Pacific Gas and Electric Company

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PG&E Letter DCL-00-039

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
Supplement to PG&E's Request for NRC Approval of Diablo Canyon Methodology for Establishing Pressure/Temperature and Low Temperature Overpressure Protection Limits Using WCAP 14040-NP-A in Accordance with Generic Letter 96-03

Dear Commissioners and Staff:

On November 24, 1999, PG&E submitted, "Request for NRC Approval of Diablo Canyon Methodology for Establishing Pressure/Temperature and Low Temperature Overpressure Protection Limits Using WCAP 14040-NP-A in Accordance with Generic Letter 96-03" in PG&E Letter DCL-99-146. This letter requested that the NRC use material previously submitted as fulfilling the requirements for information necessary to describe PG&E's methodology for calculation of the overpressure protection setpoints.

In a telephone conference call on February 7, 2000, the NRC staff provided a set of Requests For Additional Information (RAIs). The RAI questions and PG&E's responses are provided in Enclosure 1.

Sincerely,

David H. Oatley

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

Enclosure

MEL/

A001

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of PACIFIC GAS AND ELECTRIC COMPANY	)	Docket No. 50-275 Facility Operating License No. DPR-80
Diablo Canyon Power Plant Units 1 and 2	)	Docket No. 50-323 Facility Operating License No. DPR-82

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, Pacific Gas and Electric Company; that he is familiar with the content thereof; that he has executed the Supplement to Request for NRC Approval of Diablo Canyon Methodology for Establishing Pressure/Temperature and Low Temperature Overpressure Protection Limits Using WCAP 14040-NP-A in Accordance with Generic Letter 96-03 dated March 7, 2000, 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 16th day of March, 2000.
County of San Luis Obispo
State of California

Notary Public

CHUCK MACKEY
Commission # 1204640
Notary Public - California
San Luis Obispo County
My Comm. Expires Dec 12, 2002

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI) REGARDING REQUEST FOR NRC APPROVAL OF DIABLO CANYON METHODOLOGY FOR ESTABLISHING PRESSURE/TEMPERATURE AND LOW TEMPERATURE OVERPRESSURE PROTECTION LIMITS USING WCAP 14040-NP-A IN ACCORDANCE WITH GENERIC LETTER 96-03

The following NRC questions refer to information PG&E provided in letters DCL-98-121, "License Amendment Request 98-06," dated September 3, 1998; DCL-99-005, "Supplement to LAR 98-06," dated January 22, 1999; and DCL-99-017, "Supplement to LAR 98-06," dated February 5, 1999. The methodology is that specified in WCAP 14040-NP-A, Revision 2, "Methodology Used to Develop Cold Overpressure Mitigating System Setpoints and RSC Heatup and Cooldown Limit Curves," dated January 1996.

RAI QUESTIONS ON THE DIABLO CANYON PTLR SUBMITTAL

NRC Question No.1

In the November 24, 1999 submittal, you stated that the supporting license amendment request for License Amendments 133 and 131 for DCPP Units 1 and 2, respectively, included detailed descriptions of the methodology used to develop the pressure and temperature limits curves. You further stated that the methodology is that specified in WCAP 14040-NP-A, Revision 2. The staff has reviewed the submittals related to LAs 133 and 131 for DCPP Units 1 and 2 respectively and believes that the methods for calculating the LTOP arming temperature is sufficiently described on Pages 9 and 10 of PG&E Letter DCL-98-121, dated September 3, 1998 in combination with the answer to Question 5, regarding instrumentation uncertainty, provided in PG&E Letter DCL-99-005, dated January 22, 1999. The staff understands that your methodology for calculating the LTOP arming temperature is as follows:

$$T_{arming} = RT_{ndt} + 50°F + U_I + T_{1/4-t}$$

where,

T_{arming} - LTOP arming temperature

RT_{NDT} - highest adjusted reference temperature

U_I - Temperature instrument uncertainty calculated using ISA S67.04-1994, "Setpoints for Nuclear Safety-Related Instrumentation."

$T_{1/4-t}$ - The difference between the reactor coolant inlet temperature and the vessel metal temperature at a distance one-fourth of the vessel section thickness from the inside surface in the vessel beltline region. This difference is calculated in a manner to bound heatup and cooldown operations and is therefore calculated at the maximum allowed heatup rate.

Please confirm that the above understanding is correct. Also, your proposed PTLR references Westinghouse Report, "Pressure Mitigating System Transient Analysis Results," dated July 1977 as a method used in calculating the LTOP arming temperature. Please identify the sections of this report that were used and explain how they were used.

PG&E Response:

PG&E will replace Westinghouse Report, "Pressure Mitigating System Transient Analysis Results," dated July 1977, with the more recent reference of WCAP-14040-NP-A, Rev. 2, January 1996. The NRC understanding is correct, except for the minor difference of $T_{1/4-t}$. PG&E uses $T_{1/4-t}$ or $T_{3/4-t}$ whichever is greater (more limiting).

NRC Question No. 2

The Bases section to improved Technical Specifications (ITS) 3.4.12 states that the current DCPP temperature of LTOP Applicability was determined in agreement with NRC Branch Technical Position RSB 5-2. Your methodology appears to implement ASME Code Case N-514, not RSB 5-2. Please explain this statement.

PG&E Response:

PG&E agrees that the ITS Bases needs to be revised to reflect the use of Code Case N-514. The use of Code Case N-514 was approved May 3, 1999. The ITS was approved in May 28, 1999, however the timing was such that the code cases change could not be incorporated into the ITS prior to its approval. This revision is currently in progress in accordance with Technical Specification (TS) 5.5.14 as part of the implementation process.

NRC Question No. 3

In PG&E Letter DCL-99-044, dated March 17, 1999, in response to Question 2 and in the staff's letter dated May 3, 1999, it was established that for the current fluence period, that at temperatures less than or equal to 107°F, the RCS will be vented. In the proposed PTLR you used a value of 70°F for establishing this vent which is not consistent with the 107°F value approved in the staff's May 3, 1999 letter. Please discuss this inconsistency and how your PTLR methodology was applied in coming up with the 70°F value. Please provide the methodology on how this value will be evaluated in future LTOP analyses. Please include a discussion of instrument uncertainty and how it is accounted for in this value. Also, please describe the process by which this value will be incorporated into the PTLR.

PG&E Response:

Vent Temperature: The vent temperature of 107°F reported in Question 2 in DCL 99-044 did not incorporate allowances provided in Code Case N-514. The 270°F value noted in DCL 99-044 and in the SER associated with LA 133/131 was the only setpoint which included Code Case N-514 allowables (the RT_{NDT} + 50°F allowance). The 110 percent of allowable pressure provided in ASME Code Case N-514 was incorporated into the remaining LTOP administrative restrictions using upon 50.59 and the NRC approval for use of Code Case N-514 (no NRC

restrictions were placed on it's use). The revised numbers of the PTLR reflect full incorporation of the Code Case. This result is in accordance with WCAP-14040 and all future LTOP analysis will also use this reference. The following table provides a comparison of the P/T limits for the 12 EFPY interval, the current 16 EFPY interval, and the current 16 EFPY interval with full incorporation of ASME Code Case N-514 P/T Limits:

LTOP Administrative Action	12 EFPY Interval App. G Temp. Limit (F) Per LA 100/99	16 EFPY Interval App. G RSB 5.2 Temp Limit (F)	16 EFPY Interval App. G ASME Code Case N-514 Temp Limit (F)
Disable One CCP	270	305 *	270
Disable Second Charging pump	175	194	174
Block SI	134.1	194	174
Stop 1 of 4 RCPs	131	151	128
Stop 2 of 4 RCPs	121	141	113
Stop 3 of 4 RCPs	110	130	96
Stop 4 of 4 RCPs	103	123	84
Establish RCS Vent	87	107 **	70

* 270°F includes Code Case N-514 (based upon RT_{NDT} + 50°F) - Without Code Case it would have been 305°F using RSB 5-2, RT_{NDT} + 90°F: See DCL 98-121

** The 107°F vent temperature was revised to 70°F in accordance with Code Case N-514 using 10 CFR 50.59.

Instrument Uncertainty: Temperature and pressure uncertainty are accounted for when determining the LTOP pressure setpoint and minimum temperature. The RCS temperature uncertainty is transformed into an equivalent pressure uncertainty. The pressure and temperature measurement uncertainties then are statistically combined into a single equivalent pressure uncertainty value which is added to the calculated peak pressure for a given LTOP mass injection scenario. This resultant peak pressure with uncertainty for each case is then compared to the appropriate limit curve, and the minimum temperature is selected for which the calculated peak pressure (including uncertainty) is still below the limit. The resulting minimum temperatures are reported in the PTLR, Table 2.2-2.

NRC Question No. 4

Provide a detailed description and justification of the methodology for calculating the PORV lift setpoint for the LTOP mass addition analyses. Please include discussions on initial assumption, mass input rates in the different temperature regions (provide and justify flow rate assumptions for ECCS injection and charging modes for the centrifugal charging pumps and positive displacement pumps), relief valve characteristics, static and dynamic head, instrumentation uncertainties, and computer codes and their approvals for calculating overshoot. Also, explain how the temperature restriction setpoints for blocking the SI signal and securing injection and reactor coolant pumps are handled/derived in the methodology and how your methodology ensures that these setpoints will be incorporated into your PTLR.

Please explain the differences between the values for these setpoints provided in PG&E Letter 99-005 and your proposed PTLR.

PG&E Response:

Attached calculation, N-NCM-97011, Rev 0, describes the methodology used to establish the LTOP arming temperature for the current 16 EFPY period. This setpoint is based upon Code Case N-514, vessel fluence and resulting metallurgical conditions. The resulting setpoints are reported in PTLR Table 2.2-1.

Attached Westinghouse report "LTOPs Setpoint Evaluation Final Report," PGE-88-642, provides a summary of the LTOP mass analysis results for Diablo Canyon. This report calculated the peak pressure overshoot values for a wide range of mass addition cases, PORV relief characteristics, and RCS initial conditions.

Attached calculation STA-063, Rev 2, establishes the temperature restriction setpoints which ensure the acceptability of plant operation below the established pressure lift point of the PORVs. This calculation accounts for maximum mass addition injection, relief valve performance, static/dynamic fluid head effects, and instrument uncertainties. The resulting setpoints are reported in PTLR Table 2.2-2.

NRC Question No. 5

LCO 3.4.12 of your ITS allows a maximum of one centrifugal charging pump to be capable of injecting into the RCS in the LTOP region. The LCO does not limit this injection to the charging path; therefore, the pump may be allowed to inject through the ECCS injection path. Please explain how this is covered by your mass addition analysis and how this assumed restriction will be incorporated into your PTLR. In addition, no TS restrictions are included for the positive displacement pump. Please show how your LTOP analyses accounts for the injection from the positive displacement pump or provide a TS restriction consistent with your analysis for this pump.

PG&E Response:

The required restrictions are provided in PTLR Table 2.2-2. PG&E uses administrative controls to implement these PTLR restrictions, which were found acceptable by the NRC in LA 100/99, LA 123/121, and LA 133/131. Additional discussion regarding the use of administrative controls will be provided in a subsequent submittal. PTLR Table 2.2-2 has been revised to reflect the requirement to block the injection flow path.

NRC Question No. 6

Please provide a TS addressing the assumptions related to the number of reactor coolant pumps operating in the different temperature ranges.

PG&E Response:

The required restrictions are provided in PTLR Table 2.2-2. PG&E uses administrative controls to implement these PTLR restrictions, which were found acceptable by the NRC in LA 100/99, LA 123/121, and LA 133/131. Additional discussion regarding the use of administrative controls will be provided in a subsequent submittal.

NRC Question No. 7

It appears from your discussion under Section 2.2.1 of your PTLR that you only assumed one RHR pump running for your mass addition analysis. Please justify this assumption.

PG&E Response:

The only effect of RHR pumps running for the LTOP analyses is an increase in the dynamic pressure drop across the RCS system when the transient begins. An increase in the dynamic pressure drop results in a larger difference between the LTOP wide range pressure transmitters, which signal the PORV to open, and the peak RCS pressure location at the bottom of the vessel. Diablo Canyon LTOP setpoint analyses performed, with 1 RHR pump running and 2 RHR pumps running, show that the maximum additional dynamic pressure drop across the RCS for the second RHR pump was less than 1 psid. Based upon this result, it was concluded that the dynamic pressure effect of the second RHR pump had an insignificant effect compared to the other uncertainties and did not need to be addressed further.

NRC Question No. 8

Please describe the methods used to preclude injection pumps from injection when these injection paths are not analyzed. Note that these injection paths must be precluded by two means (e.g., pumps secured and discharge valve closed, pumps secured and power removed, discharge valve closed and power removed, etc.). In addition, in DCL-98-121, you stated that the LTOP analyses assume that the SI signal is blocked. Please explain how an inadvertent manual actuation is covered by the mass addition analyses and by your PTLR methodology?

PG&E Response:

The required restrictions are provided in PTLR Table 2.2-2. PG&E uses administrative controls to implement these PTLR restrictions, which were found acceptable by the NRC under LA 100/99, LA 123/121, and LA 133/131. For example, Operation Procedure L-5, step 5.14.3 requires the charging injection flow path be secured with power removed from one of the two sets of isolating parallel motor operated valves. This is based upon the current Technical Specification (CTS) Bases of LCO 3.4.9 and other administrative controls. These requirements are also included in the ITS Bases of LCO 3.4.12, Required Action A.1 and B.1.

An inadvertent SI could not start any equipment that is not all already assumed to be operating in the bounding LTOP mass injection analysis.

NRC Question No. 9

Provide a detailed description of the evaluation that was performed to establish that the mass addition analyses are more limiting over the entire temperature range for LTOP. Please include calculations comparing mass addition cases to heat addition cases for points over the entire range (e.g., 70, 100, 150, 180, 250, and 270). Please also include a discussion and justification on whether or not this evaluation will be performed each time the LTOP limits are re-evaluated. In addition, in PG&E Letter DCL-99-005, in response to Question 3, you provided an evaluation of this type at initial RCS temperature of 100°F and stated that since any change in input assumptions would affect the mass addition and energy addition cases equally, that the mass addition case remains bounding for the PG&E LTOP analyses. Please justify this statement with respect to the effect of initial RCS temperature on the resulting overshoot. Please note that your discussion of the effect of changing initial RCS temperature on the LTOP analyses is inconsistent with the Westinghouse Report, "Pressure Mitigating System Transient Analysis Results," dated July 1977 and referenced in your submittal.

PG&E Response:

The DCPP LTOP system is based upon only two pressure set points. One at system operating temperatures and 2335 psig and the other at the LTOP arming setpoint of 270°F and 435 psig that is based upon RT_{NDT}. DCPP does not have a "COMS" system with a set of calculated pressure lift points which vary as a function of temperature. WCAP 14040 is written to address plants with COMS as well as plants like DCPP. It is clear that as temperatures increase, the specific volume of water changes more rapidly such that a particular heat injection scenario will become more sever. DCPP has established that mass injection is controlling at 270°F and 435 psig, therefore, mass injection will clearly be controlling over the entire range of LTOP. This is the current condition. DCPP agrees that evaluating both mass injection and heat injection is a normal part of each reanalysis of the heatup and cooldown curves and LTOP setpoints. This direction has been added to the PTLR.

NRC Question No. 10

In PG&E Letter DCL-98-121 you stated that "normally, any changes to the RCS P/T limit curves also require adjustment of the LTOP enable temperature and/or the PORV pressure setpoint when the PORVs are being used for LTOP purposes." You further stated "allowing the use of ASME Section XI, Code Case N-514, will preclude the need to change these limits and avoid additional operational restrictions." Please clarify these statements with respect to how the LTOP limits will be evaluated as part of your PTLR methodology and how the Code Case will be utilized.

PG&E Response:

Code Case N-514 was not fully incorporated in that PG&E only converted from use of RSB 5-2: RT_{NDT} + 90°F, to Code Case N-514 : RT_{NDT} + 50°F. The statement referenced above was intended to point out that the use of this Code Case would reduce the setpoint from 305°F to 264°F and therefore the current value of 270°F would continue to be used rather then a new value of 264°F with the use of the Code Case N-514: RT_{NDT} + 50°F.

NRC Question No. 11

In PG&E Letter DCL-98-121 you stated that methods used by PG&E for calculating operating limits are "very similar" to those used by Westinghouse and are consistent with the referenced documents. The staff believes that this statement was made in reference to WCAP 14040-NP-A. Please explain and justify the differences between the methods used by PG&E and those described in WCAP 14040-NP-A with respect to LTOP analyses.

PG&E Response:

The differences between PG&E's current determination of the LTOP setpoints and WCAP 14040-NP-A are listed below. PG&E recognizes that as the plant ages, the current assumptions may not continue to be bounding and will evaluate their validity when determining new setpoints or curves as stated in the PTLR.

1) Piping Qualification - Bounded by the Operating transient starting from 2335 psig and 547°F. (Question 12)
2) RCP Number 1 seal operation - At 270°F and 435 psig there is no credible way to challenge seal operation. (Question 12)
3) Heat injection cases - Mass injection is bounding throughout the current range of operation. (Question 9)
4) WCAP 14040 assumes that the RCS is water solid - TS allow starting of an RCP regardless of temperature if pressurizer level is 50 percent or less. (Question 15)
5) PG&E has used the non-mandatory Appendix A to ASME Section XI for calculating the pressure stress intensity factor used in generating the P/T limit curves (Reference 15 in WCAP 14040). This difference is approved and discussed in LA 133/131 SER, Section 3.2.2.

NRC Question No. 12

Please explain how your methodology addresses PORV piping structural analysis loads and RCP #1 seal performance criteria.

PG&E Response:

The piping and supports limiting condition is bounded by the Operating transients at 2335 psig and 547°F. These transients are more severe than those that would occur during LTOP conditions.

There is no credible way to challenge RCP #1 seal operation with a temperature setpoint of 270°F or less and a pressure setpoint of 435 psig. RCP #1 Seal is rated for any condition which provides 200 psid across the seal. Maximum pressure undershoot has been estimated to be less then 70 psid. Direction to re-evaluate this bounding condition when ever revising the pressure and temperature arming setpoints has been added to the PTLR.

NRC Question No. 13

The TS Bases section for LTOP (Pages B 3/4 4-16) states that instrument uncertainty is not included in the TS value of 435 psig for the PORVs. According to PG&E Letter DCL-99-005,

instrument uncertainty is accounted for. In addition, it is the staff's position that instrument uncertainty should be accounted for. Please explain how your methodology will account for instrument uncertainty and if it will be included in the PTLR values.

PG&E Response:

This statement in the CTS Bases provides direction to the user that this setpoint is not to be considered "nominal." Plant operation must remain equal to or less than the 435 psig setpoint.

The next sentence of the CTS states that uncertainties are included in accordance with WCAP-14040. The RCS temperature uncertainty is transformed into an equivalent pressure uncertainty. The pressure and temperature measurement uncertainties then are statistically combined into an equivalent pressure value which is added to the calculated peak pressure for a given LTOP mass injection scenario (also see Question 3). This resultant peak pressure which includes uncertainty for each case is then compared to the appropriate limit curve, and the minimum temperature is selected for which the calculated peak pressure (including uncertainty) is still below the limit. These minimum temperature restrictions are identified in the PTLR.

NRC Question No. 14

In PG&E Letter DCL-99-005, in response to Question 2, you listed a PORV stroke time of 3.5 seconds and a delay time of 1.5 seconds. In your letter dated November 24, 1999, you list a PORV stroke time of 2.9 seconds and no delay time. Please justify your assumptions. In your justification, please include a discussion on valve stroke time as well as delay time.

PG&E Response:

The delay time of 1.5 seconds was used in the analysis and will be added to the PTLR. The original stroke time of 3.5 seconds was decreased to 2.9 seconds in order to limit revisions to setpoints during incorporation of Code Case N-514. 2.9 seconds still conservatively bounds the actual stroke time of the valves.

NRC Question No. 15

Notes in LCOs 3.4.6, 3.4.7, in the ITS allows a reactor coolant pump to be started with steam generator secondary side temperatures greater than 50°F more than the RCS cold leg temperature if the pressurizer level is less than 50 percent. Please provide your analyses to justify this LCO note.

PG&E Response:

A pressurizer level of 50 percent or less on narrow range level will provide at least 900 ft^3 of available space which is more than enough volume to accommodate a maximum thermal expansion of the RCS fluid from a temperature of 70°F to 270°F. The actual calculation upon which the TS is based was performed by Westinghouse at the time of the initial license.

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I. **PROCEDURE PTLR-1, "PRESSURE AND TEMPERATURE LIMITS REPORT," REV 0**

II. **CALCULATION N-NCM-97011, "LTOP ENABLE TEMPERATURE AT 16 EFPY," REV 0**

III. **WESTINGHOUSE REPORT, "LTOPS SETPOINT EVALUATION FINAL REPORT," PGE-88-642**

IV. **CALCULATION STA-063, "TEMPERATURE RESTRICTIONS FOR LOW TEMPERATURE OVER-PRESSURIZATION (LTOP)," REV 2**