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Sent: Thursday, March 15, 2012 9:30 AM
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Subject: Industry Flood Hazard Evaluation Prioritization Scheme
Attachments: NEI Flooding Evaluation Characterization Rev A 03-13-12.docx

Ed, Chris;

The prioritization scheme developed by the Fukushima Flooding Task Force (FFTF) is attached to this message. As we discussed yesterday, we would like to start working on the prioritization process with you as soon as possible; probably beginning with this afternoon's webinar.

A couple of key points:

- * The FFTF believes the attached scheme is a good start. It provides a structured, repeatable approach to relative prioritization based on the complexity of the analysis. We understand that the parameters we have used, their weight, and the categories defined are not the only way to do this. I think the general approach can be modified to fit alternate parameters or weights or even categories if that is desired.
- * We believe that equally important is the process we discussed yesterday, namely:
 - o FFTF and NRC agree on a scheme that is structured, simple to use and understand, and able to be consistently applied.
 - o Since we believe that there are not enough flood evaluation resources to allow all sites to start their evaluations at the same time, the scheme should define categories or groupings of plants in a way that defines who should start their evaluations first. We recommend 3 groups because the work we did in the last few months leads us to believe that more than 2 "rounds" of evaluations will be necessary to complete all the evaluations.
 - o The agreed upon plan should be distributed to the utilities who should be asked to apply the scheme to their own plants, define which of their plants falls into each group, and provide the result back to the FFTF/NRC. This allows the utilities to levelize their resources so the work can be accomplished effectively.
 - o The plant input should be evaluated by the FFTF/NRC to ensure that evaluations are being completed at an acceptable pace so that progress is evident and the Integrated Assessment guidance can be

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- o “tried out” early in the process.
- o Any changes in the plant input should be discussed with the utilities to ensure that the change is supported by them.
- o NRC would then issue the final prioritized (or categorized) list to plants 60 days after the 50.54(f) letter (May 11th).

Overall, we believe this will result in a process that ensures that the evaluations are completed in an orderly manner that satisfies everyone's interests, and that companies have control over their own resources in recognition of the fact that the flooding evaluations are only one part of a number of activities that are competing for utility attention.

Thank you,

Jim Riley

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NPP External Flooding Evaluations Categorization Scheme

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A. INTRODUCTION

In response to the nuclear fuel damage at the Fukushima-Daiichi power plant due to the March 11, 2011 earthquake and subsequent tsunami, the United States Nuclear Regulatory Commission (NRC) is requesting information pursuant to Title 10 of the Code of Federal Regulations, Section 50.54 (f) (10 CFR 50.54(f) or 50.54(f)). As part of this request, licensees will be required to reevaluate flooding hazards, per present-day guidance and methodologies for early site permits and combined license reviews, to assess margin at safety-related structures, systems, components (SSCs) and effectiveness of current licensing basis (CLB) protection and mitigation measures. The request is associated with the NRC's Post-Fukushima Near-Term Task Force (NTTF) Recommendation 2.1 for flooding, approved by the Commission in SECY 11-0137, *Prioritization of Recommended Actions to be Taken in Response to Fukushima Lessons Learned*, dated December 15, 2011.

The Post-Fukushima NTTF is responsible for conducting a review of NRC processes and regulations and determining if the agency should make additional improvements to its regulatory system. A set of recommendations, contained in a report to the Commission dated July 12, 2011 (SECY-11-0093), was developed to assess flood prevention (hardened protection), mitigation, and emergency preparedness (EP) and effectiveness in performing its safety function.

On September 9, 2011, the NRC staff submitted SECY-11-0124 to the Commission. The document identified those actions from the NTTF report that should be taken without unnecessary delay. As part of the October 18, 2011, staff requirements memorandum (SRM) for SECY-11-0124, the NRC approved the staff's proposed actions, including the development of three information requests under 10 CFR 50.54(f). The information collected would be used to support the NRC staff's evaluation of whether further regulatory action was needed in the areas of seismic and flooding design, and emergency preparedness.

In the 50.54(f) letter, the NRC indicates that flood hazard evaluations should be implemented in two (2) phases as follows:

- Phase 1: Issue 50.54(f) letters to all licensees to request they reevaluate the seismic and flooding hazards at their sites using updated seismic and flooding hazard information and present-day regulatory guidance and methodologies and, if necessary, to request they perform a risk evaluation. The evaluations associated with the requested information in this letter do not revise the design basis of the plant. This letter implements Phase 1.
- Phase 2: Based upon the results of Phase 1, the NRC will determine whether additional regulatory actions are necessary (e.g. update the design basis and SSCs important to safety) to provide additional protection against the updated hazards.

The NRC's goal is to complete the evaluations, included in Phase 1, within 3 years. The actions and information requested in the 50.54(f) letter include:

Requested Action:

- Evaluate all relevant flooding mechanisms using present-day regulations, methodologies, engineering practices, and modeling software (Phase 1). Actions associated with Phase 2 (above) are not being requested at this time, pending completion of the Phase 1 evaluations.
- Where the reevaluated flood exceeds the design basis, submit an interim action plan that documents actions planned or taken to address safety issues (if any) at the new hazard levels.

- Perform an integrated assessment of the plant for the entire duration of the flood conditions to identify vulnerabilities and corrective actions under full power operations and other plant configurations. The scope also includes those features of the ultimate heat sinks that could be adversely affected by flood conditions and lead to degradation of the flood protection. (The loss of ultimate heat sink from non-flood causes is not included.)

Requested Information:

- Hazard Reevaluation Report – Documents the results of the new evaluations for all relevant flooding mechanisms.
- Integrated Assessment Report – Documents corrective actions (completed and/or planned) for plants where the current design basis floods do not bound the reevaluated hazard for relevant mechanisms and the entire duration of the flood.

Within approximately 60 days of the date of the 50.54(f) letter, NRC staff will determine the priority for each reactor site to complete the hazard reevaluation. The site priority will affect the submittal date for the Hazard Reevaluation Report, requested 1 to 3 years from the date of the 50.54(f) letter. The purpose of this document is to present NEI/industry's proposed methodology for categorizing flooding reevaluations using indicators for susceptibility and complexity.

B. SITE CATEGORIZATION SCHEME

Detailed flooding evaluations are anticipated to involve a significant commitment of specialized technical resources. Therefore, a categorization scheme was developed to group the sites, allow for a more manageable use of technical resources, and maintain a high standard of quality and integrity. The scheme basically represents siting and complexity, relative to flood hazards, and includes the following factors:

- **Age of Plant** – Plants are segregated into three periods of construction: 1969–1975, 1976–1984, and 1985–1996. The vintage factor is an indicator related to adequacy of a plant's flooding design basis. Flooding design basis for older plants are assumed to be less up-to-date.
- **Location/Hazard** – The location/hazard factor accounts for a plant's potential susceptibility to flooding from multiple mechanisms, including rivers, upstream dams, coastal, lakes, and local intense precipitation (flooding from direct site runoff), and is an indicator of the complexity and duration of the associated flooding evaluation. Utilities are asked to calculate a total 'location/hazard' factor by adding those for individual relevant flooding mechanisms. Computing the 'location/hazard' factor may require limited investigation to screen flooding mechanisms.
- **Licensing Basis (Wet or Dry Siting)** – Some plants were licensed as 'wet' sites; that is, a Probable Maximum Flood (PMF) that will challenge safety-related equipment and/or requires the installation of temporary flood protection/mitigation measures to ensure safe shutdown. These sites will likely require detailed/site-specific flooding evaluations to accurately quantify safety margins at PMF levels. A 'dry' site has all safety-related equipment above the PMF level. PMF levels are subject to change with the reevaluations.
- **Co-Located Sites** – A site that is 'co-located' with another plant that has undergone a recent evaluation for a combined operating license application.
- **Recent Evaluations** – For the purpose of categorizing sites, 'recent (flooding) evaluations' is defined as those occurring during or after 1995, about the time current hydraulic models, including the USACE HEC-RAS and HEC-HMS computer models, were made available for public use.

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- **Size of Watershed** – The complexity of the flooding evaluation for riverine sites increases when the associated watershed area exceeds 20,000 square miles. Standard guidelines are available to define the Probable Maximum Precipitation (PMP) for watersheds at or below 20,000 square miles. Otherwise, the evaluation may require development of site-specific PMP scenarios to establish the bounding PMF.

The categorization scheme is based on a rating system developed for each of the above factors as shown in Table 1. The ratings are totaled to place a site in 1 of 3 categories, listed below. Higher total ratings generally correspond to sites with higher flooding susceptibility and complexity, and vice versa.

- Category 1 – Most complex flooding evaluation
- Category 2 – Average evaluation complexity
- Category 3 – Simplest evaluation

In the 50.54(f) letter, the NRC provides an opportunity for utilities to submit an alternative plan and schedule, within 90 days after the date of the letter, for evaluations anticipated not to be completed within the 3-year timeframe. Licensees should have the flexibility to manually adjust sites to create more workable groupings, if appropriate. These adjustments should be made once ratings for all a utility's sites are determined. See Table 2 for an example application of the categorization system.

License Vintage (select one)	Rating	Co-Located Sites (select one)	Rating
1969 - 1975	13	Yes	3
1976 - 1984	8	No	6
1985 - 1996	3		
		Recent Evaluations, after 1995 (select one)	Rating
Location/Hazard (select all that apply)	Rating	Comprehensive/Detailed	2
River	5	Mixed Detailed/Approx.	6
Lake	3	Nothing Recent	10
Coastal	7		
Upstream Dams	8	Size of Watershed (select one)	Rating
Onsite Reservoir	3	> 20,000 sq. miles	10
Local Intense Precipitation	2	< 20,000 sq. miles	3
Location/Hazard Summation	2 to 28	Not applicable	0
Licensing Basis (select one)	Rating		
Wet	14		
Dry	4		
Category 1		59 to 81	
Category 2		37 to 58	
Category 3		14 to 36	

Table 1 - Categorization Rating System

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Site 1			
Vintage	3	Co-Located Sites	6
Location/Hazard	2	Recent Evaluations	10
Siting	4	Size of Watershed	0
Total		25 (Category 3)	
Site 2			
Vintage	13	Co-Located Sites	6
Location/Hazard	15	Recent Evaluations	10
Siting	4	Size of Watershed	3
Total		51 (Category 2)	
Site 3			
Vintage	13	Co-Located Sites	6
Location/Hazard	15	Recent Evaluations	10
Siting	14	Size of Watershed	10
Total		68 (Category 1)	

Table 2 – Example Application of Rating System