June 14, 2010

Mr. John Conway
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Generation and Chief Nuclear Officer
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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 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 by e-mail at nathaniel.ferrer@nrc.gov.

Sincerely,

/RA/

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

cc w/encl: See next page

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Diablo Canyon Nuclear Power Plant, Units 1 and 2
License Renewal Application
Request for Additional Information Set 3 & 4
Aging Management Programs

RAI B2.1.1-1

Generic Aging Lessons Learned (GALL) Report aging management program (AMP) XI.M1 "scope of program" element contains a broad class of components for inservice inspection (ISI) with respective standards for flaw acceptance and flaw evaluation. Also, the "detection of aging effects" program element covers the inspections of Class 1 small-bore piping and socket welds.

In its description of the ISI program under license renewal application (LRA) Section B2.1.1, the applicant stated that Diablo Canyon Nuclear Power Plant (DCPP) evaluates every indication. However, the acceptance standards IWD-3400 and IWD-3500 and the flaw evaluation standard IWD-3600, for Class 3 components, are not included in the "program description" of LRA AMP B2.1.1. Also, Class 1 small-bore piping and socket welds for the AMP are covered under different AMPs for DCPP.

Explain how the "program description" includes the use of acceptance and evaluation standards for Class 3 components. Also, indicate in which AMP the inspection of Class 1 small-bore piping and socket welds are covered or supplemented, including a justification for using this program.

RAI B2.1.1-2

In its "operating experience" summary, the applicant noted an instance of intergranular stress corrosion cracking in an accumulator nozzle, identified in 1987, stating that all nozzles were inspected and those with unacceptable indications were subsequently weld-repaired or replaced with nozzles made of a new material. Also, in its evaluation of operating experience, the applicant indicated that a long-term inspection plan is followed with visual examination of all nozzles and underskirt piping at normal operating pressure, and ultrasonic testing (UT) of those nozzles and underskirt piping which were not replaced.

The nozzle cracking was not identified as part of the inspections performed under the ASME Section XI ISI program. It is not clear why the UT is not performed on the replacement nozzles as part of the long-term plan, while it is performed on the non-replaced nozzles.

Provide justification for why only a visual inspection is performed on the replaced nozzles and underskirt piping, and not UT, as part of the long-term inspection plan for aging management.

RAI B2.1.3-1

In LRA Section B2.1.3 and a program exception to the GALL Report, the applicant stated, "[t]he future 120-month inspection interval for DCPP will incorporate the then-current requirements specified in the version of the ASME Code incorporated into 10 CFR 50.55a twelve months

before the start of the inspection interval." Also, LRA Appendix A, Section A1.3 states, "DCPP is required to update its Section XI ISI program and use the ASME Code Edition consistent with the provisions of 10 CFR 50.55a during the period of extended operation."

The staff determines the acceptability of the newly proposed ASME Code Section XI editions for license renewal in the Statements of Consideration (SOC). The SOC are issued on the update of the 10 CFR 50.55a rule and published in the *Federal Register*. It is not evident to the staff whether the applicant's statement refers to the SOC associated with the update of 10 CFR 50.55a in order to justify the applicant's use of a more recent edition of the ASME Code Section XI when the plant enters the period of extended operation.

Clarify whether the statement quoted above means that for the future 120-month ISI intervals, which will be implemented during the period of extended operation, the applicant will incorporate the editions and addenda of the ASME Code that will be endorsed for use in 10 CFR 50.55a (as modified and subject to any limitations in rule) and be acceptable for the license renewal as referenced in the SOC on the update of 10 CFR 50.55a and published in the *Federal Register*.

RAI B2.1.3-2

During the audit of the Reactor Head Closure Studs Program (LRA Section B2.1.3), the applicant identified an exception to the "scope of program" program element. The applicant stated that the tensile strength of four heats of the material used in fabricating the studs exceeded the maximum tensile strength limit of 1172 MPa (170 ksi) specified in Regulatory Guide (RG) 1.65, "Material and Inspection for Reactor Vessel Closure Studs," October 1973. The applicant also stated that only heat and charge numbers are marked on the studs, and because there is a significant variation in tensile properties within a Heat and Charge of the material, it is unlikely that DCPP will be able to identify which stud from a given heat has tensile strength greater than 1172 MPa (170 ksi).

In addition to the tensile strength exceeding 1172 MPa, the yield strength of these heats of material exceeded 1034 MPa (150 ksi). For some materials, the yield strength was as high as 1138 MPa (165 ksi). When tempered to a tensile strength level above 1172 MPa, the high strength low-alloy steel for the studs becomes increasingly susceptible to stress corrosion cracking (SCC). In NUREG-1339, "Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants," June 1990, the U.S. Nuclear Regulatory Commission established a position that the yield strength of high-strength bolts should not exceed 1034 MPa (150 ksi).

(a) Revise the LRA to include the newly identified exception to GALL "scope of program" program element that identifies that the tensile strength of four of the heats used in fabricating the studs exceeded the maximum tensile strength limit of 1172 MPa (170 ksi) specified in Regulatory Guide (RG) 1.65, "Material and Inspection for Reactor Vessel Closure Studs," October 1973.

(b) In view of the greater susceptibility of some of the studs to SCC, describe any preventive actions taken or planned to avoid the exposure of the studs to the environmental conditions that

can lead to SCC, and describe possible changes/modifications in the program for managing cracking due to stress corrosion cracking for reactor head closure studs.

RAI B2.1.8-1

In LRA Section B2.1.8, the applicant stated that the "tubing and secondary internals in the replacement steam generators are not susceptible to corrosion due to advanced material design."

Thermally treated Alloy 690 may be susceptible to corrosion as demonstrated in laboratory tests, but are more resistant than Alloy 600 mill annealed which was previously used in the DCPP steam generators. Please clarify the statement in the LRA regarding the corrosion susceptibility of the Alloy 690 material in the replacement steam generators.

RAI B2.1.10-1

10 CFR Part 54.4(a) provides the regulations for which plant systems, structures, and components are within the scope of the license renewal. These include items under 10 CFR 54.4(a)(2), which are all nonsafety-related systems, structures, and components whose failure could prevent satisfactory accomplishment of any of the functions identified in safety-related systems. The "parameters monitored or inspected" program element of the Closed-Cycle Cooling Water AMP in the GALL Report, Section XI.M21, indicates that the program includes monitoring the effects of corrosion and stress corrosion cracking by testing and inspection in accordance with the guidance in the EPRI report closed cooling water chemistry guideline as well as performance testing for pumps and heat exchangers.

LRA, Appendix B, Section B2.1.10 indicates that the applicant's Closed-Cycle Cooling Water Program will be consistent with the GALL Report Section XI.M21 with various exceptions. In both the LRA B2.1.10 program description and the applicant's basis document, the applicant indicated that the program will not conduct inspections or performance testing for components in scope of license renewal under criterion of 10 CFR 54.4(a)(2). It is not clear to the staff what the technical basis is for limiting the prescribed guidance in the GALL Report based on how a component was scoped into the license renewal process.

Provide justification for not performing the program's inspections and performance testing on components within the scope of license renewal under criterion 10 CFR 54.4(a)(2).

RAI B2.1.10-2

The Closed-Cycle Cooling Water System AMP in the GALL Report, Section XI.M21, includes non-chemistry monitoring parameters, including pump and heat exchanger performance monitoring.

LRA, Appendix A, Section A1.10 indicates that the Closed-Cycle Cooling Water System Program will include maintenance of system chemistry parameters, but does not mention any non-chemistry monitoring parameters.

Update the Final Safety Analysis Report (FSAR) supplement to be consistent with LRA Section B2.1.10 program description, including monitoring of non-chemistry parameters or provide justification for not including the monitoring of these parameters.

RAI B2.1.16-1

GALL Report AMP XI.M32, "One-Time Inspection," "detection of aging effects" program element states that "the inspection includes a representative sample of the system population, and, where practical, focuses on the bounding or lead components most susceptible to aging…." The applicant's One-Time Inspection program description states, in part, that sampling will be conducted "using an engineered sampling technique for each material-environment group based on criteria such as the longest service period, most severe operating conditions, lowest design margins, lowest or stagnant flow conditions, high flow conditions, and highest temperature."

Provide additional details of the sampling procedure to be used. Indicate whether the One-Time Inspection program utilizes a risk-informed inservice inspection or similar methodology, or an alternative form of probabilistic or statistical sampling to select the number, types, and locations of the components to be inspected under this program. If not, provide additional details of the sampling procedure to be used.

RAI B2.1.16-2

LRA Table 3.3.1, item 3.3.1.07 refers to the aging evaluation of stainless steel non-regenerative heat exchanger components exposed to treated borated water in the auxiliary systems. The aging effect identified is cracking due to stress corrosion cracking, and the GALL Report recommends the use of the Water Chemistry Program to manage this effect. The GALL Report also states that further evaluation is recommended and that an acceptable verification program is to include temperature and radioactivity monitoring of the shell side water, and eddy current testing of the tubes. The applicant proposes to manage this aging effect using its Water Chemistry Program, with its One-Time Inspection Program to be used for verification of program effectiveness.

In its further evaluation of this aging effect, the applicant states that temperature and radioactivity of the shell-side water of the letdown (non-regenerative) heat exchanger is monitored continuously by installed plant instrumentation. The applicant also states that its One-Time Inspection Program will be used in lieu of eddy-current testing of the tubes to provide confirmation that cracking is not occurring. However, the applicant does not identify the testing technique to be used to perform the proposed inspections.

Describe the details of the inspection technique to be used to perform the one-time inspection of these components in lieu of eddy-current testing and provide relevant plant or industry experience to demonstrate the effectiveness and reliability of this technique.

RAI B2.1.17-1

Program element "parameters monitored or inspected" of GALL Report Program XI.M33, "Selective Leaching of Materials" states:

> The visual inspection and hardness measurement is to be a one-time inspection. Because selective leaching is a slow acting corrosion process, this measurement is performed just before the beginning of the license renewal period. Follow-up of unacceptable inspection findings includes expansion of the inspection sample size and location.

In the LRA, the applicant describes its Selective Leaching of Materials Program in Appendix B2.1.17 as consistent with the GALL Report, with no exceptions or enhancements. The program descriptions provided in the LRA and the FSAR Supplement (A.1.17) state that the detection of selective leaching will result in the performance of an engineering evaluation, which will then determine the need for an expansion of inspection sample sizes and locations. It is unclear if an engineering evaluation will result in an expansion of inspection sample sizes and locations, consistent with the GALL Report.

Clarify if the Selective Leaching of Materials Program will expand the inspection sample size and location if selective leaching is detected. Provide justification if no expansion of sample size and location is to occur if selective leaching is detected.

RAI B2.1.19-1

GALL AMP XI.M35, "One-Time Inspection of ASME Code Class 1 Small-Bore Piping," states that a volumetric inspection should be used to detect cracking in small-bore piping. However, the applicant's One-Time Inspection of ASME Code Class 1 Small-Bore Program in LRA Section B2.1.19 states that a reliable and effective volumetric inspection technique to detect cracking in socket welds is currently not available. The applicant instead proposes to use the visual examination technique (VT-2) for the examination of small-bore socket welds.

The applicant's proposed usage of the VT-2 technique for the examination of these welds conflicts with the guidance in the GALL Report.

Justify the proposed deviation from the GALL Report recommendation to perform volumetric examinations of socket welds in ASME Code Class 1 small-bore piping.

RAI B2.1.19-2

GALL AMP XI.M35 states that the One-Time Inspection of ASME Class 1 Small-Bore Piping Program is applicable only to plants that have not experienced cracking of ASME Class 1 small-bore piping. It further states that "[s]hould evidence of significant aging be revealed by a one-time inspection or previous operating experience, periodic inspection will be proposed, as managed by a plant-specific program."

During a review of the applicant's operating experience, the staff noted that there have been failures of Class 1 small bore piping at DCPP.

In view of the above-cited GALL Report guidance and plant-specific operating experience, justify the proposed application of the applicant's proposed One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program, or provide a plant-specific AMP for managing aging during the period of extended operation.

RAI B2.1.22-1

GALL AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," states that the program includes visual inspections of internal surfaces of steel piping, piping components, ducting, and components in an internal environment (such as indoor uncontrolled air, condensation, and steam) for degradation from various corrosion mechanisms. In the two exceptions to the GALL Report stated in LRA Section B2.1.22, the program is expanded to include additional materials (aluminum, asbestos cement, copper alloy, elastomers, nickel alloys, stainless steel, and cast austenitic stainless steel) and to include additional examination techniques (volumetric testing and physical manipulation).

In the actual application of this AMP as summarized in the applicant's LRA, the scope of the program is significantly expanded beyond both GALL XI.M38 and the applicant's description of the program in LRA Appendix B, Section B2.1.22. This expanded application of the program in the LRA appears to encompass a substantial number of additional component types, materials, and environments beyond those in the GALL Report and the applicant's AMP description.

Clarify that the program description for Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Components Program in Appendix B of the LRA encompasses the actual application of the program as described in the LRA.

RAI B2.1.22-2

In LRA Appendix B, Section B2.1.22, the applicant states that this program "will use the work control process for preventive maintenance and surveillance to conduct and document inspections."

The term "work control process" appears nowhere else in the applicant's LRA except in the Appendix A FSAR supplement for this AMP, nor does it appear anywhere in either the GALL Report or NUREG-1800, Revision 1, "Standard Review Plan for Review of License Renewal

Applications for Nuclear Power Plants." Consequently, the staff is unable to determine precisely what is meant by this term in the context of the applicant's program description.

Define what is meant by the term "work control process" as it is used in the description of the program, particularly with respect to what program elements in the GALL Report it impacts and how it impacts these elements.

RAI B2.1.24-1

The GALL Report AMP XI.E1 program description states that cables and connections from accessible areas (the inspection sample) are inspected and represent, with reasonable assurance, all cables and connections in the adverse localized environments. The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program in the LRA states "At least once every 10 years, accessible cables/cable jackets, connections, and terminal blocks within the scope of license renewal located in an adverse localized environment are inspected."

It is unclear if the applicant will use sampling or include all cables (within the scope of license renewal) in its inspection.

Please clarify if all accessible cables and connections within adverse localized environments will be inspected consistent with the GALL Report.

RAI B2.1.25-1

In order for NRC staff to review an AMP with enhancement(s), the impact of the enhancement(s) for each element of the AMP must be clearly stated.

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program (LRA Appendix B, Section B2.1.25) states "the following enhancement will be implemented in the following program elements: Scope of Program - Element 1, Parameters Monitored/Inspected - Element 3, Detection of Aging Effects - Element 4, Acceptance Criteria - Element 6, and Corrective Actions - Element 7." The LRA lacks detailed information on how the enhancement impacts each element. This information is also incomplete in the basis document.

Explain how each element will be impacted by enhancement such that it will be consistent with the GALL Report.

RAI B2.1.36-1

The applicant proposed to credit the Metal Enclosed Bus program for inspecting the in-scope iso-phase bus. The iso-phase bus provides the station blackout delay access offsite power source through back feeding the unit transformers and is included in the scope of the Metal Enclosed Bus Program. However, the inspection aspects of the iso-phase bus are different

from those of the non-segregated bus. For example, the iso-phase bus does not have bus insulation, but has a bare conductor tube with no insulation material. Therefore, the bus insulation inspection as described in the Metal Enclosed Bus Program is not applicable.

The GALL Report XI.E4 program is written specifically for managing non-segregated buses. The program attributes including parameters monitored or inspected, detection of aging effects, and acceptance criteria for non-segregated buses may not be appropriate for the iso-phase bus.

Explain how the inspections of non-segregated buses as described in the Metal Enclosed Bus Program are appropriate for the iso-phase bus.

Letter to J. Conway from N. Ferrer dated June 14, 2010

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