

Regulatory Guide Periodic ReviewRegulatory Guide Number: **1.208, Revision 0**Title: **A Performance-Based Approach to Define the Site-Specific Earthquake Ground Motion**Office/Division/Branch: **RES/DE/SGSEB**Technical Lead: **Sarah Tabatabai**Recommended Staff Action: **Reviewed with issues identified for future consideration.****1. What are the known technical or regulatory issues with the current version of the Regulatory Guide (RG)?**

The RG dates to 2007 and some references have changed since then. For example, the RG refers to the seismic sources identified and characterized by the Lawrence Livermore National Laboratory (LLNL) and the Electric Power Research Institute (EPRI) and states that the characterization of specific seismic sources found in these databases may still represent the latest information available at the time that a PSHA is to be undertaken. NUREG-2115, "Central and Eastern United States Seismic Source Characterization for Nuclear Facilities," (CEUS-SSC), has replaced the EPRI and LLNL models and needs to be referenced in the RG update. The RG also references the CEUS and WUS (Western United States) Time History databases provided in NUREG/CR-6728, "Technical Basis for Revision of Regulatory Guidance on Design Ground Motions: Hazard- and Risk- Consistent Ground Motion Spectra Guidelines," with respect to the selection of earthquake time histories for use in time history-based site response analyses. More recently updated databases, such as the Pacific Earthquake Engineering Center (PEER) Ground Motion Database, need to be referenced. For the revision, the references, including the examples mentioned above, should be updated.

As a result of staff experience from reviews of new early site permit (ESP) and combined license (COL) application reviews conducted since the guide was issued, the staff has identified several site response-related revisions needed. Appendix E "Seismic Wave Transmission Analysis" of the RG refers to the different approaches for developing a site-specific GMRS presented in NUREG/CR-6728. These approaches vary in complexity from simple deterministic amplification of probabilistically-derived rock response spectra (Approaches 1, 2A, and 2B) to rigorous treatment of soil amplification within the probabilistic seismic hazard analysis (Approaches 3, 3A, 3B, and 4). However, the RG needs to be updated to provide guidance on selecting the appropriate site response approach for a particular site. In response to NRC's Near Term Task Force seismic recommendations relative to the Fukushima Dai-Ichi accident (ML111861807), EPRI developed the Seismic Evaluation Guidance: Screening Prioritization and Implementation Details (SPID) (EPRI 1025287, 2013). Applicable guidance from EPRI's SPID should be folded into the RG. Also, guidance related to the following areas should be added to the RG using Appendix B of EPRI's SPID as a starting point: 1) Selection of kappa and representation of epistemic uncertainty; 2) Development of input motions for time domain methods or random vibration theory (RVT) methods; 3) Development of

probabilistic site-specific soil hazard curves (Approaches 3 or 4); and 5) Use of appropriate shear modulus reduction and damping curves and/or low strain damping values for materials in the site response model that are below the depth range where materials can be retrieved for testing.

In addition, Section C.3 "Evaluation of New Information Obtained from Site-specific Investigations" needs to be updated in the context of SSHAC guidelines (e.g. NUREG-2117, "Practical Implementation Guidelines for SSHAC Level 3 and 4 Hazard Studies") and, with respect to the CEUS, the NUREG-2115 CEUS-SSC model and how future updates to this model are envisioned.

2. What is the impact on internal and external stakeholders of not updating the RG for the known issues, in terms of anticipated numbers of licensing and inspection activities over the next several years?

There are no large power reactor license applications anticipated in the near future (next 3 to 5 years). Thus, there is no immediate need for revising the guide at this time to address their licensing. For small modular reactors, one application is anticipated in the next two years.

3. What is an estimate of the level of effort needed to address identified issues in terms of full-time equivalent (FTE) and contract resources?

Revision of the RG will take approximately 1.5 FTE of NRC staff time. The effort will involve updating references and the developing the additional guidance described above, pending the NRC's completion of the Recommendation 2.1 re-evaluation reviews. No contract dollars are needed.

4. Based on the answers to the questions above, what is the staff action for this guide (Reviewed with no issues identified, Reviewed with issues identified for future consideration, Revise, or Withdraw)?

Recommended action is to consider RG 1.208 reviewed with issues identified for future consideration.

5. If a RG should be revised, provide a conceptual plan and timeframe to accomplish this.

Not applicable.

NOTE: This review was conducted in November 2014 and reflects the staff's plans as of that date. These plans are tentative and subject to change.