

1. Remove Detailed Guidance From the Regulation

Part 72 currently requires license applicants for an ISFSI or MRS, in the western U.S. or in other areas of known seismicity, to comply with appendix A to part 100. Appendix A contains both requirements and guidance on how to satisfy those requirements. For example, Section IV, "Required Investigations," of Appendix A states that investigations are required for vibratory ground motion, surface faulting, and seismically induced floods and water waves. Appendix A then provides detailed guidance on what constitutes an acceptable investigation. A similar situation exists in Section V, "Seismic and Geologic Design Bases," of appendix A to part 100.

Geoscience assessments require considerable latitude in judgment because of (a) limitations in data; (b) changing state-of-the-art of geologic and seismic analyses; (c) rapid accumulation of knowledge; and (d) evolution in geoscience concepts. The NRC recognized the need for latitude in judgment when it amended part 100 in 1996.

However, specifying geoscience assessments in detail in a regulation has created difficulty for applicants and the NRC by inhibiting needed latitude in judgment. It has inhibited the flexibility needed in applying basic principles to new situations and the use of evolving methods of analyses (for instance, probabilistic) in the licensing process.

The NRC is adding a new section in part 72 that will provide specific siting requirements for an ISFSI or MRS instead of referencing another part of the regulations. The amended regulation will also reduce the level of detail by placing only basic requirements in the rule and providing the details on methods acceptable for meeting the requirements in an accompanying guidance document. Thus, the revised regulation contains requirements to:

- (i) Evaluate the geological, seismological, and engineering characteristics of the proposed site;
- (ii) Establish a DE; and
- (iii) Identify the uncertainties associated with these requirements.

Detailed guidance on the procedures acceptable to the NRC for meeting the requirements are provided in Regulatory Guide 3.73, "Site Evaluations and Design Earthquake Ground Motion for Dry Cask Independent Spent Fuel Storage and Monitored Retrievable Storage Installations."

2. Address Uncertainties and Use Probabilistic Methods

The existing approach for determining a DE for an ISFSI or MRS, embodied in Appendix A to Part 100, relies on a "deterministic" approach. Using this deterministic approach, an applicant develops a single set of earthquake sources, develops for each source a postulated earthquake to be used as the source of ground motion that can affect the site, locates the postulated earthquake according to prescribed rules, and then calculates ground motions at the site.

Although this approach has worked reasonably well for the past several decades in the sense that the SSE for NPPs sited with this approach are judged to be suitably conservative, the approach has not explicitly recognized uncertainties in geosciences parameters. Because so little is known about earthquake phenomena (especially in the eastern U.S.), there have been differences of opinion and differing interpretations among experts as to the largest earthquakes to be considered and ground-motion models to be used, often making the licensing process less predictable.

Probabilistic methods that have been developed in the past 15 to 20 years for evaluation of seismic safety of nuclear facilities allow explicit incorporation of different models for zonation, earthquake size, ground motion, and other parameters. The advantage of using these probabilistic methods is their ability to incorporate different models and data sets, thereby providing an explicit expression for the uncertainty in the ground motion estimates and a means of assessing sensitivity to various input parameters. The western and eastern U.S. have fundamentally different tectonic environments and histories of tectonic deformation. Consequently, application of these probabilistic methodologies has revealed the need to vary the fundamental PSHA methodology depending on the tectonic environment of the site.

In 1996, when the NRC accepted the use of a PSHA methodology or suitable sensitivity analyses in § 100.23, it recognized that the uncertainties in seismological and geological information must be formally evaluated and appropriately accommodated in the determination of the SSE for seismic design of NPPs. The NRC further recognized that the nature of uncertainty and the appropriate approach to account for it depends on the tectonic environment of the site and on properly characterizing parameters

input to the PSHA. Methods other than probabilistic methods (PSHA), such as sensitivity analyses, may be adequate for some sites to account for uncertainties. The NRC believes that certain new applicants for ISFSI or MRS specific licenses, as described in Section III, "Applicability," of this document, must use probabilistic methods or other sensitivity analyses to account for uncertainties instead of using Appendix A to Part 100. The NRC does not intend to require new ISFSI or MRS specific-license applicants that are co-located with an NPP to address uncertainties because the criteria used to evaluate existing NPPs are considered to be adequate for ISFSIs, in that the criteria have been determined to be safe for NPP licensing, and the seismically induced risk of an ISFSI or MRS is considerably lower than that of an NPP, as described in Section IV of this document.

The key elements of the NRC's approach for seismic and geologic siting for ISFSI or MRS license review and approval consists of:

- a. Conducting site-specific and regional geoscience investigations;
- b. Setting the target exceedance probability commensurate with the level of risk associated with an ISFSI or MRS;
- c. Conducting PSHA and determining ground motion level corresponding to the target exceedance probability;
- d. Determining if other sources of information change the available probabilistic results or data for the site; and
- e. Determining site-specific spectral shape, and scaling this shape to the ground motion level determined above.

In addition, the NRC will review the application using all available data including insights and information from previous licensing experience. Thus, the revised approach requires thorough regional and site-specific geoscience investigations. Results of the regional and site-specific investigations must be considered in applying the probabilistic method. Two current probabilistic methods are the NRC-sponsored study conducted by Lawrence Livermore National Laboratory and the Electric Power Research Institute's seismic hazard study. These are essentially regional studies. The regional and site-specific investigations provide detailed information to update the database of the hazard methodology to make the probabilistic analysis site-specific.

Applicants must also incorporate local site geological factors, such as stratigraphy and topography, and account for site-specific geotechnical properties in establishing the DE. Guidelines to incorporate local site factors and advances in ground motion