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PG&E Letter DCL-11-082

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

10 CFR 50.46

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 of Emergency Core Cooling System Evaluation Model Changes for 2010

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 Pacific Gas and Electric Company (PG&E) Diablo Canyon Power Plant (DCPP), Units 1 and 2.

There have been no changes in the small-break loss-of-coolant accident (SBLOCA) PCT results for either Unit 1 or Unit 2 since the last annual update. The last update was provided in PG&E Letter DCL-10-080, "10 CFR 50.46 Annual Report of Emergency Core Cooling System Evaluation Model Changes for 2009," dated July 19, 2010. In support of a prompt operability assessment (POA), the best estimate large-break loss-of-coolant accident (BELOCA) PCT results for both Unit 1 and Unit 2 have assessed a PCT margin allocation since the last update.

A summary of the PCT margin allocations and their bases are provided in the enclosure. The Unit 1 SBLOCA and BELOCA PCT Margin Utilization sheets are provided in Attachment A to the enclosure. The Unit 2 SBLOCA and BELOCA PCT Margin Utilization Sheets are provided in Attachment B to the enclosure. The ECCS evaluation model changes and PCT margin allocations that have occurred since the last annual report are summarized in Attachment C to the enclosure.

The PCT values remain well within the 2200°F limit specified in 10 CFR 50.46. However, since the Unit 1 BELOCA has a total PCT margin allocation that is currently greater than 50°F, PG&E is proposing a schedule for reanalysis, per 10 CFR 50.46(a)(3)(ii). PG&E has recently initiated a long term project to implement a transition to a standard fuel design that will require a reanalysis of the Unit 1 BELOCA PCT results. In addition, it is anticipated that BELOCA analysis model changes requiring NRC approval will be required to address the regulation changes

related to 10 CFR 50.46 that are still in development. In order to accommodate these anticipated changes, PG&E proposes to complete the Unit 1 BELOCA reanalysis and provide the updated PCT results to the NRC by December 2016.

If you have questions regarding this submittal please contact Mr. Steve Baker at 805-545-6742.

Sincerely,

James R. Becker
Site Vice President and Station Director

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ANNUAL REPORT OF EMERGENCY CORE COOLING SYSTEM EVALUATION MODEL CHANGES FOR 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 Pacific Gas and Electric Company (PG&E) 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 LTR-LIS-11-43, "Diablo Canyon Units 1 and 2 10 CFR 50.46 Annual Notification and Reporting for 2010," dated January 27, 2011.

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. Attachment C to this enclosure summarizes the ECCS evaluation model changes and PCT margin allocations that have occurred since the last annual report. There have been no changes in the SBLOCA PCT results for either Unit 1 or Unit 2 since the last annual update. The last update was provided in PG&E Letter DCL-10-080, "10 CFR 50.46 Annual Report of Emergency Core Cooling System Evaluation Model Changes for 2009" dated July 19, 2010. In support of a prompt operability assessment (POA), the BELOCA PCT results for both Unit 1 and Unit 2 have assessed a PCT margin allocation since the last update.

A summary of the PCT margin allocations and their bases are provided in the attachments. The final net PCT values are listed below for each unit. It should be noted that two PCT values are reported for the Unit 1 BELOCA results. The two BELOCA 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 Unit 1 BELOCA Code Qualification Document (CQD) methodology. The Unit 2 BELOCA reports only one PCT value consistent with the BELOCA Automated Statistical Treatment of Uncertainty Method (ASTRUM) methodology.

	Small-Break LOCA	**Best Estimate Large-Break LOCA**	
		Reflood 1	Reflood 2
Unit 1:	1391°F (no change)	1990°F (no change)	1975°F
Unit 2:	1288°F (no change)	1888°F	

The PCT values remain well within the 2200°F limit specified in 10 CFR 50.46. However, since the Unit 1 BELOCA has a total PCT margin allocation that is currently greater than 50°F, PG&E is proposing a schedule for reanalysis, per

10 CFR 50.46(a)(3)(ii). PG&E has recently initiated a long term project to implement a transition to a standard fuel design that will require a reanalysis of the Unit 1 BELOCA PCT results. In addition, it is anticipated that BELOCA analysis model changes requiring NRC approval will be required to address the regulation changes related to 10 CFR 50.46 that are still in development. In order to accommodate these anticipated changes, PG&E proposes to complete the Unit 1 BELOCA reanalysis and provide the updated PCT results to the NRC by December 2016.

DCPP UNIT 1 PEAK CLADDING TEMPERATURE (PCT) MARGIN UTILIZATION

SMALL-BREAK LOCA			PG&E Letter[1]
A. ANALYSIS OF RECORD	PCT =	1391°F	DCL-09-057
B. PRIOR 10 CFR 50.46 ECCS MODEL ASSESSMENTS[2]			
1. None	ΔPCT =	0°F	
C. 10 CFR 50.46 ECCS MODEL ASSESSMENTS THIS YEAR			
1. None	ΔPCT =	0°F	
D. SUM OF 10 CFR 50.46 CHANGES			
1. Net Sum of 10 CFR 50.46 PCT Changes	ΔPCT =	0°F	
2. Absolute Sum of 10 CFR 50.46 PCT Changes	ΔPCT =	0°F	
E. Analysis of Record PCT - Line A + Line D.1 Net Sum of 10 CFR 50.46 PCT Changes		1391°F	

The sum of the PCT from the most recent analysis of record using an acceptable evaluation model and the estimates of the net PCT effect for changes and errors identified since this analysis remain less than 2200°F.

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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 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 (PCT) MARGIN UTILIZATION

BEST ESTIMATE LARGE-BREAK LOCA			PG&E Letter[1]
	Reflood 1	Reflood 2	
A. ANALYSIS OF RECORD	1900°F	1860°F	DCL-05-146
	ΔPCT	ΔPCT	
B. PRIOR 10 CFR 50.46 ECCS MODEL ASSESSMENTS [2]			
1. Revised blowdown heatup uncertainty distribution.	5°F	5°F	DCL-05-086
2. HOTSPOT Fuel Relocation Error.	10°F	0°F	DCL-07-071
3. Replacement Steam Generators	75°F	71°F	DCL-09-057
C. 10 CFR 50.46 ECCS MODEL ASSESSMENTS THIS YEAR			
1. 230 kV Degraded Voltage Event Evaluation	0°F	39°F	This letter in Attachment C
D. SUM OF 10 CFR 50.46 CHANGES			
1. Net Sum of 10 CFR 50.46 PCT Changes	90°F	115°F	
2. Absolute Sum of 10 CFR 50.46 PCT Changes	90°F	115°F	
E. Analysis of Record PCT - Line A + Line D.1 Net Sum of 10 CFR 50.46 PCT Changes	1990°F	1975°F	

The sum of the PCT from the most recent analysis of record using an acceptable evaluation model and the estimates of the net PCT effect for changes and errors identified since this analysis remain less than 2200°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 PCT margin are included. Temporary PCT allocations that address current LOCA model issues are not considered with respect to 10 CFR 50.46 reporting requirements.

DCPP UNIT 2 PEAK CLADDING TEMPERATURE (PCT) MARGIN UTILIZATION

SMALL-BREAK LOCA			**PG&E Letter[1]**
A. ANALYSIS OF RECORD	PCT =	1288°F	DCL-08-061
B. PRIOR 10 CFR 50.46 ECCS MODEL ASSESSMENTS[2]			
1. None	ΔPCT =	0°F	
C. 10 CFR 50.46 ECCS MODEL ASSESSMENTS THIS YEAR			
2. None	ΔPCT =	0°F	
D. SUM OF 10 CFR 50.46 CHANGES			
3. Net Sum of 10 CFR 50.46 PCT Changes	ΔPCT =	0°F	
4. Absolute Sum of 10 CFR 50.46 PCT Changes	ΔPCT =	0°F	
E. Analysis of Record PCT - Line A + Line D.1 Net Sum of 10 CFR 50.46 PCT Changes		1288°F	

The sum of the PCT from the most recent analysis of record using an acceptable evaluation model and the estimates of the net PCT effect for changes and errors identified since this analysis remain less than 2200°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 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 (PCT) MARGIN UTILIZATION

BEST ESTIMATE LARGE-BREAK LOCA			PG&E Letter[1]
A. ANALYSIS OF RECORD	PCT=	1872°F	DCL-07-071
B. PRIOR 10 CFR 50.46 ECCS MODEL ASSESSMENTS [2]			
1. HOTSPOT Fuel Relocation Error.	ΔPCT=	0°F	DCL-07-071
C. 10 CFR 50.46 ECCS MODEL ASSESSMENTS THIS YEAR			
1. 230 kV Degraded Voltage Event Evaluation	ΔPCT=	16°F	This letter in Attachment C
D. SUM OF 10 CFR 50.46 CHANGES			
1. Net Sum of 10 CFR 50.46 PCT Changes	ΔPCT=	16°F	
2. Absolute Sum of 10 CFR 50.46 PCT Changes	ΔPCT=	16°F	
E. Analysis of Record PCT - Line A + Line D.1 Net Sum of 10 CFR 50.46 PCT Changes		1888°F	

The sum of the PCT from the most recent analysis of record using an acceptable evaluation model and the estimates of the net PCT effect for changes and errors identified since this analysis remain less than 2200°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 PCT margin are included. Temporary PCT allocations that address current LOCA model issues are not considered with respect to 10 CFR 50.46 reporting requirements.

CURRENT EMERGENCY CORE COOLING SYSTEM MODEL CHANGES AND ERRORS

230 kV Degraded Voltage Event Evaluation

During an NRC Component Design Basis Inspection it was identified that, contrary to license basis requirements, the 230 kV undervoltage relay delay setpoints are not bound by the current Diablo Canyon Power Plant (DCPP) FSAR safety analysis. Postulating a sustained 230 kV degraded voltage results in increasing engineered safety feature (ESF) component delay times beyond what has previously been evaluated. The DCPP small-break loss-of-coolant accident (SBLOCA) and best estimate large-break loss-of-coolant accident (BELOCA) safety analyses of record have been evaluated for increased ESF delay times of 5 seconds for the auxiliary feedwater (AFW) and 15 seconds for the emergency core cooling system (ECCS) injection flow as summarized below. The increased ESF delay times represent a malfunction of a structure, system, or component (SSC) important to safety with a different result than previously evaluated in the Final safety Analysis Report Update (FSARU) per 10 CFR 50.59 and is being submitted for prior NRC approval in License Amendment Request 11-06 as documented in PG&E Letter DCL-11-072.

SBLOCA

The core uncovery and peak cladding temperature (PCT) for the limiting Unit 1 and Unit 2 SBLOCA cases occurs at 12 to 15 minutes into the event. The 15 second increase in ECCS flow due delay time was determined to represent a small reduction in the total amount of ECCS injection flow that has entered the reactor coolant system (RCS) up to the time of core uncovery. Similarly, the 5 second increase in the AFW actuation time was determined to have a negligible impact on the thermal hydraulic results since the major source of decay heat removal is due to the RCS flow out of the break. Therefore, it was concluded that there was a 0°F impact on the current SBLOCA Unit 1 and Unit 2 PCT results.

Large-Break Loss-of-Coolant Accident (LBLOCA)

Both Diablo Canyon Unit 1 and Unit 2 use a BELOCA evaluation methodology for the analysis of record. The LBLOCA evaluation considered an increase in ECCS injection flow delay time from 27 seconds to 42 seconds. The primary effect of increasing the ECCS delay time is that it can lead to increased duration of fuel heatup periods during the refill and reflood periods. The blowdown remains unaffected since this phase is over before the ECCS injection flow begins. Depending on the break size and the accumulator pressure and volume, the end of the refill and periods and the accumulator injection can vary and create periods with significantly different and/or reduced ECCS injection flow.

For Unit 1, the evaluation was based on global model runs with an effective break size area greater than the reference transient. These greater break areas will depressurize the RCS faster leading to a more rapid accumulator blowdown and are more likely to result in a delay between the accumulator injection and the start of ECCS injection flow. The cases were selected to evaluate the relative effects of accumulator volume, accumulator pressure, and break size. The limiting evaluation case resulted in a 0°F penalty for the early Reflood 1 period and an estimated 39°F penalty for the Reflood 2 period.

Unit 2 uses the newer Automated Statistical Treatment of Uncertainty Method (ASTRUM) BELOCA methodology which does not track the individual Reflood 1 and Reflood 2 penalties but only reports one overall reflood penalty. For Unit 2, the evaluation was also based on selecting cases with higher break sizes that depressurize faster and lead to a faster accumulator blowdown that create a greater potential for a delay between accumulator injection and ECCS injection. The evaluation also considered cases with high accumulator pressure or low accumulator volume which could also lead to a faster accumulator blowdown. The evaluation for the limiting case concluded that there is a net PCT penalty of 16 °F due to the increased ECCS injection flow delay time.