UNITED STATES
NUCLEAR REGULATORY COMMISSION
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July 14, 2010

John Conway
Senior Vice President
Generation and Chief Nuclear Officer
Pacific Gas and Electric Company
77 Beale Street, MC B32
San Francisco, CA 94105

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION RELATED TO THE REVIEW OF THE DIABLO CANYON NUCLEAR POWER PLANT, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION (TAC Nos. ME2896 AND ME2897) – AGING MANAGEMENT PROGRAMS

Dear Mr. Conway:

By letter dated November 23, 2009, Pacific Gas & Electric Company (PG&E) submitted an application pursuant to Title 10 of the *Code of Federal Regulations* Part 54, to renew the operating licenses for Diablo Canyon Nuclear Power Plant, Units 1 and 2, for review by the U.S. Nuclear Regulatory Commission (NRC or the staff). The staff is reviewing the information contained in the license renewal application and has identified, in the enclosure, areas where additional information is needed to complete the review.

The request for additional information was discussed with Mr. Terry Grebel, and a mutually agreeable date for the response is within 30 days from the date of this letter. If you have any questions, please contact me at 301-415-1045 or e-mail nathaniel.ferrer@nrc.gov.

Sincerely,

Nathaniel Ferrer, Safety Project Manager
Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-275 and 50-323

Enclosure:
As stated

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Diablo Canyon Nuclear Power Plant, Units 1 and 2
License Renewal Application
Request for Additional Information Set 8
Aging Management Programs

RAI B2.1.14-1

License renewal application (LRA) Section B2.1.14 states that the Fuel Oil Chemistry Program manages loss of material due to general, pitting, crevice and microbiological influenced corrosion on the internal surface of components in the emergency diesel fuel oil storage and transfer system, portable diesel fire pump fuel oil tanks, and portable caddy fuel oil tanks. Although license renewal boundary drawing LR-DCPP-21-107721-05 shows the diesel fuel oil pump head tank as within the scope of license renewal, it is not clear from the program description whether this aging management program (AMP) is used for the inspection of the fuel oil pump head tank. Please confirm if this tank is inspected by this AMP or explain how this tank is age managed.

RAI B2.1.14-2

Generic Aging Lessons Learned (GALL) Report AMP XI.M30 states that an ultrasonic thickness (UT) inspection should be performed on tank bottoms to ensure that significant degradation is not occurring. LRA Section B2.1.14 states that UT inspections of fuel oil tanks will be performed only if visual inspection indicates degradation of the tank. It is noted that this was not identified as an exception to the GALL Report. Provide justification for performing UTs only if the visual inspection indicates there is degradation.

RAI B2.1.21-1

In LRA Section B2.1.21, the applicant states that its program is an existing program that is consistent with GALL AMP XI.M37. GALL AMP XI.M37 program element "acceptance criteria" states:

> Appropriate acceptance criteria such as percent through-wall wear will be established. The acceptance criteria will be technically justified to provide an adequate margin of safety to ensure that the integrity of the reactor coolant system pressure boundary is maintained. The acceptance criteria will include allowances for factors such as instrument uncertainty, uncertainties in wear scar geometry, and other potential inaccuracies, as applicable, to the inspection methodology chosen for use in the program. Acceptance criteria different from those previously documented in NRC acceptance letters for the applicant's response to Bulletin 88-09 and amendments thereto should be justified.

During its review of the applicant's supporting documentation, the staff noted that the AMP currently uses a 68% through-wall loss as the current acceptance criterion for the program as recommended by Westinghouse. The staff observed that this acceptance criterion is also the value cited in the applicant's response to NRC Bulletin 88-09. It is the staff's understanding that Westinghouse recommended that

Diablo Canyon Nuclear Power Plant (DCPP) apply a 10% uncertainty value to the flux thimble tube program to account for instrument and wear scar geometry uncertainties, and recommended that this be accomplished by subtracting 10% of the tube nominal wall thickness value from the measured wall thickness readings taken during the outages. However, the current plant procedure for evaluating the nondestructive examination measurements against the acceptance criteria does not appear to call for any corrections to account for a 10% error in instrument or wear scar geometry uncertainties.

The staff's review further reveals that additional important sources of uncertainty appear not to be accounted for in the current implementation of the acceptance criterion and the wear (rate) projection, thus increasing the concern that the overall monitoring and trending do not meet the GALL Report recommended technically justified conservatism. For instance, the close proximity of support conditions may have an unaccounted impact on the calibration for the eddy-current testing (ECT)/procedure used to determine the wear depth. This determination of depth for the volumetric degradation also requires certain flaw-shape conditions to be satisfied to maintain a level of conservatism. Furthermore, these uncertainties in the measurement not only affect the examination of acceptance criterion but also introduce error in the wear rate projection apart from the inaccuracy or uncertainty of the trending method itself. The staff seeks additional clarification on the types of uncertainties that are accounted for in either the "detection of aging effects," "monitoring and trending," or "acceptance criteria" program elements for this AMP.

Clarify which document in the current licensing basis clearly provides the reference basis for the 68% through-wall wear acceptance criterion for this AMP, and clarify how instrument and thimble tube wear scar geometry uncertainties are accounted for in either the "detection of aging effects," "monitoring and trending," or "acceptance criteria" program elements for the program, as is recommended in the GALL AMP and NRC Bulletin 88-09. Clarify whether (and if so how) proximity effect uncertainties for supports in the vicinity of the thimble tubes are accounted for in program's ECT depth reading estimate methodology.

RAI B2.1.21-2

GALL AMP XI.M37 program element "monitoring and trending," states, "[t]he wall thickness measurements will be trended and wear rates will be calculated. Examination frequency will be based upon wear predictions that have been technically justified as providing conservative estimates of flux thimble tube wear."

The "operating experience" program element for the Flux Thimble Tube Program discussed the impacts of a leak that occurred in thimble tube L13 in 2006.

The staff's current understanding is that tube L13 has the following relevant operating history:

- Replacement of the tube in refueling outage (RO) 2R10
- 16% throughwall wear detected in the tube during RO 2R11 with no corrective action taken on the tube (i.e., the tube met the acceptance criterion on throughwall wear)

- Additional 30% throughwall wear detected in the tube during RO 2R12 (i.e., 46% throughwall wear reading, and realignment of the thimble tube as a corrective action

- An approximate 40% to 46% throughwall wear reading occurring in the realigned area of the tube, as measured during RO 2R13, with a second realignment of the tube as a corrective action prior to entering into operating cycle 14

Both the DCPP "incremental wear" and "cumulative wear" projection methods are based on a two-reading linear extrapolation method. However, the historic wear data for tube L13 may indicate that wear in tube L13 may be occurring at an increasingly non-linear fashion (e.g., ~9.6% wall loss per year between 2R10 and 2R11, ~18% wall loss per year between 2R11 and 2R12, and ~27.5% wall loss per year between 2R12, and 2R13 [1]). Thus, it is not evident whether PG&E's linear "incremental wear" and "cumulative wear" projection methods for the DCPP flux thimble tubes are conservative, particularly if wear occurring in a thimble tube is occurring at an increasingly non-linearly rate over time.

Provide the basis for why the "incremental wear" and "cumulative wear" projection methods for the Flux Thimble Tube Inspection are considered to be capable of conservatively projecting the amount of wear in a thimble tube to the next scheduled thimble tube inspection outage, especially if wear rates in the thimble tubes can increase non-linearly over time.

RAI B.2.1.21-3

In the "operating experience" element for the Flux Tumble Tube Inspection Program, the applicant states that it made the following changes to the program after the leak that occurred in tube L13 in 2006: (1) added a corrective action to cap or replace a thimble tube which exhibits a wear rate greater than 25 percent/year, (2) added a corrective action to cap or replace a thimble tube which has two wear scars greater than 40 percent through-wall and (3) added a corrective action to cap or isolate a thimble tube which is chrome plated and has been repositioned greater than eight inches.

The operating experience discussion of the 2006 leakage event in DCPP Unit 2 Thimble Tube L13 did not explain why a leak had occurred in the tube so soon after returning to power operations during Unit 2 Operating Cycle 14, even after realigning (repositioning) the tube position during RO 2R13. The staff is concerned that, based on this operating experience, a leak may develop in a DCPP thimble tube in less than the time associated with one full operating cycle (i.e., in less than 18 months).

Provide your basis for adding each of the additional corrective actions that have been discussed in the "operating experience" program element of this AMP (i.e., explain what they are intended to prevent and what they will accomplish if implemented). Provide your basis for why the "detection of aging effects" activities, "monitoring and trending" activities, "acceptance criteria" and "corrective actions" for the program, when taken into account of each other, are considered to be sufficient and capable of ensuring that the program will be capable of detecting wear in the

[1] These wear rates are approximate values based on the wear data that were reviewed during the AMP audit of April 11-15, 2010 for this AMP and assumption of an 18 month operating cycle.

flux thimble tube (and of taking appropriate corrective action), prior to the occurrence of a full through-wall failure of a thimble tube at the facility.

RAI B2.1.21-4

The staff's understanding is that DCPP flux thimble tubes are ASME Code Class 1 reactor coolant pressure boundary components for portions of the tubes that are external to the reactor vessel. As a result, the flaw evaluation criteria in the ASME Code Section XI, Article IWA-3000 may apply to the flux thimble tubes, including any applicable flaw proximity rules in this article.

The staff has observed that the Flux Thimble Tube Inspection Program currently permits more than one repositioning of a flux thimble tube, which would leave more than one worn area (more than one wear related flaw) in a degraded thimble tube in service. However, it is not evident whether the "monitoring and trending" activities for the Flux Thimble Tube Inspection Program apply applicable flaw proximity rules in the ASME Code Section XI, Article IWA-3000 (or similar provisions) for thimble tubes that are left in service with multiple wear scars.

Clarify whether the current monitoring and trending program element bases for the program applies the ASME Code Section XI proximity rules or similar considerations for tubes that are repositioned more than once and that leave multiple wear scars in service. Provide your basis for not including such measures in the "monitoring and trending" activities of the AMP if the flux thimble tubes are categorized as ASME Code Class 1 components.

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To John Conway from Nathaniel Ferrer dated July 14, 2010

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