar in nature to that for the internal events. Because of its dependence on the internal events model, the external events analysis incorporates the elements of Sections 1.2.1 and 1.2.2, as necessary.

Screening and bounding analysis identifies external events other than earthquakes (such as river-induced flooding) that may challenge plant operations and require successful mitigation by plant equipment and personnel to prevent core damage from occurring. The term "screening out" is used here for the process whereby an external event is excluded from further consideration in the PRA analysis. There are two fundamental screening criteria embedded here. An event can be screened out if either (1) it meets the design criteria, or (2) it can be shown using an analysis that the mean value of the design-basis hazard used in the plant design is less than 10^{-5}/year and that the conditional core-damage probability is less than 10^{-1}, given the occurrence of the design-basis hazard. An external event that cannot be screened out using either of these criteria is subjected to the detailed analysis.

Hazard analysis characterizes non-screened external events and seismic events, generally, as frequencies of occurrence of different sizes of events (e.g., earthquakes with various peak ground accelerations, hurricanes with various maximum wind speeds) at the site. The external events are site-specific and the hazard characterization addresses both aleatory and epistemic uncertainties.

Fragility analysis characterizes conditional probability of failure of SSCs whose failure may lead to unacceptable damage to the plant (e.g., core damage) given occurrence of an external event. For significant contributors (i.e., SSCs), the fragility analysis is realistic and plant-specific. The fragility analysis is based on extensive plant walkdowns reflecting as-built, as-operated conditions.

Plant response analysis and quantification involves the modification of appropriate plant transient and LOCA PRA models to determine the conditional core damage probability, given damage to the sets of components identified. The external events PRA model includes initiating events resulting from the external events, external-event-induced SSC failures, non-external-event-induced failures (random failures), and human errors. The system analysis is well-coordinated with the fragility analysis and is based on plant walkdowns. It is recognized that at the design and initial licensing stage, plant walkdowns are not possible. The results of the external event hazard analysis, fragility analysis, and system models are assembled to estimate frequencies of core damage and large early release.

1.2.6 *Interpretation of Results*

The results of the Level 1 PRA are examined to identify the contributors sorted by initiating events, 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 [that is, both contributors to the total CDF, including the contribution from the different initiators (i.e., internal and external events) 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 contributions of various events to the model estimation of LERF and large late release probability for both individual sequences and the model as a total, using such tools as importance measure calculations (e.g., Fussell-Vesely Importance, risk achievement worth, risk reduction worth, and Birnbaum Importance).

An important aspect in understanding the PRA results is understanding the associated uncertainties. Sources of uncertainty are identified and their impact on the results analyzed. The potential conservatism associated with the successive screening approach used for the analysis of specific scope items such as fire, flooding, or seismic initiating events is assessed. The sensitivity of the model results to model boundary conditions and other assumptions is evaluated using sensitivity analyses to look at assumptions both individually or in logical combinations. The combinations analyzed are chosen to account for interactions among the variables.

1.2.7 *Documentation*

Traceability and defensibility provide the necessary information such that the results can easily be reproduced and justified. The sources of information used in the PRA are both referenced and retrievable. The methodology used to perform each aspect of the work is described either through documenting the actual process or through reference to existing methodology documents. Sources of uncertainty are identified and their impact on the results assessed. 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. A source of uncertainty is one that is related to an issue where there is no consensus approach or model (e.g., choice of data source, success criteria, reactor coolant pressure (RCP) 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 or LERF estimates that might have an impact on the use of the PRA in decision-making.

1.3 Attributes and Characteristics of the PRA Technical Elements

Tables 2 and 3 describe, for each technical element of a PRA, the technical characteristics and attributes that provide one acceptable approach for determining the technical adequacy of the PRA such that the goals and purposes, defined in Regulatory Position 1.2, are accomplished.

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 included. That is, each characteristic and attribute is always included, but the degree to which it is included, as described above, may vary.

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.

Table 2. Summary of Technical Characteristics and Attributes of a PRA

Element	**Technical Characteristics and Attributes (see Note 1)**
PRA Full-Power, Low-Power, and Shutdown	
Level 1 PRA (internal events — transients and LOCAs)	
Initiating Event Analysis	• sufficiently detailed identification and characterization of initiators • grouping of individual events according to plant response and mitigating requirements • proper screening of any individual or grouped initiating events
Success Criteria Analysis	• based on best-estimate engineering analyses applicable to the actual plant design and operation • codes developed, validated, and verified in sufficient detail ‣ 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 (PDSs)] • 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
Systems Analysis	models developed in sufficient detail to achieve the following purposes: • reflect the as-built, as-operated plant including how it has performed during the plant history • 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 • 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 and including appropriate dependencies (both pre- and post-accident)
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

Table 2. Summary of Technical Characteristics and Attributes of a PRA

Element	**Technical Characteristics and Attributes (see Note 1)**
Level 2 PRA	
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 verified, validated 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
Note 1: While each technical element has to be met and the associated characteristics addressed, it is the intent of the attribute that needs to met. It is recognized that for reactors in the design stage, such items as performing plant walkdowns, using plant-specific data, are not possible. The attribute as stated may need to be revised in order to meet the intent.	

In addressing the above elements, because of the nature and impact of internal flood and fire and external hazards, their attributes are discussed separately in Table 3. This is because flood, fire, and external hazards analyses are spatial in nature and have the ability to cause initiating events but also have the capability to impact the availability of mitigating systems. Therefore, regarding the PRA model, the impact of flood, fire, and external hazards is to be considered in each of the above technical elements.

Table 3. Summary of Technical Characteristics and Attributes of an Internal Flood and Fire Analysis and External Hazards Analysis

Areas of Analysis	Technical Characteristics and Attributes
Internal Flood Analysis	
Flood Identification Analysis	• sufficiently detailed identification and characterization of the following: ‣ flood areas and SSCs located within each area ‣ flood sources and flood mechanisms ‣ type of water release and capacity ‣ structures functioning as drains and sumps • verification of the information through plant walkdowns
Flood Evaluation Analysis	• identification and evaluation of the following: ‣ flood propagation paths ‣ flood mitigating plant design features 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
Quantification	• identification of flooding-induced initiating events on the basis of a structured and systematic process • estimation of flooding initiating event frequencies • estimation of CDF for chosen flood sequences • modification of the Level 1 models to account for flooding effects including uncertainties
Internal Fire Analysis	
Screening Analysis	• fire areas are identified and addressed that can result in significant accident sequences • all credited mitigating components and their cables in each fire area are identified • screening criteria are defined and justified • necessary walkdowns are performed to confirm the screening decisions • screening process and results are documented • unscreened events areas are subjected to appropriate level of evaluations (including detailed fire PRA evaluations as described below)
Initiation Analysis	• fire scenarios in each unscreened area are addressed that can result in a significant accident sequence • fire scenario frequencies reflect plant-specific features • fire scenario physical characteristics are defined • bases are provided for screening fire initiators
Damage Analysis	• damage to significant contributors (i.e., components) is addressed, considering all potential component failure modes • all potentially significant contributors (i.e., damage mechanisms) are identified and addressed, and damage criteria are specified • analysis addresses scenario-specific factors affecting fire growth, suppression, and component damage • models and data are consistent with experience from actual fires, as well as experiments • includes evaluation of propagation of fire and fire effects (e.g., smoke) between fire compartments

Table 3. Summary of Technical Characteristics and Attributes of an Internal Flood and Fire Analysis and External Hazards Analysis

Areas of Analysis	Technical Characteristics and Attributes
Plant Response Analysis	• fire-induced initiating events that can result in significant accident sequences are addressed so that their bases are included in the model • includes fire scenario impacts on core damage mitigation and containment systems, including fire-induced failures • analysis reflects plant-specific safe shutdown strategy • potential circuit interactions that can interfere with safe shutdown are addressed • human reliability analysis addresses effect of fire scenario-specific conditions on operator performance
Quantification	• estimation of fire CDF for chosen fire scenarios • identification of sources of uncertainty and their impact on the results • understanding of the impact of the assumptions on the CDF • all fire-significant sequences are traceable and reproducible
External Hazards Analysis	
Screening and Bounding Analysis	• credible external events (natural and man-made) that may affect the site are addressed • screening and bounding criteria are defined and results are documented • necessary walkdowns are performed • non-screened events are subjected to an appropriate level of evaluations
Hazard Analysis	• the hazard analysis is site- and plant-specific • the hazard analysis addresses uncertainties
Fragility Analysis	• fragility estimates are plant-specific for significant contributors (i.e., SSCs) • walkdowns are conducted to identify plant-unique conditions, failure modes, and as-built conditions
Plant response analysis and quantification	• external event caused initiating events that can lead to significant core damage and large release sequences are included • external event-related unique failures and failure modes are incorporated • equipment failures from other causes and human errors are included. When necessary, human error data are modified to reflect unique circumstances related to the external event under consideration • unique aspects of common causes, correlations, and dependencies are included • the systems model reflects as-built, as-operated plant conditions • the integration/quantification accounts for the uncertainties in each of the inputs (i.e., hazard, fragility, system modeling) and final quantitative results such as CDF and LERF • the integration/quantification accounts for all dependencies and correlations that affect the results

In understanding the results from a PRA, the different initiators and operating states need to be considered, in an integrated manner, when examining the results. The attributes for interpretation of the results are discussed separately in Table 4.

Table 4. Summary of Technical Characteristics and Attributes for Interpretation of Results

Element	Technical Characteristics and Attributes
Level 1 PRA	
Interpretation of Results	• identification of the key contributors to CDF (initiating events, accident sequences, equipment failures and human errors) • identification of sources of uncertainty and their impact on the results • 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 and resulting source terms • identification of sources of uncertainty and their impact on the results • understanding of the impact of the assumptions on Level 2 results

A significant aspect of the technical acceptability of the PRA is documentation. The attributes for documentation are discussed separately in Table 5.

Table 5. Summary of Technical Characteristics and Attributes for Documentation

Element	Technical Characteristics and Attributes
Traceability and defensibility	• 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 and results are fully described

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-built, as-operated plant to the extent needed to support the application. 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 reflects the as-built, as-operated plant.[5] 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

[5] 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.

Further, plant walkdowns are conducted to ensure that information sources being used actually reflects 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 6 describes the characteristics and attributes that need to be included for the above types of information.

Table 6. Summary of Attributes and Characteristics for Information Sources Used in PRA Development

Type of Information	**Attributes and Characteristics (see Note 1)**
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
Note 1: While each source of information needs to be used and the associated characteristics addressed, it is the intent of the attribute that needs to met. It is recognized that for reactors in the design stage, operational and maintenance items may not possible. The attribute as stated may need to be revised in order to meet the intent.	

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 7 provides the attributes and characteristics of an acceptable process.

Table 7. 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 an industry consensus PRA standard or standards that address the scope of the PRA used in the decision-making. An alternative acceptable approach to using an industry consensus PRA standard is to use an industry-developed peer review program.

2.1 <u>Consensus PRA Standards</u>

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 8 provides an acceptable set of principles and objectives that were established and used by ASME in development of their Level 1/LERF PRA standard. Principle 3 recognizes that the various parts 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:

(1) The scope and level of detail that reflects the plant design, operation, and maintenance may vary.

(2) Plant-specific information versus generic information is used, such that the as-built and as-operated plant is addressed.

(3) Realism is incorporated, such that the expected response of the plant is addressed.

It is recognized that the various parts of a PRA will not be to the same capability category. Which part of the PRA meets what capability category is dependent on the specific application.

Table 8. 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 (see Note below) 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-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.

Note: 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. [No definition was provided for these terms by ASME.]

The standards are written in terms of "requirements."[6] These requirements will be 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. Therefore, when a standard is used to demonstrate conformance with Regulatory Position 1, the requirements in the standard will need to be met. As a general rule, a requirement of a standard is met when it is demonstrated that there is clear evidence of an intent to meet the requirement.

For process requirements, the intent, is generally straightforward and the requirement is either met or not met. For the technical requirements, it s not always as straightforward. Many of the technical requirements in a standard apply to several parts of 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 complied with. In either case, the examples 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.

One example of an industry consensus PRA standard is the ASME standard, with a scope for a PRA for Level 1 and limited Level 2 (LERF) for full-power operation and internal events (excluding internal fires). The staff regulatory position regarding this document is provided in Appendix A to this regulatory guide. If it is demonstrated that the parts of a PRA that are used to support an application comply with the ASME standard, when supplemented to account for the staff's regulatory positions contained in Appendix A, it is considered that the PRA is adequate to support that risk-informed regulatory application.

Additional staff positions will be added in future updates to this regulatory guide to address requirements for other risk contributors, such as accidents caused by external hazards or internal fire or caused during the low-power and shutdown modes of operation.

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6 The use of the word "requirement" is standards language (e.g., in a standard, it states the standards "sets forth requirements") and is not meant to imply a regulatory requirement.

2.2 Industry Peer Review Program

An acceptable approach that can be used to ensure technical adequacy is to perform a peer review of the PRA. A peer review can be used to identify the strengths and weaknesses in the PRA and their importance to the confidence in the PRA results.

If a peer review process is used to demonstrate conformance with Regulatory Position 1, an acceptable peer review approach is one that is performed according to an established process that compares the PRA against the characteristics and attributes and by qualified personnel, and one that 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 1.3). 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-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 **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. Finally, each member of the peer review team must be knowledgeable in the peer review process, including the desired characteristics and attributes used to assess the adequacy of the PRA.

Documentation provides the necessary information such that the peer review process and the findings are both traceable and 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 9 provides a summary of the characteristics and attributes of a peer review.

Table 9. 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
Team Qualifications	• independent with no conflicts of interest • 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 standard requires a peer review to be performed. The peer review, per ASME, 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 program (i.e., NEI-00-02, Ref. 11), and noted in the ASME standard as an acceptable process. The staff regulatory position on the peer review requirements in the ASME PRA Standard and the peer review process in NEI-00-02 is provided in Appendices A and B, respectively, to this regulatory guide. When the staff's regulatory positions contained in Appendices A and B are taken into account, use of a peer review can be used to demonstrate that the PRA is adequate to support a risk-informed application.

As stated earlier, the peer review is to be performed against established standards (e.g., ASME PRA Standard). If different criteria are used than 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 provides separate criteria for a peer review of a Level 1/LERF PRA at full-power for internal events, excluding internal flood and fire and external events. NEI-00-02 also provides guidance for resolution of the differences between the established standards, as endorsed by the NRC (i.e., ASME PRA Standard and Appendix A to this guide) and its peer review criteria. The staff position on this guidance (referred to as the "Licensee Self-Assessment Guidance"), is provided in Appendix B to this guide. When the staff's regulatory positions contained in Appendix B are taken into account, use of the peer reviews performed using NEI-00-02 can be used to demonstrate that the PRA is adequate to support a risk-informed application, with regard to a Level 1/LERF PRA for full-power for internal events (excluding internal fires and external events).

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 quality of the PRA used, in total or the parts 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 parts of the PRA to support that analysis must be identified, and it is for these elements that the guidance in this regulatory guide is applied. 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.

3.1 Identification of Parts of a PRA Used To Support the Application

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
- a definition of the acceptance criteria:
    - identification of the PRA results that will be used to compare against the acceptance criteria or guidelines and how the comparison is to be made
    - the scope of risk contributors to support the decision

Based on an understanding of how the PRA model is to be used to achieve the desired results, the licensee will have identified the parts of the PRA required to support a specific application. These include (1) the logic model events onto which the cause-effect relationships are mapped (i.e., those directly affected by the application), (2) all the events that appear in the accident sequences in which the first group of elements appear, and (3) the parts of the analysis required to evaluate the necessary results. For some applications, this may be a limited set, but for others (e.g., risk-informing the scope of special treatment requirements), all parts of the PRA model are relevant.

3.2 Scope of Risk Contributors Addressed by the PRA Model

Based on the definition of the application, and in particular the acceptance criteria or guidelines, the scope of risk contributors (internal and external initiating events and modes of plant operation) for the PRA is identified. For example, if the application is designed around using the acceptance guidelines of RG 1.174, the evaluations of CDF, ΔCDF, LERF, and ΔLERF should be performed with a full-scope PRA, including external initiating events and all modes of operation. However, since most PRAs do not address this full scope, the decision-makers must make allowances for these omissions. Examples of approaches to making allowances 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. This regulatory guide does not address this aspect of decision-making, but it is focused specifically on the quality of the PRA information used.

The PRA standards and industry PRA programs that have been, or are in the process of being, developed address a specific scope. For example, the ASME PRA Standard addresses internal events (excluding internal fire) at full-power for a limited Level 2 PRA analysis. Similarly NEI-00-02 is a peer review process for the same scope. Note that the internal flooding is only addressed in the self-assessment portion of NEI-00-02 (Appendix D). Neither addresses external (including internal fire) initiating events or the low-power and shutdown modes of operation. The different PRA standards or industry PRA programs are addressed separately in appendices to this regulatory guide. In using this regulatory guide, the applicant will identify which of these appendices is applicable to the PRA analysis.

3.3 Demonstration of Technical Adequacy of the PRA

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

For the first, assurance that the parts of the PRA used in the application have been performed in a technically correct manner implies that (1) the PRA model, or those parts of the model required to support the application, represents the 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, (2) the PRA logic model has been developed in a manner consistent with industry good practice (see footnote to Table 8) 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. This is recognized in RG 1.174, which gives guidance on how to address the uncertainties. 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 parts 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 parts 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[7] 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.

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.

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[7] *A key assumption* is one that is made in response to a key source of 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.

4.1 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.
- The results of the peer review and/or self-assessment, and a description of the resolution of all the peer review or self-assessment findings and observations. 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. 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. The history of the maintenance and upgrade activities are maintained, and include 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 initiating events and operating modes modeled
- the parts of the PRA required to provide the results needed to support comparison with the acceptance guidelines

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-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 can 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).
- 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 findings and observations that are applicable to the parts of the PRA required for the application. This may 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 were not 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 3 of ASME RA-Sb-2005), to determine whether they lead to limitations on the implementation of the licensing change.

D. IMPLEMENTATION

The purpose of this section is to provide information to applicants and licensees regarding the NRC staff's plans for using this regulatory guide. No backfitting is intended or approved in connection with its issuance.

Except in those cases in which an applicant or licensee proposes or has previously established an acceptable alternative method for complying with specified portions of the NRC's regulations, the methods described in this guide reflect public comments and will be used in evaluating (1) submittals in connection with applications for construction permits, standard plant design certifications, operating licenses, early site permits, and combined licenses, and (2) submittals from operating reactor licensees who voluntarily propose to initiate system modifications if there is a clear nexus between the proposed modifications and the subject for which guidance is provided herein.

REGULATORY ANALYSIS

A draft regulatory analysis was published with the draft of this guide when it was originally published for public comment as Draft Regulatory Guide DG-1122. That draft regulatory analysis required no changes, so the NRC staff did not prepare a separate analysis for this proposed Revision 1 of Regulatory Guide 1.200. A copy of the draft regulatory analysis is available for inspection or copying for a fee in the NRC's Public Document Room at 11555 Rockville Pike, Rockville, MD; the PDR's mailing address is USNRC PDR, Washington, DC 20555; telephone (301) 415-4737 or (800)-397-4209; fax (301) 415-3548; email PDR@nrc.gov.

REFERENCES

1. **U.S. Nuclear Regulatory Commission**, "Use of Probabilistic Risk Assessment Methods in Nuclear Activities: Final Policy Statement," *Federal Register*, Vol. 60, August 16, 1995, p. 42622 (60 FR 42622).[8]

2. **Regulatory Guide 1.174**, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," Revision 1, U.S. Nuclear Regulatory Commission, Washington, DC, November 2002.[9]

3. **U.S. Nuclear Regulatory Commission**, Letter from M. Tschiltz to D. Lew, "Resolution of the Regulatory Guide (RG) 1.200 Implementation Pilot Program," June 8, 2005.

4. **U.S. Nuclear Regulatory Commission**, Letter from M. Drouin to J. Monninger, "Resolution of Stakeholder Comments on DG-1161," November 30, 2006 (available in ADAMS under Accession #ML070040474).

5. **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, November 2002.[10]

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[8] All *Federal Register* notices listed herein were issued by the U.S. Nuclear Regulatory Commission, and are available electronically through the Federal Register Main Page of the public GPOAccess Web site, which the U.S. Government Printing Office maintains at http://www.gpoaccess.gov/fr/index.html. Copies are also available for inspection or copying for a fee from the NRC's Public Document Room at 11555 Rockville Pike, Rockville, MD; the PDR's mailing address is USNRC PDR, Washington, DC 20555; telephone (301) 415-4737 or (800) 397-4209; fax (301) 415-3548; email PDR@nrc.gov.

[9] All regulatory guides listed herein were published by the U.S. Nuclear Regulatory Commission. Many Regulatory Guides are available electronically through the Public Electronic Reading Room on the NRC's public Web site, at http://www.nrc.gov/reading-rm/doc-collections/reg-guides/. In addition, where an ADAMS accession number is identified, the specified regulatory guide is available electronically through the NRC's Agencywide Documents Access and Management System (ADAMS) at http://www.nrc.gov/reading-rm/adams.html. Single copies of regulatory guides may also be obtained free of charge by writing the Reproduction and Distribution Services Section, ADM, USNRC, Washington, DC 20555-0001, or by fax to (301)415-2289, or by email to DISTRIBUTION@nrc.gov. Active guides may also be purchased from the National Technical Information Service (NTIS)on a standing order basis. Details on this service may be obtained by contacting NTIS at 5285 Port Royal Road, Springfield, Virginia 22161, online at http://www.ntis.gov, by telephone at (800) 553-6847 or (703) 605-6000, or by fax to (703) 605-6900. Copies are also available for inspection or copying for a fee from the NRC's Public Document Room (PDR), which is located at 11555 Rockville Pike, Rockville, Maryland; the PDR's mailing address is USNRC PDR, Washington, DC 20555-0001. The PDR can also be reached by telephone at (301) 415-4737 or (800) 397-4205, by fax at (301) 415-3548, and by email to PDR@nrc.gov.

[10] All NUREG-series reports listed herein were published by the U.S. Nuclear Regulatory Commission, and are available electronically through the Public Electronic Reading Room on the NRC's public Web site, at http://www.nrc.gov/reading-rm/doc-collections/nuregs/. Copies are also available for inspection or copying for a fee from the NRC's Public Document Room at 11555 Rockville Pike, Rockville, MD; the PDR's mailing address is USNRC PDR, Washington, DC 20555; telephone (301) 415-4737 or (800) 397-4209; fax (301) 415-3548; email PDR@nrc.gov. In addition, copies are available at current rates from the U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20402-9328, telephone (202) 512-1800; or from the NTIS at 5285 Port Royal Road, Springfield, Virginia 22161, online at http://www.ntis.gov, by telephone at (800) 553-6847 or (703) 605-6000, or by fax to (703) 605-6900.

6. **Regulatory Guide 1.175**, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Inservice Testing," U.S. Nuclear Regulatory Commission, Washington, DC, August 1998.

7. **Regulatory Guide 1.178**, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Inservice Inspection of Piping," Revision 1, U.S. Nuclear Regulatory Commission, Washington, DC, September 2003.

8. **Regulatory Guide 1.176**, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Graded Quality Assurance," U.S. Nuclear Regulatory Commission, Washington, DC, August 1998.

9. **Regulatory Guide 1.177**, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications," U.S. Nuclear Regulatory Commission, Washington, DC, August 1998.

10. **ASME RA-S-2002**, "Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications," ASME, New York, New York, April 5, 2002.[11]

    ASME RA-Sa-2003, "Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications," Addendum A to ASME RA-S-2002, ASME, New York, New York, December 5, 2003.

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

11. **ANSI/ANS-58.21-2003**, "American National Standard External-Events PRA Methodology," American Nuclear Society, La Grange Park, Illinois, December 2003.[12]

12. **NEI-00-02**, "Probabilistic Risk Assessment Peer Review Process Guidance," Revision A3, Nuclear Energy Institute, Washington, DC, March 20, 2000.[13]

    Nuclear Energy Institute, Letter from Anthony Pietrangelo, Director of Risk- and Performance-Based Regulation Nuclear Generation, Nuclear Energy Institute, to Ashok Thadani, Director of Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, Washington, DC, December 18, 2001.

    Nuclear Energy Institute, Letter from Anthony Pietrangelo, Director of Risk- and Performance-Based Regulation Nuclear Generation, Nuclear Energy Institute, to Scott Newberry, Director of Risk Analysis and Applications Division, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, Washington, DC, August 16, 2002.

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[11] Copies of ASME standards and documents may be obtained from the American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990; phone (212)591-8500.

[12] Copies may be obtained from the American Nuclear Society, 555 N. Kensington Avenue, La Grange, Illinois 60526; phone (708)352-6611.

[13] All NEI documents may be obtained from the Nuclear Energy Institute, Attn: Mr. Biff Bradley, Suite 400, 1776 I Street, NW, Washington, DC 20006-3708; phone (202) 739-8083.

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.

13. **NEI-05-04**, "Process for Performing Follow-on PRA Peer Reviews Using the ASME PRA Standard," Nuclear Energy Institute, Washington, DC, January 2005.

14. **SECY-00-0162**, "Addressing PRA Quality In Risk-Informed Activities," U.S. Nuclear Regulatory Commission, Washington, DC, July 28, 2000.[14]

15. **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, May 2006.

16. **SECY-02-0176**, "Proposed Rulemaking to Add New Section 10 CFR 50.69, 'Risk-Informed Categorization and Treatment of Structures, Systems, and Components'," WITS 199900061, U.S. Nuclear Regulatory Commission, Washington, DC, September 30, 2002.

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

[14] All Commission papers (SECYs) listed herein were published by the U.S. Nuclear Regulatory Commission, and are available electronically through the Public Electronic Reading Room on the NRC's public Web site, at http://www.nrc.gov/reading-rm/doc-collections/commission/secys/. Copies are also available for inspection or copying for a fee from the NRC's Public Document Room at 11555 Rockville Pike, Rockville, MD; the PDR's mailing address is USNRC PDR, Washington, DC 20555; telephone (301) 415-4737 or (800) 397-4209; fax (301) 415-3548; email PDR@nrc.gov.

APPENDIX A

NRC REGULATORY POSITION ON ASME PRA STANDARD

Introduction

The American Society of Mechanical Engineers (ASME) has published ASME RA-S-2002, "Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications" (April 5, 2002), Addendum A to this standard (ASME RA-Sa-2003, December 5, 2003), and Addendum B to this standard (ASME RA-Sb-2005, December 30, 2005). 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 RA-S-2002, RA-Sb-2003, and RA-Sb-2005 against the characteristics and attributes for a technically acceptable PRA as discussed in Regulatory Positions 1 and 2[15] 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 RA-S-2002, RA-Sb-2003, and RA-Sb-2005 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.

Table A-1 provides the staff's position on each requirement in ASME RA-S-2002, ASME RA-Sa-2003, and ASME RA-Sb-2005. 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 standard) for the staff to have no objection are provided.

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15 This guide provides the regulatory position for a full-scope Level 1 and Level 2 PRA for operating LWRs. ASME RA-Sb-2005 is a standard for CDF and LERF for full-power conditions and internal events (excluding internal fire). Consequently, the staff position on ASME RA-Sb-2005 does not include a full Level 2, low power shutdown conditions, internal fire or external events.

Table A-1. Staff Position on ASME RA-S-2002, ASME RA-Sa-2003, and ASME RA-Sb-2005

Index No	Issue	Position	Resolution
Global			
----	Use of references, the various references, may be acceptable, in general; however, there may be aspects that are not applicable or not acceptable.	Clarification	For every reference (except NEI-00-02): **No staff position is provided on this reference. The staff neither approves or disapproves of information contained in the referenced document.**
Chapter 1			
1.1	The standard is only for current generation of operating light-water reactors; the requirements may not be sufficient or adequate for advanced LWRs (particularly in the design stage), or other types of reactors.	Clarification	This Standard sets forth requirements for Probabilistic Risk Assessments (PRAs) used to support risk-informed decisions for **operating** commercial light-water reactor nuclear power plants, and prescribes a method for applying these requirements for specific applications (additional or revised requirements may be needed for **advanced LWRs,** other reactor designs**, or for reactors in the design stage)**.
1.2	The standard is only for operating light-water reactors; the requirements may not be sufficient, adequate, or applicable for reactors in the design or construction stage. Internal events includes internal fire which is not part of this standard.	Clarification	This standard applies to PRAs used to support applications of risk-informed decision making related to ~~design, licensing, procurement, construction,~~ operation, and maintenance. This Standard established requirements for ..... internal events **(excluding internal fires)** while at power.
1.3 – 1.7	-----------------	No objection	----------------------------
Chapter 2			
2.1	-----------------	No objection	----------------------------
2.2			
Core damage	The use of the term "a large fraction of the core" should be consistent with the definition of "large" used in the LERF definition.	Clarification	*core damage:* …involving a large fraction of the core **(i.e., sufficient, if released from containment, has the potential to cause offsite health effects)** is anticipated.
Extremely rare event	A frequency cutoff should be provided as part of this definition.	Clarification	*extremely rare event*: one that would not be expected to occur even once throughout the world nuclear industry over many years **(e.g., <1E-6/rx yr)**.

Table A-1. Staff Position on ASME RA-S-2002, ASME RA-Sa-2003, and ASME RA-Sb-2005

Index No	**Issue**	**Position**	**Resolution**
Internal event	Internal fire is an internal event, and not an external event.	Qualification	*internal event*: …By convention, loss of offsite power is considered to be an internal event~~, and internal fire is considered to be an external event~~.
Key assumption	A assumption in the base PRA is independent of the decision under consideration. A key assumption is dependent on the decision under consideration. This distinction is not clear as written. See discussion on Regulatory Position 1.2.7 and 3.3.2.	Clarification	*key assumption*: **an assumption made in response to a key source of uncertainty.** An assumption is made in response to a ~~key~~ source of uncertainty in the knowledge ..... is at least as sound as that of the assumptions being challenged.
Key source of uncertainty	A source of uncertainty in the base PRA is independent of the decision under consideration. A key source of uncertainty is dependent on the decision under consideration. This distinction is not clear as written. See discussion on Regulatory Position 1.2.7 and 3.3.2.	Clarification	*key source of uncertainty*: a 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 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. A *key source of uncertainty* is a source of uncertainty that influences** ~~**or**~~ 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.~~
PRA upgrade	See the issue discussed on definition of "Accident sequence, dominant."	Clarification	*PRA upgrade:* The incorporation into a PRA model of a new methodology or ~~significant~~ changes in scope or capability **that impact the significant sequences.** This could….

Table A-1. Staff Position on ASME RA-S-2002, ASME RA-Sa-2003, and ASME RA-Sb-2005

Index No	Issue	Position	Resolution
Rare event	A frequency cutoff should be provided as part of this definition.	Clarification	rare event: one that might be expected to occur only a few times throughout the world nuclear industry over many years **(e.g., <1E-4/rx yr)**.
Reactor-year	This term references the wrong footnote and could more accurately reference the right table in Section 4.5.	Clarification	*reactor year*: a calender year in the operating life of one reactor, regardless of power level. See Note ~~2~~ **3** in Table 4.5.1-2 **(c)**.
Reactor-operating-state-year	This term references the wrong footnote and could more accurately reference the right table in Section 4.5.	Clarification	…See Note ~~2~~ **3** in Table 4.5.1-2 **(c)**.
Resource expert	See the issue discussed on definition of "Accident sequence, dominant."	Clarification	*resource expert:* A technical expert with knowledge of a particular technical area~~s~~ of ~~importance to~~ a PRA.
Significant contributor	This term is used in the standard and a definition is necessary.	Clarification	***significant contributor:*** **(a) in the context of an accident sequence, a significant basic event or an initiating event that contributes to a significant sequence; (b) in the context of an accident progression sequence, a contributor which is an essential characteristic (e.g., containment failure mode, physical phenomena) of a significant accident progression sequence, and if not modeled would lead to the omission of the sequence; for example, not modeling hydrogen detonation in an ice condenser plant would result in a significant LERF sequence not being modeled.**
Other Definitions	----------------	No objection	---------------------------

Table A-1. Staff Position on ASME RA-S-2002, ASME RA-Sa-2003, and ASME RA-Sb-2005

Index No	Issue	Position	Resolution
Chapter 3			
3.1 – 3.4	----------------	No objection	---------------------------
3.5	Use of the word "significant" should match definitions provided in Section 2.2.	Clarification	2nd paragraph: If the PRA does not satisfy a SR for the appropriate Capability Category, then determine if the difference is **relevant or** significant…. Acceptable requirements for determining the ~~significance of this difference~~ **differences** include the following: (a) The difference **is not relevant if it** is not applicable or does not affect the quantification…. (b) **The difference is not significant if the m**~~M~~odeled accident sequences accounting for at least 90% of CDF/LERF, as applicable…. These determinations ~~Determination of significance~~ will depend…. If the difference is not **relevant or** significant, then the PRA is acceptable for the application. If the difference is **relevant or** significant, then….
3.6	Use of the word "safety" is not needed.	Clarification	----------------
Chapter 4			
4.1, 4.2	----------------	No objection	---------------------------
4.3			
4.3.1, 4.3.2	----------------	No objection	---------------------------
4.3.3	The use of the word "should" does not provide a minimum requirement.	Clarification	…The PRA analysis team **shall** ~~should~~ use outside experts, even when….
4.3.4 thru 4.3.7	----------------	No objection	--------------------------
4.4, 4.5	----------------	No objection	---------------------------
<u>4.5.1 - IE</u>			
4.5.1.1	----------------	No objection	---------------------------
Table 4.5.1-1	----------------	No objection	---------------------------
Tables 4.5.1-2(a) thru 4.5.1-2(d)			

Table A-1. Staff Position on ASME RA-S-2002, ASME RA-Sa-2003, and ASME RA-Sb-2005

Index No	**Issue**	**Position**	**Resolution**
IE-A1 thru IE-A3a	----------------	No objection	---------------------------
IE-A4	The search for initiators should go down to the subsystem/train level. Capability Category III should consider the use of "other systematic processes."	Clarification	<u>Cat I and II</u>: PERFORM a systematic evaluation of each system **where necessary (e.g., down to the subsystem or train level)**, including support systems…. <u>Cat III</u>: 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….
IE-A4a	Initiating events from common cause or from both routine and non-routine system alignments should be considered.	Clarification	<u>Cat II and III</u>: …resulting from multiple failures~~;~~ if the equipment failures result from a common cause, and from ~~routine~~ system alignments **resulting from preventive and corrective maintenance**.
IE-A5 thru IE-A10	----------------	No objection	---------------------------
IE-B1 thru IE-B2	----------------	No objection	-------------------------
IE-B3	The action verb AVOID is ambiguous.	Clarification	<u>Cat II</u>: ~~AVOID subsuming~~ **DO NOT SUBSUME** scenarios into a group….
IE-B4 thru IE-B5	----------------	No objection	-------------------------
IE-C1 thru IE-C9	----------------	No objection	-------------------------
IE-C10	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-5750 [Note (1)].**

Table A-1. Staff Position on ASME RA-S-2002, ASME RA-Sa-2003, and ASME RA-Sb-2005

Index No	Issue	Position	Resolution
IE-C11	Definitions of rare and extremely rare events can be deleted from this SR since they have been added to Chapter 2. How plant-specific features are included in the use of generic data for establishing rare event frequencies requires clarification.	Clarification	<u>CC I and II</u>: For rare initiating events, USE industry generic data and INCLUDE plant-specific ~~functions~~ **features in deciding which generic data is most applicable**.
IE-C12	The size of relief valves is an important consideration when evaluating ISLOCAs.	Clarification	<u>CC I and II</u>: (a) configuration of potential pathways including numbers and types of ~~values~~ **valves** and their relevant failure modes**, and the** existence**, size,** and positioning of relief valves
IE-C13	-----------------	No objection	--------------------------
Footnote 3 to Table 4.5.1-2c)	The first example makes an assumption that the hourly failure rate is applicable for all operating conditions.	Clarification	…Thus, $f_{bus\ at\ power}$ = 1x10-7/hr * 8760 hrs/yr *0.90 = 7.9x10-4/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, IE-D2	-----------------	No objection	----------------------------
IE-D3	All the sources of uncertainty and assumptions that can impact the risk profile of the base PRA need to be documented; see definition of key source of uncertainty for definition of source of uncertainty.	Clarification	DOCUMENT the ~~key~~ assumptions and ~~key~~ sources of uncertainty associated ....
<u>4.5.2 - AS</u>			
4.5.2.1	The HLR and associated SRs are written for CDF and not LERF; therefore, references to LERF are not appropriate.	Clarification	4.5.2.1 Objectives. The objectives… reflected in the assessment of CDF ~~and LERF~~ is such a way that….

Table A-1. Staff Position on ASME RA-S-2002, ASME RA-Sa-2003, and ASME RA-Sb-2005

Index No	Issue	Position	Resolution
Table 4.5.2-1	----------------	No objection	--------------------------
Tables 4.5.2-2(a) thru 4.5.2-2©)			
AS-A1 thru AS-A8	----------------	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-A10	The modifier "significant" does not have a clear definition. Examples provide a clear understanding.	Clarification	Cat II: …INCLUDE for each modeled initiating event, sufficient detail that ~~significant~~ differences in requirements on systems and **required** operator ~~responses~~ interactions **(e.g., systems initiations or valve alignments)** are captured.
AS-A11	----------------	No objection	---------------------------
AS-B1 thru AS-B6	----------------	No objection	---------------------------
AS-C1, AS-C2	----------------	No objection	---------------------------
AS-C3	All the sources of uncertainty and assumptions that can impact the risk profile of the base PRA need to be documented; see definition of key source of uncertainty for definition of source of uncertainty.	Clarification	DOCUMENT the ~~key~~ assumptions and ~~key~~ sources of uncertainty associated ....
4.5.3 - SC			
4.5.3.1	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 4.5.3-1	----------------	No objection	---------------------------
Tables 4.5.3-2(a) thru 4.5.3-2©)			
SC-A1, SC-A2	---------------- Note: SC-A3 was deleted in Addendum B.	No objection	---------------------------
SC-A4 thru SC-A6	----------------	No objection	---------------------------

Table A-1. Staff Position on ASME RA-S-2002, ASME RA-Sa-2003, and ASME RA-Sb-2005

Index No	Issue	Position	Resolution
SC-B1	Requirements concerning the use of thermal/hydraulic codes should be cross-referenced.	Clarification	Cat II and III: …for thermal/hydraulic, …requiring detailed computer modeling. **(See SC-B4.)** ….
SC-B2 thru SC-B5	----------------	No objection	---------------------------
SC-C1, SC-C2	----------------	No objection	---------------------------
SC-C3	All the sources of uncertainty and assumptions that can impact the risk profile of the base PRA need to be documented; see definition of key source of uncertainty for definition of source of uncertainty.	Clarification	DOCUMENT the ~~key~~ assumptions and ~~key~~ sources of uncertainty associated ....
4.5.4 - SY			
4.5.4.1	----------------	No objection	---------------------------
Table 4.5.4-1	----------------	No objection	---------------------------
Tables 4.5.4-2(a) thru 4.5.4-2©)			
SY-A1 thru SY-A21	----------------	No objection	---------------------------
SY-A22	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-C14 and estimated in accordance with DA-D8.** ~~(See DA-C14.)~~
SY-B1 thru SY-B8	---------------- Note: SY-B9 was deleted in Addendum B	No objection	---------------------------
SY-B10	References wrong SR.	Clarification	…required mission time (see also ~~A~~SY-A6). Examples **of support systems** include:
SY-B11 thru SY-B14	----------------	No objection	---------------------------
SY-B15	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 or failure that may occur prior to the onset of core damage**
SY-B16	----------------	No objection	---------------------------

Table A-1. Staff Position on ASME RA-S-2002, ASME RA-Sa-2003, and ASME RA-Sb-2005

Index No	Issue	Position	Resolution
SY-C1 SY-C2	-----------------	No objection	----------------------------
SY-C3	All the sources of uncertainty and assumptions that can impact the risk profile of the base PRA need to be documented; see definition of key source of uncertainty for definition of source of uncertainty.	Clarification	DOCUMENT the ~~key~~ assumptions and ~~key~~ sources of uncertainty associated ....
<u>4.5.5 - HR</u>			
4.5.5.1	-----------------	No objection	----------------------------
Table 4.5.5-1	-----------------	No objection	----------------------------
Tables 4.5.5-2(a) thru 4.5.5-2(I)			
HR-A1	Inspection may implicitly be included using 'test and maintenance', but explicit use of inspection term may eliminate interpretation errors (e.g., inspection may require actions to gain access to equipment, which could inadvertently cause a pre-initiator problem).	Clarification	For equipment modeled in the PRA, IDENTIFY, through a review of procedures and practices, those test**, inspection,** and maintenance activities that require realignment of equipment outside its normal operational or standby status.
HR-A2, HR-A3	-----------------	No objection	----------------------------
HR-B1, HR-B2	-----------------	No objection	----------------------------
HR-C1 thru HR-C3	-----------------	No objection	----------------------------
HR-D1, HR-D2	-----------------	No objection	----------------------------

Table A-1. Staff Position on ASME RA-S-2002, ASME RA-Sa-2003, and ASME RA-Sb-2005

Index No	Issue	Position	Resolution
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 **(including format, logical structure, ease of use, clarity, and comprehensiveness)** of written procedures and the **quality (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 **(e.g., adherence to human factors guidelines [Note (3)] and results of any quantitative evaluations of performance per functional requirements)** of the human-machine interface, including both the equipment configuration, and instrumentation and control layout
HR-D4 thru HR-D7	----------------	No objection	---------------------------
Notes to Table 4.5.5-2(d)	Additional references cited in clarification to HR-D3.	Clarification	NOTES: … **(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-E1	----------------	No objection	---------------------------
HR-E2	Need to explicitly state the need for some level of diagnosis in identifying the failure(s).	Clarification	(b) those actions performed by the control room staff either in response to procedural direction or as skill-of-the-craft to **diagnose and then** recover a failed function, system or component that is used in the performance of a response action as identified in HR-H1.
HR-E3, HR-E4	----------------	No objection	---------------------------
HR-F1, HR-F2	----------------	Clarification	---------------------------
HR-G1, HR-G2	----------------	No objection	---------------------------

Table A-1. Staff Position on ASME RA-S-2002, ASME RA-Sa-2003, and ASME RA-Sb-2005

Index No	Issue	Position	Resolution
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	<u>Cat I, II, and III</u>: (d) degree of clarity **of the meaning** of cues/indications (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	<u>Cat I, II, and III</u>: BASE…. **(See SC-B4.)** SPECIFY the point in time….
HR-G5 thru HR-G9	----------------	No objection	---------------------------
HR-H1 thru HR-H3	----------------	No objection	---------------------------
HR-I1, HR-I3	----------------	No objection	---------------------------
HR-I3	All the sources of uncertainty and assumptions that can impact the risk profile of the base PRA need to be documented; see definition of key source of uncertainty for definition of source of uncertainty.	Clarification	DOCUMENT the ~~key~~ assumptions and ~~key~~ sources of uncertainty associated ....
<u>4.5.6 - DA</u>			
4.5.6.1	----------------	No objection	---------------------------
Table 4.5.6-1	----------------	No objection	---------------------------
Tables 4.5.6-2(a) thru 4.5.6-2(e)			
DA-A1 thru DA-A3	----------------	No objection	---------------------------
DA-B1, DA-B2	----------------	No objection	---------------------------

Table A-1. Staff Position on ASME RA-S-2002, ASME RA-Sa-2003, and ASME RA-Sb-2005

Index No	Issue	Position	Resolution
DA-C1	The list of data sources needs to be updated.	Clarification	Examples of parameter estimates and associated sources include: (a) component failure rates and probabilities: NUREG/CR-4639 [Note (1)], NUREG/CR-4550 [Note (2)], **NUREG-1715 [Note 7]** … **See NUREG/CR-6823 [Note 8] for lists of additional data sources.**
DA-C2 thru DA-C13	----------------	No objection	---------------------------
DA-C14	This SR provides a justification for crediting equipment repair (SY-A22). 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-D8,** applicable industry experience and for each repair, COLLECT….
DA-C15	----------------	No objection	---------------------------
Notes to Table 4.5.6-2©)	Additional references cited in the clarification to DA-C.	Clarification	NOTES: … (7) NUREG-1715, Component performance study, 1987-1998, Vols. 1–4. (8) NUREG/CR-6823, Handbook of Parameter Estimation for Probabilistic Risk Assessment, USNRC, September 2003.
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-D2 thru DA-D5	----------------	No objection	---------------------------
DA-D6	For consistency with Table 1.3-1 and DA-D1, the Cat III requirement is to apply to all common-cause events.	Clarification	Cat III: USE realistic common-cause failure probabilities… for ~~significant~~ common-cause **basic** events. An example….

Table A-1. Staff Position on ASME RA-S-2002, ASME RA-Sa-2003, and ASME RA-Sb-2005

Index No	Issue	Position	Resolution
DA-D6a, DA-D7	-----------------	No objection	----------------------------
DA-D8	New requirement needed, DA-C14 was incomplete, only provided for data collection, not quantification of repair. (See SY-A22.)	Qualification	<u>Cat I, II, and III</u>: **For each SSC for which repair is to be modeled, ESTIMATE, based on the data collected in DA-C14, 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, DA-E2	-----------------	No objection	----------------------------
DA-E3	All the sources of uncertainty and assumptions that can impact the risk profile of the base PRA need to be documented; see definition of key source of uncertainty for definition of source of uncertainty.	Clarification	DOCUMENT the ~~key~~ assumptions and ~~key~~ sources of uncertainty associated ....
<u>4.5.7 - IF</u>			
4.5.7.1	-----------------	No objection	----------------------------
Table 4.5.7-1	-----------------	No objection	----------------------------
Tables 4.5.7-2(a) thru 4.5.7-2(f)			
IF-A1 thru IF-A4	-----------------	No objection	----------------------------
IF-B1	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, …**fire protection system**….
IF-B1a thru IF-B2	-----------------	No objection	----------------------------

Table A-1. Staff Position on ASME RA-S-2002, ASME RA-Sa-2003, and ASME RA-Sb-2005

Index No	Issue	Position	Resolution
IF-B3	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** ~~of water~~
IF-B3a	---------------- Note: IF-B4 was deleted in Addendum B	No objection	---------------------------
IF-C1	For a given flood source, there may be multiple propagation paths and areas of accumulation.	Clarification	For each defined flood area and each flood source, IDENTIFY the propagation path**s** from the flood source area to **the** area**s** of accumulation.
IF-C2 thru IF-C2b	----------------	No objection	---------------------------
IF-C2c	There is circular logic between this SR and IF-C5. This SR requires identifying SSCs for flood areas not screened out in IF-C5. A listed reason for screening a flood area in IF-C5 is that it does not contain SSCs.	Clarification	For each flood area not screened out using the requirements under ~~other Internal Flooding supporting requirements (e.g.,~~ IF-B1b ~~and IFC5~~),….

Table A-1. Staff Position on ASME RA-S-2002, ASME RA-Sa-2003, and ASME RA-Sb-2005

Index No	Issue	Position	Resolution
IF-C3	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: 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:** **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.**
IF-C3a	----------------	No objection	---------------------------
IF-C3b	Both a Capability Category II and III PRA should include the potential for maintenance-induced unavailability of barriers.	Qualification	Cat II, III: IDENTIFY inter-area…. INCLUDE potential for structural failure (e.g., of doors or walls) due to flooding loads **and the potential for barrier unavailability, including maintenance activities**.
IF-C3c thru IF-C9	----------------	No objection	---------------------------
IF-D1	IF-D1 incorrectly references Table 4.5.7-1 when it should cite Table 4.5.1-2(b). Note that IF-D2 was deleted in Addendum B.	Clarification	…IDENTIFY the corresponding plant initiating event group identified per Table ~~4.5.7-1~~ **4.5.1-2(b)**….
IF-D3	The action verb AVOID is ambiguous.	Clarification	Cat II: ~~AVOID subsuming~~ **DO NOT SUBSUME** scenarios into a group….
IF-D3a thru IF-D7	----------------	No objection	---------------------------

Table A-1. Staff Position on ASME RA-S-2002, ASME RA-Sa-2003, and ASME RA-Sb-2005

Index No	Issue	Position	Resolution
IF-E1 thru IF-E6	----------------	No objection	---------------------------
IF-E6a	This supporting requirement should indicate the need to adjust the definition of common-cause failure groups while doing the internal flooding analysis.	Clarification	INCLUDE, in the quantification,… **due to causes independent of the flooding including** unavailability due to maintenance, **common-cause failures** and other credible causes.
IF-E6b thru IF-E8	----------------	No objection	---------------------------
IF-F1, IF-F2	----------------	No objection	---------------------------
IF-F3	All the sources of uncertainty and assumptions that can impact the risk profile of the base PRA need to be documented; see definition of key source of uncertainty for definition of source of uncertainty.	Clarification	DOCUMENT the ~~key~~ assumptions and ~~key~~ sources of uncertainty associated ....
4.5.8 - QU			
4.5.8.1	SRs for LERF quantification reference the SRs in 4.5.8, and therefore, need to be acknowledged in 4.5.8.	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 4.5.8-1 HLR-QU-A thru HLR-QU-C	----------------	No objection	---------------------------
Table 4.5.8-1 HLR-QU-D	SRs for LERF quantification reference the SRs in 4.5.8 and, therefore, need to be acknowledged in 4.5.8.	Clarification	…significant contributors to CDF **(and LERF)**, such as initiating events, accident sequences….
Table 4.5.8-1 HLR-QU-E	All the sources of uncertainty and assumptions that can impact the risk profile of the base PRA need to be identified; see definition of key source of uncertainty for definition of source of uncertainty.	Clarification	Uncertainties in the PRA results shall be characterized. ~~Key s~~ Sources of model uncertainty and ~~key~~ assumptions shall be identified, and their potential impact on the results understood.

Table A-1. Staff Position on ASME RA-S-2002, ASME RA-Sa-2003, and ASME RA-Sb-2005

Index No	**Issue**	**Position**	**Resolution**
Table 4.5.8-1 HLR-QU-F	----------------	No objection	---------------------------
Tables 4.5.8-2(a) thru 4.5.8-2(f)			
QU-A1, QU-A2a	----------------	No objection	---------------------------
QU-A2b	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.	Clarification	Cat II: ESTIMATE the mean CDF from internal events, accounting for the "state-of-knowledge" correlation between event probabilities ~~when significant~~ (see NOTE 1).
QU-A3, QU-A4	----------------	No objection	---------------------------
QU-B1 thru QU-B9	----------------	No objection	---------------------------
QU-C1 thru QU-C3	----------------	No objection	---------------------------
Table 4.5.8-2(d)	HLR-QU-D and Table 4.5.8-2(d) objective statement just before table need to agree; SRs for LERF quantification reference the SRs in 4.5.8 and, therefore, need to be acknowledged in 4.5.8.	Clarification	…significant contributors to CDF **(and LERF)**, such as initiating events, accident sequences….
QU-D1a thru QU-D5b	----------------	No objection	---------------------------
QU-E1	All the sources of uncertainty that can impact the risk profile of the base PRA need to be assessed; see definition of key source of uncertainty for definition of source of uncertainty.	Clarification	IDENTIFY ~~key~~ sources of uncertainty.
QU-E2	All the assumptions that can impact the risk profile of the base PRA need to be assessed; see definition of key assumption for definition of assumption.	Clarification	IDENTIFY ~~key~~ assumptions made in the development of the PRA model.
QU-E3	----------------	No objection	---------------------------

Table A-1. Staff Position on ASME RA-S-2002, ASME RA-Sa-2003, and ASME RA-Sb-2005

Index No	Issue	Position	Resolution
QU-E4	Understanding of the model uncertainties and assumptions is an essential aspect of uncertainty analysis. In addition, all the sources of uncertainty and assumptions that can impact the risk profile of the base PRA need to be assessed; see definition of key source of uncertainty for definition of source of uncertainty.	Clarification	Cat I: PROVIDE an assessment of the impact of the ~~key~~ model uncertainties **and assumptions** on the results of the PRA. Cat II: EVALUATE the sensitivity of the results to ~~key~~ model uncertainties.... Cat III: EVALUATE the sensitivity of the results to uncertain model boundary conditions and other ~~key~~ assumptions using...
QU-F1	-----------------	No objection	----------------------------
QE-F2	"QE" should be "QU" SR needs to use defined term "significant" instead of "dominant."	Clarification	~~QE~~**QU**-F2 (g) equipment or human actions that are the key factors in causing the accident~~s~~ **sequences** to be ~~non-dominant~~ **non-significant.**
QU-F3, QU-F5, QU-F6	-----------------	No objection	----------------------------
QU-F4	All the sources of uncertainty and assumptions that can impact the risk profile of the base PRA need to be documented; see definition of key source of uncertainty for definition of source of uncertainty. What assumptions and uncertainties need to be documented for the other elements are stated in the documentation SR for that element.	Clarification	DOCUMENT the ~~key~~ assumptions and ~~key~~ sources of uncertainty **associated with the quantification analysis.** ~~, such as: possible optimistic or conservative success criteria, suitability of the reliability data, possible modeling uncertainties (modeling limitations due to the method selected), degree of completeness in the selection of initiating events, possible spatial dependencies, etc.~~
4.5.9 - LE			
4.5.9.1	-----------------	No objection	----------------------------
Table 4.5.9-1	-----------------	No objection	----------------------------
Tables 4.5.9-2(a) thru 4.5.9-2(g)			
LE-A1 thru LE-A5	-----------------	No objection	----------------------------
LE-B1 thru LE-B3	-----------------	No objection	----------------------------

Table A-1. Staff Position on ASME RA-S-2002, ASME RA-Sa-2003, and ASME RA-Sb-2005

Index No	Issue	Position	Resolution
LE-C1	The SR for Capability Category II contains the statement: "NUREG/CR-6595, Appendix A provides an acceptable definition of LERF source terms." In fact, the appendix contains three possible definitions of LERF.	Clarification	NUREG/CR-6595, Appendix A provides **a discussion and examples** ~~an acceptable definition~~ of LERF source terms.
LE-C2a thru LE-C10	----------------	No objection	--------------------------
LE-D1 thru LE-D6	----------------	No objection	--------------------------
LE-E1 thru LE-E4	----------------	No objection	--------------------------
LE-F1a thru LE-F3	----------------	No objection	--------------------------
LE-G1 thru LE-G3, LE-G5, LE-G6	----------------	No objection	--------------------------
LE-G4	All the sources of uncertainty and assumptions that can impact the risk profile of the base PRA need to be documented; see definition of key source of uncertainty for definition of source of uncertainty.	Clarification	DOCUMENT the ~~key~~ assumptions and ~~key~~ sources of uncertainty associated ....
Chapter 5			
5.1	----------------	No objection	--------------------------
5.2	----------------	No objection	--------------------------
5.3	----------------	No objection	--------------------------
5.4	See the issue discussed on definition of "Accident sequence, dominant."	Clarification	2nd para: …Changes that would impact risk-informed decisions should be ~~prioritized to ensure that the most significant changes are~~ incorporated as soon as practical.
5.5, 5.6	----------------	No objection	--------------------------
5.7	----------------	No objection	--------------------------
5.8 (a)–(d)	----------------	No objection	--------------------------

Table A-1. Staff Position on ASME RA-S-2002, ASME RA-Sa-2003, and ASME RA-Sb-2005

Index No	Issue	Position	Resolution
5.8 (e)	It is unclear what is to be documented from the peer review.	Clarification	"(e) record of the performance and results of the appropriated PRA reviews **(consistent with the requirements of Section 6.6)**"
5.8 (f), 5.8(g)	----------------	No objection	---------------------------
Chapter 6			
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 requirements in Section 4, the "quality" (i.e., strengths and weaknesses) of the PRA; this goal is to be clearly understood by the peer review team. See the issue discussed on definition of "Accident sequence, dominant."	Clarification	"…The peer review shall assess the PRA to the extent necessary to determine if the methodology and its implementation meet the requirements of this Standard 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…."
6.1.1	----------------	No objection	---------------------------
6.1.2	----------------	No objection	---------------------------
6.2			
6.2.1, 6.2.2, 6.2.3	----------------	No objection	---------------------------
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.** ~~Some subparagraphs of para. 6.3 contain specific suggestions for the review team to consider during the review.~~ 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."
6.3.1 thru 6.3.9	----------------	No objection	---------------------------

Table A-1. Staff Position on ASME RA-S-2002, ASME RA-Sa-2003, and ASME RA-Sb-2005

Index No	**Issue**	**Position**	**Resolution**
6.3.9.1	-----------------	No objection	----------------------------
6.3.9.2	See the issue discussed on definition of "Accident sequence, dominant."	Clarification	(I) the containment response calculations, performed specifically for the PRA, for the ~~dominant~~ **significant** plant damage states
6.4	-----------------	No objection	----------------------------
6.5	-----------------	No objection	----------------------------
6.6			
6.6.1	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	"(g) identification and significance of exceptions... including an assessment of PRA assumptions that the reviewers have determined to be relevant (h) ... (I) ... (j) identification of the strengths and weaknesses that have a significant impact on the PRA **(k) an assessment of the capability category of the SRs (i.e., identification of what capability category is met for the SRs)"**
6.6.2	-----------------	No objection	----------------------------

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. It provides guidance for the peer review of probabilistic risk assessments (PRAs) and the grading of the PRA subelements into one of four capability categories. This document includes the NEI subtier criteria for assigning a grade to each PRA subelement. The NEI subtier criteria for a Grade 3 PRA have been compared by NEI to the requirements in the American Society of Mechanical Engineers (ASME) PRA Standard (ASME RA-Sb-2005) listed for a Capability Category II PRA. A comparison of the criteria for other grades/categories of PRAs 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. 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 has provided guidance to the licensees to perform a self-assessment of their PRAs against the criteria in the ASME PRA Standard that were not addressed during the NEI peer review of their PRA. A self-assessment is likely to be performed in support of risk-informed applications. This self-assessment guidance is also included in NEI 00-02, Revision 1.

This appendix provides the staff's position on the NEI Peer Review Process (i.e., NEI 00-02), the proposed self-assessment process, and the self-assessment actions.[16] 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.

NRC Position on NEI 00-02

Table B-1 provides the NRC position on the NEI Peer Review Process documented in NEI 00-02, Revision 1. The stated positions are based on the historical use of NEI 00-02 and on the performance of a self-assessment to address those requirements in the ASME PRA Standard and Addenda A and B (ASME RA-S-2002, ASME RA-Sa-2003, and ASME RA-Sb-2005) that are not included in the NEI subtier criteria.

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[16] The staff position is not on the historical application of the process in NEI 00-02, but on future applications of the process.

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

Report Section	Regulatory Position	Commentary/Resolution
Section 1. INTRODUCTION		
1.1 Overview and Purpose	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.
		The ASME 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 the ASME 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 Scope	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 5 of the ASME PRA Standard which requires a peer review for PRA upgrades (PRA methodology changes).
1.2 Historical Perspective	No objection	------------------------------------
1.3 Process	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 PRA Peer Review Criteria and Grades	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 subelement level. The staff does not agree with the use of an overall PRA element grade in the assessment of a PRA.
	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 subelement 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.

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

Report Section	Regulatory Position	Commentary/Resolution
	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 subelement 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 Objectives	Clarification	See comment for Section 1.1.
2.2 Process Description	Clarification	The ASME 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 the ASME 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.
Steps 4, 7, & 8	Clarification	See previous comment.
2.3 PRA Peer Review Team	Clarification	The peer reviewer qualifications do not appear to be consistent with the following requirements specified in Section 6.2 of the ASME 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	

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

Report Section	Regulatory Position	Commentary/Resolution
Section 3. PRA PEER REVIEW PROCESS ELEMENTS AND GUIDANCE		
3.1	No objection	------------------------------------
3.2 Criteria and 3.3 Grading	Clarification	See comment for Section 1.1.
3.3 Grading	Clarification	The NEI peer review process grades each PRA element from 1 to 4, while the ASME 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 subelement grades. The NEI peer review process is performed at the subelement 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.
3.4 Additional Guidance on the Technical Elements Review	Clarification	The general use and interpretation of the checklists in the grading of PRA subelements 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.

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

Report Section	Regulatory Position	Commentary/Resolution
Section 4. PEER REVIEW PROCESS RESULTS AND DOCUMENTATION		
4.1 Report	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. The peer review requirements in the ASME PRA Standard requires analysis of key 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 key 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 need to address all key 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 on definition of key assumption.
	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 subelement level. The staff does not agree with the use of an overall PRA element grade in the assessment of a PRA.
4.2 and 4.3	No objection	------------------------------------
Appendix A. PREPARATION MATERIAL FOR THE PEER TEAM REVIEW		
A.1 through A.6	No objection	------------------------------------
A.7 Sensitivity Calculations	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.
A.8 through 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 PRA Standard is documented in Table B-3.

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

Report Section	Regulatory Position	Commentary/Resolution
Appendix C. GUIDANCE FOR THE PEER REVIEW TEAM		
C.1 Purpose	No objection	------------------------------------
C.2 Peer Review Team Mode of Operation	No objection	------------------------------------
C.3 Recommended Approach to Completing the Review	Clarification	See comment for Section 4.1.
C.4 Grading	Clarification/ Qualification	See the two comments on Section 3.3.
C.5 Peer Review Team Good Practice List	No objection	------------------------------------
C.6 Output	Qualification	See the comments on Section 4.1.
C.7 Forms	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.

NRC Position on the Self-Assessment Process

The staff position on the self-assessment process proposed by NEI to address the requirements in the ASME PRA Standard and Addenda A and B (ASME RA-S-2002, ASME RA-Sa-2003, and ASME RA-Sb-2005) that are not included in the NEI subtier criteria are addressed in this section. Both the self-assessment process and the specific actions recommended by NEI to address missing ASME standard requirements are addressed.[17]

Table B-2 provides the NRC position on the NEI self-assessment process documented in Appendix D1 to NEI 00-02, Revision 1.

[17] The NEI comparison between NEI 00-02 criteria and the ASME requirements utilized the original standard as modified by subsequent addenda (A and B).

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

Report Section	Regulatory 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 PRA Standard and Addenda A and B, 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.
	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 Table B-5 of this appendix.
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 needs to be addressed in the NEI self-assessment process.
3	Clarification	The self-assessment process should consider the clarifications and qualifications on Addendum B that will be provided Appendix A to RG 1.200, Rev. 1.
Self-Assessment Process Attributes	No objection	------------------------------------

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

Report Section	Regulatory Position	Commentary/Resolution
Overall Peer Review Process and Decision	No objection	-------------------------------------
Self-Assessment Process Steps		
1. thru 6.	No objection	-------------------------------------
7.a	Clarification	For the PRA subelements 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 subelements 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.
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 subelements.

Tables B-3 and B-4 provide the staff position on the NEI comparison of NEI 00-02 (including the subtier criteria) to the ASME PRA Standard Addendum B and the self-assessment actions provided in Appendix D2 to NEI 00-02, Revision 1.[18] The staff's position on the ASME PRA Standard (Addendum B) documented in Appendix A to this regulatory guide was considered in the comparison. The review of the NEI comparison and proposed actions was performed under the assumption that all of the requirements in the NEI subtier criteria were treated as mandatory. Thus, the staff position is predicated on the requirement that all of the requirements in the NEI subtier criteria are interpreted as "shall" being required.

Table B-3 provides the staff position of the "explanatory" table preceding the comparison and self-assessment actions table provided in Appendix D2. The first two columns are taken directly from the table in Appendix D2.

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[18] The NEI self-assessment process was revised to address the requirements in Addendum B of the ASME standard.

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 actions(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	------------------------------------

In Table B-4, the "NEI Assessment" includes, for each supporting requirement in the ASME standard (column heading: "ASME STD SR"):

- whether NEI's assessment of each SR is addressed in NEI 00-02 (column heading: "Addressed by NEI 00-02?")
- if it is addressed in NEI 00-02, then where it is addressed is identified (column heading: "Applicable NEI 00-02 Elements")
- whether NEI recommends any self-assessment by the licensee (column heading: "Industry Self-Assessment Actions")

In summary, following completion of the industry self-assessment actions, as augmented by the regulatory position for all applicable NEI Grade 3 sub-elements (and Grade 4 if no self-assessment specified), the corresponding SR may be considered to have met Capability Category II requirements of the standard. For NEI sub-elements receiving other grades, a self-assessment against the capability category requirements of the ASME standard (with Appendix A modifications) will determine the capability category for the corresponding SR.

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**	
Global				
---	---	---	---	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.
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
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

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**	
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
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
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

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**	
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
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

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**	
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
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**	
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
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

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**	
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
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, IE-10, **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.

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**	
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
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	--	--	--

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**	
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	--	--	--
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
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

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**	
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
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	--	--	--

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	
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
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
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**	
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
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 subelement 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

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	
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
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
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

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**	
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
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

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**	
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
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
SY-C1[2]	Yes	SY-5, SY-6, SY-9, SY-18, SY-23, SY-25, SY-26, SY-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**	
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
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

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**	
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
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
HR-D6	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**	
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).
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

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	
HR-F1	Yes	AS-19, HR-16, SY-5	None	No objection
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
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**	
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
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

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**	
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
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**	
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	--	--	--
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

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**	
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
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 00-002 (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	
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

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**	
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
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
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

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**	
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
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**	
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
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

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**	
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
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 & 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
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

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**	
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				
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	Deleted from ASME PRA 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	
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
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
IF-C2c(5)	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	
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
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
IF-C7(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**	
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
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
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

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**	
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
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
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

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	
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
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
QU-A4	Yes	QU-18, QU-19	None	No objection
QU-B1	Yes	QU-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**	
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 provides some do's and don'ts for quantification.
QU-B5	Yes	QU-14	None	No objection
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

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**	
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
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**	
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
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

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**	
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.
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**	
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
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	
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
LERF ANALYSIS				
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**	
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
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**	
LE-A4	Partial	L2-7,L2-8, L2-9, 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**	
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
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

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**	
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
LE-C3	Partial	L2-8, L2-24, L2-25	Confirm that the justification for inclusion of any of the features listed in LE-C3 meet 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**	
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
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

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	
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
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**	
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 NUREG-1335, 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
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

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	
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
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**	
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

<u>Notes from NEI 00-02 Appendix D2</u>:

(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.

NRC regulatory position on NEI-05-04, "Process for Performing Follow-On PRA Peer Review Using the ASME PRA Standard," is provided below in Table B.5.

Table B-5. NRC Regulatory Position on NEI 05-04

Report Section	Regulatory Position	Commentary/Resolution
Section 1.0. INTRODUCTION		
1.1 Purpose	No objection	----------------------------------
1.2 Background	No objection	----------------------------------
1.3 Scope	No objection	
Section 2.0. GENERAL OVERVIEW OF PEER REVIEW PROCESS		
1st paragraph	Clarification	A follow-on peer review of an at-power, internal events PRA (including internal flooding) that uses as criteria the supporting requirements of Chapter 4 of the ASME 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.
4th paragraph	Clarification	Per Section 6.3 of the ASME 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.
Section 3.0. GRADING PROCESS		
1st paragraph	Clarification	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. Since the use of a PRA for risk-informed applications needs to be determined at the SR level, the staff does not utilize an overall PRA technical element capability level in the assessment of a PRA for specific applications.
2nd paragraph	Clarification	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.
3.1 Grading Process for Peer Reviews Against ASME PRA Standard 2nd paragraph	Clarification	A follow-on peer review of an at-power, internal events PRA (including internal flooding) that uses as criteria the supporting requirements of Chapter 4, and the requirements of Chapter 5 of the ASME 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.
5th paragraph	Clarification	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 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.

Table B-5. NRC Regulatory Position on NEI 05-04

Report Section	Regulatory Position	Commentary/Resolution
3.2 Comparison Against Grading Process for NEI 00-02	Clarification	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 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 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	The NEI 00-02 peer review process grades each PRA element from 1 to 4, while the ASME 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)
	Qualification	The staff believes that different applications of a PRA can require different PRA subelement grades. The NEI peer review process is performed at the subelement 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 05-04. (Staff comment on Section 3.3 on NEI 00-02)

Table B-5. NRC Regulatory Position on NEI 05-04

Report Section	Regulatory Position	Commentary/Resolution
Section 4.0. FOLLOW-ON PEER REVIEW: ASME PRA STANDARD SCOPE		
4.1 Scope	Clarification	The staff accepts that in addition to performing a follow-on peer review of a PRA update, the process in NEI 05-04 can be used to validate the self-assessment performed under NEI 00-02 Appendix D guidance (referred to in NEI 05-04 as a gap-analysis), as endorsed in this appendix. The use of the results of the NEI 00-02 self-assessment can be used to focus such a review. However, for a follow-on peer review of a PRA upgrade, the staff's position is that all pertinent SRs must be reviewed.
4.2 Host Utility Requirements	No objection	--------------------------------
4.3 Self-Assessment	Clarification	The staff interpretation of NEI 00-02 Grades 2, 3, and 4 is that, they correspond broadly to the ASME PRA Standard 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. Thus, although it is reasonable to assign an SR that received a Grade 3 or 4 in the NEI 00-02 review as a Capability Category II, it is not reasonable to assume a Grade 2 corresponds to Capability Category I. (Staff comment on Section 3.3 on NEI 00-02)
4.5 Peer Review Schedule	No objection	---
4.6 Peer Review Process 4th paragraph	Qualification	NEI 05-04 states that a reviewer's assessment whether each SR meets the ASME PRA Standard should be derived from what is in the standard and not based on the staffs clarifications and qualifications of the SRs provided in Appendix A to this regulatory guide. The staff's position is that, when used to support a regulatory application, the assigned SR grades accepted by the NRC for a specific application will include consideration of the clarifications and qualifications to the ASME PRA Standard provided in Appendix A.
9th and 10th paragraphs	Clarification	Section 6.1 of the ASME 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.

Table B-5. NRC Regulatory Position on NEI 05-04

Report Section	Regulatory Position	Commentary/Resolution
APPENDICES		
Appendix A Sample Fact and Observation Form	No objection	------------------------------------
Appendix B Sample Summary Tables	No objection	------------------------------------
Appendix C Maintenance and Update Process Review Checklist	No objection	---------------------------------