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UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

September 3, 1981

IE INFORMATION NOTICE NO. 81-27: FLAMMABLE GAS MIXTURES IN THE WASTE GAS DECAY TANKS IN PWR PLANTS

Description of Circumstances:

In July 1981, hydrogen ignition occurred in one gaseous waste decay tank at San Onofre Unit 1 while the plant was in cold shutdown. This resulted in a release of about 8.8 curies of noble gases and minor tank damage. The cause of the hydrogen ignition was air contamination of the inert nitrogen system which is used to control the hydrogen-oxygen concentrations in the tank.

The source of air was identified as instrument air leaking through check valves at the cross connections between instrument air and nitrogen lines. Under normal operating conditions, the pressure in the instrument air system is higher than that of the nitrogen system. These cross connections had been installed in response to TMI Action Plan requirement item II.E.1.2 of NUREG-0737. The nitrogen system provided a backup gas supply to the air-operated steam supply valve for the steam-driven auxiliary feedwater pump. This backup was installed to provide a "safety grade" auxiliary feedwater system that satisfies the single-failure criteria. Other cross connections, which apparently did not leak air into the nitrogen system, had been previously installed in response to TMI Action Plan requirement II.G.1 of NUREG-0737 to provide a redundant gas supply to the air-operated pressurizer relief valves and the associated block valves.

Following the occurrence, the licensee sampled all potentially affected tanks and determined that most of the tanks had oxygen levels above 10 to 15 percent. Generally, the gas in pressurized water reactor (PWR) waste gas systems is hydrogen rich and the oxygen concentration is controlled to prevent flammable gas mixtures. Flammable concentration of gas mixtures can be prevented by limiting either the hydrogen or the oxygen concentration to less than 3 percent.

To eliminate the possibility of recurrence, the licensee has now completely separated those portions of the nitrogen system that are a backup supply to the air system from the balance of the nitrogen system that supplies cover gas. Bottles of compressed nitrogen are now used to provide the backup to the air system.

We are aware of another instance of flammable mixtures in waste gas tanks. In August 1980, Arkansas Power and Light Company (AP&L) discovered flammable concentrations of hydrogen and oxygen in the waste gas decay tanks at Arkansas Nuclear One, Unit 1. The flammable gas mixtures were created after the primary coolant picked up oxygen from the air during refueling and maintenance. No ignition or explosion was reported

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It appears that licensees need to devote more attention to the potential effects of nitrogen-air system cross connections when systems are modified to use nitrogen as a backup to air systems. If cross connections exist, the potential for the formation of flammable gas mixtures should be evaluated. A sampling program to assure that flammable gas mixtures do not exist in tanks should be considered.

No written response to this information notice is required. If you need additional information with regard to this subject, please contact the Director of the appropriate NRC Regional Office.

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