September 20, 2006

Mr. John S. Keenan
Senior Vice President and Chief Nuclear Officer
Pacific Gas and Electric Company
Diablo Canyon Power Plant
P.O. Box 770000
San Francisco, CA 94177-0001

SUBJECT: DIABLO CANYON POWER PLANT, UNIT NO. 1 - REVIEW OF STEAM GENERATOR TUBE INSPECTION REPORTS FOR THE 2005 (1R13) OUTAGE (TAC NO. MD0317)

Dear Mr. Keenan:

By letters dated November 25, 2005, February 24 and June 23, 2006, Pacific Gas and Electric Company (the licensee) submitted information summarizing the results of the 2005 steam generator (SG) tube inspections at Diablo Canyon Power Plant, Unit No. 1. These inspections were performed during the 13th refueling outage (1R13). In addition to these reports, the U.S. Nuclear Regulatory Commission (NRC) staff summarized additional information concerning the 2005 SG tube inspections at Diablo Canyon Power Plant, Unit No. 1 in a letter dated January 18, 2006.

The NRC staff has completed its review of these reports and concludes that the licensee provided the information required by its technical specifications and that no additional follow-up is required at this time. The NRC staff's review of the reports is enclosed.

If you have any questions regarding this matter, please contact me at (301) 415-1445.

Sincerely,

/RA/

Alan Wang, Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-275

Enclosure: As stated

cc w/encl: See next page

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SUMMARY OF NRC STAFF'S REVIEW OF

2005 STEAM GENERATOR TUBE INSPECTIONS

DIABLO CANYON POWER PLANT, UNIT NO. 1

FACILITY OPERATING LICENSE DPR-80

DOCKET No. 50-275

By letters dated November 25, 2005 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML053410394), February 24 (ADAMS Accession No. ML060660468) and June 23, 2006 (ADAMS Accession No. ML061860377), Pacific Gas and Electric Company (the licensee) submitted information summarizing the results of the 2005 steam generator (SG) tube inspections at Diablo Canyon Power Plant (DCPP), Unit No. 1. These inspections were performed during the 13th refueling outage (1R13). In addition to these reports, the U.S. Nuclear Regulatory Commission (NRC) staff summarized additional information concerning the 2005 SG tube inspections at DCPP, Unit No. 1, in a letter dated January 18, 2006 (ADAMS Accession No. ML053640392).

The SGs at DCPP, Unit No. 1, are Westinghouse Model 51 SGs. Each SG contains 3,388 mill annealed Alloy 600 tubing. Each tube has a nominal outside diameter (OD) of 0.875 inches and a nominal wall thickness of 0.050 inches. The tubes are supported by a number of carbon steel tube support plates and Alloy 600 anti-vibration bars. The tubes were explosively expanded into the tubesheet at both ends for the full length of the tubesheet.

The licensee provided the scope, extent, methods, and results of its SG tube inspections in the documents referenced above. In addition, the licensee described corrective actions (i.e., tube plugging) taken in response to the inspection findings.

As a result of the review of the reports, the NRC staff has the following comments/observations:

During implementation of the alternate repair criteria (ARC) for axially-oriented primary water stress-corrosion cracking (PWSCC) indications at dented tube support plates, the burst pressures for a few indications were over predicted. The over predictions were minor with the largest over prediction using the Westinghouse model being 152 pounds per square inch (psi), and the largest over prediction using the Argonne National Laboratory through-wall model being 389 psi.

The licensee determined that the total SG leak rate Monte Carlo statistical analysis for the PWSCC ARC could be more conservative than the single-indication analyses for both the condition monitoring and the operational assessment. As a result, the licensee will perform the total SG leak rate Monte Carlo analyses for each SG, regardless of the result of the single-indication analyses.

The number of circumferential indications detected during an outage at the tube support plate elevations has increased.

Four indications previously allowed to remain in service under the PWSCC ARC merged into two indications. These indications were not included in the growth rate distribution. Since merging of indications could occur in the future, if this phenomenon is not appropriately accounted for, it could result in a less conservative prediction (i.e., an over prediction) of a tube's burst pressure.

For implementation of the PWSCC ARC, the growth rates are monitored with time. Due to an increase in the growth rates (at least for length), the licensee has indicated that if during the next end-of-cycle inspection the measured growth rate (evaluated at the 90th percentile) is greater than the predicted growth rate (evaluated at the 90th percentile), the growth rate for the just completed cycle will be increased by a factor of 1.1 or more.

An indication previously left in service under the PWSCC ARC was detected at a tube support plate that had a ligament crack. This was the first outage that an ARC indication was detected at the same tube support plate with a ligament indication. The tube was plugged.

Based on an evaluation of eddy current data from axially-oriented OD stress-corrosion cracking indications that were not detected by bobbin (i.e., AONDB indications), it was determined that the bobbin to +Point^{TM} voltage correlation should only include data from Unit 1 (rather than including data from both Unit 1 and 2).

The 1R12 single-cycle probability of prior cycle detection (POPCD) curve has a lower probability of detection in the upper tail of the distribution when compared to the DCPP composite POPCD curve. Since the composite POPCD curve was used in the assessments of tube integrity, the assessments may be non-conservative if the probability of detection at DCPP, Unit No. 1 is actually equivalent to the 1R12 single-cycle POPCD curve. The licensee concluded that the reason these indications were not detected was due to conservative methodologies rather than an emerging issue with a decrease in the ability to detect degradation with a bobbin coil. The non-conservative trend in the single-cycle POPCD curve was driven primarily by three data points (with voltages ranging from 1.72 to 1.90 volts). In two of these cases, the licensee indicated that the voltages may be high because of denting and/or the mix residual signal. Although the voltages may have been affected by denting or the mixing process, it is unclear (to the staff) that the voltages measured for these indications would not be consistent with the voltages measured for other flaws in the structural and leakage integrity databases. As a result, it is difficult to conclude that the voltages are conservative since the databases supporting the data used in assessing these indications may have similarly been affected by denting or the mixing process. Nonetheless, despite potentially using a non-conservative POPCD curve, the staff expects that if the tube integrity calculations were re-performed with the more conservative POPCD curve, the results would still be acceptable (i.e., that tube integrity would be maintained). This is based on the margins between the current projections and the acceptance limits. In the event that the next inspection indicates that the projections of tube integrity were

non-conservative, it may be useful to evaluate the role (if any) the POPCD distribution had in contributing to this non-conservatism.

During 1R13, there was one instance in which an indication detected with a +Point™ coil in 1R12 was not detected with a +Point™ coil in 1R13 (i.e., a "disappearing flaw"). The voltage of the indication was small (less than 0.5 volts).

Based on a review of the information provided, the NRC staff concludes that the licensee provided the information required by its technical specifications. In addition, the NRC staff concludes that there are no technical issues that warrant follow-up action at this time, since the inspections appear to be consistent with the objective of detecting potential tube degradation and the inspection results appear to be consistent with industry operating experience at similarly designed and operated units.

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