UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555-0001

January 26, 1996

NRC INFORMATION NOTICE 96-07: SLOW FIVE PERCENT SCRAM INSERTION TIMES CAUSED BY VITON DIAPHRAGMS IN SCRAM SOLENOID PILOT VALVES

Addressees

All holders of operating licenses or construction permits for boiling water reactors (BWRs).

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to slow five percent scram insertion times associated with fluoroelastomeric (Viton) diaphragms used in scram solenoid pilot valves. 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 December 8, 1995, after a scram due to feedwater oscillations at Vermont Yankee, a licensee review of scram time data for 77 control rods revealed that the core-wide average to notch 46 (5 percent insertion) was trending slower (in the 30-40 msec range) than the previous test results taken at the beginning of the fuel cycle in April 1995. The technical specification limits were not exceeded.

On January 20, 1996, during scram time testing of a 10 percent sample of control rods at Brunswick Unit 1, 12 of the 14 rods in the sample exceeded the technical specification core-wide average limit (0.358 sec) for insertion to notch 46 by about 0.043 seconds. Previous scram time data showing a core-wide average of about 0.304 seconds had been recorded during a scram on September 30, 1995. On January 21, 1996, 6 rods were fully inserted into the core (4 of the 12 slow rods and 2 rods that were not slow). Special diagnostic test equipment was used to test the scram solenoid pilot valves (SSPVs) from one of the slow rods and one of the satisfactory rods. The slow SSPV was found to take longer (in the range of 55-120 msec) than normal to exhaust air when the solenoids were deenergized. On January 22, 1996, 14 more rods were tested and were also found to be trending slower than their previous scram times. The licensee decided to shut down the unit after finding the

first 5 rods in the second group with increased scram times. On January 23, 1996, the reactor was manually scrammed from 28 percent power. Data taken from 79 additional control rods during the scram showed that the core-wide average 5 percent insertion time was about 0.380 seconds, which exceeded the technical specification limit for insertion to notch 46.

Discussion

Investigation by General Electric (GE), Automatic Switch Company (ASCO - the SSPV manufacturer), and the licensee for Vermont Yankee determined that the slow times resulted from adherence of the Viton diaphragm to the brass valve seat. The Viton diaphragms were installed as a design change in the SSPVs (GE Part Number 107E6022P001) supplied by ASCO in response to problems with Buna-N rubber diaphragms becoming brittle and cracking, which was seen at some BWRs in the early 1990's. Most of the American BWR-2, BWR-3, BWR-4, and some BWR-5 plants have replaced the Buna-N diaphragms with Viton in the past year or so. Some BWR-5 and all BWR-6 plants use a different model (T-type) of scram solenoid pilot valve that appear not to be susceptible to this problem.

Several BWR plants have noted the trend toward slower scram insertion times to notch 46, but except for the Brunswick event discussed above, these slower times were 20 to 30 milliseconds after about 6 months in service. The Brunswick event is the first case where a plant actually exceeded the technical specification core-wide average limit for 5 percent insertion. This deterioration occurred between two successive surveillances even though the licensee performed surveillance testing at the 120 day interval required by their technical specifications.

The staff is continuing to follow this issue and will consider whether further generic communications are warranted.

Related Generic Communications

NRC Information Notice 94-71, "Degradation of Scram Solenoid Pilot Valve Pressure and Exhaust Diaphragms," was issued on October 4, 1994, to alert licensees to embrittlement and cracking of Buna-N diaphragms used in SSPVs.

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 (NRR) project manager.

for Brian Grimes

Dennis M. Crutchfield, Director
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Office of Nuclear Reactor Regulation

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Attachment filed in Jacket

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Original signed by Brian K. Grimes

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OFC	PECB:DRPM*	R-II:DRS*	C/SRXB:DSSA*	C/PECB:DRPM*
NAME	D. Skeen	H. Christensen	R. Jones	A. Chaffee
DATE	01/25/96	01/25/96	01/26/96	01/26/96

OFC	D/DRPM
NAME	D. Crutchfield
DATE	01/ 26/96

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LIST OF RECENTLY ISSUED NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
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
96-04	Incident Reporting Requirements for Radiography Licensees	01/10/96	All radiography licensees and manufacturers of radiography equipment
96-03	Main Steam Safety Valve Setpoint Variation as a Result of Thermal Effects	01/05/96	All holders of OLs or CPs for nuclear power reactors
96-02	Inoperability of Power-Operated Relief Valves Masked by Downstream Indications During Testing	01/05/96	All holders of OLs or CPs for PWRs
96-01	Potential for High Post-Accident Closed-Cycle Cooling Water Temperatures to Disable Equipment Important to Safety	01/03/96	All holders of OLs or CPs for PWRs
95-58	10 CFR 34.20; Final Effective Date	12/18/95	Industrial Radiography Licensees

OL = Operating License
CP = Construction Permit