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PG&E Letter DCL-05-086

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82
Diablo Canyon Units 1 and 2
10 CFR 50.46 Annual Report for 2004 of Emergency Core Cooling System
Evaluation Model Changes

Dear Commissioners and Staff:

Pursuant to 10 CFR 50.46, this letter provides an annual report of changes in the Westinghouse emergency core cooling system (ECCS) evaluation models that affect peak cladding temperature (PCT) calculations for Diablo Canyon Power Plant (DCPP), Units 1 and 2. There has been a bounding 5°F increase in the best estimate large-break loss of coolant accident (BELOCA) PCT results for DCPP Unit 1 and Unit 2 since the last annual report submitted via Pacific Gas and Electric (PG&E) Letter DCL-04-094, dated July 23, 2004. The small-break loss of coolant accident (SBLOCA) PCT results for Unit 1 and Unit 2 remain unchanged.

Per the commitment identified in PG&E Letter DCL-00-134, dated October 19, 2000, PG&E has performed a reanalysis for the BELOCA. The reanalysis was performed using the Westinghouse superposition step methodology approved by the NRC on March 11, 2004. PG&E is currently in the process of developing a license amendment request to revise the Technical Specifications (TS) to incorporate the Westinghouse superposition step methodology into the licensing basis and establish a new BELOCA analysis of record for Unit 1. Additionally, PG&E is performing a plant-specific BELOCA analysis for Unit 2 using the accepted methodology established in WCAP-12945-P-A, "Code Qualification Document for Best Estimate LOCA Analysis," dated 1998.

The summary of the updated PCT margin allocations and their bases are provided in the enclosure.

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The new PCT values remain within the 2200°F limit specified in 10 CFR 50.46. The Unit 1 SBLOCA and BELOCA PCT Margin Utilization Sheets are provided in Attachment A of the enclosure. The Unit 2 SBLOCA and BELOCA PCT Margin Utilization Sheets are provided in Attachment B of the enclosure. The ECCS evaluation model change that has resulted in the new PCT margin allocation is summarized in Attachment C. Attachment D contains the updated PCT values for Unit 1 using the Westinghouse superposition step methodology and is labeled "Pending Analysis of Record."

PG&E will update these DCPP Unit 1 large-break analysis-of-record PCT values after the TS revision is approved. In addition, as discussed in the enclosed report, PG&E is performing a plant-specific analysis for Unit 2 using the accepted methodology established in WCAP-12945-P-A, "Code Qualification Document for Best Estimate LOCA Analysis," dated 1998, and WCAP-16009-P-A, "Realistic Large-Break LOCA Evaluation Methodology Using the Automated Statistical Treatment Uncertainty Method (ASTRUM)," dated 2005. This analysis will be completed prior to the Unit 2 thirteenth refueling outage, currently scheduled to begin in April 2006, as discussed in PG&E Letter DCL-04-017, "Supplement to 2003 10 CFR 50.46 Annual Report of Emergency Core Cooling System Evaluation Model Changes, Unit 2 BELOCA Analysis," dated March 2, 2004.

If there are any questions regarding this report, please contact Mr. Mark Mayer of my staff at (805) 545-4674.

Sincerely,

Donna Jacobs
Vice President, Nuclear Services

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Enclosure

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**ANNUAL REPORT OF EMERGENCY CORE COOLING SYSTEM
EVALUATION MODEL CHANGES THAT AFFECT PEAK CLADDING
TEMPERATURE**

Pursuant to 10 CFR 50.46, this enclosure provides an annual report of changes in the Westinghouse emergency core cooling system (ECCS) evaluation models that affect peak cladding temperature (PCT) calculations for Diablo Canyon Power Plant (DCPP), Units 1 and 2. This report is based on changes described in the following Westinghouse 10 CFR 50.46 notification letter:

Westinghouse Letter PGE-05-19, dated March 20, 2005, "Diablo Canyon Units 1 and 2, 10 CFR 50.46 Annual Notification and Reporting for 2004."

Attachment A to this enclosure provides DCPP Unit 1 small-break loss of coolant accident (SBLOCA) and best estimate large-break loss of coolant accident (BELOCA) PCT Margin Utilization Sheets. Attachment B to this enclosure provides DCPP Unit 2 SBLOCA and BELOCA PCT Margin Utilization Sheets. While the Unit 1 and Unit 2 SBLOCA PCT results remain unchanged, there has been a bounding 5°F increase in the BELOCA PCT results for DCPP Unit 1 and Unit 2 since the last annual report submitted via Pacific Gas and Electric (PG&E) Letter DCL-04-094, dated July 23, 2004. The ECCS evaluation model change that has resulted in this new PCT margin allocation is summarized in Attachment C.

Per the commitment identified in PG&E Letter DCL-00-134, dated October 19, 2000, PG&E has performed a reanalysis for the BELOCA. The analysis was performed using the Westinghouse superposition step methodology, which was approved by the NRC in its Safety Evaluation dated March 11, 2004. PG&E is currently developing a license amendment request to revise the Technical Specifications (TS) to incorporate the Westinghouse superposition step methodology into the licensing basis and establish a new BELOCA analysis of record. Attachment D contains the updated PCT values using the Westinghouse superposition step methodology and is labeled "Pending Analysis of Record." PG&E will update these DCPP Unit 1 large-break analysis-of-record PCT values after the license amendment is issued.

It should also be noted that during the BELOCA reanalysis, Westinghouse identified that due to ECCS model changes, the Unit 2 PCT exceeded that of Unit 1 for several comparative cases. The past BELOCA analysis of record was based on a bounding plant methodology that established Unit 1 as the limiting plant, and the Unit 1 PCT results as bounding when applied to Unit 2. Based on the reanalysis results with several comparative cases showing Unit 2 PCTs exceeding those of Unit 1, PG&E determined that the bounding plant methodology was no longer appropriate for establishing the Unit 2 BELOCA

analysis of record. Therefore, PG&E will perform a plant-specific BELOCA analysis for Unit 2 using the accepted methodology established in WCAP-12945-P-A, "Code Qualification Document for Best Estimate LOCA Analysis," dated 1998, and WCAP-16009-P-A, "Realistic Large-Break LOCA Evaluation Methodology Using the Automated Statistical Treatment Uncertainty Method (ASTRUM)," dated 2005.

The Unit 2 BELOCA analysis will be completed prior to the Unit 2 thirteenth refueling outage, as discussed in PG&E Letter DCL-04-017. This outage is currently scheduled to begin in April 2006 during which a design change will be implemented which involves modifying the reactor vessel internals to provide baffle region core bypass flow in the upward direction instead of the current downward direction, and reducing the reactor coolant temperature in the upper head region.

In the interim period until the TS are revised and the Unit 2 analysis is completed, respectively, an appropriately conservative PCT margin is established by maintaining the current analysis of record PCT value for DCCP Units 1 and 2. This is conservative since the comparative case results generated as part of the Unit 1 reanalysis show a significant decrease in the overall PCT values relative to the current analysis for both DCCP Units 1 and 2 when the appropriate code corrections and ECCS model changes are implemented. The Unit 1 final PCT at the ninety-fifth percentile is significantly reduced compared with the current value (1900°F, reanalysis vs. 1976°F, original analysis). The Unit 2 comparative case results indicate that the revised Unit 2 PCT at the ninety-fifth percentile will be comparably reduced. Therefore, the PCT results of the current analysis of record remain conservative for both DCCP Units 1 and 2.

The final net PCT values that are reflected in Attachments A and B are listed below. It should be noted that two PCT values are reported for the BELOCA consistent with the current Westinghouse PCT tracking methodology. The two large-break PCT values are labeled Reflood 1 and Reflood 2, as they represent the two distinctive PCT peaks that occur during the reflood phase for the BELOCA methodology.

	<u>Small-Break LOCA</u>	<u>Best Estimate Large-Break LOCA</u>	
		Reflood 1	Reflood 2
Unit 1:	1352°F (no change)	1981°F	1969°F
Unit 2:	1306°F (no change)	1981°F	1969°F

DCPP UNIT 1 PEAK CLADDING TEMPERATURE MARGIN UTILIZATION

SMALL-BREAK LOCA

PG&E Letter¹

A.	ANALYSIS OF RECORD	PCT =	1304°F	DCL-99-096
B.	PERMANENT 10 CFR 50.46 ECCS MODEL ASSESSMENTS ²			
1.	NOTRUMP Mixture Level Tracking/Region Depletion Errors	Δ PCT =	13°F	DCL-00-107
2.	NOTRUMP Bubble Rise/Drift Flux Model Inconsistency Corrections	Δ PCT =	35°F	DCL-04-094
C.	10 CFR 50.59 AND 10 CFR 50.92 SAFETY EVALUATIONS			
1.	None	Δ PCT =	0°F	
D.	OTHER MARGIN ALLOCATIONS			
1.	None	Δ PCT =	0°F	

LICENSING BASIS PCT + MARGIN ALLOCATION PCT = 1352°F

¹ For those issues that have been previously reported under 10 CFR 50.46, a PG&E letter number is listed.

² Only permanent assessments of peak cladding temperature (PCT) margin are included. Temporary PCT allocations that address current loss of coolant accident (LOCA) model issues are not considered with respect to 10 CFR 50.46 reporting requirements.

DCPP UNIT 1 PEAK CLADDING TEMPERATURE MARGIN UTILIZATION

<u>BEST ESTIMATE LARGE-BREAK LOCA</u>		Reflowd 1	Reflowd 2	<u>PG&E Letter¹</u>
A.	ANALYSIS OF RECORD	1976°F	1964°F	DCL-00-107
		<u>ΔPCT</u>	<u>ΔPCT</u>	
B.	PERMANENT 10 CFR 50.46 ECCS MODEL ASSESSMENTS ²			
1.	Revised blowdown heatup uncertainty distribution	5°F	5°F	
C.	10 CFR 50.59 AND 10 CFR 50.92 SAFETY EVALUATIONS			
1.	None	0°F	0°F	
D.	OTHER MARGIN ALLOCATIONS			
1.	None	<u>0°F</u>	<u>0°F</u>	
LICENSING BASIS PCT + MARGIN ALLOCATION PCT		1981°F	1969°F	

¹ For those issues that have been previously reported under 10 CFR 50.46, a PG&E letter number is listed.

² Only permanent assessments of peak cladding temperature (PCT) margin are included. Temporary PCT allocations that address current loss of coolant accident (LOCA) model issues are not considered with respect to 10 CFR 50.46 reporting requirements.

DCPP UNIT 2 PEAK CLADDING TEMPERATURE MARGIN UTILIZATION

SMALL-BREAK LOCA **PG&E Letter¹**

- | | | | |
|----|---|----------------------|------------|
| A. | ANALYSIS OF RECORD | PCT = 1293°F | DCL-99-096 |
| B. | PERMANENT 10 CFR 50.46 ECCS
MODEL ASSESSMENTS ² | | |
| 1. | NOTRUMP Mixture Level
Tracking/Region Depletion
Errors | Δ PCT = 13 °F | DCL-00-107 |
| C. | 10 CFR 50.59 AND 10 CFR 50.92
SAFETY EVALUATIONS | | |
| 1. | None | Δ PCT = 0 °F | |
| D. | OTHER MARGIN ALLOCATIONS | | |
| 1. | None | Δ PCT = 0 °F | |

LICENSING BASIS PCT + MARGIN ALLOCATION PCT = 1306°F

- ¹ For those issues that have been previously reported under 10 CFR 50.46, a PG&E letter number is listed.
- ² Only permanent assessments of peak cladding temperature (PCT) margin are included. Temporary PCT allocations that address current loss of coolant accident (LOCA) model issues are not considered with respect to 10 CFR 50.46 reporting requirements.

DCPP UNIT 2 PEAK CLADDING TEMPERATURE MARGIN UTILIZATION

<u>BEST ESTIMATE LARGE-BREAK LOCA</u>				<u>PG&E Letter¹</u>
		Reflood 1	Reflood 2	
A.	ANALYSIS OF RECORD	1976°F	1964°F	DCL-00-107
		<u>ΔPCT</u>	<u>ΔPCT</u>	
B.	PERMANENT 10 CFR 50.46 ECCS MODEL ASSESSMENTS ²			
	1. Revised blowdown heatup uncertainty distribution	5°F	5°F	DCL-05-086
C.	10 CFR 50.59 AND 10 CFR 50.92 SAFETY EVALUATIONS			
	1. None	0°F	0°F	
D.	OTHER MARGIN ALLOCATIONS			
	1. None	0°F	0°F	
LICENSING BASIS PCT + MARGIN ALLOCATION PCT		1981°F	1969°F	

¹ For those issues that have been previously reported under 10 CFR 50.46, a PG&E letter number is listed.

² Only permanent assessments of peak cladding temperature (PCT) margin are included. Temporary PCT allocations that address current loss of coolant accident (LOCA) model issues are not considered with respect to 10 CFR 50.46 reporting requirements.

CURRENT EMERGENCY CORE COOLING SYSTEM MODEL CHANGES AND ERRORS

Revised blowdown heatup uncertainty distribution

Correction of modeling inconsistencies and input errors in the LOFT input decks have resulted in a change in the predicted peak cladding temperature transients. Revised analyses of the LOFT and ORNL tests were performed using the current version of WCOBRA/TRAC. As a result of this reanalysis, revised blowdown heatup heat transfer coefficients were developed and the revised cumulative distribution function (CDF) was programmed into a new version of HOTSPOT. The revised CDF was previously reported to the NRC in the Westinghouse letter LTR-NRC-04-11. The overall code uncertainty for blowdown was also recalculated and programmed into a new version of MONTECF. The overall code uncertainty for reflood was not affected.

An estimate of the PCT effect of the revised blowdown heatup CDF was performed for the BELOCA Evaluation Model by calculating the impact on the reference transient for a representative 4-loop plant. The estimate bounded all of the 95th percentile HOTSPOT results. The estimated effect of the revised overall code uncertainty for blowdown was made for DCCP by repeating the plant specific MONTECF analysis. This resulted in a bounding 5 °F increase in the peak cladding temperature for both Unit 1 and Unit 2.

**Pending Analysis of Record
 DCPD UNIT 1 PEAK CLADDING TEMPERATURE MARGIN UTILIZATION**

BEST ESTIMATE LARGE-BREAK LOCA

	Reflood 1	Reflood 2	
A. ANALYSIS OF RECORD	1900°F	1860°F	Reference 1
	<u>ΔPCT</u>	<u>ΔPCT</u>	
B. PERMANENT 10 CFR 50.46 ECCS MODEL ASSESSMENTS			
1. Revised blowdown heatup uncertainty distribution	5°F	5°F	DCL-05-086
C. 10 CFR 50.59 AND 10 CFR 50.92 SAFETY EVALUATIONS			
1. None	0°F	0°F	
D. OTHER MARGIN ALLOCATIONS			
1. None	0°F	0°F	
LICENSING BASIS PCT + MARGIN ALLOCATION PCT	1905°F	1865°F	

Reference 1: Westinghouse Letter PGE-03-33, "Diablo Canyon Unit 1 BELOCA Reanalysis Final Engineering Report," June 6, 2003

Only permanent assessments of peak cladding temperature (PCT) margin are included. Temporary PCT allocations that address current loss of coolant accident (LOCA) model issues are not considered with respect to 10 CFR 50.46 reporting requirements.