BEING PROVIDED TO SUPPORT THE MEETING WITH ACRS AND NOT TO SOLICIT EXTERNAL STAKEHOLDER FEEDBACK

FOR: The Commissioners

FROM: Mark A. Satorius
Executive Director for Operations

SUBJECT: PROPOSED RULEMAKING: MITIGATION OF BEYOND-DESIGN-BASIS EVENTS (RIN 3150-AJ49)

PURPOSE:

To obtain Commission approval to publish for public comment a proposed rule that would establish requirements for the mitigation of beyond-design-basis events.

SUMMARY:

The staff has prepared a proposed rule (Enclosure 1) that would establish requirements for the mitigation of beyond-design-basis events. This proposed rulemaking would: 1) make generically-applicable requirements previously imposed by order for mitigation of beyond-design-basis external events and for monitoring spent fuel pool wide range level, 2) include proposed provisions to have an integrated response capability, 3) include proposed requirements for increased emergency response capabilities for multi-unit events, 4) provide requirements for new reactor designs, and 5) address a number of petitions for rulemaking (PRMs) submitted in the aftermath of the March 2011 Fukushima Dai-ichi event.

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BACKGROUND:

As discussed in section II of the enclosed proposed rule *Federal Register* notice (FRN), the Nuclear Regulatory Commission (NRC) has undertaken numerous regulatory actions in the aftermath of the Fukushima event. These actions commenced with the efforts of the Near Term Task Force (NTTF) and the development of the associated NTTF recommendations. The NRC's response to the NTTF report continued these efforts, both identifying actions to be taken in the near-term and prioritizing the recommendations. Near-term actions included the issuance of three orders, a request for information that addressed several regulatory issues under Title 10 of the *Code of Federal Regulations* (10 CFR) 50.54(f), and two Advance Notices of Proposed Rulemakings (ANPRs). The regulatory efforts to address lessons-learned from Fukushima have evolved over time, and, based on several interactions with the Commission, the two major rulemaking efforts were consolidated into this proposed mitigation of beyond-design-basis events (MBDBE) rulemaking.

The NRC staff has interacted extensively with external stakeholders throughout the development of this proposed rulemaking. This includes numerous public meetings (see Section II.E. of the FRN for more information) and the request for public comments through the issuance of two ANPRs and two draft regulatory basis documents and incorporation of the stakeholder feedback in finalizing the regulatory basis documents. The more significant interactions include:

1. Issuance of the Station Blackout (this regulatory effort would later be referred to as Station Blackout Mitigation Strategies) ANPR (77 FR 16175; March 20, 2012)
2. Issuance of the Onsite Emergency Response Capabilities ANPR (77 FR 23161; April 18, 2012)
3. Issuance of the draft regulatory basis for Station Blackout Mitigation Strategies (78 FR 21275; April 10, 2013)
4. Issuance of the draft regulatory basis for Onsite Emergency Response Capabilities (78 FR 1154; January 8, 2013)

Note that the final regulatory basis documents were issued for Station Blackout Mitigation Strategies (78 FR 44035; July 23, 2013) and Onsite Emergency Response Capabilities (78 FR 63901; October 25, 2013).

DISCUSSION:

The proposed rulemaking would apply to power reactor applicants and licensees and include provisions as follows:

1. Proposed provisions that make generically-applicable requirements previously imposed by Order EA-12-049 for the mitigation of beyond-design-basis external events.

2. Proposed provisions that make generically-applicable requirements previously imposed by Order EA-12-051 for remotely monitoring spent fuel pool wide-range level.

3. Proposed requirements for the reasonable protection of mitigation equipment for beyond-design-basis external events that reflect the re-evaluated hazards determined through regulatory efforts stemming from the 10 CFR 50.54(f) request issued on March 12, 2012.

4. Proposed requirements for an integrated response capability consisting of strategies and guidelines for beyond-design-basis external events, the loss of large areas of the plant due to explosions and fires, and severe accidents. This would include the imposition of requirements for Severe Accident Management Guidelines (SAMGs), which are currently a voluntary industry initiative, and integration of SAMGs with existing emergency operating procedures.

5. Proposed requirements on applicants for future reactor designs to include design features that would enhance coping durations and reduce reliance on human actions for beyond-design-basis external events.

6. Proposed requirements to enhance the onsite emergency response capabilities for multi-unit events. These capabilities are being implemented in conjunction with the mitigation strategies requirements of Order EA-12-049, and include a capability to evaluate the consequences from multiple sources including combinations of power reactor units and spent fuel pools on a single site.

7. Proposed requirements for training, drills or exercises, and change control for the new requirements that both reflect the post-Fukushima regulatory actions and provide assurance of a continued integrated accident response capability.

8. Proposed requirements that would facilitate decommissioning of licensees who would be subject to this rule. These requirements would be coordinated with the Commission-directed Decommissioning Rulemaking.

A more complete description of the scope of the proposed rulemaking, including its relation to the various post-Fukushima regulatory actions, is provided in section II of the enclosed proposed rule FRN.

New Proposed Requirements and Supporting Backfitting Justification

When the staff proposed in enclosure 6 to SECY-14-0046 “Fifth 6-Month Status Update on Response to Lessons Learned from Japan’s March 11, 2011, Great Tōhuku Earthquake and Subsequent Tsunami,” dated April 17, 2014, to consolidate ongoing rulemaking efforts and establish the current proposed rulemaking, it committed to identify whether different proposed requirements would be justified differently under the Commission’s backfitting and part 52 issue

finality requirements. The supporting backfitting and issue finality analysis is provided in section VIII in the enclosed proposed rule FRN. The proposed rule includes the entire scope of the requirements described in SECY-14-0046. In this rulemaking the staff also proposes to require licensees to develop, implement and maintain Severe Accident Mitigation Guidelines (SAMGs), consistent with the NTTF recommendation 8. While the staff is proposing that SAMGs be required (as opposed to maintaining SAMGs as voluntary industry initiatives), the staff's proposed regulatory treatment of SAMGs was developed considering insights from its backfitting analysis. This proposed treatment (discussed in the following section) is intended to ensure that the imposition of SAMG requirements would not result in excessive focus of licensee or NRC resources from activities having greater safety importance. While the staff recognizes that available quantitative risk information indicates that SAMGs have a small safety benefit, this information is not a complete measure of SAMG safety benefits. The staff concludes that SAMG requirements would result in a substantial additional protection for public health and safety based on the qualitative reasons stated in Appendix A to the supporting draft regulatory analysis. Specifically, SAMGs directly support maintenance of containment integrity following severe accidents, and indirectly support the protective action recommendations made by the emergency response organization in such circumstances, and as such, the SAMGs have a very important link to two foundational parts of the NRC's defense-in-depth framework: containment, and emergency preparedness.

Scope of Severe Accident Management Guideline Requirements

Severe Accident Management Guidelines provide the strategies and guidelines to mitigate the consequences of a severe accident. When it is determined that adequate core cooling is no longer assured, the licensee exits the plant Emergency Operating Procedures (EOPs) or other governing processes and enters the SAMGs. The SAMGs are symptom-based, pre-planned accident mitigation strategies that were developed using state-of-the-art thermal-hydraulic and accident progression and consequence modeling. The SAMGs were developed for use in specific reactor designs and then adapted by individual licensees to reflect plant-specific design features and capabilities. The SAMGs are currently in place at all operating power reactor sites as a voluntary industry initiative and this proposed rulemaking would make them a regulatory requirement.

The industry has developed two guidance documents[1] that are intended to provide licensees with acceptable methods for meeting the proposed new SAMG requirements, such as developing, implementing and maintaining the documents, training, command and control, and drills and exercises. The staff plans to issue draft regulatory guides that would endorse these guidance documents. The NRC staff has not conducted, and does not intend to conduct, a technical review of the owners groups guidelines for SAMGs. The staff's proposal that the

[1] The industry guidance is found in NEI 13-06 (rev. 0), "Enhancements to Emergency Response Capabilities for Beyond Design Basis Accidents and Events," and NEI 14-01 (rev. 0) (found at ML14115A424) and, "Emergency Response Procedures and Guidelines for Beyond Design Basis Events and Severe Accidents," (found at ML14112A513) both dated April 2014. On April 17, 2014, NEI transmitted two letters seeking endorsement of the two guidance documents (ML14112A513 and ML14115A425).

owners groups guidelines for SAMGs would meet the proposed requirements is based on: 1) the assessment performed by the NRC staff in the 1990s when the industry initially implemented the SAMGs; the NRC staff's recent look at the latest revision of the SAMGs, through electronic portal access granted by industry; 3) the owners groups proposal of a process for maintaining the guidelines for the SAMGs; and 4) interactions with stakeholders in public meetings. The updated guidelines for SAMGs reflect the revised Severe Accident Management Guidance Technical Report developed by the EPRI in 2012[2] to incorporate lessons learned from the Fukushima accident and include experience gained since the 1990s.

Consistent with the discussion above concerning the staff's proposed backfitting justification for SAMG requirements, the proposed SAMG requirements would not include new instrumentation requirements. The SAMGs were developed and implemented based on a philosophy that makes use of available instrumentation, includes backup or alternative means for determining plant conditions when the primary means become unavailable or unreliable, and includes a course of action to follow when the event degrades to the point where there is no reliable instrumentation available. The staff concludes that this is a sound approach, and further has determined that current equipment qualification and post-accident monitoring requirements in concert with the guidance provided by the SAMGs for determining selection of the appropriate strategies negates the need to require instrumentation upgrades. Licensee Technical Support Center personnel are appropriately trained and are capable of directing the use of alternate methods or calculations in cases where installed instrumentation may not be reliable. The staff concludes that if NRC and licensee efforts and resources are focused on designing and installing severe accident instrumentation, attention could be significantly diverted from more important safety issues.

Consideration of Feedback and Lessons Learned from Implementation of Order EA-12-049

The staff, in its previous interactions with the Commission regarding mitigation strategies for beyond-design-basis external events, noted the importance of considering in the proposed rulemaking the lessons learned and feedback stemming from the implementation of Order EA-12-049. In these interactions, the Commission directed that the staff consider any potential failures or challenges to implementation. Accordingly, the staff has reflected appropriate lessons learned in the draft regulatory guidance,[3] which would endorse an updated version of industry guidance.

Consideration of Re-evaluated Hazards

[2] Severe Accident Management Guidance Technical Basis Report, Volume 1: Candidate High-Level Actions and Their Effects. EPRI, Palo Alto, CA: 2012. 1025295. Available at http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=1025295.

[3] Draft Regulatory Guide (DG-1301), "Flexible Mitigation Strategies for Beyond-Design-Basis External Events" which would endorse an updated version (revision 1) of NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide" found in ADAMS at accession number ML13168A031.

As described in the enclosed proposed rule FRN and in COMSECY-14-0037 "Integration of Mitigating Strategies for Beyond-Design-Basis External Events and The Reevaluation of Flooding Hazards," dated November 21, 2014, the staff and industry undertook development and implementation of strategies and guidelines for mitigation of beyond-design-basis external events under Order EA-12-049 in parallel with the re-evaluation of the seismic and flooding hazards under the NRC's requests for information of March 12, 2012. The proposed rule would resolve and clarify the necessary actions a licensee must take to continue to show adequate protection of public health and safety, in light of the re-evaluated hazards, as directed in SRM-COMSECY-14-0037.

Design Features Requirements for New Reactor Applicants

Order EA-12-049 requires licensees to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities (i.e., key safety functions) following a beyond-design-basis external event. Applicants or vendors proposing new reactor designs have an opportunity to incorporate enhanced capability for mitigating strategies into the design. That is, before detailed design or construction, applicants for new reactor designs can address major elements of Order EA-12-049 by incorporating into the design those features for mitigating strategies that provide enhanced ability to ensure that the key safety functions are maintained or restored. This approach is consistent with the Policy Statement on the Regulation of Advanced Reactors (73 FR 60612; October 14, 2008), in which the Commission previously encouraged vendors to include similar design features in the design. Further, the regulatory approach of establishing alternative design requirements for new reactor applicants to enhance margins of safety for beyond-design-basis events has been used successfully in the past. Relevant examples include requiring an aircraft impact assessment under 10 CFR 50.150, "Aircraft Impact Assessment," new reactor designs that incorporate an alternate ac source to meet the requirements of 10 CFR 50.63, "Loss of All Alternating Current Power," and new reactor designs that have physical separation for fire protection equipment as an improved approach for meeting the requirements of 10 CFR 50.48, "Fire Protection."

The proposed rule would require that applicants for new nuclear power plant designs incorporate into the plant design features that enhance coping durations and minimize reliance on human actions to maintain or restore key safety functions during an extended loss of all ac power concurrent with a loss of normal access to the ultimate heat sink (or, for passive reactor designs, a loss of normal access to the normal heat sink). The objective of this proposed requirement is to assure that applicants for new nuclear power reactor designs have included in the facility design the capability to mitigate the effects of an extended loss of ac power (ELAP) during all modes caused by an external hazard (e.g., a flood). Such capability would maximize reliance on installed design features to maintain or restore the key safety functions. As a result, new reactors would be better equipped for an ELAP condition and thus have a longer period of time until the plant would need to rely on portable equipment and/or offsite resources to maintain or restore the key safety functions.

The staff proposes this new requirement as a forward fit only. This proposed requirement would only apply to applicants for new nuclear power reactor designs. It would not apply to current nuclear power plant licensees (i.e., holders of an operating license or combined license) or to current holders of permits or certifications for nuclear power plant designs (i.e., holders of a construction permit, standard design certification, standard design approval, or manufacturing license). It would also not apply to renewal of design certifications. As a result, the proposed requirement would neither constitute a backfit under 10 CFR 50.109, "Backfitting," nor would it be inconsistent with any of the issue finality provisions under 10 CFR part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants."

The proposed requirements would be restricted to applicants proposing the design of the key safety functions. For example, a new design certification application would propose the design of the key safety functions, and therefore the proposed requirement would need to be addressed by the design certification applicant. However, the proposed requirements would not be imposed on applicants referencing or renewing a previously-approved design. For example, a new combined license application referencing an existing design certification would not be proposing the design of the key safety functions, but instead incorporating by reference the design of the key safety functions through the design certification, and therefore the proposed requirement would not need to be addressed by the combined license applicant.

While the staff recommends that the Commission approve noticing the proposed requirements, the staff recognizes that there are pros and cons that the Commission should consider when deciding whether new nuclear power reactor designs should include these specific design features. While including design features would result in a plant design better able to cope with these beyond-design-basis events, as discussed above, including these design features would also impose additional burden on the applicant, would rely on the accuracy of knowledge of external hazards, could increase the complexity of the plant design, and could result in designs that have less flexibility in terms of mitigation of beyond-design-basis external events since such designs would be more reliant on installed SSCs. The staff intends to use the feedback obtained from public comment on the proposed rule to fully develop the pros and cons of this proposed requirement in order to provide an appropriate recommendation to the Commission for the final rule.

Decommissioning Provisions

The staff is proposing decommissioning provisions within the applicability section for § 50.155 to reflect the cessation of requirements for strategies and guidelines when the underlying hazards no longer warrant the additional protection afforded. Under the proposed decommissioning provisions, once the NRC dockets the certifications of permanent removal of fuel from the reactor vessel and cessation of operation, a licensee would not be required to maintain any of the strategies and guidelines related to core cooling and would only be required to maintain strategies and guidelines related to spent fuel pool cooling and secondary containment capabilities, if applicable. Such a licensee would be required to maintain the full set of strategies and guidelines for spent fuel pools containing irradiated fuel, but could cease

maintaining the strategies and guidelines for mitigation of beyond-design-basis events and severe accident management guidelines once decay heat has reduced sufficiently, leaving the extensive damage mitigation guidelines. Dominion Nuclear Connecticut, Inc., would be specifically exempted from the requirements of § 50.155 as the licensee of Millstone Power Station, Unit 1, due to the significant age of the irradiated fuel within the spent fuel pool for that unit and its extremely low decay heat.

Petitions for Rulemaking

On July 28, 2011, the NRC docketed five PRMs filed by the National Resources Defense Council Inc. (NRDC) (PRM 50-97, PRM-50-98, PRM-50-100, PRM-50-101, and PRM 50-102) that are pertinent to this rulemaking.[4] The petitions rely solely on the NTTF report, and request that the NRC undertake rulemaking in a number of areas that would be addressed by this proposed rulemaking. The regulatory scope of this proposed rulemaking, as discussed in section II of the proposed rule notice, contains proposed provisions that stem from NTTF recommendations 4.1, 7.5, 8.4, 9.1, and 9.2, and as such, the proposed rule would resolve the matters in these PRMs. A more detailed discussion of the PRMs addressed in this proposed rulemaking is contained in section III of the enclosed proposed rule FRN.

Supporting Draft Guidance

This proposed rulemaking is supported by three draft regulatory guides (DG), identified in section XIX of the enclosed proposed rule notice, that the staff proposes be issued for public comment in conjunction with this proposed rulemaking. Those DGs can be found at ADAMS accession numbers ML13168A031, ML14245A454, and ML14265A070.

Inspection

The enclosed proposed rule FRN contains a discussion of the current plans for inspection activities to support this rulemaking in section IX. Many of the requirements associated with this rule will be inspected through Temporary Instruction 2515/191, "Inspection of the Implementation of Mitigation Strategies and Spent Fuel Pool Instrumentation Orders and Emergency Preparedness Communication/Staffing/Multi-Unit Dose Assessment Plans" (TI-191), as licensees come into compliance with Orders EA-12-049 and EA-12-051. Because of the planned inspection activities associated with TI-191, the only new proposed inspection requirements contained in this rule will be continuing inspection associated with SAMGs. Consistent with the staff's proposed regulatory structure for SAMG requirements, the staff is proposing a SAMG inspection that would:

1. Verify that licensees have updated the SAMGs.
2. Verify that licensees have included the SAMGs within the plant configuration management systems.

[4] PRM-50-99 was submitted by the NRDC at the same time as the other five petitions and requests the NRC to do rulemaking for NTTF Recommendation 2.2 to require licensees to confirm seismic hazards and flooding hazards every 10 years and address new and significant information. Staff is not addressing this petition in this proposed rule.

3. Verify that licensees have integrated the SAMGs consistent with the draft guidance contained in DG-1319.

Implementation and Cumulative Effects of Regulation

As previously discussed, the staff has engaged extensively with external stakeholders throughout this proposed rulemaking development process, including the issuance of two ANPRs and two draft regulatory basis documents requesting stakeholder feedback, as well as numerous public meetings, described in more detail in the enclosed proposed section II of the proposed rule notice. The staff is following its Cumulative Effects of Regulation (CER) process for this rulemaking including issuance of a support draft regulatory analysis for comment with the proposed rule. In this regard the draft regulatory analysis estimates the costs and impacts of the two post-Fukushima orders (i.e., Orders EA-12-049 and EA-12-051) that would be made generically applicable through this rulemaking as historical costs, separates the costs associated with the new requirements (e.g., those that relate to SAMG requirements) and requests stakeholder feedback on those estimates. The staff has developed supporting draft guidance which is being issued with the proposed rule for public comments, as described in section XIX of the proposed rule FRN. Finally, the staff is requesting stakeholder feedback on a number of issues, and is also requesting CER feedback, as described in sections X and XI of the proposed rule notice, respectively.

RECOMMENDATIONS:

The staff recommends that the Commission:

(1) Approve the enclosed proposed rule (Enclosure 1) for publication in the *Federal Register*.

(2) Note the following:

a. The staff has prepared a draft regulatory analysis for this rulemaking (Enclosure 2).

b. The staff will publish three draft regulatory guides for public comment concurrent with the publication of the proposed rule.

c. The staff will inform the appropriate congressional committees.

d. The Office of Public Affairs will issue a press release when the NRC publishes the proposed rule in the FR.

COORDINATION:

This paper has been prepared by NRR in coordination with NRO, NSIR, and RES. The Office of the Chief Financial Officer has reviewed this Commission paper for resource implications and has no objection. The Office of the General Counsel has no legal objection to this paper. The ACRS has reviewed the proposed rulemaking package and recommended that the staff publish the proposed rule (ADAMS ML15049A216).

Mark A. Satorius
Executive Director
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Enclosures:
1. *Federal Register* Notice
2. Draft Regulatory Analysis

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