



Nebraska Public Power District

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CNSS933190

July 21, 1993

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

Dear Sir:

Cooper Nuclear Station Licensee Event Report 93-010, Revision 1, 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
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INPO Records Center
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LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Cooper Nuclear Station										DOCKET NUMBER (2) 0 5 0 0 0 2 9 8										PAGE (3) 1 OF 4			
TITLE (4) Loss Of An RPS Bus Due To A Defective Under Frequency Trip Unit Resulting In Unplanned Actuations of Several ESFs																							
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	6	2	1	9	3	9	3	0	1	0	0	1	0	7	2	1	9	3	0	5	0	0	0
OPERATING MODE (9) N		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5. (Check one or more of the following) (11)																					
POWER LEVEL (10) 0 0 0		20.402(b)				20.405(c)				<input checked="" type="checkbox"/> 50.73(a)(2)(iv)				73.71(b)									
		20.405(a)(1)(i)				50.36(c)(1)				50.73(a)(2)(iv)				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)(ix)													
LICENSEE CONTACT FOR THIS LER (12)																							
NAME Donald L. Reeves, Jr.												TELEPHONE NUMBER 4 0 2 8 2 5 - 1 3 8 1 1											
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)																							
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC													
B	JIC	1 18 1	A 6 1 1 0	Y																			
SUPPLEMENTAL REPORT EXPECTED (14)																							
YES (If yes, complete EXPECTED SUBMISSION DATE)												NO											
												EXPECTED SUBMISSION DATE (15)											
												MONTH DAY YEAR											

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

On March 31, 1993, at 2:24 am, the "B" Reactor Protection System (RPS) bus was de-energized when the two Electrical Protection Assemblies (EPAs) on the output of the RPS Motor-Generator (MG) set supplying the bus tripped for no apparent reason. Loss of the RPS bus caused a half Group 1 (Main Steam) isolation, a half Group 2 (Primary Containment) isolation, a half Group 7 (Reactor Coolant Sample) isolation, and a half Scram. Due to plant status and maintenance activities in progress, only one Group 1 and two Group 2 isolation valves actuated. On June 21 at 8:54 am, power to the B RPS bus was again lost, resulting in the above noted ESF trips, a half Group 3 (Reactor Water Cleanup) isolation and a half Group 6 (Secondary Containment) isolation. The isolations resulted in a loss of shutdown cooling and Reactor Water Cleanup (RWCU) Systems and isolation of the Reactor Building, including actuation of the B Standby Gas Treatment (SGT) System. When these trips occurred, the plant was shutdown for the 1993 Refueling Outage.

A thorough investigation of both EPA units and the "B" RPS MG set control cabinet performed immediately following the March 31 trip revealed no discrepancies. The trip was evaluated as being due to a spurious cause. Following the trip of June 21, a faulty under frequency (UF) unit in the "B" RPS MG set control circuit was found. A spurious trip of this UF unit is the most likely cause of the March 31 trip.

Following both events, the "B" RPS bus was re-energized from its alternate source and systems were restored as needed. Following the June 21 trip, immediate action was taken to restore shutdown cooling. No change in reactor coolant temperature was noted. Since the UF units in the RPS MG sets were redundant to the UF protection afforded by the EPAs, the coils in both control circuits were jumpered. Permanent removal of the UF trip and other RPS MG set trips will be evaluated.

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

A. Event Description

On March 31, 1993, at 2:24 am, the "B" Reactor Protection System (RPS) bus was de-energized when, for no apparent reason, the two Electrical Protection Assemblies (EPAs) on the output of the RPS Motor-Generator (MG) set supplying the bus tripped. Loss of the RPS bus caused a half Group 1 (Main Steam) isolation, a half Group 2 (Primary Containment) isolation, a half Group 7 (Reactor Coolant Sample) isolation, and a half Scram. Due to plant status and maintenance activities in progress, only three valves were actuated. One was associated with Group 1 and the other two with Group 2.

On June 21, 1993, at 8:54 am, the "B" RPS bus was again de-energized, resulting in the above noted trips and a half Group 3 and half Group 6 isolations (Reactor Water Cleanup and Secondary Containment, including actuation of the Standby Gas Treatment System). The trip occurred when a Station Operator, making his rounds, lightly tapped on the RPS MG Set voltage indicator when preparing to take his readings. As contrasted with the trip of March 31, the Reactor Water Cleanup (RWCU) System was in service prior to the trip and the Reactor Building Heating and Ventilating (HV) System was in normal operation. Additionally, fuel had been re-loaded in the vessel and the Residual Heat Removal (RHR) System was in service in the Shutdown Cooling mode of operation. Upon loss of the "B" RPS bus, operation of these systems was interrupted.

B. Plant Status

In Cold Shutdown for the 1993 Refueling Outage.

C. Basis for Report

Unplanned automatic actuations of ESF Group Isolations, reportable in accordance with 10CFR50.73(a)(2)(iv).

D. Cause

An immediate investigation into the March 31 trip revealed that no one had been in the vicinity of the EPAs when they tripped. Nor could it be concluded that any of the outage related activities in progress at the time had any direct effect on the "B" RPS bus. The RPS MG set was found running with its output breaker apparently closed. Consequently, one of the two MG Set output EPA units was considered to be the cause of the trip. A thorough checkout of both EPA units as well as the "B" RPS MG set control cabinet revealed no discrepancies. The units were returned to service on April 1 and operated satisfactorily until June 21.

Subsequent to the trip of March 31, the apparent spurious trip of one of the two EPA units was discussed with the vendor. The vendor advised that they had not been successful in reproducing, in their lab facility, any of the spurious trips that had been experienced in the field by various utilities. The vendor advised that most EPA trips could be traced to a system disturbance of one form or another that caused a

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APPROVED OMB NO. 3150-0104

EXPIRES: 8/31/88

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

Cause (continued)

valid trip condition to exist. They had, however, re-designed the EPA trip circuit in an effort to eliminate the potential for spurious trips.

Investigation of the RPS MG set control cabinet following the June 21 trip revealed a blown fuse in the UF relay circuit. The blown fuse was the cause of the MG set output breaker opening. Inspection of the UF relay revealed it to be extremely sensitive when the leads were touched, causing the MG set output breaker to trip. This sensitivity suggests that the relay was susceptible to spurious actuation due to slight vibration. The UF contacts were found to not be fully inserted in their holder. It is postulated that when the operator tapped on the voltage indicator, the UF relay contacts chattered. This caused the UF relay EMF field to fluctuate, resulting in a current spike in the circuit, causing the UF relay fuse to fail. Due to determining that the RPS MG Set UF relay was defective, it was concluded that the March 31 EPA trip was also caused by the same mechanism, which at the time, was not detected.

E. Safety Significance

The safety significance of these events is minimal. As a result of the March 31 event, the outboard Drywell Floor Drain and Equipment Drain Sump Isolation valves closed. The inboard valves were already closed and tagged. The only other recorded valve status change was closure of one Main Steam Line drain valve. The steam lines were drained with the Steam Line Plugs installed at the vessel nozzles.

The event on June 21 involved loss of shutdown cooling for approximately seven minutes until the RHR System could be restored in the Shutdown Cooling mode of operation. Since the decay heat load was minimal, no reactor coolant heatup was detected. Loss of the RWC System, isolation of the Reactor Building, and startup of the "B" SGT Sub-system posed no unusual operational problems and were of no safety significance.

F. Safety Implications

When shutdown, loss of an RPS bus will result in a half Group 2 Isolation and loss of the shutdown cooling function. Plant conditions under which this loss would be most significant would be immediately following removal of the reactor vessel head when preparing for refueling activities. Based upon a very conservative determination of core heatup with no credit taken for cooling provided by the RWC System or any other heat removal mechanism, nor any makeup from the Control Rod Drive System or any other available water source, the reactor coolant heatup rate could be as high as 40 degrees Fahrenheit per hour. This would result in reaching boiling conditions in the vessel in approximately three hours with reactor coolant temperature initially at 90 degrees Fahrenheit and level at the reactor vessel flange. Based on no action being taken, very conservative calculations predict the potential for core uncover within an additional 14 hours.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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

F. Safety Implications (continued)

While the heatup and heat removal calculations are conservative, and the potential is low that immediate corrective actions to restore shutdown cooling will not be successful, specific outage guidelines regarding 1) the availability of both trains of normal and emergency power, and 2) both loops of RHR, one in the shutdown cooling mode and one in reserve, are followed until the cavity is flooded. Deviations from these guidelines are controlled and require that compensatory actions be in place.

During normal plant operation, loss of one RPS bus will cause loss of the Reactor Building HV System due to a half Group 6 Isolation. Under elevated temperature conditions with the plant at rated power, if the ventilation system were lost and not promptly restored, MG set winding temperatures would rapidly increase to their trip setpoint. This would result in loss of one or both Recirculation Pump MG sets and the associated Reactor Recirculation (RR) Pumps. If both RR Pumps were lost, the worst case situation, operator action would be taken to manually scram the reactor.

G. Corrective Action

Following each event, the RPS Bus was re-energized from its alternate source. The isolations were reset by licensed Control Room operators and system restoration activities were completed as needed.

Following the event of March 31, the EPA units and the RPS MG set control cabinet were thoroughly checked and tested. No discrepancies could be found. Subsequently, the EPAs were re-energized and monitored. No abnormalities were observed. On April 1, normal power was restored to the "B" RPS bus. No problems were experienced until the unanticipated trip of June 21, following which a defective UF monitoring unit in the MG Set control circuit was discovered. The UF relays for both the "A" and the "B" RPS MG Sets were jumpered since redundant protection is already afforded by the UF trip feature provided by the EPAs. Action has been initiated to permanently remove this feature and to evaluate removal of the RPS MG Set overvoltage and undervoltage trips, as well, since those trip features are also provided by the EPAs.

H. Similar Events

LER 90-005, dated May 30, 1991, reported a trip of the "B" RPS MG set output breaker due to a relay contact deficiency.