

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555

April 20, 1987

NRC INFORMATION NOTICE NO. 87-20: HYDROGEN LEAK IN AUXILIARY BUILDING

Addressees:

All nuclear power reactor facilities holding an operating license or a construction permit.

Purpose:

This notice is to alert addressees of the potential for a hydrogen leak in portions of the plant where the potential for the leak may not have been adequately considered. Recipients are expected to review the information for applicability to their facilities and consider actions, if appropriate, to preclude similar problems occurring at their facilities. However, suggestions contained in this information notice do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

On February 20, 1987, the Vogtle nuclear power plant reported a hydrogen leak inside the auxiliary building. This plant was recently licensed, had never been critical, and was in cold shutdown at the time of the event.

The discovery of this problem was as a result of an unassociated event involving the activation of a chlorine monitor in the control building. When additional samples indicated no chlorine gas, the shift supervisor ordered further investigation into other plant areas. Because there was no installed detection equipment, portable survey instruments were used to determine gaseous mixtures. Hydrogen was detected in the auxiliary building and indicated about 20 to 30 percent of the lower flammability limit (LFL) for hydrogen. A level of about 30 percent of LFL corresponds to about 1.2 percent hydrogen by volume. This reading was erroneously reported to the control room as 20 to 30 percent hydrogen by volume. The on-shift supervisor declared an unusual event (UE) with a subsequent report to the NRC via the emergency notification system (ENS).

When hydrogen was discovered in the auxiliary building, the licensee isolated the cryogenic hydrogen skid outside the turbine building and soon located the source of the leak as packing on a globe valve in a small line to the volume control tank (VCT). The licensee opened doors that quickly caused the hydrogen to dissipate. The globe valve was of a conventional design and had no special packing. The globe valve was located in a vertical pipe chase where little

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ventilation was present because of ongoing HVAC testing. Besides being used as a cover gas in the VCT, hydrogen from the skid also is used in the plants waste gas system and to cool the generator.

Discussion:

The lessons of this event fall into five categories: (1) proper in-plant communications during events, (2) proper valve application for use with hydrogen, (3) excess flow check valve set point, (4) heating ventilation and air conditioning (HVAC) maintenance and flow testing, and (5) hydrogen line routing.

The licensee is examining ways to improve communications in the plant during events and the training of personnel in reading portable instruments.

As another corrective measure, the licensee is examining the use of other types of valves, such as valves with a diaphragm or bellows rather than conventional stem packing, in lines containing hydrogen.

The licensee also is examining the set point for the excess flow check valves in the hydrogen lines. These check valves are designed to limit the flow of hydrogen in the event of a large leak so that when combined with proper ventilation in rooms with hydrogen lines, hydrogen levels would remain within specified limits throughout the plant.

This plant had HVAC flow balancing problems during the preparation for plant startup. Generally HVAC flow balance is based on the heat loads and the resultant room temperatures under normal and accident conditions. However, this event demonstrates that hydrogen concentrations also may need to be considered to set a lower limit on the ventilation in rooms that contain hydrogen lines.

Although this licensee has reexamined the routing of hydrogen lines throughout the auxiliary building and found no problems, licensees with older plants may not have examined this question in detail.

The NRC staff is currently reviewing an EPRI/BWROG topical report titled "Guidelines for Permanent BWR Hydrogen Water Chemistry Installation," 1987 revision. Included in this document are guidelines for design, operation, maintenance, surveillance, and testing of hydrogen supply systems.

Other Recent Reactor Events Involving Hydrogen

On March 3, 1987 an unusual event was reported at Waterford Unit 3 plant. While unloading hydrogen from a truck into the storage tank, the storage tank rupture disc failed and a deflagration and fire ensued. The fire burned itself out in about an hour with no apparent damage to the storage facility.

On January 12, 1987, an explosive mixture of hydrogen and oxygen was discovered in the number 1 holdup tank of the gaseous radwaste system at Zion Unit 1. Prompt action was taken to isolate the tank and dilute the gaseous content with a nitrogen purge to reduce the hydrogen concentration below explosive limits. Investigation showed that the holdup tank was placed in service on January 6, 1987. However, the tank was left isolated from the automatic waste gas analyzer until January 12, 1987. This violated the technical specifications requiring daily analysis of the waste gas system for oxygen and hydrogen.

A report that may be useful in considering hazards and some methods for improving the safe handling of pressurized gas is NUREG/CR-3551, ORNL/NOAC-214 "Safety Implications Associated with In-Plant Pressurized Gas Storage and Distribution Systems in Nuclear Power Plants," published in May 1985.

No specific action or written response is required by this information notice. If you have questions about this matter, please contact the Regional Administrator of the appropriate NRC regional office or this office.

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Attachment: List of Recently Issued IE Information Notices

LIST OF RECENTLY ISSUED
IE INFORMATION NOTICES 1987

| Information Notice No. | Subject | Date of Issuance | Issued to |
|------------------------|--|------------------|---|
| 85-81 Sup. 1 | Misadministrations to Patients Undergoing Thyroid Scans | 4/15/87 | All licensees authorized to use byproduct material |
| 87-19 | Perforation and Cracking of Rod Cluster Control Assemblies | 4/9/87 | All Westinghouse power PWR facilities holding an OL or CP |
| 87-18 | Unauthorized Service on Teletherapy Units by Non-Licensed Maintenance Personnel | 4/8/87 | All NPC licensees authorized to use radioactive material in teletherapy units |
| 87-17 | Response Time of Screen Instrument Volume Level Detectors | 4/7/87 | All GE RWR facilities holding an OL or CP |
| 87-16 | Degradation of Static "O" Ring Pressure Switches | 4/2/87 | All LWR facilities holding an OL or CP |
| 87-15 | Compliance with the Posting Requirements of Subsection 223b of the Atomic Energy Act of 1954, as Amended | 3/25/87 | All power reactor facilities holding a CP and all firms supplying components or services to such facilities |
| 87-14 | Actuation of Fire Suppression System Causing Inoperability of Safety-Related Ventilation Equipment | 3/23/87 | All power reactor facilities holding an OL or CP |
| 86-106 Sup. 2 | Feedwater Line Break | 3/18/87 | All power reactor facilities holding an OL or CP |
| 87-13 | Potential for High Radiation Fields Following Loss of Water from Fuel Pool | 2/24/87 | All power reactor facilities holding an OL or CP except Fort St. Vrain |

OL = Operating License
CP = Construction Permit

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