Nebraska Public Power District

COOPER NUCLEAR STATION
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CNSS913708

June 3, 1991

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

Dear Sir:

Cooper Nuclear Station Licensee Event Report 91-002, Revision 1, is being forwarded as an attachment to this letter.

Sincerely,

J. M. Meacham
Division Manager of
Nuclear Operations
Cooper Nuclear Station

JMM/bjs

Attachment

cc: R. D. Martin
G. R. Horn
R. E. Wilbur
V. L. Wolstenholm
D. A. Whitman
INPO Records Center
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R. J. Singer
CNS Training
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IE22

NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/88

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Cooper Nuclear Station	0 5 0 0 0 2 9 8	1 OF 0 6

TITLE (4) Reactor Water Cleanup Isolations Due To High System Temperature Caused By Inadequate Design

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 5 0 0 0
0 3	2 4	9 1	9 1	— 0 0 2	— 0 1	0 6	0 3	9 1		0 5 0 0 0

OPERATING MODE (9): N

POWER LEVEL (10): 0 0 0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

20.402(b)	20.405(c)	X 50.73(a)(2)(iv)	73.71(b)
20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)
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	
	AREA CODE	
John R. Myers	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	MANUFAC-TURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS
X	C E	T E	N 2 7 5	N					
E	C T	T S	M 2 3 5	N					

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 24, 1991, at 2:38 am and, again, at 4:15 am, Reactor Water Cleanup (RWCU) system isolations occurred due to high temperature conditions (140 degrees Fahrenheit) downstream of the Non-Regenerative Heat Exchangers (NRHX). At the time of these occurrences, the reactor was shutdown with the Residual Heat Removal (RHR) System providing shutdown cooling. The RWCU pumps were secured to facilitate feedwater system maintenance. Subsequent to these events, faulty instrumentation was repaired and further testing was planned to verify the source of the high temperature water.

On May 7, 1991, RWCU was removed from service to assist in investigating the cause of a slightly increased leakage inside the drywell. At 10:36 am, following closure of the inboard RWCU isolation valve, another RWCU system isolation from high temperature occurred, causing closure of the outboard RWCU isolation valve. During this occurrence, the Reactor was at approximately 100 percent power, 517 degrees and 998 psig.

Subsequent testing indicated the high temperature condition occurred as a result of backflow through the check valve in the 3/4 inch subcooling line installed between the NRHX outlet and the RWCU system inlet piping. The root cause of the backflow is Design (failure to anticipate all system operating modes), as the differential pressure available across the check valve when the RWCU pumps are secured is not sufficient to obtain a leaktight shutoff.

A caution tag has been placed on the RWCU pump switches requiring isolation of the subcooling line except during Reactor cooldown. The design of the subcooling line will be reviewed and the design review process enhanced to ensure evaluation of all anticipated modes of system operation.

A. Event Description

On March 24, 1991, at 2:38 am and 4:15 am, Reactor Water Cleanup (RWCU) System isolations occurred due to high temperature in the RWCU piping downstream of the Non-Regenerative Heat Exchangers (NRHX). In both instances, the system temperature indication was normal and no alarms were received prior to the isolation. The reactor had been shut down the preceding day and was in cold shutdown. The RWCU System had been secured at approximately 2:21 am (i.e., the demineralizers isolated, the crossover valve [MO74] opened, and the RWCU pumps secured) to allow isolating the Feedwater System for maintenance.

Following the first isolation, the operating staff reviewed the available indications in the Control Room and could determine no reason for the isolation. The isolation was reset and the isolation valves reopened at 3:48 am. Following the second isolation, a station operator investigated, and determined that the high temperature isolation switch (TIS-99) was tripped. Subsequent investigation by the system engineer indicated the piping in the area was hot, and the temperature switch (TIS-99) indicated approximately 137 degrees Fahrenheit. System isolation occurs at 140 degrees F.

Based on the observed temperature difference between the Control Room and local indications, the temperature sensing elements in the piping were tested. TE-97, the thermocouple which provides Control Room indication, was found to have a grounded lead. TS-115, a temperature switch which provides the high temperature alarm, was found to be worn internally and would not actuate within the required range.

Upon analyzing these events, it was recognized that backflow through the check valve in the subcooling line was a potential source of hot water which could result in actuation of the high temperature isolation switch. Thus, plans were being developed to investigate the potential for backflow through the check valve during the 1991 Refueling outage.

On May 7, 1991, with the reactor in normal operation at approximately 100 percent power, RWCU was removed from service to assist in investigating the cause of slightly increased unidentified leakage inside the drywell. At 10:36 am, following closure of the inboard RWCU isolation valve, another RWCU system isolation occurred, resulting in the closure of the outboard RWCU isolation valve. Investigation determined that the high temperature switch was tripped. On May 8, further investigation indicated that the check valve on the subcooling line allowed backflow, creating the high temperature condition at the isolation switch.

B. Plant Status

During the March 24 isolations, the reactor was in cold shutdown, at approximately 185 degrees F and vented. The RWCU System had been secured, with the containment isolation valves open. The RWCU System was aligned to drain to the condenser.

During the May 7 event, the Reactor was in operation at approximately 100 percent power, at 517 degrees and 997 psig. The RWCU pumps were secured and the inboard RWCU isolation valve was closed.

C. Basis for Report

Closure of the RWCU inlet isolation valves (ESF components) due to high NRHX outlet temperature, a non-ESF trip function. These events are being reported in accordance with criteria prescribed by 10CFR50.73(a)(2)(iv).

D. Cause

Design - failure to anticipate all system operating modes.

The high temperature condition in the piping downstream of the RWCU NRHX resulted from backflow through the check valve (CV-17) in the RWCU subcooling line installed between the NRHX outlet and the RWCU system inlet piping (see attached sketch). The subcooling line, installed during the 1990 Refueling Outage, is designed to prevent flashing at the RWCU pump suction by providing cooled water from the outlet of the NRHX. The check valve is a metal seat piston type lift check valve, which requires a differential pressure of 500 psi to obtain a leaktight shutoff. The differential pressure available when the RWCU pumps are secured is small, allowing backflow sufficient to cause the observed events. Operation of the system in this mode was not considered during the design process, and thus a check valve was not selected which would provide tight shutoff at low differential pressures.

The isolations were not preceded by indications of high temperature. The physical arrangement of the subcooling line and the temperature sensing elements is such that backflow through the check valve contacts the isolation switch prior to reaching the indication devices. Although the alarm switch and temperature element were found to be defective following the March 24 events, the only influence they had was to make diagnosis of the events more difficult. The failure of these components is due to lack of preventive maintenance and random component failure, respectively.

E. Safety Significance

No significant effect. The RWCU high temperature isolation is a non-safety related signal which serves to protect the RWCU demineralizer resin from the effects of high temperature. Although the temperature indication and alarm did not function as designed during the March isolations, the isolation function of the RWCU System performed correctly upon the high temperature condition, and the isolation valves closed as designed.

F. Safety Implications

The effect of a high temperature isolation at other plant conditions would not be significantly different. In the event of an isolation with the RWCU Pumps operating, the pumps automatically trip. Removal of the RWCU System from operation has no short term impact on reactor operation.

G. Corrective Action

The failed thermocouple and temperature switch, found during the March isolations, were replaced and calibrated prior to startup from the maintenance outage. The isolation switch was confirmed to be operating correctly. Preventive Maintenance activities for the temperature switch will be revised. The failure of the thermocouple is considered to be an isolated incident and, therefore, no further corrective action is warranted.

A caution tag was placed on the RWCU pump control switch requiring that the subcooling line isolation valve be closed except during Reactor cooldown. The design of the subcooling line will be reviewed and a permanent solution determined.

The design process for plant changes has been strengthened since this design was completed. This change provided a greater awareness of the operational requirements for a proposed design. To further enhance this aspect, the design process will be revised to require a detailed statement of all anticipated modes of system operation.

H. Similar Events

None.

NRC FORM 366A (6-89)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104
EXPIRES: 4/30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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

SUPPLEMENTAL INFORMATION

TE-97 is a Type T Copper Constantan 300 Series thermocouple, manufactured by Nuclear Engineering Company, Incorporated. EIIS component Code - TE

TS-115 is a Model DA-7036-153 temperature switch, manufactured by Mercoid Corporation. EIIS Component Code - TS.

EIIS System Codes

Reactor Water Cleanup - CE

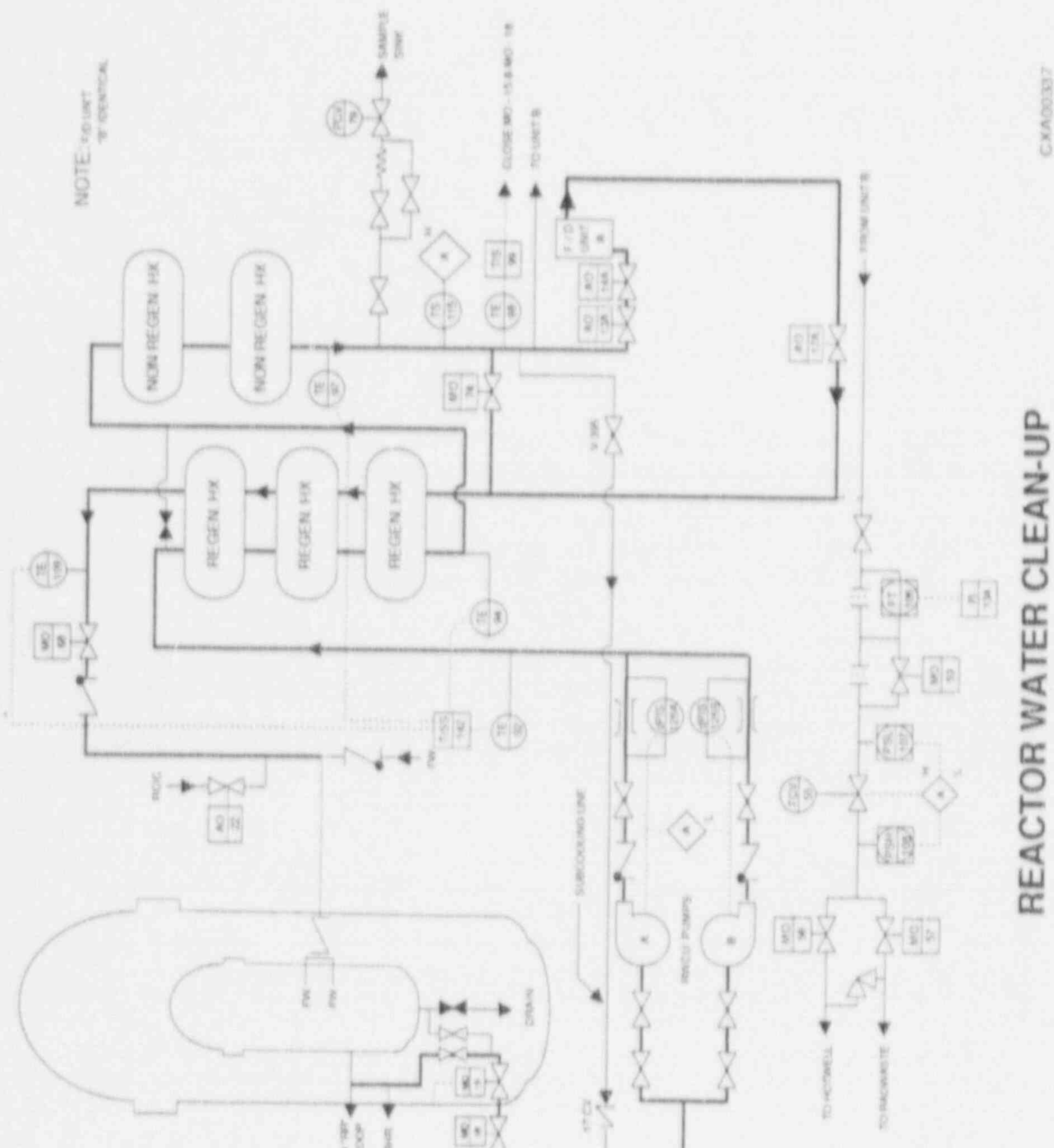
NRC Form 366A
(9-83)

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6) YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	PAGE (3)
Cooper Nuclear Station	0 5 0 0 0 2 9 8	9 1	— 0 0 2	— 0 1	0 6 OF 0 6

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



NRC FORM 366A
(9-83)