July 7, 2004

Mr. Gregory M. Rueger
Senior Vice President, Generation and
Chief Nuclear Officer
Pacific Gas and Electric Company
Diablo Canyon Power Plant
P.O. Box 3
Avila Beach, CA 93424

SUBJECT: DIABLO CANYON POWER PLANT, UNIT NO. 1 – SUMMARY OF CONFERENCE CALL REGARDING THE SPRING 2004 STEAM GENERATOR TUBE INSERVICE INSPECTION (TAC NO. MC2616)

Dear Mr. Rueger:

On April 14, 2004, the NRC staff participated in a conference call with Pacific Gas & Electric (PG&E) to discuss the results of inspections of the Diablo Canyon Power Plant, Unit No. 1 steam generator (SG) tubes performed during the Spring 2004 refueling outage. The staff indicated their plans to document the telephone conference, as well as any material that PG&E may provide to the NRC staff in support of the telephone call via a brief summary.

The enclosure represents a summary of the telephone conference held on April 14, 2004, in which results of the SG tube inspections conducted during the Spring 2004 Unit 1 refueling outage were discussed. The material received from PG&E prior to this telephone conference is attached to the enclosed summary of the conference call.

Sincerely,

/RA/

Girija S. Shukla, Project Manager, Section 2
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-275

Enclosure: Summary of Conference Call

cc w/encl: See next page

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SUMMARY OF CONFERENCE CALL WITH

PACIFIC GAS & ELECTRIC COMPANY

REGARDING THE SPRING 2004 STEAM GENERATOR INSPECTION RESULTS

AT DIABLO CANYON POWER PLANT, UNIT NO. 1

On April 14, 2004, the NRC staff participated in a conference call with Pacific Gas & Electric Company (PG&E) to discuss the results of inspections of the Diablo Canyon Power Plant (DCPP), Unit No. 1 steam generator (SG) tubes performed during the Spring 2004 refueling outage. To facilitate the discussion, the licensee provided some information that is attached to this conference call summary.

DCPP Unit 1 has four recirculating Westinghouse Series 51 SGs. At the time of the call, eddy current tube inspections were 25% complete in SG 1-1 and SG 1-2. Tube inspections were 100% complete in SG 1-3 and SG 1-4. The licensee took no exceptions to the industry SG examination guidelines provided by the Electric Power Research Institute. Primary-to-secondary leakage was approximately 1 gallon per day in the cycle immediately prior to the shutdown for the 2004 outage, which is consistent with the leakage observed during the previous 3 cycles. A secondary side pressure test was performed up to 600 pounds per square inch (psi) prior to the start of the eddy current inspections in an attempt to locate the cause of the small operational leakage. No evidence of leakage was detected during this pressure test.

Chemical cleaning was performed on all four SGs. Eddy current inspection was performed after chemical cleaning in SGs 1-1 and 1-2 and before chemical cleaning in SGs 1-3 and 1-4. A 200 tube sample was inspected with eddy current before and after chemical cleaning to determine if cleaning affected the inspection results. This sample included 100 tube support plate indications and 100 tubes with no detectable degradation. There were no new eddy current indications detected at either the support plates or in the free span of these tubes after chemical cleaning. In addition, there were no significant changes in the amplitudes of pre-existing support plate indications when measured before and after cleaning.

A description of the eddy current inspection scope and expansion criteria is shown in Table 1 of the attached information provided by the licensee. The NRC staff and licensee discussed several areas related to inspection scope in greater detail. The DCPP Unit 1 dent exam was consistent with past inspection scopes and NRC commitments. Within the tubesheet region, the licensee indicated that the minimum required rotating probe inspection extent for application of the W* alternate repair criteria (ARC) was 8.5 inches from the top-of-tubesheet (TTS). This inspection depth into the tubesheet resulted in allowances between 0.88 inches and 3.18 inches for the distance between the TTS and the bottom of WEXTEX transition (BWT). The licensee indicated they only measure the BWT for tubes with indications within the W* distance.

Based on an approximately 100 tube sample, 95% of the BWTs measured less than 0.6 inches below the TTS. The licensee indicated, for this sample, a 0.25 inch to 0.5 inch TTS-to-BWT distance was typical and a maximum distance was approximately 1.1 inches. In order to inspect a minimum of 8.5 inches below the TTS with a rotating probe, the licensee indicated the actual inspection distance usually extends up to 10 inches below the TTS. In response to recent increases in the rotating probe inspection depths below the TTS at other plants, PG&E

requested Westinghouse to review the W* inspection distance at DCPP to determine if recent laboratory test results affect the W* inspection distance. The licensee reported that the Westinghouse response concluded no changes were needed to the distance previously delineated in WCAP-14797.

In addition to the tubes inspected according to the W* criteria, the licensee stated there are about 5 to 10 tubes that were only partially expanded within the tubesheet. These tubes are inspected with a rotating probe from the TTS all the way to the tube end.

Within the U-bend region, the licensee followed the Westinghouse Owners Group inspection recommendations to check for axial (rows 13 to 17) and circumferential (rows 1 to 10) primary water stress corrosion cracking (PWSCC). All active tubes in Rows 1 through 10 and 20% of the rows 13 to 17 were inspected in the U-bend region with the +Point™ probe. This was the first +Point™ inspection of the U-bends in rows 3 and higher.

The pre-outage data for all new eddy current indications detected by the licensee at tube support plates is reviewed to determine growth rates. Only 5 of 125 new indications in SG 1-3 and SG 1-4 were not detected in this look-back analysis. The largest amplitude indication not previously detected but present in the look-back analysis was 1.2 volts. Bobbin indications in the tubing free span are compared to the data obtained in Refueling Outage 6 (or earlier) to look for a change in signal. If signal change is apparent in the look-back comparison, a +Point™ probe inspection is performed.

A summary of the repairable eddy current indications identified as of April 13 is shown in Table 2 of the attached information provided by the licensee. Discussions with the licensee provided some additional clarifications to Table 2. There were no support plate indication voltage growth outliers, i.e., greater than 5V per effective full power years. The total number of support plate indications in SG 1-3 and SG 1-4 was less than projections. The two inside diameter/outside diameter (ID/OD) indications at dented tube support plates were axially oriented and were plugged. Analysis of these two indications was not yet completed at the time of the call but past indications of this type showed sufficient separation between the ID and OD indications so that there would be no interaction between them. All axially oriented not detected by bobbin (AONDB) indications at tube support plates with dents greater than 5 volts were plugged.

There were two new damage mechanisms identified in DCPP Unit 1 during the Spring 2004 inspections. As part of the first of a kind 100% +Point™ probe inspections in the Rows 3 to 10 U-bends, 85 tubes in rows 5 to 8 of SG 1-3 and SG 1-4 were identified as having circumferential PWSCC indications. Most of the U-bend PWSCC indications were in Row 6. At the time of the call, there were no indications beyond row 8 in any SG and the largest amplitude circumferential indication was 3.52 volts with an estimated length equal to 34 degrees. Affected tubes typically contained multiple cracks with an 0.2 inch to 0.3 inch spacing between cracks. These circumferential U-bend indications were described as lining up on the tube flank and occurring between the hot leg and cold leg tangent locations of the tube bend where bobbin coil eddy current liftoff signals are typically present. Those characteristics were similar to those observed in DCPP Unit 2 during the 2003 inspections. Tubes with circumferential indications were evaluated for stabilization using the vendor's guidelines.

Full tube insitu pressure tests were conducted on 9 tubes due to greater than 1.73 volt circumferential indications in the U-bend region. Results of the insitu pressure tests are shown in Table 3 of the information provided by the licensee. Five tubes did not leak when tested to 4950 psi. Four other tubes had some leakage develop between 3750 psi and 4750 psi. The insitu pressure test results met the requirements for demonstrating tube integrity. Rotating probe eddy current examination performed after insitu pressure testing showed the indications did not change as a result of the pressure tests.

A second new damage mechanism identified in DCPP Unit 1 occurred in tubes that had once been plugged but were returned to service in previous outages under various ARC. Axial PWSCC was detected near the tube end in some of these tubes, in the area containing residual stress from original plug installation, approximately 1 inch above the tube end for rib plugs and 1.5 inches above the tube end for roll plugs. The licensee identified the initial crack using a +Point™ probe after visually detecting boron deposits near the tube end. Cracking was detected in tubes that had once been plugged with either roll plugs or rib type mechanical plugs. The licensee concluded cracking at this location occurred after the plugs were removed since +Point™ inspections at the time the tubes were deplugged and returned to service detected no indications. Cracking is postulated to have resulted from residual stress created in the tube during plug installation. There were no cold leg tube end cracks detected. X-Probe data was obtained on approximately 200 hot leg and 600 cold leg tubes between the TTS and the tube end in DCPP Unit 2 during the 2003 outage. No cracks were identified near the tube end in those tubes, which had not been previously plugged. The licensee indicated +Point™ examinations would be conducted near the tube ends of tubes that had been previously plugged and returned to service as the inspection schedule permitted. The licensee was planning on notifying the industry about the tube end cracking in previously plugged tubes using the Institute of Nuclear Power Operations Network.

At the conclusion of the call, the licensee provided verbal notification that they were fulfilling their obligation under Technical Specification 5.6.10.d to notify the NRC if circumferential indications were detected at the tube support plates. One tube in SG 1-4 contained a circumferential OD stress corrosion cracking indication at a support plate intersection.

Attachment: Information from PG&E