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SUBJECT: LER 89-015-00:on 891214,P-14 turbine trip ESF features signal due to personnel error.

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James D. Shiffer
Vice President
Nuclear Power Generation

January 16, 1990

PG&E Letter No. DCL-90-014

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

Re: Docket No. 50-275, OL-DPR-80
Diablo Canyon Unit 1
Licensee Event Report 1-89-015-00
P-14 Turbine Trip Engineered Safety Features Signal Due to Personnel Error

Gentlemen:

Pursuant to 10 CFR 50.73(a)(2)(iv), PG&E is submitting the enclosed Licensee Event Report (LER) regarding an inadvertent occurrence of a P-14 turbine trip engineered safety features signal during Unit 1 restart testing.

This event has in no way affected the public's health and safety.

Kindly acknowledge receipt of this material on the enclosed copy of this letter and return it in the enclosed addressed envelope.

Sincerely,

J. D. Shiffer

cc: A. P. Hodgdon
J. B. Martin
M. M. Mendonca
P. P. Narbut
H. Rood
CPUC
Diablo Distribution
INPO

Enclosure

DCl-89-TI-N112

3030S/0076K/ALN/2246

IE22
1/1

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 0 1 6

TITLE (4)

P-14 TURBINE TRIP ENGINEERED SAFETY FEATURES SIGNAL DUE TO PERSONNEL ERROR

EVENT DATA (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
12	14	89	89	0 1 1 5	0 0	01	16	90		0 5 0 0 0

OPERATING MODE (9)	1
POWER LEVEL (10)	0 0 7

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR : (11)

X 10 CFR 50.73(a)(2)(iv)

OTHER (Specify in Abstract below and in text, NRC Form 366A)

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER AREA CODE	TELEPHONE NUMBER
TERENCE L. GREBEL, REGULATORY COMPLIANCE SUPERVISOR	805	595-4720

COMPLETE ONE LINE 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 (16)

On December 14, 1989, at 0012 PST, while in Mode 1 at 7 percent power, an engineered safety feature (ESF) high-high steam generator (SG) level P-14 trip permissive occurred. The Unit was stabilized in Mode 2 at 2 percent power and a 4-hour, non-emergency 10CFR50.72 report was made at 0247 PST.

Operators had performed a manual main turbine trip test, which resulted in an unexpected main feedwater pump (MFP) turbine speed runback, reducing pump flow delivery. The main and bypass feedwater valves automatically opened in response to SG low water level. When MFP turbine speed control was reset, the MFP speed rapidly increased, resulting in high feed flow to the SGs through the open valves. Feedwater was secured. However, the addition of cold water had reduced RCS average temperature to 522°F. The RCS temperature recovery to greater than 541°F, as required by Technical Specifications, caused a thermal swell in the SG, which reached the P-14 setpoint and initiated an ESF.

The cause of the event was improper implementation of a Field Change to delete the circuitry providing MFP turbine runback on main turbine trip.

The MFP speed control circuitry has been corrected. Procedures have been enhanced to provide independent verification for electrical circuitry changes.

I. Plant Conditions

Unit 1 was in Mode 1 (Power Operation) at 7 percent power.

II. Description of Event

A. Event:

On December 14, 1989, at 0012 PST, a steam generator (SG)(TA) high-high level P-14 permissive (main turbine (TRB)(TA) trip, main feedwater turbine (TRB)(JB) trip and feedwater isolation valve (ISV)(JB) closure) occurred on Unit 1 during restart testing. A 4-hour, non-emergency report was made in accordance with 10 CFR 50.72(b)(2)(ii) at 0247 PST.

The digital feedwater level control system (DFWCS)(LC)(SJ) had been installed during the refueling outage. Testing of the main turbine trips was being performed per surveillance test procedure (STP) M-21A, "Main Turbine Functional Tests," with the reactor at 7 percent power and the DFWCS in automatic. The main turbine was manually tripped in accordance with STP M-21A. Following the trip, Operators observed main feedwater pump (MFP) 1-2 (P)(SJ) runback to 2300 rpm and rapidly decreasing SG levels. The Control Operator (CO) put the MFP individual controller into manual and increased the MFP speed to 100 percent, but no effect on MFP turbine speed was observed. The Assistant Control Operator (ACO) started the auxiliary feedwater pumps (AFP) (P)(SJ). Operators at the main turbine relatched the main turbine. The decreasing SG levels resulted in the main feedwater regulating valves automatically opening to approximately 45 percent.

The ACO noted that the "roll back min" annunciator was on at the MFP speed control station, indicating that the MFP turbine had run back the rpm to minimum; this was unusual and unexpected. The ACO was instructed to reset the alarm. On resetting the alarm, the MFP turbine rapidly accelerated to maximum speed, and SG levels began increasing rapidly. MFP speed was reduced on the individual controller to provide a differential pressure of approximately 60 psid. Bypass valves were put in manual and throttled to 30 percent. The AFPs were secured.

Due to the large quantity of feedwater added to the SGs, reactor coolant system (RCS) average loop temperature (Tavg) dropped to 522°F and Unit 1 entered the action statement of Technical Specification (TS) 3.1.1.4, "Minimum Temperature for Criticality." Operators pulled control rods to recover Tavg.

Feedwater flow remained too high, and operators reduced MFP speed to reduce differential pressure to 50 psid. Bypass valves were manually closed, but little effect on feedwater flow was observed. The main feedwater regulating valves were observed to be 45 percent open in automatic mode. Operators placed the controls in manual and closed the

valves. By this time, SG level was about 50 percent and increasing as the water heated up. Shortly thereafter, SG levels reached the P-14 trip (67 percent) and a P-14 alarm came in. Reactor power at this time was 6 percent. AFW pumps were manually restarted. Reactor power was lowered to 2 percent, and SG levels were allowed to return to normal. RCS Tavg was returned to 541°F, and Unit 1 exited the action statement of TS 3.1.1.4.

Troubleshooting identified that the MFP turbine speed control circuitry (P)(JB) included a speed runback feature on main turbine trip, contrary to the applicable design documents.

The history of MFP turbine speed control system modifications was investigated. On December 27, 1985, design change package (DCP) J-33347 was issued to add a Lovejoy MFP speed control system (a Class II system) to Unit 1. This PG&E DCP included a feature that provided for a MFP turbine runback on main turbine trip. This DCP also contained a wiring error that made the MFP runback feature inoperable.

On January 22, 1986, DCP J-33461 was issued to provide an interlock to prevent load transient bypass (LTB) actuation following a main turbine trip. This DCP utilized a spare contact on relay PS-329X (RLY)(SJ), however the design had a wiring error that disabled the LTB feature.

During installation of the Lovejoy modifications, it was determined that the MFP turbine speed runback on main turbine trip was not desired. On June 24, 1986, Unit 1 Field Change (FC) E-9251 to DCP J-33347 was issued to spare out annunciator circuits and to remove the MFP runback input to the Lovejoy controller. However, when the FC was implemented in September 1986, the MFP runback deletion portion of the FC was not implemented.

On October 27, 1989, Unit 2 experienced a main turbine trip followed by a LTB. The LTB should have been prevented by the installation of DCP J-34461 (the Unit 2 version of the Unit 1 DCP J-33461). Investigation determined that both Unit 2 and Unit 1 were miswired. The LTB wiring in each Unit and the wiring error in Unit 1 were in DCP J-33347 and were corrected via DCP E-43660. However, in Unit 1 the correction of the DCP J-33347 wiring error unknowingly enabled the MFP turbine runback feature that had not been deleted because of the incomplete FC.

Therefore, on December 14, 1989, a MFP turbine runback occurred following a Unit 1 main turbine trip signal. A work order was issued to restore the the wiring to the correct design configuration. Investigation following this event determined that the event was caused by failure to fully implement FC E-9251.

Post-installation testing of DCP J-33347 and FC E-9251 did not identify the installation of the MFP turbine runback feature because the combined design did not specify its connection. Therefore, startup testing did not include testing of the MFP turbine runback feature. It was only through the inadvertent action not to remove this feature via FC E-9251 that this event occurred.

Unit 2 design documents were reviewed to determine if a similar problem could exist. The Unit 2 MFP speed controller was determined to be wired correct.

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

None.

C. Dates and Approximate Times for Major Occurrences:

1. December 27, 1985: DCP J-33347 issued for work contained a wiring design error.

2. June 24, 1986: FC E-9251 issued against DCP J-33347 to delete MFP turbine runback.

3. September 24, 1986: FC E-9251 not fully implemented.

4. November 22, 1989: DCP J-33347 wiring design error corrected by DCP E-43660 and enables MFP turbine runback on main turbine trip which had not been deleted by FC E-9251.

5. December 14, 1989 at 0002 PST: Unit 1 MFP runback occurs following manual turbine trip during STP.

6. December 14, 1989 at 0012 PST: Event/discovery date. A P-14 ESF signal occurred when 2 or more SG levels exceed 67 percent.

7. December 14, 1989 at 0030 PST: Unit 1 stabilized at 2 percent power.

8. December 14, 1989 at 0247 PST: A 4-hour, non-emergency 10 CFR 50.72 report made to the NRC.

D. Other Systems or Secondary Functions Affected:

Upon initiation of P-14, the turbine stop valves tripped, the MFP turbines tripped and the feedwater isolation valves closed. During this

event, reactor coolant Tavg dropped to 522°F, but was recovered to greater than 541°F within the Technical Specification required 15 minutes.

E. Method of Discovery:

Operators observed SG levels rapidly increasing followed by a P-14 alarm on the control board.

F. Operator Actions:

1. Appropriate operator actions were taken in accordance with applicable Plant procedures in response to the Plant transient.

2. Operators stabilized the reactor at 2 percent power, restored appropriate SG levels and reset the P-14 interlock.

G. Safety System Responses:

A P-14 main turbine trip, main feedwater turbines trip and main feedwater isolation valves closure signal occurred on high-high SG levels.

III. Cause of the Event

A. Immediate Cause:

The immediate cause of the excessive feedwater addition to the SG was the resetting of the MFP turbine runback control with the speed controller set in manual. The sudden increase in pumping capacity, in combination with the main feedwater regulating valves being 45 percent open in automatic control and the bypass valves fully open in manual control, caused the rapid feed to the SGs.

B. Root Cause:

Failure to completely implement FC E-9251 due to inattention to detail to remove the MFP runback input to the Lovejoy controller.

IV. Analysis of the Event

A. Safety Analysis:

The P-14 high-high SG level protective interlock functioned as designed to prevent over-filling of the SGs. Thus the health and safety of the public were not adversely affected by this event.

V. Corrective Actions

A. Immediate Corrective Actions:

1. Operators stabilized the reactor at 2 percent power, restored appropriate SG levels and reset the P-14 interlock.

B. Corrective Actions to Prevent Recurrence:

1. Procedure DCP-303, "Wire and Cable Splices, Repairs and Terminations," was revised in 1986 during normal program enhancement to require independent verification whenever electrical circuitry is determinated or reterminated. Had the current revision of this procedure been in effect at the time these modifications were taking place the incomplete implementation of FC E-9251 would likely have been identified and the installation corrected.

2. Briefings have been held with Electrical and I&C Maintenance and with General Construction to review this event and reemphasize the importance of detailed review to ensure that all work items are complete, prior to signoff of the work plan as finished. Procedures were reviewed to ensure adequate controls are in place to preclude a future similar event.

3. The design change errors identified during the investigation of this event were not the cause of the event. Subsequent to the occurrence of the design errors in 1985 and 1986 described above, PG&E has upgraded the Engineering design process and procedures, including revisions to the Nuclear Engineering Manual Procedure 3.60N which provide for a more thorough and independent review of the design verification process.

VI. Additional Information

A. Failed Components:

None.

B. Previous LERs on Similar Problems:

None.