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REGULATORY GUIDE

OFFICE OF NUCLEAR REGULATORY RESEARCH

REGULATORY GUIDE 1.200 For Trial Use

(Draft was issued as DG-1122)

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

A. INTRODUCTION

In 1995, the NRC issued a Policy Statement (Ref. 1) on the use of probabilistic risk analysis (PRA), encouraging its use in all regulatory matters. The 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 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: 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 that 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 (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 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.

The draft of this guide, Draft Regulatory Guide DG-1122, was issued for public review and comment in November 2002. While the public comments were positive, there are remaining technical issues that are best resolved by testing the guide against different actual applications. Therefore, this regulatory guide is being issued for trial use for pilot applications. This regulatory guide does not establish any final staff positions, and may be revised in response to experience with its use. As such, this trial regulatory guide does not establish a staff position for purposes of the Backfit Rule, 10 CFR 50.109, and any changes to this regulatory guide prior to staff adoption in final form will not be considered to be backfits as defined in 10 CFR 50.109(a)(1). This will ensure that the lessons learned from regulatory review of the pilot applications are adequately addressed in this document and that the guidance is sufficient to enhance regulatory stability in the review, approval, and implementation in the use of PRA results in risk informed activities.

The information collections contained in this regulatory guide are covered by the requirements of 10 CFR Part 50, which were approved by the Office of Management and Budget (OMB), approval number 3150-0011. The NRC may not conduct or sponsor, and a person is not required to respond to, a request for information or an information collection requirement unless the requesting document displays a currently valid OMB control number.

B. DISCUSSION

EXISTING GUIDANCE RELATED TO THE USE OF PRA IN REACTOR REGULATORY ACTIVITIES

Since the PRA Policy Statement was issued, a number of documents have been written and are being developed to provide guidance on the use of PRA information in reactor regulatory activities. These include:

- At NRC, regulatory guidance documents have been written to address risk-informed applications that use PRA information. These include Regulatory Guide 1.174 (Ref. 2) and Standard Review Plan (SRP) Chapter 19 (Ref. 3), which provide general guidance on applications that address changes to the licensing basis. Key aspects of these documents are:

  — They describe a "risk-informed integrated decision-making process" that characterizes how risk information is used and, more specifically, they clarify 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."

— They reflect 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 documents.

— While the documents are written in the context of one reactor regulatory activity (license amendments), the underlying philosophy and principles are applicable to a wide spectrum of reactor regulatory activities.

In addition, guidance is provided in separate regulatory guides for such specific applications as inservice testing (Ref. 4), inservice inspection (Ref. 5), quality assurance (Ref. 6), and technical specifications (Ref. 7). SRP chapters were also prepared for each of the application-specific regulatory guides with the exception of quality assurance.

- PRA standards have been under development by the American Society of Mechanical Engineers (ASME) and 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 (Ref. 8). In December 2003, the American Nuclear Society issued a standard for external events (Ref. 8a). In the future, ANS plans to issue standards for PRAs for evaluating internal fire risk and risk from low-power and shutdown modes of operation.

- Reactor owners' groups have been developing and applying a PRA peer review program for several years. In a letter dated April 24, 2000, the Nuclear Energy Institute (NEI) submitted NEI-00-02 (Ref. 9) to the NRC for review in the context of the staff's work to risk-inform the scope of special treatment requirements contained in 10 CFR Part 50 (discussed in SECY-99-256, Ref. 10).

  On August 16, 2002, NEI submitted draft industry guidance for self-assessments (Ref. 11) 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, see Reference 11), contains:

  — Self assessment guidance document
  — Appendix 1 – actions for industry self assessment
  — Appendix 2 – industry peer review subtier criteria

- SECY-00-0162 (Ref. 12) 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.

[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.

- SECY-02-0070 (Ref. 13) discussed revisions of Regulatory Guide 1.174 and SRP Chapter 19 and informed the Commission of the staff's plan for endorsement of the then pending ASME and ANS consensus standards and peer review programs on PRA. The endorsement was to be provided in a new regulatory guide (this document) and a new SRP Chapter (Ref. 14). Figure 1 displays the relationship among existing guidance, standards and industry guidance, and this regulatory guide.

- SECY-02-0176 (Ref. 15) discusses a proposed Draft Regulatory Guide DG-1121 (Ref. 16) and how References 8 and 9, with this guide, could be used in the context of the proposed new rule, 10 CFR 50.69.

PURPOSES OF THIS REGULATORY GUIDE

The purposes of this regulatory guide are to provide guidance to licensees in determining the technical adequacy of a PRA used in a risk-informed integrated decision-making process and to endorse standards and industry guidance. Guidance is provided in four areas:

(1) A minimal set of functional requirements of a technically acceptable PRA.

(2) The NRC position on PRA consensus standards and industry PRA program documents.

(3) Demonstration that the 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 more detailed guidance, relative to Regulatory Guide 1.174, on PRA technical adequacy in a risk-informed integrated decision-making process. It does not provide guidance on how PRA results are used in the application-specific decision-making processes; that guidance is provided in such documents as References 4 through 7 and is being developed in Draft Regulatory Guide DG-1121 (Ref. 16).

The regulatory guides that address specific applications, including Draft Regulatory Guide DG-1121, 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. The regulatory guides do, however, state that the missing scope items should be addressed in some way, for example, by using bounding analyses. This regulatory guide does not address such alternative methods to the evaluation of risk contributions; it addresses PRA methods only.

RELATIONSHIP TO OTHER GUIDANCE DOCUMENTS

This regulatory guide is a supporting document to other NRC regulatory guides that address risk-informed activities. These guides include, at a minimum, (1) Regulatory Guide 1.174 and SRP Chapter 19 (Refs. 2 and 3), which provide general guidance on applications that address changes to the licensing basis, and (2) the regulatory guides for specific applications such as for

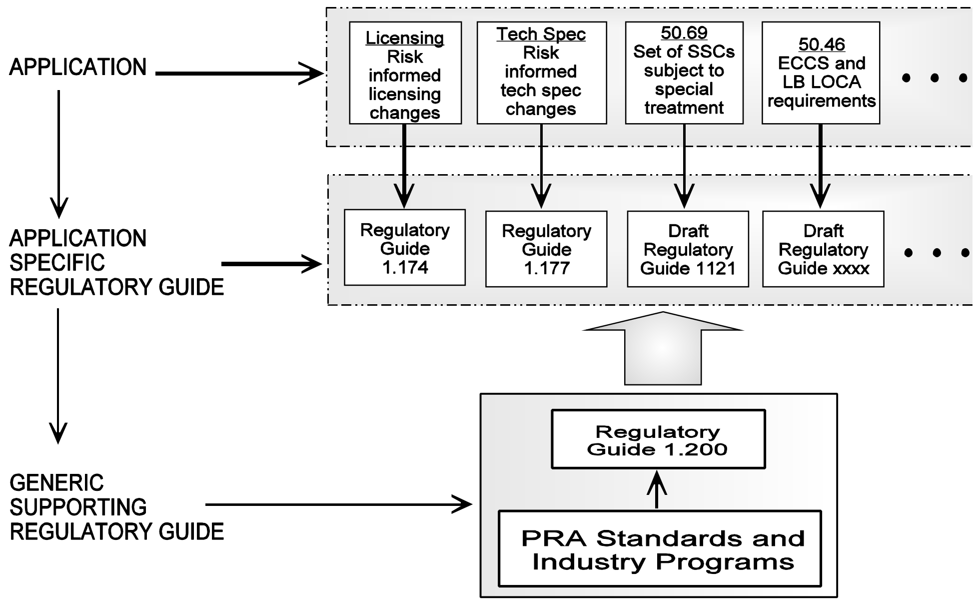

Figure 1. Relationship of Regulatory Guide 1.200 to Other Risk-Informed Guidance

inservice testing, inservice inspection, quality assurance, and technical specifications (Refs. 4 through 7). There are 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).

C. REGULATORY POSITION

1. FUNCTIONAL REQUIREMENTS OF A TECHNICALLY ACCEPTABLE PRA

This section describes one acceptable approach for defining the technical adequacy for an acceptable PRA of a commercial nuclear power plant. PRAs used in risk-informed activities may vary in scope and level of detail. In this section, the guidance provided is for a full-scope PRA. Approaches to addressing the use of limited scope PRAs are discussed in the application-specific regulatory guides. The scope is defined in terms of (1) events that can challenge the plant and, if not prevented or mitigated, would eventually result in core damage and/or a large release, and (2) the metrics used to characterize risk. The level of detail required of the PRA model is determined ultimately by the application. However, a minimal level of detail is necessary to ensure that the impact 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. This section, consequently, provides guidance in three areas:

(1) The definition of the scope of a PRA
(2) The elements of a PRA
(3) The technical attributes and characteristics for a full-scope PRA

This guidance is in accordance with SECY-00-0162 (Ref. 12).

1.1 Scope of PRA

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

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

The metrics typically used for **risk characterization** in the risk-informed integrated decision-making process are core damage frequency (CDF) and large early release frequency (LERF) (as surrogates for latent and early fatality risks, respectively). Issues related to the reliability of barriers, in particular containment integrity and consequence mitigation, are addressed through other parts of this 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.

An essential aspect of the risk characterization is an **understanding of the associated uncertainties**. Regulatory decision making using risk insights must be based on a full understanding of the contributors to the PRA results and the impacts of the uncertainties, both those that are explicitly accounted for in the results and those that are not. Consequently, as each technical element of the PRA is performed, the sources of uncertainty are identified and analyzed such that their impacts are understood at this level (e.g., accident sequence development, human reliability) and on the risk results (i.e., CDF and LERF).

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 for all subsequent accident initiating events. 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 plant operational states. 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 should be based on the total risk connected 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 should be based on a consideration of the total risk, which includes events from both internal and external sources.

1.2 Elements of a 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. 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 plant operating states. A brief discussion is provided below of the objective of each element. Because additional analyses are required to characterize their impact on the plant in terms of initiating events caused and mitigating equipment failed, internal floods, internal fires, and external hazards are discussed separately in Regulatory Positions 1.2.3, 1.2.4, and 1.2.5 respectively.

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 • Interpretation of results
Level 2	• Plant damage state analysis • Accident progression analysis	• Quantification • Interpretation of results

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 development analysis models, chronologically (to the extent practical), the different possible progression of events (i.e., accident sequences) that can occur from the start of the initiating event to either successful mitigation or to 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 different systems and operator actions during the course of the accident progression.

Systems analysis identifies the different 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 between the different 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 and quantifies 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 include the events 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[2] are not 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.

Interpretation of results entails examining and understanding the results of the PRA and identifying 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 (i.e., both the contributors to the total CDF and the contributors to each contributing sequence are identified). An important aspect in understanding the PRA results is understanding the associated uncertainties. Key sources of uncertainty[3] are identified and their impact on the results analyzed. The sensitivity of the model results to model boundary conditions and other key assumptions[4] is evaluated using sensitivity analyses to look at key assumptions both individually or in logical combinations. The combinations analyzed are chosen to account for interactions among the variables.

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.

Severe 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

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[2] *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.

[3] *A key source of uncertainty* is one that is related to an issue in which there is no consensus approach or model (e.g., choice of data source, success criteria, reactor coolant pressure seal loss-of-coolant accident model, human reliability model) and in which 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 affecting the overall CDF or LERF estimates that might have an impact on the use of the PRA in decision making.

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

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 off-site 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.

Interpretation of results entails examining results 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., Fussel-Vesely Importance, risk achievement worth, risk reduction worth, and Birnbaum Importance). Sources of uncertainty are identified and their impact on the results analyzed. An important aspect in understanding the PRA results is understanding the associated uncertainties. The sensitivity of the model results to model boundary conditions and other key assumptions is evaluated using sensitivity analyses to look at key assumptions both individually or in logical combinations. The combinations analyzed are chosen to fully account for interactions among the variables.

1.2.3 Internal Floods Technical Elements

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 due 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 are examined that 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.

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 is due to 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 (PSFs) that are due to flooding, and (5) quantify internal flood accident sequence CDF. Modifications of the Level 1 models are performed consistent with the appropriate boundary for Level 1 elements for transients and loss of coolant accidents (LOCAs). In addition, 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 sensitivity of the model results to model boundary conditions and other key assumptions is evaluated using sensitivity analyses to look at key assumptions both individually or in logical combinations. The combinations analyzed are chosen to fully account for interactions among the variables.

Interpretation of Results (See Sections 1.2.1 and 1.2.2.)

1.2.4 Internal Fire Technical Elements

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. Key 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), e.g., 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 fire experience 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. For fire scenarios involving control room abandonment, the analysis addresses the circuit interactions raised in Reference 17, including the possibility of fire-induced damage prior to transfer to the alternate shutdown panels. 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). In addition, 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 sensitivity of the model results to model boundary conditions and other key assumptions is evaluated using sensitivity analyses to look at key assumptions both individually or in logical combinations. The combinations analyzed are chosen to fully account for interactions among the variables.

Interpretation of Results (See Sections 1.2.1 and 1.2.2.)

1.2.5 External Hazards Technical Elements

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.

Level 1 model modification assures that the system models include the external-event-caused initiating events that can lead to core damage or large early release significant sequences. The system model includes 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. 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. An important aspect in understanding the PRA results is understanding the associated uncertainties. Uncertainties in each step are propagated through the process and displayed in the final results. The quantification process is capable of conducting necessary sensitivity analyses and identifying significant sequences and contributors.

1.2.6 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. Key sources of uncertainty are identified and their impact on the results assessed. Key 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 key 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 affecting the overall CDF or LERF estimates that might have an impact on the use of the PRA in decision making. A key assumption is one that is made in response to a key source of uncertainty.

1.3 Technical Adequacy of a PRA

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.

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

Element	**Technical Characteristics and Attributes**
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 – are 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: • 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 the 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 due to test and maintenance, etc.

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

Element	Technical Characteristics and Attributes
Parameter Estimation Analysis	• estimation of parameters is associated with initiating event, basic event probability models, recovery actions, and unavailability events using plant-specific and generic data as applicable • analysis is consistent with component boundaries • estimation includes a characterization of the uncertainty
Human Reliability Analysis	• identification and definition of the human failure events that would result in initiating events or pre- and post-accident human failure events that would impact the mitigation of initiating events • quantification of the associated human error probabilities, taking into account scenario (where applicable) and plant-specific factors and including appropriate dependencies both pre- and post-accident
Quantification	• estimation of the CDF for modeled sequences that are not screened due to 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
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 key assumptions* on the CDF and the identification of the accident sequence and their contributors
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 subset of representative source terms with emphasis on large early release (LER) and on large late release (LLR)

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

Element	Technical Characteristics and Attributes
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 key assumptions* on Level 2 results
Documentation	
Traceability and defensibility	• the documentation is sufficient to facilitate independent peer reviews • the documentation describes the interim and final results, insights, and key sources of uncertainties • the walkdown process and results are fully described
* See discussion in Regulatory Position 1.2.6.	

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: – 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 – 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

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*
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 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; considers all potential component failure modes • all potentially significant contributors (i.e., damage mechanisms) are identified and addressed; 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 fire experience as well as experiments • includes evaluation of propagation of fire and fire effects (e.g., smoke) between fire compartments
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 key assumptions** on the CDF • all fire-significant sequences are traceable and reproducible

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*
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.
Level 1 Model Modification	• external event caused initiating events that can lead to significant core damage and large early 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
*Documentation also applies to flood, fire, and external hazards. **See discussion in section 1.2.6.	

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 Consensus PRA Standards

One example of an industry consensus PRA standard is the ASME standard (Ref. 8), 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 appendices will be added in future updates to this regulatory guide to address PRA standards 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.

The standards are written in terms of "requirements." For example, the ASME standard states that "This standard sets forth requirements for probabilistic risk assessments (PRAs) used to support risk-informed decisions . . . ." 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. Many of the 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 a specific requirement has not been met, this does not mean that this requirement has not been met. If, for the majority of the systems or parameter estimates the requirement has been met and the few examples can be put down to mistakes or oversight, 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 at all, 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.

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 4 provides an acceptable set of principles and objectives that were established and used by ASME (Ref. 8).

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 process can be used to identify the strengths and weaknesses in the PRA and their importance to the confidence in the PRA results. Specifically, an alternative and acceptable approach to using the ASME standard is to use the industry-developed peer review program (Ref. 9), with a scope for a PRA for Level 1 and limited Level 2 (LERF) for full-power operation and internal events (excluding internal floods and fires). The staff regulatory position on this document is provided in Appendix B to this regulatory guide. When the staff's regulatory positions contained in Appendix B are taken into account, use of this document can be used to demonstrate that the PRA is adequate to support a risk-informed application.

If a peer review process is used to demonstrate conformance with Regulatory Position 1, an acceptable peer review approach is one that is performed by qualified personnel and, according to an established process that compares the PRA against the characteristics and attributes, documents the results and identifies both strengths and weaknesses of the PRA.

Table 4. 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:
   - 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 *key* [emphasis added] assumptions that may ~~significantly~~ [emphasis removed] impact the results and provides an assessment of the reasonableness of the assumptions;
   - is flexible and accommodates alternative peer review approaches; and
   - 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 **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.

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 desired PRA characteristics and attributes such as those provided in Regulatory Position 1.2 and elaborated on in a PRA standard. 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. Key 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.

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 5 provides a summary of the characteristics and attributes of a peer review.

Table 5. Summary of the Characteristics and Attributes of a Peer Review

Element	Characteristics and Attributes
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
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 key 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
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

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:

- Structures, systems, and components (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 Regulatory Guide 1.174 (Ref. 2), the evaluations of core damage frequency (CDF), ΔCDF, large early release frequency (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 (Ref. 8) addresses internal events at full power for a limited Level 2 PRA analysis. Similarly NEI-00-02 (Ref. 9) is a peer review process for the same scope (with the exception of internal flooding, which is not considered in NEI-00-02). Neither addresses external (including internal fire) initiating events nor 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 4) 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 Regulatory Guide 1.174 (Ref. 2), 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 clarifications or qualifications, 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 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 in the case of the industry peer review program, represents, a peer review. One of the functions of the peer review is to address the assumptions and make judgments as to their appropriateness. This in turn provides a basis for the sensitivity studies.

4. DOCUMENTATION TO SUPPORT A REGULATORY SUBMITTAL

To facilitate the NRC staff's review of a risk-informed submittal, the licensee provides documentation to demonstrate that the parts of the PRA used in a regulatory application are of sufficient quality to support the analysis. This documentation entails both archival and submittal documentation.

4.1 Archival Documentation

Archival documentation includes a detailed description of the process used to determine the adequacy of the PRA. In addition, should the staff elect 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 1.2 of this guide provides the attributes and characteristics of archival documentation.

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 impact of the application on the plant design, configuration, or operational practices,
- 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,
- A description of the process for maintenance, update, and control of the PRA.

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:

- 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 should provide a justification of why the change does not impact the PRA results. This justification should be in the form of a sensitivity study that demonstrates the significant accident sequences or contributors 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 should 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 significant accident sequences or contributors were not impacted (remained the same).

- Identification of the key assumptions[5] 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 either appropriate for the application, or whether sensitivity studies performed to support the decision are appropriate.

- A discussion of the resolution of the peer review comments that are applicable to the parts of the PRA required for the application. This may take the form of:

  — a discussion of how the PRA model has been changed, or

  — a justification in the form of a sensitivity study that demonstrates the significant accident sequences or contributors 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 the less detailed capability categories, as well as the limitations this imposes.

[5] A *key assumption* is one that is made in response to a key source of uncertainty. A *key 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, 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 affecting the overall CDF or LERF estimates that might have an impact on the use of the PRA in decision making.

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[1] Requests for single copies of draft or active regulatory guides and certain SRP sections (which may be reproduced) or for placement on an automatic distribution list for single copies of future draft guides in specific divisions should be made in writing to the U.S. Nuclear Regulatory Commission, Washington, DC 20555, Attention: Reproduction and Distribution Services Section, or by fax to (301)415-2289; email <DISTRIBUTION@NRC.GOV>. Copies are available for inspection or copying for a fee from the NRC Public Document Room at 11555 Rockville Pike (first floor), Rockville, MD; the PDR’s mailing address is USNRC PDR, Washington, DC 20555; telephone (301)415-4737 or 1-(800)397-4209; fax (301)415-3548; e-mail <PDR@NRC.GOV>. Copies of many regulatory guides and some SRP sections are available on NRC’s web site, <WWW.NRC.GOV> in the Document Collections.

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

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[4] Copies 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.

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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), and Addenda A to this standard (ASME RA-Sa-2003, December 5, 2003). The standard states that it "sets forth requirements for probabilistic risk assessments (PRAs) used to support risk informed decisions 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 and the changes noted in ASME RA-Sa-2003 against the characteristics and attributes for a technically acceptable PRA as discussed in Regulatory Position 3 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 and ASME RA-Sa-2003 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 position on each requirement in ASME RA-S-2002 and ASME RA-Sa-2003. 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 either in bolded text (i.e., **bold**) or strikeout text (i.e., ~~strikeout~~); that is, the necessary additions or deletions to the requirement (as written in ASME RA-S-2002 and ASME RA-Sa-2003) for the staff to have no objection are provided.

Table A-1 Staff Position on ASME RA-S-2002 and ASME RA-Sa-2003

Index No	Issue	Position	Resolution
Chapter 1			
1.1	The standard is only for current generation LWRs, the requirements may not be sufficient or adequate for other types of reactors	Clarification	This Standard sets forth requirements for Probabilistic Risk Assessments (PRAs) used to support risk-informed decisions for **current** 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 other reactor designs).

Table A-1 Staff Position on ASME RA-S-2002 and ASME RA-Sa-2003

Index No	Issue	Position	Resolution
1.2 - 1.7	----------------	No objection	---------------------------
Chapter 2			
2.1	----------------	No objection	---------------------------
2.2			
Accident sequence, dominant	The first part of the definition provides little value and may be inaccurate, a large fraction may be outside the stated range (i.e., smaller or larger than 10 to 20). In addition, it is not clear what is meant by large fraction. The term "dominant" is also used to modify, besides accident sequence, other terms such as basic events, plant damage states. Several different terms (modifiers) are used in the standard in conjunction with the terms: event, sequence, cut set, etc. Specifically, these modifiers include dominant, important, key and significant In Addendum A, a few places remain where these modifiers are used interchangeably (have the same meaning) and in other places, they are used to convey different meanings (e.g., used to distinguish whether a requirement is imposed). A common and specific quantitative understanding of these modifiers is necessary. In reviewing where these terms are used, the definition is context-dependent and dependent on the specific term it is modifying. Consequently, a single definition of "significant," for example, is not possible; a definition for each context is provided.	Clarification	~~*accident sequence, dominant:* an accident sequence that is usually represented by the top 10 or 20 events or groups of events modeled in a PRA and accounts for a large fraction of the core damage or large early release frequency.~~ ***significant basic event:* those 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.** ***significant cutset (relative to sequence):* those cutsets, when rank ordered by decreasing frequency, comprise 95% of the sequence CDF OR that individually contribute more than 1% to the sequence CDF.** ***significant cutset (relative to CDF):* those cutsets, when rank ordered by decreasing frequency, comprise 95% of the CDF OR that individually contribute more than 1% to CDF.** ***significant accident sequence:* a significant sequence is one of the set of sequences, defined at the functional or systemic level that, when rank ordered by decreasing frequency, comprise 95% of the core damage frequency (CDF)), OR that individually contribute more than ~1% to the CDF.** ***significant accident progression sequence: one of a set of containment event tree sequences that, when rank ordered by decreasing frequency, comprise 95% of the large early release frequency (LERF), OR that individually contribute more than ~1% to the LERF.*** ***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.**

Table A-1 Staff Position on ASME RA-S-2002 and ASME RA-Sa-2003

Index No	Issue	Position	Resolution
			***significant containment challenges:* those containment challenges that contribute to the set of significant accident progression sequences.** ***key assumption:* an assumption made in response to a key source of uncertainty, or one that results in an approximation made for modeling convenience in the knowledge that a more detailed model would produce different results; that is, different in terms of significant sequences, relative importance of significant sequences, or estimates of CDF/LERF (e.g., assumption that system X has the same impact as system Y for systems with different capabilities).** ***key source of uncertainty:* a source of uncertainty that is related to an issue where there is no consensus approach or model (e.g., choice of data source, success criteria, RCP seal LOCA model, human reliability model) and where the choice of approach or model is known to have an impact on the determination of PRA results in terms of introducing new accident sequences, changing the relative significance of sequences, or affecting the overall CDF or LERF estimates that might have an impact on the use of the PRA in decision-making.**
Containment challenge	This term is used in the standard and a definition is necessary.	Clarification	***containment challenge:* those phenomena, equipment failures, and human failure events that have the potential to threaten or bypass the containment pressure boundary.**
Containment failure mode	This term is used in the standard and a definition is necessary.	Clarification	***containment failure mode:* the different end states (e.g., early liner melt-through) of the accident progression sequences modeled in the containment event tree (or equivalent structure) that lead to a radionuclide release.**
Core damage	See issue discussed on definition of Accident sequence, dominant.	Clarification	*core damage:* ....enough of the core, **if released, to result in offsite public health effects**~~to cause a significant release~~.
PRA upgrade	See 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 have the potential to impact the significant sequences.** This could....
Reactor year	This term is used in the standard and a definition is necessary.	Clarification	***Reactor year*: For initiating event frequency, core damage frequency or large early release frequency, a year in the life of the reactor, independent of the operational state of the reactor. When calculated, the frequencies will reflect the expected values taking into account the different modes of plant operation.**

Table A-1 Staff Position on ASME RA-S-2002 and ASME RA-Sa-2003

Index No	Issue	Position	Resolution
Recovery Action	Recovery and repair, as modeled in the PRA use different techniques, and, as such, need to have distinctive definitions.	Clarification	*Recovery action:* ~~a general term describing restoration and repair acts required to change the initial or current state of a system or component into a position or condition needed to accomplish~~ **of** ~~a desired function for a given plant state~~ **a PRA modeling term representing restoration of the function caused by a failed SSC by bypassing the failure. Such a recovery can be modeled using HRA techniques regardless of the cause of the failure.**
Repair	Recovery and repair, as modeled in the PRA use different techniques, and, as such, need to have distinctive definitions.	Clarification	***repair:*** **a general term describing restoration of a failed SSC by correcting the failure and returning the failed SSC to operability. HRA techniques cannot be used since the method of repair is not known without knowing the specific cause.**
Resource expert	See 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.
Severe accident phenomena	This term is used in the standard and a definition is necessary.		***severe accident phenomena:*** **the phenomena (e.g., hydrogen combustion) that occurs during the accident (core melt) progression.**
State-of-knowledge	This term is used in the standard and a definition is necessary.	Clarification	***State-of-knowledge:*** **when performing uncertainty analysis for cut sets consisting of basic events using a sampling approach such as the Monte Carlo method, in each sample, the same value is used for all basic event probabilities to which the same data applies**
Other Definitions	----------------	No objection	---------------------------
Chapter 3			
3.1 - 3.4	----------------	No objection	---------------------------
3.5	See issue discussed on definition of Accident sequence, dominant.	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....

Table A-1 Staff Position on ASME RA-S-2002 and ASME RA-Sa-2003

Index No	Issue	Position	Resolution
3.6	See issue discussed on definition of Accident sequence, dominant.	Clarification	Second example of supplementary requirements: It is desired to rank the snubbers in a plant according to their ~~risk~~ significance for...... snubbers are considered safety-related,......the ~~safety~~ significance of snubbers can be approximated by the ~~safety~~ significance of the components that they support for the events in which the snubbers are ~~safety~~ significant and ..... to rank the ~~safety~~ importance of the snubbers.
Chapter 4			
4.1	----------------	No objection	---------------------------
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	----------------	No objection	---------------------------
4.5	Those action statements that apply to more than one Capability Category will be judged either to have been performed or not performed, with no need to identify a corresponding Capability Category. These are action statements that are applicable for all PRAs regardless of level of detail, plant-specificity, or realism. The distinction between Capability Categories are made in other SRs.	Clarification	....In these tables, some action statements apply to only one Capability Category, and some extend across two or three Capability Categories. When an action statement extends to more than one category, it applies equally to each Capability Category **without any need to identify a corresponding capability category. The distinction between categories is made in other SRs. That is**,~~but~~ the scope of applicability will be ~~commensurate with the Capability Category criteria in Table 1.3-1 and~~ **determined by** the scope and level of detail required by other associated SRs. **For example:** • **IE-A2 requires the initiating events and event categories to be identified that can challenge the plant. There should not be a distinction in the scope of identifying the events. However, the treatment of the identified events does vary in scope and detail as seen, for example, by AS-A9.** • **HR-F1 is a general action statement about the way a human failure event is included in the PRA model, while HR-F2 distinguishes different levels of analysis for the subsequent quantification.** It is intended that by meeting all the SRs under a given HLR, a PRA will meet that HLR....

Table A-1 Staff Position on ASME RA-S-2002 and ASME RA-Sa-2003

Index No	Issue	Position	Resolution
4.5.1 - IE			
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)			
IE-A1 thru IE-A5	-----------------	No objection	----------------------------
IE-A6	For Cat II, interviews from similar plants may not be used in lieu of plant-specific interviews.	Clarification	Cat II: INTERVIEW plant **personnel (e.g.,** operations, ... safety analysis personnel**)** to determine if potential initiating event have been overlooked. ~~Information from interviews conducted at similar plants may be used in lieu of plant-specific interviews~~.
IE-A7 thru IE-A10	-----------------	No objection	----------------------------
IE-B1 thru IE-B4	-----------------	No objection	--------------------------
IE-C1	As written, it is not clear what recovery actions can be credited. The justification of exclusion of data from the first year of operation does not need to be called out explicitly, as it is included in the previous statement.	Clarification	...USE the most recent applicable data to quantify the initiating event frequencies. JUSTIFY excluded data that is not considered to be either recent or applicable (e.g., provide evidence via design or operational change that the data are no longer applicable). CREDIT recovery actions **(those implied in IE-C4(c) or those implied and discussed in IE-C6 through IE-C9)** as appropriate; JUSTIFY each such credit (as evidenced such as through procedures or training). ~~Data from the initial year of commercial operation may be excluded; if excluded, JUSTIFY.~~
IE-C2 thru IE-C8	-----------------	No objection	--------------------------
IE-C9	While there may be no requirement for modeling of initiating events for Cat I, if fault tree models are used, the modeling of recovery actions is to be consistent with the requirements of the HRA.	Clarification	Cat I: ~~No requirement to use plant-specific information in the fault-tree modeling.~~ **If fault-tree modeling is used, USE information in the assessment and quantification of recovery actions, where available, consistent with the Human Reliability Analysis (para. 4.5.5).**
IE-C10, IE-C11, IE-C12	-----------------	No objection	--------------------------
IE-D1 thru IE-D4	-----------------	No objection	----------------------------

Table A-1 Staff Position on ASME RA-S-2002 and ASME RA-Sa-2003

Index No	Issue	Position	Resolution
<u>4.5.2 - AS</u>			
4.5.2.1	The HLR and associated SRs are written for CDF and not LERF, and 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 4.5.2-1	----------------	No objection	--------------------------
Tables 4.5.2-2(a) thru 4.5.2-2(c)			
AS-A1 thru AS-A8	----------------	No objection	---------------------------
AS-A9	The code requirements for acceptability need to be stated.	Clarification	<u>Cat II and III</u>: ....affect the operability of the mitigating systems. **The thermal/hydraulic computer codes used are developed, validated, and verified in sufficient detail to analyze the phenomena of interest, are applicable in the pressure, temperature, and flow range of interest, and are utilized by qualified trained users who have an understanding of the code and its limitations.**
AS-A10	See issue discussed on definition of Accident sequence, dominant.	Clarification	<u>Cat II</u>: ....DEVELOP the accident sequence model to sufficient detail that ~~significant~~ differences in requirements on systems and **required** operator ~~responses~~ interactions **(e.g., systems initiations or valve alignments)** are captured. ~~For example, d~~ **D**iverse systems... impact the sequence development. If, however, choosing one over another ~~significantly~~ changes the ~~requirements~~ **need** for operator intervention **(e.g., need for system realignment versus opening a valve), they are** ~~or the need for other systems, they should be~~ modeled separately.
AS-A11	----------------	No objection	---------------------------
AS-B1 thru AS-B6	----------------	No objection	---------------------------
AS-C1 thru AS-C4	----------------	No objection	---------------------------
<u>4.5.3 - SC</u>			
4.5.3.1	The HLR and associated SRs are written for CDF and not LERF, and 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 HLR-SC-A	----------------	No objection	---------------------------

Table A-1 Staff Position on ASME RA-S-2002 and ASME RA-Sa-2003

Index No	Issue	Position	Resolution
Table 4.5.3-1 HLR-SC-B	The HLR and associated SRs are written for CDF and not LERF, and therefore, references to LERF are not appropriate.	Clarification	...... for quantification of CDF~~ and LERF~~, determination of the relative impact of success criteria on **the importance of the** SSC**s** and human action**s** ~~importance~~ and the impact of uncertainty on this determination.
Table 4.5.3-1 HLR-SC-C	----------------	No objection	---------------------------
Tables 4.5.3-2(a) thru 4.5.3-2(c)			
SC-A1, SC-A2	----------------	No objection	---------------------------
SC-A3	The HLR and associated SRs are written for CDF and not LERF, and therefore, references to LERF are not appropriate.	Clarification	...to prevent core damage ~~or radioactivity release~~ in the accident sequences...
SC-A4 thru SC-A6	----------------	No objection	---------------------------
SC-B1	It has not been established that the example codes provide the necessary information for every application; more appropriate to give the requirements that the code needs to meet to be acceptable.	Clarification	Cat II and III: ....~~(e.g., thermal-hydraulic codes such as RELAP, MAAP, SAFER/GESTER, RETRAN or equivalent)~~ for thermal/hydraulic, ...requiring detailed computer modeling. **The thermal/hydraulic computer codes used are developed, validated, and verified in sufficient detail to analyze the phenomena of interest, are applicable in the pressure, temperature, and flow range of interest, and are utilized by qualified trained users who have an understanding of the code and its limitations.** .....
SC-B2, B3	----------------	No objection	---------------------------
SC-B4	The HLR and associated SRs are written for CDF and not LERF, and therefore, references to LERF are not appropriate The code requirements for acceptability need to be stated.	Clarification	....in the determination of success criteria for CDF~~/LERF~~.... USE computer codes and models only within known limits of applicability. **The thermal/hydraulic computer codes used are developed, validated, and verified in sufficient detail to analyze the phenomena of interest, are applicable in the pressure, temperature, and flow range of interest, and are utilized by qualified trained users who have an understanding of the code and its limitations.**
SC-B5, B6	----------------	No objection	---------------------------
SC-C1	See issue discussed on definition of Accident sequence, dominant.	Clarification	Cat I: DOCUMENT ~~important~~ bases, references, and **key** assumptions for success criteria. IDENTIFY which of the key assumptions are ....
SC-C2 thru C4	----------------	No objection	---------------------------

Table A-1 Staff Position on ASME RA-S-2002 and ASME RA-Sa-2003

Index No	Issue	Position	Resolution
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(c)			
SY-A1 thru SY-A18	----------------	No objection	---------------------------
SY-A19	If there are not any engineering analyses, there can be no justification for the assumption.	Qualification	Cat I and II: ...If ~~engineering analyses~~ **a basis for success (e.g., formal calculation, bounding analysis, qualitative argument) is is** not available, ASSUME that the equipment/system fails with a probability of 1.0. ~~or JUSTIFY the assumed failure probability~~.
SY-A20, 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 ~~recovery 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-B10	----------------	No objection	---------------------------
SY-B11	It is not clear what is an acceptable justification for deviating from the standard; as such, the requirement is too open ended.	Clarification	Cat I: ....MODEL them unless a justification is provided **(e.g., the initiation and actuation system can be argued to be highly reliable and is only used for that system, so that there are no inter-system dependencies arising from failure of the initiation system)**. In the model quantification...
SY-B12	It is not clear what is an acceptable justification for deviating from the standard; as such, the requirement is too open ended.	Clarification	MODEL the ability of the available inventories of air, power, and cooling to support the mission time. ~~TREAT these inventories in the model unless a justification is provided.~~
SY-B13 thru SY-B16	----------------	No objection	---------------------------
SY-C1 thru SY-C3	----------------	No objection	---------------------------
4.5.5 - HR			
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 thru HR-A3	----------------	No objection	---------------------------

Table A-1 Staff Position on ASME RA-S-2002 and ASME RA-Sa-2003

Index No	Issue	Position	Resolution
HR-B1, HR-B2	-----------------	No objection	----------------------------
HR-C1 thru HR-C3	-----------------	No objection	----------------------------
HR-D1 thru HR-D7	-----------------	No objection	----------------------------
HR-E1 thru HR-E4	-----------------	No objection	----------------------------
HR-F1, HR-F2	-----------------	No objection	----------------------------
HR-G1 thru HR-G3	-----------------	No objection	----------------------------
HR-G4	The code requirements for acceptability need to be stated.		Cat I, II and III: BASE...... **The thermal/hydraulic computer codes used are developed, validated, and verified in sufficient detail to analyze the phenomena of interest, are applicable in the pressure, temperature, and flow range of interest, and are utilized by qualified trained users who have an understanding of the code and its limitations.** SPECIFY the point in time....
HR-G5,G6	-----------------	No objection	----------------------------
HR-G7	The criteria provided for crediting recovery actions are incomplete; there are other factors equally important that are to be addressed before credit can be allowed. As written, there is no requirement to justify multiple recovery actions which can result in inaccurate and misleading results.	Clarification	....common procedures, increases stress, etc.) **(c) availability of resources (e.g., personnel accounting for time of day)**
HR-G8, G9	-----------------	No objection	----------------------------
HR-H1, H2	-----------------	No objection	----------------------------
HR-H3	The criteria provided for crediting recovery actions are incomplete; there are other factors equally important that are to be addressed before credit can be allowed. As written, there is no requirement to justify multiple recovery actions which can result in inaccurate and misleading results.	Clarification	....or cutset to which the recovery is applied. **These dependencies include:** **(a) the time required to complete all actions in relation to the time available to perform the actions** **(b) factors that could lead to dependence (e.g., common instrumentation, common procedures, increases stress, etc.)** **(c) availability of resources (e.g., personnel accounting for time of day)**

Table A-1 Staff Position on ASME RA-S-2002 and ASME RA-Sa-2003

Index No	Issue	Position	Resolution
HR-I1	The HLR and associated SRs are written for CDF and not LERF, and therefore, references to LERF are not appropriate.	Clarification	(b)(2) their impact on the CDF ~~and LERF~~ results
4.5.6 - DA			
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 thru DA-B2	----------------	No objection	---------------------------
DA-C1 thru DA-C13	----------------	No objection	---------------------------
DA-C14	This SR, which provides a justification for crediting equipment repair, assumes plant-specific data will be sufficient to justify this credit. For such components as pump repair, plant-specific data is insufficient and a broader base is necessary.	Qualification	IDENTIFY instances of ~~plant-specific~~ component repair from **both plant-specific and industry experience** and for each repair, COLLECT....
DA-C15	----------------	No objection	---------------------------
DA-D1, D2	----------------	No objection	---------------------------
DA-D3	For Cat I, what is meant by "contribute measurably" needs to be explained. See issue discussed on definition of Accident sequence, dominant.	Qualification	Cat I: PROVIDE a characterization...of the **significant** basic events ~~that contribute measurably to CDF and LERF~~.
DA-D4, D5	----------------	No objection	---------------------------
DA-D6	Cat II and Cat III are identical. For consistency with Table 1.3-1, the Cat III requirement is to apply to all common cause events.	Clarification	Cat II: USE realistic common cause failure probabilities....for significant common cause **basic** events. An example.... Cat III: USE realistic common cause failure probabilities....for ~~significant~~ common cause **basic** events. An example....
DA-D7	----------------	No objection	---------------------------

Table A-1 Staff Position on ASME RA-S-2002 and ASME RA-Sa-2003

Index No	Issue	Position	Resolution
DA-D8	New requirement needed, DA-C14 was incomplete, only provided for data collection, not quantification of repair (see SY-A22).	Qualification	Cat I, II and III: **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	-----------------	No objection	----------------------------
4.5.7 - IF			
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 thru IF-B4	-----------------	No objection	----------------------------
IF-C1 thru IF-C4	-----------------	No objection	----------------------------
IF-C5	Justification needs to demonstrate that the alternative is acceptable	Clarification	JUSTIFY any other qualitative screening criteria (provide evidence that the qualitative alternative used is ~~un~~acceptable).
IF-D1 thru IF-D5	-----------------	No objection	----------------------------
IF-E1 thru IF-E7	-----------------	No objection	----------------------------
IF-F1, IF-F2	-----------------	No objection	----------------------------
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	HLR-QU-A and Table 4.5.8-2(a) 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	HLR-QU-A: ...core damage frequency **and shall support the quantification of LERF**.

Table A-1 Staff Position on ASME RA-S-2002 and ASME RA-Sa-2003

Index No	Issue	Position	Resolution
Table 4.5.8-1 HLR-QU-B 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	See issue discussed on definition of Accident sequence, dominant. As written, implies that impact of parameter uncertainties on the results does not need to be understood.	Clarification	**Key** uncertainties **(those that have the potential to impact the significant sequences)** in the PRA shall be characterized~~. Key sources of model uncertainty and key assumptions shall be identified~~, and their potential impact on the results understood.
Table 4.5.8-1 HLR-QU-F	-----------------	No objection	----------------------------
Tables 4.5.8-2(a) thru 4.5.8-2(f)			
QU-A1 thru QU-A4	-----------------	No objection	----------------------------
QU-B1 thru QU-B6	-----------------	No objection	----------------------------
QU-B7 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-D2 thru QU-D4	-----------------	No objection	----------------------------
QU-D5	As written, required to examine "the importance" and not the important SSCs.	Clarification	Cat II and III: ... ~~EXAMINE~~ **IDENTIFY** the ~~importance of SSCs~~ **significant basic events** that contribute to **the significant** initiating event**s whose** frequencies **were quantified using fault tree type methods**...
Table 4.5.8-2(e)	Needs to be consistent with Table 4.5.8-1, HLR-QU-E.	No objection	**Key** uncertainties **(those that have the potential to impact the significant sequences)** in the PRA shall be characterized~~. Key sources of model uncertainty and key assumptions shall be identified~~, and their potential impact on the results understood.
QU-E1 thru QU-E3	-----------------	No objection	----------------------------

Table A-1 Staff Position on ASME RA-S-2002 and ASME RA-Sa-2003

Index No	Issue	Position	Resolution
QU-E4	Understanding of the key model uncertainties and assumptions is an essential aspect of uncertainty analysis.	Qualification	Cat I: PROVIDE an assessment of the impact of the key model uncertainties **and assumptions** on the results of the PRA. Cat II and III: EVALUATE the sensitivity of the results to **key sources of model uncertainty** ~~uncertain model boundary conditions~~ and other key assumptions using ...
QU-F1	See issue discussed on definition of Accident sequence, dominant.	Clarification	(g) **the significant basic events** ~~equipment or human actions that are the key factors in~~ causing the accident~~s~~ **sequences** to be ~~non-dominant~~ non-significant.
QU-F2	See issue discussed on definition of Accident sequence, dominant.	Clarification	Cat II and III: ... detailed description of ~~dominant~~ **significant** accident sequences....
QU-F2 thru QU-F6	----------------	No objection	---------------------------
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	---------------------------
Table 4.5.9-2(b)	----------------	No objection	---------------------------
LE-B1	See issue discussed on definition of Accident sequence, dominant.	Clarification	Cat III: INCLUDE the credible LERF contributors sufficient to support development of a realistic accident progression sequences. **INCLUDE all applicable failure modes**. Consider those contributors identified by IDCOR [Note (2)] and NUREG-1150 [Note 3)].
LE-B2	Requirement for determining containment challenges is needed. The code requirements for acceptability need to be stated.	Clarification	Cat II and III: DETERMINE the containment challenges .... in a realistic manner......CONSIDER...containment integrity. **USE plant-specific containment thermal hydraulic analyses to model containment and RPV/RCS response under severe accident progression. The thermal/hydraulic computer codes used are developed, validated, and verified in sufficient detail to analyze the phenomena of interest, are applicable in the pressure, temperature, and flow range of interest, and are utilized by qualified trained users who have an understanding of the code and its limitations.**

Table A-1 Staff Position on ASME RA-S-2002 and ASME RA-Sa-2003

Index No	Issue	Position	Resolution
LE-C1	NUREG/CR-6595 is only acceptable for Capability Category I. Requirements for determining which PDS result in large early release sequences are needed for Categories II and III; cannot use NUREG/CR-6595 for these two categories.	Clarification	Cat I, ~~II and III~~: ....The accident sequences are developed to a level of detail to account for the potential contributors identified in LE-B1 and analyzed in LE-B2. Containment event trees developed in NUREG/CR-6596 [note (1)] (with plant-specific modifications, if needed) are acceptable. Cat ~~I~~, II and III: ....The accident sequences are developed to a level of detail to account for the potential contributors identified in LE-B1 and analyzed in LE-B2. ~~Containment event trees developed in NUREG/CR-6596 [note (1)] (with plant-specific modifications, if needed) are acceptable.~~ **Compare the containment challenges analyzed in LE-B with the containment structural capability analyzed in LE-D and identify accident progressions that have the potential for a large release calculated source terms using an acceptable analytical method that has been quality assured and matched with appropriate experimental data.**
LE-C2	It is not clear what is an acceptable justification; as such, the requirement is too open ended. Credit for equipment repair is to be consistent with the Level 1 requirements.	Clarification	Cat II and III: ...Repair of equipment may be considered if ~~justified ... to allow repair)~~ **it can be established that the plant conditions do not preclude repair and actuarial data exists from which to estimate the repair failure probability (see SY-A22, DA-C14 and DA-D8).**
LE-C3	----------------	No objection	---------------------------
LE-C4	The modifier (e.g., may) in Cat I and II appear to eliminate the distinction between Category I, and II, and do not provide a minimum.	Clarification	Cat I: USE conservative system success criteria. ~~Realistic criteria may be used.~~
LE-C5 thru LE-C10	----------------	No objection	---------------------------
LE-D1	Requirements were inappropriately deleted.	Clarification	Cat I: DETERMINE the containment ultimate capacity for the containment challenges that result in a large early release. USE a conservative containment capacity analysis for the significant containment challenges. **If generic assessments formulated for similar plants are used, JUSTIFY applicability to the plant being evaluated. Analyses may consider use of similar containment designs or estimating containment capacity based on design pressure and a conservative multiplier relating containment design pressure and median ultimate failure pressure.** EVALUATE impact of .....

Table A-1 Staff Position on ASME RA-S-2002 and ASME RA-Sa-2003

Index No	Issue	Position	Resolution
LE-D2 thru LE-D4	----------------	No objection	---------------------------
LE-D5	The modifiers (e.g., may, possible) in Cat I, II and III appear to eliminate the distinction between Cat I, II and III, and do not provide a minimum in Cat I or II.	Clarification	Cat I: TREAT **thermally-**induced SG tube rupture in a conservative manner. ~~A realistic treatment may be used.~~ Cat II: TREAT **thermally-**induced SG tube rupture in a realistic manner, ~~when practical. Conservative treatment may be used, when justified.~~ Cat III: TREAT **thermally-**induced SG tube rupture in a realistic manner.
LE-D6	----------------	No objection	---------------------------
LE-E1, E2	----------------	No objection	---------------------------
LE-E3	New requirements: Requirements for determining what constitutes a large early release is needed.		**LE-E3** **Cat I:** **IDENTIFY large early release (LER) sequences in a conservative manner; i.e., designate early containment failures, bypass sequences and isolation failures as LER. The LER sequences identified in NUREG/CR-6595 provide an acceptable alternative.** **Cat II:** **IDENTIFY LER sequences from the results of the accident progression analysis and source term analysis of LE-C by comparing the sequence source terms with release fractions associated with LER. JUSTIFY the release fractions chosen to define LER. The criteria in Appendix A of NUREG/CR-6595 for LER provide an acceptable alternative.** **Cat III:** **IDENTIFY LER sequences from the results of the accident progression analysis by carrying out the appropriate consequence calculations.**
LE-E4	Referencing para. 4.5.8 for quantification of LERF is insufficient since those requirements are written to quantify CDF	Clarification	LE-E~~3~~**4** Cat I, II and III: Starting with plant damage states, QUANTIFY LERF consistent with the applicable requirements of para. 4.5.8, ~~as appropriate for the level of detail of the analysis~~ **specifically High Level Requirements A through E (i.e., Table 4.5.8-2(a)-(e)). The supporting requirements in these tables, although written in CDF language, are applicable depending on the method used in constructing the LERF model. IDENTIFY and JUSTIFY why a supporting requirements from Tables 4.5.8-2(a)-(e) is not applicable.**
LE-F1, F2	----------------	No objection	---------------------------

Table A-1 Staff Position on ASME RA-S-2002 and ASME RA-Sa-2003

Index No	Issue	Position	Resolution
LE-G1 thru LE-G8	----------------	No objection	---------------------------
Tbl 4.5.9-3	Mark III containments are not de-inerted and are subject to hydrogen combustion.	Clarification	For (c) de-inerted operation: the "x" for BWR Mark III should be deleted (i.e., "~~x~~")
Chapter 5			
5.1	----------------	No objection	---------------------------
5.2	----------------	No objection	---------------------------
5.3	----------------	No objection	---------------------------
5.4	See 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	---------------------------
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 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 key 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	---------------------------

Table A-1 Staff Position on ASME RA-S-2002 and ASME RA-Sa-2003

Index No	Issue	Position	Resolution
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	---------------------------
6.3.9.1	----------------	No objection	---------------------------
6.3.9.2	See 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	" (i) identification of the strengths and weaknesses that have a significant impact on the PRA **(k) assessment of the key assumptions** **(l) an assessment of the capability category of the SRs (or equivalent Peer Review grade)"**
6.6.2	----------------	No objection	---------------------------

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

INTRODUCTION

The NEI Peer Review Process is documented in NEI 00-02. It provides guidance for the peer review of PRAs and the grading of the PRA subelements into one of four capability categories. This document is supplemented by the NEI subtier criteria (to be included in a revised version of NEI 00-02). The NEI subtier criteria provide the 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 ASME PRA standard 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 will eventually be included in NEI 00-02.

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. 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.

In addition, the NEI comparison between NEI-00-02 criteria and the ASME requirements utilized ASME RA-S-2002. An Addendum (ASME RA-Sa-2003) has been issued by ASME and numerous requirements in the standard have been revised. The self-assessment will need to address these changes.

NRC POSITION ON NEI 00-02

Table B-1 provides the NRC position on the NEI Peer Review Process documented in NEI 00-02. 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 (ASME RA-S-2002) that are not included in the NEI subtier criteria.

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 differentiates 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 of 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 does 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.
	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	------------------------------------

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

Report Section	Regulatory Position	Commentary/Resolution
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 of 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 they review • the need for each person to have knowledge of the specific methods, codes, and approaches used in the PRA The NEI self-assessment process needs to address the peer reviewer qualifications with regard to these factors.
2.4 and 2.5	No objection	
Section 3 PRA PEER REVIEW PROCESS ELEMENTS AND GUIDANCE		
3.1	No objection	-------------------------------------
3.2 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 2.C on Table B-2.
	Qualification	The staff believes that different applications of a PRA can require different PRA subelment 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.

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

Report Section	Regulatory Position	Commentary/Resolution
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.
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 judgement on the validity and appropriateness of the assumptions. The peer review requirements in the ASME PRA standard requires analysis of important 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 important 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.
	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 needs 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 SELF-ASSESSMENT PROCESS

The staff position on the self-assessment process proposed by NEI to address the requirements in the ASME PRA standard (ASME RA-S-2002) 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.[8]

Table B-2 provides the NRC position on the NEI self-assessment process. The staff's position on specific aspects of this process use the categories provided in Section B.2 of this regulatory guide.

[8] The NEI comparison between NEI-00-02 criteria and the ASME requirements utilized ASME RA-S-2002. An Addendum (ASME RA-Sa-2003) has been issued by ASME and numerous requirements in the standard have been revised. The self-assessment will need to address these changes.

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 provided in Appendix A of this regulatory guide.
Comparison of NEI 00-02 and ASME Standard	Clarification	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.
General Notes for Self-Assessment Process		
1.	Clarification	The review of the NEI comparison of the subtier criteria to the ASME PRA standard was performed under the condition that all of the requirements in the NEI subtier criteria be mandatory. Thus, the staff position on the self-assessment process is predicated on the requirement that all of the requirements in the NEI subtier criteria where the verb "should" is used, it is interpreted as "shall." The self-assessment process needs to verify that, when the verb "should" was used in a subtier criterion, it was interpreted as "shall". Otherwise, the peer review report needs to identify if an alternate approach or substantially different interpretation was used.
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-3 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.	No objection	------------------------------------
Self-Assessment Process		
Process attributes	Qualification	The listed attributes need to be more than "desirable." With the use of the term "desirable," it implies that the self-assessment process is still valid even if none of the attributes are met. These attributes are needed for an acceptable self-assessment process. For example, it is more than desirable for the process be performed by knowledgeable PRA engineers, it is a necessity.
1.	Clarification	The ASME PRA standard and the staff's position on the standard documented in Appendix A of this regulatory guide needs to be used in the self-assessment of the PRA subelements required for the application against the missing requirements.
2. A	Clarification	The staff's comments on which ASME PRA requirements need to be addressed in the self-assessment, and on the NEI suggested actions (Appendix 1 of the NEI self-assessment guidance) are provided in Table B-3. The list of items subject to the self assessment needs to include those requirements where "Yes" is listed in the "Addressed by NEI" column and there are actions listed in the "Industry Self Assessment Actions" column.

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

Report Section	Regulatory Position	Commentary/Resolution
2. B	No objection	-------------------------------------
2. C	Clarification	For the PRA subelements assigned a grade other than a Grade 3 in the NEI peer review (i.e., a 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 of this regulatory guide) determined to be applicable for the application needs to be performed and documented.
2. D	No objection	-------------------------------------
3.	No objection	-------------------------------------

Tables B-3 and B-4 provide the staff position on the NEI comparison of the NEI 00-02 (including the subtier criteria) to the ASME PRA standard (ASME RA-S-2002) and the self-assessment actions provided in Appendix 1 of the NEI self-assessment process.[9] The staff's position on the ASME PRA standard documented in Appendix A of 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 1. The first two columns are taken directly from the table in Appendix 1.

[9] the NEI comparison between NEI-00-02 criteria and the ASME requirements was utilizing ASME RA-S-2002. An Addendum (ASME RA-Sa-2003) has been issued by ASME and numerous requirements in the standard have been revised. The self-assessment will need to address these changes.

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	Review comment. It is believed Peer Review Process addressed the requirements. Unless it is suspected a problem exists, no further action required.	Clarification	As written, no action may be taken, which is in conflict with the actions specified in the table providing the industry self assessment actions. It is assumed that the actions provided in that table will be taken.
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 (ASME SR), NEI's assessment if this SR is addressed in NEI 00-02 (NEI 00-02), if it is addressed then where it is addressed (NEI 00-02 ELEMENTS), and whether NEI recommends any self assessment by the licensee (INDUSTRY SELF ASSESSMENT ACTIONS).

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

NEI ASSESSMENT				REGULATORY POSITION
ASME SR	**NEI 00-02?**	**NEI 00-02 ELEMENTS**	**INDUSTRY SELF ASSESSMENT ACTIONS**	
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 were included. This can be done by either citing peer review facts and observations (F&O's) or examples from your model.	No objection with clarification: Self-assessment needs to also confirm that human-induced initiators were included.
			NEI 00-02 does not explicitly mention human-induced initiators but in practice peer reviews have addressed this.	The definition of active component provided in the Addendum A of the ASME standard needs to be used when verifying ISLOCAs were modeled; IE-7 is the applicable NEI 00-02 element
IE-A3	Yes	IE-8, IE-9	None	No objection; IE-8 is the applicable NEI 00-02 element
IE-A4	Partial	IE-5, IE-7, IE-9, IE-10	Check for initiating events that can be caused by a train failure as well as a system failure.	No objection; IE-10 is the applicable NEI 00-02 element
IE-A5	Yes	IE-8	No further action required. 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 with clarification: Self-assessment needs to document if events at low power that could occur at power were included in the PRA

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

NEI ASSESSMENT				REGULATORY POSITION
ASME SR	**NEI 00-02?**	**NEI 00-02 ELEMENTS**	**INDUSTRY SELF ASSESSMENT ACTIONS**	
IE-A6	Yes	IE-16	No further action required. 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.	No objection with clarification: Self-assessment needs to document if interviews with plant operations were used to identify potential IEs. Per the clarification of IE-A6 provided in Appendix A, interviews conducted at similar plants are not acceptable justification for excluding IEs.
IE-A7	Yes	IE-16, IE-10	None	No objection with qualification: Self-assessment needs to document if precursor information was used in IE quantification.
IE-A8	Yes	IE-10	None	No objection
IE-A9	Yes	IE-5, IE-10	None	No objection; IE-5 is the applicable NEI 00-02 element
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	None	No objection
IE-B4	Yes	IE-4	None	No objection
IE-C1	Yes	IE-13, IE-15, IE-16, IE-17	None	No objection with qualification: Self-assessment needs to confirm that appropriate justification for crediting recovery actions was used in the PRA. Appropriate justification is provided in the clarification of IE-C1 provided in Appendix A. IE-16 is the applicable NEI 00-02 element; .
IE-C2	Yes	IE-13, IE-16	None	No objection; IE-16 is the applicable NEI 00-02 element
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.	No objection. Acceptable criteria for dismissing IEs are listed in IE-C4 in the ASME PRA standard.
IE-C5	No req. for Cat II	N/A		No objection; the ASME PRA standard only requires time trend analysis for a Cat III PRA
IE-C6	Yes	IE-15, IE-17	Check that fault tree analysis when used to quantify IE's, meet 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 SR	**NEI 00-02?**	**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 either citing peer review F&O's 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 judgement was applied to quantifying extremely rare events.	No objection; IE-15 is the applicable NEI 00-02 element
IE-C12	Yes	IE-14	NRC has added a clarification in Appendix A on IE-C12 (to be confirmed by them); the features listed for a Grade 4 PRA (in the subtier criteria) must also be considered for a Grade 3 PRA.	No objection; NRC clarification been removed based on Addendum A of the ASME standard
IE-D1	Partial	IE-18, IE-19	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 request for additional information (RAIs) relative to applications.	No objection; see revised requirement for IE-D1 in Addendum A of the ASME standard
IE-D2	Partial	IE-9, IE-20	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 relative to applications.	No objection
IE-D3	Partial	IE-9, IE-18, IE-19	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 relative to applications.	No objection
IE-D4	Partial	AS-4, DE-5, SY-21	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 relative to applications.	No objection

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

NEI ASSESSMENT				REGULATORY POSITION
ASME SR	NEI 00-02?	NEI 00-02 ELEMENTS	INDUSTRY SELF ASSESSMENT ACTIONS	
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-6 is the applicable NEI 00-02 element
AS-A3	Yes	AS-7, SY-17, AS-17	None	No objection; AS-17 is the applicable NEI 00-02 element
AS-A4	Yes	AS-19, SY-5	None	No objection; AS-19 is the applicable NEI 00-02 element
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
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 either citing peer review F&O's or examples from your model. Refer to SC-A5.	No objection
AS-A9	Yes	AS-18, TH-4	None	No objection with qualification; AS-A9 is related to the environment conditions challenging the equipment during the accident sequence, AS-18 and TH-4 are focused on the initial success criteria.
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-4 and AS-7 are the applicable NEI 00-02 elements.
AS-A11	Yes	AS-8, AS-10, AS-15, DE-6, AS Checklist Note 8	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. The guidance in AS-15 must be followed.	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-4 is the applicable NEI 00-02 element
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 SR	**NEI 00-02?**	**NEI 00-02 ELEMENTS**	**INDUSTRY SELF ASSESSMENT ACTIONS**	
AS-B4	Yes	AS-8, AS-9, AS-10, AS-11	NEI-00-02 does not attempt to instruct on use of specific analysis software; ensure the software is used properly.	No objection with clarification: Self-assessment needs to confirm that the requirement of AS-B4 was met (the staff disagrees that this is a software issue).
AS-B5	Yes	DE-4, DE-5, DE-6, AS-10, AS-11, QU-25	NEI 00-02 does not provide an explicit discussion of flag settings. Ensure settings are properly made.	No objection; AS-10, AS-11, DE-6, QU-25 are the applicable NEI 00-02 elements
AS-B6	Yes	AS-13	None	No objection
AS-C1	Yes	AS-24, AS-25	None	No objection
AS-C2	Yes	AS-24, AS-25; AS-26	None	No objection; AS-26 is the applicable NEI 00-02 element
AS-C3	Partial	AS-11, AS-17, AS-20, AS-24, TH-5, DE-6	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 relative to applications.	No objection
AS-C4	Partial	AS-11, AS-24	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 relative to applications..	No objection
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	Yes	AS-6, AS-7, AS-17, AS-20	None	No objection; AS-6 is the applicable NEI 00-02 element
SC-A4	Yes	AS-7, AS-17, AS-18, SY-17, TH-9, IE-6, DE-5, SY-8	Confirm that this requirement is met. This can be done by either citing peer review F&O's 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

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

NEI ASSESSMENT				REGULATORY POSITION
ASME SR	NEI 00-02?	NEI 00-02 ELEMENTS	INDUSTRY SELF ASSESSMENT ACTIONS	
SC-A5	Partial	AS-21, AS-23, AS-20	Ensure mission times are adequately discussed as per the ASME standard. Since there are no explicit requirements for steady state condition for end state, refer to the ASME standard for requirements or cite peer review F&O's 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; TH-5 is the applicable NEI 00-02 element
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; TH-7 is the applicable NEI 00-02 element
SC-B6	Yes	QU-27, QU-28	None	No objection
SC-C1	Yes	ST-13, SY-10, SY-17, SY-27, TH-8, TH-9, TH-10, AS-17, AS-18	None	No objection; TH-9 and TH-10 are the applicable NEI 00-02 elements
SC-C2	No	TH-10	NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements. Refer to SC-B2.	No objection
SC-C3	Yes	AS-12, AS-13, TH-9, TH-10	None	No objection; TH-10 is the applicable NEI 00-02 element
SC-C4	Partial	AS-24, SY-27, TH-9, TH-10, HR-30	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 relative to applications.	No objection
SYSTEMS ANALYSIS				
SY-A1	Yes	SY-4, SY-19	None	No objection; SY-19 is the applicable NEI 00-02 element
SY-A2	Yes	AS-19, SY-5, SY-13, SY-16	None	No objection; SY-5 and SY-16 are the applicable NEI 00-02 elements

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

NEI ASSESSMENT				REGULATORY POSITION
ASME SR	NEI 00-02?	NEI 00-02 ELEMENTS	INDUSTRY SELF ASSESSMENT ACTIONS	
SY-A3	Yes	SY-5, SY-6, SY-8, SY-12, SY-14	None	No objection with clarification: 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
SY-A4	Partial	DE-11, SY-10, SY FOOTNoTE 5	Confirm that this requirement is met. This can be done by either citing peer review F&O's 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	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. This can be done by either citing peer review F&O's or example documentation.	No objection with clarification: Self-assessment needs to confirm that the PRA considered both normal and abnormal system alignments
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
SY-A8	Partial	SY-6, SY-9	Check to ensure boundaries are properly established. This can be done by either citing peer review F&O's 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	Yes	QU-12, QU-13, SY-6, SY-19	None	No objection; SY-6 is the applicable NEI 00-02 element
SY-A10	Partial	SY-9	NEI 00-02 does not address all aspects of modularization. Determine if the requirements of the ASME standard are met.	No objection
SY-A11	Yes	AS-10, AS-13, AS-16, AS-17, AS-18, SY-12, SY-13, SY-17, SY-23	None	No objection

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

NEI ASSESSMENT				REGULATORY POSITION
ASME SR	**NEI 00-02?**	**NEI 00-02 ELEMENTS**	**INDUSTRY SELF ASSESSMENT ACTIONS**	
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	No objection. The criteria in SY-7 states that passive components should be included in a Grade 4 PRA if they **influence** the CDF or LERF. No definition of the word **influence** is provided. Consistent with subelement SY-A12 of the ASME PRA standard, critical passive components whose failure affect system operability must be included in system models regardless of the grade of PRA.
SY-A13	Yes	DA-4, SY-15, SY-16	None	No objection
SY-A14	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
SY-A15	Yes	SY-8, HR-4, HR-5, HR-7	None	No objection; SY-8 and HR-4 are the applicable NEI 00-02 elements
SY-A16	Yes	SY-8, HR-8, HR-9, HR-10	None	No objection; SY-8 and HR-8 are the applicable NEI 00-02 elements
SY-A17	Yes	AS-13, SY-10, SY-11, SY-13	NRC stated that NEI 00-02 does not explicitly address including conditions that cause a system to isolate or trip. NEI disagreed with NRC comment.	No objection with clarification: Self-assessment needs to confirm that each system models address the conditions that cause the system to isolate or trip.
SY-A18	Yes	DA-7, SY-8, SY-22	None	No objection; DA-7 is the applicable NEI 00-02 element
SY-A19	Yes	AS-18, DE-10, SY-11, SY-13, SY-17, TH-8	Ensure there is a documented basis (engineering calculations are not necessarily needed) for modeling of the conditions addressed in SY-A19.	No objection; SY-A19, as qualified in Appendix A, requires that the system be assumed to fail with a probability of 1.0 if there is no engineering basis for system operation under adverse conditions.
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	DE-4, DE-5, DE-6, AS-10, AS-11, SY-12, SY-18	None	No objection; SY-12 is the applicable NEI 00-02 element (wording in this element is vague and may not be interpreted as addressing support states)
SY-A23	Yes	SY-24, DA-15, QU-18	Determine if any repair credit is appropriately justified and documented by actual data, resources and time.	No objection with clarification: disagree that SY-24, DA-15 and QU-18 address SY-A23; however, agree with self assessment actions
SY-B1	Yes	DA-8, DA-14, DE-8, DE-9, SY-8	None	No objection
SY-B2	No req. for Cat II		None	No objection

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

NEI ASSESSMENT				REGULATORY POSITION
ASME SR	**NEI 00-02?**	**NEI 00-02 ELEMENTS**	**INDUSTRY SELF ASSESSMENT ACTIONS**	
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; DA-8 is the applicable NEI 00-02 element
SY-B5	Yes	DE-4, DE-5, DE-6, SY-12,	None	No objection
SY-B6	Yes	SY-12, SY-13	None	No objection with qualification: Self-assessment needs to confirm that the support system success criteria reflect the variability in the conditions that may be present during postulated accidents.
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-10 is the applicable NEI 00-02 element
SY-B9	Yes	AS-20, L2-8, L2-9, L2-11, L2-13, SY-10	None	No objection; SY-10 is the applicable NEI 00-02 element
SY-B10	Yes	SY-12, SY-13	None	No objection
SY-B11	Yes	SY-8, SY-12, SY-13,	Confirm by either citing peer review F&O's 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 with clarification: self-assessment needs to consider revised requirement SY-B11 in Addendum A of the ASME standard
SY-B12	Yes	SY-13	None	No objection
SY-B13	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
SY-B14	Partial	DE-6, AS-6	Confirm that by either citing peer review F&O's 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	Partial	SY-23, SY-25, SY-26, SY-27	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 relative to applications.	No objection
SY-C2	Yes	SY-5, SY-6, SY-9, SY-27	None	No objection

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

NEI ASSESSMENT				REGULATORY POSITION
ASME SR	NEI 00-02?	NEI 00-02 ELEMENTS	INDUSTRY SELF ASSESSMENT ACTIONS	
SY-C3	Yes	SY-18, SY-27	None. Comment: footnote to SY-18 explains lack of Grade provision for this sub-element.	No objection
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-6 is the applicable NEI 00-02 element
HR-B2	Partial	HR-5, HR-6, HR-7, HR-26, DA-5, DA-6	Since the screening rules in HR-6 do not preclude screening of activities that can affect multiple trains of a system, ensure single actions with multiple consequences are evaluated in pre-initiators.	No objection.
HR-C1	Yes	HR-27, SY-8, SY-9	None	No objection
HR-C2	Yes	HR-7, HR-27, SY-8, SY-9	Confirm that this requirement is met. The specific list of impacts in HR-C2 is not included in NEI 00-02, but 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		This item is implicitly included in the peer review of HEP by virtue of the ability to implement the procedure within the required time under the conditions of the accident. Action is to confirm and document that the procedure quality is sufficient to support the crew response within the times assigned in the PRA evaluation.	No objection with clarification: Self-assessment needs to also confirm and document that the factors listed in HR-D3 were considered in the pre-action human error probability evaluation (NEI action statement incorrectly implies this is for post-action errors).
HR-D4	No		NEI 00-02 does not address use of expert judgment. Use the ASME standard for requirements.	No objection with clarification: This requirement does not pertain to expert judgement. Self-assessment needs to address requirements in HR-D4.
HR-D5	Yes	DE-7, HR-26, HR-27	None	No objection; HR-26 is the applicable NEI 00-02 element
HR-D6	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
HR-D7	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection

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

NEI ASSESSMENT				REGULATORY POSITION
ASME SR	**NEI 00-02?**	**NEI 00-02 ELEMENTS**	**INDUSTRY SELF ASSESSMENT ACTIONS**	
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 recommended process 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	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. The ASME standard supporting requirements are to be used during the self-assessment to confirm that the ASME intent is met for this requirement.	No objection
HR-E4	Partial	HR-14, HR-16	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. The ASME standard supporting requirements are to be used during the self-assessment to confirm that the ASME intent is met for this requirement.	No objection
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	NEI 00-02 does not explicitly address indication for detection and evaluation. Determine whether the requirements of the ASME standard are met.	No objection
HR-G1	Yes	HR-15, HR-17, HR-18	None	No objection
HR-G2	Yes	HR-2, HR-11	NEI 00-02 criteria for Grade 3 requires 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 response.	No objection with qualification: self-assessment needs to document if both cognitive and execution errors are included in the evaluation of HEPs

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

NEI ASSESSMENT				REGULATORY POSITION
ASME SR	**NEI 00-02?**	**NEI 00-02 ELEMENTS**	**INDUSTRY SELF ASSESSMENT ACTIONS**	
HR-G3	Partial	HR-17, HR-18	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. The ASME standard supporting requirements are to be used during the self-assessment to confirm that the ASME intent is met for this requirement.	No objection
HR-G4	Partial	AS-13, HR-18, HR-19, HR-20	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. The ASME standard supporting requirements are to be used during the self-assessment to confirm that the ASME intent is met for this requirement.	No objection; HR-19 is the applicable NEI 00-02 element and agrees with the revised requirement HR-G4 of Addendum A of the ASME standard
HR-G5	Partial	HR-16, HR-18, HR-20	Evaluate proper inputs per the ASME standard or cite peer review F&O's or examples from your model. NEI 00-02 does not explicitly address observation or operations staff input for time required, although HR-16 includes simulator observations.	No objection
HR-G6	Yes	HR-12	Check to ensure they are met by citing peer review F&O's 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
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 either citing peer review F&O's 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. In general, the peer reviews addressed this. See also QU-C2.	No objection
HR-G8	No	HR-27	The lower bound combined HEP of 1E-06 suggested in HR-27 is probably too low. Justify the lower bound.	No objection; see the clarification of HR-G8 in Appendix A for acceptable means of justification
HR-G9	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection

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

NEI ASSESSMENT				REGULATORY POSITION
ASME SR	NEI 00-02?	NEI 00-02 ELEMENTS	INDUSTRY SELF ASSESSMENT ACTIONS	
HR-H1	Yes	HR-21, HR-22, HR-23	None	No objection with clarification: The self-assessment needs to confirm that the revised requirements in HR-H1 in Addendum A of the ASME standard were addressed in the HRA; HR-21 is the applicable NEI 00-02 element
HR-H2	Yes	HR-22, HR-23	The additional requirements specified in the staff's qualification of HR-H2, provided in Appendix A, are not covered in NEI 00-02	No objection with qualification : The self-assessment needs to confirm that the revised requirements of HR-H2 in Addendum A of the ASME standard were included in the HRA
HR-H3	Yes	HR-26	None	No objection
HR-I1	Partial	HR-28, HR-30	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 relative to applications.	No objection
DATA ANALYSIS				
DA-A1	Yes	DA-4, DA-5, DA-15, SY-8, SY-14	None	No objection
DA-A2	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	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
DA-B2	Yes	DA-5, DA-6	Confirm that this requirement is met. 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.	No objection
DA-C1	Yes	DA-4, DA-7, DA-9, DA-19, DA-20	None	No objection
DA-C2	Yes	DA-4, DA-5, DA-6, DA-7, DA-14, DA-15, DA-19, DA-20, MU-5	None	No objection
DA-C3	Partial	DA-4, DA-5, DA-6, DA-7, MU-5	NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
DA-C4	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection

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

NEI ASSESSMENT				REGULATORY POSITION
ASME SR	**NEI 00-02?**	**NEI 00-02 ELEMENTS**	**INDUSTRY SELF ASSESSMENT ACTIONS**	
DA-C5	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
DA-C6	Yes	DA-6, DA-7	Confirm that this requirement is met. NEI 00-02 only addresses data needs when the standby failure rate model is used for demands. There are no 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	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
DA-C9	Yes	DA-4, DA-6, DA-7	Confirm that this requirement is met. Although there is 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		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
DA-C12	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
DA-C13	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
DA-C14	Yes	DA-15, AS-16, SY-24	None	No objection; DA-15 agrees with clarification of DA-C14 provided in Appendix A
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 PRA's (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 either citing peer review F&O's or example documentation.	No objection.
DA-D1	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection. The requirements in subelement DA-D1 of the ASME PRA standard (Addendum A) specifies when Bayesian analysis should be used to calculate parameter estimates for important components.
DA-D2	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection

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

NEI ASSESSMENT				REGULATORY POSITION
ASME SR	**NEI 00-02?**	**NEI 00-02 ELEMENTS**	**INDUSTRY SELF ASSESSMENT ACTIONS**	
DA-D3	Partial	QU-30	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. The guidance in the qualification of DA-D3 provided in Appendix A to NRC Reg Guide should be followed.	No objection.
DA-D4	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
DA-D5	Partial	DA-8, DA-9, DA-10, DA-11, DA-12, DA-13, DA-14	Check for acceptable common cause failure models. The criteria for NEI 00-02 elements DA-13 & DA-14 only apply to Grade 4. This can be done by either citing peer review F&O's or example documentation.	No objection; use the revised requirements of DA-D5 in Addendum A of the ASME standard in the self assessment
DA-D6	Partial	DA-8, DA-9, DA-10, DA-11, DA-12, DA-13, DA-14	Check for plant-specific screening of generic common cause failure data. The criteria for NEI 00-02 elements DA-13 & DA-14 only apply to Grade 4. This can be done by either citing peer review F&O's or example documentation.	No objection
DA-D7	No		NEI 00-02 does not specifically address how to deal with data for equipment that has been changed. Use the ASME standard for requirements.	No objection
DA-E1	Partial	DA-1, DA-19, DA-20	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 relative to applications.	No objection
INTERNAL FLOODING				
IF-A1	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
IF-A2	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection. The subject matter in IF-A2 is covered in NEI 00-02 in element DE-10
IF-A3	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
IF-A4	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
IF-B1	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
IF-B2	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection

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

NEI ASSESSMENT				REGULATORY POSITION
ASME SR	**NEI 00-02?**	**NEI 00-02 ELEMENTS**	**INDUSTRY SELF ASSESSMENT ACTIONS**	
IF-B3	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
IF-B4	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
IF-C1	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
IF-C2	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection; use the clarification to IF-C2 in Appendix A in the self assessment
IF-C3	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
IF-C4	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
IF-C5	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection with clarification: use the clarification to IF-C5 in Appendix A in the self assessment
IF-C6	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
IF-D1	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
IF-D2	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
IF-D3	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
IF-D4	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
IF-D5	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
IF-E1	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
IF-E2	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
IF-E3	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
IF-E4	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
IF-E5	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection with clarification: use the revised requirements of IF-E5 in Addendum A of the ASME standard in the self assessment

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

NEI ASSESSMENT				REGULATORY POSITION
ASME SR	**NEI 00-02?**	**NEI 00-02 ELEMENTS**	**INDUSTRY SELF ASSESSMENT ACTIONS**	
IF-E6	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
IF-E7	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
IF-F1	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
IF-F2	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
QUANTIFICATION ANALYSIS				
QU-A1	Yes	AS-4, AS-5, AS-6, AS-7, AS-8, AS-9, AS-10, AS-19	None	No objection; the requirement in QU-A1 is not explicitly stated in any element but is achieved by compliance with other NEI 00-02 elements
QU-A2	Yes	QU-8	None	No objection with qualification: the self-assessment needs to confirm that the requirements in the ASME standard as qualified in Appendix A of this regulatory guide have been met
QU-A3	Yes	QU-4, QU-8, QU-9, QU-10, QU-11, QU-12, QU-13	None	No objection; the requirement in QU-A3 is not explicitly stated in any element but is achieved by compliance with other NEI 00-02 elements
QU-A4	Yes	QU-18, QU-19	None	No objection
QU-B1	Yes	QU-4, QU-5, QU-6	None	No objection except QU-5 and portions of QU-4 are not pertinent to the requirements in QU-B1
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 addresses 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-19, QU-22, QU-24	Evaluation before and after recovery actions are applied is not relevant unless there are two models – with and w/o recovery actions. The truncation guidance in NEI-00-02 does not exclude important cutsets that include recovery.	No objection; the staff's position is that the final truncation limit must be such that convergence towards a stable value of CDF is achieved. This requirement is addressed in QU-24.

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

NEI ASSESSMENT				REGULATORY POSITION
ASME SR	**NEI 00-02?**	**NEI 00-02 ELEMENTS**	**INDUSTRY SELF ASSESSMENT ACTIONS**	
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 sub-tier 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-B7	Yes	QU-26	None	No objection
QU-B8	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
QU-B9	Partial	SY-9	SY-9 addresses the traceability of basic events in modules but does not address the correct formulation of modules that are truly independent. The warnings in SY-A10 must be considered in the modularization process.	No objection; the self assessment needs to confirm that the warnings in SY-A10 were considered in the modularization process
QU-C1	Yes	QU-10, QU-17, HR-26	None	No objection; the requirement in QU-C1, as clarified in Addendum A of the ASME standard, is achieved by compliance with these NEI 00-02 elements and HR-27
QU-C2	Partial	QU-10, QU-17	NEI 00-02 does not address cognitive aspects. Use the ASME standard for these requirements. See also 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, but in practice during peer reviews this was addressed.	No objection
QU-D1	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	Partial	QU-27, QU-28, SY-22	The identified NEI 00-02 elements do not address the consistency of the human actions with the procedures and the range of conditions modeled in the PRA. Use the ASME standard for requirements related to human actions.	No objection

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

NEI ASSESSMENT				REGULATORY POSITION
ASME SR	**NEI 00-02?**	**NEI 00-02 ELEMENTS**	**INDUSTRY SELF ASSESSMENT ACTIONS**	
QU-D3	Yes	QU-8, QU-11, QU-31	None	No objection; consistency with other PRA results is also addressed in QU-11 and QU-31
QU-D4	Yes	QU-15	None	No objection
QU-D5	Yes	QU-8, QU-31	Confirm that this requirement is met. The subject matter in QU-D5 is partially addressed in NEI 00-02 in element QU-31 (QU-8 checks the reasonableness of the results). The contributions from IE's, component failures, common cause failures, and human errors are not addressed. In practice, these were addressed during peer reviews.	No objection
QU-E1	Yes	QU-30	NEI 00-02 provides for an alternative for assessing uncertainties by, "A quantification of selected uncertainties is performed, or the impact of the selected uncertainties on the final risk measures is estimated." This was generally addressed in peer reviews.	No objection with qualification: QU-30 does not provide guidance consistent with DA-D3 on which events to include in the uncertainty analysis. The guidance in the revised requirements of HQU-E1 in Addendum A of the ASME standard needs to be addressed in the self assessment.
QU-E2	Yes	QU-27, QU-28	Confirm that this requirement is met. QU-27 and QU-28 focus on the unusual sources of uncertainty. 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 been assessed previously, such as NUREG-1150 or 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 sources of uncertainty in a broad sense.	No objection
QU-E3	Partial	QU-30	Key model uncertainties should be propagated or justified. An estimate of the overall uncertainty interval is required, including parametric, modeling, and completeness contributors to uncertainty.	No objection; this is more than is required in QU-E3
QU-E4	Partial	QU-28, QU-29, QU-30	NEI 00-02 does not explicitly specify that sensitivity studies of logical combinations of assumptions and parameters be evaluated. Use the ASME standard for requirements.	No objection

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

NEI ASSESSMENT				REGULATORY POSITION
ASME SR	**NEI 00-02?**	**NEI 00-02 ELEMENTS**	**INDUSTRY SELF ASSESSMENT ACTIONS**	
QU-F1	Partial	QU-31, QU-32, QU-34	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 relative to applications.	No objection
QU-F2	Yes	QU-31	None	No objection
QU-F3	Yes	QU-27, QU-28, QU-32	None	No objection with qualification: The self assessment needs to address the revised requirements of QU-F3 in Addendum A of the ASME standard, which states that key assumptions and causes of uncertainty must be documented for all categories of PRAs. No element in NEI 00-02 requires documentation of assumptions and uncertainties (QU-27 and QU-28 requires their identification).
QU-F4	Yes	QU-12, QU-13	None	No objection
QU-F5	Yes	QU-4, MU-7	No action required. Normal industry practice requires documentation of computer code capabilities.	No objection with qualification: Self assessment needs to confirm computer code has been sufficiently verified such that there is confidence in the results
QU-F6	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements at the time of doing an application.	No objection

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

NEI ASSESSMENT				REGULATORY POSITION
ASME SR	NEI 00-02?	NEI 00-02 ELEMENTS	INDUSTRY SELF ASSESSMENT ACTIONS	
LERF ANALYSIS				
LE-A1	Yes	AS-14, AS-20, AS-21, AS-22, AS-23, L2-7, L2-8, L2-22	No further action required. 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 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 plant damage states (PDSs) and ensuring consistency between the PDSs and the plant state. Thus the adequacy of the transfers and the process of developing the PDSs were addressed in peer reviews.	No objection with qualification: See comment for LE-A5 for self assessment action. NEI 00-02 does not address the requirements in LE-A1. 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. AS-20, AS-22, L2-8, and L2-22 are not pertinent to Level1 physical characteristics needed for the LERF analysis
LE-A2	Yes	L2-7, L2-8, AS-21	No further action required. 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. The adequacy of the transfers were addressed in peer reviews.	No objection with qualification: See comment for LE-A5 for self assessment action
LE-A3	Yes	L2-7, L2-8, L2-21	No further action required. 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. The adequacy of the transfers were addressed in peer reviews.	No objection with qualification: See comment for LE-A5 for self assessment action. L2-21 is not pertinent to the subject matter in LE-A3 and specific methods for transferring Level 1 information to the LERF analysis are not identified.

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

NEI ASSESSMENT				REGULATORY POSITION
ASME SR	NEI 00-02?	NEI 00-02 ELEMENTS	INDUSTRY SELF ASSESSMENT ACTIONS	
LE-A4	Yes	AS-20, AS-21, L2-7, L2-21. L2-8	No further action required. 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. The adequacy of the transfers were addressed in peer reviews.	No objection with qualification: See comment for LE-A5 for self assessment action. AS-20 and L2-21 are not pertinent to the subject matter in LE-A3 and specific methods for transferring Level 1 information to the LERF analysis are not identified.
LE-A5	Yes	AS-20, L2-8, L2-21	No further action required. 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. The adequacy of the transfers were addressed in peer reviews.	No objection with qualification: The self assessment needs to confirm the requirements in LE-A5 have been met.
LE-B1	Yes	L2-8, L2-10, L2-15, L2-16, L2-17, L2-19	None	No objection; It appears that the intent of the requirements of LE-B1 are met by the identified elements
LE-B2	Yes	L2-13, L2-14	None	No objection; adequately addresses the revised requirements of LE-B2 in Addendum A of the ASME standard
LE-B3	Yes	ST-4, L2-14, L2-15	No further action required. NEI 00-02 does not specify that plant-specific thermal-hydraulic analyses be performed to evaluate the containment and RPV under severe accident conditions; however, this was addressed during peer reviews.	No objection with qualification: The self assessment needs to confirm that plant-specific thermal-hydraulic analyses were used to evaluate the containment and RPV under severe accident conditions and is consistent with the revised requirements of LE-B2 in Addendum A of the ASME standard Addendum A of the ASME standard does not contain a requirement LE-B3, it was deleted, redundant to LE-B2
LE-C1	Yes	L2-24	None	No objection
LE-C2	Yes	L2-9, L2-12, L2-25	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 with clarification: The self assessment needs to confirm that the guidance provided in the clarification of LE-C2 in Appendix A was followed for any repairs included in the LERF evaluation.

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

NEI ASSESSMENT				REGULATORY POSITION
ASME SR	**NEI 00-02?**	**NEI 00-02 ELEMENTS**	**INDUSTRY SELF ASSESSMENT ACTIONS**	
LE-C3	Yes	L2-8, L2-24, L2-25	None	No objection with qualification: L2-25 provides general requirements that may cover those in LE-C3. The self assessment needs to confirm that the justification for inclusion of any of the features listed in LE-C3 meet the revised requirements of LE-C3 in Addendum A of the ASME standard
LE-C4	Yes	L2-4, L2-5, L2-6	None	No objection with qualification: The self assessment needs to confirm that the revised requirements of LE-C4in Addendum A of the ASME standard
LE-C5	Yes	AS-20, AS-21, L2-7, L2-11, L2-25	None	No objection except that L2-11 appears to be the only relevant element that addresses the requirements in LE-C5
LE-C6	Yes	L2-12, L2-24, L2-25	None	No objection except that L2-12 appears to be the relevant element that addresses the requirements in LE-C6
LE-C7	Yes	L2-7, L2-11, L2-12, L2-24	None	No objection with qualification: The self assessment needs to confirm that the requirements in LE-C7 were met.
LE-C8	Yes	L2-11, L2-12	None	No objection with qualification: The self assessment needs to confirm that the treatment of environmental impacts meet the revised requirements of LE-C8 in Addendum A of the ASME standard
LE-C9	Yes	AS-20, L2-11, L2-12, L2-16, L2-24, L2-25	No further action required. NEI 00-02 does not differentiate between containment harsh environments and containment failure effects on systems and operators. This was addressed during peer reviews.	No objection with qualification: The self assessment needs to confirm that the treatment of environmental impacts meet the revised requirements of LE-C9 in Addendum A of the ASME standard
LE-C10	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection with clarification; the revised requirements of LE-C10 in Addendum A of the ASME standard also needs to be considered in the self assessment.
LE-D1	Yes	L2-14, L2-15, L2-16, L2-17, L2-18, L2-19, L2-20, ST-5, ST-6	None	No objection with qualification: The self assessment needs to confirm that the containment performance analysis meets the revised requirements of LE-D1 in Addendum A of the ASME standard AND as clarified in Appendix A.
LE-D2	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
LE-D3	Yes	IE-14, ST-9	No further action required. In practice, peer review teams evaluated the ISLOCA frequency calculation. F&O's under IE and AS would be written if this was not adequate.	No objection with qualification: The self assessment needs to confirm that the ISLOCA analysis meets the revised requirements of LE-D3 in Addendum A of the ASME standard

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

NEI ASSESSMENT				REGULATORY POSITION
ASME SR	NEI 00-02?	NEI 00-02 ELEMENTS	INDUSTRY SELF ASSESSMENT ACTIONS	
LE-D4	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection with clarification; the revised requirements of LE-D4 in Addendum A of the ASME standard also needs to be considered in the self assessment.
LE-D5	No		NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection with clarification; the revised requirements of LE-D5 in Addendum A of the ASME standard also needs to be considered in the self assessment.
LE-D6	Yes	L2-16, L2-18, L2-19, L2-24, L2-25	No further action required. The guidance provided in NEI 00-02 does not explicitly address the requirements in LE-D6, but in practice the peer review teams addressed this.	No objection with qualification: The guidance provided in NEI 00-02 does not explicitly address the requirements in LE-D6. The self assessment needs to confirm that the containment isolation treatment meets the revised requirements of LE-D6 in Addendum A of the ASME standard.
LE-E1	No	L2-5, L2-11, L2-12	NEI 00-02 does not address equipment reliability data related to harsh environments for the LERF analysis. Use the ASME standard for requirements.	No objection; except L2-5 is not applicable to the requirement in LE-E1.
LE-E2	Yes	DA-4, HR-15, L2-12, L2-13, L2-17, L2-18, L2-19, L2-20	None	No objection with qualification: The self assessment needs to confirm that the parameter estimation meet the revised requirements of LE-E2 in Addendum A of the ASME standard
LE-E3	Yes	QU sub-elements applicable to LERF		No objection with qualification: The self assessment needs to confirm that the ASME standard requirements are met.
LE-F1	Yes	QU-8, QU-9, QU-10, QU-11, QU-31	None	No objection with clarification; The requirement in LE-F1 appears to be addressed in L2-26
LE-F2	No	QU-27	NEI 00-02 does not address this supporting requirement. Use the ASME standard for requirements.	No objection
LE-G1	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 relative to applications.	No objection
LE-G2	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 relative to applications.	No objection

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

NEI ASSESSMENT				REGULATORY POSITION
ASME SR	NEI 00-02?	NEI 00-02 ELEMENTS	INDUSTRY SELF ASSESSMENT ACTIONS	
LE-G3	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 relative to applications.	No objection
LE-G4	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 relative to applications.	No objection
LE-G5	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 relative to applications.	No objection
LE-G6	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 relative to applications.	No objection
LE-G7	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 relative to applications.	No objection
LE-G8	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 relative to applications.	No objection

DRAFT REGULATORY ANALYSIS

A draft regulatory analysis was published with the draft of this guide when it was published for public comment (DG-1122, November 2002). No changes were necessary, so a separate regulatory analysis for Regulatory Guide 1.200 for Trial Use has not been prepared. A copy of the draft regulatory analysis is available for inspection or copying for a fee in the NRC's Public Document Room at 2120 L Street NW., Washington DC, under DG-1122.