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Chris, Ed;

Attached is a written version of the major comments we discussed during our webinar last week. The comments have been modified to address our discussion during that call. Note that the comments on the scenario based approach, redundancy, and peer review contain suggestions for changing the document in a manner that addresses our concern. As we discussed during our call, we are working on an example for the document and will share that with you once we have developed it further.

The Flooding Task Force has additional comments on the IA ISG that are less significant than the attached. I will send you these comments in a separate message.



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Other Comments on the Integrated Assessment ISG for External Flooding

(JLD-ISG-2012-05, Sept. 20, 2012)

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1. Restrictions on Use of the Scenario Based Approach to Evaluate Mitigation

- a) Sections 7.1 and 7.2 have a bias towards margin-type or full PRA mitigation evaluations. As a result, it would be very difficult to evaluate the use of FLEX to mitigate flooding reevaluation results that are greater than a plant's design basis. The following explains our concern and provides a basis for a different approach.

Basis for our concern:

- A principle based approach using deterministic criteria is needed as the baseline for mitigation evaluations so that fundamentals goals are validated to ensure predictability of outcomes. This should be the baseline for mitigation evaluations so that the maintenance of fundamental goals is not lost in the details of analyses.
- NRC has endorsed the use of FLEX (as described in NEI 12-06) for mitigation of beyond design basis accidents. The specific design requirements for FLEX are established during implementation.
- Recognizing the first bullet as a baseline, if a site uses FLEX to mitigate beyond design basis floods, it should be acceptable to evaluate only the additional challenge to FLEX caused by the reevaluated flood as compared to the flooding parameters to which FLEX was designed (such as additional flood height or additional flood duration).
- Utilities must be able to evaluate FLEX's capability to mitigate by the scenario based approach because the PRA tools and data that will be necessary to evaluate FLEX equipment and associated operator actions under a margins-type or full PRA evaluation are not yet available.
- The existing document prevents the use of the scenario based approach to evaluate FLEX because it excludes application of the scenario based approach in situations with complex interactions or interdependencies, or complex operator actions. The term "complex" is not defined, yet the way it is used in this section implies that it is a threshold that determines when the scenario based approach is not appropriate. Rather than try to define the term "complex," it would be better to explain what the expectations for the scenario based approach are and let the engineering process determine when acceptable results cannot be obtained; therefore requiring a margins type or full PRA approach.

Recommendation

Industry suggests that the second paragraph in section 7.1 (beginning with "A margins-type evaluation...") be deleted. In its place describe a concept that mimics the HHA approach outlined in NUREG/CR-7046. Specifically: an evaluation of mitigation capability

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can start with a scenario based (deterministic) evaluation of mitigation strategy. If adequate reliability cannot be demonstrated using traditional engineering techniques and performance based criteria, then a margins-based approach should be tried. If it is still not possible to justify reliability with margins analysis (conservative assumptions) then a detailed PRA analysis with increased technical rigor is necessary.

Therefore it is recommended that the paragraph be replaced with the following:

“The integrated assessment can start with the scenario based evaluation methodology. This will largely use deterministic engineering evaluations applying engineering principles and performance based criteria to demonstrate reliability of the mitigation strategy. Appropriate factors of safety are required for all engineered structures, pumps and other components. A scenario based evaluation should be structured and documented using logic tools such as FMEA, logic trees, or other success path approaches to model all the components and actions required for the mitigation. Each component or action within the scenario should be evaluated for reliable performance using qualitative and/or quantitative acceptance criteria as described in Appendices A and C as applicable. Information on component reliability (such as mean time to failure) should be documented if available, but the overall probability of success of any path in the scenario need not be computed. Effects of redundancy and diversity should be addressed. When the scenario is complete, identify all success paths to define the SSCs required to safely shutdown the reactor and maintain a safe condition for the flood duration. If an assessment of the resulting scenario confirms that at least one success path can be reliably executed, then the evaluation of flood mitigation is complete. (Reliability of a success path need not be a calculated number; it can be assessed by consideration of component reliability and comparison of components and actions to the success criteria in Appendices A and C.)

If it is not possible to demonstrate reliability with the scenario based approach, a margins-type evaluation should be pursued. The margins-type evaluation can account for more complicated interactions and dependencies. Operator actions and active component reliability should be evaluated against quantitative values, if possible, for the acceptance criteria in Appendices A & C. If greater detail is required than is possible in a margins-type evaluation, an external flood PRA should be considered.”

- b) The opening paragraph in section 7.2 further perpetuates the bias towards a margins assessment. The paragraph should be re-written to say what is required, as opposed to what is not necessary, but nice to include.

Recommendation:

Change the first paragraph in section 7.2 as follows:

“The scenario-based evaluation is used to demonstrate that there is high confidence that key safety functions can be maintained, typically using engineering analysis and insights, and quantitative information. This evaluation method should define a clear success path and the equipment required to achieve a safe plant state. Engineering evaluations should be used to demonstrate that these key pieces of equipment are adequately designed to meet their intended function (e.g. pumps have adequate

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capacity or flood gates have adequate structural capacity). The additional guidance and qualitative acceptance criteria in Appendices A and C should be used to determine the reliability of active components and operator actions (respectively)."

- c) The first sentence in foot note 17 at the bottom of page 17 provides important additional guidance on the use of non-quantified approaches. As such, it should be moved up into the body of the document and placed at the end of the second bullet in the last list on the page 17. In addition, the word "quantitatively" should be removed from this bullet since quantitative acceptance criteria are not required for a scenario based approach.

Also, the second sentence in footnote 17 requiring an evaluation of the effect of excluding the component should be deleted. This severely limits the ability to evaluate equipment reliability in a non-quantifiable manner. Evaluating the capability of the remaining equipment should only have to be assumed if the criteria in Appendix A cannot be met. There should be no distinction in how a component is treated as long as it meets the acceptance criteria, no matter whether the criteria are qualitative or quantitative. The acceptance criteria in Appendix A section A.1.2 and table A.1 came from work done in the Equipment Reliability area and are based on sound engineering principles and operating experience. Since there is no specific criteria for what is considered acceptable quantified reliability, there should not be an arbitrary prejudice against the use of established qualitative criteria.

Recommendation: Footnote 17 should be deleted as explained above and the second bullet in the last list on page 17 should now read:

"Evaluate the reliability of active components based on the plant Equipment Reliability Program, operating experience, testing or other available information. The considerations of section A.1.2 of Appendix A should be used to justify high confidence in the reliability of the active component."

2. Lack of Applicable Examples

The guidance contained in the ISG is very complex and difficult to interpret. Examples are one way to provide greater clarity. Appendix D provides examples, but none are applicable to this guidance. In fact, most are, in one form or another, external flood PRAs that are the least likely part of this guidance to be used given the difficulty of quantifying flooding hazards and these old studies would be unlikely to be acceptable under current regulatory guidance (i.e., RG 1.200). Industry has offered to work with the NRC to provide examples and is presently working on an example application of the scenario based approach.

Further, given the complexity of this guidance, some sort of pilot or documented table top evaluation will be essential to gaining clarity and predictability in the process. A pilot process would provide a means to identify issues, clarify the guidance, and document examples.

Recommendation:

Add the type of appendix that illustrates the use of the IA ISG and delete current Appendix D content. Appendix D should contain examples of the use of the ISG and as a minimum should address the following cases:

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- Protection system that requires temporary and active protection features.
- Protection system that is assumed to fail and a scenario-based evaluation of mitigation is conducted.
- Protection system that is assume to fail and a margins-based evaluation of mitigation is conducted

If references to the material currently included in Appendix D are retained somewhere in the document, then the inclusion should be more selective as the examples are very non-uniform in completeness and “quality” and some do not represent the apparent intent of the ISG and would be misleading (the ISG caveat statement – *“However, this Appendix does not necessarily endorse the methodologies used in the external flood risk studies referenced here and these references do not supersede the guidance contained in this ISG.”* – is not helpful to guide the user / implementer.)

3. Expectations for Redundancy

Appendix A, Table A.1, P. 42 *“Equipment redundancy shall be provided for equipment that may be required to operate in an active manner at any time during the flood event duration”*.
- This seems to impose the defense-in-depth requirement for design basis accident mitigation systems even though this is a beyond-the-design-basis situation. For design basis accident mitigation systems there are no requirements to use PRA type approaches to demonstrate reliability.

Recommendation:

Remove the redundancy requirement from the table. The need for consideration of redundancy or diversity should be included as part of the scenario evaluation guidance. This concept was added to the recommended language above in item 1a).

4. Peer Review Requirement

The extent to which peer reviews are expected in the responses to the March 12, 2012 50.54(f) letter is unprecedented and if not limited, could lead to an expansion of this process leading to much unnecessary license burden. In addition, the peer review process described in this document infers that licensees’ normal QA requirements are not good enough which therefore implies that the QA controls required by regulation are not sufficient. This is a very undesirable precedent to set.

There are two significant issues with the peer review requirement as established by the draft ISG:

a. Need for Peer Review

The 50.54(f) letter did not call for a peer review. The addition of the requirement for Peer Review in the ISG is unprecedented for such an endeavor. To date, regulatory requirements for Peer Review have largely been limited to PRAs under Reg. Guide 1.200. Under RG 1.200, PRAs are reviewed against the

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requirements of a national consensus standard and the purpose of the peer review is to reduce the need for detailed Staff review of the PRA models used in support of risk-informed licensing changes. In the case of the IA, there is no Standard against which the evaluation will be assessed. Thus, the peer reviewers do not have a consistent basis for their review. This creates a potential for variability in peer review findings that could actually complicate the entire IA process. In addition, it is not clear how a peer review expedites the NRC's review of licensee submittals. Consequently, the requirement for peer review is an extra cost with no positive benefit.

b. Requirement for a "Participatory" Review

There is no basis (or precedent) for a regulatory requirement for a participatory peer review. There is no reason to believe that a peer review, if required at all, could not be effectively performed at the completion of the licensee analysis. Cost impact that might be due to the performance of a peer review is purely an economic consideration and should not be a concern to the NRC. It should be a licensee's decision whether or not it is in their best interest to have a peer review performed in a "participatory" manner. Again, the regulatory requirement is imposing an extra resource impact on licensees without any commensurate benefit.

Industry is concerned that the imposition of an unnecessary peer review will impose additional burden and cost on licensees and, due to limited availability of some of the resources necessary to perform the peer review as presented in the current version of the ISG and cause schedule delays in the completion of the evaluations.

Recommendations

A peer review should only be required for those portions of the integrated assessment that use PRA methods (peer review of a PRA is consistent with industry standards). In addition, it should not be necessary for a licensee to justify why an integrated assessment did not contain any of these elements – the list in item a) below would make this judgment self-explanatory.

- a) The bullet at the top of page 45 that explains when a peer review is necessary should be reduced to the following
 - A peer review should evaluate each of the following if they formed a part of the Integrated assessment:
 - Use of PRA methods
 - Any margins-type or full PRA evaluations of mitigation capability
- b) The last bullet in section B.2 should be deleted. Normal licensee processes that verify the completeness and accuracy of any submittal that is made under oath or affirmation are sufficient to evaluate the final report.
- c) If a utility conducts a peer review it should be their prerogative as to whether it is participatory or not. Delete the word "participatory" wherever it appears and delete the first bullet in section B.2

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- d) It should not be necessary to require a reviewer from outside a licensee's organization or to justify the independence of reviewers assembled from within the licensee's organization. Ensuring the independence of reviewers is a normal part of every licensee's QA processes. Delete the last two sentences in the first bullet in section B.1.

- e) With scope of the integrated assessment limited to the items in a) above, it is not necessary to include members on the peer review team with expertise in all areas of importance to the integrated assessment. Change the words "importance to the Integrated Assessment" in the second bullet in section B.1 to "utilizing PRA methods (as described in section B.2) in the Integrated Assessment"

- f) Since a peer review of flood protection measures should not be required, delete the third bullet in section B.1.

- g) In like manner, revise the last bullet in section B.1 to read as follows:
 - i. First sentence: "A larger peer review team with broader expertise is required if the PRA methods involve active components or operator manual actions."
 - ii. Delete the second sentence
 - iii. Third sentence: Delete "important" and delete "by people with appropriate expertise" and insert "utilizing PRA methods (as described in section B.2)" after the words "Integrated Assessment".

- h) Since the peer review team will not evaluate protection but will evaluate use of PRA methods, delete items (2) and (3) in the fourth bullet in section B.3.

- i) Since the peer review team does not have to review the entire Integrated Assessment Report, delete the 5th bullet in section B.4.

- j) Conforming changes should be made to the body of the ISG. Section 3.1, Section 4 and Figure 2 imply that a peer review team is established for all IA, and should be clarified to reflect the changes to Appendix B (i.e., that peer review applies to the use of PRA methods and margins-type or PRA evaluations of mitigation capability).