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 10

TITLE (4)

Residual Heat Removal System Outside Design Basis Due to Inadequate Administrative Controls

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
03	14	97	97	- 0 0 5 -	0 1	09	02	97	Diablo Canyon Unit 2	0 5 0 0 0 3 2 3

OPERATING MODE (9)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR: (11)	
1	X	10 CFR 50.73(a)(2)(ii)(B)
POWER LEVEL (10)		OTHER
1 0 0		(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	MON	DAY	YR
[ ] YES (If yes, complete EXPECTED SUBMISSION DATE)	[X] NO	SUBMISSION DATE (15)			

ABSTRACT (16)

On March 14, 1997, at 1601 PST, with Units 1 and 2 in Mode 1 (Power Operation) at 100 percent power, PG&E determined that the residual heat removal (RHR) system had operated in a condition that was outside the design basis of the plant. Administrative controls did not require sufficient refueling water storage tank (RWST) level channels to meet the single active failure criteria and ensure adequate availability of the automatic tripping function for the RHR pumps during transfer to recirculation. A 1-hour, non-emergency report was made to the NRC at 1648 PST, in accordance with 10 CFR 50.72 (b)(1)(ii)(B). The 1-hour, non-emergency report was updated on March 19, 1997, at 1300 PST, to report an additional scenario that could prevent the automatic start or cause the premature tripping of the RHR pumps.

PG&E attributes the inadequate administrative controls to personnel failing to consider the consequences of an RWST level channel failure concurrent with another level channel in test or maintenance on the functioning of the RHR system when a third level channel was added to the design in 1974.

A license amendment request was submitted to include all three RWST channels in the technical specification (TS). Until the TS change is issued, administrative controls have been implemented.

TEXT

I. Plant Conditions

Units 1 and 2 were in Mode 1 (Power Operation) at 100 percent power.

II. Description of Problem

A. Summary

On March 14, 1997, at 1601 PST, with Units 1 and 2 in Mode 1 at 100 percent power, PG&E determined that the residual heat removal (RHR) system (BP) had operated in a condition that was outside the design basis of the plant. Administrative controls did not require sufficient refueling water storage tank (RWST) (BP)(TK) level channels (BP)(LI) availability to meet the single active failure criteria and ensure the automatic tripping function for the RHR pumps (BP)(P) during transfer to recirculation. A 1-hour, non-emergency report was made to the NRC at 1648 PST, in accordance with 10 CFR 50.72 (b)(1)(ii)(B).

On March 19, 1997, at approximately 1200 PST, PG&E verified that the administrative controls could also have allowed Unit 2 to operate in a condition that permitted a single active failure to prevent the automatic start or cause the premature tripping of the RHR pumps. The 1-hour, non-emergency report was updated on March 19, 1997, at 1300 PST.

B. Background

The emergency core cooling system (ECCS)(BP)(BQ) consists of two high-head centrifugal charging pumps (CCPs)(P), two intermediate-head safety injection (SI) pumps (BP)(P), and two low-head RHR pumps(BP)(P). During a loss-of-coolant accident (LOCA), an SI signal is generated which starts the CCPs, SI pumps, and RHR pumps. The pumps take suction from the RWST and inject borated water into the reactor coolant system (RCS) (AB) for core cooling. The containment spray system (CSS) pumps (BE)(P) also take suction from the RWST and spray the containment atmosphere to reduce containment pressure. CSS water and the water escaping from the RCS collect in the containment recirculation sump.

When the RWST reaches the low-level alarm/trip setpoint, the RHR pumps receive an automatic trip signal. The trip signal is generated when two-out-of-three RWST level channels indicate less than or equal to 33

TEXT

percent. The CCPs, SI pumps, and the CSS pumps continue to draw water from the RWST. Following the trip of the RHR pumps, the operators manually realign their suction lines to the containment recirculation sump and restart the pumps.

Final Safety Analysis Report (FSAR) Amendment 16, dated August 1974, indicated that a two-out-of-three logic is used for the RWST level channels to initiate an RHR pump trip. This FSAR amendment indicated that each channel provides independent indication on the main control board, thus meeting the requirements of paragraph 4.20 of IEEE 279 - 1971.

The Safety Evaluation Report (SER) dated October 16, 1974, stated: "As a result of our review, the applicant will revise his design to provide automatic tripping of the low pressure injection (RHR) pumps when the RWST level decreases to a specified low level ... The revised design will also include three level instruments." The SER also stated that the instrumentation used "must meet the requirements of IEEE Std 279-1971."

Supplemental SER Number 2, dated May 9, 1975, noted that the NRC reviewed the RWST design in accordance with IEEE 279-1971 and found it acceptable.

Technical Specification (TS) 3.3.3.6, Table 3.3-10, "Accident Monitoring Instrumentation," Instrument 8, requires two RWST level channels with a minimum of one operable in Modes 1, 2 (Startup), and 3 (Hot Standby). The purpose of this TS is to assure adequate information is available to the operator to make decisions regarding switchover to recirculation mode.

TS 3.5.2, "Emergency Core Cooling Systems (ECCS) Subsystems - Tavg Greater Than or Equal to 350°F," requires two ECCS subsystems operable in Modes 1, 2 and 3. RHR pumps are required components of the ECCS. If one ECCS subsystem is inoperable, TS 3.5.2, Action a. requires restoration of the inoperable ECCS subsystem to operable status within 72 hours.

Surveillance Test Procedure V-7B, "Test of Engineered Safeguards Valve Interlocks and RHR Pump Trip From RWST Level Channels," provides instructions for functionally testing the RHR pumps tripping logic generated in the RWST level channel circuits.

TEXT

C. Event Description

On March 14, 1997, PG&E determined that administrative controls did not require sufficient RWST level instrument channels to adequately ensure availability of the automatic tripping function of the RHR pumps during transfer to recirculation. With one RWST level channel cut-out (removed from input to trip logic), or failed in a nontripped condition, a single active failure to a nontripped condition on one of the other two RWST level channels would prevent the two-out-of-three logic low RWST level RHR pump trip. At 1601 PST, with Units 1 and 2 in Mode 1 at 100 percent power, PG&E determined that the potential loss of the automatic tripping function for the RHR pumps is a condition outside the design basis of the plant. A 1-hour, non-emergency report was made to the NRC at 1648 PST, in accordance with 10 CFR 50.72 (b)(1)(ii)(B). This report was based on preliminary evaluations that operator response could be insufficient to prevent RWST level from dropping below the design basis level.

On March 14, 1997, administrative controls were established to require three operable channels of RWST level in Modes 1 through 4 (Hot Shutdown). These administrative controls will remain in affect until the TS are revised to ensure that three RWST channels are available.

During a review of past operability, PG&E confirmed that on several previous occasions a single RWST level channel was out of service (OOS). If a single active failure of one of the two other channels occurred, the automatic RHR trip function could be lost. During a large-break or medium-break LOCA, the operator response could be insufficient to prevent RWST level from dropping below the design basis level.

On March 19, 1997, at approximately 1200 PST, PG&E verified that Unit 2 had operated in a condition that permitted a second failure scenario involving the premature tripping or failure of the automatic start function for the RHR pumps. The second failure scenario involved one RWST level channel failing low, or being in the tripped condition, in conjunction with a single active failure low on one of the other two level channels. With two channels providing low signals, the two-out-of-three RHR pump trip logic is actuated, tripping any running RHR pump and preventing the automatic start of both RHR pumps. The 1-hour non-emergency report was updated on March 19, 1997, at 1300 PST.

TEXT

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

None.

E. Dates and Approximate Times for Major Occurrences

March 14, 1997, at 1601 PST: Event date/discovery date: PG&E identified the potential failure modes of the RHR pumps automatic trip logic as a condition outside the design basis of the plant.

March 14, 1997, at 1648 PST: A 1-hour, non-emergency report was made in accordance with 10 CFR 50.72 (b)(1)(ii)(B).

March 19, 1997, at 1300 PST: The 1-hour, non-emergency report was updated to report that Unit 2 had operated in a condition that permitted a second failure scenario.

F. Other Systems or Secondary Functions Affected

None.

G. Method of Discovery

This condition was discovered by PG&E engineering while responding to a question on a related issue by an NRC resident inspector.

H. Operator Actions

None required.

I. Safety System Responses

None required.

TEXT

III. Cause of the Problem

A. Immediate Cause

The TS covering the RWST level instrumentation only requires two channels for the post-accident monitoring function. However, RWST level channels perform other safety-related functions which are not addressed by the current TS.

B. Root Cause

PG&E attributed the inadequate administrative controls to personnel failing to consider the consequences of an RWST level channel failure concurrent with another level channel in test or maintenance on the functioning of the RHR system.

IV. Analysis of the Event

The RWST level channels are used to provide an automatic trip of the RHR pumps on low RWST level following a LOCA to allow adequate time for operators to manually transfer to the recirculation alignment. Inappropriate operation of this function could result in a failure to automatically trip the RHR pumps, failure to automatically start the RHR pumps, or inappropriate tripping of running RHR pumps.

Since only two of the three RWST level channels were administratively controlled to limit channel OOS time, there were several instances when the third channel was OOS. Evaluation of the potential channel conditions for postulated accident scenarios involving a single active failure of a RWST level channel follows.

RWST Channel Failed High or Cut-out

With one RWST level channel OOS in a failed condition other than low, or in a cut-out condition, in conjunction with a postulated LOCA and a single active failure of one of the other two channels to a condition other than low, the automatic RHR pump trip would not occur. This could result in the failure of both RHR pumps to trip and result in the RWST minimum water level margin being exceeded. In such an event, as demonstrated by simulator scenarios, operators would be observing the RWST level and would manually trip the RHR pumps as part of the transfer to recirculation mode in accordance with approved emergency operating procedures (EOP). The RWST low-level alarms were not

affected by the failure and would function to alert the operators to take manual action.

RWST Channel Failed Low

An RWST level channel OOS in a failed low condition in conjunction with a postulated LOCA and a single active failure of one of the other two channels to a low condition would prevent the RHR pumps from starting automatically or result in the premature tripping of the RHR pumps. A loss of power to an RWST level transmitter will cause the level channel to fail low.

TS Guidance

The current TS allows one RWST channel to be inoperable indefinitely, two channels to be inoperable for seven days, and all three channels to be inoperable for up to 48 hours. The current TS for ECCS equipment has a 72 hour allowed outage time (AOT) for one ECCS subsystem. Based on this, the administrative controls for the RWST channels should have required all three channels to be operable, with an AOT of up to 72 hours for one channel. The OOS channel should be required to be placed in the cut-out position within 6 hours. Thus, if all three RWST level channels had been properly controlled, the inoperability of one channel for up to 72 hours would be acceptable, as there would have been no requirement to assume a single active failure during the AOT.

Past Operability Review

Prior to the discovery of this condition, there were no administrative requirements to restore a single OOS channel within 72 hours. The channel OOS times were reviewed for the past five years, which is the time period that the TS tracking data was automated and readily available. The review of TS tracking sheets showed no occurrences when two channels were OOS at the same time, but did show that there were four occurrences during which a single RWST level instrument channel was OOS in excess of 72 hours. These four cases were evaluated as follows:

Case 1

The TS tracking sheet indicated that in November 1996, level transmitter 921 in Unit 1 was OOS for 77.1 hours. Thus, the 72 hour LCO was exceeded by 5.1 hours. However, further review indicated that the actual time the channel was

nonfunctional was less than 72 hours. With the current administrative controls, there would be no requirement to assume a single active failure for this condition. Therefore, there is no safety impact for this case.

Case 2

The TS tracking sheet indicated that in April 1992, level transmitter 922 in Unit 2 was OOS for 121.7 hours. Work was started on the channel, but the channel was returned to service and functional, though not declared operable, for a weekend. The following week, the channel was bypassed and the work completed. The nonfunctional period was less than 72 hours. With the current administrative controls, there would be no requirement to assume a single active failure for this condition. PG&E believes the channel would have performed its RHR pump trip function and/or automatic start function if required during the weekend.

Case 3

The TS tracking sheet indicated that in May and June 1994, level transmitter 920 in Unit 1 was OOS for 507 hours. This data is misleading. The channel was functional during the entire 507 hours. Because the RWST was filled to near the high level alarm setpoint in preparation for filling the refueling canal, the high level alarm on one channel was actuating so often it became a nuisance. The channel was declared inoperable and the high alarm was defeated until the RWST water level was returned to normal. However, the channel's low level alarm and trip function remained in service, providing the channel's safety-related functions during the entire 507 hours.

Case 4

The TS tracking sheet indicated that in August 1992, level indicator 920 in Unit 2 was OOS for 296 hours. However, examination of clearance documents showed that the actual time the channel was OOS was 153 hours. For this event, the channel was placed in the trip mode, so that a single active failure low would have prevented the automatic start of both RHR pumps, or resulted in the early tripping of both RHR pumps. Either of these events could have resulted in inadequate cooling of the core. Successful surveillance tests performed for the other two channels prior to and subsequent to this event along with their 99.4 percent availability factor provide a reasonable degree of assurance that both channels would have performed their intended safety function if they had been called upon. Additionally, a probabilistic risk assessment (PRA) calculation

shows the probability of a large or medium break LOCA at the same time as the failure of a second RWST level instrument during this worst case, 153 hours, is approximately 6.1 times E-8.

Summary

1. A review of clearance records did not show any times when two or more RWST level channels were inoperable at the same time.

2. Cases 1 and 2 above involved events with a single channel OOS for less than 72 hours. Using the current administrative guidance, this is acceptable.

3. Case 3 above did not affect the RWST level channel's safety function.

4. Case 4 above could have resulted in inadequate core cooling. However, successful surveillance tests performed for the other two channels prior to and subsequent to this event along with their 99.4 percent availability factor provide a reasonable degree of assurance that both channels would have performed their intended safety function if they had been called upon.

Thus, the health and safety of the public was not affected by this condition.

V. Corrective Actions

A. Immediate Corrective Actions

Operations issued a shift order requiring that an inoperable RWST level channel be cut-out within six hours of identification of the inoperable condition.

PG&E completed an interpretation of TS 3.3.3.6 regarding operator actions when an RWST level channel is declared inoperable. The TS interpretation explicitly directs operators to place the inoperable RWST level channel in "cutout" within 6 hours of declaring the level channel OOS, and if after 72 hours the channel is not returned to service, the operators must place the plant in Mode 3 (Hot Standby) within the next 6 hours and in Mode 5 (Cold Shutdown) within the next 30 hours.

TEXT

B. Corrective Actions to Prevent Recurrence

A license amendment request was submitted to include all three RWST channels in the RWST TS. Until the TS change is issued, administrative guidance has been implemented to control RWST channel availability and OOS conditions.

No additional corrective actions are deemed necessary.

VI. Additional Information

A. Failed Components

None.

B. Previous LERs on Similar Problems

LER 1-97-001-00. The component cooling water (CCW) system has operated with procedural guidance that permitted operation in a condition outside the design basis of the plant. The cause of the event is unknown, but it occurred during the original design of the plant. The cause is attributed to incomplete or incorrect application of the single failure criteria design requirement to the auxiliary salt water (ASW) and CCW systems operation during post-accident split train, hot leg recirculation. EOP E-1.4, "Transfer to Hot Leg Recirculation," was revised to no longer require immediate separation of the ASW and CCW systems into separate trains after the transfer to hot leg recirculation. Since this action did not affect the TS or the RWST level channels, this corrective action could not have prevented the current event.