Staff Comments on the American Society of Mechanical Engineers (ASME)/American Nuclear Society (ANS) Seismic Probabilistic Risk Assessment (PRA) Code Case

The Table below provides the U.S. Nuclear Regulatory Commission (NRC) staff's comments on requirements in the Code Case. Only those requirements where the staff has an objection is provided. A discussion of the staff's concern (issue) and the staff resolution is provided. The staff clarification or qualification to the requirement is indicated in the proposed staff resolution where new text is represented in bold typeface (i.e., **bold**) and deleted text is represented with a strikeout (i.e., ~~strikeout~~). The staff resolutions represent the changes that need to be made to the requirement (as written in the ASME/ANS Code Case) for interim use of the Code Case.

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1	Section 5-1.3	The last paragraph of the section states that the internal events PRA model is the starting point "…to which must be added a number of structures, systems, and components (SSCs) not included in the model but that could fail due to the external hazard." Failure modes caused by the external hazard for SSCs existing in the internal events PRA should also be included.	The approach to any external hazard PRA typically uses as its starting point the internal-events PRA model to which must be added a number of structures, systems, and components (SSCs) not included in the model but that could fail due to the external hazard **and new failure modes caused by the external hazard for SSCs already present in the model**. Both the part of the internal-events model dealing with CDF and the part dealing with LERF are used as starting points.
2	Section 5-1.6	The Part 5 Code Case does not include the language from Section 5-1.6 in ASME/ANS RA-Sb-2013, which discussed the usage of generic fragility information. Section 5-1.6 in ASME/ANS RA-Sb-2013 indicates that "(a) Analysts should apply caution in the use of generic fragilities and provide justification that the generic fragilities are applicable, and (b) Peer reviews should focus on the use of generic fragilities to ensure that their use is appropriate and justified. " These statements are important because they appropriately identify the scope of interest with respect to generic fragility for both the analysts and the peer-reviewers.	Include in the NMA language on the use of generic fragility information as in Section 5-1.6 in ASME/ANS RA-Sb-2013 as follows: **(a) Analysts should apply caution in the use of generic fragilities and provide justification that the generic fragilities are applicable, and (b) Peer reviews should focus on the use of generic fragilities to ensure that their use is appropriate and justified.**

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3	Section 5-2, third paragraph	Text was removed from Section 5-2 that helps set the context for the standard requirements.	Seismic PRA is an integrated activity requiring close interactions among specialists from different fields (e.g., seismic hazard analysis, systems analysis, and fragility evaluation). For this reason, it is important that all members of the seismic PRA team be cognizant of all of the SRs in this Part, not just those in their area of expertise, and understand the interactions required between the elements. **The analysis requires judgment and extrapolation beyond observed data. Therefore, the analyst is strongly urged to review published seismic PRA reports and to compare his/her plant-specific seismic PRA to the published studies of similar reactor types and system designs.** This understanding of the Standard **and other seismic PRAs** will promote consistency among similar PRAs and risk-informed applications and will also promote reasonableness in the numerical results and risk insights. The peer review is also directed in part toward this same objective reasonableness in the numerical results and risk insights.
4	Section 5-2.1	The first full paragraph of Section 5-2.1 states in part, “The requirements described in Part 5-2.1 address these objectives in detail. A probabilistic seismic hazard analysis (PSHA), which may directly incorporate site response analyses, is used to assess horizontal ground motions at the site.” It does not seem appropriate to highlight a specific aspect of the PSHA, particularly in such an ambiguous manner.	The requirements described in Part 5-2.1 address these objectives in detail. A probabilistic seismic hazard analysis (PSHA)~~, which may directly incorporate site response analyses,~~ is used to assess horizontal ground motions at the site.

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5	General Comments on the SHA Technical Element	The Code Case proposes definitions for the terms primary hazard and Secondary hazard. However, the Code Case only uses the term primary hazard in the definition of the term secondary hazard, which may not prompt a need to define the term primary hazard. The primary hazard described by the objectives in Section 5-2.1 seems to be the vibratory ground motion. However, in many instances, but not all, the text refers to secondary hazards from vibratory ground motions but not always. It is unclear whether there is a difference between the way vibratory ground motion is referred to or if these are intended to be synonymous. Consideration should be given to whether the definition be made more precise to the hazards, primary or secondary, that the Code Case intends to address. For example, does it intend to address tsunamis and seiches? If not, it should not be mentioned.	• Ensure consistent use of the term secondary hazards with the definition. • To the extent possible express which secondary seismic hazards are included or, alternatively, which are not.
6	Table 5-2.1-1, HLR-SHA-A	The language of the high level requirement (HLR) HLR-SHA-A states, "The frequency of seismic ground motion at the site shall be based on a site-specific PSHA that represents the center, body, and range of the technically defensible interpretations. The level of analysis, as well as the level of updates when an existing study is the initial basis for the site-specific PSHA, shall be determined based on the intended application and on the technical viability of existing PSHA models." This language is too vague. In particular, the frequency of the ground motion is a natural process. It is their calculation that is based on a PSHA.	**The basis for the calculation of** ~~T~~**t**he frequencies of **exceeding different levels of vibratory** seismic ground motion at the site shall be ~~based on~~ a site-specific PSHA that represents the center, body, and range of the technically defensible interpretations. The level of analysis, as well as the level of updates when an existing study is the initial basis for the site-specific PSHA, shall be determined based on the intended application and on the technical viability of existing PSHA models.

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7	Table 5-2.1-2, Note (1)	Note (1) of Table 5-2.1-2 states in part, "The appropriate level of the hazard analysis will depend on project-specific factors and should include considerations such as the safety significance of the nuclear power plant, the technical complexity and uncertainties in hazard inputs, regulatory oversight and requirements, and the availability of resources." Although it is a note and not a requirement, citing the availability of resources as a means of determining the appropriate level of hazard analysis may be misconstrued as a justification for excluding consideration of a safety issue.	The appropriate level of the hazard analysis will depend on project-specific factors and should include considerations such as the safety significance of the nuclear power plant, the technical complexity and uncertainties in hazard inputs~~, regulatory oversight and requirements, and the availability of resources~~.
8	Table 5-2.1-2, Note (1)	Note (1) of Table 5-2.1-2 refers to Regulatory Guide (RG) 1.208 as providing an acceptable approach to establishing a lower-bound magnitude for use in the hazard analysis. However, the NRC staff has discouraged use of the damage parameter cumulative absolute velocity (CAV) filter in place of a lower-bound magnitude for the PSHA. Use of CAV has often been misapplied in PSHAs to improperly filter out larger magnitude events at larger source-to-site distances. Recently completed PSHAs for Near Term Task Force (NTTF) Recommendation 2.1 and combined operating license (COL) and early site permit (ESP) applications no longer use the CAV damage parameter in place of a lower-bound magnitude. NRC staff's related letter pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.54(f) specified use of *M*5 (moment magnitude 5) as an appropriate lower-bound magnitude.	Remove the following language in Note (1) of Table 5-2.1-2: ~~RG 1.208 [5-3] provides one acceptable approach to establishing a lower-bound magnitude for use in the hazard analysis.~~

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9	Table 5-2.1-2, SHA-A5	Regarding supporting requirement SHA-A5 in Table 5-2.1-2, the NRC staff has discouraged use of the damage parameter cumulative absolute velocity (CAV) filter in place of a lower-bound magnitude for the PSHA. Use of CAV has often been misapplied in PSHAs to improperly filter out larger magnitude events at larger source-to-site distances. Recently completed PSHAs for Near Term Task Force (NTTF) Recommendation 2.1 and combined operating license (COL) and early site permit (ESP) applications no longer use the CAV damage parameter in place of a lower-bound magnitude. NRC staff's related letter pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.54(f) specified use of *M*5 (moment magnitude 5) as an appropriate lower-bound magnitude.	JUSTIFY the specified lower-bound magnitude ~~(or probabilistically defined characterization of magnitudes based on a damage parameter)~~ for use in the hazard analysis, such that earthquakes of magnitudes less than this value are not expected to cause significant damage to the engineered structures or equipment.
10	Table 5-2.1-3, SHA-B3	Sole use of term "attenuation" in conjunction with modeling ground motions is unnecessarily limiting.	ENSURE that the data and information are sufficient to characterize attributes important for modeling both regional **propagation** ~~attenuation~~ of ground motions and local site effects including their associated uncertainties.
11	Table 5-2.1-3, SHA-B5	The current language requires a demonstration that the updated earthquake catalog has been reviewed if an existing PSHA is used. However, this does not include accounting for the impact of the updated earthquake catalog on the existing PSHA.	If an existing PSHA is used, DEMONSTRATE that an updated catalog of earthquakes ~~was reviewed in the evaluation to determine if~~ does not make the existing PSHA ~~remains~~ **un**viable.

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12	Table 5-2.1-5, SHA-D1	The ground motion characterization model needs to include the interface with site response analysis in terms of a reference soil or rock horizon, as defined by shear wave velocity, density, and damping values.	In the ground motion characterization model that determines the range of seismic vibratory ground motion that can occur at a site, INCLUDE *(a)* credible mechanisms governing estimates of vibratory ground motion that can occur at a site, *(b)* a review of available historical and instrumental seismicity data (including strong motion data) to assess and calibrate the model, and *(c)* applicable (existing and/or newly developed) ground motion prediction equations for the ground motion estimates**,**. ***(d)* reference soil or rock horizon (defined by shear wave velocity, density, and damping values).**
13	Table 5-2.1-5, SHA-D3	The ground motion characterization model should include ground motion prediction equations (GMPEs) with alternative distance and magnitude scaling behaviors, not just a range of amplitudes.	ENSURE that uncertainties are included in the model that determine the range of seismic vibratory ground motion that can occur at a site **as well as alternative magnitude and distance scaling** ~~behaviors~~ in accordance with the level of analysis identified for HLR-SHA-A and the data and information in the update of the PSHA.
14	Table 5-2.1-6, SHA-E3	The term “ENSURE” is not the appropriate action verb.	**JUSTIFY** ~~ENSURE that~~ the approach used to incorporate the site response analysis into the hazard analysis ~~is justified~~**(e.g., sources of soils and rock material properties used in the analysis, uncertainties in site characterization and material properties, data to identify the depth to bedrock, appropriateness of one- two- or three-dimensional analysis in relation to the site stratigraphy)**.
15	Table 5-2.1-10, SHA-I2	The supporting requirement uses the terms hazards and secondary hazard interchangeably, which is potentially confusing.	For those **secondary** hazards that are not screened out, INCLUDE their effect through assessment of the frequency of ~~hazard~~ occurrence and ~~the~~ magnitude**, when applicable,** of the secondary hazard.
16	Table 5-2.1-10, Note (2)	The last sentence of Note (2) in Table 5-2.1-10 is vague and unnecessary.	The appropriate approach used to justify the basis and methodology used for screening out secondary hazards is hazard- and site-specific. ~~Justification may be based on available public literature and prior hazard studies.~~

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17	Table 5-2.2-2, SFR-A1	The intent of supporting requirement SFR-A1 needs additional clarification.	The NMA already discusses the overall intent of SFR-A1 and distinguishes between failure mechanism and failure mode. Include in the NMA a discussion such as: **The intent of SFR-A1 is to ensure that the fragility analyst provides fragility assessments for the SSCs defined by the systems analyst in the plant's SEL and for the relevant failure modes associated to the basic PRA events. The understanding is that fragility assessments relate to failure mechanisms, which, in turn, relate to failure modes defined by the systems analyst.**
18	Table 5-2.2-2, SFR-A2	The information to be included should be such that it can justify the modeling of SSCs as correlated from a fragility perspective and not simply be relevant. Justification, more than the examples provided, will be necessary for any correlation other than 0 and 1. Additionally the phrase "fragility correlation" should be replaced with "fragility dependence". Dependence between random variables characterize their interrelationship. Correlation (coefficient) is used to define the dependence structure between random variables. It is also lacking criteria for acceptability of a correlation model.	INCLUDE information relevant to ~~**justifying**~~ **the** modeling of fragility ~~**dependency**~~ correlation of SSCs and its basis ~~(e.g., similarity of component construction and location, **and response spectra at the locations**)~~ to support SPR-B4.
19	Table 5-2.2-3, SFR-B4	The action verb ESTIMATE implies using judgement or qualitative measures which are inconsistent with the intent of the SR. The action verb CALCULATE involves a mathematical process whereas the action verb ESTIMATE does not necessarily involve a calculation (e.g., quantification of a probability or frequency) and can be derived qualitatively.	If median-centered response analysis is performed, **CALCULATE** the median response (i.e., structural loads and floor response spectra) and **ESTIMATE the** variability in the response.

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20	Table 5-2.2-3, SFR-B6	In the 2009 revision (SFR-C2), part of the SR asked one to ACCOUNT for the entire spectrum of input ground motion levels displayed in the seismic hazard curves. This sentence is removed in the code case. However, this sentence also ensures the quality of the results of the probabilities response analysis	If probabilistic response analysis is performed to calculate structural loads and floor response spectra, ENSURE that the number of simulations done (e.g., Monte Carlo simulation or Latin Hypercube Sampling) is large enough to calculate stable responses. **ACCOUNT for the entire spectrum of input ground motion levels displayed in the seismic hazard curves.**
21	Table 5-2.2-4, SFR-C1	The intent is to provide the basis and methodology to justify that the capacity of the SSC exceeds the screening level.	SPECIFY the basis and methodologies established for the capacity-based screening for the level defined in SPR-B5 **(e.g., use of simplified fragility analysis, use of applicable generic fragility or qualification data or earthquake experience, and use and applicability of EPRI fragility screening guidance are examples)**.
22	Table 5-2.2-4, SFR-C2	In ASME/ANS RA-Sa-2009, Note (2) of the corresponding supporting requirement (i.e., SFR-B2) indicates that the screening criteria do not apply to high-seismic regions such as coastal California. However, SFR-C2 in the Code Case does not discuss this note.	Add the language from Note (2) of supporting requirement SFR-B2 from ASME/ANS RA-Sa-2009 in the non-mandatory appendix for SFR-C2 to clarify whether those specific screening criteria are applicable to high seismic region or not.
23	Table 5-2.2-4, SFR-C2	The intent is to provide the basis to justify that the capacity of the SSC is inherently rugged.	~~SPECIFY~~ **JUSTIFY** the basis for screening of inherently rugged components **(e.g., applicability of fragility or qualification test data, earthquake experience, past fragility analysis for similar SSCs and seismic responses, applicable EPRI guidance)**.
24	Table 5-2.2-4, SFR-C2	Additional clarification is needed regarding what is meant by the term “inherently rugged component.”	In the NMA, address: - The term inherently rugged refers to seismic capacities well beyond the risk-significant level. - Typical items include manual valves, check valves, and small, in-line strainers. - - The SPID (guidance for NTTF Recommendation 2.1 response) includes extensive discussions on the meaning of inherently rugged and many other fragility topics. (Refer to the SPID.)

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25	Table 5-2.2-5, SFR-D3, CC I	In general, the walkdown AND the fragility evaluation provide the assurance. This requirement supports that assurance but may not always ensure. Also, "vulnerability" needs to be defined.	IDENTIFY ~~seismic vulnerabilities~~ **low seismic capacities** ~~and~~ **to ensure** ~~ENSURE~~ that assumptions and the use of generic seismic fragilities are conservative.
26	Table 5-2.2-5, SFR-D3, CCII	The current language implies realistic and plant specific fragilities for all vulnerabilities, which is inconsistent with SFR-E3 and established practice.	IDENTIFY seismic vulnerabilities to ensure ~~and ENSURE~~ that the seismic fragility calculations ~~fragilities~~ ~~**for SSCs that contribute significantly to seismic CDF or seismic LERF**~~ ~~are~~ can be realistic and plant-specific as needed.
27	Table 5-2.2-5, SFR-D4	The walkdown should also focus on operator pathways and potential unavailability of those pathways SFR-D7 seems to refer to consequences of failure of one SSC on the performance of another SSC including inoperability of the SSC by and operator action. However, the words added here refer to pathways for ex-control room actions.	FOCUS on potential functional and structural failure modes, equipment anchorage, ~~and~~ support load paths, **and pathways necessary for performing required ex-control room actions**.
28	Table 5-2.2-5, SFR-D7	This supporting requirement appears to pre-judge which seismic interactions have the potential to be "risk-significant" prior to the walkdown. If the intent is that such information will be provided to the walkdown team by the plant-systems analyst it appears to be premature to expect such information to be available at the time of walkdown. Further, such an intent or appearance of intent can lead to an argument for excluding the plant-systems analyst from the walkdown. The second part of the SR starting with "EVALUATE the consequences…" is expected to capture the "risk-importance" of the identified interactions.	IDENTIFY ~~potential risk-significant~~ **credible** seismic interactions including proximity impacts, falling hazards, and differential displacements (e.g., failure and falling of masonry walls and nonseismically designed SSCs, impact between cabinets, differential building displacements). and EVALUATE the consequences of such interactions on SSCs contained in the systems model and on the credited operator actions. (See HLR-SPR-D.)

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29	Table 5-2.2-5, HLR-SFR-D	In 2009 (SFR-E3) indicates that if component screened out during or following the walkdowns, document anchorage calculation and provide the basis. However, this statement is removed in the code case and it is not clear if screening out equipment during walkdowns is allowed.	Add the following or equivalent as a new SFR-D6: IDENTIFY credible seismic-induced failure for the fire sources provided in SPR-C4. **If components are screened out during or following the walkdown, PROVIDE the basis justifying such a screening.**
30	Table 5-2.2-6, SFR-E2, CC I	The intent of the requirements should be to identify. In CCI conservative assumptions and data may be used.	For SSCs identified in ~~SPR-C4~~**SPR-C6** that significantly contribute to seismic core damage frequency and/or seismic large early release frequency, ~~conservatively~~ IDENTIFY relevant failure ~~modes~~ mechanisms of structures, equipment, and soil. **ENSURE that the assumptions and data used in the identification are conservative.**
31	Table 5-2.2-6, SFR-E2, CC II	The examples listed in the requirement confuse the understanding of the differences between CCI and CCII. The only real difference is that CCI says 'conservatively IDENTIFY relevant' while CCII says 'IDENTIFY relevant and realistic'. This SR also references SPR-C4, but should reference SPR-C6.	For those SSCs identified in ~~SPR-C4~~**SPR-C6** that significantly contribute to seismic core damage frequency and/or seismic large early release frequency, IDENTIFY relevant and realistic failure **mechanisms** ~~modes~~ of structures, equipment, and soil.
32	Table 5-2.2-6, SFR-E5, CCI and II	The SR (CC I and II) refers to SPR-B6 for identification purposes. SPR-B6 discusses "relay or other similar devices". This SR also needs to capture "or other similar devices" which is currently missing not only for consistency but also to prevent any implication that "other similar devices" need not be considered here. Additionally, the action verb for the second part of the CC II requirements needs to be capitalized to identify it.	For CCI: ESTIMATE contact-chatter seismic fragilities for relays **or other similar devices** that are identified in the systems analysis. (See SPR-B6.) For CCII: CALCULATE contact-chatter seismic fragilities for relays **or other similar devices** that are identified in the systems analysis (see SPR-B6) that significantly contribute to seismic core damage frequency and/or seismic large early release frequency.

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33	Table 5-2.2-6, SFR-E6, CCII	The action verb for the second part of the CC II requirements needs to be capitalized to identify it. Calculate is the appropriate action verb to be used for this supporting requirement.	CALCULATE seismic fragilities for credible seismic-induced flood sources (see SFR-D5) and seismic-induced fire sources (see SFR-D6) that significantly contribute to seismic core damage frequency and/or seismic large early release frequency. ~~For those flood and fire sources that do not significantly contribute to seismic core damage frequency and/or seismic large early release frequency, estimate~~ **ESTIMATE** ~~the seismic fragilities.~~
34	Table 5-2.2-7, SFR-F2	Related Table 5-2.2-6 that provides supporting requirements associated with calculation of seismic-fragility parameters use distinct action verbs ESTIMATE and CALCULATE, respectively, for Capability Category I and Capability Category II. However, the related supporting requirement SFR-F2, item *(i)* associated with documentation of fragility parameter values only uses the word "estimation," but not "calculation." Therefore, the documentation supporting requirement item *(i)* is partly inconsistent with other related supporting requirements.	Regarding list item *(i)* in SFR-F2: *(i)* estimation **or calculation** of fragility parameter values for each SSC modeled (median capacity, logarithmic standard deviation reflecting the randomness in median capacity, and logarithmic standard deviation representing the uncertainty in median capacity), and
35	Section 5-2.3 Seismic Plant Response Analysis (SPR), Second list	The seismic PRA depends on both the capability and completeness of the internal events at-power PRA.	It is assumed: • Relative to the systems-analysis requirements contained herein, the seismic PRA analysis team possesses a full-scope internal events, at-power Level 1 and Level 2 LERF PRA, developed either before or concurrently with the seismic PRA. • The internal-events PRA is then used as the basis for the seismic PRA systems analysis. • It is recognized that the capability and completeness of the seismic PRA is a function of the capability **and completeness** of the internal events at-power PRA.

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36	Section 5-2.3 Seismic Plant Response Analysis (SPR)	The sentence reads like a "how to" which is not the intent of the Standard. Further, none of the references cited in the Section are endorsed by the staff. Such references should be moved to the NMA portion of the Standard.	~~A general methodology for the modeling and quantification of a seismic~~ ~~PRA is documented in references such as EPRI 3002000709 [5-5],~~ ~~EPRI 1020756 [5-6], and EPRI 1025294 [5-7].~~
37	Section 5-2.3 Seismic Plant Response Analysis (SPR)	Cross-references in SFR to SPR (ensure that they also are in SPR). ¢ SPR-B4 includes the reference to SFR-A2 ¢ SPR-B5 includes the reference to SFR-C1 ¢ SPR-C4 does not cross-reference SFR-D6 ¢ SPR-D does not cross-reference SFR-D7	Include the missing cross-references either in the requirements or footnotes
38	Table 5-2.3-2 SPR-A2	It is unclear whether the SR is seeking to identify all possible initiating events from secondary hazards or if the intent is to identification and screen such initiators for inclusion in the plant-systems model.	Using a systematic process, IDENTIFY **credible** seismically induced initiating events caused by secondary hazards (e.g., seismically induced internal flooding, external flooding, and fire) including those identified in SHA-I2 **for consideration** ~~**retention**~~ **in the plant-response analysis and model development process**.
39	Table 5-2.3-2 SPR-A3	The verb "encompasses" is overly severe and cannot reasonably be achieved in practice. The wording of this SR should be similar to IE-A3 and IE-A4.	REVIEW plant-specific response to past seismic events, as well as other available seismic risk evaluations for nuclear plants, to ensure that the list of initiating events included in the evaluation ~~encompasses~~ **accounts for** industry experience.
40	Table 5-2.3-2 SPR-A4	The plant-response analysis should include all identified events.	INCLUDE in the plant-response analysis the events identified in SPR-A1**,** ~~and~~ SPR-A2**, and SPR-A3** above.
41	Table 5-2.3-3 SPR-B2	Due to the input from the fire and internal flooding PRAs, and possibly other hazard PRAs, in addition to internal events the findings from all relevant PRAs should be appropriately dispositioned. Additionally, it is not clear what is intended by the latter part of this SR ("…does not adversely affect…").	ENSURE that the peer review findings for the internal-events **and other hazard** PRA**s** that are relevant to the seismic PRA are resolved and ~~that the disposition does not adversely affect~~ **incorporated into** the development of the seismic PRA plant-response model.

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42	Table 5-2.3-3 SPR-B3	Incorrect reference to SPR-C4 instead of SPR-C6.	INCLUDE seismically induced failures representing the failure modes of interest in the seismic PRA plant-response model (e.g., tank rupture, pump failure to start/run, etc.). (See ~~SPR-C4~~**SPR-C6**.)
43	Table 5-2.3-3 SPR-B5	The justification for the appropriate capacity based screening level needs to be provided. Neither the action verb for this SR nor that used for SFR-C1 achieves that purpose.	~~SPECIFY~~ **JUSTIFY (e.g. based on the contribution to the risk quantification)** ~~an appropriate~~ **the** set of criteria to be used in support of the screening of SSC failure modes on the basis of fragility. (See SFR-C1.)
44	Table 5-2.3-3 SPR-B6	The term “with a significant contributor to CDF or LERF” is not defined. How can one determine the significance without performing the calculation?	USE a systematic approach to INCLUDE in the system analysis the effects of those relays or similar devices **susceptible to contact chatter** whose contact chatter results in the unavailability or spurious actuation of SSCs **on the seismic equipment list.** ~~with a significant contribution to CDF or LERF~~.
45	Table 5-2.3-1 HLR-SPR-D	The term “operator performance” can be interpreted in a narrow context to mean only in-control room actions and performance. However, the HLR and the corresponding SRs are applicable to all human actions included in the SPRA.	Human actions credited in the seismic PRA shall consider seismic-specific challenges to ~~operator performance~~ **actions included in the seismic PRA.** This comment is not for a SR but for the HLR.

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46	Table 5-2.3-5 SPR-D3	Cue availability as well as dependencies are integral part of HRA analyses and maybe affected by seismic events	For CCI: CALCULATE the HEPs for all HFEs taking into account relevant seismic-related effects on control room and ex-control room post-initiator actions in accordance with the SRs for HLR-HR-G in Part 2 of this Standard as set forth under Capability Category I. In addressing influencing factors and the timing considerations covered in SRs HR-G3, HR-G4, and HR-G5 in Part 2, attention is to be given to how the seismic event alters any previous assessments in nonseismic analyses including: additional workload and stress; effects of the seismic event on mitigation, **cue availability**, **dependencies,** required response, timing, accessibility, and potential for physical harm; and seismic-specific job aids and training. For CCII: CALCULATE the HEPs for all HFEs taking into account relevant seismic-related effects on control room and ex-control room post-initiator actions in accordance with the SRs for HLR-HR-G in Part 2 of this Standard as set forth under Capability Category II. In addressing influencing factors and the timing considerations covered in SRs HR-G3, HR-G4, and HR-G5 in Part 2, attention is to be given to how the seismic event alters any previous assessments in nonseismic analyses including: additional workload and stress; effects of the seismic event on mitigation, **cue availability**, **dependencies,** required response, timing, accessibility, and potential for physical harm; and seismic-specific job aids and training.

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47	Table 5-2.3-5 SPR-D4	The action verb ESTIMATE implies using judgement or qualitative measures only which are inconsistent with the intent of the SR. Some of the examples of approaches provide more information than an estimate.	For significant HFEs, ~~ESTIMATE~~ **DETERMINE** the timing aspects of the response actions (i.e., time of relevant indication, time available to complete action, and time required to complete action) recognizing the sequence of events and expected seismic conditions based on one or a combination of the following approaches: *(a)* Walk-throughs or talk-throughs of procedures with plant operations or training personnel *(b)* Simulator observations *(c)* Plant-specific thermal-hydraulic analyses *(d)* Realistic and applicable generic or similar plant thermal-hydraulic analyses. Based on a review of procedures with plant operations or training personnel and recognizing the sequence of events and expected seismic conditions, CONFIRM for nonsignificant HFEs the timing aspects of the response actions.
48	Table 5-2.3-6 SPR-E4	The phrase “dominant sequence insights” is not defined in either Addendum A or Addendum B. Use of the term “dominant” was decided not to be used anywhere in the standard.	USE the quantification process to ensure that the components screened out, based on the screening level defined in SPR-B5, do not become a significant contributor or do not invalidate the ~~dominant~~ **significant** sequence insights of the seismic PRA.
49	Table 5-2.3-6 SPR-E5, CC-II	It is not possible or necessary to quantify all uncertainties.	QUANTIFY the mean core damage frequency and large early release frequency and propagate the **parameter** uncertainty that results from each input (i.e., the seismic hazard, the seismic fragilities, and the systems analysis).
50	Table 5-2.3-6 SPR-E7	The reference to Part 2 is missing for HLR-QU-E for CCII.	For CC II: PERFORM the uncertainty analysis consistent with HLR-QU-E **of Part 2** addressing key assumptions in the hazard analysis (see SHA-J2), fragility analysis (see SFR-F3), and system modeling for Capability Category II.
51	Table 5-2.3-1 HLR-SPR-F	This HLR is overly broad since HLR-SHA-J and HLR-SFR-F already address documentation of the seismic hazard evaluation and the seismic-fragility evaluation, respectively.	Documentation of the seismic ~~PRA analysis~~ **plant-response model** shall be consistent with the applicable supporting requirements.

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52	Table 5-2.3-7 SPR-F2	The Code Case needs to specify the type of documentation to be provided, rather than relying on the discretion of the user.	DOCUMENT the process used in the seismic plant-response analysis and quantification**, including**~~. For example, this documentation typically includes a description of~~