Resolution of Public Comments Received on Draft Regulatory Guide DG-1178, "Instrument Sensing Lines"

During the public comment period for Draft Regulatory Guide DG-1178, which ended on February 06, 2009, the NRC received comments from Westinghouse, Nuclear Energy Institute (NEI), and Tennessee Valley Authority (TVA). The NRC staff has carefully reviewed the draft and addressed the comments as appropriated. The NRC staff has carefully reviewed the draft and addressed the comments as appropriated. The following table summarizes the comments and staff's responses.

Westinghouse Comments (ML090400332)		
Section of DG-1178	**Comment**	**Resolution**
General	Comment 1: References and citation of the instrument line standard should match the official ANSI/ISA identification, ANSI/ISA-67.02.01-1999. It should not include "S" (as in ANSI/ISA-S67.02.01-1999).	The staff agrees. ANSI/ISA-S67.02.01-1999 is the former identification for ANSI/ISA-67.02.01-1999. The Draft Regulatory Guide DG-1178 should use the current identification of the standard. The staff will correct all references and citations to the standard to read "ANSI/ISA-67.02.01-1999."
General	Comment 2: Draft guide DG-1178 does not provide guidance regarding design standards to be applied to instrument manifold valve assemblies. a. Instrument manifolds and secondary isolation valves were excluded from the ISA-S67.02-1980 scope of providing design requirements and seismic categorization for instrument sensing lines. b. In supplementing ISA-S67.02-1980, RG 1.151, (July, 1983) appears to apply ASME III and Seismic Category 1 to manifolds by the language "…from their connection(s) to the process piping or vessel to the *sensing instrumentation*." (Section C, Subsection 2.b and 3) c. ANSI/ISA-S67.02.01-1999 incorporated NRC guidance for the second isolation valve, but in the revised figures, further obscured details of instrument manifolds, and applied no pressure boundary or seismic requirements for them. Some clarification should be provided of an acceptable basis for applying design requirements and seismic categorization to instrument	The staff agrees. The terminology defining sensing lines should state that the tubing, piping, manifolds, fittings, and valves are included in under the seismic requirements. The draft will be revised to include a definition of basic sensing line components. Tables 1 and 2 of ANSI/ISA-67.02.01-1999 define the seismic categories and the associated ASME design codes that are applicable for water-filled and containment atmosphere instrument sensing lines. Figures 1 through 6 of ANSI/ISA-67.02.01-1999 illustrate the scope of the piping, tubing, valves, that are covered by the design codes, (either ASME III Class 2 or 3 or ANSI B31.1). This regulatory guide endorses these categories as the acceptable basis for design requirements and seismic categorization.

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	manifold assemblies. To clarify this, an additional regulatory position should be stated: "The term "sensing line" shall apply to all valves, fittings, tubing and piping used to connect instruments to main piping or to other instruments or apparatus or to measuring equipment." This would clarify applicability of the guidance to valves and manifold assemblies, and make the position consistent with Section 122.3 of ASME B31.1, and content originally included in sections of ASME Section III.	
General	Comment 3: The term 'evolved gas" used in DG-1178, may more appropriately refer to a different physical mechanism than the release upon depressurization of gas dissolved in water-filled instrument lines. Consideration should be given to describing the phenomenon in term like "dissolved gas," "gas in solution," or "released from solution."	The staff disagrees. The term "evolved" used in this guide does apply to any gas given off due to chemical reaction or reduction in solubility. The inaccuracy of the pressure sensing device does not depend on the physical mechanism for generating the trapped gas in the sensing line. However, the only mechanism identified as a risk is reduction in solubility. The terms "evolved gas" and "trapped gas" will be added to a nomenclature section.
General	Comment 4: There appears to be a typographical error in section C.1., second sentence. Sentence in draft reads: "The original ANSI/ISA-S67.01 covered…" It should read: "The original ANSI/ISA-S67.02 covered…"	The staff agrees. The affected sentence will be revised as proposed.
Section C.2 (page 4)	Comment 5 & 6: Comment 5: Regulatory Position 2 implies that root valves and accessible isolation valves are not required if instrument sensing lines do not penetrate the containment boundary. As presently worded, the regulatory position appears to be that an instrument line entirely within containment could be installed with no provision for isolation of the instrument from the process. This was not the intention of ANSI/ISA-S67.02.01-1999. Most of the figures in it define requirements independent of the containment boundary. It should not be the regulatory position that isolation capability is only required to maintain containment integrity. For the same reason, the last sentence of this position should be deleted.	Comment 5: The staff disagrees. Regulatory Position 2 provides specific guidance on root valve and accessible isolation valve for instrument sensing lines that penetrates primary reactor containment. The provision for these guidance are derived from General Design Criteria (GDC) 55, "Reactor coolant pressure boundary penetrating containment": "Each line that is part of the reactor coolant pressure boundary and that penetrates primary reactor containment should be provided with containment isolation valves as follows, unless it can be demonstrated that the containment isolation provisions for a specific class of lines, such as instrument lines, are acceptable on some other defined basis"

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	Comment 6: One sentence of position 2 is: "Although not specifically addressed in the standard's Section 4.2, 'Mechanical Design Requirements for Sensing,' these drawings and guidance are applicable to sensing lines." The purpose of this sentence is not clear, and doesn't appear to be correct. The correct heading of Section 4.2 in the standard is "Mechanical design requirements for sensing lines." The first sentence of the section specifically addresses "The design of components, parts and appurtenances utilized in the instrument-sensing lines…." Since the standard Section title and content specifically address applicability to instrument sensing lines, the sentence in the regulatory position is not needed and should be deleted.	ANSI/ISA-67.02.01-1999 specifically excludes containment isolation requirements in Note 1 of Table 1 and Table 2. Regulatory Position 2 clarifies the isolation requirement resulting from the exclusion by restating GDC 55 as it applies to sensing lines penetrating containment boundary. Regulatory Position 2 neither intends to exclude sensing lines that do not penetrate primary reactor containment nor limits the containment integrity requirement to isolation capability. Comment 6: The staff agrees to remove the reference to section 4.2 of ANSI/ISA-67.02.01-1999. Comment 5 & 6: To avoid the confusion and to clarify the scope of the RG, the Regulatory Position 2 is modified to read: "ANSI/ISA-67.02.01-1999 does not address containment isolation for water filled sensing lines that penetrate the containment boundary. The requirements of GDC 55 regarding penetrations of the containment by lines forming the reactor coolant pressure boundary shall be observed. For each sensing line that penetrates primary reactor containment, root valve and accessible isolation valves should be provided, unless it can be demonstrated that the containment isolation provisions for sensing lines are acceptable on some other defined basis in accordance with GDC 55. The root valve and accessible isolation valve may be the same valve if the arrangement meets all other requirements for isolation and accessibility."
General	Comment 7: In the discussion section, Draft guide DG-1178 describes the potential for dissolved gas in water filled instrument sensing lines to come out of solution under certain circumstances, adversely affecting the accuracy and reliability of level measurements. It further notes that some actions taken to prevent the condition have been deficient. Regulatory position 4 directs that the provision shall be made to mitigate this problem, but DG-1178 does not include description of a method acceptable to the	The staff disagrees. The risk for trapped gas in sensing lines is a problem that has been noted operationally. The guidance presumes the risk can exist, where it had not been addressed previously in guidance, and indicates that an applicant should address the risk and provide means to mitigate the event if it should occur. A specific mitigation method depends on the sensing line design. For the group of BWR plants that have previously experienced this problem, reference to a particular resolution that was accepted by the staff is included in the

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	NRC to implement the directive.	discussion. Other designs of sensing lines may require other approaches. As regulatory guides do not specify the design, the regulatory guidance should not dictate one approach over another.
Section B (page 3)	Comment 8: While regulatory position 4 does not make a distinction between BWR and PWR plant designs, the discussion section addresses only BWR experience. Applicability to PWR plants should be clarified. Consideration may be given to including reference to Information Notice 92-54, and as evidence of the presence of dissolved gas in an instrument line, Information Notice 95-20. Comment 2 also applies to this Regulatory Position.	The staff agrees to revise the affected discussion section to clarify the applicability to PWR plants. The revised paragraph will read: "Operational events have occurred in which evolved gases in instrument sensing lines have affected measured water levels in operating nuclear power plants. The NRC issued Information Notice No. 92-54, "Level Instrumentation Inaccuracies Caused by Rapid Depressurization," dated July 24, 1992 (Ref. 7), to alert licensees to potential inaccuracies in water level indication during and after rapid depressurization events. Inaccuracies in level instrumentation could affect the performance of safety functions in pressurized water reactor (PWR) and boiling water reactor (BWR) plants. NRC Information Notice No. 92-20, "Failure in Rosemount Pressure Transmitters Due to Hydrogen Permeation into the Sensor Cell," dated March 22, 1995 (Ref. 8), presents evidence of the presence of dissolved gas in an instrument line of PWR. For BWRs the potential problem is that dissolved gases can evolve in the reference leg for level measurements in the reactor vessels as the solubility of the gases decreases during depressurization. Such gases can be trapped in the instrument sensing line and affect differential pressure measurements, particularly level measurements. Such events have been reported in licensee event reports with significant level measurement errors. Since level instrumentation plays an important role in the plant safety and is required for both normal and accident conditions, NRC Bulletin 93-03, "Resolution of Issues Related to Reactor Vessel Water Level Instrumentation in BWRs," dated May 28, 1993 (Ref. 9), recommended that each utility implement corrective actions to ensure that the level instrumentation design is of high functional reliability for long-term operation. In response to the bulletin, the majority of BWR licensees decided to install a reference leg backfill system to supply a continuous flow of water from the control rod drive (CRD) hydraulic system

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		through the reference legs to preclude migration of dissolved noncondensable gases into the legs. However, NRC Information Notice 93-89, "Potential Problems with BWR Level Instrumentation Backfill Modifications," dated November 26, 1993 (Ref. 10), reported on several potential design problems with the retrofit backfill system by which a single failure in the backfill system would lead to a severe transient on multiple level sensing channels. Consequently, the design measures that respond to trapped gas in the reference leg should ensure that the features and systems that mitigate or preclude evolved gases do not themselves introduce additional single-failure mechanisms in the protection system. The following regulatory provisions support taking additional measures to address the potential for evolved gases in instrument sensing lines:"

Nuclear Energy Institute (NEI) Comments (ML090420180)		
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	Comment 1 TVA believes that DG-1178 and the related American National Standards Institute (ANSI)/ISA-67.02.01 standard are in agreement with our plants' design criteria and standards with one exception. ANSI/ISA-67.02.01, Section 5.3, currently states "shall" for field labeling of sense lines. TVA believes field labeling of sense lines should be stated as "should." *Reason: Since the requirements associated with heat trace and low temperature monitoring and alarm are recommendations and have a more direct impact than labeling on sense line performance, it would be more appropriate to have the labeling as a recommendation rather than a requirement. Labeling aides configuration control, but there are alternate means for maintaining configuration control.*	The staff disagrees. The ISA standards committee has chosen "shall" rather than "should" in ANSI/ISA-67.02.01-1999, Section 5.3. There is no regulation reason to alter this language. Accurate field labeling is a significant measure in preventing operating and maintenance errors.
	Comment 2 DTE believes a separate Regulatory Guide is needed for dealing with the non-condensable gasses issue. The Regulatory Guide should incorporate the results of the analyses conducted by the BWROG as well as 15 years of BWR plants operating experience with the backfill modification in service. Combining guidance for two issues (design and non-condensable gas) into one Regulatory Guide will not serve as the best guidance. *Reason: The Boiler Water Reactor Owners Group (BWROG) thoroughly investigated this issue in early the 1990s and most of the BWR plants implemented a hardware fix (backfill modification) to supply a continuous purge flow to the cold reference legs. A simple compliance with the sensing lines design and installation standard will not prevent liquid degassing in the reference leg. Even properly installed may be affected by the non-condensable gasses and special measures must be taken to ensure accurate water level measurements.*	The staff disagrees. The inclusion of design provisions for mitigating trapped gas in sensing lines is consistent with the objective of this regulatory guide to provide regulatory guidance on design and installation of safety-related instrument sensing lines. A separate regulatory guide is not required. The input of the BWROG was considered in formulating this guidance.
	Comment 3 No references are been made to identify an acceptable method for mitigating the effects of the non-condensable gasses. Such guidance	See comment 7 on Westinghouse comments

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	should be provided. *Reason: Since DG-1178 states: "Provisions shall be made to mitigate the potential effects of trapped, evolved gases in sensing lines during or following depressurization events as long as the associated measurements are required for monitoring the plant or for operating the safety system", licensee is expected to mitigate the effects but is left to develop a method on its own.*	

Tennessee Valley Authority (TVA) Comments (ML090650460)		
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General	Comment 1 TVA believes that DG-1178 and the related American National Standards Institute (ANSI)/ISA-67.02.01 standard are in agreement with our plants' design criteria and standards with one exception. ANSI/ISA-67.02.01, Section 5.3, currently states "shall" for field labeling of sense lines. TVA believes field labeling of sense lines should be stated as "should." *Reason: Since the requirements associated with heat trace and low temperature monitoring and alarm are recommendations and have a more direct impact than labeling on sense line performance, it would be more appropriate to have the labeling as a recommendation rather than a requirement. Labeling aides configuration control, but there are alternate means for maintaining configuration control.*	The staff disagrees. The ISA standards committee has chosen "shall" rather than "should" in ANSI/ISA-67.02.01-1999, Section 5.3. There is no regulation reason to alter this language. Accurate field labeling is a significant measure in preventing operating and maintenance errors.