



**Pacific Gas and  
Electric Company**

**Lawrence F. Womack**  
Vice President  
Nuclear Services

Diablo Canyon Power Plant  
P.O. Box 56  
Avila Beach, CA 93424

805.545.4600  
Fax: 805.545.4234

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PG&E Letter DCL-01-081

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

Docket No. 50-275, OL-DPR-80  
Diablo Canyon Unit 1  
Response to NRC Technical Issues on the Diablo Canyon Power Plant  
Unit 1 Refueling Outage 9 Steam Generator Inspection 90-Day Report

Dear Commissioners and Staff:

On June 8, 1999, PG&E submitted the steam generator 90-day report for Diablo Canyon Power Plant Unit 1 in PG&E letter DCL-99-076, "Special Report 99-04 - 90-Day Report, Results of Steam Generator Alternate Repair Criteria for Diablo Canyon Power Plant Unit 1 Ninth Refueling Outage." In accordance with Generic Letter 95-05, "Voltage-Based Repair Criteria for Westinghouse Steam Generator Tubes Affected by Outside Diameter Stress Corrosion Cracking," Enclosure 2 of DCL-99-076 provided the 90-day report for voltage-based alternate repair criteria (ARC), and included voltage distributions of indications and results of the tube integrity evaluation.

In a letter dated February 7, 2001, "Review of Diablo Canyon Nuclear Power Plant, Unit No. 1 - Refueling Outage 9 Steam Generator Inspection 90-Day Report (TAC No. MA6240)," the NRC identified two technical issues related to implementation of the voltage-based ARC. Enclosure 1 to this letter provides the PG&E response to these two technical issues.

If you have additional questions regarding this response, please contact Mr. Bob Exner at (805) 545-4302.

Sincerely,

Lawrence F. Womack

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cc: Edgar Bailey, DHS  
Ellis W. Merschoff  
David L. Proulx  
Girija S. Shukla  
Diablo Distribution

Enclosure

KJS

**Response to NRC Technical Issues on the Diablo Canyon Power Plant Unit  
No. 1 Refueling Outage 9 Steam Generator Inspection 90-Day Report**

NRC Technical Issue 1

*"In at least three instances axial ID and OD cracking was located at the same tube support plate intersection. Based on the material provided, it appears these indications were identified by bobbin as OD indications (i.e., DOS indications) and when inspected with a plus point coil, PG&E identified both ID and OD cracking. PG&E did not discuss whether denting was occurring at these intersections and/or the voltages associated with these dents. Although these indications were removed from service, PG&E should evaluate the need to inspect all bobbin indication with voltages below the 2.0 volt threshold to confirm that ID and OD cracking are not occurring at the same intersection. PG&E's dent inspection program may be addressing this concern; however, the submittal was not clear on this respect. The staff's concern is that PG&E may be applying a voltage based criteria to an ID flaw with no supporting correlations and/or methodology. It is also unclear whether PG&E addresses this degradation in the condition monitoring and operational assessment."*

PG&E Response to Technical Issue 1

The three Unit 1 refueling outage nine (1R9) flaws that contained both inner diameter (ID) and outer diameter (OD) cracking at the same intersection were located at dented tube support plate intersections. These intersections were inspected by Plus Point as part of PG&E's commitment to perform Plus Point inspection of bobbin indications located at less than 5 volt dented intersections (no lower voltage cutoff) to ensure that only OD flaws are left in service under the voltage-based alternate repair criteria. This commitment is documented in the NRC Staff safety evaluation transmitted to PG&E in NRC letter dated March 12, 1998. This commitment ensures that voltage-based repair criteria are not applied to intersections containing ID flaws.

Tubes that have both ID and OD cracking at the same intersection are plugged upon detection by Plus Point. For condition monitoring and operational assessment of ID/OD flaws, PG&E evaluates each ID flaw and OD flaw separately.

NRC Technical Issue 2

*"PG&E evaluated the alternate probe wear criteria to determine if there was a disproportionate number of new indications being found in tubes inspected during a prior outage with a probe that failed the probe wear criteria (i.e. 15 percent). PG&E's evaluation indicated that approximately half of the new indications were*

*in tubes that previously failed a probe wear check and that probe wear was not considered to be the dominant reason for the new indications.*

*The staff believes that PG&E should consider evaluating the alternate probe wear criteria by comparing the percentage of intersections previously inspected with probes that failed the probe wear check and developed new indications to the percentage of indications previously inspected with probes that passed the probe wear check and subsequently developed new indications. The staff recognizes assumptions regarding when the probe actually failed the probe wear check would need to be made (i.e., an estimate of the point between the calibration runs when the probe crossed-over the 15 percent criteria would need to be made) during the evaluation.*

*The staff's concern is illustrated in the following example. Suppose 20 new indications were detected during the outage. Further, suppose that of these 20, 10 were associated with a probe that failed the probe wear check during the prior inspection and 10 were associated with a probe that passed the probe wear check during the prior inspection. Also, suppose that during the prior outage a total of 100 intersections were inspected with a probe that failed the probe wear check and 10,000 intersections with a probe that passed the probe wear check. In this case, 10 percent of the intersections inspected with a "worn probe" developed new indications whereas only 0.1 percent of the intersections inspected with a "non-worn probe" developed new indications. This may indicate that the alternate probe wear criteria is resulting in missing degradation."*

#### PG&E Response to Technical Issue 2

Voltage-based repair criteria performance monitoring includes a requirement to perform an evaluation if large indications or a disproportionate number of new indications are detected in tubes that were inspected with a worn probe in the prior outage. The evaluation should address whether or not a more restrictive probe wear criteria (i.e., less than 15 percent) is needed.

The 90-day report for 1R9 voltage-based repair criteria shows that 144 of the 159 distorted support signal (DOS) indications found during 1R9 were new, and 75 of the 144 new indications (52 percent) were inspected with a worn probe in Unit 1 refueling outage eight (1R8). In response to the NRC staff concern, data in Table 1 has been compiled to allow a comparison of the percentage of 1R8 tube inspections performed with worn probes and number of new 1R9 indications subsequently detected in those tubes (1.2 percent) versus the percentage of 1R8 tube inspections performed with good probes (i.e. probes that pass the probe wear check) and number of new 1R9 indications subsequently detected in those tubes (0.9 percent). (Note: If a probe failed a wear check at the end of a calibration group, all tubes on that group were assumed to be inspected with a worn probe.) The fact that these percentages aren't significantly different supports the conclusion that probe wear is not a significant contributor to the number of new indications.

**Table 1**

	Worn Probe in 1R8	Good Probe in 1R8
New 1R9 Indications	75	69
Number of 1R8 Tube Inspections	6267	7558
Percentage of New 1R9 Indications	1.2%	0.9%

In addition, it should be noted that all of the new 1R9 DOS indications were detected during the historical review of the 1R8 data. The historical review was performed to determine the growth rates for the DOS indications that were newly detected in 1R9. Since all of the new 1R9 DOS indications were detected in the 1R8 data, probe wear is not considered to have significantly affected data quality and, therefore, the outer diameter stress corrosion cracking detection capability. If probe wear was degrading the signals of these indications, some of these indications may not have been detected during the review of the 1R8 data. Therefore, it is concluded that these new indications are a result of the probability of detection, not a worn probe.

Finally, voltage-based repair criteria require that tubes inspected with a worn probe containing an indication greater than 75 percent of the repair limit (1.5 volts) be reinspected with a good probe. As a result, a comparison has been made of the bobbin voltages using good probes and worn probes based on a review of data from Unit 1 and Unit 2 refueling outages nine and ten. The data review shows that the voltage changes are insignificant, and the continued use of the 75 percent criteria (1.5 volt) is justified.