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SUBJECT: LER 95-013-01:on 951010,CCW sys may have operated outside of its design basis due to limited capacity of auxiliary saltwater sys combined w/increases in calculated heat load into CCW sys.STP R-20 has been revised.W/970213 ltr.

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February 13, 1997

PG&E Letter DCL-97-003

U.S. Nuclear Regulatory Commission
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Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82
Diablo Canyon Units 1 and 2
Licensee Event Report 1-95-013-01
Component Cooling Water (CCW) System May Have Operated Outside of Its Design Basis Due to the Limited Capacity of the Auxiliary Saltwater System Combined With Increases in the Calculated Heat Load into the CCW System

Dear Commissioners and Staff:

Pursuant to 10 CFR 50.73(a)(2)(ii)(B), PG&E is submitting the enclosed revision to Licensee Event Report 1-95-013, which reported that the component cooling water system may have operated outside of its design basis. This revision is being submitted to provide the root cause for the condition and to provide an analysis of the safety consequences of the condition. There are no revision bars in this revision since Revision 0 consisted of an abstract with no narrative section.

This event did not adversely affect the health and safety of the public.

Sincerely,

Lawrence F. Womack

cc: L. J. Callan
Steven D. Bloom
Kenneth E. Perkins
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Diablo Distribution
INPO

200043

Enclosure
N0001930/dps/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 14

TITLE (4) Component Cooling Water (CCW) System May Have Operated Outside of Its Design Basis Due to the Limited Capacity of the Auxiliary Saltwater System Combined With Increases in the Calculated Heat Load into the CCW System

EVENT DATE (5) MON	DAY	YR	LER NUMBER (6) YR	SEQUENTIAL NUMBER	REVISION NUMBER	REPORT DATE (7) MON	DAY	YR	OTHER FACILITIES INVOLVED (8) FACILITY NAMES	DOCKET NUMBER (S)
10	10	95	95	0 1 3 -	0 1	2	13	97	Diablo Canyon Unit 2	0 5 0 0 0 3 2 3
										0 5 0 0 0

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)(ii)(B)

OTHER -

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

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER AREA CODE	
Vickie 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 NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
[X] YES (If yes, complete EXPECTED SUBMISSION DATE)	[ ] NO		12	31	97

ABSTRACT (16)

On October 10, 1995, at 1700 PDT, with Unit 1 defueled and Unit 2 in Mode 1 (Power Operation) at 100 percent power, a review of performance testing results determined that a residual heat removal heat exchanger thermal performance was more efficient (nonconservative) than had been assumed in the component cooling water (CCW) system analysis. On October 10, 1995, at 1715 PDT, this condition was reported to the NRC for Unit 1 as a 4-hour, nonemergency report in accordance with 10 CFR 50.72(b)(2)(i), and for Unit 2 as a 1-hour, nonemergency report in accordance with 10 CFR 50.72(b)(1)(ii)(B).

This event was caused by the limited capacity of the auxiliary salt water (ASW) system. Increases in the calculated heat load into the CCW over the past 20 years resulted in a decrease in the design margin in the CCW system to a minimum.

Compensating measures include the revision of plant procedures to provide guidance to assure additional cooling in the CCW and ASW systems and to ensure that the refueling water storage tank temperature is consistent with compensatory Engineering evaluations. Additional long term actions are being implemented to restore margin to the CCW and ASW systems. This LER will be revised to report these actions.

I. Plant Conditions

Unit 1 was defueled and Unit 2 was in Mode 1 (Power Operation) at 100 percent power. Both Units 1 and 2 have operated in various modes with the potential for the condition described in this LER.

II. Description of Problem

A. Summary:

On October 10, 1995, at 1700 PDT, with Unit 1 defueled and Unit 2 in Mode 1 at 100 percent power, a review of thermal performance testing results determined that Residual Heat Removal (RHR) Heat Exchanger (BP)(HX) 1-1 was more efficient than had been assumed in the design basis analysis. For component cooling water (CCW) system (BI) overheating analysis, this is nonconservative.

On October 10, 1995, at 1715 PDT, this condition was conservatively reported to the NRC for Unit 1 as a 4-hour, nonemergency report in accordance with 10 CFR 50.72(b)(2)(i), and for Unit 2 as a 1-hour, nonemergency report in accordance with 10 CFR 50.72(b)(1)(ii)(B).

B. Background:

The CCW system is designed to provide normal plant operational and postaccident cooling to the containment fan cooler units (CFCUs) (BK)(CLR), RHR HXs, skid coolers (SJ)(CLR) for the centrifugal charging pumps (CCPs) (SJ)(P), safety injection (SI) pumps (BQ)(P), CCW pumps(BI)(P), RHR pumps (BP)(P), and post-accident sampling system coolers (IP)(CLR). Additionally, the CCW system removes heat from nonvital components via the system's nonvital C Header. The waste heat from the vital and nonvital components is rejected to the ultimate heat sink via the auxiliary saltwater (ASW) system (KE). Under accident conditions, the cooling water flow to the nonvital loads is automatically isolated by closure of flow control valve 355. The Final Safety Analysis Report (FSAR) Update and Supplemental Safety Evaluation Report (SSER) Number 16 contain a 132 °F upper limit, remaining above 120 °F for no more than 20 minutes, to assure availability of vital equipment.

The CCW system temperature is a function of several factors, including the heat loads on the system, the number of CCW HXs inservice, the number of ASW pumps inservice, as well as the temperature of the ultimate heat sink. Following a design basis large break loss of coolant accident (LOCA) or main steam line break

(MSLB), large amounts of energy are released into containment. This significantly increases the heat load placed on the CCW system by the CFCUs. The heat load on the system is further increased when the RHR HXs are placed in operation to cool the water collected in the containment sump.

PG&E letters dated March 18, April 4, and May 18, 1983, provided the results of a reanalysis of the heat removal capability of the CCW system, assuming the worst design basis heat load resulting from a LOCA and the most limiting single active failure. The NRC's review of the reanalysis is documented in SSER 16. Subsequent to that analysis, several conditions, such as those documented in PG&E letters DCL 88-215, dated September 13, 1988, and DCL 92-148, dated June 29, 1992, have reduced the reported margin in the 1983 analysis of the CCW system. Each of these conditions were due to changes in assumptions made in the 1983 analysis. Actions taken following these submittals include performance of a new Westinghouse mass and energy release model for post-LOCA containment analysis, a review of the CCW overheating analysis, and revisions to emergency operating procedures.

In 1995, a new CCW overheating analysis was performed by Westinghouse using the new LOCA mass and energy release model to demonstrate that a single ASW pump and a single CCW HX provide sufficient cooling to maintain the CCW temperature within its design basis limits assuming the most limiting accidents. This analysis is conservative since, as stated in the FSAR Update, a second CCW HX is credited to be placed inservice within 20 minutes. The analysis assumed that the ASW pump flow rate satisfied the requirements of Surveillance Test Procedure (STP) M-26, "ASW System Flow Monitoring," and design CFCU and RHR HX fouling factors of 0.0005 and 0.0008, respectively. The Westinghouse analysis identified three accident scenarios which resulted in the limiting CCW temperature transients. These were:

1. An MSLB with an assumed failure of the secondary side isolation which results in high CCW temperatures in the short term. Following the isolation of the faulted steam generator, containment and the CCW system cool rapidly.

2. A LOCA with a failure of an ASW pump which results in the worst case CCW temperature transient during the injection phase.

3. A LOCA with a failure of Solid State Protection System (SSPS) Train A which results in the worst case CCW temperature transient in the recirculation phase of an accident.

The analysis performed for the LOCA with an SSPS Train A failure, concluded that the CCW temperature would remain below 132 °F but would exceed 120 °F for greater than 20 minutes (26.1 minutes), assuming no operator action to align a second CCW HX.

Technical Specification (TS) 3.5.5, "Emergency Core Cooling Systems - Refueling Water Storage Tank," specifies the operability of the refueling water storage tank (RWST) to ensure an adequate supply of borated water is available to cool and depressurize the containment in the event of a design basis event.

TS 3/4.6.2.3, "Containment Systems - Containment Cooling System," specifies the operability of the CFCUs to ensure that adequate containment heat removal capacity is available when operated in conjunction with the containment spray systems during post-LOCA conditions.

TS 3/4.7.3.1, "Plant Systems - Vital Component Cooling Water System," specifies the operability of the vital CCW system to ensure that sufficient cooling capacity is available for continued operation of safety-related equipment during normal and accident conditions.

TS 3/4.7.12, "Plant Systems - Ultimate Heat Sink," specifies the operability of the ultimate heat sink to ensure the CCW temperature remains equal to or less than 132 °F during any condition assumed in the safety analysis. One CCW HX is required to be inservice when the ocean temperature is 64 °F or less. Two CCW HXs are required inservice when the ocean temperature is greater than 64 °F. If the reactor coolant system temperature is less than 350 °F, one CCW HX inservice is adequate even if the ocean temperature is greater than 64 °F.

STP M-26 verifies that the ASW flow through the CCW HXs is sufficient to meet design basis requirements of the ASW and CCW systems.

Operating Procedure (OP) F-2.III, “Component Cooling Water System Shutdown and Cleaning,” ensures that during CCW HX maintenance, either the opposite unit's standby ASW pump through the unit crosstie valve, the second ASW pump, or the second CCW HX can be returned to service within 20 minutes by manual operator action. An alternate maintenance compensatory action is the performance of Plant Engineering Procedure (PEP) M-229, "Evaluation to Allow Taking Credit for a Single Train ASW for a Specific Duration of Time for Maintenance/Operations Evolutions," to ensure CCW system capability.

STP R-20, "Boric Acid Inventory," provides for the measurement of the RWST water volume, boron concentration, and temperature to meet TS 3.5.5 and design requirements.

C. Event Description:

Generic Letter 89-13 allows exemption of closed cooling water systems with good chemistry controls from performance testing. The CCW system is a closed cooling system which has historically maintained good chemistry control with the use of chromate as both a corrosion inhibitor and an effective biocide. The chromates were changed in 1991 to a more environmentally acceptable molybdate-based inhibitor. Since this change, a concern was raised that microbe growth may have degraded heat transfer capabilities.

PG&E conducted a number of tests and inspections to better understand the microfouling and its effect on heat transfer capability. A thermal performance test was conducted on RHR HX 1-1 during the cooldown phase at the start of the Unit 1 seventh refueling outage (1R7). The test results indicated that the HX was capable of transferring more heat to the CCW system than assumed in safety analysis calculations because of a lower than expected fouling factor.

The HXs are sized to ensure that fouling does not degrade the HX performance to below design specifications. LOCA analyses assume that heat transfer capability is reduced due to fouling. The assumed design fouling factor is 0.0008 hr-ft^2-°F/Btu (0.0005 hr-ft^2-°F/Btu on the shell side plus 0.0003 hr-ft^2-°F/Btu on the tube side). This assumption is conservative with respect to containment analysis, but is nonconservative in the CCW system overheating analysis. Based on an analysis of the 1R7 test results, it was judged that the use of a fouling factor as low as 0.0001 hr-ft^2-°F/Btu was appropriate.

Because of similar water chemistry conditions, it is conservatively assumed that the same condition exists for the other RHR HX and for the CFCUs, so that they also reject heat to CCW at a higher rate than assumed in the analysis. The CFCU design fouling factor is 0.0005 hr-ft^2-°F/Btu. At the same time, the fouling factor for the CCW HX is conservatively assumed to be at its design value of 0.001. Finally, because the same water chemistry control program is in effect for both units, this concern was conservatively assumed to exist on Unit 2.

These lower fouling factors were used to assess the heat input to the CCW system from the RHR HXs and the CFCUs. The FSAR Update and SSER 16 contain a 132 °F upper limit, remaining above 120 °F for no more than 20 minutes

to assure availability of vital equipment. An analysis using a new Westinghouse containment mass and energy release methodology showed that the FSAR Update and SSER CCW temperature limits could have been exceeded during the LOCA recirculation phase if only one CCW HX was in operation (during CCW HX maintenance). PG&E has judged that the CCW system would also have exceeded the temperature limits stated in the FSAR Update and SSER 16 if the old containment mass and energy release methodology had been used.

On October 10, 1995, at 1715 PDT, this condition was conservatively reported to the NRC as a 4-hour, nonemergency report in accordance with 10 CFR 50.72(b)(2)(i) for Unit 1, and as a 1-hour, nonemergency report in accordance with 10 CFR 50.72(b)(1)(ii)(B) for Unit 2. A preliminary operability evaluation (OE) was issued with applicable compensatory measures.

On November 17, 1995, a formal OE was approved and compensatory measures were established to ensure that the CCW temperature profile remains within its design limits until corrective actions can be completed to provide additional CCW system design margin.

PG&E letter DCL 95-265, dated December 11, 1995, submitted the new Westinghouse containment analysis using the new mass and energy release methodology to the NRC and committed to perform 10 CFR 50.59 evaluations to include the new Westinghouse containment analysis in the Units 1 and 2 design basis. PG&E letter DCL 95-265, also committed that a 10 CFR 50.59 evaluation would be performed to reflect the new design basis in the next scheduled revision of the FSAR Update. The 10 CFR 50.59 evaluations were approved and became the design basis of record on January 17, 1996. The FSAR Update was issued on November 25, 1996, via PG&E Letter DCL 96-225.

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

None.

E. Dates and Approximate Times for Major Occurrences:

1. October 10, 1995, at 1700 PDT: Event date/discovery date - Evaluation of HX test results determine RHR HX heat transfer coefficient is nonconservative.

2. October 10, 1995, at 1715 PDT: Condition was reported to the NRC as a 4-hour, nonemergency report in accordance with 10 CFR 50.72 (b)(2)(i) for Unit 1, and a 1-hour, nonemergency report in accordance with 10 CFR 50.72 (b)(1)(ii)(B) for Unit 2.

F. Other Systems or Secondary Functions Affected:

None.

G. Method of Discovery:

After changing the inhibitors used to maintain chemistry control of the closed loop CCW system, PG&E observed microfouling. A thermal performance test of RHR HX 1-1 initiated to evaluate the effect of microfouling identified that the heat transfer capability of the RHR HX was nonconservative relative to that used in the CCW overheating analysis.

H. Operator Actions:

None.

I. Safety System Responses:

None.

III. Cause of the Problem

A. Immediate Cause:

The heat transfer coefficient for the RHR HXs and CFCUs is greater than the heat transfer coefficient used in the CCW system analysis. Actual fouling was significantly less than the fouling factor used in the design basis analysis. This was nonconservative for evaluating the maximum CCW temperature profile conditions.

B. Root Cause:

This event was caused by the limited capacity of the ASW system. Increases in the calculated heat load into the CCW system since 1983 have reduced the design margin in the system to a minimum.

IV. Analysis of the Event

Evaluation of the following conditions have been performed as discussed below:

- New containment analysis (without compensatory measures)
- New containment analysis (with compensatory measures)
- Old containment analysis (without compensatory measures)
- Evaluation of lower fouling factors on other heat loads

A. New Containment Analysis (without compensatory measures):

The assumed reduction in the fouling of the CFCUs and RHR HXs to 0.0001 results in an increase in the heat transferred into the CCW system. This results in higher post-accident CCW system temperatures. To assist in evaluating the impact of the reduced fouling factors on the CCW temperature transient, Westinghouse determined the CCW temperature profile which results from various postulated scenarios. This work was performed using the new Westinghouse mass and energy release methodology. An RWST temperature of 90 °F was assumed for all cases. A PG&E calculation demonstrates that the water in the RWST has never exceeded this temperature. Each of the limiting scenarios is discussed below.

1. Effect of Reduced Fouling on CCW Temperatures Following an MSLB:

The analysis of the impact of the lower fouling factor on the results of the MSLB analysis indicates that the CCW temperature reaches a peak of 132.09 °F before dropping rapidly. This is essentially equal to the design basis CCW temperature limit. The analysis was performed by conservatively estimating that the CFCU heat input increases by 20 percent as a result of the decreased fouling. Westinghouse CFCU analysis demonstrated that the actual increase in heat transfer would be less, and therefore it is judged that the peak CCW temperature would be less than 132 °F. Additionally, it should be noted that the normal standby configuration of the ASW system is such that both ASW pumps will initially pump through the operating CCW HX. The Westinghouse analysis assumed the operation of a single ASW pump.

Because the MSLB transient included a single failure, there will be two ASW pumps available to mitigate this accident. Accordingly, the results of the MSLB analysis are conservative, and the CCW design basis temperature limits will not be exceeded.

2. Effect of Reduced Fouling on CCW Temperatures During LOCA Injection Phase:

   Westinghouse analysis, using the new mass and energy release methodology, determined that the limiting LOCA injection phase accident resulted in peak CCW temperatures that were lower than the MSLB case. It is judged that the MSLB would remain the bounding short term temperature transient even with the new lower fouling factors. Because Westinghouse has demonstrated that the CCW design basis temperature limits were not exceeded by the MSLB, it can be concluded that the LOCA injection phase transient is acceptable as well.

3. Effect of Reduced Fouling on CCW Temperatures During LOCA Recirculation Phase:

   The impact of the lower CFCU and RHR HX fouling on the LOCA recirculation phase accident with an assumed failure of SSPS Train A was evaluated. The alignment of the second CCW HX at the start of recirculation keeps the CCW temperature profile within its design basis limits. Although not credited, operator alignment of the second ASW pump would have further reduced the peak CCW temperature transient. Therefore, the decreased fouling does not result in exceeding the CCW design basis temperature limit for this limiting scenario.

4. Effect of Maintenance of the CCW HX on CCW Analysis:

   In addition to the cases discussed above, the maintenance of a CCW HX within the 72 hour TS allowed outage time action statement with no additional single active failures was evaluated.

   Existing CCW HX clearance practices resulted in having only a single ASW pump providing flow to a single CCW HX when the other HX is in maintenance. Existing recirculation phase analyses assumed that a second CCW HX would be aligned within 20 minutes. Depending on the actual maintenance under way, it may not have been possible to align the second HX in 20 minutes.

To analyze the condition that existed before compensatory measures were implemented, Westinghouse performed an analysis assuming only one ASW pump and one CCW HX were available. A reduced RHR HX fouling factor and a 20 percent increase in CFCU heat load were conservatively assumed as an estimate of the impact of reduced fouling. Although no single active failure needs to be postulated, the analysis also assumed that an SSPS train failure had occurred. This analysis predicts a peak CCW temperature less than 132 °F, but the temperature remains above 120 °F for approximately 139 minutes. This exceeds the design basis limit of 20 minutes. Note that this analysis was performed using the new containment mass and energy release methodology. It is judged, that had the above case been run without the additional single active failure of the SSPS train, the CCW system would still have exceeded 120 °F for more than 20 minutes. It is also judged that CCW temperature would still have exceeded the design basis temperature limits using the old containment mass and energy release methodology. Therefore, Unit 1 and/or Unit 2 may have operated in a condition outside the design basis of the plant.

Acceptability of this past condition is demonstrated by the following evaluation of equipment. A review of the RHR, SI, and CCW pumps performed by Westinghouse in 1994, indicated that these pumps would be qualified for operation at, or above, 120 °F for as much as six hours. The Westinghouse qualification of the CCPs for the higher CCW temperature was based on a minimum flow to the skid coolers. Skid flow measurements indicate that the actual flow to the coolers may be less than that used to qualify the CCPs. PG&E has demonstrated, that the impact of the reduced flow rates would be small, and therefore the CCPs would be capable of performing their design basis function. The CCW pumps were reviewed by Sulzer-Bingham, the pump manufacturer, and they indicated that the pumps can operate with elevated cooling water temperatures as high as 140 °F for up to 24 hours. PG&E is presently in the process of incorporating these higher temperature limits into the CCW system design basis. Based on the vendor input, and supported by PG&E's analysis, it is judged that operation above the existing limit temperature of 120 °F for a period of 139 minutes would not have prevented the CCW system from performing its design basis function in the event of a design basis accident while performing maintenance activities on the CCW HX.

It should be noted that the CCW temperature profile for the CCW HX cleaning scenario, without compensatory measures evaluated above, was

provided by Westinghouse for information only. A similar evaluation was performed using the same assumptions except that an RWST temperature of 80 °F was used. This evaluation was checked and the results were provided in the same reference. A comparison of the checked and unchecked cases shows a consistency of the results relative to the design inputs. This provides confidence that the unchecked cases may be used as the basis for the engineering judgments made above.

B. New Containment Analysis (with compensatory measures):

As discussed previously in this LER, compensatory measures have been taken to prevent the CCW system from exceeding its design basis temperature limits during periods when a CCW HX is in maintenance. This includes a revision to STP R-20 to assure that the RWST temperature does not exceed 80 °F. In addition, the procedure for clearing a CCW HX has been revised to assure that adequate ASW flow will be available to prevent CCW overheating. This is accomplished by either assuring that a second ASW pump can be aligned within 20 minutes or by verifying that the ASW flow from one pump is high enough to prevent the CCW system from exceeding its design basis temperature limits. These compensatory measures are adequate to ensure the design basis is met when evaluated with the new containment analysis and will remain in effect until the CCW temperature margin is increased.

Several analyses were performed assuming a fouling factor of 0.0001 hr-ft^2-°F/Btu for both the RHR HX and the CFCUs and a reduction in RWST temperature to 80 °F as discussed below. These analyses conservatively assumed an SSPS train failure had also occurred.

One analysis was run assuming a second ASW pump is available before the start of the recirculation phase. This case meets design basis requirements; staying over 120 °F for only 7 minutes.

Other analyses were performed to determine how much ASW flow is required for a given ASW temperature assuming only one ASW pump is running. These analyses produced a table of required ASW flow as related to temperature for one ASW pump and one CCW HX operation. These required flows are higher than those verified by the ASW STP M-26. This table was incorporated into PEP M-229. An evaluation can be performed using PEP M-229 along with flows measured by the ASW STP and other factors to allow a CCW HX to be taken out-of-service.

Current compensatory measures assure that either the evaluation discussed above is performed or measures are taken to ensure that a second ASW pump (crosstied from the other unit) can be aligned before the start of recirculation.

C. Old Containment Analysis (without compensatory measures):

Although the new mass and energy release analysis methodology did not become part of the Diablo Canyon Power Plant design basis until January 17, 1996, the old Westinghouse mass and energy release methodology was not used in evaluating this event. The new analysis is considered more accurate and realistic than the old analysis. As discussed above, the new analysis demonstrates that the CCW system would have performed its design basis function following a design basis accident even before compensatory measures were in place. Thus, the old analysis methodology is not needed to evaluate past operability and the health and safety of the public were not affected by this event.

D. Evaluation of Lower Fouling Factors on Other Heat Loads:

The heat input to the CCW system following a LOCA or MSLB comes primarily from the RHR HXs and the CFCUs. The impact of lower fouling factors on these components has already been analyzed. The balance of the vital component heat loads are small by comparison, and therefore the impact of lower fouling on these components would not significantly alter the CCW temperature profile.

CCW has a nonvital C Header which provides cooling to nonvital components. In the event of a large break LOCA or MSLB, a signal is generated to isolate the C Header. Accordingly, the potentially lower fouling of the C Header components would only impact the CCW temperature transient if the C Header fails to automatically isolate, and then only until the beginning of the recirculation phase when the C Header is manually isolated. An evaluation of the failure of C Header to isolate during a large break LOCA injection phase was conducted and it was judged that there is enough margin to accommodate lower fouling without exceeding the CCW temperature limits. Further, the limiting MSLB includes a failure of the secondary side isolation. Accordingly, the additional failure of the C Header to isolate does not need to be postulated.

The scenarios evaluated for this event bound all operating evolutions the plant has experienced. Though for some scenarios, the design temperature would be exceeded, all equipment would have fulfilled its design functions. Thus, the health and safety of the public were not affected by this event.

V. Corrective Actions

A. Immediate Corrective Actions:

The following compensatory measures were initiated and will remain in force until a design change increasing the CCW temperature margin is implemented.

1. Initially, the second CCW HX was aligned and left in operation. Subsequent analysis, however, determined that placing one CFCU in manual would achieve a similar result with less potential adverse effects. Therefore, one CCW HX was placed in operation and one of the five CFCUs was administratively removed from service (cleared) to the shift supervisor. This action is no longer required due to the new containment analysis 10 CFR 50.59 evaluation approved on January 17, 1996.

2. OP F-2.III has been revised to ensure the capability for return-to-service of either the opposite unit's standby ASW pump through the unit crosstie valve, the second ASW pump, or the second CCW HX within 20 minutes. If the above can not be assured, an engineering evaluation for ASW single train capability per PEP M-229 is performed for the maintenance activity.

3. STP R-20 has been revised to assure that the RWST water temperature is not more than 80 °F.

B. Corrective Actions to Prevent Recurrence:

1. PG&E, in conjunction with Westinghouse, is in the process of evaluating the variables used in the CCW analysis to verify that the values being used are appropriately conservative.

2. PG&E is preparing a design change to restore needed margin to the system. This LER will be revised when this corrective action has been implemented.

VI. Additional Information

A. Failed Components:

None.

B. Previous Similar Events:

LER 1-91-018-01, submitted on June 29, 1992, reported that the heat load on the CCW system during the cold leg recirculation phase following a LOCA could potentially exceed the heat load during the injection phase. Because the injection phase had previously been considered to be the limiting case for CCW temperature, this condition was considered to be outside the design basis of the CCW system. The root cause was attributed to personnel error. The corrective actions to prevent recurrence included additional training for design engineers to emphasize that data known to be conservative for one application, may be nonconservative for another application. These corrective actions could not have prevented the condition reported in this LER since these conditions existed before the corrective actions were effective.

LER 1-93-001, submitted on February 12, 1993, reported that under a combination of worst-case conditions and parameters, the CCW system water temperature design basis temperature limits may be exceeded. The root cause of this event was nonconservatism in the design basis analysis for the CCW system. Corrective actions were procedural revisions to improve flow balancing. These corrective actions could not have prevented the condition reported in this LER since these conditions existed before the corrective actions were effective.