

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

July 13, 2001

NRC INFORMATION NOTICE 2001-12: HYDROGEN FIRE AT NUCLEAR POWER STATION

Addressees

All holders of operating licenses or construction permits for nuclear power reactors except those who have ceased operations and have certified that fuel has been permanently removed from the reactor vessel.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice (IN) to alert addressees to potential hazards associated with hydrogen storage facilities. This information notice discusses a hydrogen fire event which occurred at the James A. FitzPatrick (JAF) plant. It is expected that recipients will review the information for applicability to their facilities and consider appropriate actions 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

In January of 1999, at the JAF plant, a fire occurred in the station's hydrogen storage facility while the plant was operating at 100% power. The fire was reported to the control room by a nonlicensed operator who saw the fire start after he had aligned valves at the hydrogen storage facility in preparation for putting the hydrogen injection system into service. The operator escaped injury because he was wearing fire retardant protective clothing and was able to quickly scale a 7 foot high fence enclosing the hydrogen area. The plant's fire brigade was dispatched and offsite fire fighting assistance was requested. Upon reaching the scene, the plant's fire brigade personnel reported seeing a large volume hydrogen-fueled fire in the vicinity of the hydrogen tube trailer unit. The heat of the fire potentially endangered the nearby hydrogen storage tanks. The plant fire brigade with offsite fire fighting support fought the fire until the hydrogen supply was exhausted and the fire was declared out approximately six hours later. During this period, the 115KV overhead reserve power lines were deenergized to protect fire fighting personnel. This action required entering the corresponding Technical Specification limiting condition for operation for loss of offsite power.

The licensee identified the root cause as organizational and programmatic deficiencies that resulted in multiple component failures. The hydrogen control panel and associated equipment are vendor supplied and maintained. The licensee determined that the vendor maintenance program and JAF oversight of that program were inadequate. In addition, JAF had identified recurring problems with the system that had not been effectively resolved.

ML010310258

Discussion

The NRC performed a special inspection at JAF from January 25 to January 29, 1999, and in the NRC Region I office from February 1 to February 5, 1999. The results of the NRC special inspection (Report No. 50-333/99-02, Accession No. 9904010078, dated March 26, 1999) determined that the licensee's overall response to the event was acceptable. The licensee and offsite support took appropriate actions to control the fire until the hydrogen burned out. The special investigation also determined that the licensee's subsequent event investigation was systematic and comprehensive.

The licensee identified the lack of effective maintenance as a root cause of the hydrogen fire event at JAF. Three valves failed, starting the fire. According to the root cause evaluation, all of the failures were due to an inadequate preventive maintenance program by the hydrogen system vendor and inadequate system monitoring and management oversight by JAF.

Conclusion

Hydrogen is highly flammable and poses a risk to plant personnel and equipment. As demonstrated by the JAF fire, lack of adequate maintenance, system monitoring and oversight of maintenance of these facilities can contribute to the ignition of a fire that is difficult to extinguish and poses an extreme danger to fire fighting personnel. Properly maintaining, monitoring and overseeing of hydrogen storage facility equipment can minimize the risk of fire or explosion.

Related Generic Communications

- Generic Letter 93-06, "Research Results on Generic Safety Issue 106, 'Piping and the Use of Highly Combustible Gases in Vital Areas,'" October 25, 1993.
- IN 87-20, "Hydrogen Leak in Auxiliary Building," April 20, 1987.
- IN 88-44, "Hydrogen Storage on the Roof of the Control Room," April 27, 1989.
- IN 91-27, "Compressed Gas Cylinder Missile Hazard," June 10, 1991.

This 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 (NRR) project manager.

/RA/

Ledyard B. Marsh, Chief
Events Assessment, Generic Communications
and Non-Power Reactors Branch
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Technical contacts: D. M. Frumkin, NRR
301-415-2280
E-mail: dmf@nrc.gov

M. H. Salley, NRR
301-415-2840
E-mail: mhs@nrc.gov

Attachment: List of Recently Issued NRC Information Notices

Discussion

The NRC performed a special inspection at JAF from January 25 to January 29, 1999, and in the NRC Region I office from February 1 to February 5, 1999. The results of the NRC special inspection (Report No. 50-333/99-02, Accession No. 9904010078, dated March 26, 1999) determined that the licensee's overall response to the event was acceptable. The licensee and offsite support took appropriate actions to control the fire until the hydrogen burned out. The special investigation also determined that the licensee's subsequent event investigation was systematic and comprehensive.

The licensee identified the lack of effective maintenance as a root cause of the hydrogen fire event at JAF. Three valves failed, starting the fire. According to the root cause evaluation, all of the failures were due to an inadequate preventive maintenance program by the hydrogen system vendor and inadequate system monitoring and management oversight by JAF.

Conclusion

Hydrogen is highly flammable and poses a risk to plant personnel and equipment. As demonstrated by the JAF fire, lack of adequate maintenance, system monitoring and oversight of maintenance of these facilities can contribute to the ignition of a fire that is difficult to extinguish and poses an extreme danger to fire fighting personnel. Properly maintaining, monitoring and overseeing of hydrogen storage facility equipment can minimize the risk of fire or explosion.

Related Generic Communications

- Generic Letter 93-06, "Research Results on Generic Safety Issue 106, 'Piping and the Use of Highly Combustible Gases in Vital Areas,'" October 25, 1993.
- IN 87-20, "Hydrogen Leak in Auxiliary Building," April 20, 1987.
- IN 88-44, "Hydrogen Storage on the Roof of the Control Room," April 27, 1989.
- IN 91-27, "Compressed Gas Cylinder Missile Hazard," June 10, 1991.

This 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 (NRR) project manager.

/RA/

Ledyard B. Marsh, Chief
Events Assessment, Generic Communications
and Non-Power Reactors Branch
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Technical contacts: D. M. Frumkin, NRR
301-415-2280
E-mail: dmf@nrc.gov

M. H. Salley, NRR
301-415-2840
E-mail: mhs@nrc.gov

Attachment: List of Recently Issued NRC Information Notices

Distribution: IN File PUBLIC

ADAMS ACCESSION NUMBER: ML010310258

Template #: NRR = 052

OFFICE	REXB	TECH ED	C:IQMB	SPLB	D:DSSA	REXB	C:REXB
NAME	CPetrone*	PKleene*	TQuay*	JHannon*	GHolahan*	JTappert*	LMarsh
DATE	02/05/2001	01/25/2001	02/05/2001	02/07/2001	6/26/2001	07/06/2001	07/14/2001

OFFICIAL RECORD COPY

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
2001-11	Thefts of Portable Gauges	07/13/01	All portable gauge licensees
2001-10	Failure of Central Sprinkler Company Model GB Series Fire Sprinkler Heads	06/28/01	All holders of licenses for nuclear power, research, and test reactors and fuel cycle facilities
2001-09	Main Feedwater System Degradation in Safety-Related ASME Code Class 2 Piping Inside the Containment of a Pressurized Water Reactor	06/12/01	All holders of operating licenses for pressurized water nuclear power reactors, except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel
2001-08 Supplement 1	Update on the Investigation of Patient Deaths in Panama, Following Radiation Therapy Overexposures	06/06/01	All Medical Licensees
2001-08	Treatment Planning System Errors Result in Deaths of Overseas Radiation Therapy Patients	06/01/01	All medical licensees
2001-07	Unescorted Access Granted Based on Incomplete and/or Inaccurate Information	05/11/01	All holders of nuclear reactor operating licenses who are subject to Section 73.56 of Title 10, of the Code of Federal Regulations (10 CFR 73.56), "Personnel Access Authorization Requirements of Nuclear Power Plants."
2001-06	Centrifugal Charging Pump Thrust Bearing Damage not Detected Due to Inadequate Assessment of Oil Analysis Results and Selection of Pump Surveillance Points	05/11/01	All holders of operating licenses for nuclear power reactors, except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel