DiabloCanyonNPEm Resource

From: Ferrer, Nathaniel
Sent: Monday, August 16, 2010 12:49 PM
To: Grebel, Terence; Soenen, Philippe R
Cc: DiabloHearingFile Resource
Subject: Audit Report Regarding DCPP LRA - Aging Management Programs
Attachments: Audit Report Regarding the DCPP LRA - Aging Management Programs.pdf

Terry and Philippe,

Attached is an electronic copy of the AMP Audit Report. A formal copy is being sent via mail.

Nathaniel Ferrer
Project Manager
Division of License Renewal
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Hearing Identifier: DiabloCanyon_LicenseRenewal_NonPublic
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

August 11, 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: AUDIT REPORT REGARDING THE DIABLO CANYON NUCLEAR POWER PLANT LICENSE RENEWAL APPLICATION (TAC NOS. ME2896 AND ME2897)

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). On April 29, 2010, the staff completed the on-site audit of aging management programs. The audit report is enclosed.

If you have any questions, please contact me by telephone at 301-415-1045 or by e-mail at nathaniel.ferrer@nrc.gov.

Sincerely,

Nathaniel Ferrer, 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: Distribution via Listserv

U.S. NUCLEAR REGULATORY COMMISSION

OFFICE OF NUCLEAR REACTOR REGULATION, DIVISION OF LICENSE RENEWAL

AUDIT REPORT REGARDING THE DIABLO CANYON NUCLEAR POWER PLANT

LICENSE RENEWAL APPLICATION

Docket Nos:	50-275 and 50-323
License Nos:	DPR-080 and DPR-082
Licensee:	Pacific Gas & Electric Company
Facility:	Diablo Canyon Nuclear Power Plant, Units 1 and 2
Location:	Avila Beach, CA
Dates:	April 12-15, 2010 April 26-29, 2010
Reviewers:	N. Ferrer, Project Manager, Division of License Renewal (DLR) K. Green, Project Manager, DLR D. Pelton, Branch Chief, DLR R. Auluck, Branch Chief, DLR G. Shukla, Branch Chief, DLR A. Sheikh, Sr. Structural Engineer, DLR C. Doutt, Sr. Electrical Engineer, DLR D. Nguyen, Electrical Engineer, DLR D. Brittner, Mechanical Engineer, DLR M. Banic, Sr. Materials Engineer, DLR M. Homiack, Engineer, DLR E. Murphy, Sr. Materials Engineer, Division of Component Integrity (DCI) A. Johnson, Materials Engineer, DCI Kieth Axler, Consultant, Center for Nuclear Waste Regulatory Analyses (CNWRA) Todd Mintz, CNWRA James Mancillas, CNWRA O. Chopra, Consultant, Argonne National Laboratory (ANL) D. Diercks, Consultant, ANL Y. Garud, Consultant, ANL B. Oland, Consultant, Oak Ridge National Laboratory (ORNL) D. Naus, Consultant, ORNL
Approved By:	Rajender Auluck, Chief Aging Management of Structures, Electrical and Systems Branch Division of License Renewal

Approved By Cont'd: David Pelton, Chief
Aging Management of Plant Systems Branch
Division of License Renewal

Mike Modes, Acting Chief
Aging Management of Reactor Systems and Guidance Update Branch
Division of License Renewal

Introduction

An eight-day audit was conducted by the Nuclear Regulatory Commission (NRC or the staff) at the Diablo Canyon Nuclear Power Plant, Units 1 and 2 (DCPP), in Avila Beach, California on April 12–15, 2010, and April 26–29, 2010. The purpose of this audit was to examine Pacific Gas & Electric Company's (the applicant), aging management programs (AMPs) and related documentation for DCPP and to verify the applicant's claim of consistency with the corresponding Generic Aging Lessons Learned (GALL) Report (NUREG-1801, Rev. 1) AMPs. As described in the GALL Report, the NRC staff's evaluation of the adequacy of each generic AMP is based on its review of the following 10 program elements in each AMP: 1) scope of program; 2) preventative actions; 3) parameters monitored or inspected; 4) detection of aging effects; 5) monitoring and trending; 6) acceptance criteria; 7) corrective actions; 8) confirmation process; 9) administrative controls; and 10) operating experience.

Exceptions to the GALL AMP elements will be evaluated separately as part of the staff's review of the DCPP license renewal application (LRA) and documented in the staff's Safety Evaluation Report (SER).

The Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants (NUREG-1800, Rev. 1) (SPR-LR), provides the staff guidance for reviewing a LRA. The SRP-LR allows an applicant to reference in its LRA, the AMPs described in the GALL Report. By referencing the GALL AMPs, the applicant concludes that its AMPs correspond to those AMPs which are reviewed and approved in the GALL Report and that no further staff review is required. If an applicant credits an AMP for being consistent with a GALL Report program, it is incumbent on the applicant to ensure that the plant program contains all of the elements of the referenced GALL Report program. The applicant's determination should be documented in an auditable form and maintained on-site.

During this audit, the staff audited AMP elements 1-6, & 10 (scope of program, preventative actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, acceptance criteria, and operating experience). These elements of the applicant's AMPs which were claimed to be consistent with the GALL Report were audited against the related elements of the associated AMP described in the GALL Report, unless otherwise indicated in this audit report. Elements 7-9 (corrective actions, confirmation process, and administrative controls), were audited during the Scoping and Screening Methodology audit conducted on March 15–18, 2010, and are evaluated separately. The staff audited all AMPs that the applicant stated were consistent with the GALL Report AMPs. If an applicant took credit for a program in the GALL Report, the staff verified that the plant program contains all the elements of the referenced GALL Report program. As part of the audit, an independent search of the applicant's plant-specific operating experience database was conducted to determine the adequacy of the LRA and to provide the staff team members with relevant and appropriate operating experience, and the associated corrective actions performed. During the audit, the staff conducted a random sampling of applicant's components for verification of the applicant's method of scoping and screening to support the license renewal application and the resulting components and systems scoped into the applicant's aging management review. The staff also performed a verification of the materials and environment information in the DCPP LRA. The staff performed an on-site material and environment verification of a random sample of components, by walkdowns and review of DCPP reference materials.

In performing this audit, the staff examined the applicant's LRA, program bases documents and related references, interviewed various applicant representatives, and conducted walkdowns of several plant areas. In total, 36 AMPs were reviewed and several breakout (discussion) sessions with applicant representatives were conducted. This report documents the staff's activities during this audit.

LRA AMP B2.1.1, ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD

In the DCPP LRA, the applicant states that AMP B2.1.1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," is an existing program that is consistent with the program elements in GALL Report AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and 10 (operating experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "crack," "flaw," "indication," "ISI," "weld inspection," "ASME Section XI," "summary report," "stress corrosion," "accumulator nozzle," and "loss of material."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. AD5.ID2	Inservice Inspection Program – DCPP Interdepartmental Administrative Procedure	Rev. 8 08/18/2009
2. MA1.ID13	ASME Section XI Repair/Replacement Program and Implementation – DCPP Interdepartmental Administrative Procedure	Rev. 14 08/18/2009
3. OM7.ID1	Problem Identification and Resolution – DCPP Interdepartmental Administrative Procedure	Rev. 31 08/18/2009
4. ISI Data	Dispositioning of Recorded NDE Examination Data – DCPP ISI procedure	n/a
5. NDE N-UT-1	Ultrasonic Examination Procedure – DCPP NDE Procedure	Rev. 13 10/05/2000
6. n/a	Diablo Canyon License Renewal Component List for AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," B2.1.1	n/a
7. DCPP-NRC-OE-XI.M1	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	01/21/2010
8. DCPP-AMP-B2.1.1-Rev 2	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD [Diablo Canyon AMP Evaluation Report]	Rev. 2 03/08/2010

During the audit of program elements 1 - 6, the staff found that:

element 2 (preventive actions) of the LRA AMP is consistent with the corresponding element of the GALL Report AMP; and

sufficient information was not available to determine whether elements 1 (scope of program), 3 (parameters monitored/inspected), 4 (detection of aging effects), 5 (monitoring and trending), and 6 (acceptance criteria) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP.

In order to obtain the information necessary to verify whether the LRA program element numbers 1, 3, 4, 5, and 6 are consistent with the corresponding elements of the GALL Report AMP, the staff will consider issuing requests for additional information (RAIs) for the following subjects:

The applicant stated that "In conformance with 10 CFR 50.55a(g)(4)(ii), the DCPP inservice inspection (ISI) Program is updated on each successive 120-month inspection interval to comply with the requirements of the latest edition of the ASME Code specified 12 months before the start of the inspection interval." It was not clear whether the applicant was referring to the statement of consideration and the *Federal Register* Notice for updated 10 CFR 50.55a to justify use of a more recent edition of the ASME Code during the period of extended operation. This issue affects the elements 1 (scope of

program), 3 (parameters monitored/inspected), 4 (detection of aging effects), 5 (monitoring and trending), and 6 (acceptance criteria), all of which incorporate the 2001 Code edition, including the 2002 and 2003 Addenda, in the GALL Report AMP.

The applicant has incorporated in its ISI program the ASME Code Cases N-729-1 and N-722, and the use of risk-informed process with Code Cases N-560 and N-578. These are not part of the GALL AMP XI.M1. The staff's review indicated that, according to Reg. Guide 1.193 (rev. 2, October 2007), Code Cases N-560 and N-578 were determined to be unacceptable by the NRC. Also, Code Cases N-729-1 and N-722 are not on the list of NRC acceptable cases in the latest revision of the Reg. Guide 1.147 (rev. 15, October 2007). Therefore, the applicant's use of these Code Cases is not consistent with the GALL Report, and needs to be justified as an exception to the GALL AMP XI.M1.

The staff noted that the inspections of Class 1 small-bore piping and socket welds are covered under the element 4 (detection of aging effects) of GALL AMP XI.M1. However, this coverage was not apparent in the applicant's LRA AMP B2.1.1. Some of this may be covered by the applicant under its "One-Time Inspection of ASME Code Class 1 Small-Bore Piping" AMP, but this was not referenced in the LRA AMP B2.1.1.

In its description of the ISI program under AMP B2.1.1 the applicant stated that DCPP evaluates every indication. However, the acceptance standards IWD-3400 and IWD-3500 and the flaw evaluation standard IWD-3600, in the case of Class 3 components, are not included in the LRA AMP B2.1.1. This omission is not consistent with the GALL program element 6 (acceptance criteria) which states, in part, that any indication or relevant conditions of degradation detected are evaluated for Class 3 components. Further, it was not clear if or how the applicant was evaluating Class 3 components differently from these standards.

Further, in its description of the ISI program under AMP B2.1.1, the applicant stated that its LRA AMP manages loss of fracture toughness. Because the GALL AMP XI.M1 does not include in its description and in the element 4 (detection of aging effects) the management of loss of fracture toughness, the LRA statement is not consistent with the GALL AMP.

Under element 4 (detection of aging effects) of LRA the applicant stated that its NDE Procedure for ultrasonic test (UT) examinations [NDE N-UT-1] was applicable to dissimilar metal welds until 11/22/2002 and complied with the 1989 Edition of American Society of Mechanical Engineer (ASME) Section XI. It was not clear to the staff if this procedure was updated, or how the procedure is consistent with GALL AMP XI.M1 which uses a later edition of the ASME Code.

During the audit of program element 10 (operating experience), the staff found that:

the operating experience provided by the applicant and identified by the staff's independent database searchis bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and

the operating experience provided by the applicant and identified by the staff's independent database searchis not sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

In order to obtain the information necessary to verify whether the applicant's operating experience supports the sufficiency of the LRA AMP, the staff will consider issuing RAIs for the following subjects:

The staff noted that the occurrence of unacceptable stress corrosion cracking in accumulator nozzles at DCPP was not identified by the applicant's planned inspection frequency under the ASME Section XI ISI program. Also, the applicant included only the visual examination for the subsequently replaced parts (nozzles and underskirt piping) but not the volumetric examination, as done for the non-replaced parts, in its long-term inspection plan.

In its review of the relevant operating experience the applicant considered the stress corrosion cracking and boric acid related loss of material experiences described and discussed under the NRC IE Bulletins 2001-01 and 2002-02 to not address any license renewal aging issues. It is not clear to the staff why the applicant dismissed the industry experience of time dependent degradations covered in these Bulletins as unrelated to license renewal.

The staff also audited the description of the LRA AMP provided in the final safety analysis report (FSAR) Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable, with the exceptions of its reference to the use of future editions of the ASME Code and the management of fracture toughness. These exceptions are discussed above for which it is already noted that the staff will consider issuing RAIs.

Based on this audit the staff:

verified that most aspects of the LRA program elements 1-6 are consistent with the corresponding program elements in the GALL Report while identifying certain aspects of LRA program elements 1-6 for which additional information or additional evaluation is required before consistency can be determined;

identified that additional information regarding operating experience is required before an indication regarding the sufficiency of the LRA AMP, as implemented by the applicant, to detect and manage aging can be reached; and

verified that the applicant has committed to modify the FSAR Supplement so as to make the program description adequate.

LRA AMP B2.1.2 Water Chemistry

In the DCPP LRA, the applicant states that AMP B2.1.2, Water Chemistry is an existing program that is consistent with the program elements in GALL Report AMP XI.M2, Water

Chemistry. To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (Scope, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) and 10 (Operating Experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit.

During the audit, the staff conducted a Water Chemistry walkdown, interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "Lithium," "Chloride," "Fluoride," "Fluorine," "Chlorine," "dissolved oxygen," "pH," and "corrosion."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. EPRI TR-105715	PWR Primary Water Chemistry Guidelines	Revision 6 12/2007
2. EPRI TR-103134	PWR Secondary Water Chemistry Guidelines	Revision 7 02/2009
3. OP F-5:1	Chemical Control Limits and Actions Guidelines for the Primary System	Rev 38 No date on Document
4. CAP A-1	Primary Sampling and Analysis Schedules	Rev 22 10/01/2009
5. OP F-5:II	Chemical Control Limits and Actions Guidelines for the Secondary Systems	Rev 37 08/05/2009
6. CAP A-2	Secondary Cycle Sampling Schedule	Rev 21 03/13/2009
7. AR A0557919	U-1 RCS Li Low Out of Spec	06/26/2002
8. AR A0570496	U-1 RCS Lithium Out of Spec Low	03/02/2003
9. AR A0558687	U-2 RCS Lithium Out of Spec Low	06/12/2002
10. AR A0435903	Condenser Tube Leak, Southwest Quadrant	06/05/1997
11. DCPP-AMP-B2.1.2-Rev 2	Water Chemistry AMP	Rev 2 10/26/2009

During the audit of program elements 1-6, the staff found that:

> elements 1-6 (Scope of Program, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (Operating Experience), the staff found that:

> the operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff);
>
> the operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;
>
> verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging;
>
> verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B2.1.3, Reactor Head Closure Studs

In the DCPP LRA, the applicant stated that AMP B2.1.3, "Reactor Head Closure Studs," is an existing program with an exception that is consistent with the program elements in GALL Report AMP XI.M3, "Reactor Head Closure Studs." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (Scope of Program, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) and 10 (Operating Experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit. This audit report does not consider the sufficiency of the exceptions. Issues identified but not resolved in this report are addressed in the safety evaluation report (SER).

The first exception affects LRA program element 4 (Detection of Aging Effects). In the GALL Report AMP, this program element recommends surface examination using magnetic particle, liquid penetration, or eddy current examination to indicate the presence of surface discontinuities and flaws as well as visual and volumetric examinations. Alternatively, this program element in the LRA states that only visual and volumetric examinations of the studs are conducted in accordance with ASME Code Section XI, Subsection IWB (2001 edition including the 2002 and 2003 addenda).

During the audit, the applicant also proposed the second exception. The second exception affects LRA program element 1 (Scope of Program). In the GALL Report AMP, this program element states that this program is applicable to closure studs and nuts constructed from materials with a maximum tensile strength limited to less than 1,172 MPa (170 ksi), as described in NRC Regulatory Guide 1.65, "Materials and Inspections for Reactor Vessel Closure Studs," October 1973. In contrast, the applicant's onsite program documentation indicates that the tensile strength of four of the Heats used in fabricating the studs exceeded the maximum tensile strength limit of 1,172 MPa (170 ksi) specified in Regulatory Guide (RG) 1.65. However, only Heat and Charge numbers are marked on the studs, and because there is 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 1,172 MPa (170 ksi). The staff will review this exception and may consider issuing an RAI to request that the applicant provide additional information concerning the aging management of the studs that exceed the maximum tensile strength limit in RG 1.65.

During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. The staff also conducted an independent database search of the applicant's operating experience database using keywords: "closure studs," "corrosion," and "cracking."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. MP M-7.40	Install/Remove Reactor Vessel Stud Hole Plugs	Revision 6 03/23/2007
2. MP M-7.47	Cleaning Reactor Vessel Studs	Revision 5 04/11/2006
3. NDE VT 1-1	Visual Examination During Section XI System Pressure Test	Revision 1 Information only
4. NDE VT 2-1	Visual Examination During Section XI System Pressure Test	Revision 1 01/26/2007
5. NDE UT-5	Ultrasonic Examination of Bolts and Studs	Revision 3 04/20/2007
6. ISI SCHED	ISI Program Interval Three Examinations	Revision 3 03/09/2007
7. ISI Data	Dispositioning of Recorded NDE Examination Data	Revision 4 Information only
8. STP R-8A	Reactor Coolant System Leakage Test	Revision 14 Information only
9. NDE MT-1	Magnetic Particle Examination Procedure	Revision 13 01/11/2007
10. DCPP-AMP-B2.13	Reactor Head Closure Studs	Revision 3 11/12/2009

The staff conducted its audit of LRA program elements 1–6 based on the contents of the existing program. Aspects of program elements 1 (Scope of Program) and 4 (Detection of Aging Effects) of the LRA AMP associated with the exceptions were not evaluated during this audit. Aspects of these program elements that are not associated with the exceptions were evaluated and are described below.

During the audit, the staff found that:

> elements 1-6 (Scope of Program, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) of the LRA AMP, not related to the exceptions, are consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (Operating Experience), the staff found that:

> the operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience;
>
> the operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP,

as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

verified that the aspects of LRA program elements 1-6 not related to exceptions, are consistent with the corresponding program elements in the GALL Report while identifying certain aspects of LRA program element 1, related to the exception, for which additional information or additional evaluation is required before consistency can be determined;

verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging;

verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B2.1.4, Boric Acid Corrosion Control

In the DCPP LRA, the applicant states that AMP B2.1.4, "Boric Acid Corrosion Control Program," is an existing program that is consistent with the program elements in GALL Report AMP XI.M10, "Boric Acid Corrosion." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (Scope, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) and 10 (Operating Experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "boric acid," "corrosion," "inspect," and "piping."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. DCPP-AMP-B2.1.4	Boric Acid Corrosion Control Program	Revision 5, 12/10/2009
2. DCPP-APPL-XI.M10	Component List for Boric Acid Corrosion Control Program	No Revision No., not dated
3. No Document No.	Boric Acid Corrosion Operating Experience White Paper	Revision 9, 04/06/2010
4. AD7.ID11	Fluid Leak Management Program	Revision 0, 04/06/2009
5. STP R-8C	Containment Walkdown for Evidence of Boric Acid Leakage	No Revision No., 09/22/2004
6. AD4.ID2	Plant Leakage Evaluation	Revision 10, 08/18/2009

During the audit of program elements 1-6, the staff found that:

> Elements 1, 2, 3, 4, 5 and 6 (Scope, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (Operating Experience), the staff found that:

> the operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff);
>
> the operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;

verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging;

verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.6 Flow Accelerated Corrosion

In the DCPP LRA, the applicant states that AMP B2.1.6, "Flow Accelerated Corrosion," (FAC) is an existing program that is consistent with an exception to the program elements in GALL Report AMP XI.M17, "Flow-Accelerated Corrosion." To verify this claim of consistency, the staff audited the LRA AMP. This audit report considers program elements 1-6 (Scope, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) and 10 (Operating Experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit.

The exception affects LRA program element 1 and 4 (Scope of Program and Detection of Aging Effects). In the GALL Report AMP, these program elements recommend using the EPRI guidelines contained in Nuclear Safety Analysis Center-202L-R2, "Recommendations for an Effective Flow Accelerated Corrosion Program" (NSAC-202L-R2), to assure the structural integrity of all carbon steel lines and valve bodies containing single-phase and two-phase high-energy fluids is maintained. In the LRA, the applicant states that the FAC AMP is based on the EPRI guidelines found in NSAC-202L-R3. The staff previously reviewed NSAC-202L-R3 (NUREG-1929, Volume 2) and determined that it is equivalent to NSAC-202L-R2 and in addition, allows the use of the Averaged Band Method, which is another method for determining wear of piping components from UT inspection. The staff notes that EPRI documents are created using industry experience over several years and finds that the Averaged Band Method provides another method to determine the wear of piping components from UT inspections. The staff finds this method to be more accurate, thereby resulting in better prediction of remaining life and less rework. The staff finds the use of EPRI NSAC-202L-R3 acceptable because it will continue to allow the applicant to manage wall thinning due to FAC on the internal surfaces of carbon and low alloy steel piping and components that contain both single-phase and two-phase high-energy fluids.

During its audit, the staff reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using keywords: "flow accelerated corrosion," "FAC," and "corrosion."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
NDE UT-11	UT Thickness Measurement Using a Digital Thickness Gauge	Rev. 1 / 01/05/2007
TS1.ID1	Flow-Accelerated Corrosion Monitoring Program Interfaces and Responsibilities	Rev. 2 / 10/02/2002
CAP A-2	Secondary Cycle Sampling Schedule	Rev. 21 / 03/13/2009

The staff conducted its audit of LRA program elements 1–6 based on the contents of the existing program.

During the audit, the staff found that:

elements 2 (Preventive Actions), 3 (Parameters Monitored or Inspected), 5 (Monitoring and Trending), and 6 (Acceptance Criteria) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP;

elements 1 (Scope of Program) and 4 (Detection of Aging Effects) of the LRA AMP are not strictly consistent with the corresponding elements of the GALL Report AMP but sufficient information was available to allow the staff to determine that these elements of the LRA AMP are equivalent to the corresponding elements of the GALL Report AMP.

The basis for the staff's determination that elements 1 (Scope of Program) and 4 (Detection of Aging Effects) of the LRA AMP are equivalent to the corresponding GALL Report AMP is that NSAC-202L-R3 is essentially equivalent to NSAC-202L-R2 and provides an equivalent function of managing the FAC AMP.

During the audit of program element 10 (Operating Experience), the staff found that:

the operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff);

the operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.
Based on this audit the staff:

verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;

verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging;

verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B2.1.7, Bolting Integrity

In DCPP LRA, the applicant states that AMP B2.1.7, "Bolting Integrity," is an existing program with exceptions that is consistent with the program elements in GALL Report AMP XI.M18, "Bolting Integrity." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and 10 (operating experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. This audit report does not consider the sufficiency of exceptions.

The first exception affects LRA program element 1 (scope of program). In the GALL Report AMP, this program element contains staff's recommendations and guidelines which include the criteria established in the 1995 edition through the 1996 addenda of ASME Code Section XI. Alternatively, this program element in the LRA states that, for the period of extended operation, DCPP is required to update its Code of Record to the Edition and Addenda as referenced in 10 CFR 50.55a(b) 12 months prior to the start of each 120-month interval, thereby incorporating a different edition of the Code and Addenda.

The second exception affects LRA program element 3 (parameters monitored and inspected). In the GALL Report AMP, this program element specifies that bolting for safety related pressure retaining components be inspected for loss of preload/pre-stress. Alternatively, this program element in the LRA relies on proper and carefully followed bolt installation procedures instead of inspecting for loss of bolt preload/pre-stress

The third exception affects LRA program element 5 (monitoring and trending). In the GALL Report AMP, this program element specifies that if a bolting connection for pressure retaining component (not covered by ASME Section XI) is reported to be leaking, then it may be inspected daily; if the leak rate does not increase, the inspection frequency may be decreased to biweekly or weekly. Alternatively, this program element in the LRA relies on the use of DCPP Corrective Action Program, when any non-ASME, pressure-retaining bolting leakage is reported, to determine the appropriate actions and the monitoring frequency.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using keywords: "bolting," "preload," "torque," "gasket," "leak," "lubricant or sealant," "tightening," "hot bolting," and "assembly."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's

search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. DCPP-AR-OE-XI.M18	Diablo Canyon Operating Experience Report for AMP XI.M18, "Bolting Integrity" B2.1.7	Print date: 01/21/2010
2. MP M-55.5	Diablo Canyon Power Plant Mechanical Maintenance Procedure Fabrication, Installation, and Modification of Pipe Supports	Revision 12 06/17/2004
3. MP M7.17A	Diablo Canyon Power Plant Mechanical Maintenance Procedure Removal, Inspection, Retightening and Measuring of Reactor Coolant Pump Main Flange Bolts	Revision 3 09/10/2003
4. MP M-7.17	Diablo Canyon Power Plant Mechanical Maintenance Procedure Removal and Installation of Reactor Coolant Pump Internals	Revision 15 02/10/2006
5. MP M-7.20	Diablo Canyon Power Plant Mechanical Maintenance Procedure Removal and Reassembly of Pressurizer Manway Cover	Revision 6 09/10/2003
6. CF5-ID11	Diablo Canyon Power Plant – Interdepartmental and Administrative Procedure "Lubricant Control"	Revision 8 03/30/2009
7. AD9	Diablo Canyon Power Plant – Nuclear Power Generation Program Directive "Procurement Control"	Revision 3C 10/19/2005
8. AD4-ID2	Diablo Canyon Power Plant – Interdepartmental and Administrative Procedure "Plant Leakage Evaluation"	Revision 9A n/a
9. AD5.ID2	Inservice Inspection Program – DCPP Interdepartmental Administrative Procedure	Revision 8 08/18/2009
10. CF3	Diablo Canyon Power Plant – Nuclear Power Generation Program Directive "Design Control"	Revision 7 11/01/2007
11. OM7	Diablo Canyon Power Plant – Nuclear Power Generation Program Directive "Corrective Action Program"	Revision 4 n/a
12. MP M54.1	Diablo Canyon Power Plant Mechanical Maintenance Procedure Bolt Fabrication and Tensioning	Revision 21 04/24/2008
13. DCPP-AMP-B2.1.7-Rev. 3	Diablo Canyon Power Plant Aging Management Program Evaluation Report – Bolting Integrity B2.1.7 – NUREG1801 Program XI.M18	Revision 4 n/a

The staff conducted its audit of LRA program elements 1–6, based on the contents of the existing program as modified by the proposed exceptions. Aspects of program elements 1, 3, and 5 (scope of program, parameters monitored/inspected, and monitoring and trending) of the LRA AMP associated with the exceptions were not evaluated during this audit. Aspects of these

program elements that are not associated with the exceptions were evaluated and are described below.

During the audit, the staff found that:

elements 2 and 6 (preventive actions and acceptance criteria) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP; and

sufficient information was not available to determine whether elements 1, 3, 4, and 5 (scope of program, parameters monitored/inspected, detection of aging effects, and monitoring and trending) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

In order to obtain the information necessary to verify whether the LRA program element numbers 1, 3, 4, and 5 are consistent with the corresponding elements of the GALL Report AMP, the staff will consider issuing RAIs for the following subjects:

The bolting categories covered by the applicant's LRA AMP, both in the "Program Description" and element 1 (scope of program), differ from those in GALL AMP XI.M18. Specifically, the applicant's description includes "ASME component support bolting" and "ASME Class bolting" – terms not included in GALL AMP XI.M18 – and excludes "bolting for NSSS component supports" and "structural bolting" that are included in the GALL AMP XI.M18.

It was not clear from the applicant's program description and element 1 (scope of program) where or whether "the bolting for other pressure retaining components, including non-safety-related bolting" and the "structural bolting" classifications, are included in the LRA AMP. In GALL AMP XI.M18 these bolting are explicitly covered under program description and element 1 (scope of program). It was also not clear to the staff if the applicant classified the high strength structural bolting based on the actual measured yield strength as recommended in the GALL Report AMP. Therefore, consistency of these aspects of the LRA AMP with the GALL Report AMP needs further clarifications.

GALL AMP XI.M18 is supplemented by GALL AMP XI.S3, "ASME Section XI Subsection IWF," that manages inspection of safety related bolting which includes high strength bolting for which EPRI NP-5769 and EPRI TR-104213 recommend inspections for stress corrosion cracking (SCC). Also, element 4 (detection of aging effects) of GALL AMP XI.M18 notes that the potential for SCC of structural bolts/fasteners of NSSS component supports should be assessed based on the actual yield strength and for the identified high strength bolting (greater than 1-inch nominal diameter) volumetric examination comparable to that of Examination Category B-G-1 is required in addition to visual examination. In the applicant's LRA AMP, the staff could not confirm if the potential for SCC in the applicable bolting was evaluated, whether the actual yield strength values were factored in the evaluation, and if so classified high strength bolting have been and will be inspected with both visual and volumetric examinations as required.

During the audit of program element 10 (Operating Experience), the staff found that:

the operating experience provided by the applicant and identified by the staff's independent database searchis bounded by industry operating experience (i.e. no previously unknown aging effects were identified by the applicant or the staff);

the operating experience provided by the applicant and identified by the staff's independent database searchis not sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

In order to obtain the information necessary to verify whether the applicant's operating experience supports the sufficiency of the LRA AMP, the staff will consider issuing RAIs for the following subjects:

The applicant discussed an occurrence of bolting failures in 2001 caused by an unanticipated high temperature embrittlement in combination with several other factors, summarized its corrective action leading to revised maintenance procedures to provide specific final torque values and its evaluation of remaining similar bolting. The staff could not confirm from the data how the integrity of any remaining 17-4 PH fasteners for the extended period of operation is assured through the inspection/replacement plan, how the plan checks or confirms that the embrittlement is adequately under control to provide sufficient margin against any recurrence of this type of bolting failure, and that no unique plant specific operating experience was identified.

From the more recent operating experience record at DCPP, well after the 2001 bolting failures, the staff noted several instances of loose bolting connections, with loss of preload / stress relaxation, leading to support slippage, valve body leakage, and damaged gasket. The staff is concerned that these continued instances reflect on the quality and effectiveness of the bolting procedures. The continued presence in service of the type of bolting that failed in 2001 and the increased reliance of applicant's LRA AMP on the procedural control of preload/pre-stress raise concerns about the adequacy and effectiveness of the procedural management of the bolting integrity over the extended period of operation.

It was not clear to the staff what specific aging related industry experience on the bolting issues was incorporated in the applicant's LRA AMP, and if the applicant had addressed operating experience related to bolting integrity issues identified after issuance of the GALL Report.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable, with the provisions that it should include as part of the basis "industry recommendations, as delineated in the EPRI NP-5769, with the exceptions noted in NUREG-1339 for safety-related bolting," and it should clearly state all the categories of bolting covered by the program as recommended by the SRP-LR. These provisions are discussed above for which it is already noted that the staff will consider issuing RAIs.

Based on this audit the staff:

verified that most of the LRA program elements 1-6 are consistent with the corresponding program elements in the GALL Report while identifying certain aspects of LRA program elements 1-6 for which additional information or additional evaluation is required before consistency can be determined;

identified that additional information regarding operating experience is required before an indication regarding the sufficiency of the LRA AMP, as implemented by the applicant, to detect and manage aging can be reached; and

verified that the applicant has committed to modify the FSAR Supplement so as to make the program description adequate.

LRA AMP B.2.1.8, Steam Generator Tube Integrity

In the DCPP LRA, the applicant states that AMP B.2.1.8, "Steam Generator Tube Integrity" is an existing program that is consistent with the program elements in GALL Report AMP XI.M19, "Steam Generator Tube Integrity." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (Scope, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) and 10 (Operating Experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit.

During the audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant.

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. AMP-B2.1.8	Steam Generator Tube Integrity	Revision 2 10/26/2009
2. TSI.ID3	Steam Generator Management Program	Revision 10
3. ISI.VT-7	Replacement SG Secondary Side Tubesheet Inspection and FOSAR	Revision 5
4. TS1.NE3	SG Secondary Side Integrity Program	Revision 6 08/17/2009
5. STP M-SGTI	Steam Generator Tube Inspection	Revision 16
6. NDE ET-7	Eddy Current Examination of SG Tubing	Revision 13
7. OP O-4	Primary to Secondary SG Tube Leak Detection	Revision 19
8.	SG Condition Monitoring & Operational Assessment Mode 4 Report – Diablo Canyon 2 – 2R15	10/29/2009

During the audit of program elements 1-6, the staff found that:

> elements 1 (scope), 2 (Preventive actions), 3 (parameters monitored or inspected), 4 (detection of aging effects), 5 (monitoring and trending), and 6 (acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

The staff did identify the need for clarification of the AMP B2.1.8 operating experience description, which sates that "[t]he tubing and secondary internals are not susceptible to corrosion due to advanced material design". The staff has prepared an RAI question requesting that this statement be clarified to indicate that the tube and secondary internals are more corrosion resistant than in earlier steam generator designs. The staff also requested a number of clarifications pertaining to plant procedures STP M-SGTI and TSI.ID3. The applicant agreed to these clarifications and issued Notifications 5033094 and 50313095 to actually make these changes.

During the audit of program element 10 (Operating Experience), the staff found that:

> the operating experience provided by the applicant is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff) and is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found that sufficient information was available to determine whether the description provided in the FSAR Supplement was an adequate description of the LRA AMP.

Based on this audit the staff:

verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP XI.M19;

verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging while identifying certain aspects of the LRA AMP operating experience summary for which additional information is required; and

verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B2.1.9, Open-Cycle Cooling Water System

In the DCPP LRA, the applicant states that AMP B2.1.9, "Open-Cycle Cooling Water System" is an existing program that is consistent with the program elements in GALL Report AMP XI.M20, "Open-Cycle Cooling Water System." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (Scope, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) and 10 (Operating Experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit.

During its audit, the staff conducted an open-cycle water system walkdown, interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent database search of the applicant's operating experience database using the keywords: "corrosion," "mic," "piping."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. DCPP-AMP-B2.1.9-Rev4	Open-Cycle Cooling Water System	Revision 4 03/09/2009
2. MA1.ID20	Testing/Inspection for Auxiliary Saltwater System NRC Generic Letter 89-13 Compliance	Revision 2 10/22/2009
3.STP I-1C Attachment 12.2	MODES 4 and 5 Weekly Checklist	Revision 73 10/20/2008
4. CAP E-4	Auxiliary Saltwater Sampling	Revision 16 12/06/2007
5. No Document I.D.	Open-Cycle Cooling Water Operating Experience White Paper	Revision 4 03/26/2010

During the audit of program elements 1-6, the staff found that:

elements 1, 2, 3, 5, and 6 (scope of program, preventive actions, parameters monitored or inspected, monitoring and trending, and acceptance criteria) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP.

Sufficient information was not available to determine whether element 4 (detection of aging effects) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

In order to obtain the information necessary to verify whether the LRA program element number 4 is consistent with the corresponding elements of the GALL Report AMP, the staff will consider issuing an RAI for the following subjects:

The LRA Open-Cycle Cooling Water System Program includes aging management of cracking for titanium components exposed to raw water and describes that it will evaluate cracking found in coatings by visual inspection. It is not clear to the staff how the visual inspection will be implemented to take in to consideration the tightness of cracks that can form in titanium.

During the audit of program element 10 (Operating Experience), the staff found that:

the operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e. no previously unknown aging effects were identified by the applicant or the staff);

the operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

verified that LRA program elements 1 - 6 are consistent with the corresponding program elements in the GALL Report while identifying certain aspects of LRA program elements 1-6 for which additional information or additional evaluation is required before consistency can be determined;

verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging;

verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B2.1.10, Closed-Cycle Cooling Water System

In the DCPP LRA, the applicant states that AMP B2.1.10, "Closed-Cycle Cooling Water System" is an existing program with an enhancement and exceptions that is consistent with the program elements in GALL Report AMP XI.M21, "Closed-Cycle Cooling Water." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (Scope, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) and 10 (Operating Experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit. This audit report does not consider the sufficiency of exceptions.

The first enhancement affects LRA program element 5 (monitoring and trending). This enhancement expands on the existing program element by adding the inspection of the Component Cooling Water (CCW) supply check valves to the reactor coolant pump as a leading indicator of the condition of the interior of the piping components that are not accessible for visual inspection. This periodic inspection is used to detect loss of material and fouling. These inspections are scheduled to be performed once every five years.

In Table A4-1 of the LRA, the applicant committed to implement this enhancement prior to the period of extended operation

The first exception affects LRA program elements 2, 3, and 6 (preventive actions, parameters monitored or inspected, and acceptance criteria). In the GALL Report AMP, these program elements recommend that the chemistry in the closed-cycle cooling system follow the guidance in the EPRI Closed Cycle Cooling Water Chemistry Guideline report. Alternatively, these program elements in the LRA state that while the Diesel Engine Jacket Cooling Water (DECW) uses a chromate chemistry, the range of chromate used (1580-3150 ppm) is higher than the guidance in the EPRI report (150-300 ppm). The LRA states that the EPRI limit is based on degradation of mechanical seals exposed to higher levels of chromate. The applicant further stated that operating experience and recent industry research on the subject supports the operation at higher levels of chromate.

The second exception affects LRA program elements 2 and 3 (preventive actions and parameters monitored or inspected). In the GALL Report AMP, these program elements recommend that the chemistry in the closed-cycle cooling system follow the guidance in the EPRI Closed Cycle Cooling Water Chemistry Guideline report. Alternatively, these program elements in the LRA state that the EPRI Closed Cycle Cooling Water Chemistry Guidelines suggests monitoring chloride and fluoride in a chromate system. The LRA further states that these two species are not monitored in the DECW system because 1) there are no known pathways for chloride or fluoride to enter the DECW system and 2) chromates are anodic inhibitors and the concentration of chromate is maintained at a level that prevented the onset of pitting if either chloride or fluoride entered the system.

The third exception affects LRA program elements 2 and 3 (preventive actions and parameters monitored or inspected). In the GALL Report AMP, these program elements recommend that the monitoring frequency for chemistry parameters in the closed-cycle cooling system follow the

guidance in the EPRI Closed Cycle Cooling Water Chemistry Guideline report. Alternatively, these program elements in the LRA state that the EPRI Closed Cycle Cooling Water Chemistry Guidelines suggests monitoring various chemical parameters at frequencies ranging from weekly to quarterly. The LRA further states that the DECW chemistry control parameters will be monitored quarterly because 1) the jacket cooling water chemistry has remained stable for over 25 years, 2) increasing sampling frequency would increase the amount of hazardous waste generated, and 3) increase the amount of makeup required to replace the sample and purge volume.

The fourth exception affects LRA program elements 3, 4, and 5 (parameters monitored or inspected, detection of aging effects, and monitoring and trending). In the GALL Report AMP, these program elements recommend that 1) heat exchanger parameters should be monitored, 2) performance and functional testing is conducted to ensure acceptable functioning of the closed cycle cooling water system or components, and 3) internal inspections and performance or functional testing are performed periodically to confirm effectiveness of the program. Alternatively, these program elements in the LRA state that the performance testing of heat exchangers served by the closed cycle cooling system are not performed as part of the Closed-Cycle Cooling Water Program. The LRA stated that non-chemical testing and inspection consistent with the EPRI guidelines are performed to evaluate for fouling and loss of material. These non-chemical testing includes visual inspection of the CCW supply isolation check valves to the reactor coolant pumps. This also includes thermal performance testing of CCW heat exchangers as part of the Open-Cycle Cooling Water Program. The LRA further states that corrosion coupons are placed in the CCW and Service Cooling Water (SCW) System to detect for corrosion. In addition, the LRA states that corrosion spool pieces with an orifice create low flow locations to evaluate bio-fouling in the CCW system. Finally, the LRA states that instead of performing testing and inspections of heat exchangers served by the DECW system, diesel engine performance testing monitors various engine parameters, which provide indications of corrosion issues or fouling.

The fifth exception affects LRA program elements 2, 3, 4, 5, and 6 (preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria). In the GALL Report AMP, these program elements recommend that the program use EPRI Closed Cooling Water Chemistry Guidelines, TR-107396 Revision 0. Alternatively, these program elements in the LRA state that the EPRI Closed Cooling Water Chemistry Guidelines, TR-1007820 Revision 1 is to be used.

During its audit, the staff conducted a closed cycle water chemistry walkdown, interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using keywords: "mic," "chemistry," "copper," and "piping."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. DCPP-AMP-B2.1.10	Closed-Cycle Cooling Water System	Revision 3 03/10/2010
2. CAP A-9	Auxiliary Systems Sampling Schedule	Revision 30 03/27/2008
3. EPRI TR-1007820	Closed Cooling Water Chemistry Guidelines	Revision 1 04/2004
4. OP F-5:III	Chemistry Control Limits and Action Guidelines for the Plant Support System	Revision 21 02/05/2009
5. No Document I.D.	Closed Cooling Water Chemistry Basis Document	Revision 0 04/2006
6. MA1.ID20	Testing/Inspections for Auxiliary Saltwater System – NRC Generic Letter 89-13 Compliance	Revision 2 10/22/2009
7. PEP M-234	CCW Heat Exchanger Performance Test	Revision 11 No Date
8. STP M-21-ENG.8	Diesel Engine Generator Inspection	Revision 2 12/10/2008
9. PE M 16690	Component Cooling Water System drawing 102014 Sheet 7 page 0	Revision 55 03/31/2008

The staff conducted its audit of LRA program elements 1–6 based on the contents of the existing program as modified by the proposed enhancements. Aspects of program elements 2, 3, 4, 5, and 6 (preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP associated with the exceptions were not evaluated during this audit. Aspects of these program elements that are not associated with the exceptions were evaluated and are described below.
During the audit, the staff found that:

elements 1, 4, 5, and 6 (Scope of Program, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP;

element 2 (Preventive Actions) of the LRA AMP is not strictly consistent with the corresponding element of the GALL Report AMP but that sufficient information was available to allow the staff to determine that this element of the LRA AMP is equivalent to the corresponding elements of the GALL Report AMP; and

sufficient information was not available to determine whether element 3 (Parameters Monitored or Inspected) of the LRA AMP is consistent with the corresponding element of the GALL Report AMP.

The basis for the staff's determination that element 2 (Preventive Actions) of the LRA AMP are equivalent to the corresponding GALL Report AMP is:

Element 2 of the LRA AMP states that the HVAC system is maintained as a sealed pure water system based on potable water and contains no additives. In addition, onsite documentation indicates that the frequency chemistry sampling is conducted semi-annually. In the GALL Report AMP it states that closed cycle cooling system should be maintained with corrosion inhibitor concentrations within the specified limits of EPRI TR-107396. A review of the current EPRI Closed Cooling Water Chemistry Guideline report indicates that for pure water systems, the main parameter to control is oxygen microbial activity. The applicant has limited the chemistry monitoring to semiannual measurements, which reduce the amount of oxygen ingress into the system. Secondly, the applicant uses chlorine in the potable water, which is a biocide. Based on this information the preventive actions associated with the potable water system is consistent with the GALL Report.

In element 2 of the LRA AMP states that the Diesel Engine Jacket Cooling Water System contains higher levels of chromate than specified in the EPRI Closed Cooling Water Chemistry Guideline report. In the GALL Report AMP it states that closed cycle cooling system should be maintained with corrosion inhibitor concentrations within the specified limits of EPRI TR-107396. A review of the EPRI Closed Cooling Water Chemistry Guideline report indicates that a higher level of chromate is not used because it has the potential to degrade carbon pump seals. The LRA technical basis documentation has indicated that carbon seal failure has been mainly due to buildup of corrosion product and that these occurrences do not occur frequently. An independent database search of the applicants operating experience did not find any additional occurrences of seal failure. Based on this information the preventative actions associated with the Diesel Engine Jacket Cooling Water System is consistent with the GALL Report.

In order to obtain the information necessary to verify whether the LRA program element 3 (Parameters Monitored or Inspected) is consistent with the corresponding element of the GALL Report AMP, the staff will consider issuing an RAI for the following subject:

In element 3 (Parameters Monitored or Inspected) of the LRA AMP its states that systems scoped into the license renewal process per 10 CFR 54.4(a)(2) for spatial interaction concerns only will not include inspection of performance testing. In the GALL Report AMP it states that components scoped into the license renewal process are tested and inspected in accordance with the guidance in the EPRI Closed Cycle Cooling Water Guideline. 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.

During the audit of program element 10 (Operating Experience), the staff found that:

the operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff);

the operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP,

as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

The staff found that sufficient information was not available to determine whether the description provided in the FSAR Supplement was an adequate description of the LRA AMP.

In order to obtain the information necessary to verify the sufficiency of the FSAR Supplement program description, the staff will consider issuing RAIs for the following subjects:

In Appendix A, Section A1.10 final safety analysis report supplement 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. In the SRP-LR, it states that the closed cycle cooling water system program should contain a commitment to conduct non-chemistry performance monitoring. It is not clear to the staff that the FSAR Supplement includes all the aspects of the program used to manage aging of components in the closed-cycle cooling water systems.

Based on this audit the staff:

verified that most of the LRA program elements 1-6 are consistent with the corresponding program elements in the GALL Report while identifying certain aspects of LRA program elements 1-6 for which additional information or additional evaluation is required before consistency can be determined;

verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging

identified a need for additional information regarding the adequacy of the program description in the FSAR Supplement.

LRA AMP B2.1.11, Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems

In the DCPP LRA, the applicant states that AMP B2.1.11, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems," is an existing program that is consistent with the program elements in GALL Report AMP XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and 10 (operating experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit.

During its audit, the staff conducted walkdowns, interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "crane," "corrosion," "material loss," "rail," and "trolley."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. DCPP-AMP-B2.1.11-Rev2	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	Revision 3 03/11/2010
2. N/A	Inspection of Overhead Heavy and Light Load Operating Experience White Paper	Revision 4 03/30/2010
3. A0321761	Action Request A0321761	N/A
4. N/A	Diablo Canyon License Renewal Aging Management AR Operating Experience Report for AMP XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems" B2.1.11	01/21/2010
5. A0308512	Action Request A0308512	N/A
6. MP M-50.16	Diablo Canyon Power Plant Mechanical Maintenance Procedure, Special Service Hoists, Jib Cranes and Monorails Inspection	Revision 7 07/22/2008
7. MP M-42-POL	Diablo Canyon Power Plant Mechanical Maintenance Procedure, Polar Crane Maintenance	Revision 2 06/11/2009
8. MP M-50.13	Diablo Canyon Power Plant Mechanical Maintenance Procedure, Preventive Maintenance on the Containment Dome Service Crane	Revision 3 09/24/2003
9. MP M-50.3	Diablo Canyon Power Plant Mechanical Maintenance Procedure, Overhead Gantry and Mobile Crane Inspection, Testing and Maintenance	Revision 16 01/28/2010
10. N/A	Diablo Canyon License Renewal Component List for AMP XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems" B2.1.11	N/A
11. DCM T-11	Diablo Canyon Nuclear Power Plant Units 1 and 2 Design Criteria Memorandum, Control of Heavy Loads	Revision 14 03/30/2006
12. M-1054	PG&E Engineering Design Calculation, Control of Heavy Loads Program Bases and Implementation	Revision 0 03/07/2001

During the audit of program elements 1-6, the staff found that:

elements 1, 2, 3, 5, and 6 (scope of program, preventive actions, parameters monitored/inspected, monitoring and trending, and acceptance criteria) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP; and

sufficient information was not available to determine whether element 4 (detection of aging effects) of the LRA AMP is consistent with the corresponding element of the GALL Report AMP.

In order to obtain the information necessary to verify whether LRA program element 4 is consistent with the corresponding element of the GALL Report AMP, the staff will consider issuing an RAI for the following subject:

Element 4 of the GALL Report AMP states that crane rails and structural components are visually inspected on a routine basis for degradation. The applicant's implementing procedures specify periodic visual inspections for the containment dome service crane and special service hoists, jib cranes, and monorails, but these procedures do not include specific provisions to detect corrosion of structural members. It is not clear to the staff whether the applicant's program includes inspections for corrosion of certain cranes, hoists, and monorails.

During the audit of program element 10 (Operating Experience), the staff found that:

the operating experience provided by the applicant and identified by the staff's independent database searchis bounded by industry operating experience (i.e. no previously unknown aging effects were identified by the applicant or the staff); and

the operating experience provided by the applicant and identified by the staff's independent database searchis sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

verified that most of the LRA program elements 1 - 6 are consistent with the corresponding program elements in the GALL Report while identifying certain aspects of the LRA program elements 1-6 for which additional information or additional evaluation is required before consistency can be determined;

verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging; and

verified that the description provided in the FSAR Supplement is an adequate description of the program

LRA AMP B2.1.12, Fire Protection

In the DCPP Units 1 and 2 LRA, the applicant states that AMP B2.1.12,"Fire Protection," is an existing program with enhancements and exceptions that is consistent with the program elements in GALL Report AMP XI.M26, "Fire Protection." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and 10 (operating experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. This audit report does not consider the sufficiency of exceptions.

The first enhancement affects LRA program element 1 (scope of program) and 3 (parameters monitored/inspected). This enhancement expands on the existing program element by including inspection of all fire rated doors listed in the DCPP Fire Hazards Analysis in the scope of the program.

The second enhancement affects LRA program element 4 (detection of aging effects). This enhancement expands on the existing program element by including qualification criteria for individuals performing inspections of fire dampers and fire doors.

In Table A4-1, item 2, of the LRA, the applicant committed to implement these enhancements prior to the period of extended operation.

The first exception affects LRA program element 1 (scope of program). In the GALL Report AMP, this program element provides an aging management program for managing penetration seals, fire barrier walls, ceilings, and floors, fire rated doors, fire pump fuel supply lines, and the halon/CO_2 fire suppression system. This program element in the LRA includes lightening rods, mounting structures, and ground connections and excludes halon fire suppression systems from the scope of license renewal.

The second exception affects LRA program element 3 (parameters monitored/inspected) and 4 (detection of aging effects). In the GALL Report AMP, this program element recommends a visual inspection and functional test of the halon and CO_2 systems every six months. Alternatively, these program elements in the LRA state, that the DCPP procedures for functional testing of the CO_2 fire suppression systems are performed every 18 months, while the turbine generator bearing No. 10 and circulating water pump high pressure CO_2 system detectors are tested every 24 months.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using keywords: "fire barrier," "penetration seal," "fire door," and "sprinkler."

The table below lists the documents that were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. STP M-70A	Inspection of Fire Barrier and HELB Penetration Seals	Revision 5 02/15/2005
2. STP M-70B	Inspection and Testing of Fire Dampers	Revision 12 08/01/2007
3. STP M-70C	Inspection/maintenance of Doors	Revision 15 Information only
4. STP M-70D	Inspection of Fire Barrier, Rated Enclosures, Credited Cable Tray Fire Stops, and Equipment Hatches	Revision 12A Information only
5. STP P-24	Testing of the Portable Long Term Cooling Pumps	Revision 20 Information only
7. STP M-39A1	Routine Surveillance Test of Diesel Generator 1-1 (2-1) Room CO_2 Fire System Operation	Revision 12A Information only
8. STP M-39A2	Routine Surveillance Test of Diesel Generator 1-2 (2-2) Room CO_2 Fire System Operation	Revision 13 11/13/2007
9. STP M-39A3	Routine Surveillance Test of Diesel Generator 1-3 (2-3) Room CO_2 Fire System Operation	Revision 2 10/30/2007
9. STP M-39E	Routine Surveillance Test of Turbine Generator Bearing No. 10 CO_2 Fire System Operation	Revision 13 05/23/2007
9. STP M-39F	Routine Surveillance Test of Circulating Water Pump High Pressure CO_2 Fire System Operation	Revision 6 05/12/2006
9. STP M-39G	Routine Surveillance Test of Circulating Water Pump High Pressure CO_2 Fire System Detector Operation	Revision 6 04/29/2005
10. STP M-23	Lightening Protection Surveillance	Revision 3 03/15/2007
11. OP K-2A:III	Alternate Methods of Pressurizing and Filling Firewater System	Revision 10 05/26/2009

The staff conducted its audit of LRA program elements 1–6 based on the contents of the existing program as modified by the proposed enhancements. Aspects of program elements 1 (scope of program), 3 (parameters monitored/inspected) and 4 (detection of aging effects) of the LRA AMP associated with the exceptions were not evaluated during this audit. Aspects of these program elements that are not associated with the exceptions were evaluated and are described below.

During the audit, the staff found that:

elements 2 (preventive actions), 4 (detection of aging effects), 5 (monitoring and trending), and 6 (acceptance criteria) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP;

sufficient information was not available to determine whether elements 1 (scope of program) and 3 (parameters monitored/inspected) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP.

In order to obtain the information necessary to verify whether the LRA program element numbers 1 and 3 are consistent with the corresponding elements of the GALL Report AMP, the staff will consider issuing RAIs for the following subjects:

Element 1 of the LRA AMP states that DCPP does not have permanently installed diesel driven fire pumps, and that instead it has three portable diesel driven fire pumps that may be used for fire protection. The GALL Report AMP recommends that periodic testing be performed on the diesel driven fire pumps to ensure the fuel oil supply lines can perform their intended function. It is not clear to the staff that whether the portable diesel driven pumps are credited for use in the fire protection system and included withinin the scope of license renewal. Furthermore, if the pumps are in scope for license renewal, it is not clear why an inspection program is not included in the FSAR supplement or why there are no AMR results in LRA Table 3.3.2-12 for piping or tubing exposed to fuel oil managed by the Fire Protection Program.

During the audit of program element 10 (Operating Experience), the staff found that:

the operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e. no previously unknown aging effects were identified by the applicant or the staff);

the operating experience provided by the applicant and identified by the staff's independent database searchis sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found that sufficient information was not available to determine whether the description provided in the FSAR Supplement was an adequate description of the LRA AMP.

In order to obtain the information necessary to verify the sufficiency of the FSAR Supplement program description, the staff will consider issuing RAIs for the following subjects:

It is not clear whether the portable diesel driven fire pumps are credited for use in the Fire Protection Program and are inscope for license renewal. If they are inscope, revise the description of the program FSAR Supplement in LRA Section A1.12 to include an inspection program for the portable diesel driven fire pumps and provide additional information as to why there are no AMR results for aging management of the portable

diesel driven pump fuel oil supply lines in LRA Table 3.3.2-12. If the pumps are not inscope, revise the program description in LRA Section B2.1.12 to include this as an exception.

Based on this audit the staff:

verified that most of the LRA program elements 1-6 are consistent with the corresponding program elements in the GALL Report while identifying certain aspects of LRA program elements 1-6 for which additional information or additional evaluation is required before consistency can be determined;

verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging;

identified a need for additional information regarding the adequacy of the program description in the FSAR Supplement.

LRA AMP B2.1.13, Fire Water System

In the DCPP Units 1 and 2 LRA, the applicant states that AMP B2.1.13, "Fire Water System," is an existing program with enhancements and exceptions that is consistent with the program elements in GALL Report AMP XI.M1.27, "Fire Water System." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and 10 (operating experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. This audit report does not consider the sufficiency of exceptions.

The first enhancement affects LRA program element 4 (detection of aging effects). This enhancement expands on the existing program element by adding commitment so that sprinkler heads in service for 50 years will be replaced or representative samples from one or more sample areas will be tested consistent with NFPA 25, *Inspection, Testing and Maintenance of Water-Based Fire Protection Systems* guidance. Furthermore, these test procedures will be repeated at 10-year intervals during the period of extended operation, for sprinkler heads that were not replaced prior to being in service for 50 years. In addition, this enhancement expands on the existing program element by adding another commitment to perform either periodic, non-intrusive volumetric examinations, or visual inspections on firewater piping to detect any loss of material due to corrosion to ensure that aging effects are managed, wall thickness is within acceptable limits and degradation would be detected before the loss of intended function.

The second enhancement affects LRA program element 5 (monitoring and trending). This enhancement expands on the existing program element by including trending requirements in the Fire Protection procedure.

In Table A4-1, item 3, of the LRA, the applicant committed to implement these enhancements prior to the period of extended operation.

The first exception affects LRA program element 1 (scope of program). In the GALL Report AMP, this program element provides a program for managing carbon steel and cast iron components in fire water systems. Alternatively, this program element in the LRA states, also manages components made from copper alloy and stainless steel exposed to water in the fire water system.

The second exception affects LRA program element 4 (detection of aging effects). In the GALL Report AMP, this program element specifies annual hydrant hose hydrostatic tests and gasket inspections. Alternatively, this program element in the LRA states, that DCPP has been performing hydrostatic testing of fire hoses on a 3-year frequency and gasket inspections at least once every 18 months (24 months in high radiation areas).

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using keywords: "firewater piping," "corrosion," and "leak."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. STP M-79	Indoor Fire Hose Inspection	Revision 18 11/03/2005
2. STP M-80B	Indoor Fire Hose Operability Test	Revision 17 11/03/2005
3. STP M-80D	Fire Hose Hydrostatic Testing	Revision 1 10/24/2003
4. STP M-71	Fire Water System Flow Test	Revision 8 11/02/2002
5. STP M-65	Sprinkler/Deluge System Visual Verification	Revision 15 Information only
6. STP M-66A	Deluge System Nozzle Proof Test Startup Transformer	Revision 9 Information only
7. STP M-66A	Deluge System Nozzle Proof Test Startup Transformer	Revision 7 Information only
8. STP M-66B	Deluge System Nozzle Proof Test Main and Auxiliary Transformers	Revision 8 05/09/2007
9. STP M-63B	Fire Water Deluge System Flow Test	Revision 2 10/30/2007
10. STP M-63E	Fire Water System Yard Loop Flush	Revision 5 12/19/2003
11. STP M-63F	Yard Loop Fire Water System Hydrant Flush	Revision 3 02/06/2008
12. STP I-34	Functional Test: Fire Detection System	Revision 19 Information only
13. STP P-FPP-B02	Fire Pump 0-2 Routine Surveillance	Revision 7 Information only

The staff conducted its audit of LRA program elements 1–6 based on the contents of the existing program as modified by the proposed enhancements. Aspects of program elements 1 (scope of program) and 4 (detection of aging effects) of the LRA AMP associated with the exceptions were not evaluated during this audit. Aspects of these program elements that are not associated with the exceptions were evaluated and are described below.

During the audit, the staff found that:

elements 2 (preventive actions), 3 (parameters monitored/inspected), 5 (monitoring and trending), and 6 (acceptance criteria) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP;

sufficient information was not available to determine whether elements 1 (scope of program) and 4 (detection of aging effects) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP.

In order to obtain the information necessary to verify whether the LRA program element numbers 1 and 4 are consistent with the corresponding elements of the GALL Report AMP, the staff will consider issuing RAIs for the following subjects:

Element 4 of the LRA AMP states that DCPP has been performing hydrostatic testing of fire hoses on a 3-year frequency and gasket inspections at least once every 18 months (24 months in high radiation areas). The GALL Report AMP specifies annual hydrant hose hydrostatic tests and gasket inspections. It is not clear to the staff that these statements are consistent because the inspection intervals are different.

Elements 1 and 4 of the LRA AMP state that the Fire Water Systems procedures will be revised to include either periodic, non-intrusive volumetric examinations (e.g., ultrasonic or eddy current) or visual inspections of fire water system piping to ensure these inspections are suitable to identify evidence of loss of material due to corrosion and to ensure that wall thickness is within acceptable limits. The GALL Report AMP recommends periodic flow testing of the fire water system or wall thickness evaluations (e.g., volumetric or visual inspections) be performed to ensure that the system maintains its intended function, and that these inspections must be capable of evaluating (1) wall thickness to ensure against catastrophic failure, and (2) the inner diameter of the piping as it applies to the design flow of the fire protection system. It is not clear to the staff that these statements are consistent because the LRA does not clarify whether inspections of below ground firewater piping are included in the non-intrusive volumetric or visual inspections. Also, given the plant-specific operating history, the staff questions the suitability of maintaining an 18-month inspection frequency.

In LRA Table 3.3.2-12, there are AMR results for buried steel (carbon steel, cast iron, and ductile iron) closure bolting, hydrants and valves, but there are no results for buried steel piping. In addition, LRA Section B2.1.13 does not include any information regarding the inspection of buried components. The GALL Report AMP recommends periodic flow testing of the fire water system or wall thickness evaluations (e.g., volumetric or visual inspections) to be performed to ensure that the system maintains its intended function. It is not clear to the staff that these statements are consistent because there are no AMR results in LRA Table 3.3.2-12 for buried steel piping or the method and frequency of the inspections for the internal and external surfaces of the buried components.

During the audit of program element 10 (Operating Experience), the staff found that:

> the operating experience provided by the applicant and identified by the staff's independent database searchis bounded by industry operating experience (i.e. no previously unknown aging effects were identified by the applicant or the staff);
>
> the operating experience provided by the applicant and identified by the staff's independent database searchis sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> verified that most of the LRA program elements 1-6 are consistent with the corresponding program elements in the GALL Report while identifying certain aspects of LRA program elements 1 - 6 for which additional information or additional evaluation is required before consistency can be determined;
>
> verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging;
>
> verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.14 Fuel Oil Chemistry

In the DCPP LRA, the applicant states that AMP B.2.1.14, "Fuel Oil Chemistry," is an existing program with enhancements and exceptions that is consistent with the program elements in GALL Report AMP XI.M30, "Fuel Oil Chemistry." To verify this claim of consistency, the staff audited the LRA AMP. This audit report considers program elements 1-6 (Scope, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) and 10 (Operating Experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit.

The first enhancement affects LRA program 2 (Preventive Actions) and 4 (Detection of Aging Effects). This enhancement provides for periodic draining, cleaning, and visual inspection of the diesel generator day tanks, the portable diesel-driven fire pump fuel oil tanks, and portable caddy fuel oil tanks.

The second enhancement affects LRA program elements 3 (Parameters Monitored or Inspected) and 5 (Monitoring and Trending). This enhancement provides for sampling of new

fuel prior to introduction into the portable diesel-driven fire pump tanks and the portable caddy fuel oil tanks.

The third enhancement affects LRA program element 4 (Detection of Aging Effects). This enhancement provides for supplemental ultrasonic thickness measurements if there are indications of reduced cross sectional thickness found during the visual inspection of the diesel fuel oil storage tanks, diesel generator day tanks, portable diesel-driven fire pump fuel oil tanks, and portable caddy fuel oil tanks.

The fourth enhancement affects LRA program element 5 (Monitoring and Trending). This enhancement provides for trending of water and particulate levels in accordance with DCPP Technical Specifications and plant procedures. The procedures for the portable diesel-driven fire pump fuel oil tanks will be enhanced to include monitoring and trending of water and sediment levels of new fuel oil for the portable diesel driven fire pump fuel oil tank and portable caddy fuel oil tanks.

The fifth enhancement affects LRA program element 6 (Acceptance Criteria). This enhancement will revise procedures for the portable diesel driven fire pump fuel oil tanks to state acceptance criteria for new fuel oil being introduced into the portable diesel driven fire pump fuel oil tanks or portable caddy fuel oil tanks.

In Appendix A, Table A.5 of the LRA, in Commitment No. 4, the applicant committed to implement these enhancements prior to the period of extended operation.

The first exception affects LRA program element 1 (Scope of Program). The GALL Report AMP requires the use of ASTM Standards D1796, D2276, D2709, D6217, and D4057. The applicant states that they use only D1796, D2276, and D4057. The applicant further states that use of D1796 gives quantitative results that, together with the Technical Specification (TS) acceptance criteria, meet the intent of the D2709 method. The use of D2276, along with acceptance criteria for total particulate concentration of less than 10 mg/liter, instead of D6217, is required by TS 5.5.13.c.

The second exception affects LRA program elements 2 (Preventive Actions) and 5 (Monitoring and Trending). The GALL Report AMP requires periodic removal of water in the tanks. The applicant stated that water is not removed from the portable diesel-driven fire pump fuel oil tanks and the portable caddy fuel oil tanks, as these are small tanks that do not have provisions to remove water from the tank bottoms. The fuel oil contained in these tanks is consumed on a regular basis, by quarterly surveillance tests that run the pumps for at least 30 minutes, and fuel oil is refilled into the tanks after each test. The applicant further stated that frequent addition of fuel oil and the annual draining and cleaning of the tanks obviates the need for periodic water removal. New fuel oil is tested in accordance with the Fuel Oil Chemistry program before being added to the tanks.

The third exception affects LRA program element 3 (Parameters Monitored or Inspected). The GALL Report AMP requires periodic sampling of tanks for particulate concentration. The applicant stated that the portable diesel-driven fire pump fuel oil tanks and potable caddy fuel oil tanks will not be analyzed for particulate concentration since the pumps are tested quarterly. The consumption of fuel oil during the quarterly surveillance test (minimum run time of 30

minutes) would remove any particulates that would have accumulated in the tanks. The licensee further states that frequent addition of fuel oil obviates the need for this sampling, provisions for sampling particulates from these tanks do not exist, and new fuel oil is tested in accordance with the Fuel Oil Chemistry Program prior to introduction into the portable diesel-driven fire pump fuel oil tanks and portable caddy fuel oil tanks.

The fourth exception affects LRA program elements 3 (Parameters Monitored or Inspected) and element 4 (Detection of Aging Effects). The GALL Report AMP requires the use of ASTM Standard D4057 for fuel oil sampling. This standard is not used on the portable diesel-driven fire pump fuel oil tanks or the portable caddy fuel oil tanks. These tanks are too small for multi-level samples to apply, and the pumps are tested quarterly. The consumption of fuel oil is the result of the quarterly surveillance test to run the pump for at least 30 minutes, and the frequent addition of diesel fuel oil obviates the need for this sampling. New fuel oil is tested in accordance with the Fuel Oil Chemistry Program prior to introduction into the portable diesel-driven fire pump fuel oil tanks and portable caddy fuel oil tanks.

The fifth exception affects LRA program elements 3 (Parameters Monitored or Inspected) and 6 (Acceptance Criteria). The GALL Report AMP states that ASTM Standards D1796 and D2709 are used for determination of water and sediment contamination. The applicant states that they use only ASTM D1796 and not D2709. The use of D1796, along with the acceptance criteria for water and sediment contamination of 0.05 volume percent, is required by TS Bases Surveillance Requirement 3.8.3.3.c. The testing conducted using ASTM D1796 gives quantitative results that, together with the TS Acceptance criteria, meet the intent of ASTM D2709.

The sixth exception affects LRA program element 6 (Acceptance Criteria). The GALL Report AMP requires the use of ASTM D6217 for determination of particulates. The applicant states that DCPP uses only ASTM D2276 and not D6217. The use of ASTM D2276, along with acceptance criteria for total particulate concentration of less than 10 mg/liter, is required by TS 5.5.13.c.

During its audit, the staff conducted a walkdown, interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using keywords: "MIC," "microbiological," "pitting," "corrosion," and "tank."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
STP M-10B	DCPP Diesel Fuel Oil Testing Program	Rev. 19
STP M-10B1	Emergency Diesel Fuel Oil Storage Tanks Analysis	Rev. 10
STP M-10B2	Diesel Generator Day Tanks Fuel Oil Analysis	Rev. 5
STP M-10B3	New Fuel Oil Shipments Analysis	Rev. 9
STP M-91A	Diesel Fuel Oil Storage Tanks Inspection and Cleaning	Rev. 7
CAP C-54	Water and Sediment	Rev. 2
CAP C-71	Total Particulate Contaminant of Fuel Oil	Rev. 7

The staff conducted its audit of LRA program elements 1 - 6 based on the contents of the existing program as modified by the exceptions and proposed enhancements. During the audit, the staff found that:

> elements 1 (Scope of Program), 2 (Preventive Actions), 3 (Parameters Monitored or Inspected), 5 (Monitoring and Trending), and 6 (Acceptance Criteria) of the LRA AMP are not strictly consistent with the corresponding elements of the GALL Report AMP, but sufficient information was available to allow the staff to determine that these elements of the LRA AMP are equivalent to the corresponding elements of the GALL Report AMP;
>
> element 4 (Detection of Aging Effects) was found to be not consistent with the corresponding element of the GALL Report AMP because the diesel fuel oil pump head tank was not included among the list of tanks to be inspected, and because the applicant had not included UT inspection of fuel oil tank bottoms, as recommended by the GALL Report AMP. The staff discussed these findings with the applicant during the audit and sent two RAIs on element 4 to the applicant. Resolution of the RAIs will be covered in the safety evaluation report.

During the audit of program element 10 (Operating Experience), the staff found that

> the operating experience provided by the applicant bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff);
>
> the operating experience provided by the applicant was sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement A1.14. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

verified that most of the LRA program elements 1-6 are consistent with the corresponding program elements in the GALL Report while identifying certain aspects of LRA program elements 1-6 for which additional information or additional evaluation is required before consistency can be determined;

verified that the operating experience (element 10) is sufficient to indicate that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging;

verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B2.1.16, One-Time Inspection

In the DCPP LRA, the applicant states that AMP B2.1.16, "One-Time Inspection" is a new program that is consistent with the program elements in GALL Report AMP XI.M32, "One-Time Inspection." The applicant committed to implementing this program prior to the period of extended operation in LRA Table A4-1, item 16. To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and 10 (operating experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit.

During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using keywords: "corrosion," "crack," "fatigue," "piping," and "weld."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. DCPP-AMP-B2.1.16-Rev3	Diablo Canyon Aging Management Program Evaluation Report, One-Time Inspection – B2.1.16, NUREG 1801 Program XI.M32	Revision 3 11/12/2009
2. (no number)	One-Time Inspection Operating Experience White Paper	Revision 0 02/05/2010
3. TSI.ID12	Interdepartmental Administrative Procedure, One-Time Inspection Program	Revision 0 (no date)
4. (no number)	Diablo Canyon License Renewal Component List for AMP XI.M32, "One-Time Inspection" B2.2.16	(no Rev. no.) (no date)
5. (no number)	Diablo Canyon License Renewal One Time Inspection Basis Document	Revision 0 (no date)

During the audit of program elements 1-6, the staff found that:

> elements 1 (Scope of Program), 2 (Preventive Actions), 3 (Parameters Monitored/Inspected), 5 (Monitoring and Trending), and 6 (Acceptance Criteria) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP; and
>
> sufficient information was not available to determine whether element 4 (Detection of Aging Effects) of the LRA AMP is consistent with the corresponding elements of the GALL Report AMP.

In order to obtain the information necessary to verify whether the LRA program element 4 is consistent with the corresponding element of the GALL Report AMP, the staff will consider issuing an RAI for the following subject:

> 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." The staff noted that in the applicant's existing AMP B2.1.19, "One-Time Inspection of ASME Class 1 Small-Bore Piping," the applicant states that sampling will utilize a Risk-Informed Inservice Inspection (RI-ISI) methodology based upon EPRI TR-112657, Rev. B. However, a similar description or characterization of the sampling procedure under AMP B2.1.16 is not provided. It is not clear to the staff that the applicant's proposed sampling plan for the present AMP is consistent with the GALL Program element 4 because the applicant provides insufficient detail on the sampling methodology to be employed.

During the audit of program element 10 (Operating Experience), the staff found that:

> the operating experience identified by the staff's independent database search and supplemented by the applicant is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff);
>
> the operating experience identified by the staff's independent database search and supplemented by the applicant is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> verified that most of the LRA program elements 1-6 are consistent with the corresponding program elements in the GALL Report while identifying certain aspects of LRA program elements 1-6 for which additional information or additional evaluation is required before consistency can be determined;
>
> verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is adeqate to detect and manage aging;
>
> verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B2.1.17, Selective Leaching of Materials

In the DCPP LRA, the applicant states that AMP B2.1.17, "Selective Leaching of Materials," is a new program that is consistent with the program elements in GALL Report AMP XI.M33, "Selective Leaching of Materials." The applicant committed to implementing this program during the 10 years prior to the period of extended operation in LRA Appendix A Table A4-1, license renewal commitment number 6. To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (Scope, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) and 10 (Operating Experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using keywords: "brass," "bronze," "MIC," "dealloying," and "corrosion."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. DCPP-AMP-B2.1.17-Rev3	Selective Leaching of Materials	Revision 3 03/29/2009
2. AR A0350059	Evaluation of NRC IEN 94-59, Al-Bronze Dealloying	09/04/1996
3. AR A0431200	SW-1-303 – Failed STP V-18 Inspection	11/18/1997
4. AR A0438773	SW-2-303: Dealloying of Bonnet Gasket Seating Area	08/20/1997
5. TSI.IDXX	Selective Leaching Degradation Program	Rev. 0
6. Notification 50123904	Fire water line break at SU Trans. 2-1	06/20/2009

During the audit of program elements 1-6, the staff found that:

> elements 1, 2, 4, 5, and 6 (Scope, Preventive Actions, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP;
>
> sufficient information was not available to determine whether element 3 (Parameters Monitored or Inspected) of the LRA AMP is consistent with the corresponding element of the GALL Report AMP.

In order to obtain the information necessary to verify whether the LRA program element 3 is consistent with the corresponding element of the GALL Report AMP, the staff will consider issuing an RAI for the following subject:

> In element 3 of the LRA AMP its states that the identification of selective leaching will result in an engineering evaluation and the outcome of an engineering evaluation will determine the need to expand the scope of inspections. In the GALL Report AMP it states that unacceptable inspection findings includes expansion of the inspection sample size and location. It is not clear to the staff that these statements are consistent because the program description does not explicitly expand the scope of the inspection when selective leaching is identified.

During the audit of program element 10 (Operating Experience), the staff found that:

> the operating experience identified by the staff's independent database search and supplemented by the applicant is bounded by industry operating experience (i.e. no previously unknown aging effects were identified by the applicant or the staff);

the operating experience identified by the staff's independent database search and supplemented by the applicant is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

verified that most of the LRA program elements 1-6 are consistent with the corresponding program elements in the GALL Report while identifying certain aspects of LRA program elements 1 - 6 for which additional information or additional evaluation is required before consistency can be determined;

verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging;

verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B2.1.18, Buried Piping and Tanks Inspection

In the DCPP LRA, the applicant states that AMP B2.1.18, "Buried Piping and Tank Inspection," is a new program with exceptions that is consistent with the program elements in GALL Report AMP XI.M34, "Buried Piping and Tanks Inspection." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (Scope, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) and 10 (Operating Experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit. This audit report does not consider the sufficiency of exceptions.

The first exception affects LRA program elements 1 and 3 (scope of program and parameters monitored or inspected). In the GALL Report AMP, these program elements recommend that this program manage loss of material for the external surface of buried steel piping and tanks. Alternatively, this program element in the LRA states that this program will include the aging management of buried stainless steel and asbestos cement piping.

The second exception affects LRA program elements 1, 2, 3, 4, and 6 (scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, and acceptance criteria). In the GALL Report AMP, these program elements address coatings and wrappings on buried pipe and tanks as a preventative measure. Alternatively, these program elements in the LRA state that this program will not coat or wrap stainless steel and asbestos cement piping. Instead, the LRA elements indicate that the stainless steel and asbestos cement piping will be visually inspected. The visual inspections for stainless steel piping will be performed to detect loss of material due to general, pitting, crevice, and microbiologically

influenced corrosion. The visual inspections for the asbestos cement piping will be performed to detect for cracking, loss of material, and material changes in the surface condition.

During its audit, the staff conducted walkdowns, interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using keywords: "buried," "tank," and "underground."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. DCPP-AMP-B2.1.18-Rev 3	Buried Piping and Tanks Inspection	Revision 3 10/26/2009
2. No I.D.	Buried Piping and Tanks Operating Experience White Paper	Revision 5 04/01/2010
3. STP V-3Q3	Exercising South Site Loop Fire Suppression System Sectionalizing, Isolation, and Supply Valves	Revision 2 06/10/2005

The staff conducted its audit of LRA program elements 1–6 based without considering aspects of program elements 1, 2, 3, 4, and 6 (scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, and acceptance criteria) of the LRA AMP which are associated with the exceptions. Aspects of these elements not associated with the exceptions were evaluated and are described below.

During the audit, the staff found that:

> elements 1, 2, 3, 4, 5, and 6 (scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP;

During the audit of program element 10 (Operating Experience), the staff found that:

> the operating experience provided by the applicant and identified by the staff's independent database searchis not bounded by industry operating experience;
>
> the operating experience provided by the applicant and identified by the staff's independent database searchis not sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

In order to obtain the information necessary to verify the applicant's operating experience supports the sufficiency of the LRA AMP, the staff will consider issuing an RAI for the following subject:

> Recent events at nuclear power plants have given rise to new insight for management of aging issues for buried piping. It is not clear to the staff if the applicant has evaluated these new events and incorporated this experience into its buried piping aging management program.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;
>
> identified that additional information regarding operating experience is required before an indication regarding the adequacy of the LRA AMP, as implemented by the applicant, to detect and manage aging can be reached;
>
> verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B2.1.19 One-Time Inspection of ASME Code Class 1 Small-Bore Piping

In the DCPP LRA, the applicant states that AMP B2.1.19, "One-Time Inspection of ASME Code Class 1 Small-Bore Piping," is an existing program with an exception that is consistent with the program elements in GALL Report AMP XI.M35, "One-Time Inspection of ASME Code Class 1 Small-Bore Piping." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and 10 (operating experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit.

The exception affects LRA program element 1 (Scope of Program). In the GALL Report AMP, this program element recommends the use of EPRI Report 1000701, *Interim Thermal Fatigue Management Guideline* (MRP-24), January 2001, for identifying piping susceptible to potential effects of thermal stratification or turbulent penetration. Alternatively, this program element in the LRA states that risk informed process examination requirements are performed consistent with EPRI TR-112657, *Revised Risk-Informed Inservice Inspection Evaluation Procedure*, Revision B, instead of EPRI Report 1000701.

During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's

operating experience database using keywords: "corrosion," "crack," "fatigue," "piping," and "weld."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. DCPP-AMP-B2.1.19	One-Time Inspection of ASME Code Class 1 Small-Bore Piping	Revision 2 10/28/2009
2. (no number)	ASME Code Class 1 Small-Bore Piping One-Time Inspection Operating Experience White Paper	Revision 5 03/29/2010
3. NDE N-UT-1	Ultrasonic Examination Procedure for Pipe Welds	Revision 13 10/05/2000
4. NDE PDI-UT-2	Ultrasonic Examination of Austenitic Piping	Revision 6 (no date)
5. (no number)	Diablo Canyon License Renewal Component List for AMP Xi.M35, "One-Time Inspection of ASME Code Class 1 Small Bore Piping" B2.1.19	(no rev. no.) (no date)
6. PG&E A/R A0649034	Excess Letdown HX Inlet Line Probable Leak	(no rev. no.) 11/23/2005

The staff conducted its audit of LRA program elements 1–6 based on the contents of the existing program. Aspects of program element 1 (Scope of Program) of the LRA AMP associated with the exception were not evaluated during this audit. Aspects of those program elements that are not associated with the exception were evaluated and are described below.

During the audit, the staff found that:

elements 1 (Scope of Program), 2 (Preventive Actions), 3 (Parameters Monitored/Inspected), and 6 (Acceptance Criteria) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP; and

sufficient information was not available to determine whether elements 4 (Detection of Aging Effects) and 5 (Monitoring and Trending) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP.

In order to obtain the information necessary to verify whether the LRA program elements 4 and 5 are consistent with the corresponding elements of the GALL Report AMP, the staff will consider issuing RAIs for the following subjects:

In element 4 of the LRA, the applicant proposes to use the visual VT-2 examination technique for the examination of small-bore socket welds. In the GALL Report, it states that a volumetric inspection should be used to detect cracking resulting from thermal and

mechanical loading or intergranular stress corrosion in small-bore piping. It is not clear to the staff that these statements are consistent because the applicant appears to be proposing an inspection technique that differs from that recommended in the GALL Report.

With respect to elements 4 and 5, the GALL Report 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 resulting from stress corrosion cracking or thermal and mechanical loading. The applicant's LRA summary and the staff's independent review of operating experience identified two instances of stress corrosion cracking in small-bore piping. In view of these failures, it is not clear to the staff that the applicant's proposed use of the present program is consistent with the GALL Report.

During the audit of program element 10 (Operating Experience), the staff found that:

the operating experience provided by the applicant and identified by the staff's independent database searchis bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff);

the operating experience provided by the applicant and identified by the staff's independent database searchis sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

However, as noted above with respect to program elements 3 and 4, the applicant's operating experience indicates two instances of stress corrosion cracking failures in small-bore piping, and it is not clear to the staff that the applicant's proposed use of the present program is consistent with the GALL Report.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

verified that most of the LRA program elements 1-6 are consistent with the corresponding program elements in the GALL Report while identifying certain aspects of LRA program elements 1-6 for which additional information or additional evaluation is required before consistency can be determined;

verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging;

verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B2.1.20, External Surfaces Monitoring

In the DCPP LRA, the applicant stated that AMP B2.1.20, "External Surfaces Monitoring Program" is a new program with exceptions that is consistent with the program elements in GALL Report AMP XI.M36, "External Surfaces Monitoring." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (Scope, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) and 10 (Operating Experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit. This audit report does not consider the sufficiency of exceptions.

The first exception affects LRA program element 1, (Scope of Program). In the GALL Report AMP, this program element recommends visual inspections of the external surface of in-scope components and monitors external surfaces of steel components in systems within the scope of license renewal. The applicant's AMP B2.1.20, External Surfaces Monitoring Program, contains an exception by including additional material types to be managed by the program. Alternatively, this program element in the LRA states, that the scope of the program is expanded to include coverage of aluminum, copper alloy, and elastomers.

The second exception affects LRA program element 3 (Parameters Monitored/Inspected). In the GALL Report AMP, this program element recommends that the following parameters be monitored/inspected as examples to be included in the program: i) corrosion and material wastage (loss of material), ii) leakage from or onto external surfaces, iii) worn, flaking, or oxide-coated surfaces, iv) corrosion stains on thermal insulation, and v) protective coating degradation (cracking and flaking). The applicant's AMP B2.1.20, External Surfaces Monitoring Program, contains an exception by including additional parameters to be monitored/inspected that are consist to the inclusion of elastomers to be covered by the program. The program includes the parameters recommended in the GALL AMP and is expanded to include hardening and loss of strength as parameters monitored/inspected for in-scope elastomers.

The third exception affects program element 4 (Detection of Aging Effects). In the GALL Report AMP, this program element recommends to conduct visual inspection for component surfaces. The applicant's AMP B2.1.20, External Surfaces Monitoring Program, contains an exception by including manipulation of the in-scope elastomers in addition to visual inspection.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using keywords: "inspect," "degrade," "MIC ", "corrosion" "piping", "aluminum", and "copper."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. TS5.ID1	System Engineering Program	Revision 15 12/31/2009
2. DCPP-AMP-B2.1.20	External Surfaces Monitoring Program	Revision 3 11/12/2009
3. DCPP-OE-XI.M36	Operating Experience Summary Report XI.M36 External Surfaces Monitoring Program	No Revision No. Not Dated
4. no document No.	External Surfaces Monitoring Operating Experience White Paper	Revision 6 03/29/2010
5. OM4.ID3	Assessment of Industry Operating Experience	Revision 15 Not Dated
6. DCPP-APPL-XI.M36	Components List for External Surfaces Monitoring Program	No Revision No. Not Dated

The staff conducted its audit of LRA program elements 1–6 based without considering aspects of program elements 1, 3, and 4 of the LRA AMP which are associated with the exceptions. Aspects of these elements not associated with the exceptions were evaluated and are described below.

During the audit, the staff found that:

> elements 2, 5, and 6 of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP;
>
> elements 3, 4 (Parameters Monitored/Inspected, and Detection of Aging Effects) of the LRA AMP are not strictly consistent with the corresponding elements of the GALL Report AMP but that sufficient information was available to allow the staff to determine that these elements of the LRA AMP are equivalent to the corresponding elements of the GALL Report AMP.

The basis for the staff's determination that element 1 (Scope of Program) of the LRA AMP is equivalent to the corresponding GALL Report AMP is:

> Additional parameters to be monitored/inspected are in the program to address the aging effects specifically associated with the additional materials covered in this program (aluminum, copper alloy, and elastomers).

During the audit of program element 10 (Operating Experience), the staff found that:

> the operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff);

the operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

verified that LRA program elements 1-6 are consistent, with exceptions, with corresponding program elements in the GALL Report AMP;

verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging;

verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B2.1.21, Flux Thimble Tube Inspection Program

In the DCPP LRA, the applicant states that AMP B2.1.21, "Flux Thimble Tube Inspection," is an existing program that is consistent with the program elements in GALL Report AMP XI.M37, "Flux Thimble Tube Inspection." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and 10 (operating experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "thimble," "tube," "wear," "reposition," and "thinning."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. STP R-22	DCPP Surveillance Test Procedure – Thimble Tube Inspection Program	Revision 8 04/05/07
2. PG&E Letter DCL-88-208	Thimble Tube Thinning in Westinghouse Reactors	08/26/1988
3. PG&E Letter DCL-89-280	Thimble Tube Thinning in Westinghouse Reactors	11/10/1989
4. PG&E Letter DCL-90-094	Response to NRC Bulletin 88-09 : Thimble Tube Thinning	04/04/1990
5. Westinghouse Letter PGE-90-537	BMI Thimble Tube Wear Evaluation	02/16/1990
6. WCAP-12866	Bottom-Mounted Instrumentation Flux Thimble Wear	Rev. 0 January 1991
7. NCR N0002211	Root Cause Analysis Report - RCS Leak Through MIDS Thimble Tube	09/24/2008
8. NDE ET-9	DCPP NDE Procedure – Eddy Current Examination of Bottom Mounted Instrumentation Flux Thimble Tubes	Revision 0 12/10/2007
9. NDE Results for FTT	NDE Results for FTT – 1R14, 1R15, 2R13, 2R14, 2R15	Various
10. OE White Paper	Flux Thimble Tubes Operating Experience White Paper	Revision 5 03/26/2010

During the audit of program elements 1-6, the staff found that:

elements 2 and 3 (preventive actions, and parameters monitored or inspected) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP; and

sufficient information was not available to determine whether elements 1, 4, 5, and 6 (scope of program, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP.

In order to obtain the information necessary to verify whether the LRA program element numbers 1, 4, 5, and 6 are consistent with the corresponding elements of the GALL Report AMP, the staff will consider issuing RAIs for the following subjects:

In element 1 of the LRA AMP the applicant's response to Bulletin 88-09 is provided as the PG&E Letter No. DCL-90-094 which also includes acceptance criteria for the tube wear. Subsequently, and in response to the 2006 flux thimble tube breach at DCPP, it appears that the applicant has incorporated program modifications to the original 88-09 response and criteria. The element 1 of GALL Report AMP notes that "[w]ithin scope are the licensee responses to Bulletin 88-09, as accepted by the staff in its closure letters on

the Bulletin, and any amendments to the licensee responses as approved by the staff." The applicant could not confirm if its responses were accepted or approved by the staff.

In element 4 of the LRA AMP the applicant uses eddy-current testing (ECT) for detection of volumetric wear where close proximity of support conditions or other wear scars may have an unaccounted impact on the calibration in determining the wear depth. The GALL Report AMP states that the inspection methodology (such as ECT) will be demonstrated to be capable of adequately detecting wear of the flux thimble tubes and its results will be evaluated and compared with the element 6 (acceptance criteria, discussed below) with adequate margin for errors and uncertainty. It is not clear to the staff that all significant factors and uncertainties have been adequately accounted for in the applicant's detection procedure and interpretation of the results in evaluating the wear.

In element 5 of the LRA AMP the applicant uses a plant-specific methodology for wear trending which may not be conservative relative to the actual plant specific degradation performance. In particular, the thimble tube failure event in 2006 was not projected with adequate margin and the observed wear rate trend showed accelerating effect not accounted for in the plant-specific method. The GALL AMP XI.M37 element 5 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." Therefore, the applicant's wear trending does not appear to be consistent with the GALL AMP requirement of technically based and conservative estimation.

Parts of the flux thimble tubes constitute ASME Code Class 1 reactor coolant pressure boundary components, thus indicating that the flaw evaluation criteria in the ASME Code Section XI, Article IWA-3000 may apply to these tubes, including any applicable flaw proximity rules in this article. The applicant's program currently permits more than one repositioning of a flux thimble tube, which has the potential to leave in service more than one worn area (more than one wear related flaw) in a degraded tube. However, it is not evident whether the LRA AMP element 5 (monitoring and trending) activities take into account the applicable flaw proximity rules in the ASME Code Section XI (or similar provisions).

In element 6 of the LRA AMP the applicant's plant-specific basis document recommends that a 10% value of wall loss be applied to account for instrument and wear scar geometry uncertainties. The GALL Report AMP states that the element 6 (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. However, the applicant's current plant procedure for evaluating the NDE measurements against the acceptance criteria does not appear to apply either the 10% error allowance or to account for several other potential sources of uncertainty in the wear assessment.

During the audit of program element 10 (Operating Experience), the staff found that:

> the operating experience provided by the applicant and identified by the staff's independent database searchis bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff);
>
> the operating experience provided by the applicant and identified by the staff's independent database searchis not sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

In order to obtain the information necessary to verify whether the applicant's operating experience supports the sufficiency of the LRA AMP, the staff will consider issuing RAIs for the following subjects:

> The staff's review of on-site documentation indicated that the breach of primary pressure boundary of a flux thimble tube in 2006 occurred in about 3 months of operation, even after the inspection and corrective action(s) during the RFO immediately prior to the breach. The applicant's review of experience did not explain the reason(s) for such a breach to have occurred so soon after returning to power operations during Unit 2 Operating Cycle 14. The staff also noted that in the operating period (2R12 to 2R13) just prior to the 2006 failure the same tube had shown about 40 to 46% through-wall wear even in the chrome-banded area. Therefore, staff has concerns about the level of confidence and adequacy of the applicant's program in assuring the non-recurrence of through-wall failure(s) during the extended period.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> verified that most of the LRA program elements 1-6 are consistent with the corresponding program elements in the GALL Report while identifying certain aspects of LRA program elements 1-6 for which additional information or additional evaluation is required before consistency can be determined;
>
> identified that additional information regarding operating experience is required before an indication regarding the sufficiency of the LRA AMP, as implemented by the applicant, to detect and manage aging can be reached; and
>
> verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B2.1.22, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components

In the DCPP LRA, the applicant states that AMP LRA AMP B2.1.22, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," is a new program with exceptions that is consistent with the program elements in GALL Report AMP XI.M.38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and 10 (operating experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. This audit report does not consider the sufficiency of exceptions.

The first exception affects LRA program elements 1 (Scope of Program) and 4 (Detection of Aging Effects). The GALL Report AMP provides a program of inspections of the internal surfaces of miscellaneous steel, which includes cast iron and gray cast iron, piping and ducting components. Alternatively, this program element in the LRA also manages components made from aluminum, asbestos cement, copper alloy (greater than 15 percent zinc), copper alloy (less than 15 percent zinc), elastomers, nickel alloys, stainless steel, and stainless steel (cast austenitic).

The second exception affects LRA program elements 1 (Scope of Program), 2 (Preventive Actions), 3 (Parameters Monitored/Inspected), 4 (Detection of Aging Effects), and 5 (Monitoring and Trending). The GALL Report AMP provides a program of visual inspections of the internal surfaces of miscellaneous piping and ducting components. Alternatively, this program element in the LRA will include visual inspections and additional techniques such as volumetric testing of stainless steel to detect stress corrosion cracking, and also includes physical manipulation of elastomers both internally and externally where appropriate to the component configuration and material in order to detect hardening and loss of strength.

During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using keywords: "corrosion," "crack," "duct," "piping," "pitting," "rust," and "oxidation."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. DCPP-AMP-B2.1.22	Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Components	Revision 2 10/27/2009
2. (no number)	Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Components Operating Experience White Paper	Revision 4 03/29/2010
3. TS1.IDXX	Nondestructive Examination Procedure	Revision 0 (no date)
4. (no number)	Diablo Canyon License Renewal Component List for AMP Xi.M38, "Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Components" B2.1.22	(no rev. no.) (no date)
5. (no number)	Internal Surfaces Inspection Program, Program Basis Document	(no rev. no.) 03/02/2010

The staff conducted its audit of LRA program elements 1–6 based without considering aspects of program elements 1 (Scope of Program), 2 (Preventive Actions), 3 (Parameters Monitored/Inspected), 4 (Detection of Aging Effects), and 5 (Monitoring and Trending) of the LRA AMP which are associated with the exceptions. Aspects of these elements are not associated with the exceptions were evaluated and are described below.

During the audit, the staff found that:

elements 2 (Preventive Actions), 3 (Parameters Monitored/Inspected), 4 (Detection of Aging Effects), and 6 (Acceptance Criteria) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP; and

sufficient information was not available to determine whether elements 1 (Scope of Program) and 5 (Monitoring and Trending) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP.

In order to obtain the information necessary to verify whether the LRA program elements 1 and 5 are consistent with the corresponding elements of the GALL Report AMP, the staff will consider issuing RAIs for the following subjects:

With respect to element 1, the GALL Report AMP 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 actual application as contained in the LRA, the scope is significantly expanded beyond both GALL XI.M38 and the applicant's description of the program in LRA Appendix B. It is not clear to the staff that his expanded application of the program in the LRA is consistent with the GALL

Report because it appears to encompass a substantial number of additional component types, materials, and environments.

With respect to element 5, the LRA states that this AMP "will use the work control process for preventive maintenance and surveillance to conduct and document inspections." The term "work control process" appears nowhere in either the GALL Report or the SRP-LR. It is not clear to the staff what this term means in the context of the GALL Report program elements.

During the audit of program element 10 (Operating Experience), the staff found that:

the operating experience provided by the applicant and identified by the staff's independent database searchis bounded by industry operating experience (i.e. no previously unknown aging effects were identified by the applicant or the staff);

the operating experience provided by the applicant and identified by the staff's independent database searchis sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

verified that most of the LRA program elements 1-6 are consistent with the corresponding program elements in the GALL Report while identifying certain aspects of LRA program elements 1-6 for which additional information or additional evaluation is required before consistency can be determined;

verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging;

verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B2.1.23 Lubricating Oil Analysis

In the DCPP LRA, the applicant states that AMP B2.1.23, "Lubricating Oil Analysis" is an existing program that, following enhancement, will be consistent with exception to the program elements in GALL Report AMP XI.M39, "Lubricating Oil Analysis Program." To verify this claim of consistency, the staff audited the LRA AMP. This audit report considers program elements 1-6 (Scope, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) and 10 (Operating Experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit.

In Appendix A, Table A4-1 of the LRA, in Commitment No. 10, the applicant committed to enhance the existing program prior to the period of extended operation.

The exception affects LRA program element 3 (Parameters Monitored or Inspected). The GALL Report AMP recommends that the flash point be determined for oil in components that do not have regular oil changes. The applicant states that DCPP measures fuel dilution by gas chromatography on internal combustion engine applications where the potential exists for contamination by fuel oil, and that fuel dilution by gas chromatography accomplishes the same goal as the flash point test by determining the percent by volume of fuel in the oil. The applicant also states that for lubricating oil systems not associated with internal combustion engines, lubricating oil flash point change is unlikely.

During its audit, the staff conducted a walkdown, interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using keywords: "oil," "pitting," "corrosion," "oxidation," "rust," and "leak."

The table below lists the documents that were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant.

Relevant Documents Reviewed

Document	Title	Revision / Date
TS1.ID15	Lube Oil Analyses	Rev. 0
MA1.DC51	Preventative Maintenance Program	Rev. 11
MA1.DC52	Predictive Maintenance Program	Rev. 6 10/11/2005

The staff conducted its audit of LRA program elements 1-6 based on the contents of the existing program as modified by the exceptions and proposed enhancements. During the audit, the staff found that:

elements 1 (Scope of Program), 2 (Preventive Actions), 3 (Parameters Monitored or Inspected), and 4 (Detection of Aging Effects), 5 (Monitoring and Trending), and 6 (Acceptance Criteria) of the LRA AMP are not strictly consistent with the corresponding elements of the GALL Report AMP but sufficient information was available to allow the staff to determine that these elements of the LRA AMP are equivalent to the corresponding elements of the GALL Report AMP.

under review of element 1 (Scope of Program) of the Lube Oil Analyses document was listed with two document numbers (TS1.ID15 and MA1.DC53). The applicant clarified during the interview that their procedure for document creation had required them to change the initial document number, and that the affected documents would be updated with the new document number.

During the audit of program element 10 (Operating Experience), the staff found that:

> the operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff);
>
> the operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement A1.23. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> verified that the LRA program elements 1-6 are consistent with the corresponding program elements in the GALL Report AMP;
>
> verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging;
>
> verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.24, Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environment Qualification Requirements

In the DCPP LRA, the applicant states that AMP B.2.1.24, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environment Qualification Requirements" is a new program that is consistent with the program elements in GALL Report AMP XI.E1, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environment Qualification Requirements." The applicant committed to implementing this program prior to the period of extended operation in LRA Appendix A, Table A4-1, "License Renewal Commitments." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (Scope, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) and 10 (Operating Experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit.

During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. The staff also conducted an independent database search of the applicant's operating experience database using the keywords: "cable", "degradation", "oxidation", "cracking", and "thermal." Further, the staff performed a search of operating experience for at least a 10 year period up through January 2010. Databases were searched using various key word searches and then reviewed by technical auditor staff. Databases

searched include Generic Letters, Bulletins, Regulatory Issue Summaries, Licensee Event Reports, Event Notifications, Inspection Findings, and Inspection Reports.

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. DCPP-AMP XI.E1-Rev 4	Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements	Revision: 4 Date: 11/12/2009
2. DCPP-OE-XI.E1	Diablo Canyon License Renewal Aging Management AR Operating Experience Report for AMP XI.E1	Revision: N/A Date: N/A
3. TS1.DC1	License Renewal Electrical Aging Management	Revision: 0J Date: N/A
4. A0477350	RCP 1-2 12 KV field Cable Is Cracked near Motor	Revision: N/A Date: 02/25/2009
5. A0477593	RCP 1-1 12 KV Cables In The Motor Term Box Have Cracks	Revision: N/A Date: 02/26/2009
6. A0476872	RCP 1-4 12 KV Field Cable Is Cracked Near Motor	Revision: N/A Date: 03/12/2009

During the audit of program elements 1-6, the staff found that:

> elements 1-6 (Scope of Program, Preventive Action, Parameters Monitored/Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) are consistent with the corresponding elements of the GALL Report AMP XI.E1.

During the audit of program element 10 (Operating Experience), the staff found that:

> the operating experience identified by the staff's independent database search and supplemented by the applicant is bounded by industry operating experience (i.e. no previously unknown aging effects were identified by the applicant or the staff);
>
> the operating experience identified by the staff's independent database search and supplemented by the applicant is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit, the staff:

verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;

verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging;

verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.25, Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environment Qualification Requirements Used in Instrumentation Circuits

In the DCPP LRA, the applicant states that AMP B.2.1.25, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environment Qualification Requirements Used in Instrumentation Circuits," is an existing program that will be consistent with the program elements in GALL Report AMP XI.E2, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environment Qualification Requirements Used in Instrumentation Circuits," after enhancement. The applicant committed to implementing this program prior to the period of extended operation in LRA Appendix A section, Table A4-1, "License Renewal Commitments." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (Scope, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) and 10 (Operating Experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit.

The enhancement affects LRA program element 1 - Scope of Program, element 3 – Parameters Monitored/Inspected, element 4 – Detection of Aging Effects, element 6 – Acceptance Criteria, and element 7 – Corrective Actions. This enhancement expands on the existing program by adding procedures to implement AMP B.2.1.25 and enhance the requirements for engineering evaluation of the calibration results when the loop fails to meet license renewal acceptance criteria.

During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "cable," "degradation," "oxidation," "cracking," and "thermal." Further, the staff performed a search of operating experience for at least a 10 year period up through January 2010. Databases were searched using various key word searches and then reviewed by technical auditor staff. Databases searched include Generic Letters, Bulletins, Regulatory Issue Summaries, Licensee Event Reports, Event Notifications, Inspection Findings, and Inspection Reports. The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were

provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. DCPP-AMP XI.E2	Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits	Revision: 4 Date: 04/07/2010
2. DCPP-OE-XI.E2	Diablo Canyon License Renewal Aging Management AR Operating Experience Report for AMP XI.E2	Revision: N/A Date: N/A
3. TS1.DC1	License Renewal Electrical Aging Management	Revision: 0J Date: N/A
4. A0607026	The NE-42 detector pigtail connector has degraded and allowed moisture to enter the pigtail or connector	Revision: N/A Date: 05/29/2004
5. A0695275	N41 detector cables were found wet and rust colored stains and similar indications was found on N43	Revision: N/A Date: 04/27/2006

During the audit of program elements 1 - 6, the staff found that:

> elements 1 - 6 (Scope of Program, Preventive Action, Parameters Monitored/Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) are consistent with the corresponding elements of the GALL Report AMP XI.E2.

During the audit of program element 10 (Operating Experience), the staff found that:

> the operating experience identified by the staff's independent database search and supplemented by the applicant is bounded by industry operating experience (i.e. no previously unknown aging effects were identified by the applicant or the staff);
>
> the operating experience identified by the staff's independent database search and supplemented by the applicant is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit, the staff:

verified that LRA program elements 1 - 6 are consistent with corresponding program elements in the GALL Report AMP;

verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging;

verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B2.1.26, Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

In the DCPP LRA, the applicant states that AMP B2.1.26, "Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements," is an existing program that is consistent with the program elements in GALL Report AMP XI.E3, "Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (Scope, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) and 10 (Operating Experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit.

The enhancement affects LRA program elements, 1–6 (Scope of Program, Preventive Actions, Parameters Monitored/Inspected, Detection of Aging effects, Acceptance Criteria, and Corrective Actions). This enhancement expands on the existing program by adding procedures to implement AMP B2.1.26 and enhance the periodic inspections and water removal for in-scope medium voltage cables not subject to 10 CFR 50.49 Environmental Qualification Requirements.

In LRA Appendix A, Table A4-1, "License Renewal Commitments," item 13 of the LRA, the applicant committed to implement these enhancement(s) prior to the period of extended operation.

During its audit, the staff conducted a review of a sample of previous in-scope cable pull box inspection results but in-scope pull boxes were not opened for inspection of water accumulation during the audit. An inspection of in-scope manholes is scheduled to be performed by the applicant during refueling outage 1R16 (10/03/2010) and the staff will witness the inspections at that time. In addition, the staff interviewed the applicant's staff, and reviewed onsite documentation including action requests, notifications, non-conformance reports, and basis documents provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using keywords including: "manhole," "duct, "water," "submergence," "cable," "water tree," "electrical tree," "underground," "splice," and "vault." Further, the staff performed a search of operating experience for at least a 10 year period up through January 2010. Databases were searched using various key word searches and then reviewed by technical auditor staff. Databases searched include Generic Letters, Bulletins,

Regulatory Issue Summaries, Licensee Event Reports, Event Notifications, Inspection Findings, and Inspection Reports. During the review of operating experience the staff questioned whether pull box structural components including raceways and associated supports were specifically included in the pull box inspections. In response to the staff's question, the applicant revised procedure AD7.DC8 as documented in Notification 50270859 to add a required hold point for opportunistic civil engineering inspection of any opened pull box.

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. DCPP-AMP-B2.1.26	Diablo Canyon Aging Management Program Evaluation Report: "Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements" – B2.1.26 NUREG 1801 Program XI.E3	Revision 3 Date: 11/12/2009
2. DCPP-NRC-OE-XI.E3	Inaccessible Medium Voltage Cables Not Subject To 10 CFR 50.49 EQ Requirements	Revision N/A Date: N/A
3. White Paper XI.E3	Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements Operating Experience White Paper	Revision: 1 Date: 04/06/2010
4. DCPP-OE-XI.E3	Diablo Canyon Operating Experience Summary Report: XI.E3, "Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements"	Revision: N/A Date: N/A
5. OM7	Corrective Action Program	Revision: 4 Date: N/A
6. DCL-07-053	90 Day Response to NRC Generic Letter 2007-01, "Inaccessible or Underground Power Cable Failures that Disable Accident Mitigation Systems or Cause Plant Transients"	Revision: N/A Date: 05/02/2007
7. ADAMS ML082900274	Diablo Canyon Power Plant, Units 1 and 2 – Closeout of Generic Letter 2007-01, 'Inaccessible or Underground Power Cable Failures That Disable Accident Mitigation Systems or Cause Plant Transients"	Revision: N/A Date: 10/28/2008
8. TS1.DC1	License Renewal Electrical Aging Management	Revision: OJ Date: N/A
9. TR-11DC	Electrical Component Aging Evaluation License Renewal Topical Report	Revision: 0 Date: 01/28/2010
10. A0568168	Action Request – Evaluation of the Failure Analysis of CCW PP 2-3 Cable	Revision: N/A Date: 03/20/2003
11. White Paper XI.E3	Diablo Canyon Power Plant Operating Experience White Paper XI.E3 – Pull Boxes Subject to Water Intrusion and Collection	Revision: N/A Date: 01/30/2010
12. R0269608	Recurring Task Activity – Electrical Pull Boxes: Inspect/De-water PM 47369	Revision: N/A Date: 02/28/2005
13. R0319908	Recurring Task Activity – Electrical Pull Boxes:	Revision:

Document	Title	Revision / Date
	/De-water Electrical Pull Boxes	N/A Date: 08/20/2008
14. Order: 64022500	De-water electrical pull boxes	Revision: N/A Date: 07/20/2009

The staff conducted its audit of LRA program elements based on the contents of the existing program as modified by the proposed enhancement.1–6.

During the audit the staff found that:

> elements 1-6 (Scope of Program, Preventive Action, Parameters Monitored/Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) are consistent with the corresponding elements of the GALL Report AMP XI.E3;

During the audit of program element 10 (Operating Experience), the staff found that:

> the operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff);
>
> the operating experience provided by the applicant and identified by the staff's independent database search is not sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

The applicant is currently performing inaccessible medium voltage cable inspections in response to DCPP operating experience (OE) and will enhance the existing program to be consistent with GALL AMP XI.E3. In LRA Section B2.1.26, the applicant stated that the continued implementation of the inaccessible medium voltage cable program will provide reasonable assurance that the aging effects will be managed such that the systems and components will continue to perform their intended functions. The staff reviewed both inaccessible medium voltage cable operating experience White Papers for XI.E3 and noted action requests relating to inaccessible medium voltage cables. The aging issues involved plugged drains, contaminated installation, swollen cable jackets, submerged cables, and degraded cables.

In order to obtain the information necessary to verify whether the applicant's operating experience supports the sufficiency of the LRA AMP, the staff will consider issuing an RAI for the following subject:

> SRP Appendix A.1, Section A.2.3.10, "Operating Experience," states, in part, that "the OE of aging management program, including past corrective actions resulting in program enhancement or additional program, should be considered." Given the operating

experience relating to inaccessible medium voltage cable at DCPP, the proposed testing frequency of at least every 10 years and inspection of at least every 2 years may not be adequate to ensure that inaccessible medium voltage cables will perform their intended functions during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found that sufficient information was not available to determine whether the description provided in the FSAR Supplement was an adequate description of the LRA AMP.

In order to obtain the information necessary to verify the sufficiency of the FSAR Supplement program description, the staff will consider issuing RAIs for the following subjects:

LRA FSAR Supplement Section A1.26 does not include definitions of significant moisture or significant voltage consistent with SRP LR Table 3.6-2 or GALL Report AMP XI.E3, "Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements." The lack of these definitions in combination with the applicant's objective of inspection to keep cables infrequently submerged to minimize exposure to significant moisture may not provide consistency with GALL Report AMP XI.E3.

Based on this audit the staff:

verified that LRA program elements 1 - 6 are consistent with corresponding program elements in the GALL Report;

identified that additional information regarding operating experience is required before an indication regarding the sufficiency of the LRA AMP, as implemented by the applicant, to detect and manage aging can be reached;

identified a need for additional information regarding the adequacy of the program description in the FSAR Supplement.

LRA AMP B2.1.27, ASME Section XI, Subsection IWE

In the DCPP LRA, the applicant stated that AMP XI.S1 is an existing program with exceptions that are consistent with the program elements in GALL AMP XI.S1, "ASME Section XI, Subsection IWE." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (Scope, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) and 10 (Operating Experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit. This audit report does not consider the sufficiency of exceptions.

The first exception affects LRA program element 1 (Scope of Program). This exception to the Scope of Program element would exclude inspection of pressure-retaining containment seals and gaskets from the applicant's AMP B2.1.27, ASME Section XI, Subsection IWE aging

management program because inspection requirements for pressure-retaining containment seals and gaskets are not addressed in the 2001 Edition of ASME Section XI, Subsection IWE.

The second exception affects LRA program element 3 (Parameters Monitored or Inspected). This exception would exclude the seven categories for examination in Table IWE-2500-1 because Table IWE-2500-1 in the 2001 Edition of ASME Section XI, Subsection IWE does not specify seven categories.

The third exception affects LRA program element 5 (Monitoring and Trending). This exception would exclude Examination Category E-C from the applicant's AMP B2.1.27, ASME Section XI, Subsection IWE aging management program because the inspection requirements in the 2001 Edition of ASME Section XI, Subsection IWE are not consistent with inspection requirements in Examination Category E-C.

The fourth exception affects LRA program element 6 (Acceptance Criteria). This exception would exclude the requirements in Table IWE-3410-1 from the applicant's AMP B2.1.27, ASME Section XI, Subsection IWE aging management program because acceptance standards previously specified in Table IWE-3410-1 are in IWE-3500 of the 2001 Edition of ASME Section XI, Subsection IWE.

During its audit, the staff conducted walkdowns, interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using keywords: "bolt," "concrete," "corrosion," "crack," "degrade," "inspect," "steel," "oxide," and "rust."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. DCPP-AMP-B2.1.27	ASME Section XI, Subsection IWE	Revision 2 / 11/12/2009
2. ISI VT GEN-1	General Visual Examination of the Containment Liner	Revision 1 / Date Unknown
3. NDE VT 3-L	VT-3 Visual Examination of the Containment Liner	Revision 1 / Date Unknown
4. AR No 50201281	Diablo Canyon License Renewal Aging Management AR Operating Experience Report for AMP XI.S1, "ASME Section XI, Subsection IWE" B2.1.27	10/27/2009
5. AD5.ID2	Inservice Inspection Program	Revision 8 / 08/18/2009
6. None	ASME Section XI, Subsection IWE Operating Experience White Paper	Revision 4 / 04/01/2010
7. PG&E Letter DCL-10-008	Inservice Inspection Report for Unit 2 Fifteenth Refueling Outage	02/08/2010
8. PG&E Letter DCL-09-046	Inservice Inspection Report for Unit 1 Fifteenth Refueling Outage	06/22/2009
9. ISI ADD SUCCESS	Additional and Successive Inspections	Revision 5
10. DCM No. T-1D	Diablo Canyon Power Plant Units 1 and 2 Design Criteria Memorandum T-1D Containment Liner Plate	Revision 5 / 06/15/2005
11. AR No A0687867	IWL Inspection Results, Unit 2, 2nd Cycle	02/02/2008
12. Report No.: 420DC-06.67	Diablo Canyon Power Plant Examination of Structural Concrete for Unit 2 Containment Structure	12/28/2006
13. Notification 50275117	2 R16 – Fill Gaps @ Cont. Liner Pl & Conc, Unit 2	10/16/2009
14. Notification 50202686	Cont. Liner Corrosion, Unit 1	10/16/2009
15. AR No A0607396	Evaluate IEN 04-09 Corrosion of Steel Containment Liner	07/14/2004
16. AR No A0696994	U1 Containment Liner Gouge	06/26/2007
17. Notification 50275027	Gaps found on 91'EL at floor/liner plate, Unit 2	10/16/2009

The staff conducted its audit of LRA program elements 1 – 6 based on the contents of the existing program. Aspects of program elements 1, 3, 5, and 6 (Scope of Program, Parameters

Monitored or Inspected, Monitoring and Trending, and Acceptance Criteria) of the LRA AMP associated with the exceptions were not evaluated during this audit. Aspects of these program elements that are not associated with the exceptions were evaluated and are described below.

During the audit, the staff found that:

> elements 1-6 (Scope, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (Operating Experience), the staff found that:

> the operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e.; no previously unknown aging effects were identified by the applicant or the staff);
>
> the operating experience provided by the applicant and identified by the staff's independent database search is not sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

In order to obtain the information necessary to verify whether the applicant's operating experience supports the sufficiency of the LRA AMP, the staff will consider issuing RAIs for the following subjects:

> During the audit, the staff identified an instance in Notification 50275027 where the applicant plans to seal the gaps between the concrete floor and the steel liner. However, the scope, details, and schedule for sealing the gaps to minimize the potential for carbon steel liner corrosion at Diablo Canyon Units 1 and 2 was not clearly identified in Notification 50275027. Therefore, the staff will consider issuing an RAI to obtain additional information on this subject.
>
> Program Element 10 for the Diablo Canyon ASME Section XI, Subsection IWE aging management program does not discuss operating experience related to NRC Information Notices (INs) 86-99, 88-82, 89-79, 97-10, and 2004-09. In addition, it does not discuss operating experience related to liner plate corrosion recently reported at Beaver Valley. In order for the staff to confirm that the effects of aging of the containment pressure boundary metal will be adequately managed so that it's intended function will be maintained consistent with the current licensing basis for the period of extended operation as required by 10 CFR 54.21(a)(3), the staff may consider requesting information on how the applicant has addressed these issues.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, is acceptable.

Based on this audit the staff:

verified that most of the LRA program elements 1-6 are consistent with the corresponding program elements in the GALL Report while identifying certain aspects of LRA program elements 1-6 for which additional information or additional evaluation is required before consistency can be determined;

identified that additional information regarding operating experience is required before an indication regarding the sufficiency of the LRA AMP, as implemented by the applicant, to detect and manage aging can be reached;

verified that the description provided in the FSAR Supplement is an adequate description of the program

LRA AMP B2.1.28, ASME Section XI, Subsection IWL

In the DCPP LRA, the applicant stated that AMP XI.S2 is an existing program that is consistent with the program elements in GALL AMP XI.S2, "ASME Section XI, Subsection IWL." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (Scope, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) and 10 (Operating Experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit.

During its audit, the staff conducted walkdowns, interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent database search of the applicant's operating experience database using the keywords: "concrete," "corrosion," "crack," "degrade," "inspect," "rust," and "steel."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. DCPP-AMP-B2.1.28	ASME Section XI, Subsection IWL	Revision 2 / 11/12/2009
2. NDE VT 3C-1	VT-3C Visual Examination of the Containment Concrete Shell	Revision 1
3. Report 420DC-01.43	Diablo Canyon Power Plant Examination of Structural Concrete for Unit 1 and 2 Containment Structures	09/06/2001
4. Report 420DC-06.67	Diablo Canyon Power Plant Examination of Structural Concrete for Unit 2 Containment Structure	12/28/2006
5. AD5.ID2	Inservice Inspection Program	Revision 8 / 08/18/2009
6. ISI Additional and Successive Inspections	Additional and Successive Inspections	Revision 5
7. None	ASME Section XI, Subsection IWL Operating Experience White Paper	Revision 4 / 04/01/2010

During the audit of program elements 1-6, the staff found that:

elements 1, 2, 3, and 5 (Scope, Preventive Actions, Parameters Monitored or Inspected, and Monitoring and Trending) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP;

sufficient information was not available to determine whether elements 4 and 6 (Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP.

In order to obtain the information necessary to verify whether the LRA program element numbers 4 and 6 are consistent with the corresponding elements of the GALL Report AMP, the staff will consider issuing RAIs for the following subjects:

GALL Report (NUREG-1801), AMP XI.S2, "ASME Section XI, Subsection IWL" Element 4 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. DCPP Inservice Inspection Program (Reference: AD5.ID2, Section 5.1.2.j) requires visual examinations of 100% of the accessible surfaces of the concrete containment be performed on a 10-year cycle 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. It is not clear to the staff that these statements are consistent.

GALL Report AMP 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. However, the applicant's threshold for tier three engineering evaluations, as described in DCPP procedure NDE VT 3C-1, "VT-3C Visual Examination of the Concrete Containment Concrete Shell" is significantly less stringent than the criteria specified in ACI 349.3R. It is not clear to the staff how the applicant's acceptance criteria for concrete inspections are consistent with GALL recommendations.

During the audit of program element 10 (Operating Experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff);
>
> The operating experience provided by the applicant and identified by the staff's independent database search is not sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

In order to obtain the information necessary to verify whether the applicant's operating experience supports the sufficiency of the LRA AMP, the staff will consider issuing an RAI for the following subject:

> 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. However, the staff noted that hundreds of indications of degradation were documented during containment concrete surface examinations that require further evaluation by the responsible-in-charge engineer in accordance with ACI 349.3R. It was not clear to the staff how these indications of degradation were evaluated and accepted without any remedial or corrective actions.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> verified that most of the LRA program elements 1-6 are consistent with the corresponding program elements in the GALL Report while identifying certain aspects of LRA program elements 1-6 for which additional information or additional evaluation is required before consistency can be determined;
>
> identified that additional information regarding operating experience is required before an indication regarding the sufficiency of the LRA AMP, as implemented by the applicant, to detect and manage aging effects can be reached;
>
> verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B2.1.29, ASME Section XI, Subsection IWF

In the DCPP LRA, the applicant stated that AMP XI.S3, "ASME Section XI, Subsection IWF," is an existing program that is consistent with the program elements in GALL AMP XI.S3, "ASME Section XI, Subsection IWF." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (Scope, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) and 10 (Operating Experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit.

During the audit, the staff conducted walkdowns, interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent database search of the applicant's operating experience database using the keywords: "bolt," "connection," "concrete," "corrosion," "crack," "degrade," "hangar," "inspect," "steel," "oxide," and "rust."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. DCPP-AMP-B2.1.29	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	Revision 4 / 03/11/2010
2. MA1-ID13	ASME Section XI Repair/Replacement Program and Implementation	Revision 14 / 08/18/2009
3. ISI SCHED	ISI Program Interval Three Examinations	Revision 3 / 03/09/2007
4. NDE VT 3-1	Visual Examination of Component Piping Supports	Revision 1 / Date Unknown
5. AD5.ID2	Inservice Inspection Program	Revision 8 / 08/18/2009
6. None	ASME Section XI, Subsection IWF Operating Experience White Paper	Revision 4 / 04/01/2010
7. ISI ADD SUCCESS	Additional and Successive Inspections	Revision 5 / Date Unknown
8. ISI Data	Dispositioning of Recorded NDE Examination Data	Revision 4 / Date Unknown
9. II-R-0804003	Diablo Canyon Power Plant Unit 2, Periodic Reactor Containment Building Integrated Leakage Rate Test Final Report	04/03/2008 04/04/2008
9. II-R-090301	Diablo Canyon Power Plant Unit 1, Periodic Reactor Containment Building Integrated Leakage Rate Test Final Report	03/16/2009 03/17//2009

During the audit of program elements 1-6, the staff found that:

> elements 1-6 (Scope, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (Operating Experience), the staff found that:

> the operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff);
>
> the operating experience provided by the applicant and identified by the staff's independent database search is not sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

In order to obtain the information necessary to verify whether the applicant's operating experience supports the sufficiency of the LRA AMP, the staff will consider issuing an RAI for the following subject:

> The applicant's ASME Section XI, Subsection IWF aging management program is updated to account for industry operating experience. However, it is not clear from the DCPP LRA that NRC Information Notice (IN) 2009-04 related to constant supports was considered in the operating experience. In order for the staff to confirm that the effects of aging of piping and component supports will be adequately managed so that their intended functions will be maintained consistent with the current licensing basis for the period of extended operation as required by 10 CFR 54.21(a)(3), the staff may consider requesting the applicant to explain how operating experience described in IN 2009-04 was considered at DCPP.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;
>
> identified that additional information regarding operating experience is required before an indication regarding the sufficiency of the LRA AMP, as implemented by the applicant, to detect and manage aging can be reached;
>
> verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B2.1.30, 10 CFR Part 50, Appendix J

In the DCPP LRA, the applicant stated that AMP XI.S4, "10 CFR Part 50, Appendix J" is an existing program that is consistent with the program elements in GALL AMP XI.S4, "10 CFR Part 50, Appendix J." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (Scope, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) and 10 (Operating Experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit.

During its audit, the staff conducted walkdowns, interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent database search of the applicant's operating experience database using the keywords: "bolt," "connection," "concrete," "corrosion," "crack," "degrade," "inspect," "steel," "oxid," and "rust."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. DCPP-AMP-B2.1.30	10 CFR 50, Appendix J	Revision 3 / 03/01/2010
2. AD13.DC5	Containment Leakage Rate Testing Program	Revision 8
3. NEI 94-01	Industry Guidelines for Implementing Performance-Based Option of 10 CFR 50, Appendix J	Revision 2 / 08/2007
4. Regulatory Guide 1.1.63	Performance-based Containment Leak-Test Program	September 1995
5. None	10 CFR 50, Appendix J Operating Experience White Paper	Revision 4 / 04/01/2010
6. STP M-7W, Unit 1	Containment Structural Integrity Inspection	Revision 4 / 03/10/2009
7. STP M-7W, Unit 2	Containment Structural Integrity Inspection	Revision 4 / 03/28/2009
8. STP M-8B	Leak Rate Testing of Electrical Penetrations	Revision 17

During the audit of program elements 1-6, the staff found that:

elements 1, 2, 3, 5, and 6 (Scope, Preventive Actions, Parameters Monitored or Inspected, Monitoring and Trending, and Acceptance Criteria) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP;

sufficient information was not available to determine whether element 4 (Detection of Aging Effects) of the LRA AMP is consistent with the corresponding elements of the GALL Report AMP.

In order to obtain the information necessary to verify whether the LRA program element 4 (Detection of Aging Effects) is consistent with the corresponding element of the GALL Report AMP, the staff will consider issuing an RAI for the following subject:

Element 4, Subsection 3.4.2 of LRA AMP B2.1.30 "10 CFR 50, Appendix J", states that visual inspections of containment concrete surfaces outside the containment and steel liner plate inside the containment are required by 10 CFR Part 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 in March 17, 2009, and the most recent Type A test for Unit 2 was performed in 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. The staff needs to confirm that general inspection of the containment is performed in accordance with the requirements of

ASME Section XI, Subsections IWL and IWE requirements prior to performing any Type A test.

During the audit of program element 10 (Operating Experience), the staff found that:

the operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff);

the operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

verified that most of the LRA program elements 1-6 are consistent with the corresponding program elements in the GALL Report while identifying certain aspects of LRA program elements 1-6 for which additional information or additional evaluation is required before consistency can be determined;

verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging;

verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B2.1.31, Masonry Wall Program

In the DCPP LRA, the applicant states that AMP B2.1.31, "Masonry Wall Program," is an existing program that is consistent with the program elements in GALL Report AMP XI.S5, "Masonry Wall Program." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (Scope, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) and 10 (Operating Experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit.

During its audit, the staff conducted walkdowns, interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent database search of the applicant's operating experience database using the keywords: "cracking," "voids," "corrosion," "masonry wall," and "block wall."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. DCPP-AMP-B2.1.31	"Masonry Wall Program - B2.1.31 NUREG 1801 Program XI.S5"	Revision 2/ 11/09/2009
2. AWP E-016	"Inspection Guide - Maintenance Rule & License Renewal Structural Monitoring Programs – Civil"	Revision 5
3. MA1.ID17	"Maintenance Rule Monitoring Program"	Revision 22/ 01/06/2010
4. MA1.NE1	"Maintenance Rule Monitoring Program Civil Implementation," Rev. 3	Revision 3
5. DCPP DCM T-31	"Safety Related Masonry Walls"	Revision 6
6. OM7.ID1	"Problem Identification and Resolution"	Revision 30
7.	"Masonry Wall Operating Experience White Paper"	Revision 4/ 03/29/2010

During the audit of program elements 1-6, the staff found that:

> Elements 1 (Scope of Program), 2 (Preventative Actions), 3 (Parameters Monitored/Inspected), 4 (Detection of Aging Effects), 5 (Monitoring and Trending), and 6 (Acceptance Criteria) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (Operating Experience), the staff found that:

> the operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff);
>
> the operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

A review of operating experience noted that baseline inspections of masonry walls were completed in 1997 with the walls found to be in good condition, maintaining their intended

function, and there was no significant degradation. Reported degradation incidences included voids or holes in block walls (A0428340, A0438395, A0488302) and cracks in block walls (A0452317). Corrective action documents were initiated for walls showing deficiencies to ensure further degradation did not continue to impact wall function and the walls were repaired. In 2009 the first cycle of periodic follow-up inspections was performed with no significant degradation of masonry walls reported. Any issues previously addressed during the baseline inspections were inspected and performance tracked with deficiencies detected during the "Maintenance Rule" inspections documented in the corrective action program.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;

verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging;

verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B2.1.32, Structures Monitoring Program

In the DCPP LRA, the applicant stated that AMP B2.1.32, Structures Monitoring Program is an existing program that is consistent with the program elements in GALL AMP XI.S6, "Structures Monitoring Program" with enhancements. To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (Scope, Preventative Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) and 10 (Operating Experience), and the description as contained in the FSAR supplement. Program elements 7-9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit.

The enhancements are related to Program Element 3 (parameters monitored/measured) and include:

(1) Plant procedures will be enhanced to monitor groundwater samples every 5 years for pH, sulfates, and chloride concentrations, including seasonal variations; and

(2) Plant procedures will be enhanced to specify inspections of bar racks, and associated structural components in the intake structure.

In Appendix B, Subsection B2.1.32 of the LRA, the applicant committed to implement these enhancements prior to the period of extended operation.

During its on-site audit, the staff conducted field walk downs, interviewed the applicant's staff, and reviewed on-site documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using keywords: "boric acid," "concrete," "corrosion," "cracking," and "spent fuel pool."

The table below lists the documents that were reviewed by the staff and found relevant to the on-site audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Document	Title	Revision / Date
1. DCPP-AMP-B2.1.32	Diablo Canyon Aging Management Program Evaluation Report Structures Monitoring Program – B2.1.32 NUREG 1801 Program XI.S6	Revision 3 11/16/2009
2. AWP E-016	Inspection Guide - Maintenance Rule & License Renewal Structural Monitoring Programs – Civil	Revision 5
3. MA1.ID17	Maintenance Rule Monitoring Program	Revision 22 01/06/2010
4. MA1.NE1	Maintenance Rule Monitoring Program Civil Implementation	Revision 3
5.	VT-3C-1 Visual Examination of the Containment Concrete Shell	Revision 1
6.	Auxiliary Building Operating Experience White Paper	Revision 1 01/05/2010
7.	Containment Structure Operating Experience White Paper	Revision 2 01/06/2010
8.	Turbine Building Operating Experience White Paper	Revision 1 01/08/2010
9.	Radwaste Building Operating Experience White Paper	Revision 1 01/07/2010
10.	Pipeway Structure Operating Experience White Paper	Revision 1 01/03/2010
11.	Equipment Anchorage Operating Experience White Paper	Revision 0 01/04/2010
12.	HVAC Duct Support Operating Experience White Paper	Revision 1 01/06/2010
13.	Piping and Instrument Support Operating Experience White Paper	Revision 1 01/09/2010
14.	Raceway Support Operating Experience White Paper	Revision 1 01/08/2010
15.	Outdoor Water Storage Tank Foundation and Concrete Encasement Operating Experience White Paper	Revision 1 01/03/2010
16.	Buried ASW Piping Operating Experience White Paper	Revision 1 01/04/2010
17.	Switchyard, Transmission Tower, and Poles Operating Experience White Paper	Revision 1 01/06/2010
18.	Intake Structure Operating Experience White Paper	Revision 1 01/10/2010
19.	Discharge Structure Operating Experience White Paper	Revision 1 01/05/2010
20.	Circulating Water Conduit and Auxiliary Saltwater System Vacuum Breaker Vault Operating Experience White Paper	Revision 1 01/08/2010
21.	Earth Work-Slope Operating Experience White	Revision 1

Document	Title	Revision / Date
	Paper	01/04/2010
22.	Breakwater Operating Experience White Paper	Revision 1 01/07/2010
23.	Raw Water Reservoir Operating Experience White Paper	Revision 2 01/10/2010
24. Notification #50288938	Whitepaper for System 13 – DCPP Unit 1 & 2 Spent Fuel Pool (SFP) Leakage	04/12/2010

The staff conducted its on-site audit of LRA program elements 1–6 based on the contents of the existing program as modified by the proposed enhancements.

During the on-site audit, the staff found that:

elements 1, 2, 3, and 5 (Scope of Program, Preventive Actions, Detection of Aging Effects, and Monitoring and Trending) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP;

sufficient information was not available to determine whether elements 4 (Detection of Aging Effects) and 6 (Acceptance Criteria) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP.

In order to obtain information necessary to verify whether the LRA program element numbers 4 and 6 are consistent with the corresponding elements of the GALL Report AMP, the staff will consider issuing RAIs for the following subjects:

In element 4 of the LRA AMP it states that the groundwater pH, sulfates, and chlorides had been monitored monthly at DCPP power block 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 power block 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. The staff is uncertain if the groundwater results obtained (and to be obtained) are representative of those in close proximity to safety related and important-to-safety embedded concrete walls and foundations or whether DCPP has any plans for opportunistic inspections of below-grade structures.

In element 4 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 SSC's at each unit inspected under this AMP are in compliance with the industry standards inspection frequency (e.g., as noted in ACI 349.3R-96) or that the SSCs are only inspected at a frequency of ten years.

In element 6 of the LRA AMP it states that 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 SMP 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.

During the on-site audit of program element 10 (Operating Experience), the staff found that:

The operating experience provided by the applicant and identified by the staff's independent database searchis bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff);

the operating experience provided by the applicant and identified by the staff's independent database searchis not sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

In order to obtain the information necessary to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation, the staff will consider issuing an RAI for the following subjects:

It was noted during discussions at the site audit with DCPP personnel that Unit 2 spent fuel pool has had a persistent minor leak for many years and the paper "Whitepaper on System 13 – DCPP Unit 1 & 2 Spent Fuel Pool (SFP) Leakage (Notification #50288938 dated April 12, 2010)," was provided. It is unclear to the staff that leakage of the borated water has not resulted in degradation of either the concrete or embedded steel reinforcement that is inaccessible for inspection.

During the walk down 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.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

verified that most of the LRA program elements 1-6 are consistent with the corresponding program elements in the GALL Report while identifying certain aspects of LRA program elements 4 and 6 for which additional information or additional evaluation is required before consistency can be determined;

identified that additional information regarding operating experience is required before an indication regarding the sufficiency of the LRA AMP, as implemented by the applicant, to detect and manage aging can be reached;

verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.33, RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants

In the DCPP LRA, the applicant stated that AMP B2.1.33, which is implemented as a part of the Structures Monitoring Program, is an existing program that is consistent with the program elements in GALL AMP XI.S7, "RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and 10 (operating experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit.

During its audit, the staff conducted walkdowns, interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "discharge structure," "intake structure," "circulating water conduits."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. DCPP-AMP-B2.1.33	Diablo Canyon Aging Management Program Evaluation Report , RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	Revision 3 11/09/2009
2. MAI.1D17	Interdepartmental Administrative Procedure, Maintenance Rule Monitoring Program	Revision 22
3. MA1.NE1	Maintenance Rule Monitoring Program – Civil Implementation	Revision 3
4. AWP E-016	Inspection Guide – Maintenance Rule & License Renewal Structural Monitoring Programs - Civil	Revision 5

During the audit of program elements 1-6, the staff found that:

> elements 1 through 6 (scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (Operating Experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database searchis bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff);
>
> The operating experience provided by the applicant and identified by the staff's independent database searchis not sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

In order to obtain the information necessary to verify whether the applicant's operating experience supports the sufficiency of the LRA AMP, the staff will consider issuing RAIs for the following subjects:

> Element 10 of the DCPP-AMP-B2.1.33-Rev. 3 states that the Discharge Structure is 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, DCPP-AMP-B2.1.33-Rev. 3 states that Discharge Structure is in an acceptable condition. The staff needs additional information about the applicants' inspections, assessments, and planned improvements to confirm that effects of aging of Discharge Structure will be adequately managed during the period of extended operation.
>
> The DCPP Intake Structure Element has been placed in Maintenance Rule (MR), Goal Setting (a)(1) status twice since 1996. Each occurrence indicated further the adverse

impacts of harsh saltwater environment on concrete degradation. The applicant is currently implementing a refurbishment program and placing procedural controls in place. The staff needs additional information about the refurbishment program, including evaluations and assessment used to develop the program, to confirm that effects of aging of Intake Structure will be adequately managed during the period of extended operation.

Element 10 of the DCPP-AMP-B2.1.33-Rev. 3 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. The staff needs additional information on how and when the RG 1.127 have been performed for the DCWC concrete to ensure that effects of aging are adequately managed.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;

identified that additional information regarding operating experience is required before an indication regarding the sufficiency of the LRA AMP, as implemented by the applicant, to detect and manage aging can be reached;

verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B2.1.34, Fuse Holders

In the DCPP LRA, the applicant states that AMP B2.1.34, "Fuse Holders," is a new program that is consistent with the program elements in GALL Report AMP XI.E5, "Fuse Holders." The applicant committed to implementing this program prior to the period of extended operation in reference to LRA Appendix A, Table A4-1, "License Renewal Commitments." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (Scope, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) and 10 (Operating Experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit.

During its audit, the staff conducted walkdowns, interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using keywords including: "Fuse," "Fuse Holder," "Corrosion," "Oxidation," "Block," and "Contamination." Further, the staff performed a search of operating experience for at least a 10 year period up through January

2010. Databases were searched using various key word searches and then reviewed by technical auditor staff. Databases searched include Generic Letters, Bulletins, Regulatory Issue Summaries, Licensee Event Reports, Event Notifications, Inspection Findings, and Inspection Reports.

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. DCPP-AMP-B2.1.34	Aging Management Program For Fuse Holders	Revision: 3 11/12/2009
2. TS1.DC1	License Renewal Electrical Aging Management	Revision: Draft Date: N/A
3. TR-11DC	Electrical Component Aging Evaluation License Renewal Topical Report	Revision: 0 Date: 01/28/2010
4. White Paper XI.E5	Fuse Holder Operating Experience White Paper	Revision: 0 Date: 11/24/2008

During the audit of program elements 1-6, the staff found that:

> elements 1-6 (Scope of Program, Preventive Action, Parameters Monitored/Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) of the LRA AMP are consistent with the corresponding elements of GALL Report AMP XI.E5.

During the audit of program element 10 (Operating Experience), the staff found that:

> the operating experience identified by the staff's independent database search and supplemented by the applicant is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff);
>
> the operating experience identified by the staff's independent database search and supplemented by the applicant is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;

verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging;

verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.35, Electrical Cable Connections Not Subject to 10 CFR 50.49 Environment Qualification Requirements

In the DCPP LRA, the applicant states that AMP B.2.1.35, "Electrical Cable Connections Not Subject to 10 CFR 50.49 Environment Qualification Requirements," is a new program with exception that is consistent with the program elements in GALL Report AMP XI.E6, "Electrical Cable Connections Not Subject to 10 CFR 50.49 Environment Qualification Requirements." The applicant committed to implementing this program prior to the period of extended operation in LRA Appendix A, Table A4-1, "License Renewal Commitments." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (Scope, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) and 10 (Operating Experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit.

The first exception affects LRA program element 1 (Scope of Program). In the GALL Report AMP, this program element states that connections associated with cables in scope of license renewal are part of this program, regardless of their association with active or passive components. Alternatively, this program element in the LRA states the scope of the program will be the external electrical connections at the active and passive devices within the scope of license renewal.

The second exception affects LRA program element 4 (Detection of Aging Effects). In the GALL Report AMP, this program element states that electrical connections within the scope of license renewal will be tested at least once every 10 years. Alternatively, this program element in the LRA states that a one-time inspection of a representative sample of external electrical connections within the scope of license renewal and will be performed prior to the period of extended operation.

During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. The staff also conducted an independent database search of the applicant's operating experience database using the keywords: "cable," "degradation," "oxidation," "cracking," and "thermal." Further, the staff performed a search of operating experience for at least a 10 year period up through January 2010. Databases were searched using various key word searches and then reviewed by technical auditor staff. Databases

searched include Generic Letters, Bulletins, Regulatory Issue Summaries, Licensee Event Reports, Event Notifications, Inspection Findings, and Inspection Reports.

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. DCPP-AMP XI.E6-Rev 3	Electrical cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements	Revision: 3 Date: 01/12/2009
2. DCPP-OE-XI.E6	Diablo Canyon License Renewal Aging Management AR Operating Experience Report for AMP XI.E6	Revision: Date:
3. TS1.DC1	License Renewal Electrical Aging Management	Revision:0J Date: N/A
4. A0472235	Battery 25 corosion on Terminals	Revision: N/A Date: 05/07/1999
5. A0563486	Warm Bus Side Cable Termination on Breaker 52-25D-18	Revision: N/A Date: 01/08/2003

The staff conducted its audit of the LRA program elements 1–6 without considering aspects of program elements 1 and 4 (Scope of Program and Detection of Aging Effects) of the LRA AMP which are associated with the exceptions. Aspects of these elements not associated with the exceptions were evaluated and are described below.

During the audit of program elements 1-6, the staff found that:

elements 2, 3, 5 and 6 (Preventive Action, Parameters Monitored/Inspected, Monitoring and Trending, and Acceptance Criteria) are consistent with the corresponding elements of the GALL Report AMP XI.E6.

During the audit of program element 10 (Operating Experience), the staff found that:

the operating experience identified by the staff's independent database search and supplemented by the applicant is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff);

the operating experience identified by the staff's independent database search and supplemented by the applicant is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit, the staff:

verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;

verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging;

verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.36, Metal Enclosed Bus

In the DCPP LRA, the applicant states that AMP B2.1.36, "Metal Enclosed Bus," is an existing program that will be enhanced to be consistent with the program elements in GALL Report AMP XI.E4, "Metal Enclosed Bus." To verify this claim of consistency, the staff audited the LRA AMP. This audit report considers program elements 1-6 (Scope, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) and 10 (Operating Experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit.

The enhancement involves elements 1, 3, 4, 6, and 7 (Scope of Program, Preventive Actions, Detection of Aging Effects, Acceptance Criteria, and Corrective Actions). Prior to the period of extended operation, the applicant will implement the following enhancement:

In Table A4-1, Appendix A of the LRA, the applicant committed to implement this enhancement prior to the period of extended operation.

The existing bus work order inspection activities for inspection and testing of the MEBs will be proceduralized to include specific inspection scope, frequencies and actions to be taken when acceptance criteria are not met.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted independent searches of the applicant's operating experience database using key words: "bus insulation," "loose connection," "corrosion," and "cracking." Further, the staff performed a search of operating experience for at least a 10 year period up through January 2010. Databases were searched using various key word searches and then reviewed by technical auditor staff. Databases searched include Generic Letters, Bulletins, Regulatory Issue Summaries, Licensee Event Reports, Event Notifications, Inspection Findings, and Inspection Reports.

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. DCPP-AMP-B.2.1.36	Aging Management Program for Metal Enclosed Bus	Revision: 3 Date: N/A
2. White Paper XI.E4	Metal Enclosed Bus Operating Experience White Paper	Revision: N/A Date: 02/18/2010
3. TR-11DC	Electrical Component Aging Evaluation License Renewal Topical Report	Revision: 0 Date: N/A
4. TS1.DC1	License Renewal Electrical Aging Management	Revision: OJ Date: N/A

The staff conducted its audit of the LRA program elements 1–6 based on the contents of the existing program as modified by the proposed enhancement.

During the audit, the staff found that:

elements 1, 2, and 5 (Scope of Program, Preventive Actions, and Monitoring and Trending) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP;

sufficient information was not available to determine whether elements 3, 4, and 6 (Parameters Monitors or Inspected, Detection of Aging Effects, and Acceptance Criteria) of the AMP are consistent/appropriate with the corresponding element of the GALL Report AMP.

In order to obtain the information necessary to verify whether the LRA program elements 3, 4, and 6 are consistent with the corresponding elements of the GALL Report AMP, the staff will consider issuing an RAI for the following subject:

The applicant proposed to credit the Metal Enclosed Bus program for inspecting the in-scope iso-phase bus. The iso-phase bus provides the SBO 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 a non-segregated bus. For example, the iso-phase bus does not have bus insulation but 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 bus. The program attributes including parameters monitored or inspected, detection of aging effects, and acceptance criteria for non-segregated bus may not be appropriate for the iso-phase bus. The staff requested the applicant to modify the Metal Enclosed Bus Program to include inspections appropriate for the iso-phase bus or

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

During the audit of program element 10 (Operating Experience), the staff found that:

the operating experience identified by the staff's independent database search and supplemented by the applicant is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff);

the operating experience provided by the applicant and identified by the staff's independent database searchis sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

verified that LRA program elements 1, 2, and 5 are consistent with the corresponding program elements in the GALL Report while identifying certain aspects of LRA program elements 3, 4, and 6 for which additional information or additional evaluation is required before consistency can be determined;

verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging;

verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B3.1, Metal Fatigue of Reactor Coolant Pressure Boundary Program

In the DCPP LRA, the applicant states that AMP B3.1,"Metal Fatigue of Reactor Coolant Pressure Boundary," is an existing program with enhancements that is consistent with the program elements in GALL Report AMP X.M1, "Metal Fatigue of Reactor Coolant Boundary." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (Scope, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) and 10 (Operating Experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit.

The first enhancement affects LRA program elements 1, 2, and 5 ("scope of program," "preventive actions," and "monitoring and trending"). This enhancement expands on the existing program elements by adding locations which are not covered by the current Metal Fatigue of Reactor Coolant Pressure Boundary program. Additional locations will include the NUREG/CR-6260 locations for the effects of the reactor coolant environment on fatigue. Usage

factors in the NUREG/CR-6260 sample locations will include the environmental factors, F_{en}, calculated by NUREG/CR-6583 and NUREG/CR-5704 or appropriate alternative methods. The second enhancement affects LRA program elements 1 and 3 ("scope of program" and "parameters monitored or inspected"). This enhancement expands on the existing program elements by adding transients that contribute to fatigue usage, which are not covered by the current Metal Fatigue of Reactor Coolant Pressure Boundary program. Usage factors in the NUREG/CR-6260 sample locations will include the environmental factors, F_{en}, calculated by NUREG/CR-6583 and NUREG/CR-5704 or appropriate alternative methods.

The third enhancement affects LRA program element 4 ("detection of aging"). This enhancement expands on the existing program elements by adding specific frequency of periodic reviews of the results of the monitored cycle count and cumulative usage factor data to at least once per fuel cycle. This review will compare the results against the corrective action limits to determine any approach to action limits and any necessary revisions to the fatigue analyses will be included in the corrective actions.

The fourth enhancement affects LRA program elements 2 and 6 ("preventive actions" and "acceptance criteria"). This enhancement expands on the existing program elements by adding cycle count and fatigue usage action limits, which will invoke appropriate corrective actions if a component approaches a cycle count action limit or a fatigue usage action limit. Action limits permit completion of corrective actions before the design limits are exceeded.

The fifth enhancement affects LRA program element 7 ("corrective actions"). This enhancement expands on the existing program elements by adding appropriate corrective actions to be invoked if a component approaches a cycle count action limit or a fatigue usage action limit. The corrective action options for a component that has exceeded action limits include a revised fatigue analysis or repair or replacement of the component.

In Table A4-1, Appendix A of the LRA, the applicant committed to implement these enhancements prior to the period of extended operation.

During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using keywords: "fatigue," "cooling," "steam generator," "nozzle," and "pressurizer".

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. DCPP-AMP-B3.1	Diablo Canyon Aging Management Program Evaluation Report, Metal Fatigue of Reactor Coolant Pressure Boundary – B3.1 NUREG 1801 Program X.M1	Revision 2 03/22/2010
2. P-51	Procedure for Fatigue Monitoring and Transient Cycle Counting, Diablo Canyon Units 1 and 2	Revision 0 07/09/1998
3. STP M-55	Recording of Cyclic Fatigue or Transients	No Revision No. Not Dated

The staff conducted its audit of LRA program elements 1–6 based on the contents of the existing program as modified by the proposed enhancements. (Use if appropriate) Aspects of program elements list element numbers (list element names) of the LRA AMP associated with the exception(s) were not evaluated during this audit. Aspects of these program elements that are not associated with the exception(s) were evaluated and are described below.

During the audit, the staff found that:

elements 1 and 5 ("scope of program" and "monitoring and trending") of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP;

element 3 ("parameters monitored or inspected") of the LRA AMP is not strictly consistent with the corresponding elements of the GALL Report AMP but that sufficient information was available to allow the staff to determine that this element of the LRA AMP is equivalent to the corresponding elements of the GALL Report AMP; and

sufficient information was not available to determine whether elements 2 and 4 ("preventive actions" and "detection of aging") of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP.

The basis for the staff's determination that element 3 ("parameters monitored or inspected") of the LRA AMP are equivalent to the corresponding GALL Report AMP is:

In element 3 of the AMP (Table 1 of the basis document DCPP-AMP-B3.1-Rev 4) its states that two transients, main reactor coolant pipe break and steam pipe break, will be monitored by the enhanced Metal Fatigue of Reactor Coolant Pressure Boundary AMP, and that these transient do not have cycle limit because each occurrence is analyzed by an engineering analyses. In the GALL Report AMP it states that the program monitors all plant transients that cause cyclic strains, which are significant contributors to the fatigue usage factor; the number of plant transients that cause significant fatigue usage for each critical reactor coolant pressure boundary component is to be monitored; alternatively, more detailed local monitoring of the plant transient may be used to compute the actual fatigue usage for each transient. It was not clear to the staff what

are the technical bases for (1) using a failure of systems, structures, or components (SSCs) as a transient to be tracked and monitored under the enhanced Metal Fatigue of Reactor Coolant Pressure Boundary AMP and (2) not assigning a cycle limit of 1 for main reactor coolant pipe break and steam pipe break transients. During audit interviews the applicant stated that Table 1 of the basis document DCPP-AMP-B3.1-Rev 5 will be modified to indicate that (1) main reactor coolant pipe break and steam pipe break are faulted conditions and not caused by metal fatigue and (2) a cycle limit of 1 is assigned for main reactor coolant pipe break and steam pipe break transients. The staff verified that these update have been initiated per Notification No. 50313284 "Revision of LR AMP X.M1 Metal Fatigue." Therefore, the staff determined that this element of the LRA AMP is equivalent to the corresponding elements of the GALL Report AMP.

In element 6 of the LRA AMP its states that prior to the period of extended operation Enhancement 4 will be implemented in the "acceptance criteria" program element. Enhancement 4 states: "*The procedures governing the DCPP Metal Fatigue of Reactor Coolant Pressure Boundary program will be enhanced to include additional cycle count and fatigue usage action limits, which will invoke appropriate corrective actions if a component approaches a cycle count action limit or a fatigue usage action limit. Action limits permit completion of corrective actions before the design limits are exceeded. Cycle Count Action Limits: An action limit initiates corrective action when the cycle count for any of the critical thermal or pressure transients is projected to reach the action limit defined in the program before the end of the next fuel cycle. In order to assure sufficient margin to accommodate occurrence of a low probability transient, corrective actions must be initiated before the remaining number of allowable cycles for any specified transient becomes less than one." Staff consider that a CUF action limit (referred to in the LRA as Cumulative Fatigue Usage) requires corrective action when calculated CUF for any monitored location is projected to reach 1.0 within the next three fuel cycles as described in the LRA.* In the GALL Report AMP it states that the acceptance criteria involve maintaining the fatigue usage below the design code limit considering environmental fatigue effects as described under the program description. Based on clarification from the applicant provided during the audit, Notification No. 50313284 was initiated to revise the basis document (DCPP-AMP-B3.1) to include a clarification statement "The existing DCPP fatigue management program provides for evaluation of fatigue usage or cycle count tracking results that exceed acceptance criteria". Staff consider that statement to adequately describe the technical basis for selecting cycle count action limits based on one fuel cycle and CUF action limit based on three fuel cycles.

In order to obtain the information necessary to verify whether the LRA program element numbers 2 and 4 are consistent with the corresponding elements of the GALL Report AMP, the staff will consider issuing RAIs for the following subjects:

In element 2 of the LRA AMP its states that prior to the period of extended operation first enhancement will be implemented in the "preventive actions" program element. First enhancement states: *"The scope of locations monitored by the DCPP Metal Fatigue of Reactor Coolant Pressure Boundary program will be enhanced to include additional locations which are not covered by the current Metal Fatigue of Reactor Coolant Pressure Boundary program. Additional locations will include the NUREG/CR-6260*

locations for the effects of the reactor coolant environment on fatigue. Usage factors in the NUREG/CR-6260 sample locations will include the environmental factors, F(en), calculated by NUREG/CR-6583 and NUREG/CR-5704 or appropriate alternative methods." In the GALL Report AMP it states that maintaining the fatigue usage factor below the design code limit and considering the effect of the reactor water environment, as described under the program description, will provide adequate margin against fatigue cracking of reactor coolant system components due to anticipated cyclic strains. It is not clear to the staff how this enhancement relates to the "preventive actions" program element criteria.

In element 2 of the LRA AMP its states that prior to the period of extended operation forth enhancement will be implemented in the "preventive actions" program element. Forth enhancement states: "*The procedures governing the DCPP Metal Fatigue of Reactor Coolant Pressure Boundary program will be enhanced to include additional cycle count and fatigue usage action limits, which will invoke appropriate corrective actions if a component approaches a cycle count action limit or a fatigue usage action limit. Action limits permit completion of corrective actions before the design limits are exceeded."* In the GALL Report AMP it states that maintaining the fatigue usage factor below the design code limit and considering the effect of the reactor water environment, as described under the program description, will provide adequate margin against fatigue cracking of reactor coolant system components due to anticipated cyclic strains. It is not clear to the staff how this enhancement, in particular incorporation of additional cycle count and fatigue usage action limits, relates to the "preventive actions" program element criteria.

In element 4 of the LRA AMP its states that prior to the period of extended operation third enhancement will be implemented in the "detection of aging" program element. Third enhancement states: *"The procedures governing the DCPP Metal Fatigue of Reactor Coolant Pressure Boundary program will be enhanced to specify the frequency of periodic reviews of the results of the monitored cycle count and cumulative usage factor data at least once per fuel cycle. This review will compare the results against the corrective action limits to determine any approach to action limits and any necessary revisions to the fatigue analyses will be included in the corrective actions".* In the GALL Report AMP it states that the program provides for periodic update of the fatigue usage calculations. It is not clear to the staff (1) whether the frequency of periodic reviews is specified in the existing Metal Fatigue of Reactor Coolant Pressure Boundary AMP, (2) how the frequency of periodic reviews in the existing Metal Fatigue of Reactor Coolant Pressure Boundary AMP is different from at least once per fuel cycle, (3) what are the technical bases for selecting a frequency of at least once per fuels cycle of periodic reviews for the enhanced Metal Fatigue of Reactor Coolant Pressure Boundary AMP, and (4) how this enhancement relates to the "detection of aging" program element criteria.

During the audit of program element 10 (Operating Experience), the staff found that:

the operating experience provided by the applicant and identified by the staff's independent database searchis bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff);

the operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

verified that some of the LRA program elements 1-6 are consistent with the corresponding program elements in the GALL Report while identifying certain aspects of LRA program elements 1-6 for which additional information or additional evaluation is required before consistency can be determined;

verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging;

verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B3.2 Environmental Qualification (EQ) of Electrical Components

In the DCPP LRA, the applicant states that AMP B3.2, "Environmental Qualification (EQ) of Electrical Components," is an existing program that is consistent with the program elements in GALL Report AMP X.E1, "Environmental Qualification of Electrical Components." To verify this claim of consistency, the staff audited the LRA AMP. This audit report considers program elements 1-6 (Scope of Program, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) and 10 (Operating Experience) and the description of the program as contained in the FSAR Supplement. Program elements 7-9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted independent searches of the applicant's operating experience database using key words: "cable," "corrosion," "cracking," and "environment qualification." Further, the staff performed a search of operating experience for at least a 10 year period up through January 2010. Databases were searched using various key word searches and then reviewed by technical auditor staff. Databases searched include Generic Letters, Bulletins, Regulatory Issue Summaries, Licensee Event Reports, Event Notifications, Inspection Findings, and Inspection Reports.

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. DCPP-AMP-B3.2	Environmental Qualification (EQ) of Electrical Components	Revision 3 Date: N/A
2.	Environmental Qualification Operating Experience White Paper	Revision: 5 Date: N/A
3. CF3.DC1	Maintenance and Surveillance of Electrical Environmentally Qualified (EQ) Equipment	Revision: N/A Date: N/A
4.	Electrical Class 1E Electrical Equipment Qualification List	Revision: 33 Date: N/A
5. EQ File IH-07	Limitorque Valve Actuators	Revision: 8 Date: N/A

The staff conducted its audit of LRA program elements 1-6 based on the contents of the program. As part of steam generator replacement and license renewal, the applicant updated EQ calculations for EQ electrical equipment. The staff reviewed a sample of these calculations to ensure that the design change adequately accounted for steam generator replacement and the extended qualified life for license renewal.

During the audit of program elements 1-6, the staff found that:

> elements 1-6 (Scope of Program, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (Operating Experience), the staff found that:

> the operating experience identified by the staff's independent database search and supplemented by the applicant is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff);
>
> the operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;

verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is adequate to detect and manage aging;

verified that the description provided in the FSAR Supplement is an adequate description of the program.*

Plant Specific Operating Experience Review

The staff performed an independent database search of an applicant's OE database to determine the adequacy of the use of OE to inform the AMPs for the period of extended operation. The NRC's SRP-LR provides guidance to the NRC staff on assessing the 10 program elements for each AMP submitted in a LRA. OE is listed as one of these elements, and defined in brief in the GALL Report.

The on-site specific and industry OE is also an important part of two other AMP elements: specifically, detection of aging effects and monitoring and trending. The SRP-LR also calls attention to the importance of the applicants specific OE in relation to scoping and screening, aging management review, and time-limited aging analysis activities.

For the AMP audit of the DCPP LRA, two dedicated audit team members conducted an independent database search of the applicant's plant-specific OE database to provide the staff team members with relevant and appropriate OE, and the associated corrective actions performed.

Random Sample of Diablo Canyon Components

A new activity was recently added to the staff's audit of the applicant's method of scoping and screening to support the license renewal application and the resulting components and systems scoped into the applicant's aging management review. For this survey, the NRC staff independently selected a random sample of components and independently determined whether the randomly selected components were appropriately scoped and screened into the applicant's license renewal program.

A requirement for this audit activity was a database that would provide a relatively complete list of all components and structures in Diablo Canyon. The Diablo Canyon plant equipment database provides such a list and had been used as a major tool in the applicant's license renewal scoping and screening process. The plant equipment database was used for scoping

and screening for license renewal, aging management reviews, and assignment of aging management programs. Data extracted from the plant equipment database were used for creating the Diablo Canyon License Renewal Database.

The NRC staff randomly selected components from the DCPP plant equipment database of nearly 141,477 components. The applicant provided the staff a spreadsheet with selected information on all components in the database. All the components in plant equipment database were then assigned a sequential number from 1 to 141,477 and the corresponding numbers were used to select 85 random components, through a random number generator process. From the plant equipment database, information on the component's system, function, tag number, location, name, and many of the parameters associated with license renewal were then extracted. The applicant's staff then indicated for each component whether or not it had been scoped and screened into the license renewal process as subject to an aging management review.

The selected components were then reviewed by the NRC staff. Of the 85 randomly selected components, 55 components had been scoped by the applicant into their aging management reviews; 30 were considered by the applicant to be out of scope or screened out by the criteria of 10 CFR Part 54. The NRC staff independently reviewed the 30 components that had been designated by the applicant as not subject to an aging management review.

DCPP Material and Environment Sample Audit

The staff performed a verification of materials and environment information in the DCPP LRA. To validate the DCPP plant specified in-scope generic component material and environment information as shown in the tables in the LRA, the staff performed an independent on-site audit during the weeks of April 12, and April 26, 2010. Due to the extensive number of actual component types subject to an AMR, the staff developed a statistical method to sample the DCPP material and environment component information submitted by the applicant as part of the LRA. A random sample of 35 components was selected in advance for the on-site audit. The staff assigned sequential numbers to all component groups (i.e., line items) in the DCPP LRA tables. A random number generator was then used to select the 35 sample generic component types. The staff then developed tables of the information in the LRA for the specific components in the sample for walkdowns during the audit. The staff also collected information from the LRA for similar components in the same system but possibly made of different material and in a different environment. These specific line items were provided to the applicant prior to the audit to ensure that references and examples of component types could be provided for inspection and validation.

The staff performed the on location material/environment verification by walkdowns and by review of DCPP's plant specific reference materials. These reference documents included DCPP FSAR, plant system and design drawings, and component vendor manuals. The staff was able to visually inspect 25 of the 35 randomly selected generic component types from Table 3 of the LRA. The example component items selected represented components that could be readily accessed by a walkdown inside and outside of the physical plant.

During the staff review of the 35 selected line items, 33 line items of generic material environments were verified by the staff to be correct in the LRA. The staff noted in its walkdown

and in subsequent discussion with the applicant and document searches of the applicants references, drawings and material specifications, vendor manuals, and FSAR, that the Isothermal Bath Chiller Heat Exchanger (ITB) in LRA Table 3.3.2-18, component number [2040], was not correct in regards to being listed as an, in-service component, regarding an as-found abandoned piece of equipment. The applicant responded by saying the ITB chiller was abandoned after the release of the LRA. A second component in LRA Table 3.2.2-4 that the staff discovered from drawings was component number [590] containment moisture separator that was never installed as original equipment. The applicant responded by saying this component will also be removed from the LRA table 3.

An RAI was submitted to the applicant concerning these two findings for documentation to show that LRA Tables 3.3.2-18 and 3.2.2-04 are accurate for both the isothermal bath chiller and containment HVAC moisture separator component types.

August 11, 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: AUDIT REPORT REGARDING THE DIABLO CANYON NUCLEAR POWER PLANT LICENSE RENEWAL APPLICATION (TAC NOS. ME2896 AND ME2897)

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). On April 29, 2010, the staff completed the on-site audit of aging management programs. The audit report is enclosed.

If you have any questions, please contact me by telephone at 301-415-1045 or by e-mail at nathaniel.ferrer@nrc.gov.

Sincerely,
/RA/
Nathaniel Ferrer, 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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Letter to J. Conway from N. Ferrer dated August 11, 2010

SUBJECT: AUDIT REPORT REGARDING THE DIABLO CANYON NUCLEAR POWER PLANT LICENSE RENEWAL APPLICATION (TAC NOS. ME2896 AND ME2897)

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