

September 23, 2019

PG&E Letter DCL-19-071

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

10 CFR 50.90

Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82
Diablo Canyon Units 1 and 2

Supplement to "License Amendment Request 18-02, License Amendment Request to Revise Technical Specification 5.6.5b, 'Core Operating Limits Report (COLR)' for Full Spectrum Loss-of-Coolant Accident Methodology"

Reference: 1. PG&E Letter DCL-18-100, "License Amendment Request 18-02, License Amendment Request to Revise Technical Specification 5.6.5b, 'Core Operating Limits Report (COLR)' for Full Spectrum Loss-of-Coolant Accident Methodology," dated December 26, 2018 [ML19003A196]

Dear Commissioners and Staff:

In Reference 1, Pacific Gas and Electric Company submitted a license amendment request (LAR) to revise the Technical Specification 5.6.5b, "Core Operating Limits Report (COLR)" for the Westinghouse FULL SPECTRUM™ Loss-of-Coolant Accident (FSLOCA™) Methodology. The FSLOCA™ analysis has been updated to correct two errors that were discovered by Westinghouse subsequent to submittal of the original analysis in Reference 1. The combined impact of these two analysis errors on peak cladding temperature is not significant, as defined by 10 CFR 50.46.(a)(3)(i).

The Enclosure with this letter provides a summary of the changes to the original FSLOCA™ analysis submitted in Reference 1 due to correction of the two analysis errors by Westinghouse. Attachment 1 to the Enclosure provides supplemental text for Sections 3.2 and 7 of the LAR submitted in Reference 1 for the update to the FSLOCA™ analysis. Attachment 2 to the Enclosure provides revised Updated Final Safety Analysis Report pages in the LAR.



The changes included in this supplement do not impact the significant hazards consideration evaluation, Technical Specifications changes, or the Technical Specification Bases changes contained in Reference 1.

This letter does not include a new or revised regulatory commitment (as defined by NEI 99-04).

If you have any questions or require additional information, please contact Mr. Hossein Hamzehee, Regulatory Services Manager, at (805) 545-4720.

I state under penalty of perjury that the foregoing is true and correct.

Executed on September 23, 2019.

Sincerely,

Paula Gerfen
Site Vice President

kjse/4328/51034643

Enclosure

cc: Diablo Distribution
cc/enc: Scott A. Morris, NRC Region IV Administrator
John P. Reynoso, Acting NRC Senior Resident Inspector
Gonzalo L. Perez, Branch Chief, California Department of Public Health
Balwant K. Singal, NRC Senior Project Manager

Summary of Update to the FSLOCA™ Analysis Contained in “License Amendment Request 18-02, License Amendment Request to Revise Technical Specification 5.6.5b, ‘Core Operating Limits Report (COLR)’ for Full Spectrum Loss-of-Coolant Accident Methodology”

Reference: 1. PG&E Letter DCL-18-100, “License Amendment Request 18-02, License Amendment Request to Revise Technical Specification 5.6.5b, “Core Operating Limits Report (COLR)” for Full Spectrum Loss-of-Coolant Accident Methodology,” dated December 26, 2018 [ML19003A196]

Two errors were discovered by Westinghouse in the Diablo Canyon Power Plant (DCPP) analyses with the FULL SPECTRUM™ Loss-of-Coolant Accident (LOCA) (FSLOCA™) evaluation model (EM) after the associated license amendment request (LAR) was submitted for approval in Reference 1.

The first error was discovered in the gamma energy redistribution multiplier on hot rod and hot assembly power (FGAMMA) used for the DCPP Units 1 and 2 analyses with the FSLOCA™ EM, which results in an underestimation of the hot rod and hot assembly power by up to 5 percent. The underestimation of the hot rod and hot assembly power resulted in an underprediction in the calculated peak cladding temperature (PCT) result for the DCPP analyses. Therefore, the correction of this error was assessed by Westinghouse for the DCPP Units 1 and 2 analyses, resulting in the following estimated PCT penalties:

	DCPP Unit 1	DCPP Unit 2
Small Break LOCA (Region I)	+17°F	+9°F
Large Break LOCA (Region II)	+31°F	+31°F

The second error involved several inputs in the containment model used for the DCPP Unit 1 Region II analysis that were improperly aligned in the computer code input file and were read by the WCOBRA/TRAC-TF2 computer code incorrectly. These input errors impacted the initial temperature for an unheated structure as well as the containment spray modeling which influenced the back-pressure boundary condition of a large break LOCA thermal-hydraulic response. Therefore, the correction of the input errors was assessed by Westinghouse for the DCPP Unit 1 Region II analysis, resulting in an estimated +6°F PCT penalty. The DCPP Unit 2 Region II analysis was not affected by the second error.

The information submitted in the Enclosure of the Reference 1 LAR is impacted by the correction of the FGAMMA treatment and incorrect containment response (DCPP Unit 1 Region II analysis only), therefore a description of the errors and updated analysis results are contained in Attachment 1 to the Enclosure of this letter. The description of the errors and updated analysis results are included in new Section 3.2.1 “Error Evaluations Post DCPP Unit 1 and Unit 2 FSLOCA EM Analyses” to be inserted

following the original Section 3.2, "Changes and Corrections to the FSLOCA EM in Westinghouse WCAP-16996-A", contained on pages 3 and 4 of the Enclosure in Reference 1. Revised Tables 4 and 5 replace the original Tables 4 and 5 contained on pages 15 and 16 of the Enclosure in Reference 1. The changes to the original LAR text are underlined and denoted with revision bars.

Attachment 2 to the Enclosure provides changes to the original Updated Final Safety Analysis Report (UFSAR) markups for DCPD Units 1 and 2 contained in Attachment 4 to the Enclosure in Reference 1. Changes are made to Tables 15.4.1.3-1A and 15.4.1.3-1B. Changes from the original LAR UFSAR text are contained in Attachment 2 and the changes are underlined and denoted with revision bars.

Supplement to License Amendment Request 18-02 Sections 3.2 and 7

**(Changes from original version are
indicated by revision bars)**

3.2.1 Error Evaluations Post DCP Unit 1 and Unit 2 FSLOCA EM Analyses

Two errors were discovered in the FSLOCA EM analyses after submittal for approval in LAR 18-02.

The first is an error in the gamma redistribution multiplier on hot rod and hot assembly power (FGAMMA) used for the DCP Unit 1 and 2 analyses with the FSLOCA EM, which results in an underestimation of the hot rod and hot assembly power by up to 5 percent. The underestimation of the hot rod and hot assembly power results in an underprediction in the calculated PCT results for the DCP Unit 1 and 2 analyses. Therefore, the correction of this error was assessed for the DCP Unit 1 and Unit 2 completed analyses.

The treatment for the uncertainty in the gamma energy redistribution is discussed on pages 29-75 and 29-76 WCAP-16996-P-A, Revision 1 [reference 1 in Section 6 of the Enclosure of LAR 18-02], and the equation for the assumed increase in hot rod and hot assembly relative power is presented on page 29-76. The power increase in the hot rod and hot assembly due to energy redistribution in the application of the FSLOCA EM to DCP Unit 1 and Unit 2 was calculated incorrectly. This error resulted in a 0 percent to 5 percent deficiency in the modeled hot rod and hot assembly rod linear heat rates on a run-specific basis, depending on the as-sampled value for the uncertainty. The effect of the error correction was evaluated against the application of the FSLOCA EM to DCP Unit 1 and Unit 2.

The error correction has only a limited impact on the power modeled for a single assembly in the core. As such, there is a negligible impact of the error correction on the system thermal-hydraulic response during the postulated LOCA.

For SBLOCA (Region I), the primary impact of the error correction is on the rate of cladding heatup above the two-phase mixture level in the core during the boiloff phase. The PCT impact was assessed using run-specific PCT versus linear heat rate relationships and the run-specific hot rod and hot assembly linear heat rate increase that would result from the error correction. Using this approach, the correction of the error was estimated by Westinghouse to increase the SBLOCA (Region I) analysis PCT by 17°F for DCP Unit 1 and 9°F for DCP Unit 2, leading to final results of 1,116°F for DCP Unit 1 and 1,021°F for DCP Unit 2 SBLOCA (Region I) analyses.

For LBLOCA (Region II), parametric Pressurized Water Reactor (PWR) sensitivity studies, derived from a subset of uncertainty analysis simulations covering various design features and fuel arrays, were examined to determine the sensitivity of the analysis results to the error correction. The PCT impact from the error correction

was found to be different for the different transient phases (i.e., blowdown versus reflood) based on the PWR sensitivity studies and existing power distribution sensitivity studies. Based on the results from the PWR sensitivity studies, the correction of the error is estimated to increase the LBLOCA (Region II) analysis PCT by 31°F for DCP Unit 1 and Unit 2, leading to an analysis result of 1,707°F and 1,605°F for the DCP Unit 1 and Unit 2 LBLOCA (Region II) analyses assuming loss-of-offsite power, respectively, and 1,663°F and 1,589°F for the DCP Unit 1 and Unit 2 LBLOCA (Region II) analyses assuming offsite power available, respectively.

The second error is an error in which several inputs in the containment model used for the DCP Unit 1 LBLOCA (Region II) analysis were improperly aligned in the input file and read by the WCOBRA/TRAC-TF2 code incorrectly. These input errors impact the initial temperature for an unheated structure as well as the spray modeling which influence the back-pressure boundary condition of a large break LOCA thermal-hydraulic response. These errors were evaluated by re-executing a subset of the DCP Unit 1 LBLOCA (Region II) analysis with the input issues corrected. The correction of the input errors is estimated to increase the DCP Unit 1 LBLOCA (Region II) analysis PCT by 6°F, leading to an analysis result of 1,713°F assuming loss-of-offsite power and 1,669°F assuming offsite power available.

All of the analysis results including the error corrections continue to maintain compliance with the 10 CFR 50.46 acceptance criteria.

Limitation and Condition Number 2, contained in Attachments 6 and 7 to the Enclosure of LAR 18-02 continue to be met with the post-analysis evaluations described above.

Table 4. DCP Unit 1 Analysis Results with the FSLOCA Evaluation Model

Outcome	SBLOCA (Region I) Value ⁽¹⁾	LBLOCA (Region II) Value (OPA) ⁽²⁾	LBLOCA (Region II) Value (LOOP) ⁽²⁾
95/95 PCT	<u>1,116</u> °F	<u>1,669</u> °F	<u>1,713</u> °F
95/95 MLO	9.5%	9.5%	9.5%
95/95 CWO	0.0%	0.10%	0.15%

- (1) The PCT presented shows the analysis-of-record result, which is the sum of the uncertainty analysis result (1,099°F) plus the impact of the energy redistribution uncertainty error correction (17°F). The figures presenting the analysis results correspond to the uncertainty analysis results. The MLO and CWO were confirmed to maintain compliance with the 10 CFR 50.46 acceptance criteria with the error correction.
- (2) The PCT presented shows the analysis-of-record result, which is the sum of the uncertainty analysis result (1,632 °F for OPA and 1,676°F for LOOP) plus the impact of the energy redistribution uncertainty error correction (31°F) and impact of the COCO input misalignment error correction (6°F). The figures presenting the analysis results correspond to the uncertainty analysis results. The MLO and CWO were confirmed to maintain compliance with the 10 CFR 50.46 acceptance criteria with the error correction.

Table 5. DCP Unit 2 Analysis Results with the FSLOCA Evaluation Model

Outcome	SBLOCA (Region I) Value ⁽¹⁾	LBLOCA (Region II) Value (OPA) ⁽²⁾	LBLOCA (Region II) Value (LOOP) ⁽²⁾
95/95 PCT	<u>1,021</u> °F	<u>1,589</u> °F	<u>1,605</u> °F
95/95 MLO	9.5%	9.5%	9.5%
95/95 CWO	0.0%	0.03%	0.04%

- (1) The PCT presented shows the analysis-of-record result, which is the sum of the uncertainty analysis result (1,012°F) plus the impact of the energy redistribution uncertainty error correction (9°F). The figures presenting the analysis results correspond to the uncertainty analysis results. The MLO and CWO were confirmed to maintain compliance with the 10 CFR 50.46 acceptance criteria with the error correction.
- (2) The PCT presented shows the analysis-of-record result, which is the sum of the uncertainty analysis result (1,558°F for OPA and 1,574°F for LOOP) plus the impact of the energy redistribution uncertainty error correction (31°F). The figures presenting the analysis results correspond to the uncertainty analysis results. The MLO and CWO were confirmed to maintain compliance with the 10 CFR 50.46 acceptance criteria with the error correction.

DCPP Updated Final Safety Analysis Report Changes

**(Changes from previous version are
indicated by revision bars)**

Table 15.4.1.2-7. Steam Generator Safety Valve Parameters for Diablo Canyon Power Plant Units 1 and 2

Stage	Set Pressure (psig)	Uncertainty	Accumulation (psi)
1	1065.0	+3	+5
2	1078.0	+3	+5
3	1090.0	+3	+5
4	1103.0	+3	+5
5	1115.0	+3	+5

Table 15.4.1.3-1A. Diablo Canyon Power Plant Unit 1 Analysis Results with the FSLOCA EM

Outcome	SBLOCA (Region I) Value	LBLOCA (Region II) Value (OPA)	LBLOCA (Region II) Value (LOOP)
95/95 PCT	1,116 °F ⁽¹⁾	1,669 °F ⁽²⁾	1,713 °F ⁽²⁾
95/95 MLO	9.5 %	9.5 %	9.5 %
95/95 CWO	0.0 %	0.10 %	0.15 %

(1) The PCT presented shows the analysis-of-record result, which is the sum of the uncertainty analysis result (1,099°F) plus the impact of the energy redistribution uncertainty error correction (17°F). The figures presenting the analysis results correspond to the uncertainty analysis results. The MLO and CWO were confirmed to maintain compliance with the 10 CFR 50.46 acceptance criteria with the error correction.

(2) The PCT presented shows the analysis-of-record result, which is the sum of the uncertainty analysis result (1,632 °F for OPA and 1,676°F for LOOP) plus the impact of the energy redistribution uncertainty error correction (31°F) and impact of the COCO input misalignment error correction (6°F). The figures presenting the analysis results correspond to the uncertainty analysis results. The MLO and CWO were confirmed to maintain compliance with the 10 CFR 50.46 acceptance criteria with the error correction.

Table 15.4.1.3-1B. Diablo Canyon Power Plant Unit 2 Analysis Results with the FSLOCA EM

Outcome	SBLOCA (Region I) Value	LBLOCA (Region II) Value (OPA)	LBLOCA (Region II) Value (LOOP)
95/95 PCT	<u>1,021 °F⁽¹⁾</u>	<u>1,589 °F⁽²⁾</u>	<u>1,605 °F⁽²⁾</u>
95/95 MLO	9.5 %	9.5 %	9.5 %
95/95 CWO	0.0 %	0.03 %	0.04 %

(1) The PCT presented shows the analysis-of-record result, which is the sum of the uncertainty analysis result (1,012°F) plus the impact of the energy redistribution uncertainty error correction (9°F). The figures presenting the analysis results correspond to the uncertainty analysis results. The MLO and CWO were confirmed to maintain compliance with the 10 CFR 50.46 acceptance criteria with the error correction.

(2) The PCT presented shows the analysis-of-record result, which is the sum of the uncertainty analysis result (1,558°F for OPA and 1,574°F for LOOP) plus the impact of the energy redistribution uncertainty error correction (31°F). The figures presenting the analysis results correspond to the uncertainty analysis results. The MLO and CWO were confirmed to maintain compliance with the 10 CFR 50.46 acceptance criteria with the error correction.