

# POLICY ISSUE

## Information

June 2, 2016

SECY-16-0074

FOR: The Commissioners

FROM: Victor M. McCree  
Executive Director for Operations

SUBJECT: ASSESSMENT OF FUKUSHIMA TIER 2 RECOMMENDATION  
RELATED TO EVALUATION OF NATURAL HAZARDS OTHER THAN  
SEISMIC AND FLOODING

### PURPOSE:

The purpose of this paper is to inform the Commission of the results of Task 2 of the staff's assessment of the Fukushima-related Tier 2 recommendation regarding evaluations of natural hazards other than seismic and flooding. This paper does not address any new commitments or resource implications.

### BACKGROUND:

In SECY-15-0137, "Proposed Plans for Resolving Open Fukushima Tier 2 and 3 Recommendations," dated October 29, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15254A008), the staff supplied the Commission with a grouping of the remaining open Tier 2 and 3 recommendations developed in response to the accident at the Fukushima Dai-ichi nuclear facility. The three groups described in that paper were: (1) recommendations that could be closed; (2) recommendations that the staff's initial assessment determined could be closed, but for which stakeholder interaction was warranted before completing the staff's assessment; and (3) recommendations for which the staff had not completed assessments, stakeholder interactions, and documentation.

CONTACTS: Joseph M. Sebrosky, NRR/JLD  
301-415-1132

William D. Reckley, NRR/JLD  
301-415-7490

The Commission approved the resolution plans in the staff requirements memorandum (SRM) to SECY-15-0037, dated February 8, 2016 (ADAMS Accession No. ML16039A175), and directed the staff to provide the Commission the results of Task 2 of the Group 3 recommendation associated with the evaluation of natural hazards other than seismic and flooding by the end of May 2016. This paper provides that assessment.

### DISCUSSION:

The enclosure to this paper provides the staff's assessment of whether natural hazards other than seismic or flooding warrant additional regulatory action as part of the U.S. Nuclear Regulatory Commission's (NRC's) Fukushima lessons learned response. The staff's assessment is based on a review of a variety of domestic and international documents related to external hazards. The NRC staff has determined that it has sufficient information at this time to conclude that of the natural hazards other than seismic and flooding, only those associated with high winds and snow loads warrant additional assessment to address this recommendation. The NRC staff's initial considerations for assessing high winds and snow loads are included in the enclosure to this document. The staff intends to complete its assessment in these areas by the end of 2016.

The NRC staff is continuing to assess seismic and flooding hazards as part of Tier 1 activities. While the staff is closing the review of some hazards as a Fukushima lessons learned activity, the NRC will continue to assess the impacts of natural hazards in accordance with existing regulatory processes. Examples of the NRC staff's ongoing activities include its assessment of Recommendation 2.2, "Periodic Confirmation of Natural Hazards," and its participation in an interagency working group on geomagnetic storms. The staff will take appropriate actions in the future using existing regulatory processes if it identifies the need to do so.

### Considerations Regarding the Staff's Evaluation

In SECY-11-0093, "Near-Term Report and Recommendations for Agency Actions Following the Events in Japan," dated August 19, 2011 (ADAMS Accession No. ML11186A950), the staff sought to identify additional recommendations related to the lessons learned from the Fukushima Dai-ichi event, beyond those identified in the Near-Term Task Force (NTTF) report. As part of that initiative and in response to comments from the Advisory Committee on Reactor Safeguards (ACRS), as well as specific language included in the Consolidated Appropriations Act, 2012 (Section 402 of Division B of Public Law (Pub. L.) 112-74, signed into law on December 23, 2011), the NRC staff identified an action regarding reevaluations of natural external hazards other than seismic and flooding. In SECY-12-0025, "Proposed Orders and Requests for Information in Response to Lessons Learned from Japan's March 11, 2011, Great Tohoku Earthquake and Tsunami," dated February 17, 2012 (ADAMS Accession No. ML12039A103), this action was prioritized as a Tier 2 activity because of the lack of availability of the critical skill sets for both the NRC staff and external stakeholders, and because the NRC staff considered the seismic and flooding reevaluations to be of higher priority.

As described in SECY-15-0137, the staff undertook a series of screening-type evaluations to determine if any external hazard other than seismic and flooding warranted regulatory actions, such as requesting information pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.54(f) or requiring changes to plant designs or procedures in accordance with 10 CFR 50.109, "Backfitting." The screening-type evaluations for external hazards other than

seismic and flooding cover a variety of potential natural events beyond the current licensing basis that were either: (1) not addressed within existing licensing basis documents (e.g., final safety analysis reports), or (2) calculated to be more severe than described in licensing basis documents when reevaluated using current-day information and methodologies. In assessing whether additional regulatory action is warranted, the staff is taking a holistic approach considering the likelihood of the event, the assumed severity of the event, and the plant's ability to respond to the event. When evaluating the plant's ability to respond, the staff is considering both the protection provided by structures, systems, and components in pre-Fukushima configurations, and capabilities that have been added as part of post-Fukushima upgrades. The primary post-Fukushima upgrade is the additional capabilities required by Order EA-12-49, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated March 12, 2012 (ADAMS Accession No. ML12054A735). The staff's evaluations are being performed using guidance such as Management Directive 8.4, "Management of Facility-Specific Backfitting and Information Collection," to determine if additional regulatory action is justified.

In SECY-15-0137, the NRC staff outlined a process for reviewing natural hazards other than seismic and flooding and stated that it would provide the Commission with its final assessment of this recommendation by the end of calendar year 2016. The process outlined in SECY-15-0137 included the following four tasks:

1. Define natural hazards other than seismic and flooding to determine those hazards that could potentially pose a threat to nuclear power plants and screen them to determine which of those should be reviewed generically.
2. Determine and apply screening criteria to appropriately exclude certain natural hazards from further generic evaluations, or exclude some licensees from the need to consider certain hazards.
3. Perform a technical evaluation to assess the need for additional actions if the hazard or licensee was not screened out generically in Task 2.
4. Based on the results of Task 3, determine if additional regulatory actions are needed.

The February 8, 2016, SRM directed that the staff inform the Commission no later than May 2016 of the results of Task 2.

#### Results of Stakeholder Interactions

The NRC staff provided a draft white paper to stakeholders for their review and comment, which contained much of the staff's assessment found in the enclosure to this document. The staff held a Category 3 public meeting on April 5, 2016, to solicit comments from external stakeholders. A summary of the April 5, 2016, public meeting dated April 20, 2016, is available in ADAMS at Accession No. ML16106A234. In addition, the NRC staff provided an email address and accepted comments on the draft white paper through April 12, 2016. The NRC staff also discussed the draft white paper with the ACRS, providing an overview of the staff's assessment to the ACRS Fukushima Subcommittee on April 21, 2016, and the ACRS Full Committee on May 5, 2016. The ACRS issued a letter on May 17, 2016 (ADAMS Accession No. ML16130A254), providing its conclusions and recommendations associated with the staff's

assessment. The NRC staff intends to engage the ACRS again as it completes its assessment for high winds and snow loads and during these interactions will brief the ACRS on changes that were made to the assessment based on the ACRS May 17, 2016, letter.

#### Summary of Stakeholder Comments

Appendix D of the Enclosure provides a description and the staff's proposed resolution of stakeholder comments. Changes to the staff's white paper evaluation to address stakeholder comments include the following:

- The staff's evaluation of low water levels due to a downstream dam failure or a seiche was updated to include additional discussion of a plant's capability to maintain reactor coolant system inventory control in the event there is a loss of the safety related ultimate heat sink.
- The staff's assessment of Task 1 activities found in Appendix A of the enclosure was updated to address ACRS comments from the April 21, 2016, Fukushima Subcommittee meeting and the May 5, 2016, Full Committee meeting as well as the recommendations found in the May 17, 2016, ACRS letter.

#### Summary of Results of Assessment

The NRC staff reviewed a variety of domestic and international documents related to external hazards that are listed and discussed in the enclosure to this document. These hazards were assessed and a subset identified for the next task in the screening process. The current regulatory framework requires that all U.S. nuclear sites be evaluated for hazards when initially licensed. As required by 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," Appendix A, "General Design Criteria for Nuclear Power Plants,"<sup>1</sup> General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena," licensees shall demonstrate that their safety-related structures, systems, and components are designed to withstand the effects of natural phenomena without loss of capability to perform their safety functions, giving appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated.

To complete the Tier 2 activity and satisfy the NRC's obligations under Section 402 of Division B of Pub. L. 112-74, the NRC staff evaluated external natural hazards using the most recent hazard information and guidance documents, and assessed the need for further regulatory actions. This included consideration of such previously submitted licensee information as the following:

- information associated with plants licensed in the late 1960s and early 1970s that were reviewed as part of the Systematic Evaluation Program

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<sup>1</sup> The General Design Criteria (GDC) were implemented for plants that had construction permits issued after May 21, 1971. Each plant that was licensed before the GDC were formally adopted was evaluated on a plant-specific basis. As discussed in the enclosure to this paper, these "pre GDC" plants were reviewed as part of the Systematic Evaluation Program.

- licensee submittals provided in response to a Generic Letter 88-20 Supplement 4, “Individual Plant Examination of External Events for Severe Accident Vulnerabilities”
- information provided in the licensees’ integrated plans required by Order EA-12-049
- licensee information (e.g., updated safety analysis reports) on the criteria used for their plant’s design and licensing basis
- information from recent NRC activities related to the natural hazards (e.g., Regulatory Issue Summary 15-06, “Tornado Missile Protection,” dated June 6, 2015); and recent GI program reviews

In addition, compliance with Order EA-12-049 required licensees to ensure that mitigating strategies can be implemented under a broad array of external hazards, which, in turn, required licensees to evaluate other external hazards applicable to their sites.

Based on the staff’s assessment, the natural hazards (other than seismic and flooding) proceeding to Task 2 in the process described above were high winds, extreme ambient temperatures, drought and other low-water conditions, and winter precipitation that results in snow and ice loading on structures. Based on its assessment in accordance with Task 2 of the process, the NRC staff has determined that additional regulatory actions are not warranted for extreme ambient temperatures, and drought and other low-water conditions. This assessment is based on the review of these hazards against the conservatism of the design of current operating reactors in these areas, operational limits provided in technical specifications, mitigating strategies required by Order EA-12-049, and warning time available for such hazards to allow measures to be taken to prevent an accident. The Task 2 analysis performed for low water level conditions due to downstream dam failure, seiche, and tsunami contains site-specific technical evaluations which benefited from detailed generic assessments that were started as part of the NRC’s Generic Issues Program. The staff’s assessment in the enclosure leveraged the results of this generic work and supplemented it with site-specific analyses as appropriate to close out the issue as part of Task 2.

The enclosure of this paper provides the staff’s initial assessment of high winds and extreme snow and ice loading. For both of these assessments, the staff reviewed existing operating plants against the latest NRC-issued guidance for these events, which was updated between 2007 and 2011.

For high winds, as part of Task 2 of the process, the staff recognized the conservatism in design of nuclear power plants associated with tornado missile protection, and the warning time available for hurricanes. Application of these criteria will likely screen many sites out from further evaluation. However, a few sites may require further review of available site-specific information to assure and document that there is no need for additional regulatory actions. The NRC staff is continuing its assessment using site-specific information and risk insights. For hurricanes, the NRC staff intends to engage stakeholders to better understand and document the preplanned actions licensees take to prepare for the onset of high winds on site. The NRC staff’s assessment is being performed in accordance with Task 3 of the process above. The NRC staff will provide the results of the updated assessment of high winds from tornadoes and hurricanes to the Commission by the end of 2016.

Regarding snow and ice loads, previous guidance used by the staff did not provide specific approaches to consider snow loads at ground level due to both normal snow events and extreme winter precipitation events for the design of Seismic Category I structures. As part of Task 2 of the process, the staff recognized the conservatism in the design of nuclear power plants associated with snow and ice loads, as well as the warning time available for large snow events. The staff determined that the application of these criteria will likely eliminate the hazards from additional regulatory actions, but further examination and documentation of site-specific information is warranted. The staff will provide the results of this evaluation to the Commission by the end of 2016.

Even though the agency is completing work on specific post-Fukushima recommendations, work addressing the risks to nuclear power plants introduced by natural hazards will continue. The NRC staff will, for example, continue to participate in research activities and the development of standards related to assessing risks from various natural events. The NRC staff is also participating in an interagency evaluation of geomagnetic storms and is considering that hazard within the context of ongoing rulemaking activities. If additional insights related to natural hazards are identified as a result of any of these tasks, the NRC staff will use existing regulatory processes to evaluate them and, if appropriate, initiate regulatory action.

#### CONCLUSIONS:

Based on the staff's assessment provided in Sections 3.1 through 3.3 of the enclosure to this document, the staff has closed Tasks 1 and 2 of the process described in SECY-15-0137. The staff concludes that other than seismic and flooding, only those natural hazards associated with high winds and snow loads warranted further assessments and stakeholder interactions to address the Tier 2 recommendation. In the case of high winds and snow loads, the staff provides initial considerations for the assessment of these hazards in the enclosure to this document and intends to complete its assessment by the end of 2016. The process the NRC staff is using to assess high winds and snow loads is consistent with the process described in Task 3 of SECY-15-0137.

#### COORDINATION:

The Office of the General Counsel has reviewed this paper and has no legal objection. The Office of the Chief Financial Officer reviewed the resource implications provided in SECY-15-0137 and had no objections.

***/RA Michael R. Johnson Acting for/***  
Victor M. McCree  
Executive Director  
for Operations

Enclosure:  
Evaluation of Natural Hazards  
Other than Seismic and Flooding

Regarding snow and ice loads, previous guidance used by the staff did not provide specific approaches to consider snow loads at ground level due to both normal snow events and extreme winter precipitation events for the design of Seismic Category I structures. As part of Task 2 of the process, the staff recognized the conservatism in the design of nuclear power plants associated with snow and ice loads, as well as the warning time available for large snow events. The staff determined that the application of these criteria will likely eliminate the hazards from additional regulatory actions, but further examination and documentation of site-specific information is warranted. The staff will provide the results of this evaluation to the Commission by the end of 2016.

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Executive Director  
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#### Enclosure:

#### Evaluation of Natural Hazards

Other than Seismic and Flooding

**SRM-S15-0137-5**

**ADAMS Accession Nos.: Package ML16102A297**

**SECY ML16102A301; Enclosure ML16049A291 & ML16102A303**

**\*via email**

<b>OFFICE</b>	NRR/JLD/LA*	QTE*	NRR/JLD/JHMB/PM	NRR/JLD/JOMB/PM*	NRR/JLD/JEHB/BC*
<b>NAME</b>	SLent	CHsu	JSebrosky	WReckley	MShams
<b>DATE</b>	4 /15/2016	5/02/2016	5/09/2016	5/09/2016	5 /06/2016
<b>OFFICE</b>	NRR/DRA/D*	NRR/DE/DD*	NRR/DSS/D*	NRO/DSEA/DD*	RES/DRA/D*
<b>NAME</b>	JGitter	MJRoss-Lee	TMcGinty	ACampbell	RCorreia
<b>DATE</b>	4/28/2016	4/29/2016	5/05/2016	5/02/2016	5/05/2016
<b>OFFICE</b>	RES/DE/D*	NRR/JLD/D*	OGC (NLO) *	NRR/D	EDO
<b>NAME</b>	BThomas	JDavis	SClark	WDean	VMcCree
<b>DATE</b>	5/05/2016	5/09/2016	05/24/2016	5/24/2016	06/02/2016

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