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 12

TITLE (4)

Technical Specification 3.3.1 and 3.3.2 Not Met Following Inadequate Surveillance Testing of Reactor Trip/ESF Functions Due to Inadequate Vendor Design Information Discovered as a Result of Generic Letter 96-01

EVENT DATE (5)			LER NUMBER (6)		REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MON	DAY	YR	YR	SEQUENTIAL NUMBER	REVISION NUMBER	MON	DAY	YR	FACILITY NAME	DOCKET NUMBER
09	12	97	97	- 0 1 6 -	0 1	12	15	97	Diablo Canyon Unit 2	0 5 0 0 0 3 2 3

OPERATING MODE (9): 1

POWER LEVEL (10): 1 0 0

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

X 10 CFR 50.73(a)(2)(i)(B)

____ OTHER

(SPECIFY IN ABSTRACT BELOW AND IN TEXT, NRC FORM 366A)

LICENSEE CONTACT FOR THIS LER (12)

	TELEPHONE NUMBER	
	AREA CODE	
Vickie A. Backman - Senior Regulatory Services Engineer	805	545-4289

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRPDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRPDS

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

ABSTRACT (16)

In 1984 and 1985, Technical Specifications (TS) 3.3.1 and 3.3.2 were not met when Units 1 and 2, respectively, began power operations. On September 12, 1997, PG&E identified that the P-8 interlock was not verified during the solid state protection system (SSPS) semi-automatic test. On November 14, 1997, PG&E identified that three additional functions, P-10 interlock (low setpoint power range neutron flux), P-14 interlock (feedwater isolation), and safety injection feedwater isolation functions, had also not been verified.

TS requirements were not met because the cabinets supplied by Westinghouse did not provide the wiring to the semi-automatic tester to test the P-8 inhibit function. For the additional three functions, the SSPS automatic tester did not verify each memory input to all affected individual universal logic cards.

The P-8 condition was identified by a utility engineer during a review of surveillance tests for compliance with the guidelines set forth in NRC Generic Letter 96-01. The lack of verification for the three additional functions was identified during communications with another utility.

The test procedures were revised and performed to check the affected interlock functions. The final safety analysis report will be reviewed and revised as required. PG&E will continue to check testing of safety-related logic circuitry.

TEXT

I. Plant Conditions

Units 1 and 2 have been in various Modes and at various power levels with the conditions described below.

II. Description of Problem

A. Summary

In 1984 and 1985, Technical Specifications (TS) 3.3.1 and 3.3.2 were not met when Units 1 and 2, respectively, began power operations. On September 12, 1997, PG&E identified that the P-8 interlock (IEL) function which blocks the loop low flow reactor coolant system (RCS)(AB) reactor trip (RT) was not verified during the solid state protection system (SSPS)(JG) semi-automatic test, and therefore was not periodically surveilled. On November 14, 1997, PG&E identified that three additional functions, P-10 interlock (low setpoint power range neutron flux), P-14 interlock (feedwater isolation), and safety injection (SI) feedwater isolation functions, had also not been verified.

B. Background

TS 4.3.1.1, Table 4.3-1 and TS 4.3.2.1, Table 4.3-2, require monthly surveillance by an "actuation logic test" with each train being tested on a 62-day staggered test basis. The TS define "actuation logic test" as the application of various simulated input combinations in conjunction with each possible interlock logic state and verification of the required logic output.

Surveillance Test Procedures (STP) I-38-A.1, "SSPS Train A Actuation Logic Test in Modes 1, 2, 3, or 4;" and STP I-38-B.1, "SSPS Train B Actuation Logic Test in Modes 1, 2, 3, or 4;" are performed on a 62-day staggered train frequency to fulfill TS 4.3.1.1, Table 4.3-1, item 22; and TS 4.3.2.1, Table 4.3-2, items 1.b and 5.a.

Westinghouse technical information for the SSPS indicates the semi-automatic logic tester operates to exercise and check all solid state components required to provide a RT or safeguards action.

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C. Event Description

In 1984 and 1985, Technical Specifications (TS) 3.3.1 and 3.3.2 were not met when Units 1 and 2, respectively, began power operations. The SSPS semi-automatic test did not verify the P-8 function of blocking the 1-out-of-4 loop flow RT below 35 percent power.

As discussed below, the SSPS cabinets supplied by Westinghouse for Units 1 and 2 did not have the 1-out-of-4 low flow universal logic card connected to the SSPS semi-automatic tester so that the P-8 inhibit function could be properly tested.

On January 10, 1996, the NRC issued Generic Letter (GL) 96-01.

On September 12, 1997, at 0955 PDT, a review of procedures for compliance with the guidelines set forth in NRC GL 96-01 identified that the P-8 function of blocking the 1-out-of-4 low flow RT below 35 percent is not verified during the SSPS semi-automatic test. It was determined that the condition constituted a missed surveillance of the actuation logic test for P-8, and therefore was not periodically surveilled in accordance with TS 4.3.1.1.

On September 12, 1997, at 0955 PDT, TS 4.0.3, "Surveillance Requirements," was entered for Units 1 and 2 for failure to meet TS 3.3.1, "Reactor Trip Instrumentation."

On September 12, 1997, at 1544 PDT, the P-8 function of Unit 2 was declared inoperable and Action 8 of TS 3.3.1 was entered. At 1545 PDT, P-8 was verified to be in the proper state for Mode 1 by checking the P-8 permissive annunciator window for its required state (PK0803 not lit).

On September 12, 1997, at 1724 PDT, the P-8 function of Unit 1 was declared inoperable and Action 8 of TS 3.3.1 was entered. At 1725 PDT, P-8 was verified to be in the proper state for Mode 1 by checking the P-8 permissive annunciator window for its required state (PK0803 not lit).

On September 15, 1997, testing of both Units' P-8 function in accordance with revised STP I-38-A.1 and STP I-38-B.1 was completed.

On September 15, 1997, at 1435 PDT, the Unit 1 P-8 function was declared operable for both trains.

TEXT

On September 15, 1997, at 1549 PDT, the Unit 2 P-8 function was declared operable for both trains.

After reviewing the modification history of the SSPS, PG&E determined that the SSPS was initially provided by Westinghouse without the P-8 logic card being correctly wired to the tester. Therefore, PG&E determined that TS 4.3.1.1 had never been met by the actuation logic test.

On November 14, 1997, during discussions with another utility, PG&E discovered three additional functions were not completely verified through SSPS testing. The functions were P-10 interlock (low setpoint power range neutron flux), P-14 interlock (feedwater isolation), and SI feedwater isolation.

On November 14, 1997, testing of both Units' P-10 interlock and P-14 and SI feedwater isolation functions in accordance with revised STP I-38-A.1 and STP I-38-B.1 was completed.

On November 14, 1997, at 1551 PST, the Unit 2 P-10 interlock and P-14 and SI feedwater isolation functions were declared operable for both trains.

On November 14, 1997, at 1703 PST, the Unit 1 P-10 interlock and P-14 and SI feedwater isolation functions were declared operable for both trains.

Because not all of the functions for these interlocks were tested in the memories portion of the SSPS testing, the actuation logic was not properly tested. Therefore, PG&E determined that TS 4.3.1.1 and 4.3.2.1 had never been met.

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

None.

E. Dates for Major Occurrences

1. 1984: Event date - Unit 1 entered various Modes without meeting the requirements of TS 3.3.1. and 3.3.2.

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2. 1985

Event date - Unit 2 entered various Modes without meeting the requirements of TS 3.3.1. and 3.3.2.

3. September 12, 1997, at 0955 PDT:

Discovery date - A review of procedures for compliance with the guidelines set forth in NRC GL 96-01 identified that the P-8 function was not verified during the SSPS semi-automatic test.

4. September 15, 1997, at 1435 PDT:

Testing of the Unit 1 P-8 inhibit function was completed and it was declared operable.

5. September 15, 1997, at 1549 PDT:

Testing of the Unit 2 P-8 inhibit function was completed and it was declared operable.

6. November 14, 1997:

Discovery date - PG&E discovered three additional functions were not being tested adequately.

7. November 14, 1997 at 1703 PST:

Testing of the three functions was completed and both Units' SSPS trains were declared operable.

F. Other Systems or Secondary Functions Affected

None.

G. Method of Discovery

The condition for P-8 was identified by a utility engineer during review surveillance instructions for compliance with guidelines in NRC GL 96-01.

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The condition for the additional three functions was discovered during communications with another utility.

H. Operator Actions

Control room personnel entered the appropriate TS limiting condition for operation.

I. Safety System Responses

None.

III. Cause of the Problem

A. Immediate Cause

TS 4.3.1.1 was not met because the as-supplied Westinghouse SSPS cabinets for Units 1 and 2 did not have the 1-out-of-4 low flow universal logic card connected to the SSPS semi-automatic tester so that the P-8 inhibit function could be tested.

TS 4.3.1.1 and 4.3.2.1 were not met because the SSPS automatic tester did not verify each memory input to the affected universal logic cards for the P-10 and P-14 interlocks and SI feedwater isolation functions.

B. Root Cause

The root cause of the condition was a Westinghouse design error in that the design for the SSPS cabinets should have had the 1-out-of-4 low flow universal logic card connected to the SSPS semi-automatic tester so that the P-8 inhibit function could be tested.

The root cause for failure to verify the additional three functions was determined to be design error in that the universal logic cards were not correctly connected to the tester.

TEXT

IV. Analysis of the Event

A. P-8 Interlock

The P-8 interlock blocks the RT on a low reactor coolant flow in any one loop when the plant is below 35 percent. The blocking action occurs when 3-out-of-4 neutron flux power range signals are below the setpoint. Thus, below the P-8 setpoint, the reactor could operate with one inactive loop and a RT would not occur until two loops indicate low flow.

The purpose of the low flow trip is to provide departure from nucleate boiling protection if a low flow condition exists. The purpose of the P-8, loss of flow permissive, is to change the coincidence for loss of flow trips from 1-out-of-4 loops at high power to a 2-out-of-4 coincidence for low power operation. This provides adequate protection for both high and low power operation.

Since the 1-out-of-4 low flow universal logic card is not connected to the tester, the TS surveillance requirement on a 62 day staggered basis was not met. However, the P-8 inhibit function was functionally tested satisfactorily each refueling outage during time response testing on one train of SSPS on a staggered train basis (STP I-33BRX, "SSPS Response Time Testing"). This testing provides reasonable assurance that the P-8 function would have always performed its design function.

Finally, the consequences of the P-8 block failing would be conservative for the purposes of reactor protection. The 1-out-of-4 trip would continue to be active below 35 percent power. There are no accident analyses affected by the lack of this blocking function. Additionally, Diablo Canyon Power Plant abnormal operating procedures require a manual RT on loss of an reactor coolant pump regardless of power level.

Thus, lack of surveillance testing on the P-8 inhibit did not adversely affect the health and safety of the public.

B. P-10 Interlock

The low setpoint power range neutron flux interlock, P-10, is enabled when two-out-of-four power range channels exceed the setpoint of approximately 10 percent of rated thermal power. On increasing power, P-10 allows the manual block of: (1) the intermediate range RT, (2) the low setpoint power range RT, and (3), the intermediate range rod stop C-1. Additionally, P-10 automatically

TEXT

blocks the source range RT and deenergizes the source range high voltage power supply, provides an input to the low power permissive interlock P-7, and blocks the sub-cooled margin monitor low-margin alarm. However, the source range RT and power supply are manually blocked much earlier during startup, immediately after the intermediate range neutron flux interlock, P-6, is enabled.

On decreasing power, P-10 clears when three-out-of-four power range channels are below the setpoint. The intermediate range and low setpoint power range RTs and the intermediate range rod stop C-1 are reinstated. Additionally, the P-10 blocking portion of the logic affecting the source ranges is removed. However, the source ranges are not reenergized, and the source range RT enabled, until P-6 is reached.

All of the P-10 functions were adequately tested by the SSPS automatic actuation logic and relays test except for the source range blocking/unblocking functions. The effect of partial P-10 failure to be enabled during startup on either one of the two SSPS trains would be to prevent the automatic blocking of the source range RT and power supply cutoff. However, the operators manually deenergize source range high voltage and block the source range flux trip after P-6 is enabled. Both of these actions are verified by operations in Operating Procedure L-2, "Hot Standby to Startup Mode." Erroneous operator action or SSPS failure would be required to enable the source range power supply after the source range flux block is enabled.

Partial P-10 failure to clear during shutdown on either one of the two SSPS trains has no effect, since only one train of P-10 and P-6 is required to reinstate both source ranges. However, if both SSPS trains experienced partial P-10 failure to clear, restoration of the source ranges would be prevented.

The function of the P-10 permissive is to ensure that core protection is provided during startup and shutdown by the intermediate range and low setpoint power range RTs. The source range RT provides a diverse RT for rod withdrawal from subcritical, and rod ejection accidents. However, the power range RTs provide primary protection for these events. There are no Final Safety Analysis Report (FSAR) Chapter 15 events requiring the reinstatement of the source ranges or the source range RTs.

Therefore, the lack of surveillance testing on the P-10 source range function did not adversely affect the public health and safety.

C. P-14 Feedwater Isolation Function

The P-14 interlock trips the main turbine and main feedwater pumps (MFWPs) and closes the main feedwater regulating valves (MFRVs), bypass valves, and isolation valves (MFIVs) when two of three steam generator (SG) water level channels exceed the setpoint in any SG.

The P-14 interlock prevents equipment damage due to moisture carryover from the SG to the main turbine.

Since the universal logic card was not correctly connected to the tester, part of the TS surveillance requirement on a 62 day staggered basis was not met. However, the P-14 feedwater isolation function was functionally tested satisfactorily in accordance with STP I-33 BR, "SSPS Response Time Testing for 'Outage' Surveillance/PMT Requirements," each refueling outage during time response testing on one train of SSPS on a staggered train basis. This testing provides reasonable assurance that the P-14 feedwater isolation function would have performed as designed.

There are two SSPS slave relays on each train which provide diverse feedwater isolation functions. Only the portion of the P-14 feedwater isolation function associated with the MFRV and bypass valves is not wired correctly to the semi-automatic logic tester. Should the untested portion of the P-14 feedwater isolation actuation logic fail, slave relay K620 would not close the MFRV and bypass valves. However, the tested portion of the logic energizes slave relay K621. In SSPS Train A, this relay trips the main turbine and closes the MFIVs. In SSPS Train B, this relay actuates the main turbine backup trip and trips the MFWPs. Therefore, the feedwater isolation function would still be performed by the tested portion of the P-14 function.

A failure of the untested portion of the P-14 function could affect the FSAR Chapter 15 design basis events of excessive feedwater flow and sudden feedwater temperature reduction. Both of these events assume the MFRV and bypass valves close when SG high high level setpoint is reached. If the untested portion of the P-14 feedwater isolation function should fail, feedwater isolation would occur by tripping the MFWPs and closing the MFIVs. This could delay feedwater isolation, but would not impact the final safety analysis conclusion of successful accident mitigation.

Departure from nucleate boiling (DNB) is the primary parameter of concern in feedwater malfunction events. DNB ratio rapidly increases as soon as the

reactor trips. Therefore, the event is mitigated from a DNB perspective well before feedwater isolation is complete.

Operating experience indicates that feedwater shrink in the SG following a RT offsets the delay of less than one minute in feedwater isolation and will not cause overfill.

Thus, lack of surveillance testing on the P-14 feedwater isolation function did not adversely affect the health and safety of the public.

D. SI Feedwater Isolation

Similar to the P-14 function, the SI feedwater isolation function trips the main turbine and MFWPs and closes the MFRVs, bypass valves, and MFIVs on receipt of an SI signal. However, the SI feedwater isolation function is also performed by the redundant slave relays that close the MFRVs from both trains on an SI signal.

The purpose of the SI feedwater isolation function is to rapidly close following a steam line or feedwater line rupture; thereby, limiting the RCS cooldown and limiting the total energy release to the containment.

Since the universal logic cards are not correctly connected to the tester, part of the TS surveillance requirement on a 62-day staggered basis was not met. However, the SI feedwater isolation function was tested satisfactorily each refueling outage on both trains during STP I 16C, "Trip Actuating Device Operational Test of Manual Initiation and Blocking Reactor Protection and Engineered Safeguards." This testing provides reasonable assurance that the SI feedwater isolation function would have performed as designed.

There are two SSPS slave relays on each train which provide diverse feedwater isolation functions. Only the portion of the SI feedwater isolation function associated with the MFRVs and bypass valves is not wired correctly to the semi-automatic logic tester. Should the untested portion of the SI feedwater isolation actuation logic fail, slave relay K620 would not close the MFRVs and bypass valves. However, the tested portion of the logic energizes slave relay K621. In SSPS Train A, this relay trips the main turbine and closes the MFIVs. In SSPS Train B, this relay actuates the main turbine backup trip and trips the MFWPs.

Additionally, slave relay K601 on each SSPS train is energized directly by SI actuation. This relay closes the MFRVs and bypass valves. The SI signal also

trips the reactor, which in turn trips the main turbine. Because both the redundant feedwater isolations provided by K601 and K621 are fully tested, there are no significant consequences of failure of the untested portion of the SI feedwater isolation function.

FSAR Chapter 15 accidents and Chapter 6 containment integrity analyses credit the feedwater control valves to isolate in 9 seconds. The main steam line break inside containment event is the most critical in terms of reliance on fast isolation. Since slave relay K601 performs this function even if K620 should fail, the accident analysis scenarios are not affected.

Thus, lack of surveillance testing on the SI feedwater isolation function did not adversely affect the health and safety of the public.

V. Corrective Actions

A. Immediate Corrective Actions

1. Surveillance Test Procedure (STP) I-38-A.1 and STP I-38-B.1 were revised to include testing of the P-8 low flow interlock inhibiting a 1-out-of-4 trip. Testing of the P-8 function in accordance with the STP I-38-A.1 and STP I-38-B.1 procedure revisions was completed.

2. Both procedures were also revised to include testing of the P-10 source range block and the P-14 and SI feedwater isolation functions. Testing was completed satisfactorily.

3. PG&E sent a letter to Westinghouse Electric Corporation to inform them of the P-8 problem and requested Westinghouse to determine if this issue is reportable to the NRC in accordance with 10 CFR Part 21. Westinghouse's letter to PG&E dated September 30, 1997, concurred that this did not constitute a substantial safety hazard, and therefore they will not consider this for reportability pursuant to 10 CFR Part 21. Westinghouse's response stated that at this time it does plan on issuing a technical bulletin to other potentially impacted plants.

   PG&E confirmed that Westinghouse was also aware of the lack of verification for the P-10 interlock and the P-14 interlock and SI feedwater isolation functions.

TEXT

B. Corrective Actions to Prevent Recurrence

1. STP I-38-A.3 and STP I-38-B.3 have been revised.

2. PG&E will review the FSAR regarding the description of the SSPS semi-automatic tester and make any required changes.

3. As discussed in PG&E's response (DCL-96-090) to GL 96-01, PG&E will continue to check testing of safety-related logic circuitry.

VI. Additional Information

A. Failed Components

None.

B. Previous LERs on Similar Problems

None.