

APPENDIX B

NATURAL PHENOMENA/OTHER EXTERNAL EVENTS

Natural phenomena events (i.e., earthquakes, high winds, tornadoes, tornado missiles, floods) and other external events (e.g., transportation accidents, airplane crash, industrial accidents, and fires external to the facility) should be addressed in the integrated safety analysis (ISA) as initiating events.

Currently, there are no Regulatory Guides (RGs) in Division 3, Fuels and Materials Facilities, addressing natural phenomena events and other external events. Therefore, the following sections of NUREG-0800, Standard Review Plan (SRP), and Division 1 RGs for power reactors, which describe methods for performing evaluations for natural phenomena events and other external events, should be consulted:

B1. Floods

- SRP 2.4.1, "Hydrologic Description;"
- SRP 2.4.2, "Floods;"
- SRP 2.4.3, "Probable Maximum Flood (PMF) on Streams and Rivers;"
- SRP 3.4.1, "Flood Protection;"
- RG 1.59, "Design Basis Floods for Nuclear Power Plants;" and
- RG 1.102, "Flood Protection Plan for Nuclear Power Plants."

B2. Wind and Tornadoes

- SRP 3.3.1, "Wind Loadings;"
- SRP 3.3.2, "Tornado Loadings;"
- RG 1.76, "Design Basis Tornado for Nuclear Power Plants;" and
- RG 1.117, "Tornado Design Classification."

B3. Earthquakes

- SRP 3.7.1, "Seismic Design Parameters;"
- SRP 3.7.2, "Seismic System Analysis;"
- SRP 3.7.3, "Seismic Subsystem Analysis;"
- RG 1.60, "Design Basis Response Spectra for Seismic Design of Nuclear Power Plants;"
- RG 1.92, "Combining Modal Responses and Spatial Components in Seismic Response Analysis;"
- RG 1.122, "Development of Floor Design Response Spectra for Seismic Design of Floor Supported Equipment and Components;"

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- RG 1.161, "Damping Values for Seismic Design of Nuclear Power Plants;" and
- RG 1.165, "Identification and Characterization of Seismic Sources and Determination of Safe Shutdown Earthquake Ground Motion."

B4. Other External Events

- SRP 2.2.1 - 2.2.2, "Identification of Potential Hazards in Site Vicinity;"
- SRP 3.5.1.6, "Aircraft Hazards;" and
- RG 1.91, "Evaluation of Explosions Postulated to Occur on Transportation Routes Near Nuclear Power Plants."

The applicant's approach for evaluating natural phenomena events and other external events should be in concert with the risk-informed approach described in proposed 10 CFR Part 70, Subpart H. Although the above references provide useful information for staff use in the review, some of the analysis methods described therein should be adapted to be risk-informed and to agree with the approach described in 10 CFR Part 70, Subpart H.

The applicant's risk from natural phenomena events and other external events shall meet the performance requirements described in 10 CFR Part 70, Subpart H. The applicant's evaluation to determine whether the performance requirements are met should be iterative. First, the applicant should perform evaluations to describe the likelihoods associated with a suite of magnitudes for each type of natural phenomena or other external events. For example, when assessing earthquakes, the applicant should describe likelihoods associated with a suite of maximum accelerations ("g" values); when assessing tornadoes or high winds, the applicant should describe likelihoods associated with a suite of maximum windspeeds; when assessing floods, the applicant should describe likelihoods associated with a suite of maximum water levels and velocities.

Next, the applicant should select a likelihood for each external event and identify the associated magnitude (e.g., water level, windspeed, acceleration level). For each external event, the applicant should identify failures of structures, systems, and components associated with the magnitude of the event, taking into consideration common-cause failures and the likelihoods of the failures, given the event. This step involves developing and applying intermediate assessment tools such as response spectra and floor response spectra for seismic analysis. The applicant should determine the consequences, in terms of radiation and chemical exposures to the public and workers and any nuclear criticalities, for each external event. The applicant should compare the consequences and the associated likelihoods to the performance requirements in proposed 10 CFR Part 70, Subpart H. If the likelihood and consequences of the external event satisfies the performance requirements, the selection of the external event magnitude is acceptable. Otherwise, if the performance requirements are not satisfied, a less likely event should be selected, the magnitude identified, and the process repeated until the performance requirements are satisfied. This process should be performed for each natural phenomena event and for other external events.

