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June 3, 2008

Dr. Charles E. Ader, Director
U. S. Nuclear Regulatory Commission
Division of RISC Analysis and Application
Office of Nuclear Regulatory Research
Washington, DC 20555-0001

Dear Dr. Ader,

As ANS-58.22 Working Group Chair, I am pleased to provide you with the attached formal response to comments submitted by the U.S. Nuclear Regulatory Commission (NRC) on review of Draft #6c of ANS-58.22, "Low Power Shutdown PRA Methodology." The draft standard was issued for formal committee ballot to the Risk Informed Standards Committee (RISC) on June 15, 2005. At the same time it was issued for public comment. The committee balloting period ended August 15, 2005, with the public comment period ending August 16, 2005 (except NRC was granted an extension to September 15, 2005).

The NRC provided nine high level comments by letter to the American Nuclear Society dated 9/30/2005. These comments were similar to comments provided with the NRC ballot by Mary Drouin and Mark Rubin dated 8/15/05. The nine high level comments are referenced on the comment response table by number and coded "NRCa." Additionally, the NRC provided 107 detailed comments through Daniel O'Neal directly to Kenneth Kiper as he was the ANS-58.22 Working Group Chair at that time. These comments are numbered and coded "NRCb."

Two hundred ninety-eight committee and public comments were received requiring significant debate and compromise. Selected issues were presented and addressed by the RISC Committee, as follows:

RISC Issue #1

Issue: A number of comments recommended eliminating the qualitative risk assessment (QLRA) sections, while others suggested that those sections should be enhanced. Clearly there is a fundamental disagreement with regard to the place of QLRA in the existing standard.

WG Recommendation: The WG recommended that the qualitative risk assessment sections of the LPSD Standard be separated out and incorporated into a different standard. Based on this recommendation, all comments related to Sections 4.7, 4.8, and Appendix C for draft #6C would NOT be accepted, since these sections would be deleted. This may also impact other sections.

RISC Decision: The following motion was passed at the November 2005 meeting:

1. The standard should be maintained with both the qualitative and quantitative components.
2. A subcommittee of qualitative experts to be appointed to the subcommittee
3. If a way can be found to issue the quantitative part for trial use with the placeholders identifying the qualitative text is to come later, that is the preferred way of proceeding with the current draft.

Also, based on direction from the 2006 ANS Standards Board Chair James Mallay (via email 2/15/2006), the Standard should not have "placeholders" for future sections, except potentially as explanatory words in the Foreword.

At the June 27, 2007, RISC meeting in Boston, this issue was revisited. It was decided to begin the drafting of a qualitative section and to decide further at the November 2007 RISC meeting how to proceed.

Conclusion:

New members have been added to the writing group and tasked to draft a qualitative risk assessment ("QLRA") section for this standard. The first QLRA draft was distributed for review by the entire RISC Committee in late January 2008. As the QLRA draft has been completed, the LPSD Working Group was directed by the RISC Committee at the March 2008 teleconference to incorporate it in the revised LPSD draft standard before releasing for reballot.

RISC Issue #2

Issue: A number of comments addressed the lack of guidance ("how to") on specific technical issues related to LPSD PRA. Clearly the Standard is not the vehicle for such guidance but it is clear that such guidance does not exist in any coherent form.

WG Recommendation: The WG recommended that a detailed Guidance Document be developed to address the application of PRA methodology to low power and shutdown conditions. Thus, some comments would NOT be accepted if the WG considers the comment to be more appropriate to a guidance document ("how to") rather than the Standard.

RISC Decision: The following motions were passed at the November 2005 meeting:

1. Consistent with other PRA standards, previous guidance from RISC, and the anticipated guidance from the coordinating committee, the LPSD standards should focus on the "what" and not the "how to." … Additional detailed guidance [should] not be added within the standard.
2. … Additional guidance is needed for PRA practitioners. … A separate guidance document [should be developed] …, with the understanding that RISC is not committing to sponsor the guidance document.

Conclusion: For comments that relate to lack of guidance on specific technical issues related to LPSD PRA, the study team will determine if the request is appropriate for the Standard. If not, the response will indicate NOT *Accepted:* with the *Resolution: This comment seeks more guidance than is deemed appropriate for the standard at this stage.*

RISC Issue #3

Issue: Several comments raised the issue of outage-specific risk assessment vs. an average risk assessment for LPSD. The currently envisioned applications focus on outage-specific assessments.

WG Recommendation: The WG wrote the original version of the Standard using a framework based on an average risk model. Several reviewers raised questions about specific outage assessment versus average risk assessment. This issue was referred to the RISC Committee. The issues include how to calculate average LPSD risk, how to calculate outage specific risk, and how to relate the two.

RISC Decision: The following motion was passed at the November 2005 RISC meeting:

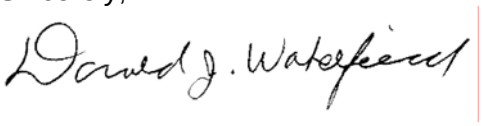
> The LPSD standard should be revised to include a section on the requirements for development of LPSD PRA as a configuration risk management (CRM) model for outage-specific applications.

Conclusion: The outcome of the above is that a new Section 3.7 ("Specific Outage Applications") has been written, describing how to use the Standard to analyze a specific outage. In this section can be found a discussion, followed by a table with those few requirements, less than 20 in number, that are different for such an application. This allows the Standard to be used for either an average-risk assessment or a specific-outage-risk assessment.

A list of writing group leads as well as responses to all NRC comments is provided in table form. The Comment Resolution Table has two columns that indicate the resolution to each comment, "Accepted?" and "Resolution". A "YES" in the Accepted column indicates that the Writing Group substantively agreed with the comment and made a change to the Standard to address the comment, as documented in the Resolution column. In some cases, a "NO" indicates a technical disagreement with the comment, as documented in the Resolution column. However, in most cases, a "NO" did not indicate disagreement but that the resolution was out of the scope of the writing group.

I hope you find the comment responses satisfactory. A revised draft is expected to be issued shortly for a second committee ballot with concurrent public review.

Sincerely,



Donald J. Wakefield
ANS-58.22 Working Group Chair

Attachments

C: Allen L. Camp, RISC Chair
Robert J. Budnitz, RISC Vice Chair
Daniel O'Neal, NRC
Mary Drouin, NRC
Mark Rubin, NRC
Patricia Schroeder, ANS Standards Administrator

List of Writing Group Leads for LPSD Standard Sections

Section	Title	LEAD from Writing Group
1	Introduction	Ken Kiper, Bill Burchill
2	Acronyms & Definitions	Ken Kiper
3	Application Process	Bob Budnitz/ Don Wakefield
4.1 – 4.3	Technical Requirements	Ken Kiper
4.4	POS Analysis	Jeff Julius/ Bill Stillwell
4.5.1	Initiating Event	Bill Burchill
4.5.2	Accident Sequence Analysis	Bill Stillwell
4.5.3	Success Criteria	Bill Stillwell
4.5.4.	Systems Analysis	Bill Stillwell
4.5.5	HRA	Dennis Bley
4.5.6	Data	Dennis Bley
4.5.7	Internal Flooding	Yehia Khalil
4.5.8	Quantification	Bill Burchill
4.5.9	LERF Analysis	Dan O'Neal/ Bob Budnitz
4.6	External Events	Bob Budnitz
4.7	Screening Methodology	[Deleted]
4.8	Qualitative Risk Assessment	[Deleted]
5.	LPSD Configuration Control	Don Wakefield
6.	Peer Review	Ken Kiper
7.	Shutdown Qualitative Risk Assessment	Doug Hance
8.	References	Don Wakefield
App. A	POS Methodology	Jeff Julius/ Bill Stillwell
App. B	Risk Metric Calculation Methodology	Bill Burchill
App. C	Qualitative Risk Assessment: POS Methodology	[Deleted] replaced by new appendix, Doug Hance
App. D	Technical Basis for QLRA Methodology	Doug Hance (new)

NRC Comments / Responses to the LPSD PRA Standard DRAFT #6c

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
1	NRCa		1.1	*	In Section 1.1, the standard indicates that a qualitative risk assessment is within the scope of a probabilistic risk assessment (PRA). A qualitative assessment is not quantitative, and therefore, it is *not* a probabilistic risk assessment.	NO	The RISC has directed that a new section related to QLRA methods be incorporated in the standard for ballot. The applications for which QLRA methods are intended is also noted in that new section.	DWak	X
1	NRCb		1.1		3rd paragraph: The following sentence could lead to confusion: "In this introductory Section 1, the phrase "PRA" is used in a generic sense to include methods identified in the Standard that may not be thought of as traditional probabilistic risk assessment methods." Qualitative methods for example are not PRAs. POSITION: Qualification PROPOSED RESOLUTION: ~~"In this introductory Section 1, the phrase "PRA" is used in a generic sense to include methods identified in the Standard that may not be thought of as traditional probabilistic risk assessment methods."~~ ~~Specifically, qualitative .... are also included within the scope of the phrase PRA.~~ **"Although PRAs and qualitative methods are capable of supporting risk- informed methods, the distinction between them and their applicability to develop risk insights needs to be clearly understood. When quantitative results are required the appropriate tool is a PRA."**	YES	Deleted the paragraph in Section 1 and added the suggested text.	KKip	X

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
2	NRCb		1.2		last paragraph: The commentary does not aid in the derivation of LPSD technical requirements but is more appropriately characterized as interpretation. POSITION: Clarification PROPOSED RESOLUTION: "To aid in the ~~derivation~~ **interpretation** of LPSD technical requirements."	YES	Revised text as suggested.	KKip	X
3	NRCb		1.3.2		4th paragraph: The discussion of the various configurations should include a discussion of the containment status. POSITION: Qualification PROPOSED RESOLUTION: Add commentary on the status of containment in the various general plant states.	YES	The associated text was moved to Appendix A and the comment addressed with a text change in Appendix A to include containment status.	JJul	
4	NRCb		1.3.2		4th paragraph: Clarification for low power description. POSITION: Clarification PROPOSED RESOLUTION: "Low Power - Power levels at which major secondary components are out of service as a plant shuts down or starts up. This is typically a transition mode to**/from** hot shutdown."	YES	Revised text as suggested.	KKip	X

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
5	NRCb		1.3.2		4th paragraph: The discussions of the characteristics of hot and cold shutdown need to be revised to prevent confusion when the analyst defines the POSs for their shutdown analysis. POSITION: Clarification PROPOSED RESOLUTION: Clarify the following: Hot Shutdown - PWR licensees typically cool down with RHR from approximately 345°F to 200°F. BWR licensee typically initiate RHR in hot shutdown when RCS pressure is reduced to approximately 100 psig. Therefore, steaming (as stated in the Standard) is not the primary means of decay heat removal. Cold Shutdown - In PWRs, the RCS is breached to permit RCS draining in cold shutdown. Therefore, the statement in the Standard, "the reactor coolant system pressure boundary remains generally intact" is not generally true.	YES	The associated text was moved to Appendix A and the comment addressed with a text change in Appendix A to include these specific examples.	JJul	
6	NRCb		1.3.2		3rd paragraph: This paragraph states "... the conditional core damage probability (CCDP) may be much higher than the average at full power CDF...." There is an inconsistency in comparing CCDP to CDF (comparing a probability to a frequency). Also, it is not clear what the conditionality refers to. POSITION: Clarification PROPOSED RESOLUTION: Explain the conditionality, and make a consistent comparison.	YES	The associated text was moved to Appendix A and the comment addressed with a text change in Appendix A to make the comparison consistent. Same comment as Finnicum #4.	JJul	X

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
7	NRCb		1.3.3		1st sentence: Frequency multiplied by consequence is one metric for measuring expected risk. POSITION: Clarification PROPOSED RESOLUTION: ~~Risk is generally defined as "frequency multiplied by consequence" for a set of accident sequences. However,~~ risk is commonly represented ...	NO	The first sentence is the "textbook definition" of risk. The second sentence acknowledges that most risk evaluations use surrogates.	WBur.	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
	NRCb		1.3.3		This section needs editing to ensure that the units for each of the CDF measures is clearly specified, i.e., whether the units are per calendar year or per POS year.	YES	All units on CDF are per calendar year.	WBur/ DWak	
					Specific examples are:				
					1st Paragraph: The sentence "Either is acceptable as long as it is applied in a manner consistent with the data upon which it is based." is unclear.	YES	Sentence changed to state per calendar year is required consistent with IE-C3		
					2nd paragraph: It is not a convolution, but an addition.	YES	Revised to replace "convolution" with "summation."		
					3rd paragraph: The 2nd sentence needs revision. Frequencies of initiating events may be stated per year (although it could be just as easily stated per hour), but equipment and human failures (rates?), and equipment unavailabilities are not. Unavailability is dimensionless.	YES	Sentence revised.		
					The equation for the aggregate core damage frequency terms identified in Section 1.3.3 is valid only if the risk is not impacted by the number of evolutions into and out of a POS rather than just how long the plant was in a POS. Therefore the discussion should address the transition risk associated with entering a given POS.	YES	Appendix B and 1.3.3 have been modified to note that the POS fractions must account for both the average duration of a POS and the frequency of outages involving that POS when estimating the fraction of time in a POS.		
					POSITION: Qualification				
					PROPOSED RESOLUTION: See general comments. The note on Table 4.5.1-2(c)) in Addendum B of the ASME Standard provides clarification on the term reactor year vs. calendar year, and operational state year.	NO	Note 3 on Table 4.5.1-2(c) addresses resolution of calendar year and reactor year. It does not address consideration of POSs with different durations. See revision to Appendix B and 1.3.3 to address other parts of the comment.		
					The CCDP for each POS is dimensionless. Therefore, the issue of defining a CDF for a POS is really a function of how the initiating event frequencies are defined. If defined on a per calender year basis, the frequencies and durations of the POSs are taken into account in the estimation. Then, the total CDF is the sum of the				

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9	NRCb		1.4		The last paragraph may cause confusion, particularly by drawing a parallel with the modeling of maintenance at full power as random unavailability . While individual maintenance configurations may be modeled as being random at shutdown, individual systems, structures, and components (SSC) maintenance terms are not. POSITION: Clarification PROPOSED RESOLUTION: Delete the paragraph or expand it, clarifying that the comparison is between the use of a "baseline" model with maintenance configurations modeled as random unavailabilities, and the configuration specific model where only those SSCs in maintenance have an associated unavailability.	YES	Text changed as proposed.	JJul	
10	NRCb		1.4		2nd paragraph, 2nd sentence: Clarification on references as outage types. POSITION: Clarification PROPOSED RESOLUTION: "Average" and "situation-specific" outages should not be referred to as "types of outage". An outage type is defined in a specific way in the definitions section. This discussion is more related to type of application.	YES	Revised text consistent with comment.	KKip	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
11	NRCb		1.4		Future outages are required to be reviewed in POS-A4. A future outages review may be applicable to other requirements than the POS requirements. POSITION: Clarification PROPOSED RESOLUTION: Add a paragraph to Section1.4 to the need and scope for a future outage(s) review, and the review's use.	NO	Section 1.4 is too high a level, and does not specifically address future outages and thus it would not fit to address other, future considerations. Section 3.7 was added to address situation-specific outages.	JJul	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
12	NRCb		2.2		Additional definitions are needed. POSITION: Qualification PROPOSED RESOLUTION: Add to definitions section: per reactor year: the standard appears to use this frequency unit when the fraction of a calendar year is assumed to be 1, i.e., not adjusted for fraction of a year. Note that this usage is inconsistent with the note added to Table 4.5.1-2(c) in Addendum B of the ASME Standard. conditional CDF (LERF): standard appears to use this as conditional on being in a given POS with units of per reactor year. It should be defined as used in the Standard. (Note: The ASME Standard does not use the term “conditional” CDF (LERF).) conditional CDP: see note on conditional CDF. annual average CDF (LERF): critical safety functions: key safety functions: See ASME standard Addendum B low power and shutdown state: used in Section 4.4 objectives (a). precursor event: used in IE-A7 by reference. Though not defined in the ASME Standard, some clarification is needed here. For example, if an inadvertent loss of RCS inventory is terminated well before suction for the RHR pumps is lost, this would not be a “shutdown initiating event”. However, it is an indication of a type of problem that could have become an initiating event, i.e., a precursor.	YES	Text changed as proposed, after checking for consistency with existing definitions, with the exceptions noted below. Note, the “per reactor year” definition was not changed since it was addressed separately in the next comment resolution. Key safety functions – not added since defined in ASME Addendum B. Low Power and Shutdown State – text changed in Section 4.4.	JJul	

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13	NRCb		2.2		Clarification of definitions are needed. "low power: ..... The power level that distinguishes full power and low power is the power level below which major plant evolutions are required to reduce or increase power (e.g., taking manual control of feedwater level)." POSITION: Clarification PROPOSED RESOLUTION: "per calendar year: units for CDF or LERF, **the calculation of** which include**s contributions from each POS, taking into account** the fraction of time **spent in that** ~~in a specific~~ POS ~~(or group of POSs)~~ **normalized to one calendar year** ... This would be consistent with HLR-POS-C. " "hot standby: a POS (or set of POSs) during which the reactor is at zero power with the primary system at or near normal **operating** temperature and pressure." The statement talks about being **below** which major plant evolutions are required to **reduce or increase** power. It is presumably that power level above which major plant evolutions are required to increase or decrease power. "The power level that distinguishes full power and low power is the power level ~~below~~ **above** which major plant evolutions are required to reduce or increase power (e.g., taking manual control of feedwater level)."	YES / NO	Low power – disagree with suggested text. It appears to be a difference of opinion about what constitutes "low power." The intent of the definition is to include power levels up to 60 or 70%, below which major equipment states are changes (e.g., a heater drain pump is taken off line at ~60% power when shutting down the plant). Note that this is significantly different from the Tech Spec definition of Low Power as >5% power. Per calendar year – text revised as suggested. Hot standby – text revised as suggested.	KKip	X

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14	NRCb		2.2		Initiating event: The definition should parallel more closely that in the ASME Standard, and also clarify that the initiating events at shutdown are of a different character. POSITION: Clarification PROPOSED RESOLUTION: initiating event: ~~an incident that challenges or causes loss of a critical safety function.~~ **Any event either internal or external to the plant that causes an unplanned change to the plant state thereby initiating an abnormal event. Initiating events trigger sequences of events that require operator intervention and activation of mitigating systems whose failure could potentially lead to core damage or large early release. (Modified ASME Standard definition)** Initiating events at low power include essentially the same types of events as at full power, however ~~the~~ both the definition and the likelihood of specific initiating events is dependent on the plant operational states, and typically involve a reactor scram ~~or initial state of subcriticality~~ from a **low power state, or a loss of the decay heat removal function by, for example, a loss of inventory, loss of the operating train of decay heat removal, or loss of reactivity control when the reactor is subcritical** ~~initial state of subcriticality~~. ~~Typical initiating events during shutdown include loss of decay heat removal, loss of the heat removal function, and loss of inventory."~~ **The loss of decay heat removal could be modeled as a loss of the operating train, or as a complete loss of function.**	NO	The proposed definition leads to another term (abnormal event) that needs to be defined. The term "initiating event" clearly needs to be defined consistently between the LPSD Standard and the ASME Standard. The WG suggests postponing this issue until the standards are integrated into a combined PRA standard.	KKip	X

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15	NRCb		2.2		Clarification of definitions are needed. POSITION: Clarification PROPOSED RESOLUTION: POSs: The use of the word configuration in this definition is confusing. In the current context it appears to be used at a relatively high level to determine which functions and/or systems are available to mitigate an initiating event. When used at the system level it refers to specific system line-ups specifying which components are out of service for example. Clarify the use of the word configuration. "Safety Function Assessment Tree (SFAT): a set of ORAM-Sentinel rules for mapping levels (typically trains) of safety equipment availability or unavailability to a color code." Where is this term used? If it is not used it does not need a definition. If it is used in a broader context than ORAM-Sentinal, the definition should be generalized. "shutdown: ... accepted meanings in the LPSD PRA context: (a) a POS during which the reactor power level is being decreased from full power to low power (as in "a normal plant shutdown is the first step in a refueling outage") , and (b) the collection of POSs during which the reactor is non-critical ~~(as in "Low Power and Shutdown PRA"~~) ... " startup: clarification should be provided. This definition should be prefaced with the statement "this term has two generally accepted meanings in the LPSD PRA context...", as in the definition of "shutdown". transient: define to be consistent with IE- A2, to clarify the broader meaning than that normally used in full power PRAs which is typically related to reactor trip. transition: The definition of transition may be too	YES / NO	POS – no change. The term "configuration" is explained in the definition ("…e.g., core power level, primary water level, …"). In this understanding of POSs, maintenance configurations are mapped onto POSs, but are not part of the POS definition. (This clearly needs to be expanded in a Guidance Document for LPSD – see RISC Issue #2). SFAT – this term has been deleted. Shutdown – text revised as suggested. Startup - text revised as suggested.	KKip	X

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16	NRCb		3.2		The examples contain "conclusions" that might not be appropriate in a real world example. For example, in example B, Section 3.2.1, the conclusion that LERF is not an important issue based in part on insights from the full power high winds hurricane PRA might not be realistic. The containment could be opened and the risk from LERF should be evaluated. POSITION: Clarification PROPOSED RESOLUTION: Clarify in the examples that LERF should be evaluated when containment could be open.	YES	The comment is accepted, and an appropriate change has been made to the text of Example B..	RBud.	X
17	NRCb		3.5		2nd paragraph, item (b): The guidance implies if 90% of the total CDF is not affected by sensitivity studies or bounding evaluation on the aggregate impact of the exceptions to the requirements, then the PRA is acceptable for the application. Therefore, for a plant whose LPSD risk (for a POS or group of POSs) is less than 10% of the total CDF, regardless of the quality of the PRAs, its LPSD PRA is automatically acceptable for any LPSD specific application. POSITION: Qualification PROPOSED RESOLUTION: "(b) Modeled accident sequences accounting for at least 90% of CDF/LERF, as applicable, are not affected by appropriate sensitivity studies or bounding evaluations. (Note, this is 90% of the ~~total CDF rather than the~~ CDF**/LERF** in any one POS). ...."	YES	Agree to modify item (b) to make the second sentence read as follows …..(Note, this is 90% of the total CDF/LERF in any one POS). –	DWak	

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18	NRCb		4.4		Objectives: Objectives (b) and (d) are written as requirements. POSITION: Clarification PROPOSED RESOLUTION: "(b) Low-power and ... each other ~~must be~~ **are** shown to ...." "(d) .....the systems available for decay heat removal ~~must be~~ **are** well characterized."	Yes	Incorporated	BStil	
19	NRCb		4.4		Provide a clarification on what is meant by characterization of POSs and its distinction from POS definition. POSITION: Clarification PROPOSED RESOLUTION: Clarify definition vs. characterization of POSs.	YES	Changed the word "characterized" to "defined" in POS-a HLR and SLR.	JJul/ BStil	
20	NRCb		4.4		POS-A3: Use of nozzle dams (or, in general RCS pressure capability), and isolation of RCS loops are also important in defining or characterizing POSs. POSITION: Clarification PROPOSED RESOLUTION: "Activities changing RCS configuration and parameters used to define the POS, e.g., draindown, filling and venting, dilution, fuel movement, ~~and/or~~ cooldown, **RCS pressure capability (eg, nozzle dams/loop isolation)**."	YES	Modified	BStil	

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21	NRCb		4.4		POS A3: POSs must be clearly defined before grouping POSs is considered. Examples would be helpful. POSITION: Qualification PROPOSED RESOLUTION: Add examples of considerations for POS definitions (p. 106 in App. A) to POS-A3 to ensure adequate POS definition before grouping of POSs is considered.	YES	Examples added	JJul/ BStil	
22	NRCb		4.4		POS-A3: The comment seems contradictory to the requirement, which says to DEFINE the characteristics of each POS in terms of .... Containment status. The comment suggests that containment status may be a variable within a POS. In addition, it would be useful to include examples of containment status. POSITION: Clarification PROPOSED RESOLUTION: Clarify whether this is a grouping concept, in which case this should be addressed in POS-B. In addition, clarify that system alignments are those that are possible within a fixed RCS configuration. Containment status could include de- inerted (for BWR Mk I and Mk II), intact, or open.	YES	Removed containment status from comments, and added examples	BStil	

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23	NRCb		4.4		POS-B1: The commentary provides some guidance on when a POS can be combined, but not when they should not be combined. POSITION: Clarification PROPOSED RESOLUTION: Add guidance also as to when POSs cannot be combined in the commentary. For example, unique POSs are to be maintained as noted in POS-B3, etc.	NO	Additional guidance provided in subsequent POS B Supporting Level Requirements	JJul/ BStil	
24	NRCb		4.4		POS-B1: The statement in the comment that "The frequency of the combined POS is not the sum of the frequency of the smaller POSs" should be clarified. How is the frequency of the combined POS used? How does it relate to the duration, fraction of a year, and outage type? POS-C3 suggests using the highest frequency of the subsumed POSs. In Section 1.3.3 and App B, it is not used. Since HLR-B is concerned with grouping, this commentary seems out of place. POSITION: Clarification PROPOSED RESOLUTION: If retained in this SR, replace by: "The frequency of the combined POS**s** is not the sum of the frequency of the smaller POSs; **rather it is the highest frequency of subsumed POSs (POS-C3).**"	YES	Removed Section	BStil	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
25	NRCb		4.4		POS-B2: Under (a) the meaning of timing in this context should be clarified. POSITION: Clarification PROPOSED RESOLUTION: For example does timing refer to early or late with respect to the outage?	YES	Removed timing and reworded.	BStil	
26	NRCb		4.4		POS-B2: Under (b) clarify “key contributors”. POSITION: Clarification PROPOSED RESOLUTION: Specify what “key contributors” refers to.	YES	Modified sentence to identify key contributors to CDF and LERF	BStil	
27	NRCb		4.4		POS-B2: “If this grouping scheme produced an unreasonable CDF result, then it would be necessary to subdivide the POS into smaller states.” POSITION: Qualification PROPOSED RESOLUTION: Delete this sentence and add a new POS requirement: REVIEW results produced from grouping scheme. If results are unreasonable or mask key contributors to risk insights, RE- EVALUATE POS grouping scheme, including possible subdivision of the grouped POS. This would be consistent with the discussion on p. 23.	YES	Changed as follows: “REVIEW results produced from grouping scheme. If results are significant in terms of plant risk or mask key contributors to risk insights, RE-EVALUATE grouping scheme, including possible subdivision of the grouped POS.	BStil	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
28	NRCb		4.4		POS-B4: Cat I: "Group initiating events ...." This is an IE requirement. The Capability Category II/III discussion is in terms of activities, which seems to make more sense. POSITION: Clarification PROPOSED RESOLUTION: Clarify requirement for Capability Category I.	YES	Added text to POS-B4 for Capability Category I. While the discussion centers on initiating events, it is their impact on the POS that makes this a POS requirement. Other POS requirements involve other PRA elements and their impact on grouping. For example, POS-B2 involves success criteria impacts.	JJul/ BStil	
29	NRCb		4.4		POS B5: This SR makes sense for a configuration specific analysis, but may not be as relevant for defining an "average" configuration. POSITION: Qualification PROPOSED RESOLUTION: See general comments.	NO	Added comments for situation specific outage. In the context of defining POS, knowledge of future outages will help ensure unique POSs that don't require redefinition.	BStil	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
30	NRCb		4.4		POS-C3: It is not clear what the consequences of the requirement to "Use the highest frequency of subsumed POSs as the frequency of the group" are. Does this mean some evolutions are subsumed such that say evolutions leading to hot shutdown only may be subsumed with those leading to cold shutdown? If so, this might lead to a very conservative estimate of risk, if the cold shutdown evolutions pose more risk. POSITION: Clarification PROPOSED RESOLUTION: Consider if there is a need for a clarification to associate a POS frequency with an outage type. For example, in POS- C3 "... Use the highest frequency of subsumed POSs, **where the POS frequencies are associated with the outage type being modeled versus POS frequencies based on all outage types**, ..."; or, other guidance may be considered.	NO	The example would not be grouped. I don't think the clarification adds to the concept of grouping.	JJul/ BStil	
31	NRCb		4.4		POS-C4: See comment on Table 4.4-3, POS-B5 POSITION: Qualification PROPOSED RESOLUTION: See above for the comment on Table 4.4- 3, POS-B5.	YES	Changed to resemble POS-B5	BStil	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
32	NRCb		4.5.1		IE-A2: The human induced IEs are particularly important, so consider highlighting this as suggested here. POSITION: Clarification PROPOSED RESOLUTION: Add to the discussion above the examples: "**INCLUDE in the analyses both equipment and human-induced events.**"	NO	IE-A2 revised to be consistent with ASME 2007 PRA Standard .	WBur.	
33	NRCb		4.5.1		IE-A2: In item (a) Transients, the parenthetic remark (i.e., for POSs with the RCS vented) is confusing. In addition, the examples get into causes of the initiating event (e.g., spurious valve closure). Some identification of causes is important, particularly when the cause of the loss is operator induced, since this has implications for recovery (see above). It may be better to give the examples like: loss of heat removal due to loss of train (mechanical); loss of heat removal train due to overdraining, etc. POSITION: Clarification PROPOSED RESOLUTION: (a) Transients. INCLUDE ..... and leave the primary system boundary ~~intact~~ unchanged (i.e., ~~for POSs with the RCS vented~~ **intact or open)**.	YES	Revised using suggested parenthetic note and placed examples in commentary column. Examples are revised per another reviewer.	WBur.	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
34	NRCb		4.5.1		IE-A2: One more LOCA type should be considered: Cold Overpressure-Induced LOCAs. Also, should fuel handling accidents be considered? POSITION: Qualification PROPOSED RESOLUTION: Add: "**(9) Cold Overpressure-Induced LOCAs**" to the list.	YES	Revised to add suggested type.	WBur.	
35	NRCb		4.5.1		IE-A2: Commentary: It is not clear why (f) was necessitated by the decision to include external hazards. POSITION: Clarification PROPOSED RESOLUTION: Clarify commentary on (f).	YES	Revised to delete reference to (f) in the commentary note.	WBur.	
36	NRCb		4.5.1		IE-A4: The SR does not specifiy for which Capability Category the requirement is written. The ASME Standard has separate requirements for each Capability Category. POSITION: Clarification PROPOSED RESOLUTION: Specify all three categories since in some instances, the plant-specific detailed approach of Cat III may be appropriate. In fact, Cat I - III is implied by Section1.5 PRA Capability Categories: "Where there are new requirements herein (e.g., the PRA Element POS), three Capability Categories of requirements are defined, with the same understanding in the ASME PRA Standard (ASME-2003)."	YES	Revised to be the same as ASME 2007 PRA Standard.	WBur.	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
37	NRCb		4.5.1		IE-A4: Is “plant evolution” meant to be “LPSD evolution” or is it different? POSITION: Clarification PROPOSED RESOLUTION: Clarify and provide a definition if necessary.	YES	Revised to be the same as ASME 2007 PRA Standard.	WBur.	
38	NRCb		4.5.1		IE-A7: Commentary: A precursor should not be counted as an initiating event, but may give insights into the types of occurrence that could lead to an initiating event, and that might be useful when creating logic models for analyzing initiating events. POSITION: Clarification PROPOSED RESOLUTION: Add to commentary that a “precursor event” is not an initiating event. For example, a draindown terminated well before loss of RHR suction would not be a shutdown initiating event, but a precursor event.	NO	Revised to be the same as ASME 2007 PRA Standard.	WBur.	
39	NRCb		4.5.1		IE-A9: The change appears to apply to Capability Categories II/III only. POSITION: Clarification PROPOSED RESOLUTION: Clarify Capability Categories I - III.	NO	Deleted as in ASME 2007 PRA Standard.	WBur.	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
40	NRCb		4.5.1		IE-B3: Human induced initiators should not be grouped because of the potential dependency with mitigation/recovery actions. POSITION: Clarification PROPOSED RESOLUTION: Either this SR should be rewritten, or the note should caution against grouping human induced initiators because of the dependency with the mitigation/recovery. While this may be read into the phrase "similar in terms of, ... effect on the operability and performance of operators and ... ", it should be made more clear to avoid ambiguity.	YES	Revised to be the same as ASME 2007 PRA Standard. Added caution to commentary.	WBur.	
41	NRCb		4.5.1		IE-C3: The ASME standard differentiates between Capability Categories. POSITION: Clarification PROPOSED RESOLUTION: Show it applies to all Capability Categories I/II and III.	YES	Second sentence revised to refer to POS time fraction rather than plant availability. Third sentence left unchanged and applicable to all capability levels due to potential significant variability from one outage to another.	WBur.	
42	NRCb		4.5.1		IE-C3/App B: In IE-C3 the fraction of time is embedded in the initiating event. Therefore, the CDF used in Appendix B must have units without the fraction of time (ie, per reactor year). POSITION: Clarification PROPOSED RESOLUTION: Clarify in Appendix B the units of CDF.	NO	The definition of CDF in App. B is fully consistent with IE-C3.	WBur.	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
43	NRCb		4.5.1		IE-C4: Screening criteria: (1) IE-C3 combined with the screening criteria in IE-C4 (a) creates the potential to screen on an initiating event frequency which has been adjusted by the fraction of time in a POS. Using a large number of POSs could cause the fractions to become very small and the risk contribution of some POSs with high conditional core damage probability could be lost. For a specific- outage approach, screening on an initiating event frequency not adjusted by the fraction of time in a POS may be more appropriate. (2) account for shutdown configurations with the RCS vented in part (a). POSITION: Qualification PROPOSED RESOLUTION: "(a) the frequency of the event is less than 1E-7 per reactor year (/ry) and the event does not involve either an ISLOCA, containment bypass, or reactor vessel rupture, **or an initiating event with the reactor coolant system vented and containment pressure capability reduced or open. DO NOT define POS durations for the purpose of facilitating screening.**" Add to the commentary: **"For a specific- outage approach, screening on an initiating event frequency not adjusted by the fraction of time in a POS may be more appropriate.**"	YES	Commentary revised to include suggested caution.	WBur.	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
44	NRCb		4.5.1		IE-C4: In shutdown, the reliability of trains can be different from that at power. To ensure important sequences are not screened out, modify part (b). POSITION: Qualification PROPOSED RESOLUTION: "(b) the frequency of the event is less than 1E-6/ry and core damage could not occur unless at least two **reliable, independent** trains of mitigating systems are failed independent of the initiator."	NO	LPSD presents nothing unique in applying this SR. Revised to be the same as ASME 2007 PRA Standard.	WBur.	
45	NRCb		4.5.1		IE-C6/ 7/ 8/ 9: The requirements should include the potential for errors of commission as contributing causes to initiating events, i.e., as basic events in the fault tree model. POSITION: Qualification PROPOSED RESOLUTION: Include explicit requirements to include EOCs.	NO	LPSD presents nothing unique in applying these SRs. Revised to be the same as ASME 2007 PRA Standard.	WBur.	
46	NRCb		4.5.1		IE-C7: The commentary is unclear. Either support system failure <u>will cause</u> an initiating event during a given POS or support system failure <u>is not assumed to cause</u> an initiating event during a given POS. If the comment is related to the calculation of the contribution to CDF, it is covered in Section 1.3.3 POSITION: Clarification PROPOSED RESOLUTION: Rewrite to explain what the point of the comment is.	YES	Commentary revised as suggested.	WBur.	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
47	NRCb		4.5.1		IE-C7: When developing an IE fault tree, it is necessary to take account that, in some circumstances, equipment failure probabilities may be unique to the configuration in which they occur. Hence it may not be enough to simply take the data used for the full power PRA and scale it to the fraction of time the plant is in the POS of interest. POSITION: Clarification PROPOSED RESOLUTION: Add a commentary to this effect.	YES	Commentary revised as suggested.	WBur.	
48	NRCb		4.5.1		IE-C: The section recognizes fault tree approaches for estimating frequency; however, for shutdown a procedural event tree approach may be used also. POSITION: Clarification PROPOSED RESOLUTION: Mention procedural event tree approaches in the section.	YES	Commentary revised as suggested.	WBur.	
49	NRCb		4.5.2		Objectives: Clarification that POSs can occur at different times after shutdown. Clarification add in (a): “ Accident sequences need to be defined ... , **and the times that a POS can occur.**”	YES	Changed as recommended	BStill	
50	NRCb		4.5.2		Objectives: Objective (a) is written as a requirement. POSITION: Clarification PROPOSED RESOLUTION: “The accident sequences ~~need to be~~ **are** defined ....”	YES	Changed as recommended	BStill	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
51	NRCb		4.5.2		AS-A1: Include accounting for changing plant conditions within a POS. POSITION: Clarification PROPOSED RESOLUTION: "CHOOSE a method for accident sequence analysis that explicitly MODELS the appropriate combinations of system responses and operator actions that affect the key safety functions**, accounting for changing plant conditions within a POS**, for...."	YES	Changed as recommended	BStill	
52	NRCb		4.5.2		AS-A4/ 5: There may be fewer formal procedures for dealing with occurrences at shutdown POSITION: Clarification PROPOSED RESOLUTION: A commentary on the availability and nature of shutdown procedures would be helpful.	NO	With the exception of Emergency Operating Procedures, formal procedures exist for all aspects of shutdown plant operation	BStill	
53	NRCb		4.5.2		AS-B1: The added example is not sufficiently clear, or is in the wrong place. POSITION: Clarification PROPOSED RESOLUTION: As a minimum, move the example after the sentence "INCLUDE the impact ...." However, the question of dependence may be more of a quantification issue. The impact on the accident progression is more that the operator has to make a recovery action to correct his error.	YES	Moved the example as suggested	BStill	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
54	NRCb		4.5.2		AS-B2: Add an example related to containment conditions. POSITION: Clarification PROPOSED RESOLUTION: **"c) system dependencies on containment conditions (e.g., de- intertion, pressure capability, sump clogging)**."	Yes	Added suggested resolution	BStill	
55	NRCb		4.5.2		AS-B2: AS-B2 specifies "For each critical safety function...." High Level Requirement A by reference to the ASME Standard requires the identification of key safety functions. POSITION: Clarification PROPOSED RESOLUTION: Replace critical safety functions by key safety functions. Note that in Addendum B of the ASME Standard, the phrase "For each critical safety function...." has been deleted.	YES	Modified as suggested	BStill	
56	NRCb		4.5.2		AS-B1/AS- B2/AS-B6: These requirements should reference the new HRA requirement identified below for dependencies between human actions. HRA analysts should be involved in this determination since they should be the best informed on what dependence mechanisms apply to human actions. POSITION: Clarification PROPOSED RESOLUTION: Add a reference to the new requirements in the HRA section for dependencies between human actions as appropriate.	Yes	See HR-H3	BStill	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
57	NRCb		4.5.2		AS-B3: The commentary is misleading POSITION: Clarification PROPOSED RESOLUTION: "For example, ... at the start of an accident **sequence** ...~~during the progression from initiating event to core damage~~ **as conditions change**. (RCIC is ..... due to lack of steam, **but as the RCS heats up and pressurizes, it may become available**)"	YES	Changed as recommended	BStill	
7	NRCa		4.5.3	*	As with the ASME standard, there is concern about the accuracy and robustness of thermal hydraulic codes used for thermal hydraulic analysis at shutdown conditions, particularly given the variety of POS′s, reactor coolant system openings, and containment openings. As with the ASME standard, the code requirements for acceptability need to be stated. Specifically, the thermal hydraulic computer codes used need to be (1) developed, validated, and verified in sufficient detail to analyze the phenomena of interest, (2) applicable in the pressure, temperature, and flow range of interest, and (3) utilized by qualified trained users who have an understanding of the code and its limitations.	NO	Code requirements modified in ASME-2007, for SC- B.	BStill	
58	NRCb		4.5.3		SC-A4/ 5: Clarify for each POS. POSITION: Clarification PROPOSED RESOLUTION: For clarity, modify the first sentence in SC- A4 and 5 to read, ".... for each initiating event group **and for each POS.**"	YES	Modified as described for SC-A4 and SC-A5	BStill	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
59	NRCb		4.5.3		SC-B3: Include the effect of the POS definition and characterization, including changing decay heat level in the consideration of defining success criteria. POSITION: Clarification PROPOSED RESOLUTION: "When defining success criteria, USE thermal/hydraulic, structural, or other analyses/evaluations appropriate to the **POS definition and characterization and** the event being analyzed, and accounting for a level of detail consistent with the initiating event group (HLR-IE-B) and accident sequence modeling (HLR-AS-A and HLR-AS-B), **and the effect of decreasing decay heat.**"	YES	Revised as text similar to proposed resolution	BStill	
60	NRCb		4.5.4		SY-A2: General Operating Procedures, with their references to specific system OP□s in preparation for shutdown, also need to be reviewed. Many systems are re-aligned, tagged out, have their automatic functions disabled, etc, in the process of going into an outage. POSITION: Clarification PROPOSED RESOLUTION: While this could be argued to be covered in the note, explicitly adding the sentence: "**Many systems are re-aligned, tagged out, have their automatic functions disabled, etc, in the process of going into an outage.**" would make the note more informative.	YES	Revised as indicated	BStill	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
61	NRCb		4.5.4		SY-A18: The comment should be expanded to provide additional guidance. POSITION: Clarification PROPOSED RESOLUTION: See the general comments. Expand the discussion to reflect the fact that, for the average CDF calculations the model has to have a separate basic event for each unique group of component outages. The set of maintenance acts is much larger than the set for full power operation when the number of configurations is restricted by tech specs. For configuration specific models, only the specific combinations need to be included.	Yes	Revised as indicated in general comments	BStill	
62	NRCb		4.5.4		SY-B13: Non-proceduralized recovery actions are permitted by HR-H2. Address non- proceduralized recovery actions also POSITION: Clarification PROPOSED RESOLUTION: "DO NOT USE proceduralized **or non- proceduralized** recovery actions as the sole basis for eliminating a support system from the model; however, INCLUDE these recovery actions in the model quantification."	Yes	Incorporated in ASME-Sc-2007 SY-B13	BStill	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
63	NRCb		4.5.4		SY-B14: Account for plant-specific configurations for which mitigation capability could be significantly reduced during shutdown. POSITION: Clarification PROPOSED RESOLUTION: "... INCLUDE components that may otherwise be screened from a system model, if their failure affects more than one system (e.g., a common suction pipe feeding two separate systems), **or a plant- specific configuration causes to be an important consideration to remaining system or train mitigation reliability.**"	Yes	Added to requirement	BStill	
64	NRCb		4.5.4		Table 4.5.4-3: There is considerable scope for more commentary. POSITION: Clarification PROPOSED RESOLUTION: Consider expanding the commentary to indicate the differences, between LP&S and full power conditions. For example: . The comment for SY-B11 applies equally to SY-B10. . Spatial and environmental hazards could vary significantly from POS to POS (SY-B8). . Inventories of air and cooling may be different in different POSs (SY- B12).	Yes	S-B10 added same comment as SY-B11 SY-B8 comment added as described SY-B12 comment added as described	BStill	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
2	NRCa		4.5.5	*	A major contributor to the risk from LPSD operations is human failures due to errors of commission, such as inadvertent drain down, over draining, maintenance on the wrong train, etc. The LPSD standard appropriately relies on the ASME full-power standard to a great extent; however, in this area (addressing errors of commission), reliance on the full- power standard is insufficient, since human errors and failures are a significant element for LPSD operations. Without appropriate consideration of errors of commission, the contributors to risk from LPSD operations will be incomplete. The LPSD standard needs to address errors of commission, specifically, the standard needs to include requirements to identify initiating events and potential recovery strategies and needs to address the dependency between the cause of the initiating events and their mitigation.	No No	A discussion of the importance of human induced initiating events during LP&SD conditions was included in the HRA section in earlier drafts, but the negotiated position was that this should be included in the Initiating Events section of the standard We agree, but, as is clear from many operating events, this is equally true for at power conditions. Requirements were included in the ASME standard to raise awareness of these issues. If that guidance is not adequate, this comment should be addressed to the ASME standard.	DBley	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
65	NRCb		4.5.5		The standard deals with LPSD operations similar to full power operations; however, LPSD operations are very different in the sense that there is little if any automation available during shutdown. Therefore, the structure of the PRA model is human-action driven in terms of both initiation of events and plant response to an initiator. POSITION: Qualification PROPOSED RESOLUTION: Recognition of this difference should be stated up-front and in the particular sections as applicable.	No	We agree, but no change is required. It applies to initiating events (see response to 2 above) and post-initiator human actions (see note to Table 4.5.5.2(g)	DBley	
					The importance of HRA should be emphasized throughout and a requirement on " PRA/HRA integration" should be added stating that the HRA shall be an integral part of the PRA whereby the inputs from the various disciplines are used together to define the PRA structure, including which human events need to be modeled, how they are defined and modeled in the PRA, and the considerations used to quantify the associated HEPs.	No	While we agree with this comment, it applies equally well to full power conditions. Therefore, it should be addressed to the ASME standard.		

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
66	NRCb		4.5.5		A full-power HRA relies on and reflects well described-EOPs/AOPs and well trained operators, an assumption that cannot be carried over to a LPSD HRA. Therefore, the applicability of ASME HRA elements to LPSD is debatable. For example, element HR-E3 should not be "same as ASME," because many of . POSITION: Qualification PROPOSED RESOLUTION: The HRA elements should address the fact that people may have to respond to accident without the availability of well-written, well-understood procedures. For example, it should be pointed out that analysts shall base their analysis on a thorough/documented understanding of plants practices and operational philosophy in order to ensure that the PRA model appropriately reflects the human contribution to LPSD risk.	No	This is a very general comment. In recent years most plants have adopted LP&SD EOPs and train on them, so a key premise of the comment no longer applies. HR-E-3 deals with the interpretation of procedures and their use in HRA; it applies to LP&SD procedures, as well as those for full power.	DBley	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
67	NRCb		4.5.5		The standard does not properly account for operator-induced initiating events. There is some commentary in IE-A2 but this does not provide adequate guidance. POSITION: Qualification PROPOSED RESOLUTION: Separate requirements are needed for Section 4.5.5 that address human-induced initiators. Reference to the new HRA requirements should be made in IE-A2, and it should apply to all initiating events categories (not just transients and LOCAs). The HRA requirements for human-induced initiators should discuss under what conditions it is appropriate to group human-induced initiators with hardware-caused initiators and under what conditions human-induced initiators should be modeled explicitly using HRA methods. The new HRA requirements should provide guidance on how to identify, model, and quantify human-induced initiators. The HRA analyst should be involved in identifying human-induced initiators. New requirements should include: . a new HR and supporting requirements to identify evolutions that could lead to initiating events, OR modify the HR to include initiating events and add appropriate supporting requirements; . a new SR in Table 4.5.5-3 for screening criteria for activities that could lead to initiating events. Those in the ASME standard HR- B1 are for failures in restoration following maintenance. It does not address evolutions or wrong train type errors; and . a new SR in Table 4.5.5-4 to identify HFEs that can contribute to the occurrence	No	See response to #2 above.	DBley	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
68	NRCb		4.5.5		This standard does not properly account for treatment of potential dependencies between human actions, especially those that cross temporal phases (e.g., initiator/post- initiator human action dependencies). POSITION: Qualification PROPOSED RESOLUTION: Separate requirements are needed for Section 4.5.5 that address potential dependencies between human actions, including those that cross temporal phases. This must include the dependency between HFEs that contribute to the occurrence of the initiating event and failure of the response. Reference to the new HRA requirements should be made in AS-B1/ AS-B2/ AS-B6. Guidance for the requirements should discuss potential mechanisms for dependencies (such as those identified in NUREG/CR-6265), e.g., common PSFs, such as communications, organizational factors, instrumentation.	Yes	Additional guidance has been added to specifically call attention to actions that span more than one POS.	DBley	
					Also, expand HR-E1 and Table 4.5.5-8 to discuss potential dependencies between human actions and special attention to cues for human action (e.g., availability of instrumentation, field communication, coordination with ex-CR operators, etc.).	No	While we agree with this comment, it applies equally well to full power conditions. Therefore, it should be addressed to the ASME standard.		

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
69	NRCb		4.5.5		HR-A1: The last sentence reads "Average outage conditions shall be identified and modeled." There are two problems: a) the word shall is used only for high level requirements, and b) it is not clear what "average outage conditions" means. What is being excluded? POSITION: Qualification PROPOSED RESOLUTION: Define and provide examples of "average outage conditions."	Yes	Revised current text to link to POSs (shifting this discussion on average back to the POS section)	DBley	
70	NRCb		4.5.5		HR-A2: Many of the required system actuations at shutdown are manual, and not automatic. POSITION: Clarification PROPOSED RESOLUTION: "... impact on the automatic **or manual** initiation of standby safety equipment ~~or on~~ **including** ...."	No	No change required. This is recognized in the current language. See Note at Table 4.5.5.2(g).	DBley	
71	NRCb		4.5.5		HR-A2: It is necessary to distinguish between those calibrations performed during the outage which may impact at-power operation (already taken into consideration in the full power PRA), from those calibrations performed at- power or during LPSD POSs, which may impact equipment performance during LPSD POSs. POSITION: Clarification PROPOSED RESOLUTION: Clarify in the commentary.	Yes	Both full power and LP&SD standards require accounting for all maintenance that affect operations during the phase under current analysis. This is not an HRA issue and it applies equally to full power and LP&SD conditions. We have added commentary to emphasize this point.	DBley	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
72	NRCb		4.5.5		Table 4.5.5-5: It is not clear that ASEP and THERP are appropriate methods for quantifying the types of errors of commission that could lead to initiating events. They will work for the wrong train type of unsafe act, but probably not for the loss of control (e.g., overdraining) failures. POSITION: Clarification PROPOSED RESOLUTION: Consider at least some commentary to highlight these concerns.	No	Table 4.5.5.2(d) applies to pre-initiator human actions, not initiating events. See response to #2.	DBley	
73	NRCb		4.5.5		HR-E1: Clarify the word “traps” in the commentary of (b). POSITION: Clarification PROPOSED RESOLUTION: Clarify the word “traps” in the commentary of (b).	Yes	We have revised the commentary.	DBley	
74	NRCb		4.5.5		HR-F2: This requirement is borrowed from ASME, but should be expanded to include that both, EOCs and EOOs should be identified. POSITION: Qualification PROPOSED RESOLUTION: Include that both, EOCs and EOOs should be identified.	No	While we agree with this comment, it applies equally well to full power conditions. Therefore, it should be addressed to the ASME standard.	DBley	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
75	NRCb		4.5.5		Table 4.5.5-8: While the note to Table 4.5.5-8 contains useful information, some of which applies in a more general sense than this particular HLR, it is not clear what to do with it absent a methodology specifically designed to address these issues. HR-G1 and HR-G2 do not require reference to the note. POSITION: Qualification	No	The commentary refers the analyst to the note. The note does not specify requirements, but provides guidance on how to apply the requirements in light of special conditions that exist during LP&SD conditions.	DBley	
					PROPOSED RESOLUTION: An expanded note might be better placed at the beginning of Section 4.5.5 to motivate and explain a number of new SRs that deal with the unique circumstances during LPSD operation.	No	An earlier version of the standard had such a note, but the negotiated position is to include it here, because it is most important to post-initiator activities.		

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
76	NRCb		4.5.5		Note to Table 4.5.5-8: The commentary given in this note is useful but not complete in addressing some of the LPSD-specific human performance issues that have been identified in reviews of operational events, etc. (See, for example, NUREG/CR- 6093, NUREG/CR-6265.) POSITION: Qualification PROPOSED RESOLUTION: Additional guidance should be provided to address LP&S-specific human performance issues, such as:			DBley	
					~ The importance of errors of commission & mistakes (as dominant error types & modes of human error);	No	While we agree with this comment, it applies equally well to full power conditions. Therefore, it should be addressed to the ASME standard.		
					~ The lack of importance (with respect to at-power HRA) of available time;	No	Disagree. In some POS time is especially limited.		
					~ The importance of certain PSFs (not commonly used in at-power HRA), such as workload, stress, external hazards (e.g., heat), communications (especially CR to field operators), human-system interface (poor lighting or lack of visibility for ex-CR actions), organizational factors (e.g., inappropriate ex-CR labeling);	No	Disagree that these are not important at power.		
					~ The fact that LPSD human failures, especially human-induced initiators, are very context-specific; and,	No	While we agree with this comment, it applies equally well to full power conditions. Therefore, it should be addressed to the ASME standard. See #2.		
					~ The importance of multiple, concurrent activities (in causing potential human-induced initiators).	No			

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
77	NRCb		4.5.5		Table 4.5.5-9: Recovery may be essential rather than optional, since if the initiating event is loss of RHR, the primary function is to restore RHR. POSITION: Qualification PROPOSED RESOLUTION: Include new SRs to address recovery.	No	Covered under HR-E. The example is specifically covered in LP&SD EOPs.	DBley	
78	NRCb		4.5.6		Table 4.5.6-4: There is a lot of commentary, which hints at things to consider as special influences during shutdown operations. Also, the notes contain such phrases as “may need to be”, or “may be” which should be strengthened if they are believed to be really significant. POSITION: Clarification PROPOSED RESOLUTION: Consider writing some of the issues as requirements if they are believed to be really significant.	No	First, it is not necessary. Second, some of the separation between requirements and commentary have been negotiated over several years. While many requirements are the same as for power operation, cautions for those new to LP&SD analysis seems wise.	DBley	
79	NRCb		4.5.6		Table 4.5.6-5 Data is required to support conversion to per calendar year. For example, if the approach uses a POS frequency of POSs per outage, then the number of outages (outage types) per calendar year is necessary. POSITION: Clarification PROPOSED RESOLUTION: Consider adding a new SR to address this data. Provide a cross reference to Table 4.4-4 where much of this (e.g., number of outages, outage types, number of POSs, durations of POSs) is addressed.	No	RISC Issue #3 For comments related to outage-specific risk assessments, additional guidance and commentary has been added in, section 3.7. Data requirements for POS durations have been added.	DBley	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
80	NRCb		4.5.6		DA-C12: The ASME Standard has separate requirements for Capability Category I, and Capability Categories II/III. POSITION: Clarification PROPOSED RESOLUTION: Clarify how the changes are made to both requirements.	No	The current LP&SD standard applies to Cat. II	DBley	
81	NRCb		4.5.6		DA-E1: Document justification for use of full power or other POS data. POSITION: Qualification PROPOSED RESOLUTION: Add: **"(k) justification for use of full power or other POS data."**	Yes	This section has been revised to be consistent with the revised ASME standard and requires justification for the use of time periods for which data were collected.	DBley	
82	NRCb		4.5.7		The configuration of flood control features could change during a POS. This should be reflected in the introductory paragraph. POSITION: Clarification PROPOSED RESOLUTION: "The objectives and high-level requirements of the Internal Flooding (IF) Analysis for LPSD conditions are the same as those identified in the ASME PRA Standard (ASME-2003), and shall be accomplished for each POS. **Changing plant configurations within a POS will need to be considered for flooding sources and pathways."**	YES	Done and Section 4.5.7 has been updated to reflect this comment.	YKhalil	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
83	NRCb		4.5.7		Note: The internal flooding requirements have been significantly changed in Addendum B to ASME RA- S-2003a. While these comments are written to Addendum A, the issues apply to Addendum B.	YES	Okay.	YKhalil	
84	NRCb		4.5.7		IF-A1: While a review of LPSD activities is needed to determine if any previously existing flood barriers are going to be impaired to the point where the flood zone mapping needs to be altered, this is not an SR about flood sources. That is addressed elsewhere. POSITION: Clarification PROPOSED RESOLUTION: Simplify and focus the commentary on definition of flood areas. Consider moving high level comments to the introductory paragraphs.	YES	Done and Section 4.5.7 (under IF-A1) has been updated to reflect this comment.	YKhalil	
85	NRCb		4.5.7		IF-A2: Temporary equipment may used during outages. POSITION: Clarification PROPOSED RESOLUTION: A commentary reminder to consider the location of temporary equipment taken credit for in the PRA model may be useful.	YES	Comment noted and Section 4.5.7 (under IF-A2) has been updated to reflect the content of this comment.	YKhalil	
86	NRCb		4.5.7		IF-B2: Commentary should also say “more likely”, not just “more critical”, and that a careful study of the activities of an outage schedule will be needed to complete this step. POSITION: Clarification PROPOSED RESOLUTION: Provide clarification.	YES	Comment noted and Section 4.5.7 (under F-B2) has been updated to reflect this comment.	YKhalil	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
87	NRCb		4.5.7		IF-B3: When considering large internal sources of water, it is necessary to consider the movement of large volumes of water around the plant during the course of a refueling outage. Also, consider that some pressurized sources may be depressurized in certain POSs, or even isolated. Flooding sources can be POS-specific. POSITION: Clarification PROPOSED RESOLUTION: Add commentary that reflects these concerns.	YES	Section 4.5.7 (under IF-B3) has been updated to reflect the intent of this comment.	YKhalil	
88	NRCb		4.5.7		IF-D5: Diversion flow-related events may be an important consideration for frequency estimation. POSITION: Clarification PROPOSED RESOLUTION: Add: **"(f) human-induced mechanisms that could lead to overfilling tanks, diversion of flow through openings created to perform maintenance; inadvertent actuation of fire suppression system**."	YES	Added to Table 4.5.7-2 (d) as new item f.	YKhalil	
89	NRCb		4.5.7		IF-F: The SR for HLR-IF-F is missing. POSITION: Qualification PROPOSED RESOLUTION: See ASME-2003.	YES	Added reference to ASME-2007 for SR IF-F1 and IF-F2	YKhalil	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
90	NRCb		4.5.8		There is an implicit understanding that 4.5.8 quantifies internal events (SR QU-A2) (while 4.6 quantifies external events). The applicability to internal/external should be clarified. POSITION: Clarification PROPOSED RESOLUTION: Clarify that Section 4.5.8 is for internal events up front.	YES	HLR-EXT-H in Sect. 4.6 encompasses quantification. SR-EXT-H1 and –H2 refer to the quantification requirements given in ANS 58.21. HLR-ANA-C, Systems Analysis and Quantification, in ANS 58.21 states "The model SHALL be adapted from the internal-events, full-power PRA systems model" and, hence, indicates that the quantification requirements of the ASME PRA Standard be applied. Thus, the requirements stated in Sect. 4.5.8 apply to both internal and external events. This has been further clarified in introduction to section 4.5.8	WBur/ DWak.	
91	NRCb		4.5.8		For 4.5.8 the objective states "... to provide an estimate of CDF and LERF ...." HLR-QU-A states "... shall support the quantification of LERF." The objective and requirement should be clarified. POSITION: Clarification PROPOSED RESOLUTION: In the objective: "... to provide and estimate of CDF and **to support the quantification of LERF**...."	YES	Sect. 4.5.8 objective revised as suggested.	WBur.	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
92	NRCb		4.5.8		QU-F1(e): Clarify the meaning of "total" plant CDF: for one POS, integrated POSs, internal events, external events? (Also, the external event section appears to address only integrated POSs.) POSITION: Clarification PROPOSED RESOLUTION: Given current draft standard, "total" would apply to one POS, internal events. If so, integrated POSs for internal POSs would have to be addressed somewhere.	YES	The first sentence of Sect. 4.5.8 states "The objectives and high level requirements of the Quantification for LPSD conditions are the same as those identified in the ASME 2007 PRA Standard, and shall be accomplished for each POS." Thus, the term "total plant" in SR-QU-F2 (e) is interpreted to apply to the specific POS under evaluation. The summation of risk from multiple POSs is described in Sect. 1.3.3.	WBur.	
93	NRCb		4.5.8		4.5.8 requires (SR QU-A2) the estimation of the total CDF, but the "total" appears to be for the POS that is being quantified (... and shall be accomplished for each POS). 4.6 requires integration over all POS states (EXT-H1, EXT- H2). There should be consistency with respect to individual POS quantification and integration over POS quantification requirements for internal and external events. POSITION: Clarification PROPOSED RESOLUTION: Provide requirements, or clarification of requirements, to quantify for each POS and for integration of POSs.	YES	This clarification is provided in Sect. 1.3.3 which applies to both internal and external events.	WBur.	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
94	NRCb		4.5.9		Table 4.5.9: Reference NUREG/CR- 6595, Rev. 1 POSITION: Clarification PROPOSED RESOLUTION: Add a note after Table 4.5.9-1: **"Some requirements below reference ASME-2003 which includes references to NUREG/CR-6595, which has been updated.** **NUREG/CR 6595, Rev. 1, "An Approach for Estimating the Frequencies of Various Containment Failure Modes and Bypass Events," October 2004, is the applicable reference for this section."**	YES	The note was incorporated for ASME-2007.	DONeal	X
95	NRCb		4.5.9		Note: The LERF requirements have been significantly changed in Addendum B to ASME RA-S-2003a. While these comments are written to Addendum A, the issues apply to Addendum B, though the suggested resolutions may need adjustment. e.g., item additional item (e) in LE-A1 would become (h).	YES	Changes have been made to be consistent with the ASME 2007 standard such as the example given. A more significant change was to subsume the new requirement LE-AA1 under LE-C1 as SR LE-C1b. In this way, the requirements supplement LE-C1a (a modification of LE-C1 of ASME 2007).	DONeal	X
96	NRCb		4.5.9		LE-A1: Time after shutdown, or alternatively, fission product inventory, should be considered as a characteristic of the end state, unless it is considered adequately addressed in LE-AA1. POSITION: Clarification PROPOSED RESOLUTION: Add "**(e) Time after shutdown"** to ASME SR.	YES	The comment was incorporated.	DONeal	X

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
97	NRCb		4.5.9		LE-AA1: Show the requirement applies to Cat I, II, III. Also, the criteria for screening appear to be very general as are those in NUREG/CR-6595, Rev. 1. It is not clear why NUREG/CR-6595 is called out for Capability Category I specifically, and not for the other Capability Categories. POSITION: Clarification PROPOSED RESOLUTION: Show the requirement applies to Cat I, II, III. ~~For Capability Category I, NUREG/CR- 6595, Revision 1, provides an acceptable approach.~~	YES	The comment was incorporated. LE-AA1 modified is now LE-C1b.	DONeal	X
98	NRCb		4.5.9		LE-B1: The majority of the potential LERF contributors identified in Table 4.5.9-3, referenced in LE-B1 of ASME RA-Sa- 2003, will not apply to many POSs. POSITION: Clarification PROPOSED RESOLUTION: Expand the commentary to discuss when certain contributors are not relevant.	YES	The following clarifying note is added… Note that some of potential LERF contributors in Table 4.5.9-3 will not contribute to a specific POS if the physical conditions of the POS or the POS's time evolution do not permit the relevant condition to occur.	BBud	X

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
99	NRCb		4.5.9		LE-D1: The statement in the commentary is true, but does not provide significant guidance. POSITION: Clarification PROPOSED RESOLUTION: The commentary could include such things as: . This evaluation is not required for POSs when the containment is open. . The calculation of containment capacity will be associated with the capacity of temporary closures for certain POSs.	YES	The commentary was updated to include the second comment.	DONeal	X
100	NRCb		4.5.9		LE-D2: The commentary reads like a permissive. If secondary containment effectiveness is to be considered., it ought to be its own SR, maybe differentiating between capability categories. POSITION: Clarification PROPOSED RESOLUTION: Clarify as its own SR, maybe differentiating between categories.	YES	Secondary containment was incorporated into LE-C10.	DONeal	X
101	NRCb		4.5.9		Table 4.5.9-2(e): Regulatory Guide 1.200 For Trial Use, February 2004, Appendix A, LE-E3 suggested a new LE-E3 giving a requirement for determining what constitutes a large early release. POSITION: Clarification PROPOSED RESOLUTION: A new LE-E3 is included in Addendum B that captures the intent of that proposed in RG 1.200 and renumbered the old LE-E3 as LE-E4. Add a new LE-E3.	YES	The LE-E3 in the ASME 2007 standard, and its related requirements in LE-C1a and b, were modified to be consistent with the draft Regulatory Guide 1.200, dated February 2004, Appendix A clarifications of LE-E3 and LE-C1 and with low power and shutdown considerations.	DONeal	X

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
105	NRCb		4.6		Table 4.6- 1:HLR- EXT-H HLR-EXT-H requires "The LPSD external events analysis shall include integration to produce CDF and LERF." POSITION: Clarification PROPOSED RESOLUTION: To parallel Section 4.5.8: change to read "...shall include integration to **quantify** ~~produce~~ CDF and **support the quantification of** LERF."	YES	The comment is accepted, and an appropriate change has been made. However, the change consists only of changing the word "produce" by the word "quantify", so that the new text reads "to quantify CDF and LERF	RBud.	X
106	NRCb		4.6		EXT-A1: The commentary provides acceptance guidance: "In the screening, it is fully acceptable to screen out any specific external event for a given POS, based on the POS duration or the hazard frequency, or some combination." Screening for external events should be consistent with internal events screening which considers duration and frequency (see comment on IE-C4 screening criteria above). Also, screening for a specific-outage approach may be different as noted in the comment. POSITION: Qualification PROPOSED RESOLUTION: Change the commentary to be consistent with internal events screening. Also, add to the commentary: "**For a specific- outage approach, screening on an initiating event frequency not adjusted by the fraction of time in a POS may be more appropriate.**"	YES	The comment is accepted, and an appropriate change has been made. The new wording captures the spirit of the comment although the actual wording is slightly different than suggested.	RBud.	X

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
102	NRCb		4.6.3		Item (3) redefines an “initiating event” as the set of specified initial damage to the plant form the external hazard. This would be better referred to as a “Hazard induced plant damage state”, and keep the designator of initiating event to be the systems analysis definition, which is the way it is used in the External Events Standard. The ordering of the tasks is illogical. Item (3) should follow item (5), i.e., identify what equipment is needed, evaluate it□s fragility, and then determine potential hazard plant damage states. POSITION: Qualification PROPOSED RESOLUTION: Replace “initiating event” by “Hazard induced plant damage state.” Re-order the tasks as suggested in the issue column.	YES	The first comment is accepted, and an appropriate change has been made. The reordering of the paragraphs so that paragraph (3) follows (5) is also agreed to.	RBud.	X

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
103	NRCb		4.6.3		item (3), final sentence: "The analyst needs to account not only for the POS but also for any special effects of the given external event, such as damage that might be caused by the external hazard that would not otherwise be modeled in the PRA." There is a need to consider activities, as well as "plant conditions" during the POS. For example, a DBE during the time of an RV head or RX internals lift may increase the probability of a heavy load drop. Calcification Add a comment about considering specific activities, along with an example like that provided.	YES	The comment is accepted, and an appropriate change has been made.	RBud.	X
104	NRCb		4.6.3		item (4): "The fragility analysis work is identical to that for full- power operation." While this may be true, the scope will be different, particularly if the plant is using temporary equipment. POSITION: Clarification PROPOSED RESOLUTION: Add a commentary to that effect.	YES	The comment is accepted, and an appropriate change has been made.	RBud.	X

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
4	NRCa		4.7	*	Screening methodology (Section 4.7 and Appendix C): The use of a reference plant to screen a POS from requiring a quantitative risk assessment as described in Section 4.7 is not appropriate. It is not clear that without doing a detailed review of a reference plant's shutdown PRA, and the reference plant's administrative controls and TS, a comparison of risk between a reference plant and the analyzed plant can be performed. The screening methodology approach is more of a "how to do" than a "what to do", which is not appropriate for this standard. The method needs to be better defined and tested in a pilot to ensure its appropriateness.	NO	Section 4.7 has been deleted. A separate section of the standard has been prepared to address qualitative risk assessment.	KKip	X

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
5	NRCa		4.8	*	The use of the qualitative risk assessment methodology as described in Section 4.8 does not evaluate the quantitative risk of a given POS. The risk levels as described in Section 4.8.2 consider only the number of systems capable of meeting a safety function (i.e., the depth of a licensee□s mitigation capability). The supporting requirements for the qualitative risk assessment in Table 4.8-2 have no correlation with risk. The qualitative methodology does not provide a structured approach to analyze the impact of human error on the likelihood of causing an initiating event in a given POS (i.e., ongoing work activities, availability and quality of instrumentation for determining reactor coolant system conditions and residual heat removal system status, administrative controls, etc.). The method needs to be better defined and tested in a pilot to ensure its appropriateness. Further, since the standard□s objective is to "set forth requirements for a LPSD PRA," this section is not appropriate for this standard. It needs to be removed and incorporated in a separate standard.	NO	A separate section of the standard has been prepared to address qualitative risk assessment.	KKip	X
8	NRCa		App. A	*	Appendix A, Plant Operational State Analysis Methodology, requires clarification in numerous places and requires additional technical guidance. Until this guidance is developed, it may be more appropriate to remove this appendix. The examples which help in defining the POSs would be useful to ensure definitions have adequate resolution before considering grouping. The examples on page 106 need to be provided as examples within POS-A3.	YES	Appendix A modified.	JJul	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
6	NRCa		App. B	*	The units used for core damage frequency (CDF) are inconsistent between the requirements and Appendix B. The second sentence in the second paragraph of Appendix B states that the CDF for a particular POS, calculated according to the requirements of the standard, is the conditional probability of core damage if the POS "existed for a specified time interval, usually one year." Supporting Requirement IE-C3, on the other hand, requires the initiating event frequencies to be calculated on a per calendar year basis, taking into account the duration of the POS. In piloting the ASME standard there was, in addition, some confusion about the terms reactor year and calendar year. A note has been added to IE-C3 in Addendum B to the ASME standard to resolve this issue. The LPSD standard needs to be reviewed carefully to ensure that units are used consistently both internal to the standard and with the ASME Standard Addendum B. This consistent use of units will ensure, among other things, that the contributions to CDF from the various POS, can be simply added to provide the total CDF.	YES	A paragraph and accompanying equations have been added to appendix B to show how scaling the initiating event frequencies accomplishes the same thing; i.e. to show that after properly scaling initiator frequencies, the contributions from each POS can then be directly summed.	DWak.	
107	NRCb		App. B		In the context of integration over POSs, is App B to include combinations of internal and external events? (Note: The requirement to integrate POSs for external events is separate from internal event requirements.) POSITION: Clarification PROPOSED RESOLUTION: Indicate that the rationale for combining internal and external events should be given.	YES	App. B is non-mandatory and simply provides details to support Sect. 1.3.3. However, the summation method stated in Sect. 1.3.3 is intended to be applied to both internal and external events.	WBur.	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
3	NRCa		general	*	There is technical difficulty in defining an "average outage." Even when plant operational states (POSs) can be defined in a relatively unambiguous manner, the equipment configurations within those defined POSs can vary from outage to outage. Unlike full power operation, when the equipment taken out of service is constrained by technical specifications, during LPSD operations there are far fewer constraints. Because multiple systems, structures, and components may be taken out of service simultaneously, the basic events in the fault tree models need to represent the unique combinations of equipment out of service (OOS) in order to model LPSD operations properly. In addition, the OOS times need to be estimated for each combination. Because the number of such combinations is potentially very large, it is not clear if this is feasible. In this case, some sort of bounding sets of configurations would have to be proposed. The standard needs to address: (1) Requirements that define the "average" configurations and parameters. In addition, the treatment of configurations in the "average" PRA is highly uncertain, and this has to be recognized as a key uncertainty and handled with appropriate compensatory measures in applications. OR (2) Requirements that ensure that the LPSD model has the structure that would support a configuration specific assessment, and leave it to the application specific guidance on how to define and evaluate "average" conditions. 1. conditions.	YES	RISC Issue 3 Regarding (1), an additional emphasis was placed on the documentation in sections 1.4 and the POS requirements (section 4.4). Regarding (2), section 3.7 was added specifically stating the relaxations for a situation-specific outage.	JJul	

#	Reviewer	Pg.	Section	*	Comment	Accepted ?	Resolution	Lead	
9	NRCa		General		The commentary is useful, but in many cases, it should be more specific. For example, in Supporting Requirement IE-C3, the second paragraph of the note states that the requirement may not be necessary. This comment is not informative, and would be strengthened by an example of when and under what conditions it would not be necessary. In Supporting Requirement IE-C4, the commentary suggests that it might be necessary to develop different criteria. An example of when this might be the case would be useful. In general, additional commentary should be considered where it can help highlight the special considerations, but it should be explicit, even if only through the use of examples.	YES	In both IE-C3 and IE-C4, reference is made to section 3.7, and the notion that configuration risk management applications may not require accounting for different POS durations or different numerical criteria.	DWak	