

DiabloCanyonNPEm Resource

From: Ferrer, Nathaniel
Sent: Thursday, September 30, 2010 3:04 PM
To: Grebel, Terence; Soenen, Philippe R
Cc: DiabloCanyonNPEm Resource
Subject: Draft RAI Set 29 - Aging Management Programs
Attachments: Draft RAI Set 29 Inaccessible Low Voltage Cable and Buried Piping.doc

Terry and Philippe,

Attached is Draft RAI Set 29 containing draft RAIs, specifically on portions of aging management programs. Please review the attached draft RAIs and let me know if and when you would like to have a teleconference call. The purpose of the call will be to obtain clarification on the staff's request.

Please let me know if you have any questions.

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

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Created By: Nathaniel.Ferrer@nrc.gov

Recipients:

"DiabloCanyonNPEm Resource" <DiabloCanyonNPEm.Resource@nrc.gov>
Tracking Status: None
"Grebel, Terence" <TLG1@PGE.COM>
Tracking Status: None
"Soenen, Philippe R" <PNS3@PGE.COM>
Tracking Status: None

Post Office: HQCLSTR01.nrc.gov

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Diablo Canyon Nuclear Power Plant, Units 1 and 2 (DCPP)
License Renewal Application (LRA)
Draft Request for Additional Information Set 29
Aging Management Review

D-RAI B2.1.18-2 (Follow-up)

Background:

Given that there have been a number of recent industry events involving leakage from buried or underground piping, the staff requested further information to evaluate the impact that these recent industry events might have on the applicant's Buried Piping and Tanks Inspection Program. By letter dated August 3, 2010, the staff issued RAI B.2.1.18-2 requesting that the applicant provide information regarding how Diablo Canyon will incorporate the recent industry operating experience into its aging management reviews and programs. The applicant responded on August 30, 2010. In reviewing the response, the staff noted the following.

Issue:

- 1) The applicant's response stated that, "Evaluation and appropriate changes to applicable programs as a result of recent operating experience are still ongoing both within PG&E and the industry. PG&E is committed to follow the EPRI 1016456, Recommendations for an Effective Program to Control the Degradation of Buried Pipe. The EPRI initiative addresses recent industry operating experience. PG&E programs, which will be modeled after the EPRI initiative, will also consider plant-specific operating experience. The EPRI initiative will set an inspection schedule for buried piping segments based on, among other things, pipe materials and locations. PG&E will develop an inspection plan for buried piping in accordance with NRC staff accepted industry guidelines that will provide the number of excavations, the minimum length of piping that will be exposed, and the percentage of the total length of piping that will be inspected."

The staff believes that in order to provide a reasonable assurance that in-scope buried piping will be capable of performing its intended function(s) and not release hazardous materials (i.e., material which, if released, could be detrimental to the environment such as diesel fuel and radioisotopes that exceed EPA drinking water standards) to the environment, each material, safety/Code class, and potential to contain hazardous material during normal operation category of in-scope buried pipe should be inspected. The staff also believes that there is a minimum set of excavated and visual inspections of buried piping segments that should be conducted. The LRA and supplemental material did not contain enough specifics on the planned inspections for the staff to determine if the inspections would be adequate to manage the aging effect for all material, safety/Code class, and potential to contain hazardous material categories of in-scope buried pipes.

- 2) The applicant's response stated that, "At this time, PG&E does not plan to use any examination method other than excavation or visual inspection of buried piping. If PG&E decides to use methods of examination other than excavation and direct visual inspection, these methods will be submitted for NRC staff approval in accordance with NRC staff accepted buried piping and underground piping guidelines."

The staff acknowledges that examining buried pipe from the exterior surface may

sometimes not be possible due to plant configuration (e.g., the piping is located underneath foundations); nevertheless, it is important to expose a large enough length of the piping in order to establish reasonable assurance of the condition of the piping system. The staff believes that in instances where it is not possible to expose the program designated length of piping during each inspection, an alternative examination should be proposed. The staff notes that it is reasonable to substitute an ultrasonic volumetric examination from the interior of the pipe provided the surface is properly prepared. Although the applicant stated that they will submit alternative examination methodologies for NRC staff approval, there is no specific requirement for a licensee to submit such changes for approval in the license renewal guidelines. Therefore the RAI response lacks sufficient specificity for the staff to find the applicant's proposal acceptable.

- 3) The applicant stated that, "The remaining DFO system piping runs in air either in a conduit between the DFO tank and DFO transfer pump or in a concrete lined trench from the DFO transfer pumps to each diesel generator with no CP since the piping is not buried." The staff believes that this statement is in conflict with LRA Table 3.3.2-13 which indicates that there is buried piping in the diesel generator fuel oil system. The staff also believes that there is a minimum set of excavated and visual inspections of buried piping segments that contain hazardous materials that should be conducted to establish a reasonable basis of assurance that aging effects are not adversely impacting buried pipe and resulting in the system or component not meeting its intended function. Additionally, the staff does not have enough information to determine what percent of total linear feet of the Diesel Generator Fuel Oil System piping will be inspected by the External Surfaces Monitoring Program during each ten year period starting ten years prior to the period of extended operation.
- 4) The applicant stated that,

CP is used in portions of the auxiliary saltwater (ASW) piping and for the intake structure traveling screens, gates and guides, ASW pumps and screen wash pumps. PG&E procedures perform monthly monitoring of the rectifier output voltage and current for the CP system. An annual survey of the ASW pipe CP system includes monitoring rectifier output voltage and current, "ON/OFF" pipe to soil potentials, and individual anode currents. The recent annual survey results show that the ASW piping meet at least one of the specified CP criteria for CP, as established by the National Association of Corrosion Engineers International in their Standard SP0169-07, "Control of External Corrosion on Underground or Submerged Metallic Piping Systems.

The staff believes that cathodic protection is an important preventive measure for steel piping. The LRA and supplemental documents lack sufficient detail for the staff to understand (a) which portions of the ASW piping systems that contain steel piping are not cathodically protected, (b) the availability of the cathodic protection system, and (c) given that NACE SP0169-07, paragraph 6.2.2, allows "other criteria" than demonstrating a negative potential of at least 850mv or a minimum of 100 mv of cathodic polarization between the piping and a stable reference electrode contacting the electrolyte, what CP criteria is being used for buried in-scope steel piping.

- 5) The LRA does not describe the quality of the backfill in the vicinity of buried in-scope piping. The staff understands that the presence of rocks and sharp objects in the backfill around buried pipes is a leading precursor of degradation of buried piping when over time ground movement causes these materials to come in contact with the buried pipe resulting in damage to the pipe's coating or external surfaces.
- 6) Based on a review of LRA Section 2.3.3.5 and the License Renewal Boundary Drawings, it is not clear to the staff if the in-scope buried make-up water system piping has a safety related function.

Request:

- 1) For buried piping within the scope of license renewal, respond to the following:
 - a) Understanding that the total number of inspections performed will be dictated by plant-specific and industry operating experience, clarify the minimum number of inspections of buried in-scope piping are planned during the 30 – 40, 40 – 50, and 50 – 60 year operating period. When describing the minimum number of planned inspections, differentiate between material, code/safety-related piping, and potential to contain hazardous material category piping inspection quantities of buried in-scope piping.
 - b) For the minimum number of planned inspections, indicate what length of piping will be excavated and have a direct visual inspection conducted.
- 2) For buried piping within the scope of license renewal, respond to the following:
 - a) Describe what alternative inspection methods will be utilized when excavated direct visual examinations are not possible due to plant.
 - b) If alternative volumetric examination methods, beyond ultrasonic examinations, will be utilized for conducting an interior wall thickness measurement when not excavating and visually inspecting a buried piping segment, justify why they will be effective at providing a reasonable assurance that the buried in-scope piping systems will meet their current licensing basis function.
 - c) If a volumetric examination method is used in lieu of direct visual examination, indicate what percentage of interior axial length of the pipe will be inspected.
- 3) For buried steel piping within the scope of license renewal, respond to the following:
 - a) LRA Table 3.3.2-13, page 3.3-200, Diesel Generator Fuel Oil System, lists an AMR line item, piping constructed of buried carbon steel and being managed for loss of material by the Buried Piping and Tanks Inspection Program. Reconcile this line item with the statement in Issue 3 above, that there is no in-scope buried carbon steel piping in the Diesel Generator Fuel Oil System.
 - b) If portions of the piping are buried, state what percent of total linear feet of the Diesel Generator Fuel Oil System piping will be inspected by the Buried Piping and Tanks Inspection Program during each ten year period starting ten years prior to the period of extended operation.
 - c) If the piping is not buried, state what percent of total linear feet of the Diesel Generator Fuel Oil System piping will be inspected by the External Surfaces Monitoring Program during each ten year period starting ten years prior to the period of extended operation.

- d) If there are no planned inspections for this piping, justify why it is acceptable to not inspect in-scope pipe containing hazardous materials.
- 4) For buried steel piping within the scope of license renewal, respond to the following:
- a) State which portions of the ASW system that contain steel piping are not cathodically protected.
 - b) If portions of the in-scope ASW system piping are not cathodically protected:
 - i. Justify how the piping will meet or exceed the minimum design wall thickness throughout the period of extended operation.
 - ii. State what augmented inspections of these portions of the ASW system will be conducted, and if no augmented inspections are planned, justify how a reasonable assurance will be established that the piping will meet its Current Licensing Basis intended functions throughout the period of extended operation.
 - c) State the availability of the cathodic protection system, and if portions of the system are not available 90% of the time or will be allowed to be out of service for greater than 90 days in any given year, justify how the piping will meet or exceed the minimum design wall thickness throughout the period of extended operation.
 - d) State whether the acceptance criteria for the annual survey of the CP system is either a negative potential of at least 850mv or a minimum of 100 mv of cathodic polarization between the piping and a stable reference electrode contacting the electrolyte, or if alternative criteria are utilized justify how it achieves corrosion control comparable to the above criteria.
- 5) For buried piping within the scope of license renewal, respond to the following:
- a) Provide details on the quality of the backfill in the vicinity of in-scope buried pipes.
 - b) If there is no information on the condition of the quality of backfill beyond initial installation specifications (i.e., no documented observations of the quality of the backfill), justify why the planned inspections are adequate to detect potential degradation as a result of coating damage or holidays, or damage to the exterior surface of non-coated piping.
- 6) Clarify whether any of the buried make-up water system piping within the scope of license renewal has a safety related function.

D-RAI B2.1.26-3

Background:

NUREG-1801, Rev. 1, "Generic Aging Lessons Learned," (the GALL Report) addresses inaccessible medium voltage cables in Aging Management Program (AMP) XI.E3, "Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements." The purpose of this program is to provide reasonable assurance that the intended functions of inaccessible medium voltage cables (2 kV to 35 kV), that are not subject to environmental qualification requirements of 10 CFR 50.49 and are exposed to adverse localized environments caused by moisture while energized, will be maintained consistent with the current licensing basis. The scope of the program applies to inaccessible (in conduits, cable

trenches, cable troughs, duct banks, underground vaults or direct buried installations) medium-voltage cables within the scope of license renewal that are subject to significant moisture simultaneously with significant voltage.

The application of AMP XI.E3 to medium voltage cables was based on the operating experience available at the time Revision 1 of the GALL Report was developed. However, recently identified industry operating experience indicates that the presence of water or moisture can be a contributing factor in inaccessible power cables failures at lower service voltages (480V to 2kV). Applicable operating experience (OE) was identified in licensee responses to Generic Letter (GL) 2007-01, "Inaccessible or Underground Power Cable Failures that Disable Accident Mitigation Systems or Cause Plant Transients," which included failures of power cable operating at service voltages of less than 2kV where water was considered a contributing factor.

Recently identified industry operating, provided by the NRC licensees in response to GL 2007-01, has shown that there is an increasing trend of cable failures with length in service beginning in the 6th through 10th years of operation and also that moisture intrusion is the predominant factor contributing to cable failure. The staff has determined, based on the review of the cable failure distribution, that annual inspection of manholes and cable testing frequency of at least every 6 years is a conservative approach to ensuring the operability of power cables and, therefore, should be considered.

In addition, recently identified industry operating experience has shown that some NRC licensees may experience events, such as flooding or heavy rain, that subjects cables within the scope of program for GALL Report XI.E3 to significant moisture. The staff has determined that event driven inspections, in addition to a 1 year periodic inspection frequency, is a conservative approach and, therefore, should be considered.

Issue:

The staff has concluded, based on recently identified industry operating experience concerning the failure of inaccessible low voltage power cables (480v to 2kV) in the presence of significant moisture, that these cables can potentially experience age related degradation. The staff noted that the applicant's Inaccessible Medium-Voltage Cables Program does not address inaccessible low voltage power cables (400V (Nominally 480V) to 2kV inclusive). In addition, increased cable test and inspection frequencies (6 and 1 years respectively) should be evaluated to ensure that the Inaccessible Medium Voltage Program test and inspection frequencies reflect industry and plant-specific operating experience and that test and inspection frequencies may be increased based on future industry and plant-specific operating experience.

Request:

1. Provide a summary of your evaluation of recently identified industry operating experience and any plant-specific operating experience concerning inaccessible low voltage power cable failures within the scope of license renewal (not subject to 10 CFR 50.49 environmental qualification requirements), and how this operating experience applies to the need for additional aging management activities at your plant for such cables.
2. Provide a discussion of how Diablo Canyon Nuclear Power Plant, Units 1 and 2, will manage the effects of aging on inaccessible low voltage power cables within the scope of license renewal and subject to aging management review; with consideration of recently identified industry operating experience and any plant-specific operating

experience. The discussion should include assessment of your aging management program description, program elements (i.e., Scope of Program, Parameters Monitored/Inspected, Detection of Aging Effects, and Corrective Actions), and FSAR summary description to demonstrate reasonable assurance that the intended functions of inaccessible low voltage power cables subject to adverse localized environments will be maintained consistent with the current licensing basis through the period of extended operation.

3. Provide an evaluation showing that the Inaccessible Medium Voltage Program test and inspection frequencies, including event driven inspections, incorporate recent industry and plant-specific operating experience for both inaccessible low and medium voltage cable. Discuss how the Inaccessible Medium Voltage Program will ensure that future industry and plant-specific operating experience will be incorporated into the program such that inspection and test frequencies may be increased based on test and inspection results.