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Ms. Cindy K. Bladey
Chief, Rules, Announcements, and Directives Branch
Office of Administration
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Industry Comments on Draft Interim Staff Guidance (ISG) for Performing the Integrated Assessment for Flooding (JLD-ISG-2012-05, Docket ID NRC–2012–0222)

Project Number: 689

Dear Ms. Bladey:

On September 28, 2012, the NRC issued a Federal Register Notice (77FR59675) soliciting public comments on the draft Interim Staff Guidance (ISG) for Performing the Integrated Assessment for Flooding. The Integrated Assessment ISG is one of the deliverables described in Enclosure 2 of the NRC's March 12, 2012, request for information on topics related to Fukushima lessons learned short term activities.

The NEI Fukushima Flooding Task Force (FFTF) has been meeting with the NRC on this document for several months. The attached comments reflect the results of these meetings to the extent that the topics were addressed. The Nuclear Energy Institute (NEI)[1] submits these comments on behalf of the nuclear energy industry. Based on these public meetings, it is expected that industry's two major comments (use of the scenario based approach for evaluating mitigation capability and expectations for peer review) have been resolved in an acceptable manor. Industry's understanding of the approach to resolution is described in the attached comments.

[1] NEI is the organization responsible for establishing unified nuclear industry policy on matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues. NEI's members include all utilities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel fabrication facilities, materials licensees, and other organizations and individuals involved in the nuclear energy industry.

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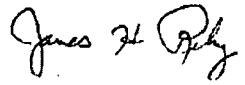
If there are any questions on this material, please contact me at 202-739-8137; jhr@nei.org.

Sincerely,



James H. Riley

Attachment

c: Mr. Christopher B. Cook, NRO/DSEA/RGS2, NRC
Mr. Edward G. Miller, NRR/JLD/JPMB, NRC

Fukushima Response Working Group
Fukushima Flooding Task Force
Fukushima Points of Contact

ATTACHMENT

Comments on the Integrated Assessment ISG for External Flooding

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

Major Comments

The following four comments are the greatest concern. These are followed by a number of additional comments starting on the seventh page of this document. Suggested text is in red font.

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 document noticed for comment 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 set of attributes that the scenario based approach should include or specific tools that must be used to document the evaluation.

For example, the elements that should be included in a scenario based evaluation should include:

- Description of the scenario and its key components
- Discussion of the mitigating actions
- Timeline showing necessary actions or logic structure containing information on reliability of actions and active components (the failure branches of the logic structure would not have to be fully developed as long as the reliability of components can be adequately justified)
- Evaluation of components against Appendix A
- Documentation of component reliability data when available
- Evaluation of actions against Appendix C
- Conclusion of the overall reliability of the mitigation strategy

If the logic structure and failure branches become too complex it would be apparent that the scenario based evaluation is not capable of reaching a justifiable conclusion, thereby requiring the use of a margins-type or full PRA evaluation. In this way the evaluation of mitigation capability could mimic the HHA approach outlined in NUREG/CR-7046. Specifically: an evaluation of mitigation capability 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. A scenario based evaluation should include the following elements:*
>
> - *Description of the scenario and its key components*
> - *Discussion of the mitigating actions*

- *Timeline showing necessary actions or logic structure containing information on reliability of actions and active components*
- *Evaluation of components against Appendix A*
- *Documentation of component reliability data when available*
- *Evaluation of actions against Appendix C*
- *Conclusion of the overall reliability of the mitigation strategy*

The approach 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, however the failure branches of the logic structure do not have to be fully developed as long as the reliability of components can be adequately justified. Each component or action within the scenario should be evaluated for reliable performance using qualitative and/or quantitative deterministic 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. In the margins-type evaluation, operator actions and active component reliability should be evaluated against quantitative probabilistic 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 deterministic 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 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 <u>quantified</u> 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. <u>Lack of Applicable Examples</u>

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 or state that the examples will be developed later. Examples could be developed, reviewed during industry-NRC meetings, and approved using the FAQ process established for the flooding walkdown guidance.

If references to the material currently included in Appendix D are retained 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 additional peer reviews (in addition to normal QA processes) are expected in the responses to the March 12, 2012 50.54(f) letter is unprecedented and could lead to much unnecessary license burden. Licensees should be able to use their regular QA processes to

review the integrated assessment, augmented when necessary to address unique aspects or areas of specialized expertise not covered by licensee staff. 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 additional 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 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 why a utility's normal QA processes could not satisfy the peer review functions described in Appendix B. Requiring an additional layer of review beyond that which would normally be applied to any information submitted to the NRC under oath or affirmation is an unnecessary burden. If there are aspects of the integrated assessment that require the application of expertise beyond that possessed by utility staff, it is the licensee's responsibility to recognize this and obtain the expertise necessary from an outside organization. It should be sufficient to describe the attributes of the peer review and leave it to the licensees to ensure that the attributes are met.

Finally, 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. Any cost impact that might be incurred 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 licensees 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 ISG, cause schedule delays in the completion of the evaluations.

Recommendations:

The peer review should be performed by utility staff in accordance with their normal QA processes unless there are aspects of the Integrated Assessment that require expertise that is not available within the licensee staff. Appendix B should describe the key attributes of the peer review. Licensees should be expected to determine if the attributes can be satisfied by their normal processes, or require additional efforts. In this regard, we suggest the following changes to Appendix B.

- Revise Appendix B in general to be less prescriptive and to indicate that the items discussed are attributes of a peer review.
- Change the introduction to Appendix B to allow a licensee to credit their internal processes as a means to satisfy the peer review attributes and to expect that the licensee will obtain outside assistance for those attributes that cannot be satisfied by their internal programs or expertise.
- Delete the requirement to justify independence of the reviewers. Ensuring an appropriate degree of independence is part of a licensee's normal processes.
- A participatory review may be recommended for the reasons explained in the appendix, but it should be optional at a licensee's discretion.
- Focus the expectations for peer review on those aspects of the integrated assessment that are unique, outside of normal practice, demanding of special expertise, or important for the overall accuracy of the assessment.
- Require that the integrated assessment report include a description of how the licensee satisfied the peer review attributes in Appendix B.
- Change the other places in the ISG that describe the peer review process in a manner consistent with Appendix B.

Additional Comments

The format for the comments below is as follows: Page number in ISG / text being commented on in italic / comment / recommendation in subparagraph that follows.

Page 4: *"(The loss of the UHS from causes other than flooding are not included.)"* It has never been totally clear that this does not include seismic failure of downstream dams. In the ACRS public meeting on the revision to RG 1.59 the ACRS questioned this point and the implication of the

testimony is that downstream dam failures resulting in loss UHS would include consideration of seismic failures of the downstream dams.

Recommendation: The statement "(The loss of the UHS from causes other than flooding are not included.)" should be revised to make this clear - "(The loss of the UHS from causes other than flooding, **such as seismic failure,** are not included.)"

Page 8: *"The Integrated Assessment should also consider whether specific vulnerabilities may arise during modes of operation other than full-power (e.g., conditions where flood protection features may be bypassed or defeated for maintenance or refueling activities)."* The ISG should remain consistent with the scope and intent of the 50.54(f) with regard to evaluating all modes of operation. A qualitative analysis of the expected plant configuration at the time of the flood event that identifies challenges to any flood protection or mitigation features is appropriate. The configurations evaluated should be limited to those resulting from the execution of plant procedures and processes.

Also, modes of operation and plant configuration are being integrated in this sentence and it is confusing.

Recommendations:

Clarify the guidance on the type of analysis that can be used.

Change the quoted sentence to – "The Integrated Assessment should also consider whether specific vulnerabilities may arise during modes of operation **or configurations** other than **normal** full-power **operation and configuration** (e.g., conditions arising from normal plant procedures or processes where flood protection features may be bypassed or defeated for maintenance or refueling activities)".
Change the prior sentence to read – "In addition, the Integrated Assessment should describe the expected total plant response under other modes of operation, including a discussion of controls **(such as programmatic controls)** that are in place in the event that a flood occurs during any of these modes (e.g., during refueling)".

Page 9: Typo in footnote, *ref 28* should be ref 27.

Page 14 *"quantify the reliability of the active features, other than flood doors and hatches, based on operating experience and other available data or information using traditional PRA or statistical techniques".* This is discussed more completely in A.1.2.

Recommendation: change "quantify the reliability of the active features, other than flood doors and hatches, based on operating experience and other available data or information using traditional PRA or statistical techniques" to "quantify the reliability of the active features **in accordance with A.1.2**".

Page 15 *"The Integrated Assessment should also demonstrate that the flood protection system integrity is reliably maintained with margin based on comparison against appropriate performance criteria or quantification of feature or system reliability."* It isn't clear how this demonstration is to be provided.

Recommendations: Delete the sentence

OR change to "The Integrated Assessment should also demonstrate that the flood protection system integrity is reliably maintained with margin based on comparison against appropriate performance criteria or quantification of feature or system reliability **by examples to be provided later.**"

OR "The Integrated Assessment should also demonstrate that the flood protection system **has** margin based on comparison against appropriate performance criteria or quantification of feature or system reliability."

Page 15 *"In addition, if a flood protection feature or system is not able to accommodate the flood scenario parameters, the flood protection evaluation should determine at what flood height and under what associated effects, the flood protection feature or system is able to reliably accommodate a flood with margin."* Since the feature or system has already been determined to not be adequate for the scenario it may be more relevant to know what the absolute capability is, that is without margin.

Recommendation: Change to – "In addition, if a flood protection feature or system is not able to accommodate the flood scenario parameters, the flood protection evaluation should determine at what flood height and under what associated effects, the flood protection feature or system is able to reliably **accommodate a flood.**"

Page 16 *"An evaluation of mitigation capability is appropriate for sites that have not demonstrated that the flood protection systems are reliable and have margin."* If the intent is that an evaluation is required then it would be clearer to say it is required.

Recommendation: Change to – "An evaluation of mitigation capability is **required** for sites that have not demonstrated that the flood protection systems are reliable and have margin."

Page 18 first paragraph in section 7.3: clarify the expectations on the scope of the margin assessments.

Recommendation: Add the following after the second sentence in the first paragraph in Section 7.3: "Margins assessments should be performed for a flood protection feature or flood protection feature combinations that are not judged to be reliable or have margin. While "scenario-Based" assessments may assume flood protection features are failed,

margin assessments may consider the probability of the flood protection feature failure in the impact assessment."

Page 18 second paragraph, second sentence: "plant system models should be updated or developed". Plants do not currently have shutdown PRAs. Furthermore no PRA standard for shutdown PRAs has been developed. While 'at-power" PRAs can be enhanced to include additional mitigation components, such as those introduced due to FLEX, developing a full shutdown PRA model to quantify CCDP and LERP impacts should not be expected as part of the integrated assessment.

Recommendation: Change to "at-power plant system PRA models should be updated or enhanced".

Page 19 *"When it is not feasible to use HRA concepts and approaches,"*: this is in reference to quantification so quantification should be included.

Recommend: Change to – "When it is not feasible to use HRA concepts and approaches **to quantify the reliability**",

Page 19, second bullet at the top of the page: "*When it is not feasible to use HRA concepts and approaches, criteria described in Appendix C to demonstrate acceptability of the operator manual actions. In such cases, for quantification purposes in a margin analysis, use an initial failure probability of no less than 1X10^{-1} if the criteria in Appendix C are met.*" The focus of this statement should be on the procedure to be used when a qualitative assessment is used in lieu of a detailed quantitative analysis. The statement should not reference Appendix C tables as those tables are judged to justify feasible and reliable actions and could in principle, based on its detailed structure, be quantified. In fact using Appendix A of SPAR-H and the limiting performance shaping factors from Section C.1, page 48, the human error probability can be calculated to be less than $3x10^{-2}$. The focus should be on the analyst's choice to use purely qualitative approaches.

Recommendation: Change to: "When the analyst chooses to use qualitative approaches or engineering judgment within a quantitative model to quantify Human Error Probabilities (HEP), use an initial screening failure probability of no less than 0.1. This value may be used as a basis for further refinement (e.g., through justifying improved performance shaping factors via use of past experience, relevant results of plant drills, improvements to training, modifications to operator manual actions, etc.)."

If the parenthetical statement at the end of this bullet is retained, change the phrase "exceed the requirements" to "exceed the nominal requirements"

Page 19 first sentence after second bullet: Suggest clarification.

Recommendation: Modify sentence as follows: "In addition, for all resources and actions credited in the Margins evaluation, the evaluation should: "

Page 19 first paragraph after the send set of bullets: Requiring evaluation of all failure modes should be unnecessary if lesser failure modes can be shown to be bounded by more severe modes.

Recommendation: Clarify that lower mode evaluations can be subsumed by evaluation of more extreme failure modes.

Page 20 *"Controlling Flood Mechanism(s)"* In earlier discussion it was noted that the identification of the conservatism of the analysis that led to the scenario may be useful in understanding the IA results and therefore it would be acceptable but not mandatory to include such information.

Recommendation: Add a statement such as – **"If desired and useful to understanding the scenario parameters, describe the conservatisms associated with the flooding analysis that led to the scenario parameters."**

Page 21 (two places) *"the reliability of active features",* if Table A 1 is used this will not be available.

Recommendation: Change to – "the reliability of active features **or results of application of Table A 1.**"

Page 21 *"Provide an evaluation (including sensitivity studies if appropriate) regarding the effectiveness of the total mitigation capability"* It isn't clear what this means. It would be helpful to list or describe the elements against which the evaluation should be performed.

Recommendation: Change to – "Provide an evaluation (including sensitivity studies if appropriate) regarding the effectiveness of the total mitigation capability **in providing the following elements: - - - "**
OR
"Provide an evaluation (including sensitivity studies if appropriate) regarding the effectiveness of the total mitigation capability **as specified in the following bullets specific to scenario-based , margins-base and full PRA evaluations."**

Page 36 *"The following sections provide points of consideration in evaluating soil structures (embankment, levees, and berms), concrete barriers, seals and plugs, and drainage systems. In evaluating these types of barriers, licensees should refer to the guidance below as well as appropriate codes and standards to assess whether in place or planned systems conform to good practices."* It isn't clear how these are supposed to be used in decision making or reporting.

Recommendation: Change to – "The following sections provide points of consideration in evaluating soil structures (embankment, levees, and berms), concrete barriers, seals and

plugs, and drainage systems. In evaluating these types of barriers, licensees should refer to the guidance below as well as appropriate codes and standards to assess whether in place or planned systems conform to good practices. **Plant features not meeting the implied expectations associated with these points of consideration shall be identified and a technical judgment provided summarizing what their implications are if they are noteworthy and if not noteworthy why they are not."**

Page 39 *"Equipment should not be damaged or otherwise adversely effected by the flood event (e.g., due to direct inundation, humidity, hydrodynamic forces, or debris) or adverse environmental conditions."* It is not practical to avoid any humidity.

Recommendation: "Equipment should not be damaged or otherwise adversely effected by the flood event (e.g., due to direct inundation, **excessive** humidity, hydrodynamic forces, or debris) or adverse environmental conditions."

Page 40 *"A.2 Evaluating flood protection systems"* and **Page 14**. *"Performance criteria"* The relationship between these two sections is confusing. There is duplicate content, example: 6.2 - evaluate the feasibility and reliability of credited operator actions (including construction, installation, or other actions) through comparison against criteria described in Appendix C A.2 - the feasibility and reliability of operator manual actions that must be performed to install or construct barriers (e.g., flood gates, sandbag walls), including factors that can influence operator performance, as described in Appendix C

And there is important, seemingly more detailed content in 6.2 (presumed to be the higher level section) that is not included in A.2. For example: 6.2 - compare the performance, characteristics, and configuration of the flood protection feature(s) against appropriate, present-day design codes and standards (including Standard Review Plan Sections 3.4.1 and 3.4.2, Refs. (5) and(6)) to determine that the feature(s) conforms to good practices and is sufficiently robust (e.g., demonstrates an appropriate factor of safety)

Recommendation: Clarify the relationship between these two sections

Page 44 *"Individuals with experience assessing operator manual actions (e.g., for fire) should be included in the peer review team at sites relying on operator manual actions to protect against or mitigate a flood event."* The use of "fire" implies it is a relevant "analog" to flooding which is not appropriate as fire and flooding events require significantly different action response times, types of actions, number of operators involved, etc. and is misleading in the sense that it implies there is an analogous, consensus-accepted approach.

Recommendation: Change to the following by **deleting (e.g. for fire)** - "Individuals with experience assessing operator manual actions should be included in the peer review team at sites relying on operator manual actions to protect against or mitigate a flood event."

Page 47 *"This appendix provides guidance on evaluating operator manual actions associated with flooding based on concepts and approaches used in human reliability analysis (HRA)."* It has been discussed during public meetings on several occasions that consensus methods for assessing reliability of operator(s) actions during flooding events do not exist and that use of existing methods entail a "best effort" type approach.

> Recommendation: Change to: "This appendix provides guidance on evaluating operator manual actions associated with flooding based on concepts and approaches used in human reliability analysis (HRA). **Due to the nature of and variety of potential flooding events and responses it is anticipated that other approaches may be used or developed for this purpose."**

Page 52 The following experience metrics are not relevant to this situation – a more appropriate measure would be training on the action or procedure. See recommendation below.
"□Low—less than 6 months experience and/or training. This level of experience/training does not provide the level of knowledge and deep understanding required to adequately perform the required tasks; does not provide adequate practice in those tasks; or does not expose individuals to various abnormal conditions.
□Nominal—more than 6 months experience and/or training. This level of experience/training provides an adequate amount of formal schooling and instruction to ensure that individuals are proficient in day-to-day operations and have been exposed to abnormal conditions.
□High—extensive experience; a demonstrated master. This level of experience/training provides operators with extensive knowledge and practice in a wide range of potential scenarios. Good training makes operators well prepared for possible situations."

> Recommendation: Change to a training based metric along the lines of the following:
> □Low— **on the job training obtained while performing flooding event actions during a flooding event**.
> □Nominal— **training at the frequency of periodic compulsory site training**
> □High— **training at the frequency of periodic compulsory site training for multiple training sessions and/or participation in the development of the training**

Page 55 "Human factors engineering": The discussion of this topic in the ISG point out the fundamental and significant differences in flooding related events and those typically addressed by HRA, yet the PSFs utilized are those for events associated with operators in a control room environment, such as major focus on instrumentation.

> Recommendation: Recommend deleting this area until research is done to understand what the relevant human factors engineering PSFs are for flooding events.