



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

December 10, 2009

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

**SUBJECT: DRAFT FINAL REVISION 1 OF REGULATORY GUIDE 1.151, "INSTRUMENT SENSING LINES"**

Dear Mr. Borchardt:

During the 568th meeting of the Advisory Committee on Reactor Safeguards, December 3 - 5, 2009, we reviewed Draft Final Revision 1 of Regulatory Guide (RG) 1.151, "Instrument Sensing Lines." This regulatory guide was also reviewed by our subcommittee on Regulatory Policies and Practices on December 1, 2009. During these reviews, we had the benefit of the documents referenced and discussions with the NRC staff.

**CONCLUSIONS AND RECOMMENDATIONS**

1. Regulatory Guide 1.151 Revision 1 should not be issued until the staff resolves recommendations 2 and 3.
2. The scope of Draft Final Revision 1 to Regulatory Guide 1.151 should be reviewed to determine whether it should be revised to include non-safety-related systems categorized under the provisions of Regulatory Treatment of Non-Safety Systems (RTNSS).
3. The staff should review existing requirements to determine whether the potential for flashing needs to be included in the regulatory guide as a mechanism affecting instrument accuracy.

**DISCUSSION**

RG 1.151 describes a method that the staff considers acceptable for use in complying with the Commission's regulations on the design and installation of safety-related instrument sensing lines in nuclear power plants. This regulatory guide addresses instrument sensing lines that serve safety-related functions to prevent the release of reactor coolant as a part of the reactor coolant pressure boundary and provide adequate connection to the reactor coolant system for measuring process parameters such as pressure, temperature, level, and flow.

Revision 0 of RG 1.151 was issued in July 1983. Subsequent to the issuance of Revision 0, operational events occurred in which dissolved gases in instrument lines were released during plant transients causing inaccurate instrument indications. To ensure that plants continued to operate safely and conservatively, the staff provided additional guidance and information on instrument sensing lines through a bulletin, a generic letter, and information notices. As a result

of operating experience and the NRC guidance, the industry made several changes to improve the reliability of instrument indications during normal and transient conditions. One significant enhancement was a design change to keep the instrument reference line filled using available plant systems.

The industry has subsequently developed improved guidance for the design and installation of instrument sensing lines. The Instrument Society of America (ISA) prepared American Nuclear Standards Institute ANSI/ISA-67.02.01-1999, "Nuclear Safety-Related Instrument-Sensing Line Piping and Tubing Standard for Use in Nuclear Power Plants." This 1999 standard incorporates several of the regulatory positions in RG 1.151 Revision 0, and includes additional provisions to address lessons learned from operating experience.

Another industry standard has been developed to provide additional guidance on heat tracing. This standard was developed by the Power Generation Committee of the Institute of Electrical and Electronics Engineers (IEEE) Power Engineering Society. They developed IEEE Std 622-1987, "Recommended Practice for the Design and Installation of Electric Heat Tracing Systems for Nuclear Power Generating Stations." Although this standard was not developed specifically for instrument sensing lines, it provides guidance that is applicable to sensing lines that may be vulnerable to freezing or crystallization of the process fluid.

The NRC staff developed Draft Final Revision 1 of RG 1.151 to update the available guidance to current licensees and applicants for new plants. Revision 1 of RG 1.151 endorses the applicable portions of ANSI/ISA-67.02.01-1999 and IEEE Standard 622-1987, with four exceptions or additions.

During our review of the proposed revision, we questioned whether considerations for flashing of the process fluid should be included in the regulatory guide. The staff stated that it was their intent that RG 1.151 address gas from any reasonable mechanism that could adversely affect needed instrument indications. The staff agreed to review the current requirements and determine whether additional guidance is needed for flashing considerations.

The stated scope in RG 1.151 could be interpreted as applying only to safety related instrument sensing lines. However, some of the new plant designs have fewer safety related systems and may use non-safety related systems in ways that will be important to overall safety. These systems will be included in the RTNSS category. The staff should review the scope of RG 1.151 against new plant designs to determine if the scope definition is sufficient to cover new plant designs that may include RTNSS systems.

The staff was responsive to our concerns and agreed to examine the scope of RG 1.151 and the need to include flashing as a mechanism affecting instrument accuracies in Revision 1. Draft Final Revision 1 to RG 1.151 should not be issued until the staff has completed their review and incorporated any additions or modifications to the Guide. We look forward to future discussions with the staff on this subject.

Sincerely,

**/RA/**

Mario V. Bonaca  
Chairman

**REFERENCES**

1. U. S. Nuclear Regulatory Commission: Regulatory Guide 1.151, Revision 1, "Instrument Sensing Lines," 12/2009 (ADAMS Accession no.: ML092330219)
2. U. S. Nuclear Regulatory Commission: Regulatory Guide 1.151, "Instrument Sensing Lines," 07/1983 (<http://www.nrc.gov/reading-rm/doc-collections/reg-guides/power-reactors/active/>)
3. U. S. Nuclear Regulatory Commission: Generic Letter Number 92-04: Resolution of the Issues Related to Reactor Vessel Water Level Instrumentation in BWRs Pursuant to 10 CFR 50.54 (F), 08/19/1992 (Accession no.: 9208190057)
4. NRC Information Notice 92-54: Level Instrumentation Inaccuracies Caused by Rapid Depressurization, 07/24/1992 (Accession no.: 9207240177)
5. NRC Bulletin 93-03: Resolution of Issues Related to Reactor Vessel Water Level Instrumentation in BWRs, 05/28/1993 (Accession no.: 9305280173)
6. NRC Information Notice 95-20: Failures in Rosemont Pressure Transmitters Due to Hydrogen Permeation into the Sensor Cell, 03/22/1995 (Accession no.: 9503200279)
7. NRC Information Notice 2002-06: Design Vulnerability in BWR Reactor Vessel Level Instrumentation Backfill Modification, 01/18/2002 (ADAMS Accession no.: ML013470481)

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Sincerely,  
**/RA/**  
 Mario V. Bonaca  
 Chairman

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Letter to the Honorable Gregory B Jaczko, Chairman, NRC, from Mario V. Bonaca, Chairman, ACRS, dated December 10, 2009

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