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PG&E Letter DCL-04-117

U.S. Nuclear Regulatory Commission
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Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82
Diablo Canyon Units 1 and 2
Response to August 24, 2004, NRC Request for Additional Information Regarding License Amendment Request 04-01, "Revised Steam Generator Voltage-based Repair Criteria Probability of Detection Method for DCPP Units 1 and 2"

Dear Commissioners and Staff:

PG&E Letter DCL-04-028, dated March 18, 2004, submitted License Amendment Request (LAR) 04-01, "Revised Steam Generator Voltage-based Repair Criteria Probability of Detection Method for DCPP Units 1 and 2." LAR 04-01 proposes to update the Diablo Canyon Power Plant (DCPP) Final Safety Analysis Report Update to use a revised steam generator (SG) voltage-based repair criteria probability of detection (POD) method using plant specific SG tube inspection results. The proposed POD method is referred to as the probability of prior cycle detection (POPCD) method. The POPCD method was requested to be used on a permanent basis for all remaining cycles for DCPP Units 1 and 2 until SG replacement, starting with DCPP Unit 1 Cycle 13 and DCPP Unit 2 Cycle 13. Based on the results of the DCPP Unit 1 twelfth refueling outage, the POPCD method was not needed for DCPP Unit 1 Cycle 13.

PG&E provided responses to a June 15, 2004, NRC request for additional information (RAI) in PG&E Letter DCL-04-104, "Response to NRC Request for Additional Information Regarding License Amendment Request 04-01, 'Revised Steam Generator Voltage-based Repair Criteria Probability of Detection Method for DCPP Units 1 and 2,'" dated August 18, 2004. PG&E provided responses to a July 8, 2004, NRC RAI in PG&E Letter DCL-04-105, "Response to July 8, 2004, NRC Request for Additional Information Regarding License Amendment Request 04-01, 'Revised Steam Generator Voltage-based Repair Criteria Probability of Detection Method for DCPP Units 1 and 2,'" dated August 20, 2004.

On August 24, 2004, the NRC staff requested additional information required to complete the review of LAR 04-01. PG&E's responses to the staff's questions are provided in Enclosure 1.

In PG&E Letter DCL-04-028, PG&E stated that upon NRC approval to use the POPCD method, PG&E would adopt the EPRI outlier (extreme) growth method for application coincident with the use of the POPCD method. Based on NRC acceptance of PG&E's response to Question 3(b) in Enclosure 1, which proposes criteria for excluding the 11 volts per effective full power year growth rate in the Unit 2 Cycle 13 operational assessment (OA), PG&E does not anticipate the need to apply the extreme growth method for the Unit 2 Cycle 13 OA at this time. Therefore, approval of the extreme growth method prior to the start of the upcoming Unit 2 twelfth refueling outage is no longer required and the extreme growth method can be approved at a later time.

This information does not affect the results of the technical evaluation or the no significant hazards consideration determination previously transmitted in PG&E Letter DCL-04-028.

If you have any questions, or require additional information, please contact Stan Ketelsen at (805) 545-4720.

Sincerely,

David H. Oatley
Vice President and General Manager

kjse/4328
Enclosures
cc: Edgar Bailey, DHS
Bruce S. Mallett
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cc/enc: Girija S. Shukla

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

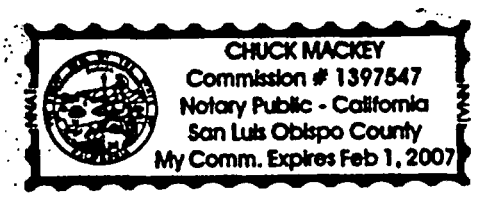
AFFIDAVIT

David H. Oatley, of lawful age, first being duly sworn upon oath says that he is Vice President and General Manager of Pacific Gas and Electric Company; that he has executed this response to the NRC request for additional information on License Amendment Request 04-01 on behalf of said company with full power and authority to do so; that he is familiar with the content thereof; and that the facts stated therein are true and correct to the best of his knowledge, information, and belief.

David H. Oatley
Vice President and General Manager

Subscribed and sworn to before me this 17th day of September 2004.

Notary Public
County of San Luis Obispo
State of California



ENCLOSURE 1

PG&E Response to the August 24, 2004, NRC Request for Additional Information Regarding License Amendment Request 04-01, "Revised Steam Generator Voltage-based Repair Criteria Probability of Detection Method for DCPP Units 1 and 2"

NRC Question 1:

In your August 18, 2004 letter (refer to response to question 5), you discuss the assigned voltages associated with axial outside diameter stress corrosion cracking indications not detected by bobbin (AONDBs). In Figure 1, a plot of the inferred bobbin voltage as a function of actual bobbin voltage is provided. Given the scatter in Figure 1, please discuss your plans to assess whether the bobbin voltages assigned to AONDB indications continue to remain conservative. For example, once AONDBs become detectable by bobbin, discuss your plans to assess whether the actual bobbin voltages are consistent with what would be expected based on the inferred bobbin voltage from the prior inspection and typical voltage growth. In addition, discuss your plans to include this assessment in your 90-day report. Please note that it would seem more appropriate to draw the vertical line in Figure 1 at 0.96 volts as a horizontal line at 0.96 volts (indicating that the actual voltages are not consistently conservative).

PG&E Response:

In 90-day reports for steam generator (SG) voltage-based alternate repair criteria (ARC) that implement the probability of prior cycle detection (POPCD) method as the calculation of record, PG&E will assess bobbin voltages assigned to AONDB indications to verify that the assigned voltages are conservative. For prior cycle AONDB indications that become detectable by bobbin, the review will assess the prior cycle assigned bobbin voltages, the current cycle actual bobbin voltages, and growth rates.

NRC Question 2:

Clarify the statement that the affects of potential preventive plugging below the repair limit should be considered (refer to step 3a in your response to question 8 of your August 18, 2004 letter).

PG&E Response:

If preventive plugging below the repair limit has been performed, such as in Diablo Canyon Unit 2 Refueling Outage Eleven (2R11) when all indications greater than 1.2 volts were plugged, these affects should be considered when evaluating whether a voltage-dependent growth (VDG) or voltage-independent growth distribution should be used. For example, as discussed in Section 7.3 of the 2R11 90-day

report contained in PG&E Letter DCL-04-112, "Special Report 04-02 - Results of Steam Generator Inspections for Diablo Canyon Power Plant Unit 1 Twelfth Refueling Outage," dated September 7, 2004, the voltage-independent growth distribution provided a more conservative probability of burst (POB) and leak rate than the VDG distribution. However, PG&E determined that use of VDG more appropriately reflected the benefit of preventive plugging. In the NRC letter to PG&E dated October 21, 2003, the NRC Staff agreed that the POPCD case with VDG provided reasonable margins when compared to the reporting thresholds.

NRC Question 3:

The extreme growth of an indication is considered a random event that is not expected to occur with a high probability in successive cycles (refer to response to question 9e of your August 18, 2004 letter). The staff review of the extreme value growth methodology is continuing; however, there are still a number of issues that will need to be addressed before the staff can complete its review. For example, in the case of the 3/4-inch tubes, it does not appear that the occurrence of the "extreme growths" listed are random events. Rather, for this tube size, it appears that "extreme" growth rates should have been an expectation. For the 7/8-inch tubes, the occurrence of these "extreme" growth rates appears to be more random; however, it is important that criteria for distinguishing between random and routine "extreme" growths would need to be developed. Given that these extremes are not routinely expected, discuss your plans for incorporating larger voltage growths (i.e., those exceeding 5 volts per effective full power year as discussed in your August 18, 2004 response to question 8 (step 1 and 4c)) in your standard growth rate distribution pending NRC staff review and approval of the extreme "growth" modeling.

Another issue that the staff is considering is whether the extreme growths for the plants with 7/8-inch tubes would have started to become more "expected" events (rather than random) near the end-of-life of the steam generators given that the extremes at plant A-1 happened just prior to steam generator replacement and the extremes at plants W-2 and Y-2 just recently occurred (i.e., during the last operating cycle). This issue may not be able to be addressed until after the next inspections at these plants.

Summary of PG&E Response:

3a) If "x" extremes are detected in a SG, and the probability of occurrence of "x" extremes is greater than an NRC approved probability, e.g.,1.27 percent using equation (13) of Enclosure 1, "Extreme Values of ODSCC ARC Growth (hereafter referred to as the extreme growth report)," of Nuclear Energy Institute (NEI) Letter "Revision to ODSCC ARC Task – Extreme Values of ODSCC ARC Growth," dated July 9, 2004, then the extreme growths are included only in the extreme growth distribution for the simulation of that SG. Otherwise, the extreme growth method is not applied. The use of the example probability of

occurrence of 1.27 percent (98.73 percent probability of no extreme) in any 1 SG is based on the expectation that there is a 95 percent probability of observing no extremes in all 4 SGs.

3b) In the interim, if POPCD is approved but approval of the extreme growth method is still pending, then all growth rate data from the last 2 cycles will be included in the growth distribution assessment, with the exception that the 11 volts per effective full power year (volts/EFPY) growth rate from Unit 2 Cycle 11 will be excluded contingent on no growth rates greater than 8 volts/EFPY being observed in Unit 2 Cycle 12.

3c) Upon NRC approval of the extreme growth methodology, updates to the EPRI ARC database addenda reports will include an assessment for a trend toward extreme growth occurrences near the time of replacement based on updated databases.

Detailed responses to questions 3a, 3b, and 3c are provided below:

Detailed Response to Question 3(a)

The NRC staff's concerns are related to the protocol for dealing with large extremes, and essentially deals with the appearance of extremes for cause, which could be an increasing probability of occurrence with operating age, as opposed to being random occurrences. A visualization of the pattern of large extremes on a per inspection basis results when the data contained in Table 1 of PG&E Letter DCL-04-105, "Response to July 8, 2004, NRC Request for Additional Information Regarding License Amendment Request 04-01, 'Revised Steam Generator Voltage-based Repair Criteria Probability of Detection Method for DCPP Units 1 and 2'" dated August 20, 2004, are used to create a modified version of Table 4 in which the number of extremes are substituted for the designation of the use of the data. It appears that the 3/4-inch plants experience a "cluster" or peak number of large extremes in the inspection outage prior to replacement. The staff apparently looked at the frequency of appearance of large extremes in successive outages on a plant basis and concluded that the appearance(s) may not have been entirely random. The same conclusion is implied if the data of Table 1 of PG&E Letter DCL-04-105 are segregated by plant and SG. For example, SG C of Plant AC-2 had seven large extremes at the inspection prior to the last cycle of operation. This number of large extremes appears to be disproportionately large for the number of indications in the SG, i.e., 768. The probability of the appearance of seven large extremes in a SG with 768 total indications can be seen to be extremely small based on the results provided at the bottom of Table 6 of the extreme growth report for 3/4-inch diameter tubes, e.g., on the order of $1x10^{-8}$. This would imply that the appearance of the large extremes for cause as opposed to being entirely random should be investigated. Alternatively, the number could be considered to be not random if further investigation is not pursued. Regardless, the same observation is not true when the data from plants with 7/8-inch diameter SG tubes is examined

since there have been significantly less large extremes in 7/8-inch diameter SG tubes for a similar population size.

The initial response to the staff's observation is to consider a simple test or criterion regarding the number of extremes found in one SG at one time. For example, the appearance would be considered to be not random if the number of large extremes in any one SG has a probability less than an NRC approved expected frequency of occurrence (e.g., less than or equal to 1.27 percent) for a 4-loop plant. The use of the example 1.27 percent probability of occurrence (98.73 percent probability of no extreme) in any 1 SG is based on the expectation that there is a 95 percent probability of observing no extremes in all 4 SGs. The affect on the simulations would be that if there is an expectation of the appearance of large extremes, e.g., a presumption that they are no longer random, the growth values would be included in the cumulative growth curve for the simulations performed to estimate the statistics of the structural integrity of the SG, otherwise, the approach based on the probability of occurrence of large extremes would be acceptable. For a plant with 7/8-inch diameter tubes with a total of 500 indications in each SG, the finding of 2 or more large extremes in the 1 SG is a probability less than 1.27 percent (0.000338 or 0.034 percent per Table 6 of the extreme growth report), and would lead to their being retained in the growth curve for the simulation of that SG. The probability of occurrence of "x" extremes is calculated using equation (13) of the extreme growth report. On the other hand, the finding of one extreme in this example is a probability greater than 1.27 percent (0.025689 or 2.57 percent per Table 6 of the extreme growth report), and would lead to their being included only in the extreme growth curve for the simulation of that SG. This relatively simple test should be applied as part of the extreme growth methodology to define random/nonrandom occurrences of large growth to define whether the new extreme growth values can/cannot be included in the extreme growth rather than the cumulative growth curve. It is recommended that the existing Table 3 (of the extreme growth report) database for extreme growths be retained, even though some of the data would not be classified as random by the above test, since a high frequency of historical large growths is conservative when applying the extreme growth methodology.

Additional considerations regarding the trend of the appearance of large extremes with time of operation could be made to assess additional criteria for determining whether to retain the growth values of the large extremes in the cumulative distribution curve for the SG or to continue to use the probabilities associated with the expectation that the large extremes are occurring at random. However, the above suggested approach should be sufficient. Overall, the determination of more complex criteria is likely not necessary based on the fact that the number of plants that continue to apply the ARC is diminishing. For example, there are only two plants with 3/4-inch diameter tubes and five plants with 7/8-inch diameter tubes where application continues to be needed, most of which are already scheduled for replacement. The plants with 7/8-inch diameter tubes operate at a lower temperature than plants with 3/4-inch diameter tubes and their associated probability of occurrence of large extremes is diminished.

Detailed Response to Question 3(b)

Pending NRC staff review and approval of the extreme growth modeling, PG&E will revise Step 1 and Step 4c of PG&E's response to NRC Question 8 in PG&E Letter DCL-04-104, "Response to NRC Request for Additional Information Regarding License Amendment Request 04-01, 'Revised Steam Generator Voltage-based Repair Criteria Probability of Detection Method for DCPP Units 1 and 2,'" dated August 18, 2004, as follows:

Step 1: Prepare cumulative probability distribution function (CPDF) growth curves for each of last two cycles (i.e., SG-specific and SG-composite growth curves for cycle n and cycle n-1). When POPCD is applied, then either Steps 1a or 1b are applicable.

a. If the NRC has not approved the extreme growth modeling, then all growth rate data from the last 2 cycles will be included in the assessment, with the exception that the 11 volt/EFPY growth rate from Unit 2 Cycle 11 will be excluded contingent on no growth rates greater than 8 volts/EFPY being observed in Unit 2 Cycle 12.

b. If the NRC has approved the extreme growth modeling, then any growth rates greater than 5 volts/EFPY should be excluded from these curves and included in the extreme growth distribution, subject to possible future NRC limitations on the extreme growth methods (e.g., the probability of the number of extreme occurrences found in the inspection being greater than 1.27 percent as discussed in response to Questions 3(a) and 3(c)).

In step 1a, the basis for excluding growth rates greater than 11 volts per EFPY that occurred in cycle n-1 is as follows: 11.9 volts/EFPY is the SG tube R44C45 growth rate in DCPP Unit 2 Cycle 11. The absence of any repetition of growth rates near 11 volts in the DCPP Unit 2 Cycle 12 growth data will support the expected very low likelihood of a repetition of a growth rate near 11 volts, given the fact that all large (greater than 1.9 volts) Plus Point indications less than the 2 volt bobbin repair limit were preventively plugged at 2R11 (total of 3 indications met this criterion and were plugged per PG&E Letter DCL-04-105). In PG&E Letter DCL-04-104, PG&E committed to Plus Point inspect 100 percent of bobbin indications exceeding 1.7 volts, upon NRC approval of multi-cycle POPCD and use of a 2 volt ARC, and preventively repair those indications exceeding 1.9 volts Plus Point. Had this practice been in place at Unit 2 Refueling Outage Ten, SG tube R44C45 would have been repaired, thus eliminating the considerations of the 11 volt growth issue. (Note: For locked tube support plates and a 4 volt ARC, the need for an augmented Plus Point program will be based on leakage considerations, as discussed in PG&E Letter DCL-04-104.) Given the expected condition of no large growth rates in Unit 2 Cycle 12, it would be excessively conservative to include the 11 volt growth value when comparing the Cycles 11 and 12 growth distributions to define the bounding

growth. It should also be noted that the pulled tube R44C45 burst test results satisfied burst margin requirements, whereas the ARC predictions indicated a burst probability near the reporting limit, which demonstrates the excessive conservatism obtained when including the 11 volt growth in the growth distributions for operational assessments. If the largest growth rate for DCPP Cycle 12 exceeds 8 volts, which represents a growth rate closer to 11 volts/EFPY than to 5 volts/EFPY, the 11 volt growth would be retained in the Cycle 11 data on the basis that there could be a finite potential for repeating an 11 volt growth rate.

Step 4c: If an extreme voltage growth has occurred during either cycle, then either Steps 4c(i) or 4c(ii) are applicable for determination of extreme growth data to be excluded in the calculation of the average cycle growth for delta volts adjustment purposes. Extreme growth rates will significantly influence the average cycle growth rate.

(i): Similar to the logic defined in Step 1a, if the NRC has not approved the extreme growth modeling, then all growth rate data from the last 2 cycles will be included in the assessment, with the exception that the 11 volt/EFPY growth rate from Unit 2 Cycle 11 will be excluded contingent on no growth rates greater than 8 volts/EFPY being observed in Unit 2 Cycle 12.

(ii): If the NRC has approved the extreme growth modeling, then growth rates greater than 5 volts/EFPY in either cycle should be excluded, subject to possible future NRC limitations on the extreme growth methods (e.g., the probability of the number of extreme occurrences found in the inspection being greater than 1.27 percent as discussed in response to Questions 3(a) and 3(c)).

Detailed Response to Question 3(c)

The NRC staff's issue under consideration with regard to the potential for an increasing appearance of large extremes at plant A-1 near the time of replacement is based on one in April 1997 in SG C and one each in November 1998 in SGs B and C. If all plants that have replaced SGs without the occurrence of extreme growths near the time of replacement would be considered, there would be even less of a trend toward extremes near SG replacements. There is no definable pattern at this time. PG&E agrees with the staff's conclusion that future data should be evaluated to ascertain whether or not a pattern is emerging. Operating plants with recent extremes are scheduled for inspection in the near term: the next Plant Y-2 inspection is November 2004 and the next plant W-2 inspection is April 2005. The simple approach suggested above will help in making judgments regarding the trend of the data once it is obtained. Upon NRC approval of the extreme growth methodology, updates to the EPRI ARC database addenda reports will include an assessment for a trend toward extreme growth occurrences near the time of replacement based on updated databases.