UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001

May 17, 2016

Mr. Victor M. McCree
Executive Director for Operations
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: NRC STAFF UPDATED ASSESSMENT OF FUKUSHIMA TIER 2 RECOMMENDATIONS RELATED TO EVALUATION OF NATURAL HAZARDS OTHER THAN SEISMIC AND FLOODING

Dear Mr. McCree:

During the 634th meeting of the Advisory Committee on Reactor Safeguards (ACRS), May 5-6, 2016, we reviewed the white paper, "Draft Nuclear Regulatory Commission Staff Updated Assessment of Fukushima Tier 2 Recommendations Related to Evaluation of Natural Hazards Other Than Seismic and Flooding." Our Fukushima Subcommittee reviewed material related to this matter on October 6, 2015 and April 21, 2016. During these meetings, we had the benefit of discussions with the NRC staff. We also had the benefit of the referenced documents.

CONCLUSIONS AND RECOMMENDATIONS

1. We agree with the staff's conclusion that further evaluation of the effects from high winds and snow loads is warranted.

2. We plan to review the analyses which support the staff's conclusions that no further effort is needed to examine the effects from downstream dam failures and intake water seiche conditions at selected sites.

3. The staff has provided adequate justification for excluding most other natural hazards from further evaluation. The following items merit additional attention:

    - Hazards that may disable the ultimate heat sink as a source of water with adequate quality to support long-term heat removal

    - Hazards that may prevent reliable operation of plant equipment and alternative mitigation equipment which rely on adequate air quality for combustion or ventilation

4. The staff should remain involved in the multi-agency investigation of severe geomagnetic storms. They need to distill from this effort expeditiously those factors important for the NRC's regulatory process.

BACKGROUND

The effects from reevaluated seismic and external flooding hazards at all U.S. nuclear power plant sites are being addressed under the Tier 1 recommendations developed in response to the March 11, 2011 accident at the Fukushima Dai-ichi nuclear power plant. In SECY-15-0137, the staff presented their plans to resolve and close the remaining open Tier 2 and Tier 3 recommendations. One recommendation involves the examination of other natural external hazards to determine whether any may merit regulatory attention. Enclosure 1 to SECY-15-0137 outlines a four-step process for evaluating these hazards:

1. Define natural hazards other than seismic and flooding to determine whether any are sufficiently important to be reviewed generically.

2. Determine and apply screening criteria to exclude certain natural hazards from further evaluations.

3. Perform a technical evaluation to assess the need for additional actions if the hazard was not screened out in Task 2.

4. Based on the results of Task 3, determine if additional regulatory actions are needed.

The staff plans to complete these evaluations by the end of 2016. The white paper provides interim information about their progress. In particular, it addresses completion of Task 1 and Task 2 of these evaluations. It also contains preliminary information regarding the Task 3 assessments for selected hazards and plant sites.

A forthcoming Commission paper, based on subsequent enhancements to the white paper, will describe the current status of this effort. We did not receive the draft Commission paper in time to support our deliberations for this letter. Our conclusions and recommendations account for information in the version of the white paper that was made available for our May 5, 2016 meeting.

DISCUSSION

Appendix A to the white paper contains a comprehensive tabulation of natural hazards compiled from a broad spectrum of reference literature and operating experience. We did not identify any natural hazards that were inadvertently omitted from consideration.

The staff has concluded that two categories of hazards require further evaluation in Task 3 of the assessment process:

- Wind and missile loads from tornadoes and hurricanes

- Snow and ice loads for roof design

We agree with the staff's conclusion that further evaluation of the effects from high winds and snow loads is needed to determine whether regulatory action may be warranted and to identify the sites that may be affected.

In the following sections, we provide our observations about some elements of the Task 2 screening evaluations and the preliminary information in support of the Task 3 assessments for selected hazards and plant sites.

Needs for Additional Task 2 Screening Justification

In some of the assessments summarized in Appendix A of the white paper, the reasons for excluding a hazard from further evaluation seem to rely primarily on considerations of coincident loss of all AC power and loss of the ultimate heat sink. Those combined consequences are a pragmatic surrogate that has proved useful for the development of site-specific strategies to prevent or mitigate damage from severe seismic events or external flooding. However, the screening rationale for some specific hazards may suffer from that focus. The following categories of hazards merit additional attention or enhanced justification to conclude that no further evaluations are needed.

Hazards that Adversely Affect the Ultimate Heat Sink

Some hazards may not directly affect offsite or onsite AC power supplies or the physical integrity of a plant's ultimate heat sink. However, they may introduce large amounts of small debris, aquatic or terrestrial biomass, or other material which could render the water supply unfit for effective heat removal. Examples of these effects include plugging of intake screens with small cross-sections, plugging or fouling of heat exchangers, and erosion of piping or heat exchangers by abrasive sands. General categories of hazards that may introduce these materials include avalanches, landslides, and the broad group that includes biological events and lake- or river-borne material. Introduction of debris can also be exacerbated by local or regional storms.

The staff's assessments of these hazards rely on a variety of considerations that do not seem to address the possibility that the effects from such foreign material may persist for an extended period of time. That condition may affect screening conclusions which rely on the event duration or mobilization of FLEX equipment that takes suction from the same water supply. The staff should provide additional justification for removing these hazards from further evaluation.

Hazards that Adversely Affect Site Air Quality

The staff's assessment of hazards that include dust storms, forest and grass fires, and sandstorms indicates that plants “should be able to achieve safe stable shutdown conditions using safety related equipment.” The assessment also indicates that the FLEX mitigating strategies developed in response to Order EA-12-049 provide additional assurance that no further evaluation is needed. However, the summary does not explicitly address whether stable long-term core cooling can be sustained if these conditions persist longer than a plant's nominal Phase 1 FLEX coping time.

Appendix A contains a more detailed assessment of the effects from volcanic ash at six sites. Except for specific information about the Columbia Generating Station, the white paper does not describe the assessments for the other five sites. However, based on the brief summary for Columbia, that assessment seems to rely on an assumed limited duration of the hazard and implementation of the Phase 2 FLEX mitigating strategies.

It is not apparent whether the staff's evaluations of these hazards account for concentrations of smoke and particulates that may persist longer than the FLEX Phase 1 coping time or, perhaps, for days. The adverse air quality may contaminate insulators for offsite power supplies and may affect plant ventilation systems, combustion air for installed emergency generators, and combustion air for alternative generators mobilized under the FLEX strategies. The staff should provide additional justification for removing these hazards from further evaluation.

Preliminary Conclusions for Task 3 Evaluations

The staff informed us that the intent of the evaluations performed during Task 2 is to screen out a hazard only if it does not merit further examination at any site. That criterion is more stringent than a conclusion that two or more sites are affected to justify further evaluation under the NRC's Generic Issues Program. However, considering the site-specific nature of these hazards and their potential consequences, it is appropriate for these initial assessments.

The white paper summarizes more detailed assessments of three hazards that are proposed for resolution without further evaluation. Those hazards are:

- Volcanic activity
- Low water conditions due to downstream dam failure
- Low water conditions due to a seiche

The preceding section of this letter contains our comments on possible prolonged adverse air quality conditions that may be caused by volcanic activity.

The staff has performed risk-informed evaluations for several sites to support a conclusion that random (so-called “sunny day”) failures of seismically-qualified downstream dams do not merit further consideration under the Generic Issues Program. The white paper contains additional details of a qualitative evaluation for the H.B. Robinson site, which is the only site that was retained after the Generic Issues examinations. The white paper does not describe the risk-informed evaluations for the other sites. Those evaluations are functionally equivalent to the types of assessments that are to be performed under Task 3 of Enclosure 1 to SECY-15-0137. Therefore, we plan to examine them and their conclusions as part of our review of the Task 3 activities.

The white paper contains summary information about assessments that were performed to examine the effects of low water conditions due to a seiche phenomenon at sites located on the Great Lakes and Chesapeake Bay. That hazard was also proposed as a potential Generic Issue. The staff has indicated that the assessments documented in the white paper will be used to close that issue. The white paper does not provide sufficient details of each site-specific assessment to support a risk-informed conclusion that further evaluation is not needed. Therefore, we also plan to examine those assessments and their conclusions as part of our review of the Task 3 activities.

Geomagnetic Storms

The staff has concluded that geomagnetic storms will not be evaluated further in Task 3 of the process that is described in Enclosure 1 to SECY-15-0137. Instead, evaluation of this hazard will continue through ongoing activities associated with a petition for rulemaking, PRM-50-96, filed in March 2011. The staff cites previous studies which have concluded that U.S. nuclear power plants can achieve safe shutdown following a severe geomagnetic storm. Current efforts to develop flexible mitigation strategies are focused on achievement and maintenance of long-term core cooling, spent fuel cooling, and containment functions. The white paper indicates that ultimate resolution of this issue will be coordinated with other Federal agencies through the National Space Weather Strategy and a national action plan.

Coordinated Federal research and development of a national action plan to address this hazard may continue for several years, if not decades. Considering the earlier studies that the staff has cited in the white paper and our current understanding of these phenomena, suitable conclusions should be possible regarding plant-specific protection and mitigating strategies, without waiting for completion of the national efforts and plans. The staff should remain involved in the multi-agency investigation of severe geomagnetic storms. They need to distill from this effort expeditiously those factors important for the NRC's regulatory process.

We look forward to continuing our interactions with the staff on the issues noted in this letter and as they complete their remaining Task 3 evaluations.

Sincerely,

/RA/

Dennis C. Bley
Chairman

REFERENCES

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2. U.S. Nuclear Regulatory Commission, SECY-15-0137, "Proposed Plans for Resolving Open Fukushima Tier 2 and 3 Recommendations," October 29, 2015 (ML15254A006).

3. Nuclear Energy Institute, NEI 12-06, “Diverse and Flexible Coping Strategies (FLEX) Implementation Guide,” Revision 2, December 2015 (ML16005A625).

4. U.S. Nuclear Regulatory Commission, Order EA-12-049, “Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events,” March 12, 2012 (ML12054A735).

5. U.S. Nuclear Regulatory Commission, Petition for Rulemaking PRM-50-96, March 15, 2011 (ML110750145).

6. U.S. Nuclear Regulatory Commission, “Recommendation for Dispositioning Proposed Generic Issue on the Effects of Downstream Dam Failures on Nuclear Power Plants,” March 11, 2016 (ML15253A365).

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10. U.S. Nuclear Regulatory Commission, Interim Staff Guidance DC/COL-ISG-007, “Assessment of Normal and Extreme Winter Precipitation Loads on the Roofs of Seismic Category I Structures,” June 23, 2009 (ML091490556).

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