

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
OFFICE OF NEW REACTORS
WASHINGTON, DC 20555-0001

July 3, 2013

NRC INFORMATION NOTICE 2013-12: IMPROPERLY SLOPED INSTRUMENT
SENSING LINES

ADDRESSEES

All holders of an operating license or construction permit for a nuclear power reactor under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," except those that have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel.

All holders of an operating license for a non-power reactor (research reactor, test reactor, or critical assembly) under 10 CFR Part 50, except those who have permanently ceased operations.

All holders of and applicants for a power reactor early site permit, combined license, standard design certification, standard design approval, or manufacturing license under 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants."

All contractors and vendors that supply basic components to U.S. Nuclear Regulatory Commission (NRC) licensees under 10 CFR Part 50 or 10 CFR Part 52.

PURPOSE

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice (IN) to inform addressees of recent operating experience regarding instrument sensing line sloping problems caused by improper design or installation that have occurred at U.S. nuclear power plants. This IN also emphasizes to the recipients the importance of applying related design and installation criteria and providing adequate oversight. The NRC expects that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this IN are not NRC requirements; therefore, no specific action or written response is required.

DESCRIPTION OF CIRCUMSTANCES

Watts Bar Nuclear Unit 2 Construction Project

On April 29, 2013, Tennessee Valley Authority (TVA), the construction permit holder for Watts Bar Nuclear Unit 2 (Watts Bar 2), issued an interim construction deficiency report in accordance with 10 CFR 50.55(e), "Conditions of Construction Permits, Early Site Permits, Combined Licenses, and Manufacturing Licenses," regarding a condition that has the potential to be a

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significant programmatic breakdown in the instrument sensing line installation program. Watts Bar 2 determined that a number of instrument sensing lines within multiple systems may not have been inspected completely for proper slope. The apparent cause of this condition involves a misinterpretation of the related construction procedure, which lacked proper detail to define the boundary of the sensing line from the panel isolation valve to process connection, including the root valve. The construction permit holder's corrective actions included revising the construction procedure, providing training on the revised construction procedure, and completing the required walkdowns or evaluations to correct any identified deficiencies. Additional information is available on the NRC's public Web site in the Agencywide Documents Access and Management System (ADAMS) under Accession No. ML13121A427.

James A. FitzPatrick Nuclear Power Plant

On November 1, 2012, Entergy, the licensee for James A. FitzPatrick Nuclear Power Plant, submitted licensee event report (LER) 3332012003 (ADAMS Accession No. ML12307A075) in accordance with 10 CFR 50.73, "Licensee Event Report System." In this LER, the licensee reported that on September 2, 2012, with the plant running at 100 percent power, the high-pressure coolant injection (HPCI) system was declared inoperable. This condition was caused by air in the instrument sensing line for the HPCI main pump discharge flow element, which caused a false flow indication while HPCI was in standby. An apparent cause evaluation determined that a portion of the sensing line was improperly sloped. The licensee took immediate corrective actions to fill and vent the instrument lines using a revised procedure that provided instructions to perform a pressurized back flush. Additional information is available in ADAMS under Accession No. ML12307A075.

Browns Ferry Nuclear Plant Unit 1

On November 15, 2010, TVA, the licensee for Browns Ferry Nuclear Plant, Unit 1, submitted LER 2592010002, which was later revised on May 20, 2011 (ADAMS Accession No. ML11144A288). In this LER, the licensee reported that on September 16, 2010, it determined that a condition initially identified on December 8, 2008, reflected the inoperability of a drywell pressure channel for longer than allowed by technical specifications at its Browns Ferry Nuclear Plant Unit 1. Subsequent review for extent of this condition identified that the inoperable condition existed from October 2, 2008, until corrected on December 9, 2008. Additionally, a subsequent occurrence of an inoperable drywell pressure channel between May 25, 2010, and October 6, 2010, was discovered. The cause was improperly sloped instrument sensing lines that allowed water to condense and collect in the sensing lines, resulting in nonconservatively biased instrumentation output signals. The licensee took corrective actions that included purging the instrument sensing lines of water to restore operability and implementing a design change in the fall of 2010 to reconfigure the sensing lines to eliminate water traps. Additional information is available in ADAMS under Accession No. ML11144A288.

BACKGROUND

The International Society of Automation (ISA), formerly known as the Instrument Society of America, prepared standard ANSI/ISA-67.02.01-1999¹, "Nuclear Safety-Related Instrument-Sensing Line Piping and Tubing Standard for Use in Nuclear Power Plants," which has been endorsed by NRC Regulatory Guide 1.151, Revision 1, "Instrument Sensing Lines," with certain exceptions and clarifications, to provide design, physical protection, and installation guidance for safety-related instrument sensing lines, and for sampling lines previously covered by ANSI/ISA-S67.10, "Sample-Line Piping and Tubing Standard for Use in Nuclear Power Plants."

Related NRC Generic Communications

NRC IN 92-54, "Level Instrumentation Inaccuracies Caused by Rapid Depressurization," dated July 24, 1992, discusses inaccuracies in water level indication during and after rapid depressurization events that may affect the indication of pressurizer level for pressurized-water reactors and reactor vessel level for boiling-water reactors (ADAMS Accession No. ML082340376).

NRC IN 84-45, "Reversed Differential Pressure Instrument Sensing Lines," dated June 11, 1984, discusses events that primarily occurred during construction and preoperational testing that involved discovery of the high- and low-pressure sensing lines for safety-related differential pressure instrumentation being reversed (ADAMS Accession No. ML082890902).

DISCUSSION

The provisions in 10 CFR Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants," General Design Criterion 13 ("Instrumentation and Control"), require that instrumentation be provided to monitor variables and systems to ensure adequate safety. Many nuclear power plant safety-related instruments that use sensing lines are relied upon to perform required safety functions, such as to initiate reactor trips, control flows, maintain proper fluid levels, actuate emergency systems, and provide the operators information that is used as the basis for actions to ensure adequate core cooling. For these instruments to function properly, their sensing lines need to be sloped adequately. Currently, ANSI/ISA-67.02.01-1999, which has been endorsed by NRC Regulatory Guide 1.151, Revision 1, with certain exceptions and clarifications, provides design, physical protection, and installation guidance for safety-related instrument sensing lines, and for sampling lines previously covered by ANSI/ISA-S67.10. This includes sloping guidance for instrument sensing lines.

The standard states that sensing lines for liquid measurements are to slope continuously downward from the process connection to the instrument to help prevent air entrapment in the lines that could impact the function of the instrument and lead to false indications. Conversely, it states that sensing lines for gas measurements are to slope continuously upward from the process connection to the instrument to ensure water entrained in the gas does not impair the function of the instrument. If slope requirements cannot be met, the addition of a high point vent

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Copies of American National Standards (ANS) may be purchased from the American National Standards Institute (ANSI), 1819 L Street, NW., 6th floor, Washington, DC 20036 (phone: 202-293-8020). Purchase information is available through the ANSI Web site at <http://webstore.ansi.org/ansidocstore/>.

for liquid systems or a low point drain for gas systems may be necessary to ensure operability of the instrument. This problem is typically caused by inadequate design or installation and can result in false indication or improper instrument operation, which can hinder a safe response to changing plant conditions. Since sensing line sloping problems often are caused by improper design or installation, the most effective way to avoid them is by implementing a robust design control process and by ensuring proper installation oversight at both initial construction and during the implementation of design changes.

While Appendix A of 10 CFR 50 only applies to power reactor licensees, other licensees (e.g., non-power reactors) use similar instrumentation to that described in the above inspection findings for important safety functions. Operability or functionality of these instruments could also be affected by the issues described in those findings.

CONTACT

This IN requires no specific action or written response. Please direct any questions about this matter to the technical contacts listed below or the appropriate NRC project manager.

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Note: NRC generic communications may be found on the NRC public Web site, <http://www.nrc.gov>, under NRC Library.

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