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DRAFT REGULATORY GUIDE

FOR COMMENT

Draft Appendix C

"NRC Staff Regulatory Position on ANS External Hazards PRA Standard" to

Regulatory Guide 1.200 For Trial Use

"An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk Informed Activities"

The NRC has issued for comment draft Regulatory Guide DG-1138 which is a preliminary draft of the staff's regulatory position on ANSI/ANS 58.21-2003, "External Events PRA Methodology Standard." The staff's position is documented in Appendix C to Regulatory Guide (RG) 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities." RG 1.200 was issued for trial use in February 2004 and did not contain Appendix C. The NRC staff is only soliciting comments on Appendix C to RG 1.200; Appendix C has not been issued for use. It is the staff's intent to issue a draft Revision 1 to RG 1.200 with Appendix C for public review and comment before issuing a final Revision 1 to RG 1.200 for use in mid-2005.

DG-1138

DRAFT APPENDIX C

NRC STAFF DRAFT REGULATORY POSITION ON ANS EXTERNAL HAZARDS PRA STANDARD

Introduction

The American Nuclear Society has published ANSI/ANS-58.21-2003, "External Events PRA Methodology Standard." The standard states that it "sets forth requirements for external-event probabilistic risk assessments (PRAs) used to support risk informed decisions for commercial nuclear power plants, and prescribes a method for applying these requirements for specific applications." The NRC staff has reviewed ANSI/ANS 58.21-2003 against the characteristics and attributes for a technically acceptable PRA as discussed in Chapter 3 of Regulatory Guide 1.200. The staff's draft position on each requirement (referred to in the standard as a requirement, a high-level requirement, or a supporting requirement) in ANSI/ANS 58.21-2003 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 C-1 provides the staff draft position on each requirement in ANSI/ANS 58.21-2003. A discussion of the staff 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 ANSI/ANS 58.21-2003) for the staff to have no objection are provided.

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Index No	Issue	Position	Resolution
SECTION 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	The objectives of this standard are to set forth requirements for external-event probabilistic risk assessments (PRAs) used to support risk-informed decisions for **current** commercial light water reactor nuclear power plants, and to prescribe a method for applying these requirements for specific applications **(additional or revised requirements may be needed for other reactor designs).**
1.2	----------	No objection	----------

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Index No	Issue	Position	Resolution
1.3 Scope	Second Paragraph can potentially lead to confusion and misinterpretation, concerning when the term "PRA " is inclusive of "SMA" and when it is not. Further, the distinction between the seismic PRA and SMA methodologies needs to be clearly stated.	Qualification	Delete the 2nd para. Add a para: **Although both seismic PRA and SMA are intended to support risk-informed applications, the distinction between them regarding their applicability to develop risk insights needs to be clearly understood. The SMA is a deterministic risk methodology, and in this context, a well executed SMA analysis can provide qualitative, and limited quantitative risk insights that could be used to support an intended application. However, for situations where detailed quantitative risk insights are necessitated, a seismic PRA is needed to obtain the required insights.**
1.3.2	The term full-scope PRA is misleading in the context of RG 1.200.	Clarification	...that use aspects of PRA methodology but are not ~~full-scope~~ **complete** PRAs themselves (see 3.4, for example).
1.3.2	The "demonstrably conservative" and "bounding" analyses are performed using different approaches, and should not be used interchangeably.	Clarification	...(~~Herein, the phrases "bounding analysis" and "demonstrably conservative analysis" are used interchangeably.~~)
1.3.3	----------	No objection	----------
1.3.4	The effects of the external event (e.g., earthquake) on the integrity of the containment boundary should be discussed. A potential LERF may be mitigated by containment for an internal event initiator. However, effective containment may be compromised by physical damage/weakening of the containment boundary due to the external event.	Clarification	The analysis of the LERF endpoint proceeds in the same way as the analysis of the CDF endpoint, with one major exception, as follows: There are some accident sequences, leading to core damage but not to large early releases in the internal-events PRA model, that need to be elevated to potential LERF sequences when the initiator is an external event. **One set of sequences are those where the effects of the external initiators might compromise containment integrity and thereby possibly contribute to LERF. The other set** ~~These~~ are sequences in which offsite protective action (specifically, the evacuation of nearby populations) is impeded due to the external event. The same sequence that might not be a LERF sequence due to any internal initiator may perhaps affect nearby populations who cannot evacuate as effectively.
1.3.5-1.3.6	----------	No objection	----------

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1.4, 5th para.	The interpretation of supporting requirements (SR) that use the same word under more than one capability category is different from that currently adopted in RG 1.200.	Qualification	Furthermore ... , ~~it is understood that the interpretation is somewhat graded, with more detail, or more specificity, or more realism, or a combination thereof, required for the higher Capability Category than for the lower one~~. **, it applies equally to each Capability Category without any need to identify a corresponding Capability Category. The differentiation between capability categories is made in other SRs.**
1.4, 2nd to the last para.	It is inappropriate to make statements regarding the quality and uniformity of past SMA analyses for IPEEE in the standard.	Qualification	Concerning the requirement ... from the EPRI guidance report. ~~Essentially every SMA that has been completed using the EPRI SMA method followed the EPRI guidance closely, with only minor deviations. Thus there exists little gradation among the SMAs accomplished to date, and it is anticipated that if another SMA were to be done it too would exhibit very little difference from those already completed~~. Therefore, it has been judged ...
1.4, the last para.	The last para needs greater clarity of intent. A choice of words such as “As a matter of philosophy” could lead an analyst to do things outside the requirements of this standard.	Clarification	~~The SMA covered in Section 3.6 and the Seismic PRA covered in Section 3.7 may be used together. As a matter of philosophy, an analyst can augment an SMA with issue-focused specific PRA evaluations and seismic-PRA evaluations to support an application. The analyst would need justify the adequacy of the blended or enhanced treatment, and peer review is to be relied upon to verify the treatment.~~ **This standard permits the use of issue-focused specific PRA evaluations to augment an SMA. The analyst needs to document the technical basis for the adequacy of the methodology, and a peer review needs to verity it.**
1.4, Table 1	The table does match the Table of Addenda to ASME RA-Sa-2003	Qualification	Replace with the table 1.3-1 of Addenda to ASME RA-Sa-2003.

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1.5	To be consistent with the ASME Standard, the word SHALL, should only appear in a high level requirement. The words, 'should' and 'may' are permissives and do not provide a minimum requirement. Action verbs should be used in all SRs.	Qualification	~~**Shall, Should, and May**: The high-level requirements contained herein are phrased in the usual language of standards, namely the language of "shall," "should," or "may." These three terms are defined in Section 2. These definitions are repeated here:~~ ~~shall - used to state a mandatory requirement~~ ~~should - used to state a recommendation~~ ~~may - used to state an option to be implemented at the user's discretion.~~ **SHALL is used to state a high-level requirement.** ~~Action Verbs: Some of the~~ **Supporting** requirements are phrased in "action verb" form, to conform to the format in the ASME standard (ASME, 2002). Whenever an action verb is used, the requirement is to be understood as if the "shall" form were used. As an example, the requirement REQ. EXT-B4 reads in part, "REVIEW any significant changes since the NRC operating license was issued." This is to be understood as equivalent to "Any significant changes since the NRC operating license was issued SHALL BE REVIEWED."
1.5, 3rd para	The word "consider" is permissive and inappropriate for SRs. Action verbs should be used.	Qualification	~~**The Word "Consider"**: ... pay particular attention to this topic.~~
1.6-1.10	----------	No objection	----------
SECTION 2			
2.1	Acronysms and Initialisms	Clarification	**HLR - High-Level Requirement** **SR - Supporting Requirements**
2.2			
	Definition of the bounding analysis should be provided	Clarification	**bounding analysis: Analysis that uses assumptions such that the assessed outcome will meet or exceed the maximum severity of all creditable outcomes.**
	Definition of the demonstrably conservative analysis should be provided	Clarification	**demonstrably conservative analysis: Analysis that uses assumptions such that the assessed outcome will be conservative relative to the expected outcome.**

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Composite variability	The term 'uncertainty' should be used consistent with the aleatory and epistemic uncertainty definitions	Clarification	*Composite* variability, the composite variability includes the ~~randomness variability~~ **aleatory (randomness) uncertainty** (β_R) and the **epistemic (modeling)** uncertainty (β_U). The logarithmic standard deviation of composite variability, β_c, is expressed as $(\beta_R^2 + \beta_U^2)^{1/2}$
Core Damage	See issue discussed in RG 1.200 Table A-1, Chapter 2, 2.2, Core Damage.	Clarification	*core damage:* ....enough of the core, **if released, to result in offsite public health effects** ~~to cause a significant release~~.
Dependency	The definition should be consistent with the ASME RA-Sa-2003.	Clarification	**dependency:** Requirement external to an item and upon which its function depends **and is associated with dependent events that are determined by, influence by, or correlated to other events or occurrences.**

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Dominant contributor	See Significant contributor in Table A-1, Reg. Guide 1.200, Appendix A.	Clarification	~~**dominant contributor:** A component, a system, and an accident class, or as accident sequence that has a major impact on the CDF or on 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.** **significant basic event: those basic 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.**
Failure mode	This is an incorrect definition. Use ASME definition.	Clarification	**failure mode:** ~~A condition ... or a system.~~ **a specific functional manifestation of a failure (i.e., the means by which an observer can determine that a failure has occurred) by precluding the successful operation of a piece of equipment, a component, or a system (e.g., fails to start, fails to run, leak).**

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Fractile hazard curves	Definition of terms lacks clarity.	Clarification	**fractile hazard curves** - A set of hazard curves used to reflect the uncertainties associated with estimating seismic hazard. A common family of hazard curves used in describing the results of a PSHA ~~is~~ **consists of** curves of fractiles of the probability distributions of estimated seismic hazard as a function of the level of ground motion parameter.
Fragility	The use of uncertainty should be consistent with the aleatory and epistemic uncertainty definitions	Clarification	...Fragility of an SSC is the conditional probability of its failure at a given hazard input level. The input could be earthquake motion, wind speed, or flood level. The fragility model used in seismic PRA is known as a double lognormal model with three parameters, $A_{m,}$ β_R and β_U which are respectively, the median acceleration capacity, logarithmic standard deviation of **aleatory (**randomness**) uncertainty** in capacity and logarithmic standard deviation of ~~the~~ **epistemic (modeling)** uncertainty in the median capacity.
Large early release	Inconsistent with ASME definition	Clarification	...protective actions **such that there is a potential for early health effects.**
Screening analysis	Inconsistent with ASME definition	Clarification	... An analysis that eliminates items from further consideration based on their negligible contribution to the probability of ~~a significant~~ **an** accident or its consequences.
Success path	Success path is usually defined at the system level rather than components.	Clarification	...A set of **systems and associated** components that can be used to bring the plant to a stable hot or cold condition and maintain this condition for at least 72 hours.
SECTION 3			
3.1-3.2	----------	No objection	----------
3.3			
1st para.	----------	No objection	----------
2nd para.	To ensure the quality of the outcome of the application of this standard, the minimum qualifications of the analyst need to be clearly stated.	Clarification	The high-level requirements ... and the peer review team (see Section 5). **Further, the analysis team needs to be experienced in performing activities associated with all elements of the PRA. As a minimum, the analysis team must show capability by direct experience from previous PRA studies of the methodology, and by training in the use of computer codes used in the analyses.**

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3rd para.	The Supporting Requirements depend on the Capability Category selected for the PRA. The category may be different for different systems or elements included in the PRA. The analyst should specify which SR's are being used and justify their use for the intended application.	Qualification	The High Level Requirements and the Supporting Requirements, taken together, are formulated in a way that is intended to support the applications being considered. Specifically, a PRA can meet the High Level Requirements and Supporting Requirements at various levels-of-detail and various scopes, that need not extend beyond what is adequate to support the intended application. **The analysis team needs to identify the SR's used in the PRA and justify the selection of Capability Category from which they have been selected.**
3.4			
Title	The title lacks clarity.	Clarification	~~Probabilistic Risk Assessment for Other External Events:~~ Requirements for Identification and Screening ~~and Conservative Analysis~~
3.4.1	----------	No objection	----------
3.4.2, 1at para., item (3)	The "demonstrably conservative" and "bounding" analyses are performed using different approaches, and should not be used interchangeably.	Clarification	...(~~Herein, the phrases "bounding analysis" and "demonstrably conservative analysis" are used interchangeably.~~)
3.4.2, last para., 3.4.3, 2nd para.	Since this section pertains to external events screening other than seismic event, references to 3.6 and 3.7 requirements should be removed.,	Clarification	...subjected to the requirements in 3.5, ~~3.6, 3.7,~~ 3.8, or ...
3.4.3 HLR-EXT-A	The section is entitled Requirements for Screening and Conservative Analysis. However, the HLR has a requirement to perform a screening, bounding, or detailed analysis. The latter is inconsistent with the intent. Furthermore, the supporting requirements only address identification of external hazards. The screening is performed in HLR-EXT-B and HLR-EXT-C.	Qualification	HLR-EXT-A: ~~All~~ pPotential external events (i.e., ~~all~~ natural..... SHALL be **identified** ~~considered and conservative analysis), or detailed analysis~~. ~~SHALL be subjected to either screening bounding analysis (demonstrably conservative analysis), or detailed analysis~~.
3.4.3 HLR-EXT-B	----------	No objection	----------
3.4.3 HLR-EXT-C	The "demonstrably conservative" and "bounding" analyses are performed using different approaches, and should not be used interchangeably.	Clarification	HLR-EXT-C: A bounding **or** ~~(~~demonstrably conservative~~)~~ analysis, if used ...

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3.4.3 HLR-EXT-D to HLR-EXT-E	----------	No objection	----------
3.4.4 HLR-EXT-A	The section is entitled Requirements for Screening and Conservative Analysis. However, the HLR has a requirement to perform a screening, bounding, or detailed analysis. The latter is inconsistent with the intent. Furthermore, the supporting requirements only address identification of external hazards. The assessment is performed in HLR-EXT-B and HLR-EXT-C.	Qualification	HLR-EXT-A: ~~All p~~Potential external events (i.e., ~~all~~ natural..... SHALL be **identified** ~~considered and conservative analysis), or detailed analysis~~. ~~and SHALL be subjected to either screening bounding analysis (demonstrably conservative analysis), or detailed analysis~~.
3.4.4, REQ. EXT-A1	Permissive MAY is inappropriate for a SR requirement.	Qualification	"... and this list ~~MAY be used as~~ **PROVIDES** one acceptable way to meet this requirement."
3.4.4, REQ. EXT-A2 and Note EXT-A2	----------	No objection	----------
3.4.4, REQ. EXT-B1	Permissives should not be used in SRs.	Qualification	...the following screening criteria ~~MAYbe used as~~ **PROVIDE** an acceptable basis:
3.4.4, REQ. EXT-B2	Permissives should not be used in SRs.	Qualification	..., the following screening criterion ~~MAY be used as~~ **PROVIDES** an acceptable basis..."
3.4.4, REQ. EXT-B3	----------	No objection	----------
3.4.4, REQ. EXT-B4	The word "consider" is permissive and inappropriate for SRs. Action verbs should be used.	Qualification	REVIEW... In particular, ~~CONSIDER in the review~~ **REVIEW** all of the following:
3.4.4 HLR-EXT-C and NOTE HLR-EXT-C	The "demonstrably conservative" and "bounding" analyses are performed using different approaches, and should not be used interchangeably.	Clarification	HLR-EXT-C: A bounding **or** ~~(~~demonstrably conservative~~)~~ analysis, if used ... ~~NOTE HLR-EXT-C: Herein, the phrases "bounding analysis" and "demonstrably conservative analysis" are used interchangeably~~.

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Index No	Issue	Position	Resolution
3.4.4, REQ. EXT-C1	Permissive MAY should not be used in SRs.	Qualification	For screening out an external event, ~~the analytst ... screening criteria is met:~~ **any one of the following three screening criteria PROVIDE an acceptable basis for bounding analysis or demonstrably conservative analysis:**
3.4.4, NOTE EXT-C1	The "demonstrably conservative" and "bounding" analyses are performed using different approaches, and should not be used interchangeably.	Clarification	NOTE EXT-C1: The bounding **or** ~~(~~demonstrably conservative~~)~~ analysis ...
3.4.4, REQ. EXT-C2	This SR addresses the hazard analysis. The SR contains two alternatives. The first is a state-of-the-art hazard analysis, the second is a bounding analysis. The SR should reflect the minimum requirement which is that for a bounding analysis. In the ASME Standard, the term "state-of-the-art" is used to correspond to a capability category III. To conform to that meaning, the term should not be used here. Furthermore, the last sentence is appropriate for a detailed analysis but not for a bounding analysis.	Qualification	~~BASE the estimation of the mean frequency and opther parameters of the design-basis hazard on state-of-the-art modeling and recent data (.....), or BOUND the estimation for the purposes of a demonstrably conservative analysis> CONSIDER the uncertainties in modeling and data in this hazard evaluation.~~ **ESTIMATE the frequency and other parameters of the hazard using a bounding analysis or a demonstrably conservative analysis.**
3.4.4, NOTE EXT-C2	The "demonstrably conservative" and "bounding" analyses are performed using different approaches, and should not be used interchangeably.	Clarification	NOTE EXT-C2: The spirit of a bounding **or** ~~(~~demonstrably conservative~~)~~ analysis ...
3.4.4, REQ. EXT-C3	The requirement in the standard should represent the minimum, which is a demonstrably conservative analysis.	Qualification	~~In estimating the mean conditional core damage probability (CCDP), USE a systems model of the plant that meets the systems-modeling requirements in ASME-RA-S-2002 insofar as they apply [1]. For the purposes of this screening analysis, a demonstrably conservative approach to the analysis is acceptable.~~ **Calculate the CCDP using a bounding analysis or a demonstrably conservative analysis.**
3.4.4, REQ. EXT-C3a	There is no requirement that identifies the impact of the hazard on the plant SSCs.	Qualification	NEW SR: **Identify those SSCs required to maintain the plant in operation or that are required to respond to an initiating event to prevent core damage, that are vulnerable to the hazard, and determine their failure modes**.

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3.4.4, REQ. EXT-C3b	There is no requirement that addresses the incorporation of the impact of the hazard into the estimation of the CCDP	Qualification	NEW SR: **ESTIMATE the CCDP taking into account the initiating events caused by the hazard, and the systems of functions rendered unavailable. Modifying the internal events PRA model as appropriate, using conservative assessments of the impact of the hazard (fragility analysis), is an acceptable approach.**
3.4.4, REQ. EXT-C4	Permissives should not be used in SRs.	Qualification	BASE...This includes not only the hazard analysis but also any fragility analysis that ~~may be necessary~~ **is applicable**.
3.4.4, REQ. EXT-C5	Since section 3.4 provides requirements for external event hazards other than seismic, reference to sections dealing with SMA and seismic PRA should be removed.	Clarification	...(See 3.5, ~~3.6, 3.7~~, 3.8, and 3.9.)
3.4.4, REQ. EXT-D1, D2	----------	No objection	----------
3.4.4, NOTE EXT-D1	----------	No objection	----------
3.4.4, REQ. EXT-E1- E3	----------	No objection	----------
3.5			
3.5.1	As currently written, the scope of this section allows analyses of wind hazards and external flooding hazards to be performed using the requirements of this section. However, requirements for analyses of wind and external flooding hazards are explicitly provided in sections 3.8 and 3.9. Therefore, the scope of section 3.5 should be narrowed.	Qualification	**Scope**: ...The term “other external events” refers to external events other than earthquakes, **high winds, and external floods.** **Applicability**: ... external event. ~~Alternatively, the requirements in 3.8...then all of the requirements therein apply.~~
3.5.3, HLR-ANA-A	The last sentence in the statement of the high level requirement contains the phrase "SHOULD NOT be unduly influenced by ... ", but there is no supporting requirement that relates to this. It is not, in fact clear what this last sentence means. If there is a real trend in frequencies this should in fact be included in the assessment.	Clarification	The analysis ... a mixture of the two. ~~The models used for ..... short term trends in the frequencies.~~

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3.5.3, HLR-ANA-B thru. HLR-ANA-D	----------	No objection	----------
3.5.4, HLR-ANA-A	The last sentence in the statement of the high level requirement contains the phrase "SHOULD NOT be unduly influenced by ... ", but there is no supporting requirement that relates to this. It is not, in fact clear what this last sentence means. If there is a real trend in frequencies this should in fact be included in the assessment.	Clarification	The analysis ... a mixture of the two. ~~The models used for ..... short term trends in the frequencies.~~
3.5.4, REQ.ANA-A1	----------	No objection	----------
3.5.4, REQ.ANA-A2	The word “properly” in the statement “ACCOUNT properly for and ...” is superfluous.	Clarification	... ACCOUNT ~~properly~~ for and ...
3.5.4, NOTE ANA-A2	The note contains a discussion on the parameterization of the hazard curve(s). This does not clarify the requirement, but suggests that another requirement be added.	Qualification	NEW SR: **To develop the PRA model, define the hazard curve in terms of the parameter that best represents a measure of the intensity of the hazard.**
3.5.4, REQ.ANA-A3 thru. B1	----------	No objection	----------
3.5.4, REQ.ANA-B2	The word "consider" is permissive and inappropriate for SRs. Action verbs should be used.	Qualification	... ~~CONSIDER~~ **INCORPORATE** the findings of a plant walkdown in this evaluation.
3.5.4, NOTE ANA-B3	The note contains discussions that should be requirements.	Qualification	NEW SR: **Define the fragility curve for each failure mode as a function of the same parameter used to represent the intensity of the hazard.**

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3.5.4, REQ.ANA-C1	There is no requirement to identify the SSCs affected by the hazard, nor the initiating events caused by the hazard. The supporting requirements do not support the HLR as stated. There is no requirement that addresses the incorporation of the impact of the hazard into the estimation of the CCDP	Qualification	NEW SR: **Identify those SSCs required to maintain the plant in operation or that are required to respond to an initiating event to prevent core damage, that are vulnerable to the hazard, and determine their failure modes**. NEW SR: **ESTIMATE the CCDP taking into account the initiating events caused by the hazard, and the systems of functions rendered unavailable. Modifying the internal events PRA model as appropriate, using conservative assessments of the impact of the hazard (fragility analysis), is an acceptable approach.**
3.5.4, REQ.ANA-C1	The word "consider" is permissive and inappropriate for SRs. Action verbs should be used.	Qualification	ASSESS the accident sequences initiated by the external event to estimate CDF and LERF contribution. In the analysis, **USE as appropriate** the ~~appropriate~~ **applicable** hazard curves and the fragilities of structures and equipment.
3.5.4, REQ.ANA-D1 thru. D7	----------	No objection	----------
3.6			
7th para, 2nd and 3rd sentences	These sentences need greater clarity of intent. A choice of words such as “As a matter of philosophy” could lead an analyst to do things outside the requirements of this standard.	Clarification	As discussed in 1.4, ~~the SMA covered in Section 3.6 and the Seismic PRA covered in Section 3.7 may be used together. As a matter of philosophy, an analyst can augment an SMA with issue-focused specific PRA evaluations and seismic-PRA evaluations to support an application. The analyst would need justify the adequacy of the blended or enhanced treatment, and peer review is to be relied upon to verify the treatment.~~ **this standard permits the use of issue-focused specific PRA evaluations to augment an SMA. The analyst needs to document the technical basis for the adequacy of the methodology, and a peer review needs to verity it.** ...
3.6.1, HLR-SM-A	----------	No objection	----------
3.6.1, HLR-SM-B	The last phrase, “..."...following an earthquake larger than the RLE" , could be misinterpreted.	Clarification	"...following an earthquake **equal to or** larger than the RLE".
3.6.1, HLR-SM-C	----------	No objection	----------
3.6.1, HLR-SM-D	----------	No objection	----------

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3.6.1, HLR-SM-E	Plant walkdown is a major part of the margin assessment process (not a supplemental part) for identifications of SSC failure modes.	Clarification	..., through the review of design documents, including plant-specific analysis and test reports **, and the results of a plant walkdown** supplemented by earthquake experience data, fragility test data, **and** generic qualification test data**.** ~~, and by a walkdown~~
3.6.1, HLR-SM-F	----------	No objection	----------
3.6.1, HLR-SM-G	----------	No objection	----------
3.6.1, HLR-SM-H	The wording "..applying the PRA and updating it," needs to changed. The term "PRA" should not be used in an HLR for an SMA.	Clarification	...~~applying the PRA and updating it~~ **its application and update** ...
3.6.2, REQ SM-A1 to REQ SM-C1	----------	No objection	----------
3.6.2, REQ SM-C2	Permissives should not be used in SRs.	Qualification	..., realistic seismic responses ~~MAY~~ ~~be~~ **are** obtained...
3.6.2, REQ SM-C3 to SM-D4	----------	No objection	----------
3.6.2, REQ SM-D5 and NOTE SM-D5	The word "FOCUS" does not provide a direction regarding what actions should be taken.	Clarification	~~FOCUS the walkdown on~~ **During the walkdown, IDENTIFY** the potential for ...
3.6.2, NOTE SM-D6	NOTE SM-D6, related to "II/I issue" is misleading in the context of SMA. Any object (whether seismically qualified to the plant design basis or not) that can fall on and damage any item on the SSEL is a "II/I issue" for SMA. The HCLPF capacity of the falling object may control the HCLPF capacity of the success path and potentially the plant HCLPF capacity if it is less than the HCLPF capacity of the weakest item on the SSEL .	Qualification	**NOTE SM-D6: For SMA,** ~~**A**~~ **a** "II/I issue" refers to ~~the condition ... safety equipment.~~ **any object (whether seismically qualified to the plant design basis or not) that can fall on and damage any item on the SSEL. The HCLPF capacity of the falling object may control the HCLPF capacity of the success path and potentially the plant HCLPF capacity if it is less than the HCLPF capacity of the weakest item on the SSEL .**
3.6.2, REQ. SM-E1	----------	No objection	----------
3.6.2, REQ. SM-E2	The word "consider" is permissive and inappropriate for SRs. Action verbs should be used.	Qualification	~~CONSIDER~~ **EXAMINE** all relevant failure modes...
3.6.2, REQ. SM-F1	REQ. SM-F1 duplicates HLR-SM-F, and is less prescriptive.	Clarification	~~**(REQ. SM-F1)** BASE ...test data.~~

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3.6.2, REQ. SM-F2 and NOTE SM-F2	----------	No objection	----------
3.6.2, REQ. SM-F3 and NOTE SM-F3	----------	No objection	----------
3.6.2, REQ. SM-G1 and NOTE SM-G1	----------	No objection	----------
3.6.2, REQ. SM-G2 and NOTE SM-G2	"Seismic upgrade" is interpreted to mean a physical plant modification to increase the seismic capacity of a weak SSC. This is not part of the SMA methodology just as performing seismic upgrade as a result of a seismic PRA is not part of the PRA methodology.	Clarification	~~**(REQ. SM-G2)** REPORT ... have been done.~~ ~~**Note SM-G2:** If the plant ... would have been done.~~
3.6.2, REQ. SM-H1 thru H5 and NOTE SM-H5	----------	No objection	----------
3.7			
3.7, 3.7.1.1	----------	No objection	----------
3.7.1.2, HLR-HA-A to HLR-HA-B	----------	No objection	----------
3.7.1.2, HLR-HA-C	The word "consider" is permissive and inappropriate for SRs. Action verbs should be used.	Qualification	... SHALL ~~consider all~~ **examine** ... SHALL be ~~considered~~ **addressed** in characterizing the ground motion propagation.
3.7.1.2, HLR-HA-D	The word "consider" is permissive and inappropriate for SRs. Action verbs should be used.	Qualification	... SHALL ~~account for all~~ examine credible ... Both the aleatory ... be ~~considered~~ **addressed** ...
3.7.1.2, HLR-HA-E	----------	No objection	----------
3.7.1.2, HLR-HA-F	----------	No objection	----------

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3.7.1.2, HLR-HA-G	The reference to NUREG/CR-0098 broad band spectrum shape should be made in a supporting requirement. Further, NURGE/CR-0098 spectral shapes are not always appropriate, particularly for CEUS sites.	Qualification	For further use in the SPRA, the spectral shape SHALL be based on a site-specific evaluation taking into account the contributions of deaggregated magnitude-distance results of the PSHA. ~~Broad-band, smooth spectral shapes, such as those presented in NUREG/CR-0098 [6] (for lower-seismicity sites such as most of those east of the U.S. Rocky Mountains) may also be used taking into account the site conditions.~~ The use of uniform hazard response spectra ~~may also be appropriate~~ **is acceptable** if it reflects the site-specific shape. **NEW SR HA-G1a: Broad-band, smooth spectral shapes, such as those presented in NUREG/CR-0098 [6] are acceptable if they are shown to be appropriate for the site.** **NEW NOTE HA-G1a: Recent developments [42] indicate that these spectral shapes are not appropriate for CEUS sites where high frequency content is dominant at hard rock sites.**
3.7.1.2, HLR-HA-H to HLR-HA-J	----------	No objection	----------
3.7.1.3, HLR-HA-A	----------	No objection	----------
3.7.1.3, HA-A1	----------	No objection	----------
3.7.1.3, HA-A2, Cat. I and II	This requirement contains two separate requirements. There is a requirement to capture the frequencies of SCCs that are dominant to the PRA results and insights. This can not be a priori.	Qualification	As the parameter to characterize both hazard and fragilities, USE the spectral accelerations, or the average spectral acceleration over a selected band of frequencies, or peak ground acceleration. ~~In the selection of frequencies to determine spectral accelerations or average spectral acceleration, CAPTURE the frequencies of those SSCs that are of interest and are dominant contributors to the PRA results and insights.~~ **NEW SR HA-A2a:** In the selection of frequencies to determine spectral accelerations or average spectral acceleration, CAPTURE the frequencies of those SSCs that are ~~of interest and dominant contributors to~~ **significant in** the PRA **quantification** ~~results ans insights~~.

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3.7.1.3, HA-A2, Cat. III	This requirement contains two separate requirements. There is a requirement to capture the frequencies of SCCs that are dominant to the PRA results and insights. This can not be a priori.	Qualification	As the parameter to characterize both hazard and fragilities, USE the spectral accelerations, or the average spectral acceleration over a selected band of frequencies. ~~In the selection of frequencies to determine spectral accelerations or average spectral acceleration, CAPTURE the frequencies of those SSCs that are of interest and are dominant contributors to the PRA results and insights.~~ **NEW SR HA-A2b:** In the selection of frequencies to determine spectral accelerations or average spectral acceleration, CAPTURE the frequencies of those SSCs that are ~~of interest and dominant contributors to~~ **significant in** the PRA **quantification** ~~results ans insights~~.
3.7.1.3, HA-A3	As stated, the requirement is difficult to meet.	Clarification	In developing the PSHA results, whether they are characterized by spectral accelerations, peak ground accelerations or both, EXTEND them to large enough values (consistent with the physical data and interpretations) so that the truncation does not significantly impact the numerical results. ~~final numerical results, such as core damage frequency, reflect accurate estimates of risk, and the delineation and ranking of seismic-initiated sequences are not affected.~~
3.7.1.3, HLR-HA-B	----------	No objection	----------
3.7.1.3, HA-B1	For Capability Category III applications, the available data base must be able characterize local effects on site response.	Clarification	In performing the PSHA, BASE it on available and developed comprehensive geological, seismological, ~~and~~ geophysical **and geotechnical** data bases that reflect the current state-of-the-knowledge, and that are used by experts/analysts to develop interpretations and inputs to the PSHA. **For Category III applications, INCLUDE site specific laboratory data for site soils including their potential uncertainty to characterize local site response effects** .
3.7.1.3, NOTE HA-B1	The use of term “the amount of resources and sophistication...” as the reason for the distinction between Capability Categories II and III is inconsistent with the bases for PRA capability categories.	Qualification	... ~~The difference between Capability Category II and III is ... the databases.~~
3.7.1.3, HA-B2 and HA-B3	----------	No objection	----------

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3.7.1.3, NOTE HA-B2 and NOTE HA-B3	The use of term “the amount of resources and sophistication...” as the reason for the distinction between Capability Categories II and III is inconsistent with the bases for PRA capability categories.	Qualification	... ~~The difference between Capability Category II and III is ... the databases.~~
3.7.1.3, HLR-HA-C	The word "consider" is permissive and inappropriate for SRs. Action verbs should be used.	Qualification	... SHALL ~~consider all~~ **examine** ... SHALL be ~~considered~~ **addressed** in characterizing the ground motion propagation.
3.7.1.3, HA-C1 - C4	----------	No objection	----------
3.7.1.3, HLR-HA-D	The word "consider" is permissive and inappropriate for SRs. Action verbs should be used.	Qualification	... SHALL ~~account for all~~ examine credible ... Both the aleatory ... be ~~considered~~ **addressed** ...
3.7.1.3, HA-D1	Since attenuation relationships for characterizing the ground motion propagation are developed based on empirical data and subjective inputs, several attenuation models may exist.	Qualification	ACCOUNT in ... Seismicity data (including strong motion data), **and c) Current attenuation models in the ground motion estimates.**
3.7.1.3, HA-D2 -D4	----------	No objection	----------
3.7.1.3, HLR-HA-E	----------	No objection	----------
3.7.1.3, HA-E1,	----------.	No objection	----------
3.7.1.3, Note HA-E1	The site-specific transfer functions that are used to modify the rock ground motions should computed using probabilistic estimates of site properties.	Clarification	The purpose of a local site response analysis... for the site characteristic [41]. **Probabilistic estimates of site properties should be used in determining the site-specific functions.**
3.7.1.3, HA-E2 and Note HA-E2	----------	No objection	----------
3.7.1.3, HLR-HA-F	----------	No objection	----------
3.7.1.3, HA-F1 to HA-F3	----------	No objection	----------

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3.7.1.3, HLR-HA-G	The reference to NUREG/CR-0098 broad band spectrum shape should be made in a supporting requirement. Further, NURGE/CR-0098 spectral shapes are not always appropriate, particularly for CEUS sites. Also, the last sentence is inconsistent with that stated by 3.7.1.2 HLR-HA-G	Qualification	For further use in the SPRA, the spectral shape SHALL be based on a site-specific evaluation taking into account the contributions of deaggregated magnitude-distance results of the PSHA. ~~Broad-band, smooth spectral shapes, such as those presented in NUREG/CR-0098 [6] (for lower-seismicity sites such as most of those east of the U.S. Rocky Mountains) may also be used taking into account the site conditions.~~ The use of ~~existing~~ uniform hazard response spectra (UHSs) is acceptable ~~unless evidence comes to light that would challenge these UHS spectral shapes~~ **if it reflects the site-specific shape**. **NEW SR HA-G1a: Broad-band, smooth spectral shapes, such as those presented in NUREG/CR-0098 [6] are acceptable if they are shown to be appropriate for the site.** **NEW NOTE HA-G1a: Recent developments [42] indicate that these spectral shapes are not appropriate for CEUS sites where high frequency content is dominant at hard rock sites.**
3.7.1.3, HA-G1	----------	No objection	----------
3.7.1.3, Note HA-G1	Spectral shapes used to evaluate in-structure SSC's must include the effects of amplification from both local site conditions and SSI. Based on IPEEE reviews, certain UHS shapes used for CEUS were not appropriate for the screening purpose.	Clarification	**NOTE HA-G1**: The issue of which spectral shape should be used in the screening of structures, systems, and components (SSCs) and in quantification of SPRA results requires careful consideration. For screening purposes, the spectral shape used should have amplification factors**, including effects from both local site conditions as well as soil-structure interaction,** such that the demand resulting from the use of this shape is higher than that based on the design spectra. This will preclude premature screening of components and will avoid anomalies such as the screened components (e.g., surrogate elements) being the dominant risk contributing components. Additional discussion on this issue can be found in Ref. 22. In the quantification of fragilities and of final risk results, it is important to use as realistic a shape as possible. Semi-site specific shapes, such as those given in NUREG-0098, have been used in the past and ~~are considered~~ **may be** adequate for this purpose**, provided that they are shown to be reasonably appropriate for the site [42]**. The UHS is acceptable for this purpose **if it can be shown that the UHS shape is appropriate for the site.** ~~unless evidence comes to light (e.g., within the technical literature) that these UHS do not reflect the spectral shape of the site-specific events.~~
3.7.1.3, HLR-HA-H	----------	No objection	----------

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3.7.1.3, Note HA-H	----------	No objection	----------
3.7.2			
3.7.2.1	----------	No objection	----------
3.7.2.2, HLR-SA-A	Words: "important, significant" used to characterize the contribution to CDF should be clearly stated in quantitative manner.	Clarification	The seismic-PRA systems models SHALL include ~~all important~~ seismic-caused initiating events and ~~that can lead to core damage or large early release, and SHALL include all~~ other ~~important~~ failures ~~that can contribute significantly to CDF or LERF,~~ including seismic-induced SSC failures, non-seismic-induced unavailabilities, and human errors~~.~~ **, that give rise to significant accident sequences and/or significant accident progression sequences.**
3.7.2.2, HLR-SA-B to HLR-SA-F	----------	No objection	----------
3.7.2.3, HLR-SA-A	Words: "important, significant" used to characterize the contribution to CDF should be clearly stated in quantitative manner.	Clarification	The seismic-PRA systems models SHALL include ~~all important~~ seismic-caused initiating events and ~~that can lead to core damage or large early release, and SHALL include all~~ other ~~important~~ failures ~~that can contribute significantly to CDF or LERF,~~ including seismic-induced SSC failures, non-seismic-induced unavailabilities, and human errors~~.~~ **, that give rise to significant accident sequences and/or significant accident progression sequences.**
3.7.2.3, SA-A 1	To more closely follow the ASME Standard, this SLR should conclude with the statement "using a systematic process", and there needs to be a definition of significant.	Clarification	ENSURE that ~~significant~~ earthquake-caused initiating events **that give rise to significant accident sequences and/or significant accident progression sequences** are included in the seismic-PRA system model **using a systematic process**.
3.7.2.3, NOTE SA-A 1	The note does not identify systematic process.	Clarification	NOTE SA-A1: It is ...br thoroughly investigated. **One approach that has been used successfully is to perform an FMEA of the seismic failures identified by the fragility analysis**...
3.7.2.3, SA-A2	The requirement is unclear.	Clarification	To be resolved.

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SA-A3	1st paragraph: The SR contains the word "all", which is inappropriate in a Standard. There needs to be a definition of significant. 2nd paragraph: Permissives should not be used in Srs. Move to new SA-A3b below. The note contains two issues that should be requirements. Last sentence of th 1st para refers to the use of "supercomponent". Although "supercomponent" could greatly simplify system modeling, it could also lead to a situation where the "supercomponent" becomes a dominant contributor and the risk insights of SSCs within the "supercomponent" could be masked, if it is not applied properly.	Qualification	ENSURE that the PRA system model reflect ~~all significant~~ earthquake-caused failures and ~~all significant~~ nonseismically induced unavailabilities and human errors **that give rise to significant accident sequences and/or significant accident progression sequences** ~~The analysis MAY~~ **It is acceptable to** group earthquake-caused failures **in the analysis** if the leading failure in the group is modeled. NOTE SA-A3: **NEW SA-A3a: USE the event trees and fault trees from the internal-events full-power PRA model as the basis for the seismic event trees.** **NOTE SA-A3a:** ~~The event trees and fault trees from the internal-events full-power PRA model are generally used as the basis for the seismic event trees.~~ This is done both to capture the thinking that has gone into their development, and to assist in allowing comparisons between the internal-events PRA and the seismic PRA to be made on a common basis ... The lumping of certain groups of individual components into so-called "supercomponents" in the systems model is also a valid approximation in many situations. **However, it is cautioned that supercomponents should be used in a manner that they will not become significant contributors to the seismic CDF**.] In special circumstances ... Further, it is then especially important that a peer review be undertaken that concentrates on these aspects. **NEW SA-A3b: INCLUDE in the PRA system models, the consequences of those earthquake caused failures of structures and components that are not included in the internal event models. ~~The analysis MAY~~ It is acceptable to group earthquake-caused failures in the analysis if the leading failure in the group is modeled.** **Note for SA-A3b:** Earthquakes can cause failures that are not explicitly represented in the internal-events models, primarily (but not exclusively) due to damage to structures and other passive items ... This means that initiating events and SSC failures that could lead to LERF-type consequences need to be included in the systems model even if the CDF frequency is quite low. (See FR-F4 and NOTE FR-F4.)
3.7.2.3, HLR-SA-B	----------	No objection	----------

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3.7.2.3, SA-B1	----------	No objection	----------
3.7.2.3, SA-B2	The word "consider" is permissive and inappropriate for SRs. Action verbs should be used.	Qualification	In the human reliability analysis (HRA) aspect, ~~CONSIDER~~ **EXAMINE** ~~that~~ whether...
3.7.2.3, SA-B3, 2nd para, cat. I and II	Permissives should not be used in SRs.	Qualification	~~The analysis~~ ~~MAY~~ **It is acceptable to** use generic dependency and correlation values **in the analysis and PROVIDE bases** ~~if justified~~.
3.7.2.3, SA-B4	----------	No objection	----------
3.7.2.3, SA-B5	The word "consider" is permissive and inappropriate for SRs. Action verbs should be used.	Qualification	~~CONSIDER~~ **EXAMINE** the effects ...
3.7.2.3, SA-B7	The word "consider" is permissive and inappropriate for SRs. Action verbs should be used.	Qualification	~~CONSIDER~~ **EXAMINE** the possibility ...
3.7.2.3, SA-B8	The word "consider" is permissive and inappropriate for SRs. Action verbs should be used.	Qualification	~~CONSIDER~~ **EXAMINE** the likelihood ...
3.7.2.3, SA-B8, 2nd para, Cat. I.	Permissives should not be used in SRs.	Qualification	**It is acceptable to use** conservative recovery values ~~MAY be used~~.
3.7.2.3, SA-B9	The word "consider" is permissive and inappropriate for SRs. Action verbs should be used.	Qualification	~~CONSIDER~~ **EXAMINE the effect of** including ...
3.7.2.3, SA-B10	----------	No objection	----------
3.7.2.3, HLR-SA-C	----------	No objection	----------
3.7.2.3, SA-C1	The phrase “demonstrating ... significantly alter...” is permissive and inappropriate for the requirement.	Clarification	To ensure that the systems-analysis models reflect the as-built, as-operated plant, JUSTIFY any important conservatisms or other distortions introduced by demonstrating that ~~they do not significantly alter~~ the seismic-PRA's validity for applications **is maintained**.
3.7.2.3, SA-D1 to SA-E1	----------	No objection	----------
3.7.2.3, SA-E2, 2nd para, cat I	Permissives should not be used in SRs.	Qualification	**It is acceptable to use** broad groupings ~~MAY be used~~.

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3.7.2.3, SA-E4, 2nd para, cat I and II	Permissives should not be used in SRs.	Qualification	~~The analysis~~ ~~MAY~~ **It is acceptable to** use generic dependency and correlation values **in the analysis and PROVIDE the basis for such application** ~~if justified~~.
3.7.2.3, HLR-SA-F	----------	No objection	----------
3.7.2.3, NOTE SA-F1	The tem "dominant risk contributors" is not defined.	Qualification	**NOTE SA-F1:** The major outputs of a seismic PRA, such as mean CDF, mean LERF, uncertainty distributions on CDF and LERF, results of sensitivity studies, **significant** ~~dominant~~ ~~risk~~ contributors, and so on are examples of the PRA results that are generally documented.
3.7.2.3, SA-F2 to SA-F3	----------	No Objection	----------
3.7.3			
3.7.3.1, HLR-FR-A to HLR-FR-B	----------	No objection	----------
3.7.3.1, HLR-FR-C	Permissives should not be used in SRs.	Qualification	The seismic fragility evaluation SHALL be based on realistic seismic response that the SSCs experience at their failure levels. Depending on the site conditions and response analysis methods used in the plant design, **DEVELOP** realistic seismic response ~~MAY be obtained~~ by an appropriate combination of scaling, new analysis and new structural models.
3.7.3.1, HLR-FR-D thru. HLR-FR-G	----------	No objection	----------
3.7.3.2, HLR-FR-A	----------	No objection	----------
3.7.3.2, FR-A1 and FR-A2	----------	No objection	----------
3.7.3.2, HLR-FR-B	----------	No objection	----------
3.7.3.2, FR-B1	Permissives should not be used in Srs.	Qualification	...For example, **it is acceptable to apply** guidance given in EPRI NP-6041 and NUREG/CR-4334 ~~MAY be used~~ to screen out components...
3.7.3.2, FR-B2	----------	No objection	----------

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3.7.3.2, HLR-FR-C	Permissives should not be used in SRs.	Qualification	The seismic fragility evaluation SHALL be based on realistic seismic response that the SSCs experience at their failure levels. Depending on the site conditions and response analysis methods used in the plant design, **DEVELOP** realistic seismic response ~~MAY be obtained~~ by an appropriate combination of scaling, new analysis and new structural models.
3.7.3.2, FR-C1	Spectral shape issues for Capability Category I and II	Clarification	ESTIMATE the seismic responses that the components experience at their failure levels on a realistic basis using site-specific earthquake response spectra in three orthogonal directions, anchored to a ground motion parameter such as peak ground acceleration or average spectral acceleration **over a given frequency band**~~, or~~ . ENSURE that the spectral shape used reflects or bounds the site-specific ~~considerations~~ **conditions**.
3.7.3.2, FR-C1	Spectral shape issues for Capability Category III	Clarification	ESTIMATE the seismic responses that the components experience at their failure levels on a realistic basis using site-specific earthquake response spectra in three orthogonal directions, anchored to a ground motion parameter such as peak ground acceleration or average spectral acceleration **over a given frequency band**.
3.7.3.2, FR-C2	Probabilistic parameters for Capability Category I	Clarification	If probabilistic response analysis is performed to obtain realistic structural loads and floor response spectra, ENSURE that the number of simulations done (e.g., Monte Carlo simulation and Latin Hypercube Sampling) is large enough to obtain stable median and 85% non-exceedance responses **for free-field site response**. ~~In the response analysis,~~ ~~appropriately~~ ACCOUNT for the entire spectrum of input ground motion levels displayed in the seismic hazard curves.
3.7.3.2, FR-C2	Probabilistic parameters for Capability Category II	Clarification	If probabilistic response analysis is performed to obtain realistic structural loads and floor response spectra, ENSURE that the number of simulations done (e.g., Monte Carlo simulation and Latin Hypercube Sampling) is large enough to obtain stable median and 85% non-exceedance responses **for free-field site response**. ~~In the response analysis,~~ ~~appropriately~~ ACCOUNT for the entire spectrum of input ground motion levels displayed in the seismic hazard curves.

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3.7.3.2, FR-C2	Probabilistic parameters for Capability Category III	Clarification	PERFORM probabilistic seismic response analysis taking into account the uncertainties in the input ground motion ~~and structural and~~**, site** soil properties and **structural parameters.** CALCULATE joint probability distributions of the responses of different components in the building.
3.7.3.2, NOTE FR-C2	Update reference	Clarification	NOTE FR-C2: For a description of the probabilistic seismic response analysis, the reader is referred to Ref. 49 **and Ref. 42**
3.7.3.2, FR-C3 to FR-C5	----------	No objection	----------
3.7.3.2, FR-C6, Cat I and II	The word "consider" is permissive and inappropriate for SRs. Action verbs should be used.	Qualification	... dominate the seismically induced core damage frequency. ~~CONSIDER~~ **ACCOUNT for** the uncertainties in the SSI analysis ... The minimum value of Cv ~~SHALL be~~ **is** 0.5. ...
3.7.3.2, HLR-FR-D	----------	No objection	----------
3.7.3.2, FR-D2	The word "consider" is permissive and inappropriate for SRs. Action verbs should be used.	Qualification	~~CONSIDER~~ EXAMINE all relevant failure modes of structures ...
3.7.3.2, HLR-FR-E	----------	No objection	----------
3.7.3.2, FR-E1	Fragility calculations should incorporate effects of potential seismic interaction including both structural and functional interactions.	Clarification	CONDUCT a detailed walkdown of the plant, focusing on equipment anchorage, lateral seismic support, **spatial interactions** and potential systems interactions **(both structural and functional interactions)**.
3.7.3.2, FR-E2	Walkdown team qualifications should be documented.	Clarification	DOCUMENT the walkdown procedures, walkdown team composition **and its members' qualifications**, walkdown observations and conclusions.
3.7.3.2, FR-E3	If a component is screened out by the walkdown team, the basis for the screening should be provided.	Clarification	If components are screened out during or following the walkdown, DOCUMENT anchorage calculations ~~or some other~~ **and PROVIDE the** basis ~~justifying~~ **for** such screening.
3.7.3.2, FR-E4	----------	No objection	----------
3.7.3.2, FR-E5	Masonry wall failures and potential sources for seismic-fire interactions should also be examined.	Clarification	During the walkdown, EXAMINE potential sources of interaction (e.g., II/I issues, impact between cabinets, **masonry walls, flammable and combustion sources,** flooding and spray) and consequences of such interactions on equipment contained in the systems model.

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3.7.3.2, NOTE FR-E5	The “II/I issues” should also include situations where a low seismic capacity object falls on and damages an SSC item with higher seismic capacity. In such case, the fragility of the higher capacity SSC item may be controlled by the low capacity object.	Qualification	A "II/I issue" refers to situations where a non-seismically qualified object could fall on and damage a seismically qualified item of safety equipment, **and also situations where a low seismic capacity object falls on and damages an SSC item with higher seismic capacity. In such case, the fragility of the higher capacity SSC item may be controlled by the low capacity object.**
3.7.3.2, HLR-FR-F	----------	No objection	----------
3.7.3.2, FR-F1 to FR-G4	----------	No objection	----------
3.8			
3.8.1	The organization of high level requirements is inconsistent with other sections of the Standard	Clarification	Insert: **3.8.2 High Level requirements** and list all high level requirements consistent with other parts of the Standard.
3.8.2	Section number should be changed to 3.8.3. See comment for 3.8.1	Clarification	Change the section number to 3.8.3. See Resolution for 3.8.1.

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WIND-A1, Cat. II and III and NOTE WIND-A1	The six elements described in NOTE WIND-A1 provide the details required for the tornado wind hazard analysis and should be included in WIND-A1. The word “properly” is superfluous.	Qualification	In the tornado wind hazard analysis, ... ACCOUNT ~~properly~~ for and ...a mean hazard curve can be derived. **INCLUDE the following elements in the tornado wind hazard analysis:** **(1) Variation of tornado intensity with occurrence frequency (The frequency of tornado occurrence decreases rapidly with increased Intensity);** **(2) Correlation of tornado width and length of damage area; longer tornadoes are usually wider;** **(3) Correlation of tornado area and intensity; stronger tornadoes are usually larger than weaker tornadoes;** **(4) Variation in tornado intensity along the damage path length; tornado intensity varies throughout its life cycle;** **(5) Variation of tornado intensity across the tornado path width.** **(6) Variation of tornado differential pressure across the tornado path width.** **NOTE WIND-A1:** State-of-the-art methodologies are given ... can be found in Refs. 13, 56, and 57. ~~Tornado wind hazard analysis SHOULD include the following elements:~~ ~~(1) Variation of tornado intensity with occurrence frequency (The frequency of tornado occurrence decreases rapidly with increased Intensity);~~ ~~(2) Correlation of tornado width and length of damage area; longer tornadoes are usually wider;~~ ~~(3) Correlation of tornado area and intensity; stronger tornadoes are usually larger than weaker tornadoes;~~ ~~(4) Variation in tornado intensity along the damage path length; tornado intensity varies throughout its life cycle;~~ ~~(5) Variation of tornado intensity across the tornado path width.~~ ~~(6) Variation of tornado differential pressure across the tornado path width.~~

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WIND-A4, Cat. II and III	The word "consider" is permissive and inappropriate for SRs. Action verbs should be used.	Qualification	... ~~CONSIDER~~ EXAMINE specific features ...large early release.
WIND-A4, Cat. II	There is no requirement for calculating the population of missiles.	Qualification	**NEW SR WIND-A4a: SURVEY the plant building and surroundings to assess the number, types, and locations of potential missiles.**
WIND-A4, Cat. III	There is no requirement for calculating the population of missiles.	Qualification	**NEW SR WIND-A4a: SURVEY the plant building and surroundings and to catalog the number, types, and locations of potential missiles.**
HLR-WIND-B	Permissive 'may' should not be used in HLR. A requirement missing for identifying those plant structures, systems and components which are vulnerable to the wind hazards.	Qualification	(HLR-WIND-B): ... whose failure ~~may~~ contribute to core damage or large early release. NEW SR **WIND-B1a: IDENTIFY plant structures, systems and components that are vulnerable to the wind hazards. ACCOUNT for both wind effect and wind-borne missiles effect.**
WIND-B1	The word "consider" is permissive and inappropriate for SRs. Action verbs should be used.	Qualification	... In this evaluation, ~~CONSIDER~~ **INCLUDE** the findings of a plant walkdown.
NOTE WIND-B1	In the 5th para., the phrase "...nonseismic Category I structures" should be Category II.	Clarification	...for nonseismic Category ~~I~~ **II** structures...
HLR-WIND-C	Use of words "All" and "important" is improper.	Qualification	The wind-PRA systems model SHALL include ~~all important~~ **significant** wind-caused initiating events and other ~~important~~ **significant** failures that can lead to core damage or large early release.
WIND-C1	The word "consider" is permissive and inappropriate for SRs. Action verbs should be used.	Qualification	ASSESS accident sequences initiated by high winds to estimate CDF and LERF contribution. In the analysis, ~~CONSIDER~~ **USE** the site-specific wind hazard curves and the fragilities of structures and equipment.

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Index No	Issue	Position	Resolution
WIND C-2 through D-7	----------	No objection	----------
3.9			
3.9.1	The organization of high level requirements is inconsistent with other sections of the Standard	Clarification	Insert: **3.9.2 High Level requirements** and list all high level requirements consistent with other parts of the Standard.
3.9.2	Section number should be changed to 3.8.3. See comment for 3.9.1	Clarification	Change the section number to 3.9.3. See Resolution for 3.9.1.
FLOOD-A1	Permissives should not be used in SR.	Qualification	In the hazard analysis for extreme local precipitation, USE up-to-date data for the relevant phenomena, **it is acceptable to utilize** both site-specific and regional data ~~MAY be utilized~~.
FLOOD-A2	Permissives should not be used in SR.	Qualification	In the hazard analysis for extreme river flooding, including floods due to single or cascading dam failures, USE up-to-date data for the relevant phenomena. **It is acceptable to utilize** both site-specific and regional data ~~MAY be used~~.
NOTE FLOOD-A2	----------	No objection	----------
FLOOD-A3	Permissives should not be used in SR.	Qualification	In the hazard analysis for extreme ocean (coastal and estuary) flooding, USE up-to-date data for the relevant phenomena, **it is acceptable to use** both site-specific and regional data ~~MAY be used~~.
FLOOD-A4	The word "consider" is permissive and inappropriate for SRs. Action verbs should be used.	Qualification	... ~~CONSIDER~~ **ACCOUNT for** high water levels, ...
FLOOD-A5	Permissives should not be used in SR.	Qualification	In the hazard analysis for extreme tsunami flooding, USE up-to-date data for the relevant phenomena, **it is acceptable to use** both site-specific and regional data ~~MAY be used~~.
HLR-FLOOD-B	Permissives should not be used in HLR.	Qualification	(HLR-FLOOD-B): ... whose failure ~~may~~ contribute to core damage or large early release, or both.
FLOOD-B1	The words "consider" and “MAY”are permissives and inappropriate for SRs. Action verbs should be used. A requirement missing for identifying those plant structures, systems and components which are vulnerable to the wind hazards.	Qualification	In the evaluation of flood fragilities of structures and exposed equipment (low-lying equipment on the site, intake and ultimate-heat-sink equipment, etc.), USE plant-specific data. In this evaluation, ~~CONSIDER~~ **INCLUDE** the findings of a plant walkdown. **It is acceptable in the** fragility analysis for both capacity and demand ~~MAY be based on~~ **to apply** the standard methodology used for seismic events, with appropriate modifications unique to the flooding event being studied. NEW SR **FLOOD-B1a: IDENTIFY plant structures, systems and components that are vulnerable to the flood hazards.**

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Index No	Issue	Position	Resolution
HLR-FLOOD-C	Use of words “All” and “important” is improper.	Qualification	The external-flooding-PRA systems model SHALL include ~~all important~~ **significant** flood-caused initiating events and other ~~important~~ **significant** failures that can lead to core damage or large early release...
FLOOD-C1	The word "consider" is permissive and inappropriate for SRs. Action verbs should be used.	Qualification	To estimate CDF and LERF contributions, ASSESS accident sequences initiated by external flooding. In the analysis, ~~CONSIDER~~ **USE where applicable** the appropriate flooding hazard curves and the fragilities of structures and equipment.
FLOOD-C2 to FLOOD- D7	----------	No objection	----------
SECTION 4: Table A1of APPENDIX A, Chapter 5 applies.			
SECTION 5: Table A1 of APPENDIX A, Chapter 6 applies.			
5.1	Regarding reference to ASME PRA Standard, see issues for R.G. 1.200, APPENDIX A, Chapter 6 of Table A-1.	Clarification	See comments for R.G. 1.200, APPENDIX A, Chapter 6 of Table A-1.
5.1, 3rd papa.	The purpose stated lacks clarity.	Clarification	The purpose of the peer review is ~~fundamentally~~ to provide an independent review of the PRA or SMA, **to ensure concurrence with** ~~This means reviewing the analysis vis-à-vis~~ the applicable Requirements in the Standard. The composition and qualifications of the peer review team are important, as is its independence; these aspects are covered in the ASME Standard's requirements (ASME, 2002) that are incorporated here by reference. Other process issues, including the need for a team leader and the need for a methodology for the review, are also covered in the ASME Standard.
5.2-5.4	----------	No objection	----------
SECTION 6			
6.1	Regarding reference to ASME PRA Standard, see issues for R.G. 1.200, APPENDIX A, Chapter 3 of Table A-1.	Clarification	See comments for R.G. 1.200, APPENDIX A, Chapter 3 of Table A-1.
6.2	See Appendix D, general comment 1	Quantification	Delete 2nd para.
SECTION 7	----------	No objection	----------
APPENDIX A	----------	No objection	----------
APPENDIX B	----------	No Objection	----------
Equation (B2)	This example does not contains non-seismic failures.	Qualification	Select an example of a cutset which will contain both seismic and non-seismic failures.
APPENDIX C			

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Index No	Issue	Position	Resolution
C.1 Introduction, 2nd para.	Incorrect reference to Section 3.5.1.1	Clarification	Change “3.5.1.1" to “3.6.1".
C.2 Seven Steps (Step 1)	The word “stylized” is not appropriate.	Clarification	Delete the word “stylized”.
C.2 Seven Steps (Steps 2 -7)	----------	No Objection	----------
C.3 Enhancements	----------	No Objection	----------
C.4 Seven Steps - Detailed Discussion (C.4.4)	Mitigating small LOCA accidents should be an objective of at least one of the success paths	Clarification	(2) select a primary success path and an alternate success path for the SMA, eliminating those elements or paths that cannot be evaluated for seismic adequacy economically. **Ensure that one of these two paths is capable of mitigating a small loss-of-coolant accident.** It is important....
C.4 Seven Steps - Detailed Discussion (C.4.6)	The last sentence under Step 6 is not correct if only one success path can mitigate a SLOCA and that success path has a lower HCLPF. In this scenario, the plant HCLPF is governed by the SLOCA success path HCLPF.	Clarification	HCLPF capacities are documented for all elements in the primary and alternate success paths which have capacities less than the specified RLE. The element with the lowest HCLPF capacity in a success path establishes the seismic HCLPF capacity for the path. The higher seismic HCLPF capacity of the primary and alternative success paths is the seismic HCLPF capacity of the plant-as-a-whole **if both paths can mitigate an SLOCA or only one path mitigate an SLOCA but the SLOCA path has a higher HCLPF than the other path. However, in the case where only one success path can mitigate an SLOCA and that path also has a lower HCLPF than the other path, then the plant HCLPF is governed by the SLOCA success path HCLPF.**
C.4 Seven Steps - Detailed Discussion (C.4.8 ?)	There is no C.4.7. Looks like C.4.8 should be C.4.7.	Clarification	Change subsection number to C.4.7.
C.5 Four En-hancements - Detailed Discussion (C.5.1 thru 3)	----------	No Objection	----------
APPENDIX D			

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Index No	Issue	Position	Resolution
General Comment 1	Appendix D attempts to expand the range of applicability of SMA considerably beyond its stated objectives, in order to support risk-informed applications for regulatory relief. The staff cannot accept a priori the possible enhancements described in the appendix. At the same time, the staff has no basis to reject these enhancements. The staff will need to conduct a case-by-case evaluation of (1) the implementation of a specific enhancement, and (2) the specific results and conclusions obtained. The standard would be vastly improved from a regulatory perspective if Appendix D is deleted from the standard.	Clarification	Delete Appendix D.
General Comment 2	Assuming that ANS does NOT delete Appendix D from the standard, Appendix D should be rewritten to focus strictly on the risk insights directly derivable from a SMA and present examples of its applicability and limitations. Implementation of any enhancements will require specific staff review.	Clarification	Revise Appendix D to focus on the applicability of SMA and its limitations in developing risk insights. If desired, clearly and concisely list and describe possible enhancements in one section of the appendix, with an introduction clearly stating that implementation of any of these enhancements requires specific peer review, and is subject to regulatory review on a case-by-case basis.
General Comment 3	Throughout Appendix D, ANS takes the position that the plant HCLPF capacity is defined by the HCLPF capacity of the more seismically rugged success path. The staff takes exception to this position. This is only true if both success paths can mitigate a SLOCA or the SLOCA path has higher HCLPF. The SMA requirement is that only one success path has to be capable of mitigating a SLOCA. This was previously identified under Index No. C.4 (C.4.6).	Clarification	Revise the statements and examples in Appendix D to consider the case where the only success path capable of mitigating a SLOCA has the lower HCLPF capacity.