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 FACIL: 50-275 Diablo Canyon Nuclear Power Plant, Unit 1, Pacific Ga 05000275
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 RECIP. NAME RECIPIENT AFFILIATION

SUBJECT: LER 93-003-01: on 930108, LTOP setpoint analysis
 nonconservatism identified due to miscommunication on
 setting parameters for LTOP.RCP operation restricted to low
 temp.W/930813 ltr.

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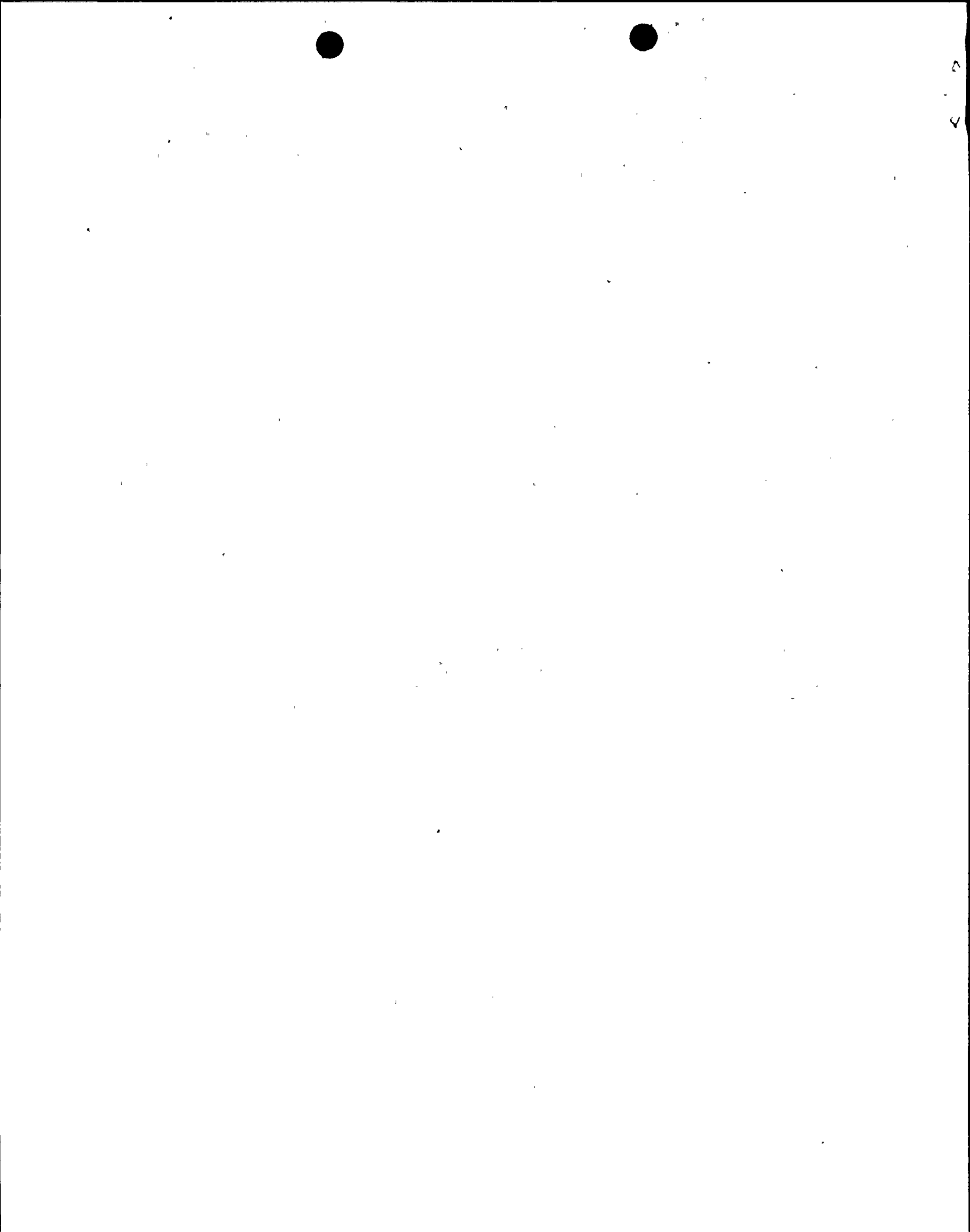
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Gregory M. Rueger
Senior Vice President and
General Manager
Nuclear Power Generation

August 13, 1993

PG&E Letter No. DCL-93-204

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

Re: Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82
Diablo Canyon Units 1 and 2
Licensee Event Report 1-93-003-01
Low Temperature Overpressure Protection Setpoint Analysis
Nonconservatism Due to Miscommunication

Gentlemen:

PG&E is submitting the enclosed revision to Licensee Event Report (LER) 1-93-003-00 concerning a low temperature overpressure protection setpoint analysis nonconservatism. This revision is being submitted to report the analysis of the event, root cause, and updated corrective actions. Revision bars are included to indicate the changes.

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

Sincerely,



Gregory M. Rueger

cc: Bobby H. Faulkenberry
Ann P. Hodgdon
Mary H. Miller
Sheri Peterson
CPUC
Diablo Distribution
INPO

DCO-93-NS-N001

Enclosure

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LICENSEE EVENT REPORT (LER)

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TITLE (4) **LOW TEMPERATURE OVERPRESSURE PROTECTION SETPOINT ANALYSIS NONCONSERVATISM DUE TO MISCOMMUNICATION**

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 NAMES			DOCKET NUMBER (S)		
01	08	93	93	- 0 0 3	- 0 1	06	01	93	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)

10 CFR 50.73(a)(2)(v)(D)
 OTHER - _____
 (Specify in Abstract below and in text, NRC Form 366A)

LICENSEE CONTACT FOR THIS LER (12)

DAVID SOKOLSKY, SENIOR NUCLEAR GENERATION ENGINEER	TELEPHONE NUMBER	
	AREA CODE 415	973-9717

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)	MONTH	DAY	YEAR
<input type="checkbox"/> YES (if yes, complete EXPECTED SUBMISSION DATE)	<input checked="" type="checkbox"/> NO			

ABSTRACT (16)

On January 8, 1993, at 1500 PST, with Units 1 and 2 in Mode 1 (Power Operation) at 100 percent power, PG&E determined that a condition existed that could have prevented the fulfillment of a safety function needed to mitigate the consequences of an accident. The pressurizer power-operated relief valve setpoint had been calculated without consideration of the pressure drop between the core beltline and the low temperature pressure sensor due to the dynamic pressure effect of running a reactor coolant pump (RCP) and the effect of elevation head. On January 8, 1993, at 1605 PST, a four-hour, non-emergency report was made to the NRC in accordance with 10 CFR 50.72(b)(2)(iii)(D).

During the review of operating experiences at another nuclear power plant, PG&E determined that a similar condition existed at Diablo Canyon.

The immediate cause was that the Westinghouse Low Temperature Overpressure Protection setpoint analysis did not consider the above-mentioned nonconservatisms. The root cause of this event was determined to be the result of miscommunication during the collaborative efforts between Westinghouse and a Westinghouse Owners Group subcommittee when establishing parameters for the LTOP setpoint analysis.

Corrective actions for this event included restricting RCP operation at low temperature conditions.

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TEXT (17)

I. Plant Conditions

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

II. Description of Event

A. Summary:

On January 8, 1993, at 1500 PST, PG&E determined that a condition existed that could have prevented the fulfillment of a safety function needed to mitigate the consequences of an accident. The pressurizer power-operated relief valve (PORV)(AB)(RV) setpoint had been calculated without consideration of the pressure drop between the core beltline and the low temperature overpressure protection (LTOP)(AB) pressure sensor (AB)(PT). Specifically, neither the dynamic pressure effect of running a reactor coolant pump (RCP)(AB)(P) nor the effect of elevation head was considered in the calculation. On January 8, 1993, at 1605 PST, this condition was reported to the NRC as a four-hour, non-emergency report in accordance with 10 CFR 50.72(b)(2)(iii)(D).

B. Background:

In late 1992, another pressurized water reactor discovered nonconservatism in the calculation determining the PORV setpoint used for LTOP. LTOP protects the reactor vessel (AB)(RPV) at low temperature by providing reactor coolant system (RCS) pressure relief through the PORVs. At lower temperatures (Modes 4 (Hot Shutdown), 5 (Cold Shutdown), and 6 (Refueling)), the PORV pressure setpoint automatically resets to a reduced value (Technical Specification (TS) 3.4.9.3) to prevent exceeding TS 3.4.9.1 (ASME/10 CFR 50, Appendix G) RCS pressure-temperature limits in the event of an RCS pressure transient.

C. Event Description:

On January 8, 1993, at 1500 PST, based on information from the reactor vendor, PG&E determined that a condition existed that could have prevented the fulfillment of a safety function needed to mitigate the consequences of an accident. The pressure difference between the wide range pressure indication location and the region of interest for the heatup/cooldown curves (typically, the core midplane elevation) was determined to not have been considered in the PORV setpoint. Further, the dynamic pressure (which varies, depending on the number and loop of operating RCPs) had been neglected.

Due to these discrepancies, the indicated wide range pressure could be lower than the local pressure at the reactor vessel - core midplane elevation by approximately 50 psi.



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A four-hour, non-emergency report was made to the NRC in accordance with 10 CFR 50.72(b)(2)(iii)(D). PG&E performed an Operability Evaluation (OE) on January 8, 1993. The OE concluded that the LTOP may not prevent Diablo Canyon from violating TS 3.4.9.1 (Appendix G) at temperatures below 107°F for the design basis mass addition transient (i.e., full unthrottled charging pump flow into a water solid RCS with only one PORV operable).

As an immediate compensatory measure, a night order was issued to the control room restricting RCP operations at low temperatures.

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

None.

E. Dates and Approximate Times for Major Occurrences:

1. January 8, 1993, at 1500 PST: Event/Discovery date. The condition was determined to be applicable to Diablo Canyon based on information from Westinghouse.
2. January 8, 1993, at 1605 PST: A four-hour, non-emergency report was made to the NRC in accordance with 10 CFR 50.72(b)(2)(iii)(D).

F. Other Systems or Secondary Functions Affected:

None.

G. Method of Discovery:

During the review of an event at another Westinghouse plant, PG&E determined that the condition was also applicable to Diablo Canyon.

H. Operator Actions:

Both units were operating at 100 percent power but no operator action was required.

I. Safety System Responses:

None.



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III. Cause of the Event

A. Immediate Cause:

The immediate cause of the event was that Westinghouse LTOP setpoint analysis did not consider the pressure drop between the core beltline and the LTOP pressure sensor. Specifically, neither the dynamic pressure effect of running an RCP nor the effect of elevation head was considered.

B. Root Cause:

The root cause was determined to be miscommunication between Westinghouse and a Westinghouse Owners Group (WOG) subcommittee when establishing initial parameters for the LTOP setpoint analysis.

IV. Analysis of the Event

The current methodology used to develop Appendix G limits for protecting against brittle failure of the RCS pressure boundary is highly conservative. For example, in the past, low temperature overpressure transients have resulted in Appendix G pressure limit violations in excess of 200 psi at several other Westinghouse plants. Exceeding the Appendix G limits requires additional evaluation to confirm continued structural integrity of the reactor vessel. Subsequent post-event Westinghouse assessments of vessel integrity showed that no integrity problems resulted from the pressure limit violations.

PG&E calculations have conservatively estimated the maximum pressure overshoot above the Appendix G limit that could occur due to the omission of the vessel pressure drop in the original LTOP analysis. The design basis mass injection transient was postulated to occur at 70°F with all RCPs and residual heat removal (RHR)(BP)(P) pumps running. This transient assumes full unthrottled flow from one charging pump, only one PORV operable, no pressurizer steam bubble, letdown isolated, and no credit is taken for the RHR system pressure relief valves. For this unlikely worst-case scenario, the maximum pressure above the Appendix G limit would be about 40 psig for the current LTOP field setpoint of 435 psig. For an LTOP setpoint at the TS limit of 450 psig, the Appendix G limit would be exceeded by 55 psi. Exceeding the Appendix G limit by 55 psi is bounded by the post-event evaluations previously performed by Westinghouse for other plants.

Also, past low temperature pressure transients which challenged the LTOP system at Diablo Canyon were reviewed. These transients were less severe than the design basis mass injection transient. For these actual events, it was concluded that no violation of the Appendix G limits occurred even after considering the effects of dynamic pressure losses or elevation head between the core beltline and the LTOP pressure sensor.



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Although no Appendix G violations occurred at Diablo Canyon, a hypothetical, plant specific post-event evaluation was performed to provide additional quantification of the available margin. Because reactor vessel embrittlement differs from plant to plant, a plant-specific evaluation is needed to justify return to power following a violation of the Appendix G limits. ASME Section III, Appendix E provides guidance on how to perform an evaluation following an overpressure transient at low temperature.

PG&E performed this evaluation for the limiting reactor vessel plate/weld using conservative fast neutron fluences corresponding to an 8-Effective-Full-Power-Year operating history. The results showed that at 70°F, a peak pressure of 808 psig could be tolerated during an unanticipated pressure transient without having to perform additional plant/event specific linear elastic fracture mechanics analyses. Since the isothermal Appendix G limit at 70°F is 520.9 psig, the allowable pressure exceeded this limit by over 280 psi. This is well above the conservative worst-case estimate of 55 psi over the limit calculated by PG&E for the TS LTOP setpoint of 450 psig.

The validity of the PG&E calculations is confirmed by the pressure drop value calculated by Westinghouse based upon a conservative set of assumptions for possible plant conditions. These assumptions include RCS temperature at 70°F, no pressurizer (AB)(PZR) steam bubble and RCPs in operation. For Diablo Canyon, the applicable pressure drop value determined by Westinghouse is 74 psi. Using an independent method, the corresponding value determined by PG&E was 77 psi.

PG&E believes that the compensatory measure restricting RCP operation at low temperatures provides adequate assurance that the health and safety of the public are not adversely affected.

V. Corrective Actions

A. Immediate Correction Actions:

1. On January 8, a night order was issued to the control room restricting RCP operation at low temperatures.
2. Operations procedures were revised to restrict RCP operation at low temperatures.

B. Corrective Actions to Prevent Recurrence:

The immediate corrective actions were determined to be sufficient to prevent recurrence. Westinghouse will include the pressure difference from the wide range pressure transmitter to the reactor vessel in their LTOP setpoint calculations, based on Westinghouse's further review of the septoint analysis. PG&E will continue to investigate Westinghouse actions taken in response to this issue.



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VI. Additional Information

A. Failed Components:

None.

B. Previous LERs on Similar Problems:

None.



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