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PG&E Letter DCL-00-153

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Docket No. 50-275, OL-DPR-80
Diablo Canyon Unit 1
Licensee Event Report 1-2000-011-00
Manual Reactor Trip Due to Rod Control Failure

Dear Commissioners and Staff:

PG&E is submitting the enclosed Licensee Event Report concerning a Unit 1 manual reactor trip due to a rod control system failure.

This event was not considered risk significant and did not adversely affect the health and safety of the public.

Sincerely,

David H. Oatley

cc: Ellis W. Merschoff
David L. Proulx
Girija S. Shukla
Diablo Distribution
INPO

Enclosure

JMB/2246/A0519831

IE22

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Diablo Canyon Unit 1	0 5 0 0 0 2 7 5	1 OF 7

TITLE (4)

Manual Reactor Trip Due to Rod Control Failure

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
11	05	2000	2000	- 0 1 1 -	0 0	12	05	2000		

OPERATING MODE (9)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR: (11)
2	X 10 CFR 50.73(a)(2)(iv)
POWER LEVEL (10)	OTHER ________ (SPECIFY IN ABSTRACT BELOW AND IN TEXT, NRC FORM 366A)
0 0 1	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER AREA CODE	
Roger Russell - Senior Regulatory Services Engineer	805	545-4327

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
X	A A	E C B D	W 1 2 0	N					

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MON	DAY	YR
[ ] YES (If yes, complete EXPECTED SUBMISSION DATE)	[x] NO				

ABSTRACT (Limit to 1400 spaces. i.e., approximately 15 single-spaced typewritten lines.) (16)

On November 5, 2000, at 1707 PST with Unit 1 in Mode 2 (Startup), at 6E-9 amperes, the shift foreman ordered a manual trip of the reactor due to a failure in the rod control system. At 1744 PST, operators made a 4-hour, nonemergency notification in accordance with 10 CFR 50.72(b)(2)(ii).

The root cause of the rod control failure was a faulty buffer memory card. The card was replaced and personnel performed the required maintenance verification testing.

TEXT

I. Plant Conditions

Unit 1 was in Mode 2 (Startup) at 6E-9 amperes.

II. Description of Problem

A. Background

The rod control system [AA] is a Design Class II system for positioning the reactor control rods for reactor power modulation by manual or automatic control of control rod banks. A logic cabinet urgent failure alarm is actuated when a pulser/oscillator failure, slave cycler failure, or a loose, faulty or removed circuit card occurs [AA][DID]. A power cabinet urgent alarm is actuated when a phase failure, regulation failure, logic error, multiplexing error, or loose or missing card occurs.

The urgent failure alarm inhibits further rod motion until the alarm condition is reset. This control feature is provided to stop further rod action that may result in an unintended rod position that could cause an uncontrolled reactivity increase. The rod control system is provided electrical power from the nonsafety-related motor generator set through the safety-related reactor trip breakers. See Figure 1 for graphical detail.

STP R-6, Unit 1 and 2, “Low Power Reload Physics Testing,” serves as the controlling document for reload low power physics testing. The purpose of this testing is to verify that the reactor physics characteristics of the core are consistent with design.

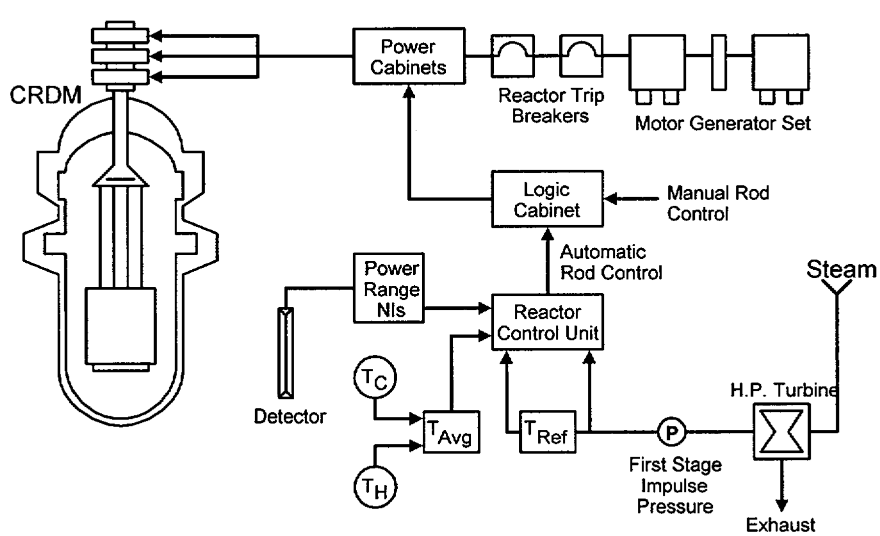

FIGURE 1: Block Diagram of Rod Control System

TEXT

B. Event Description

On November 5, 2000, at 1258 PST, Diablo Canyon Power Plant (DCPP) Unit 1 had achieved initial criticality of the new core reloaded during the tenth refueling outage when an urgent failure alarm was received. The urgent failure alarm occurred while inserting the Control Bank D control rods during startup for low power physics testing. While inserting Control Bank D, the control operator released the in-hold-out switch to stop inward control rod motion. After he released the switch, the step counters for control rod bank D group 1 appeared to take an additional step. It was at this time that the urgent failure alarm occurred, and the rod control system suspended further movement of the control rods.

Operators were dispatched to the control rod cabinets. Power Cabinet 2BD was identified to have an urgent failure indicating a movable coil regulation failure. Maintenance personnel performed troubleshooting.

Observations by maintenance personnel noted that the cycle lamp lit continuously on 2BD power and on the A514 slave cycler logic card. Utilizing the Westinghouse corrective maintenance logic flow diagram (ref. WCAP15360) led to an indication of a fault in the Control Bank D logic cabinet slave cycler circuitry. Voltages on counter cards indicated a locked up count. Since the Westinghouse logic flow diagrams are relatively new, not all control systems are described in detail. When the Westinghouse logic flow diagrams did not provide adequate solutions to the rod control failure being experienced, standard trouble shooting techniques were used and the counter card (A513) was replaced with a warehouse spare, the alarm was reset, and rod motion was requested.

Upon initial demand of inward movement, the original problem repeated at a different count on the counter card. Again, the rod control system suspended further movement of the control rods. The shift foreman then performed a tailboard and ordered a manual reactor trip on November 5, 2000, at 1707 PST.

Further troubleshooting identified that a buffer memory card had failed. The card was replaced and verified to be functioning.

TEXT

Reactor power at the time of the trip was stable at 6E-9 amperes. The reactor trip response was normal with no equipment problems identified during the trip. All rods fully inserted.

On November 5, 2000, at 1744 PST, operators made a 4-hour, nonemergency notification in accordance with 10 CFR 50.72(b)(2)(ii).

C. Inoperable Structures, Components, or Systems that Contributed to the Event

None

D. Other Systems or Secondary Functions Affected

None

E. Method of Discovery

The manual reactor trip was an intended operation action.

F. Operator Actions

Operators manually tripped the reactor when initial rod control troubleshooting was unsuccessful.

G. Safety System Responses

The manual reactor trip actuated the reactor protection system, which responded as expected.

III. <u>Cause of the Problem</u>

A. Immediate Cause

Operators received an urgent alarm in the Unit 1 control room.

B. Root Cause

The root cause of the rod control failure was failure of the portion of the Supervisory Buffer Memory Card (A112) that controls inward rod motion.

TEXT

C. Contributory Cause

There are no contributory causes.

IV. <u>Analysis of the Event</u>

The rod control system is a Design Class II system for positioning of the reactor control rods for reactor power modulation by manual or automatic control of control rod banks in a preselected sequence, and for manual operation of individual banks. The urgent failure alarm is actuated from pulser/oscillator failure, slave cycler failure, or a loose, faulty or removed circuit card, phase failure, regulation failure, logic error, multiplexing error, or loose or missing card. This alarm inhibits further rod motion until the alarm condition is resolved. This control feature is provided to stop further rod action that may result in an unintended rod position.

In the event of rod control system failure, DCPP employs a number of redundant systems in order to safely trip the reactor. The rod control system is provided electrical power from the nonsafety-related motor generator set through the safety-related reactor trip breakers to the rod control system and the control rod grippers. Operators can manually open the reactor trip breakers [JC][BKR]. Opening either of the redundant breakers results in a loss of power to the control rod drive mechanism (CRDM) [AA][STC], resulting in a reactor scram. Any single active or passive failure will not prevent system function to trip the reactor. During this event, operators retained the ability to manually trip the reactor.

In the event of an increase in neutron flux at low power, the nuclear instrumentation system is designed to provide automatic reactor trip signals. Two of these signals were available to terminate the unintended power increase in the unlikely event that manual operator action was not taken. The intermediate range neutron flux reactor trip is designed to trip the reactor when one of two intermediate range channels measures a power level greater than approximately 25 percent reactor thermal power (RTP) as stated in the Final Safety Analysis Report (FSAR) Update Section 15.2.1.1.2. The power range high neutron flux reactor trip (low setting) is designed to trip the reactor when two of four power range channels indicate a power level greater than approximately 25 percent RTP as stated in the FSAR Update Section 15.2.1.1.3. Both of these reactor trips require manual operator action to block the trips in order to intentionally increase RTP above 25 percent. Therefore, in the event that plant operators had not tripped the reactor manually, and the rod control system had malfunctioned in such a way as to withdraw rods, the reactor would have automatically tripped when the RTP threshold was exceeded.

The failure described in this LER had no effect on any safety-related portion of the reactor trip system. Therefore, the manual reactor trip initiated during this event represents a conservative course of action and did not involve a safety system functional failure.

Based upon the above analysis, the health and safety of the public were not adversely affected, and there were no adverse consequences or safety implications resulting from this event.

The condition was not evaluated using the NRC's Significance Determination Process (SDP) because it involved a performance indicator and therefore does not require SDP screening.

V. Corrective Actions

A. Immediate Corrective Actions

Immediate corrective actions included manually tripping the reactor and troubleshooting Power Cabinet 2BD.

B. Corrective Actions to Prevent Recurrence

A faulty supervisory buffer memory card was replaced and personnel performed the necessary maintenance verification testing.

VI. Additional Information

A. Failed Components

The failed component was a faulty Westinghouse #3359C83G01 supervisory buffer memory card.

B. Previous Similar Events

LER 1-91-008-00, "Manual Reactor Trip Caused by Rod Power Supply Fuse Failure Due to Personnel Error"

TEXT

This LER addressed an urgent failure in Rod Control Power Cabinet PN1AC resulting in a Unit 1 manual reactor trip. The root cause of the event was unknown. However, based on investigations of possible causes, PG&E believes the most probable root cause is personnel error. Due to misleading information contained in a 1989 work order, a contract electrician had replaced the power supply fuses in the wrong electrical cabinet thereby inadvertently leaving low reliability fuses in the system. Corrective actions to prevent recurrence included labeling of the fused disconnect panels for the rod control system and tailboarding of maintenance personnel.

The corrective actions described in LER 1-91-008-00 did not prevent the Unit 1 manual reactor trip explained in this LER because the event was caused by a supervisory buffer memory card failure.