

the 19 ISFSI licenses issued in the past decade, none were in seismic areas. The NRC has not licensed unanchored cylindrical casks in any seismic areas. The commenter noted that there are no performance data, test data, or earthquake experience data for dry casks or for ISFSIs. The commenter further stated that the rule is based on principles that are antithetical to earthquake engineering principles because, for unanchored casks, the NRC relies solely on the predictions of non-linear computer models. The commenter also stated that, up to this point, the non-linear computer model predictions of the seismic behavior of casks have not been validated with shake table data or actual performance data. The commenter also stated that without adequate and reliable performance and test data, it cannot be determined if the casks will actually provide the critical barrier described and relied upon in the rule. Another commenter stated that non-linear dynamic analyses are inherently reliable. Further, the commenter noted that proper input parameters for cask stability analyses are not elusive unknowns but can be determined from basic physical principles, and that these analyses have been shown not to be highly sensitive to changes in input parameters. Therefore, the commenter argued, shake table testing is unnecessary.

Response: The integrity of the dry storage cask during an earthquake is a key to protecting the health and safety of the public because it confines the radioactivity during a potential accident event, such as an earthquake, and prevents it from being dispersed into the environment. Contrary to traditional building designs, the cask design is not governed by stresses resulting from an earthquake, but is governed by requirements resulting from shielding, thermal, criticality, and postulated handling accidents. Therefore, the critical performance requirement for a cask is that it would remain stable and not displace excessively to impact adjacent casks. The cask stability can be determined by nonlinear dynamic analyses, considering uncertainties in engineering parameters, and using multiple computer codes. The NRC has also performed structural analyses of casks tipping and sliding. In neither case did the canister fail.

It is a common engineering practice to design and build structures, including new design concepts, based on detailed structural analyses using sound engineering principles and laws of physics, without performing confirmatory experiments. For example,

new concepts in structural designs and construction of landmark structures, such as the Sears Tower, Hancock Tower, Eiffel Tower, and space vehicles were based solely on analyses.

The advent of computers has helped in the development of analytical tools, including the non-linear dynamic analyses. Results of these analyses are being used to design structures more complex than a dry storage cask. The concept of free-standing casks is not new. The buildings the NRC uses every day are free-standing on a foundation, and thus would move during an earthquake. The analytical tools for non-linear structural analyses are verified and validated using multiple computer codes and available experimental data. Therefore, shake table tests or actual performance data are not necessary.

Comment 5: A commenter requested a rule to establish a definitive design basis earthquake at a return period level [the return period of an earthquake is an inverse of the mean annual probability of exceedance (MAPE) of the earthquake] greater than 2,000 years that is tied to defined risk and performance goals.

Response: The NRC does not agree that we must establish a definitive design basis earthquake by rule. The current regulations in § 72.122(b)(2)(i), require that the structures, systems, and components of an ISFSI or MRS must be designed to withstand the effects of natural phenomena, such as earthquakes, without impairing their capability to perform their intended design functions. For earthquakes, these requirements are then supplemented by the requirements at §§ 72.102, 72.103, and 72.122 for detailed site investigations and appropriate consideration of the most severe of the natural phenomena and associated probability of occurrence, including consideration of uncertainties, in the prediction of earthquakes. This approach is consistent with the NRC's philosophy of using risk-informed, performance-based regulations. In a risk-informed, performance-based approach, the design of the ISFSI or MRS facility is based on an assessment of the radiological risk (potential for adverse consequences) due to an earthquake. Thus, specifying a value for the reference probability in the rule would preclude applicants from considering structures, systems, and components with risks other than the risk associated with the specified reference probability.

Comment 6: A commenter stated that the supplementary information in the final rule should state that the NRC's policy for promulgating risk-informed

regulations was a primary motivation for the rule changes.

Response: The NRC agrees that the supplementary information for the final rule should more clearly state that the rule was amended, in part, to conform to the Commission's recent policy to increase the use of risk insights and information in its regulatory applications. An additional statement has been added to Section II, Objectives, of the Supplementary Information portion of this document, that states the intent to revise the regulation in accordance with this policy.

Applicability of Proposed § 72.103

Comment 7: A commenter requested clarification of the proposed rule so that applicants for an ISFSI co-located with an NPP have the option of using the existing DE of the NPP without any further evaluations and that this applies to all sections of the rule. The commenter pointed out that the proposed amendments at §§ 72.103(a)(2) and 72.103(b), as well as explanatory statements made in the proposed rule indicate that applicants for an ISFSI that are co-located with an NPP have the option of using the existing NPP design criteria without additional evaluations, but that this option is not identified in § 72.103(f).

Response: To further clarify the NRC's intent that an applicant for an ISFSI that is co-located with an NPP has the option of using the existing DE of the NPP without the need to undertake any additional evaluations of the sort described in § 72.103(f), the introductory phrase of that section has been modified so that it now reads: "Except as provided in paragraphs (a)(2) and (b) of this section, the DE for use in the design of structures, systems, and components must be determined as follows."

Comment 8: Two commenters stated that the criteria presented for establishing the DE for ISFSI and MRS sites at existing NPPs allows for the use of the existing NPP SSE as one alternative. This alternative is key to ensuring that significant new probabilistic ground motion studies are not required at existing NPP sites.

Response: The commenters are correct. The regulatory changes allowing the licensee flexibility to use the existing SSE for an NPP at co-located ISFSIs or MRSs means that new studies are not required at ISFSIs or MRSs co-located with NPPs.

Alternative of Adopting 10 CFR 100.23

Comment 9: One commenter recommended withdrawing the proposed rule and adopting the option