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September 5, 1989

Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

DOCKET 50-255 - LICENSE DPR-20 - PALISADES PLANT -
LICENSEE EVENT REPORT 89-020 (REACTOR TRIP DUE TO
BLOWN FUSE AND SUBSEQUENT AUXILIARY FEEDWATER PUMP START)

Licensee Event Report (LER) 89-020 (Reactor Trip Due to Blown Fuse and Subsequent Auxiliary Feedwater Pump Start) is attached. This event is reportable to the NRC per 10CFR50.73(a)(2)(iv) and 10CFR50.73(a)(2)(vii).

Brian D Johnson
Staff Licensing Engineer

CC Administrator, Region III, USNRC
NRC Resident Inspector - Palisades

Attachment

IE22

OC0989-0185-NL04

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)
PALISADES NUCLEAR PLANT	0 5 0 0 0 2 5 5	1 OF 0 5

TITLE (4)
REACTOR TRIP DUE TO BLOWN FUSE AND SUBSEQUENT AUXILIARY FEEDWATER PUMP START

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)
									N/A	0 5 0 0 0
0 8	0 4	8 9	8 9	— 0 2 0	— 0 0	0 9	0 5	8 9	N/A	0 5 0 0 0

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	0 8 0	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)	X 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
C S Kozup, Technical Engineer, Palisades Plant	AREA CODE 6 1 6 7 6 4 - 8 9 1 3

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
A	B A	A L M		No					

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)

Abstract

On August 4, at 1945, a reactor trip from 80% power occurred due to a blown fuse [JB;FU] in a flow indicating controller [SJ;FIC] that caused the feedwater regulating valve [SJ;LCV] for the B steam generator to close, thereby decreasing feedwater flow to the steam generator and resulting in a reactor trip on low steam generator level. The plant response to the trip was considered normal with no safety significant deviations or anomalies observed.

On August 5, 1989 at 0300, an unanticipated start of auxiliary feedwater pump P-8B [BA;P] occurred while the plant was in the hot shutdown condition. The spurious signal was caused by a failure by the operators to reset the AFAS signal following the reactor trip.

Corrective actions to be taken in response to these incidents include a review of the fuse control program and a revision to post trip operating procedures that will add instructions to the operators for resetting alarms and activated actuation signals.

Description

On August 4, 1989, at 1945, a reactor trip from 80% power occurred due to a blown fuse [JB;FU] that caused the feedwater regulating valve (CV-0703) [SJ;LCV] for the "B" steam generator (E-50B) to close, thereby decreasing feedwater flow to the steam generator and resulting in a reactor trip on low steam generator level. The fuse, located in level indicating controller LIC-0703 [SJ;LIC], blew during transfer of preferred AC Bus Y20 to the bypass regulator while personnel was troubleshooting a ground on the DC bus. The blown fuse caused CV-0703 to close and prevented the valve from automatically transferring to manual operation, which normally occurs on a turbine trip. The plant response to the trip was considered normal with no safety significant deviations or anomalies observed. The auxiliary feedwater actuation system (AFAS) actuated as designed.

On August 5, 1989 at 0300, what was then considered a spurious AFAS signal [BA;ALM] occurred. At the time of the actuation, the plant was in the hot shutdown condition (reactor subcritical, Tave greater than 525 degrees F) with auxiliary feedwater (AFW) pump P-8A [BA;P] supplying feedwater to both steam generators. The idle turbine driven AFW pump P-8B [BA;P] received a start signal from actuation channel A and and a low flow signal, causing the steam admission valve to the turbine to start opening. The operator took immediate action to close the admission valve and then reset the AFAS signal. At the time, the spurious AFAS signal was believed to be caused by a severe thunderstorm, which was in progress at the time.

Subsequent investigation revealed that the unanticipated start of P-8B was caused by a failure of the operators to reset the AFAS signal following the reactor trip. Before the P-8B start occurred, P-8A was supplying approximately 100 gpm to steam generator E-50B and slightly less than 100 gpm to steam generator E-50A. At 0300, AFW flow was throttled to less than 100 gpm to each steam generator. The standing AFAS logic and flow of less than 100 gpm to each steam generator demanded starting the next AFW pump, P-8C. This pump did not start for the following two reasons:

One, the low suction pressure trip for P-8C had not been reset following the temporary deenergizing of Y20, which had occurred the previous day during the transfers to and from the bypass regulator.

Two, it was discovered while resetting the AFAS signal that the B actuation channel was not activated. The 12 volt DC power supply for this channel was found in a tripped condition due to overvoltage, rendering it incapable of initiating a B channel AFAS signal. The cause of this overvoltage trip remains unclear and is under investigation. The power supply was subsequently reset and observed to function properly.

Because P-8C was tripped, AFAS logic continued to the next idle pump, turbine driven AFW pump P-8B. Upon observing the opening of the steam

admission valve, an operator took action to close the valve and then reset the AFAS signal.

Immediately after the plant trip, the operators erroneously believed that the 1D safeguards bus had failed to transfer to startup power. Follow up investigation indicated that the 1D bus had transferred properly but a red light signalling a closed breaker had burned out. Additionally, the operators did not verify bus voltage until after the breaker had been manually closed, although they did observe that the 1D bus equipment was operating normally during the safety system status check.

Operator interviews after the trip indicated that the Emergency Shutdown Checklist (GLC-10), which reviews plant status after an unplanned shutdown, was not user friendly, with checklist items not arranged in order of importance.

Equipment deficiencies observed after the trip included a loss of condenser vacuum about one and a half hours after the plant trip. Investigation of this identified that two moisture separator and reheater relief valves had failed to properly reseat. The condenser vacuum was restored when action was taken to seal the relief valves.

Cause of the Event

The root cause of the reactor trip was a fuse that blew due to a current surge, which occurred when the dead bus transfer of Y20 to the bypass regulator occurred. This was verified following the plant trip by replacing the blown fuse and simulating the bus transfer. The test verified that the fuse blew during dead bus transfer. The blown fuse, which was installed in the flow indicating controller FIC-0703, caused the feedwater regulating valve, CV-0703, to close, decreasing feedwater supply to the B steam generator and causing the reactor to trip on low steam generator level.

The root cause of the unanticipated P-8B start was attributed to procedural inadequacy. Post trip procedures do not instruct the operators to reset the AFAS signal and associated alarms. Although operator training includes resetting of these signals and alarms, these actions may be overlooked by the operators with the numerous alarms and concerns present after a plant trip. This procedural inadequacy exists not only with AFAS but with other control room alarms as well.

Corrective Action

The fuse that failed and caused the reactor trip was an instantaneous fuse. This fuse was replaced by a slow blow fuse that was shown to be functionally equivalent. Although use of the instantaneous fuse was not considered to be

inappropriate, the slow blow fuse is believed to be better suited for this application. This new fuse was tested by alternating power supplies and no problems were observed. As a follow up action, the fuse control program is being reviewed to determine whether the program adequately addresses the fuse replacement performed in this incident.

Regarding the unanticipated start of P-8B, General Operating Procedure 10, "Emergency Shutdown from Power", will be revised to instruct operators to reset alarms and activated actuation signals, such as AFAS and AFW pump low suction pressure trips, as appropriate. This procedure will also be made more user friendly, with checklist items arranged in order of importance. Moreover, this incident will be reviewed by the operators to insure awareness of the need to reset these alarms and signals.

The over voltage trip of the power supply in the B AFAS actuation channel is being investigated to determine whether further corrective action is required to address the problem.

The events that led the operators to erroneously diagnose the condition of the 1D bus will be reviewed by the operators. Also, this item will be incorporated into operator requalification training.

The moisture separator and reheater relief valves will be evaluated to determine whether they need to be replaced to insure that they reseat properly.

Analysis of the Event

Plant response to the reactor trip on low steam generator B level was as expected with no safety significant deviations or abnormalities observed. Both trains of safety equipment were available throughout the transient to perform their safety functions.

The unanticipated start of P-8B occurred after the reactor trip, so there was no adverse effect on the plant. Should an AFW pump start during normal power operation, for whatever reason, the feedwater regulating valves would balance main feedwater flow with AFW flow and maintain steam generator levels steady.

The failure of the AFW pump P-8C to start due to the failure to reset the AFW pump low suction pressure trip and the loss of the B AFAS actuation channel would not adversely effect the plant under other accident scenarios. Auxiliary feedwater pumps P-A and B are redundant to P-8C and would still be available to provide AFW to the steam generators in the event that P-8C was not available.

The loss of condenser vacuum due to two moisture separator and reheater relief valves failing to reseat could adversely impact plant safety if it occurred coincident with a steam generator tube rupture. This scenario could result in a radioactive release. This event is bounded by the Plant's safety analysis for a steam generator tube rupture incident.

Additional Information

The following reportable events involve inadvertent AFAS actuation:

Licensee Event Report 87-009 AFAS Actuation During Steam Dump Testing

Licensee Event Report 87-029 Personnel Error Results in Inadvertent Auxiliary Feedwater Actuation

Licensee Event Report 88-006 Inadvertent Manual Auxiliary Feedwater Acutation System (AFAS) Acutation

Licensee Event Report 88-007 Procedural Inadequacy Results in Inadvertent AFAS Actuation