

UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
OFFICE OF NUCLEAR REACTOR REGULATION  
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS  
WASHINGTON, DC 20555-0001

September 2, 2010

NRC INFORMATION NOTICE 2010-18:      GENERIC ISSUE 199, "IMPLICATIONS OF  
  UPDATED PROBABILISTIC SEISMIC HAZARD  
  ESTIMATES IN CENTRAL AND EASTERN  
  UNITED STATES ON EXISTING PLANTS"

**ADDRESSEES**

All holders of an operating license or construction permit for a nuclear power reactor issued under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities."

All holders of or applicants for a license (general or site specific) for an independent spent fuel storage installation (ISFSI) issued pursuant to 10 CFR Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste."

**PURPOSE**

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice (IN) to inform addressees about the August 2010 NRC document, "Safety/Risk Assessment Results for Generic Issue [GI] 199, Implications of Updated Probabilistic Seismic Hazard Estimates in Central and Eastern United States on Existing Plants" (Agencywide Documents Access and Management System (ADAMS) Accession No. ML100270582 (package)), that discusses recent updates to estimates of the seismic hazard in the central and eastern United States (CEUS). Although not specifically evaluated as part of Generic Issue 199 (GI-199), the updated seismic hazard estimates also apply to independent spent fuel storage installation (ISFSIs) located in the CEUS. This includes ISFSIs that are co-located at the reactor sites, which use the plant safe shutdown earthquake (SSE) as their design/licensing basis, as well as ISFSIs located away from the reactor site, which have their own location-specific licensing/design-basis earthquake. The NRC expects that recipients will review the information for applicability to their facilities and consider actions, as appropriate. Suggestions contained in this IN are not NRC requirements; therefore, no specific action or written response is required.

**ML101970221**

## BACKGROUND

In support of early site permits for new reactors, the NRC staff reviewed updates to the seismic source and ground motion models provided by applicants, which identified higher seismic hazard estimates that may result in the increased likelihood of exceeding the SSE at operating facilities in the CEUS. This seismic update included new Electric Power Research Institute (EPRI) models to estimate earthquake ground motion and updated models for earthquake sources in the CEUS such as around Charleston, South Carolina and New Madrid, Missouri.

The regulatory requirements that establish the seismic design bases for currently operating nuclear power plants are 10 CFR Part 100, "Reactor Site Criteria", and 10 CFR Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants," Criterion 2, "Design bases for protection against natural phenomena." These regulatory requirements are fundamentally deterministic, while the new seismic hazard information evaluated for GI-199 is fundamentally probabilistic.

The NRC Probabilistic Risk Assessment (PRA) Policy Statement encourages the use of PRA methods and states that "PRA should be used to support the proposal for additional regulatory requirements in accordance with 10 CFR 50.109, "Backfitting." NRC regulations and guidance such as 10 CFR 50.109 and NUREG/BR-0058, "Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission," provide a framework for changing regulatory positions in light of new information. The Generic Issues Program (GIP) utilizes the "backfitting" and regulatory analysis guidelines for evaluating generic issues.

Considering that estimates of the seismic hazard for some currently operating plants in the CEUS have increased, the NRC staff reviewed and evaluated this new information along with similar U.S. Geological Survey (USGS) seismic hazard estimates. From this review, the NRC staff concluded that seismic design of currently operating reactor and ISFSI facilities provides safety margin; however, the likelihood of exceeding the seismic hazard values used in plant design and in previous evaluations may be higher than previously understood for some currently operating CEUS sites. This review also resulted in the NRC staff issuing a memorandum, dated May 26, 2005 (ADAMS Accession No. ML051450456), recommending that the new data and models for CEUS seismic hazards be examined under the NRC's GIP as GI-199.

As part of its examination, the NRC staff compared the new seismic hazard data with the earlier evaluations conducted as a part of the Individual Plant Examination of External Events (IPEEE) program. The examination was intended to assess seismic performance of existing plants at or beyond the design-basis level. Based on that assessment (using the seismic hazard information available at the time of the IPEEE), the NRC staff determined that the seismic designs of operating plants in the CEUS still provide adequate safety margins.

To follow-up with interested stakeholders, the NRC staff held a public meeting on February 6, 2008, attended by many operating reactor licensees and EPRI representatives (ADAMS Accession No. ML080350189), to discuss its ongoing activities related to GI-199. In that meeting, the NRC staff described the screening process and criteria and explained the screening analysis results (ADAMS Accession No. ML073400477).

## DESCRIPTION OF CIRCUMSTANCES

The NRC's "Safety/Risk Assessment Results for Generic Issue 199, Implications of Updated Probabilistic Seismic Hazard Estimates in Central and Eastern United States on Existing Plants," documents the two-stage assessment performed by the NRC staff to determine the implications of updated probabilistic seismic hazard estimates in the CEUS on existing plants. The first stage involved evaluating the change in seismic hazard with respect to previous estimates at individual plants. The second stage estimated the change in seismic core damage frequency (SCDF) as a result of the change in the seismic hazard for each operating plant in the CEUS. The Safety/Risk Assessment describes the NRC staff's approach in detail. The methodology, analyses, results, and limitations of the Safety/Risk Assessment are briefly summarized below.

## DISCUSSION

### Evaluation of Changes in Seismic Hazard Estimates

In this stage, the NRC staff evaluated the potential significance of changes in seismic hazards in a stepwise fashion by assessing the degree to which the seismic hazard estimates developed using the most recent seismic hazard information and NRC staff guidance deviate from previously developed assessments. The comparison of results indicated an increase in the seismic hazard estimates relative to previous assessments for a number of plants.

### Evaluation of Changes in Seismic Core Damage Frequency

In the second stage, the NRC staff developed SCDF estimates using three sets of mean seismic hazard curves (the 1989 EPRI study, the 1994 Lawrence Livermore National Laboratory study, and a 2008 USGS study) and plant-level fragility curves developed from information provided in the IPEEE submittals. The changes in NRC's SCDF for a number of plants lie in the range of  $10^{-4}$  per year to  $10^{-5}$  per year, which meets the numerical risk criteria for an issue to proceed to the regulatory assessment phase of the GIP.

It should be recognized that the approach used to estimate SCDF in the Safety/Risk Assessment does not provide insight into which structures, systems, and components (SSCs) are important to seismic risk. Such knowledge provides the basis for postulating plant backfits and conducting a value-impact analysis of potential backfits during a regulatory analysis. For a number of plants, especially those that performed reduced-scope seismic margins analysis, detailed information is presently not available to the NRC regarding plant seismic capacity (the ability of a plant's SSCs to successfully withstand an earthquake) beyond the required design-basis level.

## CONCLUSION

- (1) Operating nuclear power plants are safe. The Safety/Risk Assessment confirms that the overall seismic risk estimates remain small for operating nuclear power plants and the current seismic design provides a safety margin.
- (2) Some seismic hazard estimates have increased. Updates to seismic data and models show increased seismic hazard estimates for some operating nuclear power plant sites and co-located ISFSI facilities in the CEUS. New consensus seismic hazard estimates for the CEUS will become available in early 2011 (these are a product of a joint NRC, U.S. Department of Energy, USGS, and EPRI project). Based on this, the NRC staff has commenced evaluating the development of a regulatory mechanism to routinely and promptly evaluate new seismic hazard information as it becomes available.
- (3) Assessment of GI-199 will continue, however, not all of the information needed to perform the regulatory assessment is currently available to the NRC staff. The NRC will follow the appropriate regulatory process to request operating plants and ISFSIs to provide specific information relating to their facilities to enable the NRC staff to complete the Regulatory Assessment. Based on results of the Safety/Risk Assessment, the NRC staff determined that the issue should continue to the regulatory assessment stage of the GIP for further investigation to assess whether candidate backfits should be considered for plant improvements to reduce seismic risk and to evaluate their potential cost-justified imposition.

While these conclusions do not point to a safety concern, there were limitations to the risk methodology employed and uncertainties associated with the data used. As such, although there is no specific requirement, licensees of operating power reactors and ISFSI facilities in the CEUS may evaluate whether the updated seismic hazard estimates impact their current design/licensing basis.

## CONTACT

This IN requires no specific action or written response. Please direct any questions about this matter to the technical contact listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.

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Note: NRC generic communications may be found on the NRC public Web site, <http://www.nrc.gov>, under Electronic Reading Room/Document Collections.

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ADAMS Accession No. ML101970221

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