NRC staff suggestions for discussion with NEI regarding dam failure white paper

Public Meeting

December 14, 2012

Proposed change to format for discussion

"Primary" document (To be Endorsed)

- **Introduction**
  - **Purpose**
  - **Background**
- **Overview of Dam Failure Mechanisms**
  - **Hydrologically Induced Failures**
  - **Seismically Induced Failures**
  - **Sunny Day Failures**
  - **Individual and Cascading Failures**
- **Overview of HHA Approach to Dam Failure**
- **Use of Existing Information**
- **Dam Failure Flood Modeling**
  - **Simplified Modeling Approaches for Dealing with Large Watersheds with Many Dams**
  - **Further Analysis**
    - **Hydrologic**
    - **Seismic**
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    - **Concrete Dams**
    - **Embankment Dams**
  - **Flood Routing**
- **Definitions and References**

Supplemental documentation or appendices (Information Only)

- **Hydrologic and Hydraulic Flow Models**
- **Examples of Simplified Approaches for Large Watersheds with Many Dams**
- **Dam Stability Analysis**
  - **Hydrologic Loading**
  - **Seismic Loading**
- **Breach Parameter Formulations**

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Take content from existing version of white paper

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- EAPs and other studies (if available) should be considered if:
  - Have the appropriate attributes as described in the white paper
  - Reflect current state of practice and information
  - Assumptions used are still valid (e.g., condition of the dam, inspection frequency)
  - Reflect appropriate level of conservatism depending on the application (e.g., screening versus detailed analysis) and the characteristics of the available information

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Address attributes such as:

- Use of a simplified and conservative approach for dealing with large watersheds with many dams
  - Use of conservative assumptions with respect to routing, timing, etc.
  - Use of conservative models (e.g., regression equations)
- Conservation of mass/volume
- Inclusion of multiple models and methods
- Inclusion of sensitivity studies
- Assurance that clustering has a defensible engineering basis based on timing, watersheds, etc. (e.g., use of HUCs)

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Address attributes such as:

- Defensible engineering evaluation of credibility of mechanism, including
  - Inflow model and assumptions (e.g., design storm, rainfall run-off model)
  - Capacity of dam to pass PMF (as defined in NRC guidance)
  - Considerations other than spillway capacity
    - Condition and characteristics of dam and spillway (including capability to withstand volume and duration of flood event)
    - Potential failure of spillway gates during flood

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Address attributes such as:

- Defensible engineering evaluation of credibility of mechanism, including
  - Develop ground motions at 1E-4 level at the dam site using present day methods
  - Evaluation of capacity of dam under appropriate load combinations:
    - 1E-4 ground motion with a 25-year flood
    - ½ the ground motion associated with the 1E-4 level with lesser of 1/2PMF or 500-year flood
  - Consideration of dam failure coincident with appropriate flood if dam cannot withstand ground motion
  - Consideration of multiple dams

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Address attributes such as:

- Discussion and analysis of credible failures modes

  Note: Should refer to present day criteria for man-related hazards per 10 CFR 100.20(b). Other hazards have numerical criteria in SRP 2.2.1-2.2.2. However, with appropriate justification, other failure mechanisms may be considered in lieu of calculating the breach parameters under a sunny day failure. Differences in associated effects (e.g., warning time, duration, debris loads) must be considered.
- Description of condition of dam
- Dam operational characteristics (e.g., monitoring and surveillance)
  Note: These characteristics may be used to assess warning time with respect to recognition that dam failure is likely or imminent

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Address attributes such as:

- Choice of breach models and parameters
  - Use of appropriate and justifiable models and methods
  - Use of multiple models and methods and performance of sensitivity studies

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Address attributes such as:

- Choice of models and methods
  - Type of model chosen (e.g., 1D vs. 2D, hydrologic vs. hydraulic, steady vs. unsteady flow), including justification
  - Performance of sensitivity studies for parameters in model (e.g., roughness)
  - Use of site-specific values (if known) over generic values