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

February 26, 1996

NRC INFORMATION NOTICE 96-13: POTENTIAL CONTAINMENT LEAK PATHS THROUGH HYDROGEN ANALYZERS

Addressees

All holders of operating licenses or construction permits for nuclear power reactors.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to potential containment leak paths through hydrogen analyzers. It is expected 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 information notice are not NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances

On September 13, 1995, the licensee for Catawba Nuclear Station determined that leakage from an internal component in a Unit 1 hydrogen analyzer panel exceeded the containment bypass leakage limits specified in the technical specifications (TS). Testing, performed in response to several other containment integrity concerns with the hydrogen analyzer systems, showed that the source of the bypass leakage was a defective pump shaft seal on a sample pump located inside the hydrogen analyzer cabinet in the auxiliary building.

Two redundant hydrogen analyzer systems are installed at each unit at Catawba to provide continuous indication of hydrogen concentration inside the containment after a design-basis accident. The analyzer panels are Teledyne Analytical Instruments and are located in the auxiliary building adjacent to the containment. Each hydrogen analyzer system is connected to the containment atmosphere with inlet instrument tubing that draws the sample stream to the analyzer panel and with outlet tubing through which the sample stream is returned to the containment atmosphere. The inlet and outlet tubing is isolated at the containment boundary by two containment isolation valves in series on each line that do not receive an automatic containment isolation signal. The internal components of the analyzer panel also consist of isolation valves, a small positive displacement pump, and an analysis volume. In standby conditions, containment isolation valves located on the inlet and outlet lines are normally closed and the hydrogen analyzer is deenergized with the internal isolation valves closed and the sample pump off. After an accident, emergency procedures direct the inlet and outlet isolation valves to be opened and the hydrogen analyzer panel to be energized to begin sampling

the containment atmosphere. When the hydrogen analyzer panel is energized, the internal isolation valves open and the sample pump starts.

The licensee did not recognize during the development of the local leak rate test and post-maintenance test procedures for the hydrogen analyzer penetrations that the hydrogen analyzer panel was required to be energized and its sample pump disabled to fully test the system as a containment boundary. Failure to energize the panel during leak rate testing results in an incomplete containment boundary configuration and can allow an undetected potential containment bypass path to exist. The licensee analysis of the potential dose consequences of the hydrogen analyzer containment bypass as-found leakage showed that the calculated control room operator exposure from a design basis accident would not exceed the criteria of General Design Criterion 19 of Appendix A to Part 50 of Title 10 of the Code of Federal Regulations (10 CFR) and calculated offsite exposures from a design basis accident would not exceed the exposure guidelines of 10 CFR Part 100.

The licensee also identified a containment integrity concern associated with the periodic calibration testing of the hydrogen analyzers. The licensee recognized that calibration testing allows a vent path from the containment into the analyzer that was not Type C tested and would not automatically isolate during a design-basis accident.

On November 9, 1994, the licensee for Braidwood Station, Unit 2, completed a containment integrated leak rate test. For this test, the 1/4-inch nominal containment penetration hydrogen sensing lines for both trains were disconnected outboard of the closed containment isolation valves, and a balloon was placed on the end of each line to identify any leakage. The procedure did not specify whether to disconnect the sensing line inside the hydrogen monitor cabinet or outside. The operators who lined up the test disconnected the lines inside the cabinet. The licensee's investigation concluded that when other operators restored the system after the test, they observed the exterior sensing lines and assumed that the lines had been reconnected. Therefore, the sensing lines remained disconnected inside the cabinet. On January 31, 1995, the operations department wrote a problem identification report to identify a growing difference in the hydrogen readings on the A and B trains that are taken every shift. On February 15, 1995, during troubleshooting, the A train lines were found to be disconnected, approximately 3 months after they were disconnected.

The hydrogen monitors at Braidwood are normally isolated. However, during a loss-of-coolant accident, the emergency operating procedures direct the operators to put them in service to monitor containment hydrogen concentration. This would create an unfiltered release path from the containment to the auxiliary building. The licensee calculated that regulatory limits would be exceeded within 3 hours if both monitors were disconnected and within 5 hours if only one monitor were disconnected. Area radiation monitors near the hydrogen monitors and radiation monitors in the auxiliary building exhaust would assist the operators in identifying the leak.

Discussion

Because containment penetrations, systems, and equipment that will be exposed to the containment atmosphere must be leak rate tested to ensure that containment integrity is maintained after a design-basis accident, the procedures for these tests must adequately consider the penetration configuration. Additionally, because hydrogen monitor containment isolation valves are normally procedurally opened after a design-basis accident, any leakage in the hydrogen monitor system may bypass the containment and can challenge regulatory radiological exposure guidelines.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation project manager.

Dennis M. Crutchfield

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Attachment: List of Recently Issued NRC Information Notices

Attachment filed in Jacket

LIST OF RECENTLY ISSUED NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
96-12	Control Rod Insertion Problems	02/15/96	All holders of OLs or CPs for nuclear power reactors
96-11	Ingress of Demineralizer Resins Increases Potential Stress Corrosion Cracking of Control Rod Drive Mechanism Penetrations	02/14/96	All holders of OLs or CPs for pressurized water nuclear power reactors
96-10	Potential Blockage by Debris of Safety System Piping Which is Not Used During Normal Operation or Tested During Surveillances	02/13/96	All holders of OLs or CPs for nuclear power reactors
96-09	Damage in Foreign Steam Generator Internals	02/12/96	All holders of OLs or CPs for pressurized water reactors
96-08	Thermally Induced Pressure Locking of a High Pressure Coolant Injection Gate Valve	02/05/96	All holders of OLs or CPs for nuclear power reactors
96-07	Slow Five Percent Scram Insertion Times Caused By Viton Diaphragms in Scram Solenoid Pilot Valves	01/26/96	All holders of OLs or CPs for boiling water reactors
96-06	Design and Testing Deficiencies of Tornado Dampers at Nuclear Power Plants	01/25/96	All holders of OLs or CPs for nuclear power reactors
96-05	Partial Bypass of Shutdown Cooling Flow from the Reactor Vessel	01/18/96	All holders of OLs or CPs for boiling water reactors

OL = Operating License
CP = Construction Permit

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Tech Editor Reviewed 12/11/95 * see previous concurrence

OFFICE	C/SCSB:DSSA	C/PECB:DRPM	D/DRPM
NAME	CBerlinger *	AChaffee *	DCrutchfield
DATE	12/21/95	1/25/96	2/26/96

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Discussion

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