DiabloCanyonNPEm Resource

From: Ferrer, Nathaniel
Sent: Tuesday, June 22, 2010 9:33 AM
To: Grebel, Terence; Soenen, Philippe R
Cc: Green, Kimberly; DiabloHearingFile Resource
Subject: RAI Letter dated, June 21, 2010
Attachments: RAI Related to the Review of the DCPP LRA - Structures AMPs.pdf

Terry and Philippe,

Attached is an electronic copy of RAI Letter dated, June 21, 2010. A formal copy is being sent via mail.

Nathaniel Ferrer
Project Manager
Division of License Renewal
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
(301)415-1045

Hearing Identifier: DiabloCanyon_LicenseRenewal_NonPublic
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From: Ferrer, Nathaniel

Created By: Nathaniel.Ferrer@nrc.gov

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Tracking Status: None
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June 21, 2010

Mr. 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 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:
Request for Additional Information

cc w/encl: See next page

June 21, 2010

Mr. John Conway
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77 Beale Street, MC B32
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Sincerely,
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Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-275 and 50-323

Enclosure:
Request for Additional Information

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 5
Aging Management Programs - Structures

RAI B2.1.27-1

NUREG-1801, "The Generic Aging Lessons Learned (GALL) Report," aging management program (AMP) XI.S1, "ASME Section XI, Subsection IWE," "operating experience" program element states:

> ASME Section XI, Subsection IWE was incorporated into 10 CFR 50.55a in 1996. Prior to this time, operating experience pertaining to degradation of steel components of containment was gained through the inspections required by 10 CFR Part 50, Appendix J and ad hoc inspections conducted by licensees and the Nuclear Regulatory Commission (NRC). NRC Information Notices (INs) 86-99, 88-82 and 89-79 described occurrences of corrosion in steel containment shells. NRC Generic Letter (GL) 87-05 addressed the potential for corrosion of boiling water reactor (BWR) Mark I steel drywells in the "sand pocket region." More recently, NRC IN 97-10 identified specific locations where concrete containments are susceptible to liner plate corrosion. The program is to consider the liner plate and containment shell corrosion concerns described in these generic communications. Implementation of the ISI requirements of Subsection IWE, in accordance with 10 CFR 50.55a, is a necessary element of aging management for steel components of steel and concrete containments through the period of extended operation.

Program element 10 for the Diablo Canyon Nuclear Power Plant (DCPP) ASME Section XI, Subsection IWE AMP does not discuss operating experience related to NRC INs 89-79, 97-10, and 2004-09. In addition, program element 10 for the DCPP ASME Section XI, Subsection IWE AMP does not discuss operating experience related to liner plate corrosion recently identified at other operating plants.

1. Describe potential effects of steel liner plate corrosion issues discussed in NRC INs 89-79, 97-10, and 2004-09 on the containment liners for DCPP Units 1 and 2.

2. Describe the potential effects of steel liner plate corrosion issues that recently occurred at other operating plants on the containment liners for DCPP Units 1 and 2.

RAI B2.1.27-2

As mentioned in GALL Report AMP XI.S1, "ASME Section XI, Subsection IWE," "operating experience" program element, NRC IN 97-10 identified specific locations where concrete containments are susceptible to liner plate corrosion. The program is to consider the liner plate and containment shell corrosion concerns described in this generic communication.

During its review of plant-specific operating experience, the staff noted that the applicant indicates that gaps were identified in isolated spots along the liner plate and floor interface on 91'EL during the 2R15 outage for Unit 2. The applicant issued notifications documenting the issue. In one of the notifications, the applicant stated that no corrosion was found at the liner/concrete interface and the concrete was in good condition (no cracks or delaminations). However, the applicant recommended that it seal these gaps to prevent any liquid intrusion into the gaps and minimize the potential for corrosion of the carbon steel liner.

Explain how the program will effectively manage aging of the carbon steel containment liner during the period of extended operation if permanent remediation by permanently sealing the gap between the liner plate and concrete is not completed.

RAI B2.1.28-1

GALL Report AMP XI.S2, "ASME Section XI, Subsection IWL" "acceptance criteria" program element states that ASME Section XI, Subsection IWL, Article IWL-3000 provides acceptance criteria for concrete containments. The GALL Report further states that quantitative acceptance criteria based on the "Evaluation Criteria" provided in Chapter 5 of ACI 349.3R may also be used to augment the qualitative assessment of the responsible engineer.

In its license renewal supporting documentation, the applicant states that its ASME Section XI, Subsection IWL program utilizes a three-tier acceptance process similar to that described in ACI 349.3R-96, and is identified in a plant procedure. According to this procedure, the third tier engineering evaluation criteria include the following thresholds:

a. Popouts and voids, less than or equal to 4 ft. in diameter or equivalent surface area.

b. Scaling less than or equal to 4 in. in depth.

c. Spalled areas less than or equal to 4 in. in depth and 4 ft. in any dimension.

d. For areas not around embedments and penetration outer plates, passive cracks less than or equal to 0.060 in. in maximum width.

e. No limitations on the length, orientation and depth of passive cracks.

f. No evidence of passive deflections.

g. No exposed reinforcing steel.

h. No excessive corrosion on the surface of embedments.

i. Cracks around the embedments and penetration outer plates less than 0.060 in. Any crack equal to or greater than 0.060 in. shall be evaluated on case by case basis.

j. No evidence of seepage or water intrusion into concrete.

The evaluation criteria in ACI 349.3R provides acceptance without further evaluation (tier one), acceptance after review (tier two), and conditions requiring further evaluation. The threshold for tier three engineering evaluations as described above is less stringent than the criteria specified in ACI 349.3R.

Provide a discussion of the basis for the tier three acceptance criteria described in the DCPP implementing procedure. This basis should include reference to any design calculations and industry codes and standards that establish the technical rationale for the tier three acceptance criteria.

RAI B2.1.28-2

LRA Section B2.1.28 states that DCPP operating experience is evaluated and corrective actions are implemented to ensure that the components of the ASME Section XI, Subsection IWL program are maintained.

During its audit, the staff reviewed structural concrete surface examination data for DCPP Units 1 and 2. These data indicate that DCPP Units 1 and 2 containments concrete surface condition at hundreds of locations exceeded the second tier evaluation criteria described in ACI 349.3R. In addition, at more than 10 locations the surface condition exceeded the DCPP inspection criteria for third tier indications. Pacific Gas and Electric Company (PG&E) determined that there is no apparent loss of structural capacity; however, as part of its process, PG&E states that Nuclear Services/Engineering Services/Design Engineering/Civil Engineering (NS/ES/DE/CE) shall assess the results of the examination for acceptance and evaluation.

The applicant is requested to provide the following information:

1. A summary of the information in the Notifications issued by the responsible engineer for the tier three gross indications that exceeded the threshold limitations for Unit 1 and Unit 2.
2. A summary of acceptance and evaluation results for assessments performed by NS/ES/DE/CE for the tier three gross indications that exceeded the threshold limitations for Units 1 and 2.
3. Details of remedial and corrective actions that the applicant plans to implement to address aging management of tier two indications and areas of tier three degradation that do not conform to ACI 349.3R guidance during the period of extended operation.

The staff needs the above information to confirm that the acceptance criteria used and evaluations performed by the DCPP for containment concrete surface degradations are in accordance with the recommendations of element 6 of GALL Report AMP XI.S2, “ASME Section XI, Subsection IWL.”

RAI B2.1.28-3

GALL Report AMP XI.S2, “ASME Section XI, Subsection IWL” “detection of aging effects” program element states that the frequency and scope of examinations specified in 10 CFR 50.55a and Subsection IWL ensure that aging effects would be detected before they would compromise the design-basis requirements. The frequency of inspection is specified in IWL-2400.

In the LRA, the applicant stated that the DCPP ASME Section XI, Subsection IWL program is in accordance with IWL-2400. Each unit is examined on an alternating 10 year cycle as specified in IWL-2421. Visual examinations of 100% of the accessible surfaces on the concrete shells will be completed on 10 year cycles for each unit (1 unit every 5 years). However, the 2001 edition of ASME Section XI, Subsection IWL-2410 states that concrete shall be examined in accordance with IWL-2510 at 1, 3, and 5 years following the completion of the containment Structural Integrity Test CC-6000 and every 5 years thereafter. In addition, the requirements in ASME Section XI, Subsection IWL-2421 only apply to sites with multiple units that have containments with unbonded post-tensioning systems. Therefore, it does not appear that the program is consistent with the recommendations in the GALL Report XI.S2 “detection of aging effects” program element.

1. What is the basis for selecting the 10-year inspection frequency for each unit?
2. What is the impact of the use of 10-year inspection frequency on the DCPP Unit 1 and Unit 2 containment AMP, including detection of aging effects?

RAI B2.1.29-1

The DCPP ASME Section XI, Subsection IWF states that industry operating experience is evaluated for relevancy to DCPP, and appropriate actions are taken and documented.

It is not clear from the DCPP LRA if NRC IN 2009-04 related to constant supports has been considered in the operating experience.

Explain if the age-related degradation mechanism described in IN 2009-04 has been considered at DCPP.

RAI B2.1.30-1

GALL Report AMP XI.S4, “10 CFR 50, Appendix J,” “detection of aging effects” program element states:

> A containment LRT program is effective in detecting degradation of containment shells, liners, and components that compromise the containment pressure boundary, including seals and gaskets. While the calculation of leakage rates demonstrates the leak-tightness and structural integrity of the containment, it does not by itself provide information that would indicate that aging degradation has initiated or that the capacity of the containment may have been reduced for other types of loads, such as seismic loading. This would be achieved with the additional implementation of an acceptable containment inservice inspection program as described in XI.S1 and XI.S2.

In LRA AMP B2.1.30, the applicant stated that visual inspections of containment concrete surfaces outside containment and steel liner plate inside containment are required by 10 CFR 50, Appendix J to be performed prior to any Type A test. In addition, according to LRA AMP B2.1.30, “10 CFR 50, Appendix J,” Element 10, Subsection 3.10.2, the most recent

Type A test for Unit 1 was performed on March 17, 2009, and the most recent Type A test for Unit 2 was performed on April 4, 2008. However, it is not clear from the LRA how and when the general inspection of the containment concrete surfaces outside containment and steel liner plate inside containment were performed.

Confirm that the DCPP procedures for Type A test comply with the requirements of 10 CFR Part 50 Appendix J, which requires a general visual examination of the accessible interior and exterior surfaces of the containment system for structural deterioration prior to each Type A test. GALL Report AMP XI.S4, “10 CFR Part 50, Appendix J,” recommends the use of 10 CFR Part 50 Appendix J for detecting age related degradation of containment.

RAI B2.1.32-1

GALL Report XI.S6, “Structures Monitoring Program,” notes that ACI 349.3R-96 provides an acceptable basis for developing acceptance criteria for concrete structural elements, steel liners, joints, coatings, and waterproofing membranes. The plant-specific structures monitoring program is to contain sufficient detail on acceptance criteria to conclude that this program attribute is satisfied.

The “acceptance criteria,” program element of the DCPP Structures Monitoring Program references ACI 349.3R-96 as providing an acceptable basis for developing acceptance criteria for concrete structural elements, steel liners, joints, coatings, and waterproofing membranes. The DCPP Structure Monitoring Program uses “Acceptable,” “Acceptable with Deficiencies,” and “Unacceptable” categories. Although ACI 349.3R is referenced as providing the basis for the acceptance criteria, the staff is unclear what criteria are associated with each of the three acceptance criteria listed in the LRA and how the criteria align with the ACI 349.3R-96 criteria.

Provide the acceptance criteria associated with each of the three categories and indicate how the three categories are comparable to the categories provided in ACI 349.3R-96.

RAI B2.1.32-2

The “detection of aging effects” program element of the LRA AMP states that periodic inspections are scheduled such that the accessible areas of both units are inspected over a maximum ten (10) year interval (measured from the date of the baseline or prior routine observation), except water control structures for which all accessible areas of both units are inspected at a frequency of no more than five (5) years.

Industry standards (e.g., ACI 349.3R-96) identified in the GALL Structures Monitoring Program suggest a five-year inspection frequency for structures exposed to natural environment, structures inside primary containment, continuous fluid-exposed structures, and structures retaining fluid or pressure, and a ten-year inspection frequency for below-grade structures and structures in a controlled interior environment.

It is not clear to the staff that all structures, systems, and components (SSCs) at each unit inspected under this AMP are consistent with the industry standards inspection frequency (e.g., as noted in ACI 349.3R-96) or if the SSCs are only inspected at a frequency of ten years. Please discuss the inspection frequency for each unit and how the frequency meets compliance with industry standards.

The staff needs the information to confirm that the inspection frequency criteria in the DCPP Structures Monitoring Program and criteria in ACI 349.3R-96 are aligned.

RAI B2.1.32-3

In its “operating experience,” program element, the applicant noted that pH, sulfates, and chlorides had been monitored monthly at DCPP powerblock locations from August 2008 through July 2009, to obtain data sufficient for making a groundwater aggressiveness determination. The groundwater sample results indicate that the DCPP powerblock groundwater is non-aggressive (i.e., pH > 6.9, chlorides < 215 ppm, and sulfates < 567 ppm).

The GALL Report recommends that for plants with non-aggressive groundwater/soil (i.e., pH > 5.5, chlorides < 500 ppm, or sulfates < 1500 ppm) as a minimum they consider: (1) examination of the exposed portions of the below-grade concrete, when excavated for any reason, and (2) periodic monitoring of below-grade water chemistry, including consideration of potential seasonal variations.

1. Provide locations where groundwater test samples were, or will be taken relative to safety-related and important-to-safety embedded concrete walls and foundations, and provide historical results (i.e., pH, chloride content, and sulfate content).
2. Due to the high chloride ambient environment, exposure of some plant structures to sea water at DCPP and indications of concrete cracking, spalling, and delaminations, and steel reinforcement corrosion noted in the “operating experience” portion of the AMP for several structures, discuss PG&E’s plans, if any, for opportunistic inspections of below-grade structures.

RAI B2.1.32-4

NRC IN 2004-05, “Spent Fuel Pool Leakage to Onsite Groundwater,” dated March 3, 2004, has identified the potential for leakage of borated water from the spent fuel pool of pressurized-water reactors.

A review of operating experience during the AMP audit did not indicate that leakage of the spent fuel pool has occurred at DCPP. During discussions with DCPP personnel it was indicated that Unit 2 has had a persistent minor leak for many years. It is unclear to the staff if leakage of the borated water has resulted in degradation of either the concrete or embedded steel reinforcement that is inaccessible for inspection.

1. Provide information with regard to how long the leak has been occurring and the size of the leak (volume). Indicate if any chemical analysis has been performed on the leakage for Units 1 & 2 and provide the results of the analysis.
2. What was the root cause of the leakage? Include information on the path of the leakage and structures that could be potentially affected by the presence of the borated water.
3. Discuss any plans for remedial actions or repairs to address the leakage. In the absence of a commitment to fix the leakage prior to the period of extended operation, explain how the SMP, or other plant-specific program, will address the leakage to ensure that aging effects, especially in inaccessible areas, will be effectively managed during the period of extended operation.
4. Provide background information and data, including industry reports cited in the operating experience records, to demonstrate that concrete and embedded steel reinforcement potentially exposed to the borated water have not been degraded. If experimental results will be used as part of the assessment, provide evidence that the test program is representative of the materials and conditions that exist at DCPP Unit 2 spent fuel pool.

RAI B2.1.32-5

The "operating experience" section of LRA Section B2.1.32, "Structures Monitoring Program," states that baseline inspections completed in accordance with 10 CFR 50.65(a), Maintenance Rule, in 1997-2003, and the first periodic follow-up inspection completed in early 2009 concluded that the plant's structures were in good condition and performing well.

During a walkdown of the Unit 1 auxiliary building, the staff noted that there was a crack in the reinforced concrete ceiling adjacent to the spent fuel pool that exhibited evidence of prior leakage in the form of white deposits, potentially indicating either leaching of calcium hydroxide from the concrete or boric acid deposits. The staff is uncertain of the source of the leakage or if this has been documented and will be addressed.

1. Provide information regarding the occurrence of the crack and the source of the apparent leakage.
2. Provide information on any chemical analysis performed on the deposits and analyses conducted to identify the leakage source and path of the leakage.
3. If the source of the leakage is the spent fuel pool, identify structures that potentially could be affected by the presence of borated water.
4. Discuss any plans for remedial actions or repairs. In the absence of a commitment to repair the crack prior to the period of extended operation, provide information/documentation to demonstrate that the concrete and embedded steel reinforcement have not degraded.

RAI B2.1.33-1

Element 10 of the GALL Report AMP XI.S7, “RG 1.127, Inspection of Water Control Structures Associated with Nuclear Power Plants,” states that inspections implemented in accordance with the guidance in RG 1.127 have been successful in detecting significant degradation before loss of intended function occurs.

The “operating experience” program element of LRA Section B2.1.33 states that since 1996, the Intake Structure has been place in Maintenance Rule (MR), Goal Setting (a)(1) status twice. Each occurrence indicated further the adverse impacts of harsh saltwater environment on concrete degradation. With the current refurbishment program and procedural controls in place, the Intake Structure is expected to resume monitoring under MR (a)(2) status by 2010. However, it is not clear to the staff how the adverse impacts are quantified. In addition, it is not clear how the current refurbishment program will be able to manage the aging during the period of extended operation.

Provide the following information:

1. How the adverse impacts, including delaminations in the concrete at the Intake Structure, are quantified.
2. A summary of the evaluations and assessments performed to determine the scope of the refurbishment program.
3. Details of the current refurbishment program, and how it will help in aging management during the period of extended operation. How does the current refurbishment program differ from the two previous repairs performed since 1996?

In absence of a formal commitment to refurbish the Intake Structure, explain how the DCPP AMP XI.S7, “RG 1.127, Inspection of Water Control Structures Associated with Nuclear Power Plants,” will adequately manage aging during the period of extended operation.

RAI B2.1.33-2

Element 10 of the GALL Report AMP XI.S7, “RG 1.127, Inspection of Water Control Structures Associated with Nuclear Power Plants,” states that inspections implemented in accordance with the guidance in RG 1.127 have been successful in detecting significant degradation before loss of intended function occurs.

The “operating experience” section of AMP B2.1.33 states that the discharge structure which is currently being monitored and inspected in accordance with DCPP procedures on refueling cycle intervals has had some minor concrete repairs done to the exterior incline wall in early 2002. In addition, during a walkdown, the staff noted delamination of concrete on the top slab of the Discharge Structure. However, PG&E states in LRA Section B2.1.33 that the Discharge Structure is in acceptable condition.

Provide the following information:

1. How the concrete inside the Discharge Structure is examined and documented during each refueling cycle. Does this examination include any non-destructive examination?

2. History and details of the repairs performed in the Discharge Structure, and how these repairs will prevent further degradation during the period of extended operation.

3. What plans does PG&E have, if any, to repair or remove the delaminations in the Discharge Structure?

RAI B2.1.33-3

Element 10 of the GALL Report AMP XI.S7, "RG 1.127, Inspection of Water Control Structures Associated with Nuclear Power Plants," states that inspections implemented in accordance with the guidance in RG 1.127 have been successful in detecting significant degradation before loss of intended function occurs.

The "operating experience" section of AMP B2.1.33 states that the discharge circulating water conduits (DCWC) concrete is not visible for detailed inspections due to marine growth found on the interior wall surface. The applicant is developing a schedule to remove marine growth in order to further enhance the monitoring process.

Provide the following information:

1. When was the DCWC interior concrete surface last inspected in accordance with the requirements ACI 349.3R?
2. What is the current frequency for inspection of the DCWC interior concrete surface?
3. If marine growth is not removed, explain how the program will effectively manage aging of the DCWC interior concrete during the period of extended operation.
4. How is the DCWC interior concrete surface inspected since it is covered with marine growth?

Letter to J. Conway from N. Ferrer dated June 21, 2010

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Diablo Canyon Nuclear Power Plant
Units 1 and 2

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