Nebraska Public Power District

COOPER NUCLEAR STATION
P.O. BOX 98, BROWNVILLE, NEBRASKA 68321
TELEPHONE (402) 825-3811

CNSS933093

April 28, 1993

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Dear Sir:

Cooper Nuclear Station Licensee Event Report 93-009, Revision 0, is forwarded as an attachment to this letter.

Sincerely,

R. L. Gardner
Plant Manager

RLG/ju

Attachment

cc: J. L. Milhoan
G. R. Horn
J. M. Meacham
R. E. Wilbur
V. L. Wolstenholm
D. A. Whitman
INPO Records Center
NRC Resident Inspector
R. J. Singer
CNS Training
CNS Quality Assurance

IE22
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NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/88

LICENSEE EVENT REPORT (LER)

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TITLE (4)
Potential Inoperability Of Solenoid Operated Valves Due To Overpressurization Discovered During Design Review

EVENT DATE (5)			LER NUMBER (6)					REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR		SEQUENTIAL NUMBER		REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
0 3	2 9	9 3	9 3	—	0 0 9	—	0 0	0 4	2 8	9 3		0 5 0 0 0
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OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
N		20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10)		20.405(a)(1)(i)	50.36(c)(1)	X 50.73(a)(2)(v)	73.71(c)
0 1 0 0		20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
		20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
		20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
John R. Myers	AREA CODE 4 0 2 8 2 5 - 3 8 1 1

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)	X NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On March 29, 1993, the potential for Solenoid Operated Valves (SOVs) installed in safety-related applications to be overpressurized and thereby unable to perform their safety function was identified during an evaluation being performed for Generic Letter (GL) 91-15 (NUREG 1275, Volume 6, "Operating Experience Feedback Report - Solenoid Operated Valve Problems"). The following systems and components are affected: Reactor Building emergency exhaust damper, the Standby Gas Treatment (SGT) system fan inlet vortex damper control, reactor coolant sample line primary containment isolation valves, and the solenoid pilot valves for the inboard Main Steam Isolation Valves (MSIVs). At the time of discovery, the plant was shutdown for the 1993 Refueling Outage, with the Reactor defueled and secondary containment relaxed.

The cause of this condition was the failure to anticipate that pressure regulators could fail open resulting in overpressurization of the solenoid valves, impacting equipment operability. A previous review of SOVs, conducted in response to Information Notice 88-24, did not investigate the use of nitrogen to the SOVs. Additionally, those SOVs identified as EPs (electric to pneumatic components) were thought to be control components rather than SOVs. Replacement of the SOVs affecting SGT and Reactor building ventilation with components qualified for a higher pressure was completed before Secondary Containment was required. Similar modifications will be made for the remaining equipment prior to the systems being required to be operable. The SOV evaluation being performed per GL 91-15 (NUREG 1275) will ensure that all SOVs subject to this failure mode in safety related applications are identified. This evaluation will be completed prior to startup from the Refueling Outage.

A. Event Description

On March 29, 1993, the potential for Solenoid Operated Valves (SOVs) installed in safety-related applications to be overpressurized and thereby unable to perform their safety function was identified during an evaluation being performed for Generic Letter 91-15 (NUREG 1275, Volume 6, "Operating Experience Feedback Report - Solenoid Operated Valve Problems").

The pneumatic supply systems to these SOVs contain non-safety related Pressure Regulating Valves (PRVs) and/or Relief Valves (RVs) to maintain the operating pressure below the SOVs' Maximum Operating Pressure Differential (MOPD). MOPD is defined as the maximum difference in pressure of any two ports that will allow the SOV to operate (change states). Failure of the PRVs and RVs (such as a PRV failing full open due to a ruptured diaphragm) could allow the inlet pressure of the SOV to increase to the pressure upstream of the PRV. Since the supply pressure to the PRVs is in excess of the MOPD for these SOVs, the high pressure could prevent the SOVs from performing their safety function.

The SOVs in question were manufactured by Honeywell and Automatic Switch Company (ASCO), and are installed in the following safety-related applications:

HV-EP-(AD-R-1C) (Honeywell model RP403E1006) controls the position of the Reactor Building Emergency Exhaust Damper, AD-R-1C. This damper opens to vent the Reactor Building through the Standby Gas Treatment (SGT) System. When the SOV is energized, instrument air is supplied to the damper operator, and the damper is held closed. When the SOV is de-energized, the air pressure is vented, and the damper goes to its fail safe position (open). The SOV was installed during original plant construction.

SGT-EP-543A2 and SGT-EP-543B2 (Honeywell model RP403D1058) control the SGT system fans' inlet vortex dampers. These dampers open to control flow through their respective SGT trains. When the SOV is energized, instrument air is provided as pilot air to the operator causing the damper to be held closed. When the SOV is de-energized, control of the damper is passed to a variable controller which automatically or manually controls the SGT flow rate. The vortex dampers fail safe (open) on complete loss of air. The SOVs were installed during original plant construction.

RR-SOV-SPV740 and RR-SOV-SPV741 (ASCO model NP832094E) control the position of the primary containment isolation valves for the reactor coolant sample line. When the SOV is energized, pressurized nitrogen gas is provided to the valve operator to hold the valve open. When the SOV is de-energized, the operator is vented, and the valve goes to its fail safe position (closed). The pneumatic supply to the existing SOVs was changed from instrument air to nitrogen via a design change in 1987.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

E. Safety Significance - (Continued)

Solenoid pilot valves for inboard MSIVs: If the non-essential PRV and RVs regulating the supply nitrogen to the inboard MSIV actuators had failed open during a postulated accident, the SOVs serving as solenoid pilot valves would have been overpressurized and may not have been able to change states. Therefore, the inboard MSIVs would have been unable to close and perform their isolation function if they were in an open position before SOV failure. The consequences of this failure would not be significant by itself since the outboard MSIVs (operating on instrument air and utilizing different SOVs) would still function and isolate primary containment.

F. Safety Implications

The safety implications of this event are fully described in the section above.

G. Corrective Action

Replacement of HV-EP-(AD-R-1C) and SGT-EP-543A2/B2 with higher pressure rated SOVs was completed before Secondary Containment was required. Modifications to the nitrogen supply system which will resolve the concerns for RR-SOV-SPV740/741 and the solenoid pilot valves for the inboard MSIVs will be completed before these valves are required to be operable.

The SOV evaluation being performed per GL 91-15 (NUREG 1275) will be completed prior to startup from the Refueling Outage to ensure that all SOVs subject to this failure mode in safety related applications are identified. This evaluation is nearly complete and no additional SOV problems are expected.

H. Similar Events

LER 89-22, "Identification of a Condition Which Could Have Rendered Both Trains of Standby Gas Treatment Inoperable," discusses a deficient condition related to the installation of solenoid valves in the SGT system.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

E. Safety Significance - (Continued)

HV-EP-(AD-R-1C): If the non-essential PRV upstream of HV-EP-(AD-R-1C) was to have failed open during a postulated accident, the SOV would have been overpressurized and may not have been able to change states. Therefore, if damper PC-AD-(AD-R-1C) was not already in an open position, the normal Reactor Building to SGT exhaust path would have been isolated, thus the SGT system would have been prevented from performing its safety function. It is more likely, however, that the high pressure resulting from the PRV failure would have resulted in the rupture of the operator diaphragm. Upon failure of the diaphragm, the operator's internal spring would have returned the damper to its failure position (open). Each SGT train is provided with a smaller inlet line which allows room air for long term cooling of the SGT media. This would provide some ventilation of the Reactor building, although the design negative pressure would not be developed.

SGT-EP-543A2 and SGT-EP-543B2: If the non-essential PRV upstream of SGT-EP-543A2 or SGT-EP-543B2 had failed full open during a postulated accident, the SOV would have been overpressurized and may not have been able to change states. Therefore, if the affected SGT train was not already in operation, the inlet vortex damper to that train's fan would be unable to open from its normally closed position, and that train would be unable to perform the SGT safety function. (A single PRV failure would only affect one SGT train). More likely, however, the high pressure resulting from the PRV failure would have resulted in the rupture of the operator diaphragm. Upon failure of the diaphragm, the operator's internal spring would have returned the damper to its fail position (full open).

RR-SOV-SPV740 and RR-SOV-SPV741: If the non-essential PRV upstream of RR-SOV-SPV740 and RR-SOV-SPV741 had failed open during a postulated accident, the SOV would have been overpressurized and may not have been able to change states. Therefore, since the primary containment isolation valves RR-AOV-740AV and RR-AOV-741AV are normally open, the valves would have been unable to close and isolate the Reactor Recirculation sampling line and primary containment. However, since the sample line that is to be isolated is only 3/4" diameter, potential leakage due to the isolation failure is not considered substantial.

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TEXT *(If more space is required, use additional NRC Form 366A's)* (17)

A. Event Description - (Continued)

Solenoid pilot valves for the inboard Main Steam Isolation Valves (MSIVs) MS-AO-A080A/B/C/D (ASCO model NP8323A36V and NP8320A185V) control the position of the MSIVs. When either of the model NP8323A36V dual solenoids and the single solenoid of the model NP8320A185V are energized, the SOV provides pressurized nitrogen gas to cause the MSIV to open. When both of the model NP8323A36V dual solenoids or the single solenoid of the model NP8320A185V are de-energized, the SOV will vent, and the MSIV will close. The solenoid pilot valves were installed via a design change in 1987.

B. Plant Status

Shutdown for the 1993 refueling outage, with the Reactor defueled and secondary containment relaxed.

C. Basis for Report

A condition alone that could have prevented the fulfillment of the safety function of systems needed to mitigate the consequences of an accident, reportable in accordance with 10CFR50.73(a)(2)(v).

D. Cause

Design. The instrument air and nitrogen supply systems were designed as non-safety related. Pneumatically operated components installed in safety related applications were designed to assume a fail safe position upon loss of air. The problem of overpressurization of the instrument air or nitrogen systems was not anticipated. A failure of an air or nitrogen supply PRV was assumed to only result in a lower pressure, not a higher pressure.

A previous evaluation of the instrument air system in response to the concerns identified in Information Notice 88-24 was concluded in 1990. This evaluation concentrated on SOVs vulnerable to overpressurization due to a failure in the instrument air system; the valves using nitrogen were not considered. In addition, the SOVs for AD-R-1C and the SGT system were labeled as EPs (electric to pneumatic components), and the SOVs for the MSIV's were not individually identified since they were part of larger components. Thus these components were not included in the scope of the earlier review.

E. Safety Significance

The SOVs susceptible to this problem and the possible impact to the components and systems that could have been affected are as follows: