UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001

July 27, 2009

Mr. R. W. Borchardt
Executive Director for Operations
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: DRAFT FINAL REVISION 3 TO REGULATORY GUIDE 1.100, "SEISMIC QUALIFICATION OF ELECTRICAL AND ACTIVE MECHANICAL EQUIPMENT AND FUNCTIONAL QUALIFICATION OF ACTIVE MECHANICAL EQUIPMENT FOR NUCLEAR POWER PLANTS"

Dear Mr. Borchardt:

During the 564th meeting of the Advisory Committee on Reactor Safeguards, July 8-10, 2009, we reviewed the Draft Final Revision 3 to Regulatory Guide (RG) 1.100, “Seismic Qualification of Electrical and Active Mechanical Equipment and Functional Qualification of Active Mechanical Equipment for Nuclear Power Plants." During this review, we had the benefit of discussions with representatives of the NRC staff as well as the referenced documents. We also received oral comments from representatives of MPR Associates and Westinghouse Electric Company.

RECOMMENDATION

Prior to issuance, Revision 3 to RG 1.100 should be revised to delineate clearly the process for submitting and approving the details of experience data, including applicable implementation procedures so as to obviate the need for case-by-case review.

BACKGROUND

RG 1.100 describes acceptable methods for seismic qualification of electrical and active mechanical equipment and functional qualification of active mechanical equipment for nuclear power plants.

Revision 2 of RG 1.100 endorsed, with exceptions and clarifications, the Institute of Electrical and Electronics Engineers (IEEE) Standard (Std.) 344-1987, “IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations,” and extended the application of that Standard to include seismic qualification of active mechanical equipment. Revision 3 of RG 1.100 updates and further extends the guidance in Revision 2 by:

- Endorsing, with exceptions and clarifications, updated IEEE Std. 344-2004, "IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations.

- Endorsing, with exceptions and clarifications, American Society of Mechanical Engineers (ASME) Standard QME-1-2007, "Qualification of Active Mechanical Equipment Used in Nuclear Power Plants."

- Subsuming the provisions of RG 1.148, "Functional Specification for Active Valve Assemblies in Systems Important to Safety in Nuclear Power Plants."

These revisions extend the scope of RG 1.100 to cover seismic qualification of electrical equipment, and seismic and functional qualification of active mechanical equipment.

DISCUSSION

Revision 3 of RG 1.100 endorses ASME Standard QME-1-2007. This Standard contains guidance for both seismic qualification and functional qualification of active mechanical components. The functional qualification guidance applies for nonmetallic parts, dynamic restraints, pumps, and valves. In particular, the guidance in ASME QME-1-2007 incorporates extensive lessons learned from operating experience, testing, design, and qualification of motor-operated valves in the intervening years since issuance of Generic Letter 89-10, “Safety-Related Motor-Operated Valve Testing and Surveillance.” The guidance for seismic and functional qualification of mechanical equipment has been consolidated into RG 1.100, to obviate the need for redundant endorsements of specific sections of ASME QME-1-2007 in separate regulatory guides, and to replace outdated guidance in RG 1.148.

The principal staff positions in Revision 3 of RG 1.100 address specific elements of the seismic qualification guidance in the referenced standards. A major change from IEEE Std. 344-1987 to Std. 344-2004 involves updated and expanded guidance for the use of experience data to seismically qualify electrical equipment, including instrumentation and control (I&C) components. Appendix QR-A to ASME QME-1-2007 also describes the use of experience data as a method for seismic qualification of active mechanical equipment.

Experience data includes equipment performance records compiled from actual earthquakes and cataloged seismic qualification test data for classes of similar components. The NRC has accepted the use of experience data to justify the seismic adequacy of equipment in older operating nuclear power plants that are the subject of Unresolved Safety Issue (USI) A-46. Revision 3 of RG 1.100 states that analysis and testing are the preferred methods for seismic qualification of electrical, I&C, and mechanical equipment in non-USI A-46 operating plants licensed under 10 CFR Part 50 and in new plants licensed under 10 CFR Part 52. If the use of experience data is proposed to support seismic qualifications for these plants, Sections 1.1.1.b and 1.2.1.d of RG 1.100 specify guidance for documentation of the data and NRC review of their applicability to the plant-specific installation.

Recent studies of certain hard-rock plant sites in the Central and Eastern United States have indicated that the site-specific seismic response spectra may exceed the current plant design spectra in the high-frequency range (viz., above 20 Hertz - Hz). Revision 3 of RG 1.100 states that the input frequency range for seismic qualification testing should not be limited to the typical former maximum of 33 Hz. This Guide specifies that the applied frequency range should be

consistent with the site-specific response spectra for the respective plant structures and equipment. This Guide also indicates that additional seismic testing may be necessary to confirm that certain types of electrical components are not susceptible to chatter or other failure modes during high-frequency ground motions. This guidance may limit the applicability of previously documented experience data, or may necessitate supplemental testing to confirm equipment response to high-frequency ground accelerations.

The staff explained it is not the intent of RG 1.100 to preclude the use of experience data to support qualification of equipment at non-USI A-46 plants. Also, it is not the staff's intent to impose the need for a case-by-case review of each proposed use of experience-based seismic qualification data. However, neither of these intents are clearly stated in Revision 3 of the Guide.

RG 1.100 should be revised to delineate clearly the process for submitting and approving the details of experience data, including applicable implementation procedures to obviate the need for case-by-case staff review. These enhancements will help to clarify the potential applications that may be supported by experience data and the types of situations that require specific component testing or analysis.

Sincerely,

/RA/

Mario V. Bonaca
Chairman

References:

1. Memorandum from Michael J. Case, Director, Division of Engineering, Office of Nuclear Reactor Research to Edwin M. Hackett, Executive Director, ACRS; Subject: Regulatory Guide 1.100, "Seismic Qualification of Electrical and Active Mechanical Equipment and Functional Qualification of Active Mechanical Equipment for Nuclear Power Plants," 05/27/2009 (ML091420355)

2. Draft Regulatory Guide DG-1175, "Seismic Qualification of Electric and Active Mechanical Equipment and Functional Qualification of Active Mechanical Equipment for Nuclear Power Plants," May 2008 (ML072620346)

3. American Society of Mechanical Engineers, Standard QME-1-2007, "Qualification of Active Mechanical Equipment Used in Nuclear Power Plants," November 2007

4. "Seismic Qualification of Equipment in Operating Plants (Item A-46)" in "Resolution of Generic Safety Issues: Section 2. Task Action Plan Items," U.S. Nuclear Regulatory Commission, NUREG-0933, August 2008 (ML082410719)

5. Institute of Electrical and Electronics Engineers, Standard 344-1987, "Functional Specification for Active Valve Assemblies in Systems Important to Safety in Nuclear Power Plants," November 2002

6. Institute of Electrical and Electronics Engineers, Standard 344-2004, "IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations," June 2005

7. NRC Generic Letter 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance - 10 CFR 50.54(f)," 06/28/1989 (ML031150300)

8. Regulatory Guide 1.148, "Functional Specification for Active Valve Assemblies in Systems Important to Safety in Nuclear Power Plants," March 1981 (ML003739979)

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Letter to the Honorable Gregory B Jaczko, Chairman, NRC, from Mario V. Bonaca, Chairman, ACRS, dated July 27, 2009

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