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Subject: Draft FAQs
Date: Tuesday, February 05, 2013 5:48:53 PM
Attachments: [FAQ 008 - IA Lite Submittal Timing Rev 2.doc](#)
[FAQ 009 - IA Lite Peer Review Rev 1.doc](#)
[FAQ 011 - Seismic_Rev 0.docx](#)
[FAQ 013 - Sunny Day Dam Failure Evaluation Rev 1.doc](#)
[FAQ 017 - IA Scope - Hazards that must be Evaluated Rev 0.doc](#)

Chris, Ed;

I am forwarding the following 5 FAQs for your review.

- FAQs 008 and 009 - You commented on these at our last webinar. The attached versions attempt to resolve your comments
- FAQs 011, 013, and 017 - You are seeing these for the first time
 - The goal of FAQs 011 and 013 is to provide guidance for the subject dam failure evaluations as compared to the FEMA document we talked about during our webinar.
 - The goal of FAQ 17 is to further clarify the scope of Integrated Assessments

We have several more FAQs in development (hydrologic dam failure, breach parameters, dam failure screening, flood duration, evaluating debris effects, evaluating dams when dam design information is limited, and performing seismic evaluations of multiple dams). I hope to have drafts of all of these, with the exception of the FAQ on limited design information, to you prior to our meeting on February 21st.

Jim Riley

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A. TOPIC: Submittal Timing of Simple Integrated Assessments
Source document: <u> NRC Integrated Assessment Trigger Letter </u> Section: <u> NA </u>
B. DESCRIPTION: The NRC Letter dated 12/3/12 on the subject of trigger conditions for performing an integrated assessment identified two scenarios for which a full integrated assessment (IA) is not required. The letter indicates that the limited integrated assessments associated with these scenarios would be submitted with the hazard reevaluation. Due to time restraints, especially for Group 1 sites, additional time may be necessary to complete these limited assessments. Would it be acceptable to submit the limited integrated assessments at a later time (e.g., 6 months following submittal of final hazard evaluation) without constituting an extension of the hazard reevaluation?
C. Initiator: Name: <u> R Gil </u> Phone: <u> </u> Date: <u> 12/14/12 </u> E-Mail: <u> rudu_gil@fpl.com </u>
D. RESOLUTION: (Include additional pages if necessary. Total pages: <u> 2 </u>) Inquiry number: <u> 008 </u> Priority: <u> M </u> It is acceptable to submit the limited integrated assessments at a time separate from the flooding hazard report. This is substantiated by the following sentence in the last paragraph on the first page of the "Trigger" letter: "It should be noted that, although only licensees in scenario 4 are required to perform an integrated assessment, licensees in scenarios 1, 2, and 3 may elect to perform an integrated assessment, to be submitted 2 years after submitting the reevaluated hazard report." Furthermore, the word "should" in the following sentence that appears in the description of scenarios 2 and 3 in the "Trigger" letter can be interpreted as "may": "The results of this evaluation <u>should</u> be submitted with the hazard report." Submitting a limited Integrated Assessment at a time after submittal of the hazard reevaluation does not constitute an extension of the hazard reevaluation as long as the submittal occurs within 2 years of the reevaluation submittal. Revision: <u> 2 </u> Date: <u> 1/25/13 </u>
E. NRC Review: Not Necessary <u> </u> Necessary <u> X </u> Explanation: <u> </u>
F. Industry Approval: Documentation Method: <u> </u> Date: <u> </u>

Inquiry Form – Industry Approval

A. TOPIC:	Peer Review of Simple Integrated Assessments
Source document:	<u>NRC Integrated Assessment Trigger Letter</u> Section: <u>NA</u>
B. DESCRIPTION:	
<p>The NRC Letter dated 12/3/12 on the subject of trigger conditions for performing an integrated assessment identified two scenarios for which a full integrated assessment (IA) is not required. Scenario 2 requires application of Appendix A of the IA ISG and NUREG-0800. Scenario 3 requires application of Section 6 and Appendix A of the IA ISG. Accordingly, other sections of the IA ISG, and specifically the requirements for peer reviews, are not required for evaluation of these scenarios. This approach appears reasonable, since the scenarios are not complex and normal reviews associated with submittals under 50.54(f) will ensure the accuracy of the evaluations. Please confirm this interpretation.</p>	
C. Initiator:	
Name:	<u>R Gil</u> Phone: _____
Date:	<u>12/14/12</u> E-Mail: <u>rudyl_gil@fpl.com</u>
D. RESOLUTION: (Include additional pages if necessary. Total pages: <u>1</u>)	
Inquiry number:	<u>009</u> Priority: <u>M</u>
<p>It is necessary to perform the peer reviews described in section 4 and Appendix B of JLD-ISG-2012-05 for all Integrated Assessments including those assessments described in scenarios 2 and 3 of the December 3, 2012 NRC letter to NEI. It is expected that use of JLD-ISG-2012-05 will result in an assessment that is comparable in complexity to its associated flooding reevaluation, i.e., simple reevaluations should result in simple integrated assessments and simple peer reviews.</p>	
Revision: <u>1</u>	Date: <u>1/25/13</u>
E. NRC Review:	
Not Necessary _____	Necessary <u>X</u>
Explanation: _____	
F. Industry Approval:	
Documentation Method: _____	Date: _____

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A. TOPIC: Criteria for Seismic Dam Stability Analyses

Source document: ANS 2.8-1992 and NUREG/CR-7046 Section: 6.2 & 9.2.1.2 and Appendix H

B. DESCRIPTION:

ANS 2.8-1992, Section 6.2 titled "Seismic Dam Failures" provides guidance on evaluating the consequences of dam failures due to seismic events and points the user to Section 9, Combined Events Criteria for the specific details on combinations to be evaluated. NUREG/CR-7046 repeats the same load cases in Appendix H, Combined-Effect Floods. These documents are listed as current criteria for the use of flood hazard re-evaluations in the 10CFR50.54(f) letter in Enclosure 2, Recommendation 2.1: Flooding. The criteria for seismic dam failures (ANS 2.8-1992, Section 9.2.1.2) is as follows:

- Alternative I
 - 25-yr flood
 - Dam failure caused by the safe shutdown earthquake (SSE) coincident with the peak of the flood
 - 2-yr wind speed applied in the critical direction

- Alternative II
 - One-half probable maximum flood (PMF) or 500-yr flood, whichever is less
 - Dam failure caused by the operating basis earthquake (OBE) coincident with the peak of the flood
 - 2-yr wind speed applied in the critical direction

The use of the terms SSE and OBE imply deterministic earthquakes since these terms are not used within new plant licensing. The use of a deterministic earthquake for evaluation of dams does not align with current practice within the technical communities (nuclear power or dam safety). Therefore, there is a need to define criteria for use of a probabilistic earthquake for the evaluation of combined events due to seismic dam failures.

C. Initiator:

Name: Penny Selman Phone: _____

Date: 2/4/13 E-Mail: pbselman@tva.gov

D. RESOLUTION: (Include additional pages if necessary. Total pages: _____)

Inquiry number: _____ Priority: _____ H _____

The intent of the ANS 2.8-1992 combined events seismic is to evaluate an earthquake that produces higher ground accelerations, presumably with a high return period, with a flood of shorter return periods and under the second alternative, evaluate an earthquake that produces ground accelerations on the

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order of half those of the SSE with a flood with a higher return period flood. The flooding of those two alternatives have the potential to produce floods of differing durations and magnitude as well as differing timing of the flood wave to the nuclear power plant, so both alternatives require consideration unless a bounding evaluation is completed¹. To maintain the intent of ANS 2.8-1992, the following alternatives are proposed:

- Alternative I
 - 25-yr flood
 - Dam failure caused by 1E-4 ground motions coincident with the peak of the flood
 - 2-yr wind speed applied in the critical direction

- Alternative II
 - One-half probable maximum flood (PMF) or 500-yr flood, whichever is less
 - Dam failure caused by one-half the 1E-4 ground motions coincident with the peak of the flood
 - 2-yr wind speed applied in the critical direction

The 1E-4 ground motions shall be determined at the dam site. The following methods are acceptable for determination of the 1E-4 ground motions or 1E-4 uniform hazard response spectra (UHRS):

- Use Central and Eastern United States Seismic Source Characterization (CEUS-SSC) for Nuclear Facilities (NUREG-2115) and associated attenuation model to develop the mean seismic hazard curves and UHRS at the dam site for 1 Hz, 5 Hz, 10 Hz, 25 Hz and peak ground acceleration (PGA). Either EPRI 2004/2006 attenuation models or the updated EPRI 2004/2006 attenuation model (available in May 2013) may be used for development of the 1E-4 UHRS.
- Use United States Geological Survey (USGS) (2008) to determine the mean seismic hazard curves for 1 Hz, 5 Hz, 10 Hz and PGA. Apply one of five EPRI mean amplification functions to the mean rock seismic hazard curves based on the known geologic conditions at the dam site. EPRI mean amplification functions can be found in EPRI (1993). From the site-adjusted mean hazard curves, develop the 1E-4 UHRS.

After determining the 1E-4 UHRS, the evaluation of the dam's structural stability may be completed. This evaluation shall include the concrete and earthen sections of the dam as well as a structural evaluation or assessment of the dams appurtenances, e.g., spillway gates, navigation locks, etc. The headwater and tailwater used for the evaluation shall be the 25-year flood design values. The methods of completing this evaluation are those described by the criteria established by the agency having jurisdiction (e.g., FERC, USACE, Bureau of Reclamation, etc.). The applicable factors of safety per the dam regulator's criteria must be met to demonstrate that the dam will remain stable under the combined seismic and flood loading condition.

The above method shall be completed again for one-half the 1e-4 UHRS combined with headwater and

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tailwater for the 500-year flood or one-half PMF, whichever is less.

These evaluations shall be completed for each dam within the watershed that is desired to demonstrate stability during these loading conditions. It is permissible to make conservative assumptions of failure within these analyses.

¹The bounding evaluation would use conservative assumptions and require justification as the bounding condition.

Revision: 0 Date: 2/4/13

E. NRC Review:

Not Necessary _____

Necessary X

Explanation: _____

F. Industry Approval:

Documentation Method: _____

Date: _____

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<u>A. TOPIC:</u>	Dam Failure Evaluations: Sunny-Day Failures		
Source document: _____	JLD ISG-2013-xx _____	Section: _____	NA _____
<u>B. DESCRIPTION:</u>			
The Interim Staff Guidance for dam failure evaluations describes a "sunny-day failure" but does not provide sufficient guidance on attributes of such an evaluation or how it might be performed.			
<u>C. Initiator:</u>			
Name: _____	J Riley _____	Phone: _____	
Date: _____	1/25/13 _____	E-Mail: _____	jhr@nei.org _____
<u>D. RESOLUTION:</u> (Include additional pages if necessary. Total pages: _____ 1 _____)			
Inquiry number: _____	013 _____	Priority: _____	H _____
<p>A 'sunny-day' dam failure is not associated or concurrent with an initiating event (such as an extreme flood or earthquake) and may result from, for example, a structural, geotechnical, or operational deficiency. Sunny-day failures are typically associated with short warning times. Because of their nature, a sunny-day failure need not be considered for more than one dam at a time but the potential cascading effect of an upstream sunny-day dam failure on downstream dams must be considered. As with other dam failure analyses, the sunny day dam-failure analysis must consider not only dams upstream of the site, but also dams on tributaries that confluence with the river downstream of the site, which may affect the site due to backwater caused by the dam failure flood wave.</p> <p>A hierarchical hazard assessment (HHA) approach as described in NUREG/CR 7046 should be applied to the sunny-day dam failure analysis. Simplified but conservative methods should be employed to identify the critical dam whose individual sunny-day failure may result in a flood hazard that exceeds the current flooding design basis for the site. For the critical dam (or cascading sequence of dams), the analysis should be refined progressively using site-specific data until one of the following criteria is satisfied:</p> <ol style="list-style-type: none">1. The current flooding design basis for the site unambiguously bounds the critical sunny-day dam failure scenario results, or2. The results from another flood causing mechanism considered in the flood hazard reevaluation unambiguously bound the critical sunny-day dam failure scenario results, or3. No further site-specific refinement of the critical sunny-day dam failure scenario is possible or practical in accordance with the state of the practice, and the critical sunny-day dam failure scenario results unambiguously bound the current flooding design basis for the site. The critical sunny-day dam failure scenario results would become the revised flooding design basis for the site. <p>The attributes of a sunny-day dam failure analysis for the critical dam should include:</p> <ul style="list-style-type: none">• Assume normal pool water level at the time of dam failure. This assumption applies to the initiating sunny-day dam failure as well as any downstream impoundments for analysis of cascading dam failures.			

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- Assume no precipitation during the event or runoff into the critical reservoir other than normal baseflow conditions (which may be negligible). This assumption also applies to downstream impoundments in the cascading sequence (if applicable).
- Use conservative, but realistic, physics-based breach parameters that are appropriate to the type of dam(s) being evaluated.
- Assume warning times that are no greater than the time necessary to grow the breach from initiation to failure plus the time necessary for the flood water to reach the site.
- Develop information to appraise the probability of sunny-day failure of the critical dam or cascading series of dams.

Studies have shown that the overall probability of dam failure is in the range of 10^{-4} to 10^{-5} per year. For this reason, excluding a sunny-day failure from flooding reevaluations for riverine sites with critical upstream dams can be based on a probabilistic approach, rather than arguments that are based on satisfaction of applicable codes and standards during design or on meeting specified standards for dam operation or surveillance. The NRC has stated that a sunny day failure can be shown to not occur by proving that the probability of a sunny day failure for the specific dam under consideration is less than:

- 10^{-7} per year or
- 10^{-6} per year with additional justification

The information below may be helpful as additional justification:

- Ongoing monitoring and inspection programs that are able to detect problems prior to leakage
- Structural dimensions,
- Construction records,
- Records from installed monitoring instrumentation and/or piezometer wells,
- Field surveys,
- On-site inspection reports,
- Maintenance records,
- Risk tolerance of operating agency,
- Durable operation, maintenance, and corrective action procedures and agreement,
- Information from the dam owner, developed or approved by a state or federal agency.

Revision: 1 Date: 2/5/13

E. NRC Review:

Not Necessary _____

Necessary X _____

Explanation: _____

F. Industry Approval:

Documentation Method: _____

Date: _____

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A. TOPIC: IA Scope: Hazards that must be Evaluated
Source document: <u>IA ISG: JLD ISG 2012-05</u> Section: <u>5.2</u>
B. DESCRIPTION: Section 5.2 of JLD ISG 2012-05 ("Identification of Controlling Flood Parameters) contains the following statement: "...the integrated assessment should be performed for a set(s) of flood scenario parameters defined based on the results of the Recommendation 2.1 hazard reevaluations." Further guidance should be provided on the flood hazards that must be considered in defining the scenario parameters.
C. Initiator: Name: <u>Jim Riley</u> Phone: _____ Date: <u>1/25/13</u> E-Mail: <u>jhr@nei.org</u>
D. RESOLUTION: (Include additional pages if necessary. Total pages: <u>1</u>) Inquiry number: <u>017</u> Priority: <u>H</u> An integrated assessment is required if a licensee's flooding reevaluation results for any hazard exceed the parameters defined in the current licensing basis for that hazard. Since the intent of the integrated assessment is to evaluate the plant's response to the increased hazard, the scope of the integrated assessment should be limited to only the hazards or their associated effects that exceed the information in the current licensing basis. In other words, the integrated assessment need not consider flood reevaluation scenarios arising from hazards that are bounded by the current licensing basis. The statement quoted above should be revised to state: "...the integrated assessment should be performed for set(s) of flood scenario parameters derived from the hazards or associated effects for which the results of the Recommendation 2.1 hazard reevaluations exceed the results documented in the current licensing basis." Revision: <u>0</u> Date: <u>1/25/13</u>
E. NRC Review: Not Necessary _____ Necessary <u>X</u> Explanation: _____
F. Industry Approval: Documentation Method: _____ Date: _____