January 29, 2008

MEMORANDUM TO: Patrick L. Hiland, Director
Division of Engineering
Office of Nuclear Reactor Regulation

FROM: Christiana H. Lui, Director */RA/*
Division of Risk Assessment
Office of Nuclear Regulatory Research

SUBJECT: CURRENT STATUS AND APPROACH FOR ADDRESSING GENERIC ISSUE 199, IMPLICATIONS OF UPDATED PROBABILISTIC SEISMIC HAZARD ESTIMATES IN CENTRAL AND EASTERN UNITED STATES FOR EXISTING PLANTS

The purpose of this memorandum is to update the sponsor of the subject Generic Issue (GI) regarding the current status and plans for processing the issue. This memorandum summarizes the background for GI-199, describes recent activities, outlines the status of the issue within the context of the Generic Issues Program (GIP), and identifies important considerations should the issue proceed to the safety and risk assessment stage of the GIP.

Background

The NRC's Office of Nuclear Reactor Regulation (NRR) memorandum to the Office of Nuclear Regulatory Research (RES), dated May 26, 2005, recommended that the impact of higher seismic hazard estimates on current nuclear power plants in the Central and Eastern United States (CEUS) region be examined under the GIP. This memorandum is available in the NRC's Agency-wide Documents Access and Management System (ADAMS), under Accession No. ML051450456.

That recommendation originated during the staff's review of Early Site Permits (ESPs) for new reactors, which included new models to estimate earthquake ground motion and updated models for earthquake sources in seismic regions such as eastern Tennessee, and around both Charleston, South Carolina, and New Madrid, Missouri. The new data and models resulted in increased estimates of the seismic hazards for some plants in the CEUS, although these estimates remain small in an absolute sense. The staff reviewed and evaluated this new information along with similar U.S. Geological Survey (USGS) seismic hazard estimates, used for building code applications (as opposed to nuclear power plant licensing).

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As part of that review, the staff compared the new seismic hazard data with the earlier evaluations conducted by the NRC staff as part of the Individual Plant Examination of External Events (IPEEE) Program. From this comparison, the staff determined that seismic designs of operating plants in the CEUS still provide adequate safety margins. The staff also recognized that these new seismic data and models could lead to increased estimates of the probability associated with seismic hazards at some of the currently operating sites in the CEUS where updated seismic hazard estimates are not available. Existing plants were not licensed based on a probabilistic assessment of seismic hazards or a probabilistic assessment of their potential impact on plant structures, systems, and components. Rather, the licensing basis for these plants is based on deterministic analysis for design basis loads from the maximum earthquake level that is determined from historical data. Although the new seismic data and models do not alter the design basis of existing CEUS plants, NRR recommended that this issue be examined under the GIP (ADAMS Accession No. ML051450456). RES reviewed the information in NRR's memorandum, and identified the issue as GI-199, as described in the RES response, dated June 9, 2005 (ADAMS Accession No. ML051600272).

Current Status of GI-199 Within the Generic Issues Program

The current framework for the GIP is contained in MD 6.4 and SECY-07-0022 (ADAMS Accession No. ML063460239). NRC staff has developed seven criteria to determine if an issue belongs in the GIP. These criteria are: 1) affects public health and safety, the common defense and security, or the environment; 2) generic, i.e. affects two or more facilities or licensees; 3) not readily addressed by other regulatory programs and processes, or existing regulations or industry initiatives; 4) can be resolved by new or revised regulation or policy; 5) risk or safety significance can be adequately determined; 6) the issue is well-defined, discrete, and technical; and 7) resolution may involve action by licensees. The criteria are intended to control GIP entry and assist in identifying the appropriate agency program for those issues that do not belong in the GIP. The criteria apply throughout the GIP. If an issue is determined to not satisfy at least one of the above seven criteria, the issue exits the GIP, and would be handled by another NRC program.

The GIP process consists of five stages, 1) identification, 2) acceptance review, 3) screening, 4) safety/risk assessment, and 5) regulatory assessment. The GIP staff members apply a "graded approach" throughout the process, i.e. as an issue proceeds through the program, more resources are devoted to it. Essentially, stages 2-5 are each a progressively more rigorous application of the GIP criteria.

<u>Identification and Acceptance Review</u>: The issue was identified in the memorandum from NRR to RES in May 2005 (ADAMS Accession No. ML051450456). The issue was then reviewed and accepted into the GIP as documented in the June 2005 memorandum from RES to NRR (ADAMS Accession No. ML051600272). The issue is currently within the screening stage.

<u>Screening</u>: In November 2007, staff from RES involved in the GI-199 initial screening analysis met with seismic hazard and analysis expert representatives from NRR and the Office of New Reactors (NRO) to discuss actions and identify an approach that is suitable for completing the screening analysis and that also supports the more detailed safety/risk analysis, should GI-199 proceed to that GIP stage. The outcome of the meetings was to proceed with the GI-199 screening analysis consistent with the current framework of the Generic Issues Program (GIP)

and with the ongoing initiatives and needs of NRR and NRO. Specific suggestions are outlined below.

The screening analysis includes information from readily available sources to develop a qualitative assessment of the potential for increased seismic hazard estimates. The staff will apply the seven screening criteria outlined above to reach a conclusion with respect to screening the issue. The screening panel met on January 9, 2008, and plans to issue panel recommendations to the RES Director for approval by the end of January 2008.

Safety/Risk Assessment: If the outcome of the Screening Stage is the approval to proceed to the Safety/Risk Assessment stage, some additional analysis will be required for this particular issue. A detailed, plant-specific seismic safety/risk assessment is a complex task. As a result, the staff has concluded it is most efficient to perform a second more detailed evaluation based on seismic hazard to potentially reduce the number of plants that may require a detailed safety/risk assessment. Therefore, the staff will identify and select specific CEUS nuclear power plant sites for which the most recent seismic data and models indicate that the estimates of seismic hazards might have increased. The staff's selection will be based on potential risk impacts and generic risk insights. The analysis will use seismic information and models that are consistent with the performance based approach for assessing seismic hazards for new reactors as described in memorandum to the Commission, "A Performance-Based Approach to Define the Safe Shutdown Earthquake Ground Motion," dated July 26, 2006 (ML052360044) and NRC Regulatory Guide 1.208, "A Performance-Based Approach to Define the Site-Specific Earthquake Ground Motion," dated March 2007.

A detailed assessment was performed by EPRI (EPRI, 2005a, b) for 28 of the 29 sites included in Regulatory Guide 1.165 (USNRC, 1997). That study used updated attenuation models and incorporated updates to the EPRI seismic source model developed during the preparation of the ESPs and an approach consistent with Regulatory Guide 1.208. The results of that EPRI study can be used to assess the potential impact on risk and safety margins. The recommended path forward is to engage industry stakeholders (e.g., EPRI and NEI) to extend the EPRI 2005 analyses to address additional plant sites.

The purpose of involving external stakeholders is to leverage the existing detailed hazard results and to obtain commitment from the Nuclear Energy Institute (NEI) and EPRI on behalf of plant licensees to examine additional sites beyond those 28 already evaluated in the 2005 EPRI report. The goal would be for industry representatives to complete this evaluation as soon a practical.

The staff expectation is that detailed hazard results will be provided in the form of site-specific hazard curves. Using these results, the staff would compare site-specific uniform hazard spectra, design response spectra, or other hazard results to the beyond-design-basis review level earthquake or hazard curve used as part of the IPEEE evaluation (USNRC, 2002). This would enable NRC staff to identify and evaluate any plants determined to have increased estimates of seismic hazards.

The staff would engage industry stakeholders to perform detailed safety and risk assessments for any plants where increased estimates of seismic hazard are substantial and warrant further review to estimate the risk impact. Based on these results, staff will apply the seven GIP criteria identified above and document the outcome of the Safety/Risk Assessment Stage. The

potential outcomes of that assessment are to conclude the issue does not warrant further action in the GIP program (is either closed with no further action or closed with follow up actions such as industry initiatives, regulatory office implementation or research activities) or the issue proceeds to the Regulatory Assessment Stage of the GIP.

Conclusions

The staff plans to hold a public meeting on GI-199 if the issue is approved for continuing on to the Safety/Risk Assessment Stage of the GIP. The purpose of the proposed meeting is to discuss plans for engaging industry on specifics to support the Safety/Risk Assessment Stage described above.

The ultimate deliverables from the GI-199 assessment include: assess potential reduction in available safety margins using a probabilistic approach, determine whether any regulatory actions or changes are warranted for these plants based on results from this assessment, and provide NRR the basis for responding to future requests involving information that indicates seismic hazards might have increased at operating nuclear power plants. The path outlined above aims at providing those deliverables.

References

EPRI, 2005a. Program on Technology Innovation: Assessment of a Performance-Based Approach for Determining Seismic Ground Motions for New Plant Sites, V1 (Performance-Based Seismic Design Spectra), Report No. 1012044, Electric Power Research Institute, Palo Alto, CA.

EPRI, 2005b. Program on Technology Innovation: Assessment of a Performance-Based Approach for Determining Seismic Ground Motions for New Plant Sites, V2 (Seismic Hazard Results at 28 Sites), Report No. 1012045, Electric Power Research Institute, Palo Alto, CA.

USNRC,1997. Identification and Characterization of Seismic Sources and Determination of Safe Shutdown Earthquake Ground Motion, U.S. Nuclear Regulatory Commission, Regulatory Guide 1.165, Washington, D.C.

USNRC, 2002. Perspectives Gained from the Individual Plant Examination of External Events, U.S. Nuclear Regulatory Commission, NUREG-1742 (2 vols.), Washington, D.C.

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