Pacific Gas and Electric Company

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PG&E Letter DCL-00-123

U.S. Nuclear Regulatory Commission
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Docket No. 50-275, OL-DPR-80
Diablo Canyon Unit 1
Response to NRC Request for Additional Information Regarding License Amendment Request (LAR) 99-03, Unit 1 Reactor Core Thermal Power Uprate

Dear Commissioners and Staff:

In a letter dated September 13, 2000, the NRC staff identified additional technical information required in order for them to complete their evaluation associated with the Diablo Canyon Power Plant Unit 1 reactor core thermal power uprate. PG&E's response to the request for additional information is included in Enclosure 1. This response documents information provided by Westinghouse during a conference call with the NRC staff on August 31, 2000. This additional information does not affect the results of the safety evaluation performed for LAR 99-03 (PG&E Letter DCL-99-170, dated December 31, 1999).

If you have any questions regarding this response, please contact Tom Grozan at (805) 545-4231.

Sincerely,

David H. Oatley

cc: Edgar Bailey, DHS
Steven D. Bloom
Ellis W. Merschoff
David Proulx
Diablo Distribution

A001

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of PACIFIC GAS AND ELECTRIC COMPANY Diablo Canyon Power Plant Unit 1	Docket No. 50-275 Facility Operating License No. DPR-80

AFFIDAVIT

David H. Oatley, of lawful age, first being duly sworn upon oath says that he is Vice President - Diablo Canyon Operations and Plant Manager of Pacific Gas and Electric Company; that he is familiar with the content thereof; that he has executed this response to an NRC request for additional information regarding License Amendment Request 99-03 on behalf of said company with full power and authority to do so; and that the facts stated therein are true and correct to the best of his knowledge, information, and belief.

David H. Oatley
Vice President - Diablo Canyon
Operations and Plant Manager

Subscribed and sworn to before me this 22nd day of September, 2000.

Notary Public
State of California
County of San Luis Obispo

LISA M. NELSON
Commission # [illegible]
Notary Public - California
San Luis Obispo County
My Comm. Expires Mar 31, 2004

PG&E Responses to Request for Additional Information For DCPP-1 Power Uprate (PG&E Letter DCL-99-170)

Question 1

In the July 24, 1998, letter (PG&E Letter DCL-98-101) regarding ECCS model changes, an input error was identified in the Diablo Canyon Power Plant, Unit 1 (DCPP) best estimate (BE) large break loss-of-coolant accident (LBLOCA) analysis. The error was said to be an intercell force gap numbering error and a peak cladding temperature (PCT) penalty of 67°F was assessed. In the April 5, 2000, letter (PG&E Letter DCL-00-051), PG&E cited the new Westinghouse PCT monitoring process of tracking PCTs for two reflood periods during a LBLOCA, and provided a reassessment of the PCT penalties of 33°F for reflood period 1 and 67°F for reflood period 2 for the intercell gap numbering error.

a. *Describe the intercell gap numbering error in detail, including the number of gaps and the largest gap number in the analysis input, the parts of the reactor vessel model affected, and the calculations of the WCOBRA/TRAC code affected by the input error.*

b. *Describe how the PCT penalties of 33 °F and 67 °F for reflood period 1 and 2, respectively, were assessed. Provide an assessment of the bounding effects on the PCT of the BE LBLOCA analysis result.*

PG&E Response to Question 1

a) The gap numbering error occurs if sequential numbers are skipped in the input deck, such that the highest numbered gap exceeds the total number of gaps specified with the code variable NK. In this situation, the gaps with numbers that exceed NK do not have the intercell interphase drag force cleared at the end of a time step. As a result, an incorrect force is applied in the gap momentum equation. Figures 3-2-7 and 3-2-8 of WCAP-14775, "Best Estimate Analysis of the Large Break Loss-of-Coolant Accident for Diablo Canyon Power Plant Units 1 & 2 to Support 24-Month Fuel Cycles and Unit 1 Uprating," dated January 1997, show that gap numbers 51 and 62 were not used in the DCPP Unit 1 model. Therefore, gap numbers 65 and 66 exceed the total number of gaps specified, NK = 64. The lateral flow for these gaps, located in the upper head, was therefore affected by this input error.

b) A plant-specific reanalysis of the DCPP reference transient was performed in order to support the 10 CFR 50.46 peak cladding temperature assessment. The PCT for the reference transient is shown in Figure 5-3-1 of WCAP-14775. With the input error correction, the Reflood 1 PCT increased by 33°F and the Reflood 2 PCT increased by 67°F.

The response to Question 2 below indicates that the net effect of the two error corrections on the reference transient is being conservatively tracked in the 10CFR50.46 reports. The response to Question 3 below indicates that the original uncertainties calculated for DCPP can be reasonably assumed to remain valid for Reflood 1, and should be slightly conservative for Reflood 2. Therefore, these estimates are considered to adequately bound the effects on the reflood PCTs of the BE LBLOCA analysis.

Question 2

In the April 5, 2000, letter, PG&E identified a generic coding error, "Vessel Channel DX Error," in that incorrect cell height is used in calculating gap flow wall friction and interfacial drag coefficients at various gap levels. PG&E stated that the vessel channel DX error was a minor benefit for reflood period 1 and a large benefit for reflood period 2.

a. *Describe the vessel channel DX error in detail, including the regions in the reactor vessel model and the calculations affected by the error.*

b. *Explain why the error is a benefit in the LBLOCA analysis, and how its impacts of 0°F and -67°F, respectively, to the PCTs of reflood periods 1 and 2 were determined.*

PG&E Response to Question 2

a) The vessel DX error occurs for any section in the vessel which is modeled using multiple levels. In these sections, an error in the computer code caused the cell height used to calculate the interfacial drag and wall friction for lateral flow to be erroneously based on the cell height of the top node in the section below. Referring to the DCPP noding diagram in Figure 3-2-3 of WCAP-14775, it is seen that sections 2, 3, 5 and 7 are affected by this code error.

b) A plant-specific reanalysis of the DCPP reference transient was performed in order to support the 10 CFR 50.46 PCT assessment. The effect of the code error correction was a minor benefit on the Reflood 1 PCT, which was conservatively assessed as a 0°F impact. The effect on Reflood 2 PCT was a large benefit, which offset the 67°F penalty previously calculated for the gap numbering correction.

The calculated benefit is attributed to a reduction in the lateral flow of droplets out of the hot assembly above the quench front, due to reduced interfacial drag. The original calculation based the interfacial drag for lateral flow in the core on the height of the top cell of Section 2. That cell height is about three times the height of the core cells. With the error corrected, the axial droplet flow is increased, resulting in reduced vapor superheat, increased cladding heat transfer, and a corresponding reduction In PCT.

Question 3

Provide assessments of the overall bounding effects of the two errors (intercell gap numbering error and the vessel channel DX error) on the BE LBLOCA analysis results of PCT, maximum cladding oxidation, and hydrogen generation. Provide the bases of the assessments.

PG&E Response to Question 3

For each of these 10 CFR 50.46 PCT assessments, a PCT bias was established for each reflood time period using a plant-specific reanalysis of the DCPP reference transient. The sensitivity studies used to develop the uncertainties can be assumed to remain valid because the timing of significant events which can affect uncertainty propagation were unchanged, or shifted in a beneficial manner. With regard to the heat transfer uncertainty propagation, the timing of beginning of the blowdown heatup, blowdown cooling, refill, and reflood periods were unchanged. The timing of other significant events such as end of bypass, beginning and end of accumulator injection, and timing of Reflood 1 and Reflood 2 PCTs were unchanged with one exception. The timing of Reflood 2 PCT was shifted earlier when the vessel DX error was corrected. This timing shift would result in less propagation of uncertainties, in particular that of the reflood heat transfer multipliers, whose uncertainty distribution has a mean less than 1.0. Therefore, this timing shift would reduce the uncertainty propagation and the amount of positive PCT bias introduced by the reflood heat transfer multipliers for the Reflood 2 results.

This method of establishing PCT assessments is consistent with that discussed in Section 28-3 of the approved methodology, WCAP-12945-P-A, "Westinghouse Code Qualification Document for Best-Estimate Loss of Coolant Analysis," June 1996.

The maximum cladding oxidation and hydrogen generation calculation results are dependent on the amount of time the cladding is exposed to steam at high temperatures (> ~1800°F), and the temperatures attained during this time period. The net effect of the two error corrections on the reference transient was to shorten the period of time at high temperatures, and reduce the maximum temperature attained. Also, the uncertainty propagation can be considered to remain valid for the reasons discussed above. Therefore, the existing analysis results for maximum cladding oxidation and hydrogen generation remain valid.