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Ed, Chris,

The attached document contains some general comments on the draft Integrated Assessment ISG. FFTF members will also have specific comments on the text of the document.

*Jim Riley*

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# **Integrated Assessment – General Comments**

## **Document Content / Format**

The draft ISG is a very complicated document that provides a lot of background information but its complexity makes it hard to use as guidance. Overall guidance or a flow chart that illustrates the entire process is needed to ensure understanding of how the IA is to be done. An industry developed flow chart has been drafted to illustrate our understanding.

## **Specific Circumstances which Require Performance of an Integrated Assessment**

It is not clear when an Integrated Assessment is required and what needs to be included within its scope. For example, Figure 1 in the 50.54(f) letter (decision block 3) states that an IA is necessary when the reevaluated flood level exceeds the level in the design basis (i.e., an IA only needs to be performed when flood levels are larger than in the design basis – other effects are not considered). In other places in the letter and in the IA document, the more general term “hazard” is used. Does hazard mean the entire event (e.g., a comparison of the design basis flood level result for dam failure with the reevaluated flood level for the same thing), or are individual elements of the hazard evaluations compared (e.g., the design basis evaluation of dam break did not consider wind and debris effects at all but the reevaluation does consider these effects, does the IA need to be done only on the wind and debris effects?).

If the IA must only be performed for elements of a hazard evaluation that are not bounded by the design basis, what needs to be done for a “focused” IA needs to be defined and treated consistently throughout the document. For example, the last paragraph in section A.3 and figure 3 both refer to evaluating all flood parameter scenarios; it might be better to refer to all applicable flood parameter scenarios, where applicability is defined by those scenarios that are not bounded by the design basis.

## **IA Scope: Evaluation of Ability to Maintain Key Safety Functions During a Flood**

The introduction to the IA document describes “two fundamental aspects to the Integrated Assessment.” The first aspect discussed (evaluation of flood protection capabilities) is within the scope described by the 50.54(f) letter. However, the second aspect - to perform additional analysis for the postulated compromise of flood protection systems including considering ways the system can fail and the likelihood of various failure modes - does not appear to have a basis the 50.54(f) letter. Key words such as “compromised”, “likelihood”, and “failure modes” do not appear in the letter’s 2.1 Flooding section or Attachments. This expansion of the scope goes beyond the statement of purpose in the 50.54(f) letter where it defines the purpose of the IA as a simple determination of the effectiveness of the existing design basis and Step 8 in the same section which requires the identification of vulnerabilities that are found and actions that have or will be taken to address them.

The additional requirement to perform a failure modes and effects analysis with probabilities assigned also appears to be in conflict with the last sentence of the PURPOSE statement for the IA

## **Integrated Assessment – General Comments**

which states, “It should be noted that the guidance provided in this ISG is not intended to describe methods for use in regulatory activities beyond the scope of the March 12, 2012, 50.54(f) letter.”

Note that if this evaluation is required by plants that must perform an IA, the information will not be prepared by those plants that do not have to perform an IA or for those flood protection systems that are not covered in a focused IA.

### **Acceptance / Performance Criteria**

The IA document refers to established acceptance or performance criteria in many places, but no criteria are provided (see page 15 for example). It is recognized that detailed numeric acceptance criteria are not desirable due to differences in plant design and flood protection features, but a description of the concepts required for acceptance criteria (qualitative acceptance criteria) would be helpful. Examples of industry’s concepts for qualitative acceptance criteria are included at the back of this document.

### **Definition of Terms**

Several terms that are important to implementation of the document must be defined or acceptance criteria established for them. These include:

- “sufficiently high reliability” or “reliable” (examples: page 15, first paragraph: demonstrate that the flood protection system integrity is maintained with sufficiently high reliability, and figure 3 block 5 – in both cases, what is reliable enough?)
- “large” margin (example: figure 3 block 6 – the term “large” determines what subsequent actions are expected, but no guidance on how the term “large” is to be interpreted are included)

As an example, the following sentence in the 4<sup>th</sup> paragraph on page 14:

“Quantification of the reliability of operator manual actions under a flood parameter scenario(s) is appropriate if conservative, qualitative evaluations do not demonstrate that an operator manual action can be performed with sufficiently high reliability when accounting for the considerations in Appendix C.”

could be replaced with:

“If the criteria in Appendix C are successfully addressed then operator actions are considered to have sufficient reliability.”

# **Integrated Assessment – General Comments**

## **Evaluating Mitigation: Use of CCDP as an Acceptance Criteria / Ability to Use FLEX**

The methods in Appendix B for evaluating mitigation methods all rely on PRA techniques and / or use  $1 \times 10^{-2}$  Conditional Core Damage Probability as an acceptance criterion. PRA techniques for flooding events are not developed and there are no consensus methods for quantifying human reliability for many flood protection type actions (e.g., installation temporary barriers, deployment and use of portable equipment, etc.). This makes any attempt to quantify such actions impractical and likely inconsistent.

In addition adoption of a  $1 \times 10^{-2}$  CCDP criterion would make it difficult to allow the use of the FLEX concept as a mitigation option because of its reliance on operator actions. This unintended consequence seems to be in direct conflict with the industry and NRC Steering Committee decision to pursue FLEX.

Qualitative acceptance criteria for evaluating mitigation actions need to be developed. Examples of qualitative criteria, adopted from the FLEX implementation guidance, are provided at the end of this document.

## **Need for Peer Review**

The expectations for peer review described in Appendix D are unnecessarily burdensome and may lead to delay in submittal of the IA (for example, the expectation that at least one member of the team should be external to the licensee's organization). The Integrated Assessment Report must be submitted under oath or affirmation and the utility process for submitting documents of this nature are very rigorous. Additional requirements are not necessary.

# Qualitative Acceptance Criteria

## App A – Evaluation of Flood Protection

- General
  - A basis must be provided for the capability of the flood protection features with respect to the re-evaluated flood hazards. Therefore, redundancy of flood protection features is not required.
  - Capability of credited flood protection features is maintained through the plant design change control processes and preventive maintenance programs
- Exterior and Incorporated passive flood protection features
  - Flood barriers must be higher than the reevaluated flood height and structurally able to withstand the static and dynamic loads of the applicable reevaluated flood hazards
  - Plugs in flood barriers must withstand the new static and dynamic forces while restricting any leakage to an amount within the capacity of available drainage or pumping systems
  - Penetration seals in flood barriers below the height of the reevaluated flood must be capable of withstanding the imposed static pressure
  - Water diversion structures must be capable of withstanding any increased flow or additional flood height
  - Storm drainage systems must be capable of passing sufficient flow to accommodate the reevaluated flood flow rate while maintaining the flood height no greater than the evaluated value
- Incorporated active flood protection features
  - Doors, or hatches in flood barriers must withstand the new static and dynamic forces or must shown to only pass an amount of water that is within the capacity of available drainage or pumping systems
  - Doors, or hatches in flood barriers must subject to appropriate administrative controls to ensure they are in place prior to a flood condition.
  - Sump pump capacity must be sufficient to accommodate the computed inflow rate associated with the reevaluated flood for the expected duration of the flood condition
  - All credited water level instrumentation must have sufficient range and any alarm or actuation functions are set as appropriate to monitor or respond to the reevaluated flood
- Temporary flood protection features (active and passive)
  - Temporary provisions must either be protected from or designed to withstand the new static and dynamic forces and must be shown to be leak-tight or only pass an amount of water that is within the capacity of available drainage or pumping systems
  - Temporary equipment must be capable of being moved to the location where it is needed and installed considering the height and warning time, anticipated environmental conditions associated with the reevaluated flood
  - Consumables necessary for the operation of temporary features must be sufficient to withstand the duration of the reevaluated flood

## Qualitative Acceptance Criteria

- Plant Preparations for Flood
  - Only those warning systems located at the site and under control of plant personnel should be relied upon
  - Emergency procedures and technical or administrative specifications requiring shutdown would govern plant response
  - Substantiation of the adequacy of the time available requires:
    - Estimating the time required to bring the plant to the configuration planned
    - Establishing the warning indicators that will initiate procedures
    - Documenting that sufficient time will remain after the warning for the configuration to be established before water can flood
  - Communication systems to alert both onsite and offsite company personnel are required

### App B – Evaluation of Plant Mitigation Capability

- Consistent with Flex guidance, equipment that is used to mitigate a flood that is greater than the current licensing basis must meet the guidance contained in the applicable sections of NEI 12-06 revision 0, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide*. These sections are listed below. If this equipment is also credited by the current licensing basis to mitigate the design basis flood, it must also continue to meet the applicable licensee and regulatory requirements.
  - The N+1 redundancy requirements of Section 3.2.2.
  - Section 6.2.3.1 – Protection of FLEX equipment
    - The equipment storage level is above the new flood level
  - Section 6.2.3.2 – Deployment of FLEX Equipment
  - Section 6.2.3.3 – Procedural Interfaces
  - Section 6.2.3.4 – Considerations in Utilizing Off-site Resources
  - Section 11.1 – Quality Attributes
  - Applicable requirements in Section 11.2 – Equipment Design – especially the following.
    - Portable towable equipment that is designed for over the road transport typically used in construction/remote site are deemed sufficiently rugged to function following the flood
    - Functionality of the equipment may be outside the manufacturer's specifications if justified in a documented engineering evaluation
  - Applicable requirements in Section 11.3 – Equipment Storage – especially the following.
    - Consideration should be given to transport from the storage area following the external event recognizing that external events can result in obstacles restricting normal pathways for movement.
    - ...equipment should be stored and maintained in such a manner that is consistent with assuring that it does not degrade over long periods of storage and that it is accessible for periodic maintenance and testing.

## Qualitative Acceptance Criteria

- Debris removal equipment...should be reasonably protected from the applicable external events such that it is likely to remain functional and deployable to clear obstructions from the pathway between the ...equipment's storage location and its deployment location.
- Any plant equipment may be used for mitigation as long as it can be shown to be available during the flood conditions
- Available equipment may be used in non-traditional ways as long as it has been shown to be capable of performing the required function and procedures are available to govern its operation.

### App C – Acceptable Operator Actions

- Demonstrate that the condition can be diagnosed and accomplished in the time available including consideration of uncertainties in estimating
  - the time available and
  - the time required to diagnose and execute the actions under the conditions expected during a flood.
- Consider the environmental conditions (e.g., light, heat, water level, for internal actions; debris, water level, road or bridge washout, downed power lines, actuated security barriers, for external actions) in both the locations where the manual actions will be performed and along the access and egress routes.
- Equipment that is necessary to enable implementation of a manual action is accessible, available, and not damaged or otherwise adversely affected by the event and its effects.
- Diagnostic indications relevant to the manual actions are available. These include those that:
  - enable the operators to determine which manual actions are appropriate
  - direct the personnel performing the manual actions, and
  - provide feedback to the operators.
- Equipment necessary to support communication among personnel is available to ensure proper performance of the actions
- Portable equipment, especially unique or special tools is readily available and its location is known and constant.
- Plant procedures that cover the manual actions are available and are maintained and personnel who are expected to perform the actions are trained on the procedures.
- An adequate number of qualified personnel are available. Assumed staffing should be consistent with the FLEX strategy. Credited personnel may be normally on site or available through the emergency planning staff augmentation system as long as they will be available within the time needed to perform the actions.
- Test, by actual performance by at least one randomly selected, but qualified team, that all criteria can be met.
  - Some flood mitigation measures can't actually be installed without taking systems out of service. The reasonable simulation from the 2.3 walkdowns can be credited.