November 30, 2009

Mr. Christopher Costanzo
Vice President, Nuclear Plant Support
NextEra Energy Duane Arnold, LLC
P.O. Box 14000
Juno Beach, FL 33408-0420

SUBJECT: AUDIT REPORT REGARDING THE DUANE ARNOLD ENERGY CENTER LICENSE RENEWAL APPLICATION (TAC NO. MD9769)

Dear Mr. Costanzo:

By letter dated September 30, 2008, as supplemented by letter dated January 23, 2009, FPL Energy Duane Arnold, LLC, submitted an application pursuant to 10 *Code of Federal Regulations* Part 54 (10 CFR Part 54) for renewal of Operating License Number DPR-49 for the Duane Arnold Energy Center. On August 10, 2009, 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 301-415-2277 or by e-mail at Brian.Harris2@nrc.gov.

Sincerely,

/RA/

Brian K. Harris, Project Manager
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-331

Enclosure:
As stated

cc w/encl: See next page

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Vice President, Nuclear Plant Support
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ADAMS Accession No. ML093010539

OFFICE	PM:DLR:RPB1	LA:DLR	BC:DLR:RPB1	PM:DLR:RPB1
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DATE	11/23/09	11/19/09	11/24/09	11/30/09

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Letter to C. Costanzo from B. Harris dated November 30, 2009

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SUBJECT: AUDIT REPORT REGARDING THE DUANE ARNOLD ENERGY CENTER LICENSE RENEWAL APPLICATION (TAC NO. MD9769)

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Duane Arnold Energy Center

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U.S. NUCLEAR REGULATORY COMMISSION

OFFICE OF NUCLEAR REACTOR REGULATION, DIVISION OF LICENSE RENEWAL

1Docket No:	050-00331
License No:	DPR-049
Licensee:	NextEra Energy Duane Arnold, LLC
Facility:	Duane Arnold Energy Center
Location:	3277 DAEC Road Palo, IA 52324
Dates:	August 10 – 14, 2009
Reviewers:	B. Harris, Project Manager, Division of License Renewal (DLR) M. Heath, Project Manager, DLR J. Dozier, Chief, DLR R. Auluck, Chief, DLR A. Hiser, Sr. Mechanical Engineer, DLR A. Prinaris, Sr. Materials Engineer, DLR J. Davis, Sr. Materials Engineer, DLR W. Smith, Sr. Materials Engineer, DLR R. Voucher, Mechanical Engineer, DLR B. Lehman, Structural Engineer, DLR D. Brittner, Mechanical Engineer, DLR J. Shea, Mechanical Engineer, DLR J. Gavula, Mechanical Engineer, DLR D. Alley, Materials Engineer, DLR S. Min, Mechanical Engineer, DLR C. Yang, Mechanical Engineer, DLR D. Hoang, Structural Engineer, DLR Z. Xi, Structural Engineer, DLR A. Sheikh, Structural Engineer, DLR D. Nguyen, Electrical Engineer, DLR C. Doutt, Sr. Electrical Engineer, DLR H. Gonzalez, Mechanical Engineer, DCI T. Morgan, Nuclear Engineer, DCI E. Patel, Consultant, Advanced Technologies & Laboratories (ATL) W. Jackson, Consultant (ATL) W. Pavinich, Consultant (ATL) K. Chiang, Consultant (SWRL) T. Mintz, Consultant (SWRL) D. Naus, Consultant (ORNL)
Approved By:	Rajender Auluck, Chief Aging Management of Structures, Electrical, and Systems Division of License Renewal Jerry Dozier, Chief Aging Management of Reactor Systems and Guidance Update Division of License Renewal

Introduction

A five day audit was conducted by the U.S. Nuclear Regulatory Commission (NRC or the staff) at the Duane Arnold Energy Center (DAEC), (the plant) in Palo, IA on August 10 – 14, 2009. The purpose of this audit was to examine the FPL Energy Duane Arnold, LLC, (the applicant) aging management programs (AMPs) and related documentation for DAEC 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 (or the staff) 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 DAEC license renewal application (LRA) and documented in the staff's Safety Evaluation Report.

The Standard Review Plan (SRP) for Review of License Renewal Applications for Nuclear Power Plants (NUREG-1800, Rev. 1) provides the staff guidance for reviewing a LRA. The SRP 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 were claimed to be consistent with the GALL Report and 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 August 24 – 28, 2009, and are evaluated separately. The staff audited all AMPs that the applicant stated were consistent with the GALL Report AMPs.

During this audit, 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. In addition, the staff verified the conditions at the plant were bounded by the conditions for which the GALL Report program was evaluated.

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, 43 AMPs were reviewed and 31 breakout (discussion) sessions with applicant representatives were conducted. This report documents the staff's activities during this audit.

LRA AMP B.3.1, 10 CFR PART 50 APPENDIX J PROGRAM

In the DAEC LRA, the applicant states that AMP B.3.1, "DAEC 10 CFR Part 50 Appendix J Program," is an existing program that is consistent with the Program elements in GALL Report AMP XI S4, "10 CFR 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. Issues identified but not resolved in this report are addressed in the SER.

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: "10 CFR Appendix J," "Appendix J Type A test," "Appendix J Type B test," and "Appendix J Type C test."

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. LRAP –S004	Aging Management Program Basis Document, 10 CFR Part 50, Appendix J	Revision 2 03/31/2009
2.	DAEC Containment Leak Rate Testing Types A, B, and C Periodic Testing RFO 20	
3. USNRC RG 1.163	Performance Based Leak Test Program	September 1995

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 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 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 sufficient 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 sufficient to detect and manage aging;

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

LRA AMP B.3.2, Aboveground Steel Tanks Program

In the DAEC LRA, the applicant states that AMP B.3.2, "Aboveground Steel Tanks Program" is an existing program that is consistent with the program elements in GALL Report AMP XI.M29, "Aboveground Steel Tanks 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 Aboveground Steel Tanks FSAR Supplement, described in Section 18.1.2. program elements 7 - 9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

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: "storage tank," "tank rust," and "condensate storage 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
1. LRAP-M005	Aboveground Steel Tanks	Revision 3 8/6/2009
2. CAP000206	Proposed Modification to Condensate Storage Tank Level Switches	12/15/1997
3. CAP008268	Vegetation Growing in the Seam Between 1T005A/B (Condensate Storage Tanks) and the Pit Floor	10/7/2000
4. CAP045143	Tritium Identified in Rain Water From CST Pit	10/31/2006
5. CAP058852	CAQ – Unable to Drain the CST Pit Due to Procedure Issue	7/12/2008

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

Elements 1, 2, 3 and 4 (Scope of Program, Preventive Actions, Parameters Monitored or Inspected, Detecting of Aging Effects) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP;

Sufficient information was not available to determine whether 5 and 6 (Monitoring and Trending and Acceptance Criteria) 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 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 5 of the LRA AMP, the applicant states that the tank bottoms are monitored for material degradation using ultrasonic thickness measurements from inside of the tank. The GALL Report AMP states that the effects of corrosion of the underground external surface are detectable by thickness measurement of the tank bottom. It is not clear to the staff that these statements are consistent because the frequency of tank bottom thickness measurement may not be sufficient to monitor the effects of corrosion on the tank bottom surface;

In Element 6 of the LRA AMP, the applicant states that the program utilizes ultrasonic inspection to determine material degradation in the tank bottom areas. The GALL Report AMP states that thickness measurements of the tank bottom are evaluated against the design thickness and corrosion allowance. It is not clear to the staff that these statements are consistent because a description and justification of the Duane Arnold Energy Center ultrasonic inspection acceptance criteria are not provided.

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 sufficient 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:

In the DAEC operating experience, corrosion pits were reported on tank bottom ultrasonic thickness measurements for both condensation storage tanks IT-005A and IT-005B in 1992. The maximum pit depths were 0.080" and 0.066" for IT-005A and IT-005B, respectively. It is not clear what the acceptance criteria are.

The staff also audited the description of the LRA AMP provided in the Aboveground Steel Tanks FSAR Supplement, described in Section 18.1.2. 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;

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

LRA AMP B.3.3, ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program

In the DAEC LRA, the applicant stated that AMP B.3.3 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, 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. Issues identified but not resolved in this report are addressed in the SER.

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: "Class 1," "weld," "examination," "inspection," "ISI," "indication," "crack" and "flaw;" and another search using "Class 1," "weld," "examination," "inspection," "ISI," "indication," "crack," "flaw," "small-bore," "small," and "bore." The staff screened these results for relevance to the AMP and used them to evaluate the adequacy of the applicant's operating experience review. The staff verified that the operating experience described in the applicant's basis document adequately addresses the plant-specific operating experience for this AMP.

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	ASME Sec. XI Administrative Manual: Augmented Inspection	16
2	ASME Sec. XI Administrative Manual: BWRVIP Administrative Document	14
3	Inservice Inspection Administrative Document ASME Sec. XI	12
4.	ASME Sec. XI Administrative Manual:Repair, Replacement and Modification	18
5	ASME Sec. XI Administrative Manual:	1
6	Activity request OTH006097, ISI inspection of Weld # RRB-F002 Nozzle to safe end two linear indications found	11/06/1999
7	Equipment Root Cause Evaluation of N2C Linear Indications	1

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

Sufficient information was not available to determine whether Elements 1 and 4 (Scope of Program, Detection of Aging Effects) of the LRA AMP were consistent with the corresponding element of the GALL Report AMP;

Elements 2, 3, 5 and 6 (Preventive Actions, Parameters Monitored/ Inspected, Monitoring and Trending, and Acceptance Criteria) 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 elements 1 and 4 (Scope of Program, Detection of Aging Effects) are consistent with the corresponding element of the GALL Report AMP, the staff will consider issuing RAIs for the following subjects:

In Element 1 (Scope of Program), the applicant's LR program personnel stated that DAEC has experienced aging effects specified in GALL Report AMP XI.M35, and that it does not need to have a one-time inspection AMP for its Class 1 small bore piping. However upon further discussion, the staff found out that the applicant did not prepare a plant-specific AMP for managing the aging effects as specified in GALL Report AMP XI.M35. The staff will consider issuing an RAI requesting the applicant to prepare and provide a plant-specific AMP to manage the aging effects in its Code Class 1 small bore piping;

In Element 4 (Detection of Aging Effects) of the LRA AMP it states it will use risk-informed methodology as an alternative for the examination of Table IWB-2500-1 category B-F and B-J welds. In the GALL Report AMP Section XI.M1 recommends the use of ASME Section XI Table IWB-2500-1 to determine the examination of category B-F and B-J welds. Since the applicant can not assume the same alternative will be approved during the subsequent Ten-Year intervals, additional information will be requested to show that the alternative is adequate in addressing GALL Report recommendation.

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 identified by the staff's independent database search and supplemented by the applicant is not sufficient to allow the staff 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.

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 program documents submitted do not include plant-specific operating experience. The staff finds it difficult to evaluate the sufficiency of the aging management program in the absence of operating experience, and will request the applicant to provide DAEC plant-specific operating experience related to the Section XI, IWB, IWC, and IWD 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 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 and 4 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;
>
> Identified a need for additional information regarding the adequacy of the program description in the FSAR Supplement.

LRA AMP B.3.4, ASME SECTION XI, SUBSECTION IWE PROGRAM

In the DAEC LRA, the applicant states that AMP B.3.4,"Duane Arnold Energy Center (DAEC) ASME Section XI, Subsection IWE Program" is an existing program that is consistent with the program elements in GALL Report AMP in GALL Report 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. Issues identified but not resolved in this report are addressed in the SER.

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: "IWE," "torus," "sand pocket" and "drywell."

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. LRAP-S001,	Aging Management Program Basis Document, ASME Section XI, Subsection IWE.	Revision 2
2. LRTR-DWL	Response to LR-ISG-2006-01 – Drywell Shell AMP	Revision 0
3.	DAEC Station 2nd Interval Containment Inspection Plan	Revision 0
4.	DAEC Safety Evaluation by the Office of Nuclear Reactor Regulation, Relief Requests MC-R001 and MC-P001 for Second Containment Inspection Interval.	Dated 09/22/2008
STP 3.6.1.1-01	DAEC Surveillance Test Procedure, Suppression Chamber Drywell Visual Examination	Revision 7
ACP 1601	Application of Protective Coatings	Revision 8

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

> Element 2 (preventive actions) of the LRA AMP was consistent with the corresponding elements of the GALL Report AMP;
>
> Elements 1, 3, 4, and 6 (scope of program, parameters monitored, detection of aging effects, and acceptance criteria) of the LRA AMP were 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; and sufficient information was not available to determine whether element 5 (monitoring and trending) of the LRA AMP was consistent with the corresponding element of the GALL Report AMP.

The basis for the staff's determination that Elements 1, 3, 4 and 6 (scope of program, parameters monitored, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP are equivalent to the corresponding GALL Report AMP is:

> During the audit, the staff noted that the applicant's AMP is based on the 2001 Edition, 2003 Addenda of the ASME code while the elements 1, 3, 4, 5, and 6 of the GALL Report use excerpts of the 1995 Edition. The applicant compared the elements of their program against the 2001 Edition of the ASME code, which is referenced in the GALL Report program description. The staff finds this acceptable because it compares the

applicant's AMP to their current code edition approved under 10 CFR 50.55a and captures the intent of the GALL Report.

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

In Element 5 of the LRA AMP its states, "When the reexaminations required by IWE-2420(b) reveal that the flaws or areas of degradation remain essentially unchanged for the next inspection period, these areas no longer require augmented examination in accordance with Table IWE-2500-1, Examination Category E-C." However, In the GALL Report AMP it states, "When these reexaminations reveal that the flaws, areas of degradation, or repairs remain essentially unchanged for three consecutive periods, these areas no longer require augmented examination in accordance with Examination Category E-C." It is not clear to the staff that these statements are consistent because GALL report reexamination of the degraded areas for three consecutive periods as compared to one period stated in the LRA 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 sufficient 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:

Explain why Section 3.5 of the DAEC LRAP-S001 requires augmented inspection of the degraded or the repaired area for the next inspection period. GALL AMP X1.S1 requires that inspection to be continued for three consecutive periods;

Explain how relief requests MC-R001 and MC-P001 are consistent with GALL Element 5. In addition, provide documentation that these relief request have been approved by the NRC for the period of extended operation;

Explain how DAEC maintain the records of degradations and repairs of the torus internal surface to ensure that the effects of aging on the torus will be adequately managed for the period of extended operation;

Explain why there is no aging management program for safety-related, Service Level 1 coatings applied to the torus. In addition, justify why NUREG-1801 AMP XI S.8 does not apply to DAEC;

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;

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

LRA AMP B.3.5, ASME Section XI Inservice Inspection, Subsection IWF Program

In the DAEC LRA, the applicant states that AMP B.3.5, "ASME Section XI Inservice Inspection, Subsection IWF Program," is an existing program that is consistent with the program elements in GALL Report 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. Issues identified but not resolved in this report are addressed in the SER.

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: "IWF," "support failure".

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. LRAP-S003	ASME Section XI, Subsection IWF ISI Program	Revision 2 03/31/2009
2.	Inservice Inspection, Administrative Document, ASME Section XI	09/29/2008

3.CAP066750	CAQ-HPCI Torus Suction Pipe Support HBB-8-SR-3 Not in Accordance with Design	04/22/2009
4. ACE001956	CAQ-HPCI Torus Suction Pipe Support HBB-8-SR-3 Not in Accordance with Design	07/16/2009

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

> Elements 2 through 6 (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;
>
> Element 1 (scope of program) of the LRA AMP were 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.

The basis for the staff's determination that Element 1 (scope of program) of the LRA AMP are equivalent to the corresponding GALL Report AMP is:

> Section LRA AMP 3.5 states that DAEC ASME Section XI, Subsection IWF, Inservice Inspection Program as described in the Program Engineering ASME Section XI Administrative Manual, Inservice Inspection Administrative Document and the Augmented Inspection Administrative Document delineates the scope, sample, and frequency for inspections of Class 1, 2, 3 and MC component supports. Staff reviewed this document and found that the scope identified in this document is equivalent to the scope defined in GALL Report AMP XI S3.

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 sufficient 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 sufficient to detect and manage aging;

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

LRA AMP B.3.6, Bolting Integrity Program

In the DAEC LRA, the applicant states that AMP B.3.6, "Bolting Integrity Program" is an existing program 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, 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 LRA Appendix A.18.1.6, "Bolting Integrity Program." Program elements 7 - 9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

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: "bolt," "torque," "lose," "fastener," "gasket," and "Bolting Integrity Program."

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. LRAP-M018	DAEC License Renewal Project Aging Management Program Basis Document, Bolting Integrity	Revision 3 5/4/2009
2. GMP-MECH-01	General Maintenance Procedure – General Bolting Requirements	Revision 21
3. MD-042	Bolting Practices	Revision 6
4. MD-034	Specification of Thread Lubricants for Fasteners	Revision 5
5. MD-050	Planning Guidelines	Revision 14
6. N/A	DAEC BWRVIP Administrative Document	Revision 10
7. N/A	Inservice Inspection Administrative Document ASME Section XI	Revision 10
8. N/A	Repair, Replacement and Modification Administrative Document ASME Section XI	Revision 15
9. Module 6	DAEC Maintenance Rule Program, Module 6, Monitoring of Structures	Revision 4 3/31/2005
10. LRTR-005	DAEC License Renewal Project Technical Report – Loss of Preload of Bolted Closures	Revision 1 2/13/2009

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

> 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 were consistent with the corresponding elements of the GALL Report AMP;
>
> Element 1 (Scope of Program) of the LRA AMP was 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 element 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:

> The GALL program element describes AMP XI.M18, "Bolting Integrity" as including bolting within the scope of license renewal, except for the reactor head closure studs that are addressed by GALL AMP XI.M3, "Reactor Head Closure Studs." The applicant does not perform visual inspections of in-scope bolting and fasteners as part of a separate Bolting Integrity Program inspection activity. Instead, the applicant credits visual inspections performed as part of the ASME Section XI Inspection Subsections IWB, IWC and IWD Program, the External Surfaces Monitoring Program, the Structures Monitoring Program, the ASME Section XI Inservice Inspection Subsection IWF Program, and the Buried Piping and Tanks Inspection Program. The staff determined that the visual inspections credited by the applicant are equivalent to the inspections recommended in the GALL AMP and encompass the bolting and fasteners recommended by the GALL Report to be included in AMP XI.M18. The staff finds this acceptable because the applicant's AMPs, taken in combination, include all components recommended to be within the scope of GALL AMP XI.M18.

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 sufficient 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, LRA Appendix A.18.1.6, "Bolting Integrity Program." was an adequate description of the LRA AMP.

In order to obtain the information necessary to verify the sufficiency of the LRA Appendix A.18.1.6 program description, the staff will consider issuing RAIs for the following subjects:

In its review of the applicant's program basis document, the staff noted that the applicant credits visual inspections performed under five (5) other aging management programs to encompass the visual inspections recommended by the GALL AMP. However, the FSAR Supplement in the LRA, does not correctly describe and list the AMPs which are credited. The discrepancy between the program basis document and the FSAR Supplement needs to be resolved.

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 sufficient to detect and manage aging;

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

LRA AMP B.3.7, Buried Piping and Tanks Inspection

In the DAEC LRA, the applicant states that AMP B.3.7, "Buried Piping and Tanks Inspection" is a new program that is consistent with the program elements in GALL Report AMP XI.M34, "Buried Piping and Tanks Inspection." The applicant committed to implementing this program prior to the period of extended operation in commitment number 1 which was provided in Section 18.4 of Appendix A of the LRA. 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 UFSAR Supplement. Program elements 7 - 9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

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: "cathodic," "piping," "tank," and "MIC 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. 7884-M-125 (BECH-MRS-M125)	Technical Specification for External Surface Treatment of Underground Metallic Pipe	Rev 1 / 10/7/70
2. ACP 1602	Specification for Protective Coatings in Areas Outside the Primary Containment	Rev 5 / 9/28/07

Document	Title	Revision / Date
3. ACP 1408.29	Excavation and Trenching Controls	Rev 9 / 7/8/09
4. ACP 1415.1	Inspection Planning Guideline	Rev 10 / 4/17/08
5. OTH008155	Evaluation of Safety-Related Piping	5/26/2000
6. CAP006412	Underground Well Water Line Rupture	3/2/2000
7. CAP007157	"C" Well Water Leak	5/25/2000
8. CAP007192	Evaluate Safety-Related Buried Pipe	5/26/2000
9. CAP009800	Well Water Leak	4/14/2001
10. CAP068793	Buried Piping Guided Wave Exam Results	8/3/2009
11. CAP054749	Buried Piping Inspections not Periodic	1/11/2008
12. CAP019967	Underground Piping Material Condition	12/6/2002
13. CAP033904	Discrepancy on Cathodic Protection System Data Sheet	11/17/2004
14. CAP038095	Cathodic Protection System Improvements	9/28/2005
15. CAP046152	Cathodic Protection System Survey Results	1/2/2007

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

Elements 3 and 5 (Parameters Monitored or Inspected and Monitoring and Trending) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP;

Sufficient information was not available to determine whether elements 1, 2, 4, and 6 (Scope, Preventive Actions, Detection of Aging Effects, and Acceptance Criteria) 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, 2, 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 1 of the LRA AMP it states that the scope of the program includes carbon steel, low alloy steel, and stainless steel. The scope of the LRA AMP does not appear to include cast iron although cast iron components appear to be present in systems addressed by this AMP. In the GALL Report AMP it states that the scope of the AMP includes buried steel piping and tanks. Chapter IX of Volume 2 of the GALL Report states that the term "steel" includes carbon steel, low alloy steel and cast iron. The term "steel" does not include stainless steel. Given that the corrosion characteristics of stainless steel are different than steel (as defined in the GALL Report) and that the procedures for adequately managing aging may, therefore, be different, the inclusion of stainless steel in this AMP must be considered an exception to the GALL AMP;

In Element 2 of the LRA AMP it states that carbon and low alloy steel pipes are coated. Elsewhere in the LRA AMP it states that stainless steel pipes are not coated. From the LRA AMP, it is not clear whether cast iron pipes are coated. Given that the corrosion rate of uncoated pipe exceeds that of coated pipe and that the GALL Report AMP is designed for coated pipe, it is not clear that the LRA AMP, which claims consistency with the GALL AMP will adequately manage aging. The absence of coatings must, therefore, be considered an exception to the GALL AMP;

Section A.1.2.3.4 of the SRP-LR states that the program element "detection of aging effects" should contain information concerning the frequency, extent, sample size and methods used to detect aging. The staff notes that much of this information is absent from this section of the LRA AMP. In order for the staff to evaluate the consistency of this LRA program element with the corresponding GALL Report program element, it is necessary that the applicant provide additional information concerning the program for detection of aging effects;

Section A.1.2.3.6 of the SRP-LR states that the program element "acceptance criteria" should contain information concerning the acceptance criteria against which the need for corrective action will be measured. This section of the SRP-LR also states that the acceptance criteria should consist of numerical values or methods by which they are determined. The staff notes that this information is absent from this section of the LRA AMP. In order for the staff to evaluate the consistency of this LRA program element with the corresponding GALL Report program element, it is necessary that the applicant provide this information in the LRA 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 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, to be implemented by the applicant, is sufficient 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 UFSAR Supplement. The staff found that sufficient information was not available to determine whether the description provided in the UFSAR Supplement was an adequate description of the LRA AMP.

In order to obtain the information necessary to verify the sufficiency of the UFSAR Supplement program description, the staff will consider issuing an RAI for the following subject:

Appendix A, Section 18.4, table A-1 of the LRA, contains commitments for each new AMP. In this table the applicant uses words such as "develop or "establish" to describe the action to be taken prior to the period of extended operation. The SRP-LR (tables 3.x-2 where x= 1 through 6) recommends the use of very precise language to describe the actions to be taken prior to the period of extended operation. In reviewing the new AMPs the staff has, in general, found that the language used in the SRP is contained within the AMP. However, the staff recognizes that it is possible to develop an AMP without implementing it. Given the possibility that an AMP could be developed and not implemented, it is not clear to the staff that the wording used by the applicant is consistent with the wording used in the SRP-LR.

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, to be implemented by the applicant, is sufficient to detect and manage aging;
Identified a need for additional information regarding the adequacy of the program description in the UFSAR Supplement.

LRA AMP B.3.8, BWR Control Rod Drive Return Line Nozzle Program

In the DAEC LRA, the applicant states that AMP B.3.8, "BWR Control Rod Drive Return Line Nozzle Program" is an existing program that is consistent with the program elements in GALL Report AMP XI.M6, "BWR Control Rod Drive Return Line Nozzle." 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 LRA Appendix A.18.1.8, "BWR Control Rod Drive Return Line Nozzle Program." Program elements 7 - 9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

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 selected unique component identifiers and the keywords: "CRD," "return line," "nozzle," "crack," "stress," and "CRD return line nozzle."

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. LRAP-M006	DAEC License Renewal Project Aging Management Program Basis Document, BWR Control Rod Drive Return Line Nozzle Program	Revision 2 3/20/2009
2. N/A	Program Engineering ASME Section XI Administrative Manual – Augmented Inspection Administrative Document	Revision 13
3. Drawing 921D217	Reactor Vessel (Nozzle Details)	Revision 12
4. Letter LDR-81-42	Letter from Larry D. Root, Iowa Electric Light and Power Company, to Harold Denton, NRC	2/4/1981
5. Letter LDR-81-0306	Letter from Larry D. Root, Iowa Electric Light and Power Company, to Harold Denton, NRC	10/26/1981
6. Letter LDR-81-264	Letter from Larry D. Root, Iowa Electric Light and Power Company, to Harold Denton, NRC	9/22/1981
7. Letter on Docket No. 50-331	Letter from Thomas A. Ippolito, NRC, to Duane Arnold, Iowa Electric Light and Power Company, "Implementation of Unresolved	12/8/1981

Document	Title	Revision / Date
	Safety Issue A-10, BWR Nozzle Cracking – Duane Arnold Energy Center"	
8. Letter NG-83-3740	Letter from Richard W. McGaughy, Iowa Electric Light and Power Company, to Harold Denton, NRC	11/1/1983
9. Drawing Isometric Number 1.2-12A	Control Rod Drive Return	Revision 4 7/6/1995
10. Drawing Isometric Number 1.2-12B	Control Rod Drive Return	Revision 3 7/22/1994
11. DAEC Office Memo NG-94-3352	Comparison of the 1983 Photos of the CRDRL PT Results to the 1990 Photos of the CRDRL PT Results	9/6/1994
12. Database Report for Work Orders	Work Orders: A18905, A29372, A47852, A49905, S005478, S005477, and S015912	N/A

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

Elements 1 and 6 (Scope of Program and Acceptance Criteria) of the applicant's AMP were consistent with the corresponding elements of the GALL Report AMP;

Sufficient information was not available to determine whether elements 2, 3, 4 and 5 (Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, and Monitoring and Trending) of the applicant's AMP were consistent with the corresponding elements of the GALL Report AMP.

In order to obtain the information necessary to verify whether the applicant's program elements number 2, 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:

In the GALL Report AMP, Element 2 states that mitigation occurs by system modifications such as rerouting the control rod drive return line (CRDRL) to a system that connects to the reactor vessel or, by cutting and capping the CRDRL nozzle without rerouting. In its review of the applicant's program element 2, the staff noted that the applicant's modification did not reroute the CRDRL, and the modification implemented an alternative to cutting and capping the CRDRL nozzle. It is not clear to the staff that the applicant's program element 2 is consistent with the GALL Report AMP because the applicant's CRDRL modification is different from CRDRL modifications described in the GALL Report and in NUREG-0619, which is referenced in the GALL Report AMP;

In the GALL Report AMP, Element 3 states that the AMP monitors the effects of cracking in accordance with NUREG-0619; Element 4 states that the extend and schedule of inspection, as delineated in NUREG-0619, assures detection of cracks before the loss of intended function; and Element 5 states that the inspection schedule of NUREG-0619 provides timely detection of cracks. In its review of the applicant's program elements 3, 4 and 5, the staff noted that the applicant's current inspection schedule for the CRDRL piping that contains stagnant water is not consistent with the recommendations in NUREG-0619, which calls for inspection of the stagnant water piping at each refueling outage. It is not clear to the staff that the applicant's program elements 3, 4 and 5, are consistent with the GALL Report AMP because of the difference between inspection frequencies recommended in NUREG-0619 and inspection frequencies implemented by the applicant's 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 sufficient 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 LRA Appendix A.18.1.8. 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 sufficient to detect and manage aging;
>
> Verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B.3.9, BWR Feedwater Nozzle Program

In the DAEC LRA, the applicant states that AMP B.3.9, "BWR Feedwater Nozzle Program," is an existing program that is consistent with the program elements in GALL Report AMP XI.M5, "BWR Feedwater Nozzle 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 BWR Feedwater Nozzle Program FSAR Supplement, described in Section 18.1.9. program elements 7 - 9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

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: "feedwater nozzle," "sparger," and "nozzle 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. LRAP-M0005	BWR Feedwater Nozzle	Revision 3 8/6/2009
2. NEDC-23677	Duane Arnold Feedwater Nozzle Temperature Cycling	9/1/1977
3. NUREG-0619	BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking	November, 1980
4. GE-523-A71-0594	Alternate BWR Feedwater Nozzle Inspection Requirement, BWR Owner's Group	Revision 1 8/1/1999
5. CAP001978	Feedwater Nozzle UT Inspection Frequency	7/1/1998
6. CAP004280	EPRI Thermal Performance Peer Assessment of the Duane Arnold Energy Center	7/7/1999
7. CAP006004	NRC Inspection Report 99014: Resident Inspectors Evaluations of Operations	12/23/1999
8. CAP011176	NRC IN 2001-09: Main Feedwater System Degradation Safety-related ASME Code Class 2 Piping Inside the Containment of a PWR	7/24/2001
9. CAP028674	NRC IN 2003-11; Leakage Found on BMI Nozzles	8/19/2003
10. CAP005052	Feedwater Sparger Indications During IVVI	3/28/2005
11. CAP044485	Feedwater Correction Factors Indicate Increased Feedwater Nozzle Fouling	9/27/2006
12. CAP055462	NCAQ – Develop Recovery Plan for Feedwater Sparger Design Package	2/11/2008

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 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 sufficient to detect and manage aging effects during the period of extended operation. The staff verified that because of the plant-specific feedwater nozzle/thermal sleeve design, the BWR feedwater nozzles do not suffer from the same degradation as in other BWR reactor designs. Results of ultrasonic inspection of feedwater nozzles conducted in 2005 and 2007 were reviewed and found to be satisfactory.

The staff also audited the description of the LRA AMP provided in the BWR Feedwater Nozzle Program FSAR Supplement, described in Section 18.1.9. 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;
>
> Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging;
>
> Verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B.3.10, BWR Penetrations program

In the DAEC LRA, the applicant states that AMP B.3.10 "BWR penetrations program" is an existing program that is consistent with the program elements in GALL Report AMP XI.M8, "BWR penetrations." 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 UFSAR Supplement 18.1.10. Program elements 7 - 9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

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: "BWR penetrations," "SBLC," "nozzle safe end," "instrument penetration," "LCA-D001," "VIE-D001" and "nozzle 30."

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. LRAP-M008	BWR Penetrations - Aging Management Program Basis Document	Rev. 2 3/16/09
2. LRAP-M002	Water chemistry - Aging Management Program Basis Document	Rev. 3 3/16/09
3. LRAP-M001	ASME XI, Inservice inspection, subsections IWB, IWC, and IWD - Aging Management Program Basis Document	Rev. 2 3/16/09
4. Program engineering ASME Section XI Administrative manual	Inservice inspection - Administrative document - ASME Section XI - Duane Arnold Energy Center	Rev. 12 9/29/08
5. Program engineering ASME Section XI	BWRVIP - Administrative document - Duane Arnold Energy Center	Rev. 14 8/8/09

Document	Title	Revision / Date
Administrative manual		
6.	DAEC Fourth Interval Inservice Inspection Plan for DUANE ARNOLD ENERGY CENTER	Rev. 4 1/22/09
7. Program engineering ASME Section XI Administrative manual	Repair, replacement and modification - Administrative document - ASME Section XI - Duane Arnold Energy Center	Rev. 18 5/29/09
8.	DUANE ARNOLD ENERGY CENTER – ASME XI Inservice inspection boundary basis document	Rev. 5 2/01/09
9. ASME Section XI	Augmented inspection - Administrative document - Duane Arnold Energy Center	Rev. 15 4/08/09
10. PCP 1.16	Plant chemistry procedures 3200 manual - Chemistry BWRVIP program	Rev. 3 1/30/09
11. LRAM-62.00	Technical report - Aging management review - nuclear boiler system	Rev. 5 3/26/09

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

Elements 3 and 5 (parameters monitored/inspected and monitoring and trending) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP;

Sufficient information was not available to determine whether elements 1, 2, 4 and 6 (scope of program, preventive actions, detection of aging effects and acceptance criteria) 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, 2, 4 and 6 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 (Section 3.1.2 of the DAEC Program Basis document for BWR penetrations (LRAP-M008)) states that the DAEC program manages the aging effects shown in Section 3.1.2 for the components in the systems and structures listed in the AMRs identified in Section 7.0. However, the staff noted that the applicant did not provide a detailed description of the welds covered by the BWRVIP-27-A and BWRVIP-49-A and included in its BWR penetrations program. The staff reviewed documents such as the BWRVIP and the inservice inspection administrative documents but could not find a clear description of the welds included in the DAEC BWR penetrations program in accordance with the components discussed in BWRVIP-49-A. Moreover, the staff noted that the references for welds addressed by the BWRVIP-27-A in the BWRVIP administrative document do not correspond to those of attachment 7.1 of LRAP-M008. The staff requested that the applicant should clarify which welds covered by BWRVIP-27-A and BWRVIP-49-A are included in the BWR penetrations program;

Element 1 of the LRA AMP (Section 3.1.2 of the DAEC Program Basis document for BWR penetrations (LRAP-M008)) states that the DAEC program manages the aging effects shown in Section 3.1.2 for the components in the systems and structures listed in the AMRs indentified in Section 7.0. In Attachment 7.1 of the Duane Arnold Energy Center Program Basis document for BWR penetrations (LRAP-M008), the applicant states that the aging effects for the components are SCC/IGA. The corresponding GALL

Report AMP states that the program is focused on managing the effects of cracking due to stress corrosion cracking (SCC) or intergranular stress corrosion cracking (IGSCC). It is not clear to the staff that these statements are consistent because the components concerned by the BWR penetrations program are stainless steel and their environment is reactor coolant. Thus, the aging effect should be IGSCC, not IGA. The staff concluded that the applicant should discuss its plan to modify its basis document accordingly;

Element 2 of the LRA AMP (Section 3.2.2 of the Duane Arnold Energy Center Program Basis document for BWR penetrations (LRAP-M008)) states that the monitoring and control of reactor coolant water chemistry is in accordance with applicable BWRVIP reports, which are implemented by the DAEC water chemistry program. The applicant also states that its water chemistry program is consistent with NUREG-1801 Chapter SI, program XI.M2. The corresponding GALL Report AMP states that reactor coolant water chemistry is monitored and maintained in accordance with the guidelines in BWRVIP-29. In Section 2.0 of LRAP-M008, the applicant states that the control of water chemistry per the EPRI guidelines of BWRVIP-130 BWR water chemistry guidelines – 2004 revision is not considered an exception relative to the NUREG-1801 program description of the XI.M2 program. However, the staff considers this an exception to the GALL Report XI.M8 program because the applicant implemented the water chemistry guidelines through procedures based on another BWRVIP report rather than the one recommended in the GALL report. Furthermore, the staff noted that the applicant did not refer to the same procedures and the same BWRVIP reports for water chemistry according to the implementing documents. The staff concluded that the applicant should clarify the use of BWRVIP reports and their acceptability, as well as the procedures used;

Element 4 of the LRA AMP (Section 3.4.2 of the Duane Arnold Energy Center Program Basis document for BWR penetrations (LRAP-M008)) states that alternatives for examinations for categories B-F and B-J have been incorporated into the DAEC BWR penetrations program. These alternatives are based on a risk-informed methodology. The corresponding GALL Report AMP states that the evaluation guidelines of BWRVIP-49-A and BWRVIP-27-A recommend that the inspection requirements currently in ASME Section XI continue to be followed. It is not clear to the staff that these statements are consistent because the alternatives are approved only for the current ten-year interval. Moreover, the staff noted that the alternatives are based on a risk-informed methodology, which is not described in the guidelines of BWRVIP-27-A or BWRVIP-49-A. The staff concluded that the applicant should clarify how the inspections described in BWRVIP-27-A and BWRVIP-49-A will be implemented during the period of extended operation and modify its application as necessary;

Element 4 of the LRA AMP (Section 3.4.2 of the DAEC Program Basis document for BWR penetrations (LRAP-M008)) states that further details for examination are described in DAEC Aging Management Program LRAP-M001, ASME XI, Inservice Inspection, Subsections IWB, IWC, and IWD. The staff noted that the LRAP-M001 document does not refer to the DAEC program basis document dedicated to BWR penetrations, LRAP-M008. The staff concluded that the applicant should explain how it takes the requirements of LRAP-M008 into account in LRAP-M001;

Element 4 of the LRA AMP (Section 3.4.2 of the DAEC Program Basis document for BWR penetrations (LRAP-M008)) states that the guidelines in BWRVIP-03 are also being followed. The corresponding GALL Report AMP states that the nondestructive examinations (NDE) techniques appropriate for inspection of BWR vessels internals […] are included in BWRVIP-03. It is not clear to the staff that these statements are consistent because it did not find any reference to this BWRVIP report in the implementing documents it reviewed. The staff concluded that the applicant should explain how it takes the guidance of this BWRVIP report for detection of aging effects into account in its aging management program for BWR penetration;

Element 6 of the LRA AMP (Section 3.6.2 of the DAEC Program Basis document for BWR penetrations (LRAP-M008)) states that the evaluation of crack growth is in accordance with article IWB-3000 of ASME XI with guidance from BWRVIP-14, BWRVIP-59 and BWRVIP-60. The corresponding GALL Report AMP states that applicable and approved BWRVIP-14, BWRVIP-59, and BWRVIP-60 documents provide guidelines for evaluation of crack growth in different alloys. It is not clear to the staff that these statements are consistent because it did not find any reference to these three BWRVIP reports in the implementing documents it reviewed. The staff concluded that the applicant should explain how it takes the guidance of these BWRVIP reports for acceptance criteria into account in its aging management program for BWR penetrations.

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 sufficient 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 RAI for the following subject:

Element 10 of the LRA AMP (Section 3.10.2 of the DAEC Program Basis document for BWR penetrations (LRAP-M008)) states that DAEC operating experience demonstrates that the current Inservice and Augmented Inspection programs are effective in managing the aging effect of cracking in the BWR penetration nozzles. The applicant based its statement especially on the finding of indications in welds not included in the BWR penetrations program. The staff concluded that the applicant should explain how the operating experience deducted from these indications can be applied for the BWR penetrations program and identify any operating experience specific to the BWR penetration nozzles.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement 18.1. 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;

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

LRA AMP B.3.11, BWR Reactor Water Cleanup System

In the DAEC LRA, the applicant states that AMP B.3.11, "BWR Reactor Water Cleanup System" is an existing program with an exception that is consistent with the program elements in GALL Report AMP XI.M25, "BWR Reactor Water Cleanup 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 UFSAR 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 exception. Issues identified but not resolved in this report are addressed in the SER.

The exception affects LRA program elements 1, 3, 4 and 5 (Scope of Program, Parameters Monitored/Inspected, Detection of Aging Effects, and Monitoring and Trending).

In relation to the program elements 1, 3, 4 and 5, GALL AMP XI.M25 states that the extent and schedule for inspection in accordance with the recommendations of NRC Generic Letter (GL) 88-01 provides timely detection of cracks and leakage of coolant. Alternatively, the LRA claims that the NRC issued a Safety Evaluation dated September 15, 2000, approving the use of BWRVIP-75 in lieu of the inspection requirements of GL 88-01 and the inspection schedules/frequencies included in the NRC Safety Evaluation have been incorporated into the applicant's program.

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: "reactor water cleanup system," "stress corrosion cracking," "SCC," "indications," "weld," repair," "corrosion," and "weld overlay."

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. LRAP-M025	Aging Management Program Basis Document: LRAP-M025 BWR Reactor Water Cleanup System Program	Revision: 2 4/9/2009
2. U.S. NRC letter to the Iowa Electric Light and Power Company	NRC Generic Letter 88-01 - "NRC Position on IGSCC in BWR Austenitic Stainless Steel Piping" (TAC NOS. 69008 and 69123)	Revision: N/A 5/31/1990
3. U.S. NRC letter to C. Terry, BWRVIP Chairman	Final Safety Evaluation of the "BWRVIP Vessel and Internals Project, BWR Vessel and Internals Project, Technical Basis for Revisions to Generic Letter 88-01 Inspection Schedules (BWRVIP-75)," EPRI Report TR-113932, October 1999 (TAC No. MA5012): including Enclosure (Final Safety Evaluation)	Revision: N/A 5/14/2002
4. OTH007175	Evaluate the effect of the implementation of the New Rule on existing weld overlay Note: Evaluation of implementation of BWRVIP-75 with open items 3.1, 3.2, 3.3, 3.4, 3.5, 3.6 and 3.8	Revision: N/A 12/16/2002
5. OTH010368	Review Open Items 3.7 and 3.8 of NRC Safety Evaluation of BWRVIP-75 Note: Evaluation of implementation of BWRVIP-75 with open items 3.7 and 3.8	Revision: N/A 12/16/2002
6. N/A	Program Engineering ASME Section XI Administrative Manual: Augmented Inspection Administrative Document (including Attachment 1)	Revision: 16 No Date
7. BWRVIP Letter 2006-248	Inspection Relief for Hydrogen Water Chemistry or Noble Metal Chemical Application	Revision: N/A 4/27/2006
8. CAP036173	Conductivity > PCP Action Level 2 for > 24 hrs (Value is 1.083 μS/cm)	Revision: N/A 4/27/2005
9. CAP010488	V27-180 Reactor Water Cleanup	Revision: N/A 12/14/2002
10. DCP 1464	Safety Evaluation RWCU Pipe Replacement (Pages 1 and 2)	Revision: N/A 6/21/1989

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, 4 and 5 (Scope of Program, Parameters Monitored/Inspected, Detection of Aging Effects and Monitoring and Trending) of the LRA AMP associated with the exception were not evaluated during this audit. Aspects of these program elements that are not associated with the exception 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 were consistent with the corresponding elements of the GALL Report AMP;

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.

In order to obtain the information necessary to verify whether the LRA program elements –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:

In relation to the program elements 3, 4 and 5 (Parameters Monitored/Inspected, Detection of Aging Effects, and Monitoring and Trending), LRA Section B.3.11 stated that the program includes the RWCU [reactor water cleanup system] stainless steel pipe welds between the reactor and the second containment isolation valve and inspections of the appropriate welds outboard of the second isolation valve;

The staff also noted that the following reference indicated that the applicant's RWCU had 81 non-safety-related welds under IGSCC Category G: In accordance with GL 88-01, Category G welds are the welds that are made of non-resistant material and not inspected.

Reference: U.S. NRC Letter to the Iowa Electric Light and Power Company, NRC Generic Letter 88-01 - "NRC Position on IGSCC in BWR Austenitic Stainless Steel Piping" (TAC NOS. 69008 and 69123), May 31, 1990, including Enclosure: See pages 7 and 8 of Enclosure.

The staff also noted that GALL AMP XI.M25 recommends inspection Schedule A, B or C depending on the applicant's satisfactions of the NRC screening criteria for the RWCU piping outboard of the second isolation valve.

The LRA or on-site documentation does not clearly describe what inspections are performed on the piping outboard of the second isolation valve in the applicant's program in terms of inspection extent and schedule.

Therefore, the staff will consider issuing RAIs to clarify what inspections are performed on the RWCU welds outboard of the second isolation valve in the applicant's program in terms of inspection extent and schedule: In the RAIs, the staff considers requesting the applicant to provide the technical information related to the screening criteria for the inspection schedule.

In relation to element 1 (Scope of Program) as described above, LRA Section B.3.11 stated that the program includes the RWCU stainless steel pipe welds between the reactor and the second containment isolation valve and inspections of the appropriate welds outboard of the second isolation valve.

In contrast, LRA Table 3.3.2-24 for the aging management review of the RWCU components indicates that Class 1 components such as flow element, pipe fittings and tubing, and valve in the system credit the BWR Stress Corrosion Cracking Program to manage the effects of stress corrosion cracking.

In addition, the staff noted that the Program Description section of GALL AMP XI.M25, "BWR Reactor Water Cleanup System," stated that based on the NRC criteria related to inspection guidelines for RWCU piping welds outboard of the second isolation valve, the program includes the measures delineated in NUREG-0313, Rev. 2, and NRC Generic Letter (GL) 88-01. The staff also noted that the program element "scope of program," of GALL AMP XI.M25 describes the screening criteria for the determination of the inspection schedule for the RWCU piping outboard of isolation valves. In turn, the detailed inspection schedules for the RWCU welds outboard of the second isolation valves are described in the program element, parameter monitored/inspected of the GALL AMP.

Therefore, the staff will consider issuing RAIs to clarify what portions of RWCU piping and piping welds are included in the program scope of the BWR Reactor Water Cleanup System Program to manage the effects of SCC or IGSCC. By the RAIs, the staff will consider requesting the applicant to describe what other programs are credited to manage the effects of SCC in the RWCU piping inboard of the second isolation valves.

In addition, the staff will consider requesting the applicant that in consideration of the program scope and the inspection schedules for the RWCU outboard piping as described in GALL AMP XI.M25, the applicant should clarify whether the exception regarding the inspection frequency modified by BWRVIP-75 is still applicable to the BWR Reactor Water Cleanup 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 search is not sufficient to allow the staff 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.

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:

In its review of operating experience, the staff noted that CAP010488 was submitted on June 28, 1994 with the One Line Description of "V27-180 Reactor Cleanup." The Detailed Description section of CAP010488 stated that:

> 1) Verify CMARS are written & applicable weld are repaired during RFO13;
> 2) Verify that the operations exams welds during class 1 leak test QDR 94007 conversion.

The staff found a need to clarify whether the weld repair is related with the occurrence of stress corrosion cracking. As applicable, the staff also needs to clarify how effective the

applicant's BWR Reactor Water Cleanup System Program has been in terms of detecting and managing the effects of stress corrosion cracking in the RWCU system.

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

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

The applicant claimed an exception to GL 88-01 for the inspection frequency modified by BWRVIP-75. Depending on the program scope (inboard versus outboard) and inspection schedule described in GALL AMP XI.M25, the exception might not be applicable to the applicant's program. If the exception is not applicable to the applicant's program, the corresponding revision of the UFSAR supplement should be made.

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;

Identified a need for additional information regarding the adequacy of the program description in the UFSAR supplement.

LRA AMP B.3.12, BWR Stress Corrosion Cracking Program

In the DAEC LRA, the applicant states that AMP B.3.12, "BWR Stress Corrosion Cracking," is an existing program that is consistent with the program elements in GALL AMP XI.M7, "BWR Stress Corrosion Cracking." 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 described in Section 18.1.12. Program elements 7-9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

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: "IGSCC," "SCC," "SCC repair," "SCC indication," and "small bore 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. LRAP-M007	BWR Stress Corrosion Cracking	Revision 2 3/20/09
2. LRTR-POE	Programs Operating Experience Review	Revision 0 11/17/08
3. QRNO. PDA -06-008	Inservice Inspection Program Assessment	4/28/06
4. RCE 1062	Equipment Root Cause Evaluation of N2F & N2C Linear Indications	2/8/07
5. DAEC LER 2007-003	Linear Indications Found During UT Examination of Safe-End to Nozzle Welds	Revision 0 4/20/07
6. DAEC LER 1999-006	Indications in Recirculation Riser Nozzle-to-Safe End Welds	Revision 0 12/6/99
7. OTH6011	Disposition Nonconformance: Indication indicative of IGSCC found in Recirculation Inlet Nozzle N2F	11/11/99
8. CAP047472	Indication found on RHR weld	2/15/07
9. CAP047600	SCQA – Linear indication found during UT examination RRF-002 Weld	2/18/07
10. CAP047722	Linear indication found during UT examination of RRC-F002 Weld	2/21/07
11. CAP063771	CAQ – Indication identified in RHR-F002A	2/8/09
12. PCP 1.16	Plant Chemistry Procedures 3200 Manual – Chemistry BWRVIP Program	Revision 3 1/30/09
13.	Program Engineering ASME Section XI Administrative Manual, Augmented Inspection Administrative Document	Revision 15
14. NG-09-0413	Inservice Inspection Summary Report for RF021, DEAC	May 29, 2009
15. NG-07-0492	Fourth Ten Year Interval Inservice Inspection Summary Report	June 1, 2007
16. NG-05-0420	Third Ten Year Interval Inservice Inspection Summary Report	July 28, 2005

During the audit, the staff found that:

Elements 2 - 5 (Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, and Monitoring and Trending) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP;

Sufficient information was not available to determine whether elements 1 and 6 (Scope and Acceptance Criteria) 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 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 it states that the DAEC Water Chemistry program includes the provisions for hydrogen water chemistry which helps mitigate the aggressive environment. The DEAC Program Basis document for the BWR Stress Corrosion Cracking (LRAP-M0004) uses PCP 1.16, "Plant Chemistry Procedures 3200 Manual, Chemistry BWRVIP Program," as the implementing document to apply mitigation in accordance to the DEAC Water Chemistry Program. The BWR SCC program also implements the "Program Engineering ASME Section XI Administrative manual, BWRVIP Administrative Document," Revision 14. The staff notes that PCP 1.16 references BWRVIP-130 for implementing recommendations, and the BWRVIP Administrative Document Section 5.15 references BWRVIP-190 as the water chemistry guideline. It is not clear to the staff which applicable BWRVIP water chemistry guideline will be implemented for the BWR SCC program to be consistent with NUREG-1801 X1.M7, Scope;

In Element 6 of the LRA AMP, it states that the DAEC BWR SCC program will evaluate any indication detected in accordance with IWB-3600 of the applicable Edition/Addenda of ASME Section XI, and the applicable BWRVIPs to determine acceptance and/or disposition. It is not clear to the staff in which applicable BWRVIPs will be implemented for this program per NUREG-1801 X1.M7 Acceptance 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 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 sufficient 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 Section 18.1.12. 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 sufficient to detect and manage aging;

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

LRA AMP B.3.13, BWR Vessel ID Attachment Welds

In the DAEC LRA, the applicant states that AMP B.3.13, "BWR Vessel ID Attachment Welds" is an existing program that is consistent with the program elements in GALL Report AMP XI.M4, "BWR Vessel ID Attachment Welds." 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 Section 18.1.13. Program elements 7 - 9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

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: "guide rod bracket," "steam dryer support bracket," "dryer holdown bracket," "feedwater sparger bracket," "jet pump riser support pad," "core spray bracket," and "surveillance specimen bracket."

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. LRAP-M0004	Aging Management Program Basis Document: BWR Vessel ID Attachment Welds	Revision 2 3/16/09
2. LRAM-62.00	Aging Management Report: Nuclear Boiler (Reactor Vessel & Internals)	Revision 5 3/26/09
3. LRTR-POE	Programs Operating Experience Review, Section 2.1.14, Attachment 4.14	Revision 0 11/17/08
4. PCP 1.16	Plant Chemistry Procedures 3200 Manual – Chemistry BWRVIP Program	Revision 3 1/30/09
5. ACP 1211.36	Administrative Control Procedure – Reactor Pressure Vessel Inspection Procedure	Revision 7 2/6/2009
6.	Program Engineering ASME Section XI Administrative Manual, BWRVIP Administrative Document	Revision 14 8/6/2009
7.	Program Engineering ASME Section XI Administrative Manual, Inservice Inspection Document (ASME Section XI)	Revision 12
8. PDA-06-008	In-Service Inspection Program Assessment	4/28/06
9. CAP004933	6 inches long crack was found in the stainless steel clad pad which is overlaid	3/23/1995

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 were consistent with the corresponding elements of the GALL Report AMP;

Sufficient information was not available to determine whether Elements 1, 4, 5 and 6 (Scope, 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.

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 5 of the LRA AMP states that the BWR Vessel ID Attachment welds program will follow the requirements of ASME Section XI, IWB, and the guidelines of BWRVIP-48-A. It is not clear to the staff how indications will be monitored or trended to ensure sample expansion and/or inspections are performed for meeting the stated requirements and guidelines, consistent with NUREG-1801 X1.M4 Monitoring and Trending;

In Element 4 of the LRA AMP states that the BWR Vessel ID Attachment welds program will follow the guidelines of BWRVIP-48-A. NUREG-1801 X1.M4 Detection of Aging Effects, permits BWRVIP-48 as an acceptable guidance to follow. For nondestructive examination (NDE), BWRVIP-03 is mentioned as appropriate. It is not clear if BWRVIP-03 will be implemented for appropriate NDE techniques per NUREG-1801 X1.M7 Detection of Aging Effects;

In Element 6 of the LRA AMP states that the BWR Vessel ID Attachment welds program will evaluate any indication detected in accordance with ASME Section XI and applicable approved BWRVIPs. It is not clear to the staff which specific applicable BWRVIPs will be implemented for this program per NUREG-1801 X1.M4 Acceptance Criteria;

In Element 1 of the LRA AMP its states that the scope of the DAEC BWR Vessel ID Attachment Welds is, in part, implemented in the DAEC Water Chemistry program. The DEAC Program Basis document for the BWR Vessel ID Attachment Welds uses PCP 1.16, “Plant Chemistry Procedures 3200 Manual, Chemistry BWRVIP Program,” as the implementing document to apply mitigation in accordance to the DEAC Water Chemistry Program. The BWR Vessel ID Attachment Welds program also implements the “Program Engineering ASME Section XI Administrative manual, BWRVIP Administrative Document,” Revision 14. The staff notes that PCP 1.16 references BWRVIP-130 for implementing recommendations, and the BWRVIP Administrative Document Section 5.15 references BWRVIP-190 as the water chemistry guideline. It is not clear to the staff which applicable BWRVIP water chemistry guideline will be implemented for the BWR Vessel ID Attachment Welds program to be consistent with NUREG-1801 X1.M4, Scope.

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 sufficient 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 Section 18.1.13. 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 sufficient to detect and manage aging;

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

LRA AMP B.3.14, BWR Vessel Internals

In the DAEC LRA, the applicant states that AMP B.3.14, "BWR Vessel Internals" is an existing program with an enhancement that is consistent with the program elements in GALL Report AMP XI.M9, "BWR Vessel Internals." 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 Section 18.1.14. Program elements 7 - 9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

The enhancement affects LRA program elements 1, 3 and 4 (Scope, Parameters Monitored or Inspected, Detection of Aging Effects). In the LRA, the applicant states that since the top guide at DAEC has exceeded a neutron fluence of 5E20 prior to the period of extended operation, the program shall be enhanced to require an EVT-1 inspection of five percent (5%) of the top guide locations within six years after entering the period of extended operation, and subsequently, additional 5% of the top guide locations will be inspected within twelve years after entering the period of extended operation. This is consistent with the GALL AMP XI.M9 guideline. DAEC identified that top guides assembly between top guides cells 34 and 35 exceed the 5E20 threshold prior to the extended period of operation (FPL-FLU-001-R-002). The applicant commits to implementation of the enhancements within the stated schedule (LRA Table A-1, Items 2 and 3).

In Table A-1, Items 2 and 3 of the LRA, the applicant committed to implement this enhancement within 6 years of entering the extended period of operation for item 2, and within 12 years of entering the extended period of operation for item 3.

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: "core plate," "core shroud," "shroud support plate," "LPCI coupling," "top guide," "jet pump assembly," "spray sparger," "core spray," "lower plenum," and "steam dryer."

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. LRAP-M0009	Aging Management Program Basis Document: BWR Vessel Internals	Revision 2 3/16/09
2. LRAM-62.00	Aging Management Report: Nuclear Boiler (Reactor Vessel & Internals)	Revision 5 3/26/09
3. LRSP-62.00	Nuclear Boiler System – Scoping and Screening Report	Revision 6 3/26/09
4. FPL-FLU-001-R-002	Duane Arnold Energy Center Core Shroud, Top Guide, Jet Pump, Core Support Plate and Core Spray Sparger Component Fluence Evaluation at 32 EFPY and 54 EFPY	Revision 0 1/18/08
5. LRTR-POE	Programs Operating Experience Review, Section 2.1.15, and Attachment 4.15; Section 2.1.30, and Attachment 4.30	Revision 0 11/17/08
6. PCP 1.16	Plant Chemistry Procedures 3200 Manual – Chemistry BWRVIP Program	Revision 3 1/30/09
7. ACP 1211.36	Administrative Control Procedure – Reactor Pressure Vessel Inspection Procedure	Revision 7 2/6/2009
8.	Program Engineering ASME Section XI Administrative Manual, BWRVIP Administrative Document	Revision 14 8/6/2009
9. CAP 004933	6 Inches Long Crack was Found in the Stainless Steel Clad Pad which is Overlaid	3/23/1995
10. CAP026721	Indications found in steam dryer via visual inspection during RFO 18	4/4/2003
11. CAP026742	Steam Dryer Indications observed during RFO18 IVVI exam	4/5/2003
12. CAP035703	Steam Dryer Indications observed during DAEC RFO19 IVVI Exam	4/6/2005
13. CAP047697	Steam Dryer Indications observed during DAEC RFO20 IVVI Exam	2/21/2007
14. CAP064516	CAQ – Steam Dryer indications (INR IVI-09-09)	2/17/2009

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

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

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 were consistent with the corresponding elements of the GALL Report AMP;

Sufficient information was not available to determine whether element 1 (Scope) of the LRA AMP was 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 1 is consistent with the corresponding elements of the GALL Report AMP, the staff will consider issuing RAIs for the following subjects:

DAEC LRA 4.3.2, “Reactor Vessels Internal Fatigue,” states that the shroud support is considered part of the vessel. Table 4.3.2 presents fatigue usage factor for the shroud support. Section 7, Attachment 7.1, “List of Equipment with Aging Management Program Scope,” of DAEC Program Basis document for the BWR Vessel Internals (LRAP-M0009), identifies the shroud support covered under this program. The staff notes that Attachment 7.1 of LRAP-M0009 does not identify fatigue as an aging effect considered for the shroud support. It is not clear to the staff how the BWR Vessel Internals program is addressing this possible aging effect, or why it is not necessary to be evaluated under the BWR Vessel Internals program;

In element 1 of the LRA AMP, it states that the DAEC BWR Vessel Internals program utilizes applicable BWRVIP Water chemistry program. The DAEC Program Basis document for the BWR Vessel Internals (LRAP-M0009) uses PCP 1.16, “Plant Chemistry Procedures 3200 Manual, Chemistry BWRVIP Program,” as the implementing document to apply mitigation in accordance to the DAEC Water Chemistry Program. The BWR Vessel Internals program also implements the “Program Engineering ASME Section XI Administrative manual, BWRVIP Administrative Document,” Revision 14. The staff notes that PCP 1.16 references BWRVIP-130 for implementing recommendations, and the BWRVIP Administrative Document Section 5.15 references BWRVIP-190 as the water chemistry guideline. It is not clear to the staff which applicable BWRVIP water chemistry guideline will be implemented for the BWR Vessel Internals program to be consistent with NUREG-1801 X1.M9, Scope.

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 sufficient 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 Section 18.1.14. 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 is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging;

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

LRA AMP B.3.15, Closed-Cycle Cooling Water System Program

In the DAEC LRA, the applicant states that AMP B.3.15, "Closed-Cycle Cooling Water System Program" is an existing program that is consistent with the program elements in GALL Report AMP XI.M21, "Closed-Cycle Cooling Water System 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 Closed Cooling Water System FSAR Supplement, described in Section 18.1.15. Program elements 7 - 9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

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: "RBCCW," "GSW," and "Chiller."

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. LRAP-M021	Closed-Cycle Cooling Water System	Revision 3 6/26/2009
2. PCP 1.8	Closed Cooling Water System Chemistry Guidelines	Revision 8 5/1/2009
3. PCP 9.2	Chemical Additions to Plant Systems	Revision 19 7/16/2007
4.	DAEC Heat Exchanger Program	Revision 1

Document	Title	Revision / Date
5. Chemistry Form 317	Reactor Building Closed Cooling Water	Revision 16
6. Chemistry Form 305	CB Chiller Water	Revision 18
7. ER-AA-201-2002	System Performance Monitoring	Revision 1 4/27/09
8.	System Performance Monitoring Trend Plan - RBCCW	8/10/09
9. OTH012393	INPO AFI CY 3.2, Some Portions of the Closed Cooling Water System Chemistry/Corrosion Control Program and Practices are not Consistent with the Industrial Standards	6/12/2001
10. CAP000702	Treating/Monitoring CCW Systems – Review INPO 96-007 Good Practices	12/14/2002
11. CAP025211	Chemistry Parameter Out of Expected Range	1/15/2003
12. CAP031817	Chloride Levels in A Diesel Cooling Jacket Exceed Expected Range	5/30/2004
13. CAP033483	Chloride, Sulfate Levels in RBCCW Exceed Expected Levels	10/21/04
14. CAP049863	1g021 Jacket Water Analysis Exceeds Closed Cooling Limits	5/18/2007
15. CAP050596	"B" Chiller – Closed Cooling Action Level 1 for Moly, Out of Spec for Nitrite/pH	6/22/2007
16. CAP060666	NCAQ-Diesel Cooling Jacket "A" Molybdate Exceeds Closed Cooling Action Level 1	10/1/2008
17. CAP064166	CAQ- Exceeded Closed Cooling Water Systems Action Level 2 Value for RBCCW (PCP1.8)	2/13/2009

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

> Elements 4, 5, and 6 (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;
>
> Sufficient information was not available to determine whether elements 1, 2, and 3 (Scope of Program, Preventive Actions, and Parameters Monitored or Inspected) 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, 2, and 3 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 applicant's basis document, LRAP-M021, it states that the Closed-Cycle Cooling Water System Program is managed through the Duane Arnold Energy Center procedures and guidance documents that are based upon the EPRI TR-107396, "Closed Cooling Water Chemistry Guideline, Rev. 0." However, the applicant's closed-cycle cooling water system technical basis document, LRAP-M021 Rev. 3, appears to reference the EPRI TR-1007820, "Closed Cooling Water Chemistry Guideline, Rev. 1." The GALL Report AMP states that the program should rely upon EPRI TR-107396 as guidance for managing both the corrosion inhibitor concentrations and solution impurity chemistry components. It is not clear to the staff that the applicant is consistent with the GALL report as claimed because the GALL

Report and the applicant's technical basis are referencing different revisions of the EPRI report;

In element 2 of the applicant's basis document, LRAP-M021, it states that the DAEC prevention and monitoring practices are based on the guidance in the EPRI Closed Cooling Water Chemistry Guideline. The EPRI Closed Cooling Water Chemistry Guideline, Section 5.1, indicates that because various controlled parameters can have a negative synergistic effect on system corrosion rates if two of these controlled parameters are outside the normal operating range at the same time, the action level may need to be increased one step higher than the current level. The Duane Arnold Energy Center procedures do not appear to be taking into account any potential negative synergistic effect. The GALL Report AMP states that the program should rely upon EPRI Closed Cooling Water Chemistry Guideline as guidance for managing both the corrosion inhibitor concentrations and solution impurity chemistry. It is not clear to the staff that the applicant is consistent with the GALL Report because it does not take into account any potential negative synergistic effect of multiple controlled parameters being out of compliance as indicated in the EPRI Closed Cycle Cooling Water Guideline;

In element 3 of the applicant's basis document, LRAP-M021, it states that the DAEC inspections of chemistry parameters are based on the guidance in the EPRI Closed Cooling Water Chemistry Guideline. The GALL Report AMP states that this program should monitor the effects of corrosion and SCC by testing and inspection in accordance with guidance in EPRI Closed Cooling Water Chemistry Guideline. The EPRI Closed Cooling Water Chemistry Guideline, Table 5-1, recommends that azoles be used as an inhibitor to control corrosion in systems containing copper. It is not clear to the staff if the applicant is consistent with the EPRI Closed Cooling Water Chemistry Guideline because their reactor building closed cycle cooling water system contains copper, but does not utilize azoles to manage the corrosion in this system.

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 sufficient to detect and manage aging effects during the period of extended operation. The staff identified some additional operating experience indicating a possible trend in chloride ingress; however, this has already been captured under the applicant's corrective action program and is being corrected.

The staff also audited the description of the LRA AMP provided in the Closed Cooling Water System FSAR Supplement, described in Section 18.1.15. 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 sufficient to detect and manage aging;

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

LRA AMP B.3.16, Compressed Air Monitoring

In the DAEC LRA, the applicant states that AMP B.3.16, "Compressed Air Monitoring" is an existing program that is consistent with the program elements in GALL Report AMP XI.M24, "Compressed Air 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 UFSAR supplement. Program elements 7 - 9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

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: "instrument air," "safety-related air," "air," "compressor," "air receiver," "corrosion," "leakage," "valve corrosion," "high temperature," "low pressure," and "high pressure."

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. LRAP-M024	Aging Management Program Basis Document: LRAP-M024 Compressed Air Monitoring	Revision: 2 4/9/2009
2. OP-017	Instrument Air System Blowdown and Air Dryer Swap	Revision: 12 No Date
3. STP 3.7.9-01	Surveillance Test Procedure: CB/SBGTS Instrument Air Compressors Functional Test Note: CB (Control Building) and SBGT (Standby Gas Treatment)	Revision: 4 No Date
4. STP 3.7.9-02	Surveillance Test Procedure: CB/SBGTS Instrument Air	Revision: 12

Document	Title	Revision / Date
	Compressors System Leakage and Capacity Test	No Date
5. STP NS180001	Surveillance Test Procedure: Instrument Air Quality Test	Revision: 6 No Date
6. N/A	Auxiliary Operator's Log: pages 8, 16 and 17	Revision: 103 No Date
7. NG-89-0347	Duane Arnold Energy Center, Docket No: 50-331, Op. License No: DRP-49, Response to NRC Generic Letter 88-14, "Instrument Air Supply System Problems Affecting Safety-Related Equipment" Note: Letter from Iowa Electric Light and Power Company to the U.S. NRC	Revision: N/A 2/21/1989
8. NG-90-2517	Duane Arnold Energy Center, Docket No: 50-331, Op. License No: DRP-49, Response to NRC Generic Letter 88-14, "Instrument Air Supply System Problems Affecting Safety-Related Equipment" Note: Letter from Iowa Electric Light and Power Company to the U.S. NRC	Revision: N/A 11/8/1990
9. U.S. NRC letter to the Iowa Electric Light and Power Company	Response to Generic Letter 88-14 (TAC No. 71655)	Revision: N/A 6/18/1991
10. CAP030820	3" JBD018 Air Line Thinned below 87% nominal wall (0.216)	Revision: N/A 5/27/2004
11. CAP030621	1T055A Instrument Air Tank Has Min wall of 0.224 & UT Readings down to 0.077"	Revision: N/A 2/5/2004
12. CAP037186	Excessive Rust Found in Instrument Air Receivers	Revision: N/A 8/24/2005
13. CAP034722	Degrading Trend in Instrument Air Compressor Loading	Revision: N/A 2/2/2005
14. AOP518	Abnormal Operating Procedure, AOP 518, Failure of Instrument and Service Air	Revision: 31 No Date
15. LP# 94.17	AOP-518, Failure of Instrument and Service Air Note: Training Material	Revision: 7 No Date
16. N/A	LOR Two Year Plan 2009/2010 Note: Training Plan	Revision: N/A 3/12/2009

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

> Element 4 - 6 (Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) of the LRA AMP was consistent with the corresponding elements of the GALL Report AMP;
>
> Sufficient information was not available to determine whether elements 1 - 3 (Scope of Program, Preventive Action, and Parameters Monitored/Inspected) of the LRA AMP were consistent with the corresponding elements of the GALL Report.

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

> In relation to element 1 (Scope of Program) of the LRA AMP, LRA Section B.3.16 states that the Compressed Air Monitoring Program manages and mitigates the aging effect of corrosion and [is] assuring an oil free dry air environment in the instrument air system. LRA Section 18.1.16, which provides the UFSAR supplement, also states that the applicant's program manages or mitigates aging effects of the instrument air system;

In contrast, LRA Section 3.3.1.15 indicates that the Compressed Air Monitoring Program is not credited for the instrument air system, while the applicant credits the Bolting Integrity Program, External Surfaces Monitoring Program and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (IIS-in-MPDC) Program for the aging management of the instrument air system;

In comparison, GALL XI.M24 AMP, "Compressed Air Monitoring" states that the GALL AMP manages the effects of corrosion and the presence of unacceptable levels of contaminants on the intended function of the compressed air system;

Therefore, the staff will consider issuing an RAI to clarify whether the Compressed Air Monitoring Program manages the aging effects and performs the relevant inspection, monitoring and testing for the applicant's compressed air system(s) including the applicant's instrument air system and safety-related air system in accordance with the GALL Report;

In relation to Element 2 (Preventive Actions) of the LRA AMP, LRA Section B.3.16.1 states that a semi-annual air system quality check is performed as part of the monitoring activities of the program. In addition, applicant's on-site Aging Management Program Document, LRAP-M024 Compressed Air Monitoring, indicates that the plant Auxiliary Operator Log records system and equipment parameters each shift and the parameters, which are recorded on the log, include instrument air dew point and system pressure (see page 12);

In comparison, ISA-S7.0.01-1996, "Quality Standard for Instrument Air," which is one of the technical references of GALL AMP XI.M24, "Compressed Air Monitoring," states that a monitored alarm is preferred for the pressure dew point; however, if a monitored alarm is unavailable, shift monitoring is recommended;

The staff noted that the on-site documentation for the program references included applicant's surveillance test procedure (STP), NS180001, "Instrument Air Quality" and the procedure described air quality tests, which are oil concentration test, dew point test and particulate size and concentration test. However, the staff found that the surveillance test procedure does not specify the test frequencies for the air quality tests in contrast to the semi-annual air system check described in LRA Section B3.16. Therefore, the staff found a need to clarify how the frequencies of the air quality tests are specified and controlled in the applicant's program;

The staff also reviewed pages 8, 16 and 17 of applicant's Auxiliary Operator's Log, Revision 103, as provided as part of the on-site documentation by the applicant and found that the dew point is one of the parameters to record. However, the staff noted that Auxiliary Operator's Log does not specify the frequency of recording the dew point. Therefore, the staff will consider issuing RAIs to clarify how the frequencies of the air quality tests per STP NS180001 are specified and controlled and to clarify how the frequency of monitoring the dew point data with the Auxiliary Operator's Log is specified and controlled. The staff will also consider issuing an RAI to confirm whether the frequency of the dew point monitoring is consistent with the recommendation of ISA-S7.0.01-1996, which is shift monitoring;

In relation to elements 1 and 3 (Scope of Program and Parameters Monitored/Inspected) of the LRA AMP, the staff will consider issuing an RAI for the following item. Element 3 (Parameters Monitored/Inspected), of the GALL AMP recommends that inservice inspection and testing be performed to confirm that maintenance practices, emergency procedures and training are adequate to ensure that the intended function of the air system is maintained;

In conjunction with GL 88-14, NUREG-1275, Volume 2 (Part I, Section 9.0) also recommends that anticipated transient and system recovery procedures and related training for loss of air systems events should be reviewed for adequacy and revised as necessary. NUREG-1275 Volume 2 also recommends that the plant personnel should be trained in the anticipated transient and system recovery procedures to respond to loss of air systems events. The staff found a need to clarify whether the aforementioned recommendations for the emergency procedures and training are implemented and performed in the applicant's program;

After the communication with the applicant on the subjects, the applicant provided related documents regarding the emergency procedures and training. The staff finds that the provided documents on the abnormal operating procedure and training conformed that the applicant has implemented the emergency procedures and training regarding loss of instrument and service air. Therefore, the staff will not consider issuing RAIS regarding these subjects.

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 sufficient 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:

In LRA Section B.3.16.5, which described the operating experience related to the Compressed Air Monitoring Program, the applicant stated that corrosion products were found in the instrument air receiver tanks and in the accessible sections of the air receivers supply piping. The applicant also stated that modifications included replacement of the carbon steel underground piping (in 2007) with stainless steel piping and the installation of blowdown piping on the Y-strainers associated with the instrument air receiver tanks to allow the Y-strainers to be cleared by blowing them down which allowed the downstream drain taps to perform their water removal function more reliably;

In addition, applicant's on-site Aging Management Program Document, LRAP-M024 Compressed Air Monitoring, addressed CAP030621 (1T055A Instrument Air Tank Has Min wall of 0.224 & UT Readings down to 0.077", dated on February 5, 2004) as part of the operating experience with the Compressed Air Monitoring Program;

The Detailed Description section of CAP030621 indicated that: A work order was written to take UT readings on the lower portion of 1T055A (instrument air receiver tank) to determine the wall thinning due to internal corrosion. The bottom head is nominal wall of 0.344". Minimum wall based on hoop stress is 0.224. Four small areas indicate wall thickness of 0.224 down to 0.181, 0.094, 0.082 and 0.077. Need [was identified] to evaluate for continued acceptance and/or repair;

EPRI/NMAC NP-7079, "Instrument Air System," is one of the technical references of GALL AMP XI.M24, "Compressed Air Monitoring." In relation with instrument air receivers, NP-7079, Section 2.0 states that: In some systems air from the after cooler enters a moisture separator for final water removal, thus protecting the receiver from moisture accumulation. The compressed air temperature at the outlet of the aftercooler may still be above the plant ambient temperature, in which case further cooling and condensation occurs in the air receiver. Plants without a moisture separator usually provide drain taps and receiver blowdown. Finally, the compressed air enters the receiver, acts as a storage tank and pressure surge buffer for the distribution system;

Based on its review of the foregoing technical information, the staff will consider issuing RAIs to clarify how the wall thinning evaluation was performed for continued acceptance and/or repair of the four small areas, which indicated thickness less than the minimum wall thickness based on hoop stress as described in CAP030621. In addition, the staff will consider issuing related RAIs including a request to describe what actions were taken to prevent and mitigate the wall thinning and internal corrosion of the air receiver tank.

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

In order to obtain the information necessary to verify the sufficiency of the sufficient information program description, the staff will consider issuing RAIs for the following subjects in comparison with SRP-LR. The applicant's UFSAR supplement did not clearly indicate:

Whether the aging management program performs inspection, monitoring and testing of the entire system including frequent leakage testing valves, piping and other system components especially those made of steel;

Whether the aging management program is in response to NRC GL 88-14 and INPO's Significant Operating Experience Report (SOER) 88-01;

Whether the description "instrument air system" in the UFSAR supplement needs to be changed to the "Compressed Air Systems" or relevant terminology for system

description in such a way to encompass the instrument air system and the safety-related air system.

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;

Identified a need for additional information regarding the adequacy of the program description in the UFSAR supplement.

LRA AMP B.3.17 ELECTRICAL CABLES AND CONNECTIONS PROGRAM

In the DAEC LRA, the applicant states that AMP B.3.17, "Electrical Cables and Connections Program," 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 Environmental Qualification Requirements." The applicant committed to establish this program prior to the period of extended operation in reference to the LRA Appendix A Section 18.4 containing this commitment. 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. Issues identified but not resolved in this report are addressed in the SER.

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: "cables," "connections," "cracking," "melting," "discoloration" and "embrittlement."

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. LRAP-E001	Electrical Cables and Connections	Revision 3, 12/29/08
2. LRAM-ECAB	Aging Management Preview Report Electrical Cables	Revision 3, 12/29/09
3. LRAM-ECON	Aging Management Review Report for Electrical	Revision 3

Document	Title	Revision / Date
	Connections	
4. LRTR-ELAE	Adverse Localized Equipment Environments	Revision 3
5. LRTR-EOE	Electrical Operating Experience Review	Revision 1, 7/9/09

During the audit of program elements, 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 were consistent with the corresponding elements of the GALL Report AMP;
>
> The staff also reviewed the applicant's method for identifying an adverse localize environment. The staff reviewed Technical Report LRAP-E001, and found that the applicant did address the criteria of how the adverse localized environment is identified for temperature, and radiation.

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, to be implemented by the applicant, is sufficient 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 UFSAR Supplement was an adequate description of the LRA AMP.

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

> LR SRP Table 3.6.2, "FSAR Supplement for Aging Management of Electrical and Instrumentation and Control System," states that the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program will be implemented prior to the period of extended operation. The LRA Appendix A, "Duane Arnold UFSAR Supplement," Section 18.1.17, "Electrical Cables and Connections Program," does not include an implementation schedule (etc., first test for license renewal should be completed prior to the period of extended operation) consistent with the LR SRP. The applicant's FSAR supplement is not consistent with that in LR SRP Table 3.6.2. The staff noted that this inconsistency is applicable to other electrical AMPs. The staff is considering issuing a generic RAI and will resolve this issue in the SER.

Based on this audit the staff:

Verified that 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 sufficient to detect and manage aging;

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

LRA AMP B.3.18, Electrical Cables and Connections Used In Instrumentation Circuits Program

In the DAEC LRA, the applicant states that AMP B.3.18, "Electrical Cables and Connections Used in Instrumentation Circuits" is a new program that is consistent with the program elements in GALL Report AMP XI.E2, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits" with no exceptions or enhancement. The applicant committed to establish this program prior to the period of extended operation in reference to LRA Appendix A, Section 18.4 containing commitment. 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. Issues identified but not resolved in this report are addressed in the SER.

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: "instrumentation," "resistance," "insulation," "cable," "melting," 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. LRAP-E002	Electrical Cables and Connections Used in Instrumentation Circuit	Revision 2, 8/14/08
2. LRAM-ECAB	Aging Management Review Report for Electrical Cables	Revision 2
3. LRTR-ELAE	Adverse Localized Equipment Environments	Revision 2
4. LRTR-EOE	Electrical Operating Review	Revision 1

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

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

In order to obtain the information necessary to verify whether the LRA program element 1 is consistent with the corresponding element of the GALL Report AMP, the staff will consider issuing an RAI for the following subject:

> GALL AMP XI.E2, under Scope of Program, states that this program applies to electrical cable and connections used in circuits with sensitive, high voltage, low-level signals such as radiation monitoring and nuclear instrumentation that are subject to an aging management review. In the applicant's basis document LRAP-E002, under Scope of Program, it states that the cables in scope are in the nuclear instrumentation system and there are no radiation monitoring system cables in the scope of this aging management program. The radiation monitoring system cables are in the scope of license renewal because it performs an intended function. These cables are used in sensitive, high voltage, low level signal circuits. Exposure of these electrical cables to adverse localized environments caused by heat, radiation, or moisture can result in reduced insulation resistance (IR). Reduced IR can cause an increase in leakage current between conductors and from individual conductors to ground. A reduction in IR is a concern for circuits with sensitive, high voltage, low-level signals such as high-range radiation monitoring system cables.

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, to be implemented by the applicant, is sufficient 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 also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found that sufficient information was not available to determine whether the description provided in the UFSAR Supplement was an adequate description of the LRA AMP.

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

LR SRP Table 3.6.2, “FSAR Supplement for Aging Management of Electrical and Instrumentation and Control System,” states that the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program will be implemented prior to the period of extended operation. The LRA Appendix A, “Duane Arnold UFSAR Supplement,” Section 18.1.18, “Electrical Cables and Connections Program,” does not include an implementation schedule (etc., first test for license renewal should be completed prior to the period of extended operation) consistent with the LR SRP. The applicant’s FSAR supplement is not consistent with that in LR SRP Table 3.6.2. The staff noted that this inconsistency is applicable to other electrical AMPs. The staff is considering issuing a generic RAI and will resolve this issue in the SER.

Based on this audit, the staff:

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

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

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

LRA AMP B.3.21, EXTERNAL SURFACES MONITORING PROGRAM

In the DAEC LRA, the applicant states that AMP B.3.21, “External Surfaces Monitoring” is an existing program with four element enhancements and no exceptions. The applicant further states that the program is consistent with all of 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 updated FSAR Supplement. Program elements 7 - 9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

The first enhancement affects LRA program element 1 (Scope of Program). In this enhancement, the applicant expands the existing program element by implementing an enhanced “system walkdown to more specifically address the types of components to be inspected, the relevant degradation mechanisms and effects of interest, and the refueling outage inspection frequency.”

The second enhancement affects LRA program element 3 (Parameters Monitored/Inspected). This enhancement expands the existing program element by including an enhanced “system

walkdown to more specifically address the types of components to be inspected, and the relevant degradation mechanisms and effects of interest."

The third enhancement affects LRA program element 5 (Monitoring or Trending). This enhancement expands on the existing program element by adding revised program procedures to include an enhanced "system walkdown to more specifically address the qualifications required for inspection personnel and periodic reviews to determine program effectiveness."

The fourth enhancement affects LRA program element 6 (Acceptance Criteria). This enhancement expands on the existing program element. It adds an enhanced "system walkdown to more specifically address the acceptance criteria for the component/aging effect combination to be sure that corrective actions will be identified before loss of intended function, and periodic reviews to determine program effectiveness."

In the LRA and LRA Supplement 1, as appended by a letter dated January 23, 2009, the applicant provided a commitment to "revise the inspection program to address inspector qualifications, types of components, degradation mechanisms, aging effects, acceptance criteria, and inspection frequency," as applicable to elements of this program.

During its audit, the staff conducted walkdowns, interviewed the applicant's staff, and reviewed on-site documentation provided by the applicant. The staff also conducted multiple independent searches of the applicant's operating experience database. Sequentially matching the keyword "corrosion" with "steel," "iron," and "insulation," an initial search, yielded 217 hits (94 for steel, 88 for iron, and 35 for insulation). In a follow-up search, replacing "corrosion" with "degradation" produced 33 hits for steel, 74 for iron and 42 for insulation. Thereafter, combining "degradation" with "paint" and or "coating" yielded 22 hits. Pairing "leakage" and "pipe" produced 178 hits. Finally, consecutive use of the keyword "loss of material," with "steel" and "iron," returned 31 and 45 hits respectively.

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. DAEC LRAP-M036	External Surfaces Monitoring Program, Program Basis Document (partial review) with Attachment 7.1 – Duane Arnold Energy Center (DAEC)	Revision 3 03/18/2009
2. ACP 1201.2	Administrative Control Procedure, Conduct of Systems / Plant Engineering	Revision 14
3. FPL-1	Quality Assurance Topical Report (QATR),	06/23/2009
4. DA-ESP-SYS-005M	Perform System Walkdown as Required to Accomplish Safe Reliable and Efficient Operation of Assigned System, Mentoring Guide	
5. DA-ESP-SYS-002M	Monitoring System with License and Design Basis Requirements, Mentoring Guide	
6. INPO 85-033 TS-413	Use of System Engineers	Revision 1 03/01/1992
7. EPRI-TR1007933	Aging Assessment Field Guide, EPRI Technical Report	Revision 0 12/01/2003

Document	Title	Revision / Date
8. EPRI-TR1009743	Aging Identification and Assessment Checklist, EPRI Technical Report	Revision 0 08/01/2004
9. ACP 1208.2	Equipment Performance Monitoring Program	Revision 19 05/13/2009
10. ACP 1208.7	Program Health Process	Revision 11 01/20/2009
11. ACP 1408.1	Work Order Procedure	Revision 145 08/12/2009
12. MD-050	Planning Guidelines, Maintenance Directive	
13. CAP007199	Evaluate replacement of 4" MRD001 (EMBEDDED RADWASTE)	06/09/2000
14. CAP053510	NCAQ - TSC Diesel Tank should be replaced with a new doubled wall tank.	10/29/2007
15. CAP 007460	QA Audit recommendations resulting from Fire Protection Audit	07/10/2000
16. CAP 053816	NCAQ - Monthly inspection on stored spare condensate pump.	11/13/2007
17. CAP067581	NCAQ-Significant corrosion is observed in the Domestic Water Treatment Rm &1T125	05/29/2009
18. CAP067318	CAQ-Env. audit finding#6; Failure to provide sec. containment for TSC Diesel tank	05/19/2009
19. CAP001049	External piping corrosion on EDB015	04/08/1998
20. CAP034346	Corrosion of plant equipment ignored by plant management	12/21/2004
21. CAP039608	CWP-1D Scope decision making (loss of metal) Build up of corrosion products on pipe above FIC8058	01/06/2006
22. CAP043089	Surface corrosion on EF piping in EFP-3 building Repeated 1VHP021 pump seal leaks may be causing pipe corrosion	07/07/2006
23. CAP050983	External pipe corrosion found on JBD059	07/09/2007
24. CAP059191	NCAQ - Materiel Condition Issues from NOS Assessment Walkdowns of electronic circuitry)	07/30/2008
25. CAP016947	Request Engineering Evaluation of V03-0089 leak	01/18/1996
26. CAP002807	DAC and Training Center HVAC Water Loop (closed) Corrosion	12/01/1998
27. CAP060150	NCAQ-Startup Transformer has housekeeping/ maintenance issues to be resolved.	09/10/2008

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. In addition to the specific enhancements of program elements described in the LRA and elaborated above, the basis document (see audited document #1) included also additional enhancement statements aimed to improve plant walkdown procedures. The staff considered only the specific program element enhancements as recorded in the LRA and similarly reflected during enumeration of the elements in the basis document.

During the audit, the staff found that:

Element 2 (Preventive Actions) of the LRA AMP was consistent with the corresponding element of the GALL Report AMP;

Elements 3 and 6 (Parameters Monitored/Inspected and Acceptance Criteria – both with the included enhancements) of the LRA AMP were not strictly consistent with the

corresponding elements of the GALL Report AMP but that sufficient information became 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;

Sufficient information was not available to determine whether elements 1, 4 and 5, (Scope of Program, Detection of Aging Effects, Monitoring and Trending) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

The staff's determination that Elements 3 and 6 (Parameters Monitored/Inspected and Acceptance Criteria) of the LRA AMP are equivalent to the corresponding GALL Report AMP is based on interviews and documents reviews (see listings in the above Table) regarding the enhancement of system walkdown procedures. Specifically:

For Element 3 (Parameters Monitored/Inspected), the staff accepts the applicant's intent to espouse the monitoring of material degradation according to the inspection parameters listed in the GALL AMP. Hence, the staff determines the enhanced program element when coupled with the applicant's commitment (see DAEC LRA supplement 1, Table A-1, commitment #8) fulfills the guidance given in GALL;

For Element 6 (Acceptance Criteria), the applicant expressed the intent to take corrective actions prior to the loss of SSCs intended functions. The staff concludes, therefore, that the essence of the program element is equivalent to GALL recommendations when it is enhanced and coupled with the applicant's commitment (see DAEC LRA supplement 1, Table A-1, commitment #8).

In order to obtain the information necessary to verify whether the LRA program elements 1, 4 and 5 (Scope of Program, Detection of Aging Effects and Monitoring and Trending) are consistent with the corresponding elements of the GALL Report AMP, the staff is considering issuing the following RAIs:

In Element 1 (Scope of Program) of the LRA for this AMP, in the basis document the applicant discusses both inaccessible areas and insulated areas. That document references the current system engineering walkdown procedure and has no apparent discussions regarding inaccessible areas and the inspection of insulated external surfaces. The LRA enhancements to this program element do not address these aspects. GALL XI.M36, External Surface Monitoring, program element 1, Scope of Program, discusses inaccessible areas that need to be inspected at intervals to provide reasonable assurance that aging effects will be managed. The intent of the first RAI, therefore, is to request a clarification from the applicant on the details of the enhancement regarding walkdowns of inaccessible areas and insulated external surfaces. A second RAI for this element may be issued for a clarification of inspection walkdown procedures related to insulated hot pipes. Specifically, for these components, the basis document makes a distinction between insulation of hot and cold pipes. The applicant in the basis document states there is no need to inspect systems of hot insulated pipes (with class I, II, III insulation) because the formation of a wetted external surface is not possible. The staff, however, believes, depending on the leak rate, the insulated external surfaces could be wet. Under the circumstances, the assumption by the applicant, that high temperatures will preclude the formation of wetted external

surfaces may not be valid. GALL XI.M36, External Surfaces Monitoring, program element 1, discusses how to inspect insulated external surfaces so that there is a reasonable assurance the effects of aging will be managed. The GALL does not make the distinction between hot and cold pipes for corrosion inspection of insulated SSCs. Because of this discrepancy between the LRA, the supporting basis document, and GALL, the staff contemplates, as stated above, requesting the applicant to provide a clarification as to why there is no need to inspect such surfaces;

In Element 4 (Detection of Aging Effects) of the LRA AMP the applicant describes the element to be consistent with GALL. The LRA AMP B.3.21, provides no enhancement to this element. Yet the applicant, in the LRA commitments (see DAEC LRA supplement 1, Table A-1, commitment #8) states that it will revise the inspections to address aging effects. The staff plans to request the applicant to identify or provide the specific enhancement applicable to the detection of aging effects for the steel commodity;

In Element 5 (Monitoring and Trending) of the LRA AMP the basis document stipulates, the External Surfaces Monitoring Program will use a plant-specific instructions/checklist for the license renewal aging management walkdowns. GALL states “deficiencies to be documented using approved processes and procedures such that results can be trended.” The LRA enhancement for this program element, discusses only qualifications of inspection personnel and their periodic reviews. It does not elaborate on plant-specific instructions/checklists as an approved procedure for trending the results of inspections. The staff contemplates issuing a RAI requesting clarifications and/or additions to the enhancements regarding the inclusion of specific instructions/checklists procedural requirements for the license renewal aging management walkdowns.

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

In order to obtain the information necessary to verify the sufficiency of the UFSAR Supplement program description, the staff, as stated above, is considering issuing RAIs for the following subjects:

Inspection for leakage of hot insulated pipes;
Walkdowns of inaccessible areas.

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 sufficient to detect and manage aging;

Identified a need for additional information regarding the adequacy of the program description in the UFSAR Supplement.

LRA AMP B.3.22, Fire Protection Program

In the DAEC LRA, the applicant states that AMP B.3.22, "Fire Protection Program" is an existing program with enhancement(s) and exception(s) that is consistent with the program elements in GALL Report AMPXI.M26, "Fire Protection." 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, Appendix A.18.1.22. 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. Issues identified but not resolved in this report are addressed in the SER.

The first enhancement affects LRA program elements 3, 4, 5 and 6 (Parameters Monitored/Inspected, Detection of Aging Effects, Monitoring and Trending and Acceptance Criteria). This enhancement expands on the existing program elements by adding criteria for visual inspection of the fire barrier walls, ceilings, and floors to examine for any sign of degradation such as cracking, spalling, and loss of material caused by freeze thaw, chemical attack, and reaction with aggregates by fire protection qualified inspectors.

The second enhancement affects LRA program elements 3 (Parameters Monitored/Inspected, Detection of Aging Effects, Monitoring and Trending and Acceptance Criteria). This enhancement expands on the existing program elements by adding criteria to inspect the entire Diesel Driven Fire Pump fuel supply line for degradation (any component in a state of disrepair).

In Appendix A, Table A-1 of the LRA, in Commitment Nos. 9 and 10, the applicant committed to implement these enhancements prior to the period of extended operation.

The first exception affects LRA program elements 4 and 5 (Detection of Aging Effects and Monitoring and Trending). In the GALL Report AMP, this program element recommends that visual inspections for the walls, ceilings, and floors used as fire barriers be performed once every refueling cycle. Alternatively, this program element in the LRA states, the frequency of the visual inspections for the walls, ceilings, and floors used as fire barriers be performed at an interval of 35 per cent once each operating cycle with 100 per cent visually inspected within a period of five years.

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: "penetration seal," "seal rupture," "fire door degradation," "fire pump fuel line," "diesel fire pump," and "CO_2 fire suppression."

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. LRAP-M026	Program Basis Document – Fire Protection Program	Revision 3 7/9/2009
2. STP-NS13F001	Fire Barrier Penetration Seal Inspection	Revision 12
3. STP-NS13F002	Fire Door and Frame Inspection	Revision 18
4. STP-NS13B009	Diesel Driven Fire Pump Operability Tests and Fuel Oil Supply Verification	Revision 26
5. STP-NS13B013	Diesel Fire Pump Fuel Test	Revision 3
6. STP-NS13D002-A	CO_2 Cardox System Operability Test	Revision 16
7. CAP040770	Fire Protection Self Assessment 1FA 7 Penetration Seal Program Effectiveness	3/27/2006
8. CAP043911	Unacceptable Sealing Material found on Penetration Seals	8/29/2006

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 element 4 (Detection of Aging Effects) and program element 5 (Monitoring and Trending) of the LRA AMP associated with the exception 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 numbers 1 and 2 (Scope of Program and Preventive Actions) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP;
>
> Sufficient information was not available to determine whether element numbers 3, 4, 5 and 6 (Parameters Monitored/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.

In order to obtain the information necessary to verify whether the LRA program elements 3 - 6 are consistent with the corresponding elements of the GALL Report AMP, the staff will consider issuing RAIs for the following subjects:

> In the GALL Report AMP Element numbers 3 and 4, it states that periodic visual inspection and function test is performed at least once every six months to examine the signs of degradation of the halon/CO2 fire suppression system. In LRA program

element numbers 3 and 4, the applicant's program basis document states that performance testing and visual inspection of CO2 fire suppression system is done annually. However, there is no exception taken in the LRA;

In the GALL Report AMP Element numbers 4 and 6, it states that visual inspections of the halon/CO2 fire suppression system detect any sign of added degradation, such as corrosion, mechanical damage, or damage to dampers; and that any signs of corrosion and mechanical damage of the halon/CO2 fire suppression system are not acceptable. Review of the DAEC Fire Protection Program basis document, and supporting surveillance test procedure document for Cardox System Operability Test indicated that this procedure only addresses performance testing and did not include visual inspection. It is not clear how a performance test would detect any sign of age related degradation;

In the GALL Report AMP Element number 4, it states that visual inspection of the fire barrier walls by qualified fire protection inspectors, ceilings, and floors, performed in walkdowns at least once every refueling outage ensures timely detection of concrete cracking, spalling, and loss of material. Review of the DAEC Fire Protection Program basis document, Section 3.4.2, indicates that fire barriers are inspected once every five years. However, there is no exception taken in the LRA.

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 sufficient 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:

LRA B.3.22, Fire Protection Program, in Section B.3.22.5, states that "DAEC performs a biennial assessment of the Fire Protection Program. The most recent assessment concluded that, on an overall basis, the Fire Protection Program is satisfactory." Review of DAEC operating experience identified a CAP040770 dated March 7, 2006 that was written to address the Fire Protection self-assessment of Penetration Seal Program Effectiveness, which identified several issues with the penetration seal program and warranted the classification of penetration seal program as an issue of attention. However, this plant operating experience was not included in LRA Section B.3.22.5.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement A.18.1.22. 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;

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

LRA AMP B.3.22, Fire Protection Program

In the DAEC LRA, the applicant states that AMP B.3.22, "Fire Protection Program" is an existing program with enhancement(s) and exception(s) that is consistent with the program elements in GALL Report AMPXI.M26, "Fire Protection." 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, Appendix A.18.1.22. 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. Issues identified but not resolved in this report are addressed in the SER.

The first enhancement affects LRA program elements 3, 4, 5 and 6 (Parameters Monitored/Inspected, Detection of Aging Effects, Monitoring and Trending and Acceptance Criteria). This enhancement expands on the existing program elements by adding criteria for visual inspection of the fire barrier walls, ceilings, and floors to examine for any sign of degradation such as cracking, spalling, and loss of material caused by freeze thaw, chemical attack, and reaction with aggregates by fire protection qualified inspectors.

The second enhancement affects LRA program elements 3 (Parameters Monitored/Inspected, Detection of Aging Effects, Monitoring and Trending and Acceptance Criteria). This enhancement expands on the existing program elements by adding criteria to inspect the entire Diesel Driven Fire Pump fuel supply line for degradation (any component in a state of disrepair).

In Appendix A, Table A-1 of the LRA, in Commitment Nos. 9 and 10, the applicant committed to implement these enhancements prior to the period of extended operation.

The first exception affects LRA program elements 4 and 5 (Detection of Aging Effects and Monitoring and Trending). In the GALL Report AMP, this program element recommends that visual inspections for the walls, ceilings, and floors used as fire barriers be performed once every refueling cycle. Alternatively, this program element in the LRA states, the frequency of the visual inspections for the walls, ceilings, and floors used as fire barriers be performed at an

interval of 35 per cent once each operating cycle with 100 per cent visually inspected within a period of five years.

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: "penetration seal," "seal rupture," "fire door degradation," "fire pump fuel line," "diesel fire pump," and "CO_2 fire suppression."

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. LRAP-M026	Program Basis Document – Fire Protection Program	Revision 3 7/9/2009
2. STP-NS13F001	Fire Barrier Penetration Seal Inspection	Revision 12
3. STP-NS13F002	Fire Door and Frame Inspection	Revision 18
4. STP-NS13B009	Diesel Driven Fire Pump Operability Tests and Fuel Oil Supply Verification	Revision 26
5. STP-NS13B013	Diesel Fire Pump Fuel Test	Revision 3
6. STP-NS13D002-A	CO_2 Cardox System Operability Test	Revision 16
7. CAP040770	Fire Protection Self-Assessment 1FA 7 Penetration Seal Program Effectiveness	3/27/2006
8. CAP043911	Unacceptable Sealing Material found on Penetration Seals	8/29/2006

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 element 4 (Detection of Aging Effects) and program element 5 (Monitoring and Trending) of the LRA AMP associated with the exception 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 numbers 1 and 2 (Scope of Program and Preventive Actions) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP;
>
> Sufficient information was not available to determine whether element numbers 3, 4, 5 and 6 (Parameters Monitored/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.

In order to obtain the information necessary to verify whether the LRA program elements 3 - 6 are consistent with the corresponding elements of the GALL Report AMP, the staff will consider issuing RAIs for the following subjects:

> In the GALL Report AMP Element numbers 3 and 4, it states that periodic visual inspection and function test is performed at least once every six months to examine the

signs of degradation of the halon/CO2 fire suppression system. In LRA program element numbers 3 and 4, the applicant's program basis document states that performance testing and visual inspection of CO2 fire suppression system is done annually. However, there is no exception taken in the LRA;

In the GALL Report AMP Element numbers 4 and 6, it states that visual inspections of the halon/CO2 fire suppression system detect any sign of added degradation, such as corrosion, mechanical damage, or damage to dampers; and that any signs of corrosion and mechanical damage of the halon/CO2 fire suppression system are not acceptable. Review of the DAEC Fire Protection Program basis document, and supporting surveillance test procedure document for Cardox System Operability Test indicated that this procedure only addresses performance testing and did not include visual inspection. It is not clear how a performance test would detect any sign of age-related degradation;

In the GALL Report AMP element number 4, it states that visual inspection of the fire barrier walls by qualified fire protection inspectors, ceilings, and floors, performed in walkdowns at least once every refueling outage ensures timely detection of concrete cracking, spalling, and loss of material. Review of the DAEC Fire Protection Program basis document, Section 3.4.2, indicates that fire barriers are inspected once every five years. However, there is no exception taken in the LRA.

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 sufficient 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:

LRA B.3.22, Fire Protection Program, in Section B.3.22.5, states that "DAEC performs a biennial assessment of the Fire Protection Program. The most recent assessment concluded that, on an overall basis, the Fire Protection Program is satisfactory." Review of DAEC operating experience identified a CAP040770 dated March 7, 2006 that was written to address the Fire Protection self-assessment of Penetration Seal Program Effectiveness, which identified several issues with the penetration seal program and warranted the classification of penetration seal program as an issue of attention. However, this plant operating experience was not included in LRA Section B.3.22.5.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement A.18.1.22. 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;

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

LRA AMP B.3.24, Flow-Accelerated Corrosion Program

In the DAEC LRA, the applicant states that AMP B.3.24, "Flow-Accelerated Corrosion Program" is an existing program that is consistent with 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. Issues identified but not resolved in this report will be addressed in the SER.

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: "flow-accelerated corrosion," and "FAC."

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. LRAP-M017	Aging Management Program Basis Document, Flow-Accelerated Corrosion	Revision 2 3/20/2009
2. (None)	Corrosion Monitoring Program Manual, Part A, Flow-Accelerated Corrosion Monitoring Program	Revision 12 5/15/2009
3. OTH006849	Evaluate replacement of extraction steam piping to 1E002A&B (low pressure feedwater)	2/15/2000
4. OTH007743	Line Management Self Assessment: DAEC Flow Accelerated Corrosion Program	5/3/2000
5. OTH025769	Should inspect piping downstream of CV1340 for flow accelerated corrosion wear	11/19/2002
6. OTH019238	INPO SEN 164: "Extraction Steam Line Rupture"	2/18/2002

Document	Title	Revision / Date
7. OE015978	INPO SER 5-06 Flow-Accelerated Corrosion	10/26/2006
8. OE009068	OE-21384 - LaSalle Steam Leak on 13B Low Pressure Feedwater Heater Shell	10/25/2005
9. OE006187	OE20386 – Flow Accelerated Corrosion of LP Feedwater Drain End Cap (Palo Verde)	6/15/2005
10. OE016342	OE23342 – Pinhole steam leak in MSR reheat drain line elbow	11/20/2006
11. OE016155	OE23290 – (Surry) Pipe Wall Thinning in Condensate Polishing System	11/9/2006
12. OTH036338	Unplanned power reduction due to steam leak on 8"-GED-10 (6A dump line to condenser)	11/25/2003
13. LRTR-POE	Programs Operating Experience Review, Attachment 4.23, Flow-Accelerated Corrosion Program	Revision 0 10/2/2008
14 SSA 022898	Snapshot Assessment of FAC & SW/MIC	9/26/2007
15. 2005-001-1-008	Observation Report for Erosion Corrosion	5/10/2005
16. NG-07-0642	RFO20 FAC, Service Water and Fire Protection Outage Summary Report.	7/27/2007

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 were 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 - 6, and 10 are consistent with the corresponding elements of the GALL Report AMP, the staff will consider issuing RAIs for the following subjects:

> The applicant's program basis document indicated that, in addition to material loss due to flow-accelerated corrosion, this AMP would also be used to manage material loss due to erosion. According to GALL AMP XI.M17, the guidance for implementing an effective flow-accelerated corrosion program is provided in NSAC-202L, which specifically states that erosion due to cavitation, liquid impingement and other mechanisms is not part of a flow-accelerated corrosion program. Although the program basis document adequately addressed flow-accelerated corrosion, it did not provide any discussion regarding erosion within any of the applicable program elements. The staff will consider issuing an RAI to address this issue, and the staff's evaluation will be documented in the SER;
>
> In addition, LRA Section B.3.24.5, "Operating Experience," states that the flow-accelerated corrosion program has verified "that actual wear was less than or equal to predicted wear." However, in reviewing the flow-accelerated corrosion summary report from refueling outage 20 in 2007, there were several areas where the measure wear rate was greater than the predicted wear rate. In some cases, the measured wear rate was more than an order of magnitude greater than the predicted wear rate. The staff will consider issuing an RAI to address this issue, and the staff's evaluation will be documented in the SER.

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 sufficient 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:

> LRA, Appendix A, "Duane Arnold UFSAR Supplement," Section 18.1.24, "Flow-Accelerated Corrosion Program," states that this AMP includes performance of limited baseline inspections. The tables in the SRP-LR for the corresponding FSAR supplement discussed performance of baseline inspections, but did not indicate any limitations in these inspections.

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 sufficient to detect and manage aging;
>
> Identified a need for additional information regarding the adequacy of the program description in the FSAR Supplement

LRA AMP B.3.25, Fuel Oil Chemistry Program

In the DAEC LRA, the applicant states that AMP B.3.25, "Fuel Oil Chemistry Program" 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 UFSAR 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. Issues identified but not resolved in this report are addressed in the SER.

The first enhancement affects LRA program element 2 (preventive action). This enhancement expands on the existing program element by adding periodic draining or cleaning of the diesel fuel oil day tanks, diesel fire pump day tank and diesel driven air start air compressor fuel oil tanks on a schedule of every ten years.

The second enhancement affects LRA program element 3 (parameters monitored/inspected). This enhancement expands on the existing program element by adding a requirement to sample and test new fuel oil delivered to the Diesel Fire Pump day tank 1T089.

The third enhancement affects LRA program element 3 (parameters monitored/inspected). This enhancement expands on the existing program element by creating a procedure for testing the bottom thickness of the diesel fuel oil day tanks on a schedule of every ten years.

The fourth enhancement affects LRA program element 3 (parameters monitored/inspected). This enhancement expands on the existing program element to require particulate testing of fuel oil samples from the Diesel Fire Pump day tank 1T089.

The fifth enhancement affects LRA program element 3 (parameters monitored/inspected). This enhancement expands on the existing program element Create procedures for bottom thickness testing of the Standby Diesel Generator Fuel Oil Day Tanks (1T37A and 1T37B) and the Diesel Fire Pump Fuel Oil Day Tank (1T089) every ten years.

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

The first exception affects LRA program elements 1, 3 and 4 (scope of program, parameters monitored/inspected and acceptance criteria). In the GALL Report AMP, these program elements recommend using modified ASTM D 2276, Method A, for determination of particulates. The modification consists of using a filter with a pore size of 3.0 µm, instead of 0.8 µm. Alternatively, these program elements in the LRA state that for determination of particulates the Modified ASTM D 2276, Method A is recommended. DAEC uses the non-modified ASTM D 2276 which uses the more conservative filter pore size of 0.8µm verses the 3.0 µm as used by the Modified ASTM D 2276, Method A.

The second exception affects LRA program element 2 (preventive action). In the GALL Report AMP, this program element recommends that the quality of fuel oil is maintained by additions of biocides to minimize biological activity, stabilizers to prevent biological breakdown of the diesel fuel, and corrosion inhibitors to mitigate corrosion. Accordingly, these measures are effective in mitigating corrosion inside diesel fuel oil tanks. Alternatively, this program element in the LRA states that DAEC does not use fuel additives of biocides to minimize biological activity, stabilizers to prevent biological breakdown of the diesel fuel, and corrosion inhibitors to mitigate corrosion. The monthly testing for and removal of water and the purchase of quality fuel oil negates the need for additives.

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: "Fuel Oil Tank," "Day Tank Diesel," "Fuel Oil Supply Line."

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. LRAP-M030	Aging Management Basis Document, Fuel Oil Chemistry Program	Revision 2 3/24/2009
2. ASTM D 975-06b	Standard Specification for Diesel Fuel Oils	11/1/2006
3. ASTM D 4057-95	Standard Practice for Sampling of Petroleum and Petroleum Products	11/10/1995
4. ASTM D 1796-97	Standard Test Method for Water and Sediment in Fuel Oils by the Centrifuge Method (Laboratory Procedure)	12/10/2002
5. ASTM D 2709 -96	Standard Test Method for Water and Sediment in Middle Distillate Fuels by Centrifuge	1/10/1996
6.UFSAR/DAEC-1	UFSAR, Chapter 16, Technical Specifications	Revision 14 11/98
7. CE003253	Fuel Oil Leak from Fuel Oil Pump Discharge Fitting on 'A' SBDG	11/21/2005
8. LRTR-MOE	Technical Report, Mechanical Operating Experience Review, Attachment 4.17	Revision 0
9. WO 1113669	Pump Out 1T035, Filter Fuel Oil, Clean Out Tank, Perform Inspections and pump Fuel Oil Back in 1T035	04/28/2001
10. API 650	Welded Steel Tanks for Oil Storage	Ninth Edition 7/1993
11. CAP056139	NCQA – Question concerning quarterly diesel fuel oil testing	3/7/2008
12. STP 3.8.1-08A	SBDG Diesel Fuel Oil Test for 1T-37A (Viscosity and Water/Sediment)	Revision 3
13. STP 3.8.1-10	SBDG Diesel Fuel Oil Delivery Test	Revision 9
14.	DAEC Fire Plan – Volume 1, Program	Revision 56
15. STP 3.8.1-09	SBDG Diesel Fuel Oil Test for 1T-37A (Viscosity Water/Sediment and Particulate Contamination)	Revision 8

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 element 1, Scope of Program element 2, Preventive Actions, element 3, Parameters Monitored/Inspected element 4, Detection of Aging Effects and element 6 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:

Element 5, Monitoring and Trending of the LRA AMP was consistent with the corresponding elements of the GALL Report AMP;

Sufficient information was not available to determine whether elements 1, 2, 3, 4 and 6 (Scope of Program, Preventive Actions, Parameters Monitored/Inspected, Detection of Aging Effects and Acceptance Criteria) 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 2, 3 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 3 of the LRA AMP does not state if and how biological activity is monitored at DAEC. In the GALL Report AMP it recommends monitoring for microbiological organisms. It is not clear to the staff how biological activity is monitored and what action will take place if microbiological activity is found in diesel fuel oil;

In element 4 of the LRA AMP, it is stated that there are no equipment specific procedures required to validate the quality of the fuel oil in the diesel driven air start air compressor fuel oil tanks 1T-477 and 1T-478. In addition, it was also stated that these tanks are not subjected to periodic cleaning and visual inspection, or UT because the tanks are small, have high fuel turnover and general inspections indicate no degradation, and as such this is not considered an exception to the GALL. The staff disagrees with the assertion that in-scope fuel tanks not subjected to any of the elements recommended in the GALL AMP XI.30, is not an exception to GALL AMP XI.30. Further justification is needed for not subjecting these tanks to GALL recommendations;

In element 2 of the LRA AMP provides an enhancement to the Fuel Oil Chemistry Program to expand the existing program preventive action element to add periodic draining or cleaning of the diesel fuel oil day tanks, diesel fire pump day tank and diesel driven air start air compressor fuel oil tanks on a schedule of every ten years. GALL AMP XI.M30, element 2 (preventive action) states that periodic cleaning of a tank allows removal of sediment and periodic draining of water collected at the bottom of a tank minimizes the amount of water and the length of contact time. Further justification is needed for not subjecting these tanks to draining, cleaning and visual inspection on a ten-year interval.

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 sufficient 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:

Biodiesel B5 blend 1) can have a cleaning effect that can increase sediment that could plug filters, 2) could form "dirty water" which leads to algae growth, 3) is biodegradable such that long term storage is not recommended and 4) can be more susceptible to gel creation. These effects could lead to plant-specific operating experience outside the bounds of industry operating experience. What method(s) are being used to assure that biodiesel fuel is not inadvertently being introduced into DEAC fuel tanks?

The operating experience element of the LRA indicates that the main diesel fuel oil storage tank was drained, cleaned and ultrasonically inspected in April 2001. GALL AMP XI.M30 recommends visual examination after draining and cleaning. Was visual inspection performed at that time and will visual inspection be performed after draining and cleaning in the future?

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

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

In element 2 of the LRA AMP provides an enhancement to the Fuel Oil Chemistry Program to expand the existing program preventive action element to add periodic draining or cleaning of the diesel fuel oil day tanks, diesel fire pump day tank and diesel driven air start air compressor fuel oil tanks on a schedule of every ten years. GALL AMP XI.M30, element 2 "preventive action" states that periodic cleaning of a tank allows removal of sediment and periodic draining of water collected at the bottom of a tank minimizes the amount of water and the length of contact time. Further justification is needed for not subjecting these tanks to draining, cleaning and visual inspection on a ten-year interval.

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;

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

LRA AMP B.3.26, Fuse Holders Program

In the DAEC LRA, the applicant states that AMP B.3.26, "Fuse Holders Program" is a new program consisting of existing inspection/monitoring activities 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 as referenced to LRA Appendix A, Table A-1, DAEC License Renewal Commitments, Item No. 18. 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 UFSAR Supplement Appendix A, Section 18.1.26. Program elements 7 - 9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

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: "fuse," "holder," "corrosion," "oxidation," "block," "contamination," "electrical," "loose" and "thermography."

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. NUREG 1801	Generic Lessons Learned (GALL) Report Chapter XI, "Aging Management Programs (AMPS)," AMP XI.E5, "Fuse Holders."	Vol. 2, Revision 1 09/2005
2. LRAP-E005	Aging Management Program Basis Document – Fuse Holders	Revision 3 08/12/09
3. BECH-E514	Fuse Control Drawing Index	Revision 24 04/14/09
4. GMP-Test-48	Thermographic Monitoring of DAEC Equipment	Revision 33 01/09/2009
5. LRAM-EFH	Aging Management Report	Revision 5 08/12/09
6. PI-AA-102	Operating Experience Program	Revision 0 05/06/09
7. LRTR-EOE	Duane Arnold Energy Center License Renewal Project Electrical Operating Experience Review	Revision 1 07/09/09
8. CAP026365	Fuse Clip Damage	Revision N/A 03/25/2003
9. CAP035998	Fuse Block Insulating Ears Breaking Due to Age of Fuse Block	Revision N/A 04/17/2005

During its review, the staff noted that the referenced aging effects requiring management stated for LRA AMP B.3.26, basis document LRAP-E005, and aging management report LRAM-EFH

are not consistent with each other. Based on a staff discussion with the applicant, the applicant agreed to revise LRAP-E005 and LRAM-EFH to be consistent with the aging effects identified in LRA AMP B.3.26. The revised LRAP-E005 and LRAM-EFH were provided to the staff during the audit.

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

> Elements 2, 5 and 6 (Preventive Actions, Monitoring and Trending, and Acceptance Criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP;
>
> Sufficient information was not available to determine whether elements 1, 3 and 4 (Scope of Program, Parameters Monitor/Inspected, 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 numbers 1, 3 and 4 are consistent with the corresponding elements of the GALL Report AMP, the staff will consider issuing RAIs for the following subjects:

> LRA AMP B.3.26 does not provide a discussion as to why some of the aging stressors identified in GALL XI.E5 are not applicable to LRA AMP B.3.26;
>
> Duane Arnold report LRAM-EFH, “Aging Management Review for Fuse Holders,” Section 2.4, “Operating Environments and Exposures,” item 2.4.1, Environmental Conditions,” states that all fuse holders are located inside a cabinet, panel, or other electrical enclosure to protect the fuse holder from moisture. Item 2.4.1 also states that fuse holders will be exposed to ambient temperature conditions inside the electrical enclosure. However, LRAM-EFH Section 5.1 under “Corrosion” states that fuse holders are protected by their location within a controlled environment.

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, to be implemented by the applicant, is sufficient 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 UFSAR Supplement Appendix A, Section 18.1.26. The staff found that sufficient information was not available to determine whether the description provided in the UFSAR Supplement was an adequate description of the LRA AMP.

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

LRA Appendix A, "Duane Arnold UFSAR Supplement," Section 18.1.26, "Fuse Holders Program," does not include a frequency of inspection (every 10 years) consistent with the LR SRP Table 3.6-2;

Appendix A, Section 18.4, Table A-1 of the LRA, contains commitments for each new AMP. In this table the applicant uses words such as "develop" or "establish" to describe the action to be taken prior to the period of extended operation. The SRP-LR (tables 3.x-2 where x=1 through 6) recommends the use of very precise language to describe the actions to be taken prior to the period of extended operation. In reviewing the new AMPs the staff has, in general, found that the language used in the SRP is contained within the AMP. However, the staff recognizes that it is possible to develop an AMP without implementing it. Given the possibility that an AMP could be developed and not implemented, it is not clear to the staff that the wording used by the applicant is consistent with the wording used in the SRP-LR.

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, 3 and 4 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 sufficient to detect and manage;

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

LRA AMP B.3.27, Inaccessible Medium Voltage Cables Program

In the DAEC LRA, the applicant states that AMP B.3.27, "Inaccessible Medium Voltage Cables Program" is a new program that uses existing inspection/monitoring activities that is consistent with the program elements in GALL Report AMP XI.E3, "Inaccessible Medium-Voltage Cable Not Subject To 10 CFR 50.49 Environmental Qualification Requirements." The applicant committed to implementing this program prior to the period of extended operation as referenced to LRA Appendix A, Table A-1, "Duane Arnold License Renewal Commitments," Item No. 19. 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/Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) and 10 (Operating Experience) and the description of the program as contained in Appendix A, "Duane Arnold UFSAR Supplement," Section 18.1.27. Program elements 7 - 9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

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: "manhole," "electrical," "duct, "water," "submergence," "cable," "water tree," 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. NUREG 1801	Generic Lessons Learned (GALL) Report Chapter XI, "Aging Management Programs (AMPS)," AMP XI.E3, "Inaccessible Medium-Voltage Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements."	Vol. 2, Revision 1 09/2005
2. LRAM-ECAB	Aging Management Report - Electrical cables	Revision 3 12/29/08
3. LRAP-E003	Inaccessible Medium-Voltage Cables	Revision 3 08/14/08
4. AOP 902	Abnormal Operating Procedure AOP 902 Flood	Revision 35 Date N/A
5. CAP068541	Standing Water in Manhole 1MH109	Revision N/A 07/20/09
6. CAP0668665	Standing Water in Manhole 1MH207	Revision N/A 07/27/09
7. LRTR-EOE	Duane Arnold Energy Center License Renewal Project Electrical Operating Experience Review	Revision 1 07/09/09
8. BECH-E350	Underground Duct Bank Layout	Revision 5 06/17/09
9. E--353	Underground Duct Bank Layout Pump House Area	Revision 1 04/19/74
10. BECH-E351	Manhole Details	Revision 1 09/11/03
11. PI-AA-102	Operating Experience Program	Revision 0 05/06/09
Z19157	Pre-Planned Task – Electrical Manhole Sump Pump	08/11/2008
Z13642	Pre-Planned Task – 1A3 to 1B09 480V SWGR Trans	04/14/005
WO 1131221	1A4 to 1B20 480V Switchgear Transformer	07/27/2005
GMP-ELEC-09	Electrical Insulation Resistance Testing	Revision 17 04/16/09
OTH040313	NCAQ – Standing Water in Manhole 1MH109	Revision N/A 07/27/2009
FSK – 622	Duct Banks I-1, I-2, I-3 Profile	Revision 2 Date 1/6/72
FSK - 909	Duct Bank I-4	Revision 0 7/25/72

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

> Element 5 (Monitoring and trending) of the LRA AMP was consistent with the corresponding elements of the GALL Report AMP;

Sufficient information was not available to determine whether 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 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, 2, 3, 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 AMP XI.E3 program element 2, Preventive Actions, states that periodic actions are taken to prevent cables from being exposed to significant moisture, such as inspecting for water collection in cable manholes, and draining water, as needed. The applicant's aging management program basis document LRAP-E003, "Inaccessible Medium-Voltage Cables," aging management attribute 3.2, Preventive Actions, Section 3.2.2, DAEC Program Preventive Actions, states that the DAEC program consists of periodically inspecting the manholes for moisture and ensuring that the sump pumps in the manholes are operational. Section 3.2.2 further states that the sump pumps will drain the water as necessary and the sump pumps will keep the water below the level of the cables during normal seasonal conditions;

Based on staff walkdowns and review of the applicant's duct bank documentation, the staff notes that it's not clear that all manholes associated with GALL AMP XI.E3 medium voltage cables are equipped with sump pumps and associated alarms such that the operation of the sump pumps provides consistency with GALL AMP I.E3;

GALL AMP XI.E3 program element 3, Parameters Monitored/Inspected, states that the specific type of test will be determined prior to the initial test, and is to be a proven test for detecting deterioration of the insulation system due to wetting, such as power factor, partial discharge, or polarization index, as described in EPRI TR-103834-P1-2, or other testing that is state of the art at the time the test is performed;

The applicant's aging management program basis document LRAP-E003 Section 2.0, Description of Aging Management Program states that the testing methodology to be used is a resistance test (meggar). LRAP-E003, Section 3.3, Parameters Monitored or Inspected also states that the testing methodology to be used is an insulation resistance test (meggar). The Acceptance Criteria stated in Section 3.6 of LRAP-E003 is also based on the above specific testing;

Based on the above, the staff finds the applicant's basis document is not consistent with GALL AMP XI.E3 program element 3 and 6;

GALL AMP XI.E3, Scope of Program, states that significant moisture is defined as periodic exposure to moisture that lasts more than a few days (i.e., normal rain and drain) is not significant.

The applicant's aging management report LRAM-ECAB states in Section 5.1 that one of the conditions needed for water treeing to occur is the presence of continuous (long term) moisture. The applicant states cables in conduit embedded in the lowest floor of

the building, direct buried cables, and cables in buried ducts are assumed to be exposed to long term moisture. In addition, the applicant's basis document LRAP-E003 identifies cables subject to long term moisture as cables in a duct bank, embedded conduit (building base mat only), or direct buried. Further, LRA AMP B.3.27 states that the program includes medium voltage cables that support a license renewal function, are subject to submergence and are energized a significant portion of their life. LRA Appendix A, Section 18.1.27, UFSAR supplement also states that in-scope cables are medium-voltage cables exposed to significant moisture and energized a significant portion of their life;

Based on the above, LRAM-ECAB, LRAP-E003, LRA AMP B.3.27, and the UFSAR supplement are not consistent with the definition of significant moisture as stated in GALL AMP XI.E3, program element 1, "Scope of Program.";

GALL AMP XI.E3 Scope of Program states that the program applies to inaccessible medium-voltage cables within the scope of license renewal that are exposed to significant moisture simultaneously with significant voltage;

The applicant's basis document LRAP-E003 Table 7.2 lists all medium voltage cables and their applicability to LRA AMP B.3.27. Cable X00403D is listed as a medium voltage cable, having a license renewal function, energized more than 25 percent of the time, routed in embedded/duck bank, and therefore meeting the conditions for scoping for license renewal per 10 CFR 54.4. However, per Table 7.2 this cable does not require an AMP based on listed insulation type;

The staff finds that additional documentation is needed to confirm the cable insulation type for Cable X00403D and its exclusion from LRA AMP B.3.27;

Gall AMP XI.E3, program element 4, Detection of Aging Effects states that the first tests for license renewal are to be completed before the period of extended operation. GALL AMP XI.E3 also states that the first inspection for license renewal is to be completed before the period of extended operation. The applicant's basis document LRAP-E003 Section 3.4, Detection of Aging Effects, states that this is an existing testing activity and therefore the first test has already been performed;

The implementation schedule is not consistent with GALL AMP XI.E3.

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, to be implemented by the applicant, is sufficient 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 UFSAR Supplement Appendix A, Section 18.1.27. The staff found that sufficient information was not available to determine whether the description provided in the UFSAR Supplement was an adequate description of the LRA AMP.

In order to obtain the information necessary to verify the sufficiency of the UFSAR Supplement Appendix A, Section 18.1.27 program description, the staff will consider issuing RAIs for the following subjects:

GALL AMP XI.E3 states that significant voltage exposure is defined as being subjected to system voltage for more than twenty-five percent of the time;

The LRA UFSAR supplement states that medium voltage cables energized a significant portion of their life are in-scope. LRA AMP B.3.27 also states that the program includes medium voltage cables that are energized a significant portion of their life. The applicant's basis document LRAP-E003 states that continuously energized is defined as the feeder breaker being closed greater than 75 percent of the time. The applicant's aging management report LRAM-ECAB states that continuously energized means energized greater than 25 percent of the time;

LRA UFSAR supplement, basis document LRAP-E003, and LRA AMP B.3.27 are inconsistent with LR SRP Table 3.6-2, "FSAR Supplement for Aging Management of Electrical and Instrumentation and Control System," and GALL AMP XI.E3 which states that significant voltage exposure is defined as being subjected to system voltage for more than 25 percent of the time;

Appendix A, Section 18.4, Table A-1 of the LRA, contains commitments for each new AMP. In this table the applicant uses words such as ""develop or "establish" to describe the action to be taken prior to the period of extended operation. The SRP-LR (tables 3.x-2 where x=1through 6) recommends the use of very precise language to describe the actions to be taken prior to the period of extended operation. In reviewing the new AMPs the staff has, in general, found that the language used in the SRP is contained within the AMP. However, the staff recognizes that it is possible to develop an AMP without implementing it. Given the possibility that an AMP could be developed and not implemented, it is not clear to the staff that the wording used by the applicant is consistent with the wording used in the SRP-LR.

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 sufficient to detect and manage aging;

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

LRA AMP B.3.28 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program

In the DAEC LRA, the applicant states that AMP B.3.28 "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program" is a new program that is consistent with the program elements in GALL Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components." The applicant committed to implementing this program prior to the period of extended operation in DAEC License Renewal Commitment #20 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. Issues identified but not resolved in this report are addressed in the SER.

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: "internal surface inspection," "piping corrosion," and "ducting corrosion."

The table below lists the document which was reviewed by the staff and found relevant to the audit. This document was provided by the applicant.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. LRAP-M038	License Renewal Aging Management Program Basis Document, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	Revision 3 03/31/09

During the audit of program elements, the staff found that:

Program elements 1 - 4 and 6 (Scope, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, and Acceptance Criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP;

Sufficient information was not available to determine whether element 5 (Monitoring and Trending) of the LRA AMP was consistent with the corresponding elements of the GALL Report AMP.

In order to obtain the information necessarily to verify whether the LRA program element number 5 is consistent with the corresponding element of the GALL Report, the staff will consider issuing RAIs for the following subject:

> In Element 5 of the LRA AMP, specific commitments to trending of aging degradation, with inspection intervals dependent on component material and environment, and with consideration of industry operating experience are not provided for the staff to confirm the AMP Element's acceptability and consistency with the GALL Report AMP XI.M38.

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).

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 a RAI for the following subject:

> The LRA information regarding program element 10 (operating experience) does not adequately address industry experience. It is not clear to the staff that the industry operating experience and practices beyond DAEC will be searched and reviewed, and how it will be utilized for this AMP. The staff needs information on the DAEC search and review of industry experience and practices in planning and implementing this new AMP.

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 5 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.3.29, Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program

In the DAEC LRA, the applicant states that AMP B.3.29, "Inspection of Overhead Heavy Load and Light Load Handling Systems Program" is an existing program with enhancement 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 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 (LRA Section A.18.1.29). Program elements 7 - 9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

The enhancement affects LRA program element 3 (Parameters Monitored or Inspected). This enhancement expands on the existing program element by adding, (a) corrosion and wear as monitored parameters for the supporting steel and rails of the respective load handling and, (b) procedures for recording usage of the Reactor Building Crane and Turbine Building Crane.

In Section A.18.4 of the LRA, the applicant committed to implement this enhancement 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: "load handling," "crane," and "hoist."

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. LRAP-M023	Aging Management Program Basis Document: Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program	Revision 2 3/31/2009
2. ACP 1408.34	Lifting and Rigging Program	Revision 7
3. CRANE-H046-01	Equipment-Specific maintenance procedure	Revision 14

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.

During the audit, the staff found that:

> Elements 1 through 6 (Scope, 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 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 sufficient 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 (LRA Section A.18.1.29). 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 sufficient to detect and manage aging;

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

LRA AMP B.3.30, LUBRICATING OIL ANALYSIS PROGRAM

In the DAEC LRA, the applicant states that AMP B.3.30, "Lubricating Oil Analysis Program" is an existing program having one enhancement and no exceptions. The staff, however, found a potential exception. The applicant further states that the program is consistent with the program elements in the 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 updated FSAR Supplement. Program elements 7 - 9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scooping and screening methodology audit. This audit report does not consider the sufficiency of the potential exception. Issues identified but not resolved in this report are addressed in the SER.

The enhancement affects LRA program element 3 (Parameters Monitored/Inspected). This enhancement expands on the existing program element by adding the "Diesel Fire Pump 1P-049 to Oil Scope/Equipment Database for obtaining oil samples and required parameters to be monitored."

The potential exception relating to the Lubricating Oil Analysis Program is to ensure the oil environment in the mechanical systems is maintained to the required quality. It addresses the integrity of the incoming bulk oil as well as that of the in-service lubricating oil to be free of contaminants. To this end GALL XI.M39 calls for a number of parameters to be monitored/inspected, through various tests. For components with periodic oil changes, these tests identify particle count and water in the lubricating oil. For components that do not have regular oil changes the test for viscosity, neutralization number, and flash point are to be

performed. These parameters are monitored to verify the suitability of oil for continued use. In addition, analytical ferrography and elemental analysis are also to be performed to identify wear particles.

During its audit, the staff conducted walkdowns, interviewed the applicant's staff, and reviewed on-site documentation provided by the applicant. The staff also conducted several independent searches of the applicant's operating experience database. The first search focused on wear metal contaminants and oil additives. When the term "lube oil," is independently combined, with twelve variables, the number of results were: "zinc, 2" "silver, 2" "iron, 21" "copper, 16" "chromium, 2" "aluminum, 3" "lead, 37" "tin, 285" "nickel, 1" "molybdenum, 4" "magnesium, 10" "sodium, 3. There were no results, however, when paired with "titanium" "antimony," "boron" "barium" "phosphorous" "calcium" and "silicon," or "sand." Subsequently, the staff conducted an additional search using the keywords "lube oil," paired with "contam," "viscosity," "water," "soot," "ferrography," and "acidity." This new search yielded respectively 27, 45, 145, 0, 2, and 6 hits. A final search incorporating the keywords: lube oil," combined, once again separately with "pump," "outboard motor," "bearing," "pipe," "heat exchanger," yielded respectively 202, 10, 81, and 37 results. Not all entries, however, were strictly relevant to this AMP. Some hits were just character string recognitions.

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. DAEC LRAP-M039	Lubricating Oil Analysis Program, Program Basis Document with attachment 7.1 – Duane Arnold Energy Center (DAEC)	Revision 2 03/16/2009
2. ALEX	Database	
3. DAEC	Lubrication Program Manual, with attachments 1, 2, and 3	Revision 5
4. DAEC MD-045	Rotating Equipment Master Lube List	Revision 10
5. DAEC GMP-TEST-56	General Maintenance Procedure, Oil Samples – General	
6. DAEC PCP 4.33	Plant Chemistry Procedures 3200 Manual, Oil Chemistry	Revision 30
7.	Oil Scope Database	05/18/2008
8. CAP 031869	1P089B Upper reservoir oil dark in color	06/04/2004
9. CAP 033924	1G201A and B Oxidation life low	11/18/2004
10. CAP 005297	Lube oil sample from lower bearing of 1P201A (REACTOR RECIRC PUMP A) contaminated (3.3.3E-7 micro curries/ml)	10/28/1999
11. CAP 005296	Lube oil sample from upper bearing of 1P201A (REACTOR RECIRC PUMP A) contaminated (2.79E-7 micro curries/ml)	10/28/1999
12. CAP 008365	Unable to perform "Oilview Analysis" for 1H213 (LLRPSF BRIDGE CRANE) & 1P211A-M	01/09/2001
13. CAP 032678	Pulsa-lube 7H Hydraulic fluid new oil contamination level elevated	08/18/2004
14. CAP 042557	Evaluate suitability of sample containers for high temperature fluid samples.	06/04/2006
15. CAP 051314	1P101 [Pump] Oil/Water contamination history	07/25/2007
16. CAP 018906	1P022B ('B' RHR SERVICE WATER PUMP) indications of water	10/09/1997

Document	Title	Revision / Date
	in oil for the upper motor bearings	
17. CAP 030275	DAEC has experienced a number of failures of "Copper-Tubed Heat Exchangers"	01/05/2004
18. CAP 045183	1P001A ("A" Feedpump) indicating increasing copper wear debris trend in oil	11/02/2006
19. CAP 018906	1P022B ('B' RHR SERVICE WATER PUMP) indications of water in oil for the upper motor bearing	10/09/1997
20. CAP 000526	Particle counting of lube oil samples	01/26/1998
21. CAP 013887	NRC IN 2002-22, Degraded bearing surfaces in GM/EMD emergency diesel generators	07/08/2002
22. CAP 002970	Review type of lubricant used in 1K028A/B (BREATHING AIR COMPRESSOR)	02/17/1999
23. CAP 004514	1P022A-D (RHR SERVICE WATER PUMPS) upper/lower bearings indicating higher than normal contamination levels	09/10/1999
24. CAP 004736	1P008A & B (CONDENSATE PUMPs) upper oil samples contaminated	09/10/1999
25. CAP 030441	RCIC Pump inboard bearing oil color appears different than Mobil 797 (lead to ACE 001345)	01/20/2004
26. CAP 032066	1S274A indicates 30% Visc drop after 1 week of operation	06/22/2004
27. CAP 006328	Trend 1G021/GEN & 1G031/GEN (GENERATOR,EMER AC PWR TO 1A3&4,DIESELS) Iron Wear	02/04/2000
28. CAP 006854	Incorrect oil installed in 1P209B (CONTROL ROD DRIVE HYDRAULIC PUMP)	05/08/2000
29. CAP 047547	Copper flakes in "A" Sump during cleaning - Follow-up to CA044423	02/17/2007
30. RCE 000199	1P022B ('B' RHR SERVICE WATER PUMP) indications of water in oil for the upper motor bearing, Root Cause Evaluation	10/09/1997
31. Herguth Labs, # A28692	ID: 1g021/ENG - Fairbanks Morse 38TD Engine, Diesel	02/03/2009
32. Herguth Labs, # A28688A	ID: 1P004A-M - Upper Bearing, Circulating Water Motor	02/04/2009
33. DAEC.RBM Database	1P004A-M - Upper Bearing, Circulating Water Motor (Trending Document)	05/11/2009
34. Program Health Report	Predictive Maintenance Program Report, Self Assessment	
35. DAEC LTR-QUAL	Corrective Action, Confirmation Process, & Administrative Controls	Revision 1 08/06/2008

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. During the audit, the staff found that:

> Elements 1, 2 and 4 - 6 (Scope of the Program, Preventive Actions, Detection of Aging Effects, Monitoring and Trending, Acceptance Criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

Sufficient information was not available to determine whether element 3 (Parameters Monitored/Inspected) of the LRA AMP was consistent with the corresponding elements of the GALL Report AMP. In order to obtain the information necessary to verify whether the LRA program element 3 (Parameters Monitored/Inspected) is consistent with the corresponding element of the GALL Report AMP, the staff will consider issuing RAIs for the following subjects:

In LRAP-M039, DAEC Lubricating Analysis Program Basis Document, paragraph 3.3.2, the applicant maintains the DAEC parameters monitored or inspected are identified as listed in the GALL. In paragraph 3.6.2 of the same document, however, the applicant does not list the flash point as a test to be performed. To this end, the staff requests the applicant to provide justification for the exclusion. In addition, the applicant in the LRA has provided an enhancement to the element. The applicant will enhance the program element by adding Diesel Fire Pump 1P-049 to this element. In aging management scope of activities the LRA "should include the specific… components" subject to license renewal. The staff requests the applicant to provide a justification why the pump is considered a parameter and not a component in which case it should be listed with others in the scope of the 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 search is sufficient to allow the staff 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 also audited the description of the LRA AMP provided in the UFSAR 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 which require either additional information or evaluation, before consistency can be determined;

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

Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.3.31, Metal Enclosed Bus Program

In the DAEC LRA, the applicant states that AMP B.3.31, "Metal Enclosed Bus," is a new program with an exception that is consistent with GALL Report AMP XI.E4, "Metal Enclosed Bus." The applicant committed to implementing this program prior to the period of extended operation in reference to LRA, Appendix A Section 18.4 containing the list of commitment. 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. Issues identified but not resolved in this report are addressed in the SER.

The first exception affects LRA program element 4 (Detection of Aging Effects). In the GALL Report AMP, this program element recommends a five year frequency for visual inspection of bolted connections covered with insulation with no thermography or resistance measurement. Alternatively, this program element in the LRA states, the DAEC performs the visual inspection on a 6 year frequency as part of the major inspection of the associated transformer. The applicant also states that the inspection that have been performed since the bus bar insulation was replaced have not identified any degradation. Further, the applicant states that performing visual inspection on a 6-year frequency provides reasonable assurance that the metal enclosed bus will be maintained consistent with the current licensing basis through the period of extended operation.

During its audit, the staff conducted a walk down, 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: "bus," "metal," "connections," "duct," and "phase."

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. LRAP-E004	Duane Arnold Energy Center License Renewal Project Aging Management Program Basis Document Metal Enclosed Bus	Revision 4, 9/16/08
2. TRANSF-M175-01, Section B-5.12	Non-Segregated Phase Bus Inspection	Revision 3
3. LRAM-EBUS	Aging Management Review for Metal Enclosed Bus	Revision 2
LTR-EOE	Electrical Operating Experience Review	Revision 1, 7/9/09

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

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

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

> GALL AMP XI.E4, under Acceptance Criteria, states that MEBs are to be free from unacceptable visual indications of surface anomalies, which suggests that conductor insulation degradation exists. In addition no unacceptable indication of corrosion, crack, foreign debris, excessive dust buildup or evidence of moisture intrusion is to exist. When the visual inspection alternative for bolted connections is used, the absence of discoloration, cracking, chipping or surface contamination will provide positive indication that the bolted connections are not loose. In the basis document LRAP-E004, under the same element, the applicant stated that Maintenance Procedure TRANSF-M175-01 contains acceptance criteria. The applicant did not provide acceptance criteria in the associated aging management program basis document. This was needed to determine if any corrective actions are required to ensure that the structure and component intended function(s) are maintained under all CLB design condition during the period of extended operation. The staff discussed these inconsistencies with the applicant. The applicant agreed to revise the Acceptance Criteria Element in the basis document. The staff verified that this element is now consistent with the corresponding element in GALL AMP XI.E4.

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, to be implemented by the applicant, is sufficient 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 a generic RAI for the following subjects:

> The applicant's FSAR supplement is not consistent with that in LR SRP Table 3.6.2. LR SRP Table 3.6.2, "FSAR Supplement for Aging Management of Electrical and Instrumentation and Control System," states that the MEBs inspection will be implemented prior to the period of extended operation. The LRA Appendix A, "Duane Arnold UFSAR Supplement," Section 18.1.31, "Metal Enclosed Bus," does not include an implementation schedule (etc., first test for license renewal should be completed prior to the period of extended operation) consistent with the LR SRP. The staff noted that this inconsistency is applicable to other electrical AMPs. The staff is considering issuing a generic RAI and will resolve this issue in the SER.

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 element 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 sufficient to detect and manage aging;

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

LRA AMP B.3.32, One-Time Inspection Program

In the DAEC LRA, the applicant states that AMP B.3.32, "One-Time Inspection Program" 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 License Renewal Commitment 25 of LRA Table A-1. 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 UFSAR Supplement. Program elements 7 - 9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

During its audit, the staff conducted 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: "One Time Inspection."

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. LRAP-M032	One Time Inspection Aging Management Basis Document	Revision 2 3/18/2009
2. Work Order 144320	Replace Relief Valve	3/10/2008
3. Work Order 1139549	Inspect & Clean, AI to Perform Internal & External Inspection	10/02/2008

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 were 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 was 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 RAIs for the following subjects:

Element 4 of the LRA AMP states that the examination techniques will be visual, surface, volumetric, or other appropriately established NDE methods. In the GALL Report AMP it states that the inspection includes a representative sample of the system population, and, where practical, focuses on the bounding or lead components most susceptible to aging due to time in service, severity of operating conditions, and lowest design margin. It is not clear to the staff that these statements are consistent because the LRA B.3.32, OTI program and the associated basis document do not provide criteria that will be used to select locations and sample size for OTI inspection nor the techniques to be used to detect the various aging mechanisms;

In Element 4 of the LRA AMP the timing of inspections is not identified. In the GALL Report AMP it states that with respect to inspection timing, the population of components inspected before the end of the current operating term needs to be sufficient to provide reasonable assurance that the aging effect will not compromise any intended function at any time during the period of extended operation. It is not clear to the staff that all OTIs can take place in the last RFO before entering the period of extended operation.

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 not sufficient to allow the staff 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.

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:

Although there is no captured plant-specific OE related to this program because this program is yet to be developed, any OE resulting from maintenance etc. should be included for systems and components that will be subjected to OTI. The applicant was requested to provide a summary of OE resulting from observations resulting from maintenance and corrective action activities.

The staff also audited the description of the LRA AMP provided in the UFSAR 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;

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

LRA AMP B.3.33, Open Cycle Cooling Water System

In the DAEC LRA, the applicant states that AMP B.3.33, "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 UFSAR Supplement. Program elements 7 - 9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

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: "emergency service water" and "service water pipe".

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. Commitment 890292	Prepare report to licensing on NRC GL 89-13; service water system problems affecting safety-related equipment	01/05/90
2. Commitment 890293	Respond to GL 89-13; service water system problems affecting safety-related equipment	01/29/90
3. Commitment 890416	Safety-related service water program (prior to cycle 11 startup). (Integrated Plan, Schedule B Item)	10/01/90
4. NG-90-2404	Letter, NRC Region III to DAEC, Docket 50-331	10/9/90

Document	Title	Revision / Date
5. NG-91-2825	Letter, from DAEC	9/19/91
6. NG-93-4548	Letter, from DAEC	10/22/90
7. NG-93-4733	Letter, from DAEC	11/5/93
8. Commitment 930572	Address actions described in para. 1 of NG 93-4548, attachment NG 93-4580	02/28/94
9. Commitment 920573	Address the actions described in para. 2 of NG 93-4548, attachment (NG 93-4580	30/31/94
10. Commitment 930574	Address the actions described in para. 4 of NG 93-4548, attachment (NG 93-4580	05/4/94
11. NG-94-1767	Letter, from DAEC	5/4/94
12.	Heat Exchanger Program	Rev 1 / 8/8/07
13. ACP 1208.4	GL 89-13 Heat Exchanger Thermal Performance and Trending Program	Rev 9 / 12/5/06
14.	Service Water and Fire Protection Monitoring Program, Part C	Rev 9 / 4/23/07
15. ACP 1208.4	GL 89-13 Heat Exchanger Performance & Trending	Rev 9 / 12/5/06
16. ACP 1208.5	Service Water Reliability Program	Rev 2 / 3/15/05
17. PCP 9.2	Chemical Additions to Plant Systems	Rev 22 / 8/6/08
18. CAP015656	Internal Coating of GSW Piping	7/16/96
19. CAP048131	ESW Piping below 87.5% of Nominal Wall Thickness	3/5/07
20. CAP048030	ESW Piping below 87.5% of Nominal Wall Thickness	3/2/07
21. CAP002592	Improvements in Heat Exchanger Testing	10/23/98
22. CAP060852	ESW Piping below 87.5% of Nominal Wall Thickness	10/9/08
23. CAP059918	ESW Piping below 87.5% of Nominal Wall Thickness	8/29/08
24. CAP053151	ESW Piping below 87.5% of Nominal Wall Thickness	10/13/07
25. CAP047747	ESW Piping below 87.5% of Nominal Wall Thickness	2/22/07
26. CAP046167	ESW Piping UT Thickness Results Require Evaluation	1/2/07
27. CAP025481	ESW Piping below 87.5% of Nominal Wall Thickness	2/7/03
28. CAP025471	UT Service Water exam found areas below 87% of Nominal Thickness	2/7/03
29. CAP025466	UT Service Water exam found areas below 87% of Nominal Thickness	2/6/03
30. CAP018014	Calculations for psi loss across River Water Supply filters	4/24/97
31. CAP015131	Found GSW Pipe Leak in Recirc MG-Set Room	5/8/96
32. CAP006357	Thin pipe in GSW piping to MG set lube oil coolers	4/12/95

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

> Elements 1, 4, and 6 (scope, detection of aging effects, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP;
>
> Sufficient information was not available to determine whether elements 2, 3, and 5 (Preventive Actions, Parameters Monitored or Inspected, 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 2, 3, and 5 are consistent with the corresponding elements of the GALL Report AMP, the staff will consider issuing RAIs for the following subjects:

In elements 2, 3, and 5 of the LRA AMP it states that open cycle cooling water piping is constructed from carbon steel which is not lined or coated. In the GALL Report AMP it states that system components should be constructed of appropriate materials and be lined or coated to protect the underlying metal surfaces. Corrosion rates of lined piping exposed to open cycle cooling water are expected to be much lower than those experienced by unlined pipe. Since the GALL Report AMP is designed to manage the corrosion of lined pipe, it is not clear that the LRA AMP, which claims consistency with the GALL AMP, will adequately manage the aging of the unlined pipe. The inclusion of unlined pipe in the LRA AMP is considered to be an exception to the GALL 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 sufficient 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 UFSAR 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 sufficient to detect and manage aging;

Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.3.34, Reactor Head Closure Studs Program

In the DAEC LRA, the applicant states that AMP B3.34, Reactor Head Closure Studs Program is an existing program 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, 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, Appendix A18.1.34. Program elements 7 - 9 (Corrective Actions,

Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

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: "closure studs," "loss of preload."

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. LRAP-M0003	AMP Basis Document, Reactor Head Closure Studs Program	Revision 2 3/18/2009
2. LRAP-M0003, Reference 6.10	Reference Material, Reactor Head Closure Studs, Pipe Machinery Company, Material Test Certificates	9/7/1971
3. RFP-210,	Refueling Procedure, Reactor Pressure Vessel Reassembly	Revision 10
4.	Inservice Inspection Administrative Document, ASME Section XI, Attachment III	Revision 12 9/24/2008
5. Report No. I03002	UT Calibration data sheets C-033 and 034	4/10/2003

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

> Elements 1 - 3, 5 and 6 (Scope, Preventive Actions, Parameters Monitored or Inspected, Monitoring and Trending, and Acceptance Criteria) of the LRA AMP were 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 was 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 elements of the GALL Report AMP, the staff will consider issuing an RAI for the following subject:

> In the GALL Report AMP it states that examination category B-G-1 for pressure retaining bolting greater than 2" diameter in reactor vessels…surface and volumetric examination of studs when removed is recommended. Element 4 of the LRA AMP Basis Document references Attachment III of the Inservice Inspection Administrative Manual, Attachment III, Table IWB-2500-1, Examination Category B-G-1, for Reactor Vessel closure head studs and nuts, under footnote 7, states that when bolts or studs are removed for examination, surface examination meeting the acceptance standards of IWB-3515 may be substituted for volumetric examination. These statements are not consistent because the applicant stated in Attachment III that either surface or volumetric examination will be performed when bolts or studs are removed for examination.

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 sufficient 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, Appendix A.18.1.34. 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 sufficient to detect and manage aging;
>
> Verified that the description provided in the FSAR Supplement is an adequate description of the program.

LRA AMP B.3.35, Reactor Vessel Surveillance

In the DAEC LRA, the applicant states that AMP B.3.35, "Reactor Vessel Surveillance" is an existing program with two enhancements that are consistent with the program elements in GALL Report AMP XI.M31, "Reactor Vessel Surveillance." 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 Section 18.1.35. Program elements 7 - 9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit.

The two enhancements affect LRA program elements 1, 3, 4 and 5 (Scope, Parameters Monitored or Inspected, Detection of Aging Effects, and Monitoring and Trending). The first enhancement expands on the existing program element by adding the development of a procedure to evaluate the BWRVIP ISP data as it becomes available. The evaluation will determine the effect of the data on the DAEC reactor vessel beltline materials and the plants operating limits. The second enhancement expands on the existing program element by adding the development of requirements to ensure that in the future all capsules pulled from the vessel

will be placed in storage after being tested. In Table A-1 (Items 26 and 27) 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 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. LRAP-M0031	Reactor Vessel Surveillance Program	Revision 2 3/18/09
2. LRTR-POE	Programs Operating Experience Review, Section 2.1.31, and Attachment 4.31	Revision 0 11/17/08
3. APED-B11-067	DEAC Drawing – Surveillance Program	Revision 3 4/8/09
4. DAEC STP – NS620002	Surveillance Test Procedure – NIL Ductility Transition Sample Test	Revision 6

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.

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 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 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 sufficient to detect and manage aging effects during the period of extended operation. The staff confirmed that the next planned surveillance capsule retrieval is planned for 2013 per the BWRVIP-86-A schedule.

The staff also audited the description of the LRA AMP provided in the FSAR Supplement Section 18.1.35. 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;

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

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

DAEC LRA AMP B.3.36 Selective Leaching of Materials Program

In the DAEC LRA, the applicant states that AMP B.3.36 "Selective Leaching of Materials Program" is a new program that is consistent with the program elements in GALL Report AMP XI.M33, "Selective Leaching of Materials." 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). Program elements 7 - 9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

During its audit, the staff conducted interviews of 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: "selective leaching," "dealuminification," "graphitization," "dealloying," "gray cast iron," "copper alloy," and "dezincification."

The table below lists the document which was reviewed by the staff and found relevant to the audit. This document was provided by the applicant.

Relevant Documents Reviewed

Document	Title	Revision / Date
1. LRAP-M033	DAEC License Renewal Project Aging Management Program Basis Document, "Selective Leaching of Materials Program"	Revision 3, 04/06/09

During the audit, the staff found that:

Elements 2 and 5 (Preventive Actions and Monitoring and Trending) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP;

Elements 1, 3, 4 and 6 (Scope of Program Parameters Monitored or Inspected, Detection of Aging Effects, Acceptance Criteria) of the LRA AMP were not strictly 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 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 basis for the inspection population for the selected set of sample components for the one-time visual and hardness measurement is not clear, and a requirement to evaluate the external surface, as well as internal, where appropriate, is not specified;

In Element 3 of the LRA AMP, the parameters to be monitored or inspected, including the methods or techniques to be used, are not adequately described, and the specifics of the hardness measurements or other inspection techniques are not identified;

In Element 4 of the LRA AMP, the basis for the inspection population for the selected set of sample components for the one-time visual and hardness measurement is not clear, a requirement to evaluate the external surface, where appropriate, is not specified, and what are acceptable as "other mechanical tests" is not identified;

In Element 6 of the LRA AMP, the acceptance criteria and details for hardness and other mechanical inspection techniques are not identified and sufficiently described. Also, from the LRA AMP description, it is not clear what constitutes "identification of selective leaching," which would lead to further engineering evaluation and, if necessary, a root cause analysis.

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 sufficient 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:

The LRA information regarding program element 10 (operating experience) does not adequately address industry experience. It is not clear to the staff that the industry operating experience and practices beyond DAEC will be searched and reviewed, and how it will be utilized for this AMP.

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 verified that the LRA program elements 2 and 5 are consistent with the corresponding program elements in the GALL Report while identifying certain aspects of LRA program element 1, 3, 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.3.37 Structures Monitoring Program

In the DAEC LRA, the applicant states that AMP B.3.37, “Structures Monitoring Program” is an existing program with enhancements that is consistent with the program elements in GALL Report AMP XI.S6, “Structures Monitoring Program.” The LRA also states that the Duane Arnold Structures Monitoring Program incorporates the required elements of GALL Report AMPs XI.S5, “Masonry Wall Program,” and XI.S7, “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, Preventive Actions, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria) and 10 (Operating Experience) for each of the three GALL Report AMPs, and the description of the program as contained in the UFSAR Supplement. Program elements 7 - 9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

The first enhancement affects LRA program element 1 (Scope of Program). This enhancement expands on the existing program element by adding structures to the scope of the Structures Monitoring Program which are not covered in the current Maintenance Rule Program.

The second enhancement affects LRA program element 3 (Parameters Monitored or Inspected). This enhancement expands on the existing program element by including periodic sampling of groundwater for chloride concentration, sulfate concentration, and pH on a 10 year basis.

The third enhancement affects LRA program element 3 (Parameters Monitored or Inspected). This enhancement expands on the existing program element by including elastomer inspections for deterioration of seals leading to loss of sealing and leakage through Containment Penetrations.

The fourth enhancement affects LRA program element 4 (Detection of Aging Effects). This enhancement expands on the existing program element by including a requirement for contacting the proper personnel to allow for opportunistic inspections following an excavation that exposes a buried concrete foundation.

The fifth enhancement affects LRA program element 4 (Detection of Aging Effects). This enhancement expands on the existing program element by including a ten year evaluation of opportunistic inspections of buried concrete.

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

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: "rebar corrosion," "concrete repair," "intake structure," "spalling," "masonry wall degradation," and "cement wall degradation."

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. LRAP-S006	Aging Management Program Basis Document – Structural Monitoring Program	Rev. 2 3/16/09
2. DAEC Maintenance Rule Program	Module 6 – Monitoring of Structures *Online Accessible* 10 Years Inspection – Parts I & II	Rev. 3a 2009
3. Technical Report – LRTR-004	Aging Effects Applicability Evaluation for Structures	Rev. 2 2/13/09
4. CA041787	Quantify and Identify Source of Drainage from Spent Fuel Pool Liner Drains	
5. CA042480	Inspect New Fuel Storage Vaults	3/13/2006
6. Work Order A78892	Fool Pool Cooling & Cleanup	
7. CAP068913	Maintenance Rule Structures CWOs Closed Without Repair, now Reopened	8/10/09
8. ACP 1203.60	Masonry Wall Analysis	Rev. 0
9. AOP 902	Flood	Rev. 28
10. LRAP-M020	Open-Cycle Cooling Water System	Rev. 6
11. FP-E-MOD-04	Design Inputs	Rev. 3
12. QF-0515B	Design Input Checklist	Rev. 6
13. ACP 1408.29	Excavation and Trenching Controls	Rev. 5

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.

During the audit, the staff found that:

> Elements 1, 2, 5, and 6 (Scope of Program, Preventive Action, Monitoring and Trending, and Acceptance Criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMPs;

Sufficient information was not available to determine whether elements 3 and 4 (Parameters Monitored or Inspected, 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 numbers 3 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 3 of the LRA AMP it states that periodic sampling of groundwater for chloride concentration, sulfate concentration, and pH will be done on a 10 year basis. In the GALL Report AMP XI.S6, it states that parameters monitored or inspected are selected to ensure that aging degradation will be detected. Parameters are to be commensurate with industry codes, standards and guidelines. Industry standards (ACI 349.3R-96) suggest a five year inspection frequency for structures in an aggressive environment. It is not clear to the staff that these statements are consistent because the staff believes the sampling for an aggressive environment should be at least as frequent as the inspection of structures located in an aggressive environment;

In element 4 of the LRA AMP it states that the Structures Monitoring Program inspection frequency will be five or ten years plus or minus one year depending on the environment. In the GALL Report AMP it states that inspection methods and schedule are selected to ensure that aging degradation will be detected before there is a loss of intended function. The methods and schedule are to be commensurate with industry codes, standards and guidelines. Industry standards (ACI 349.3R-96, RG 1.127) suggest a five or ten year inspection frequency with no mention of a one year extension. It is not clear to the staff that these statements are consistent.

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 sufficient 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 UFSAR 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 3 and 4 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 sufficient to detect and manage aging;

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

LRA AMP B.3.38, Thermal and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program

In the DAEC LRA, the applicant states that AMP B.3.38, "Thermal and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program" is a new program that is consistent with the program elements in GALL Report AMP XI.M13, "Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)." The applicant committed to establishing this program prior to the period of extended operation in Table A-1 of Section 18.4 of the LRA. 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 Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program FSAR Supplement, described in Section 18.1.38. Program elements 7 - 9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

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: "cast austenitic," "CASS," "SA 351," "thermal embrittlement," "neutron irradiation," fuel support casting," "core spray sparger," "jet pump ram head," and "jet pump nozzles."

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.LRAP-M013	Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)	Revision 2 3/17/2009
2.FPL-FLU-001-R-005	Non-Proprietary Version of Duane Arnold Energy Center Core Shroud, Top Guide, Jet Pump, Core Support Plate and Core Spray Sparger Component Fluence Evaluation at 32 EFPY and 54 EFPY	Revision 0 1/18/2008
3. DAEC-RFO-20-07-955-JXH5N-KE1	QA Documentation Package for Refueling Outage Number 20	2/2007

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

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

Sufficient information was not available to determine whether elements 1 and 4 (Scope of Program and 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 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:

In Element 1 of the applicant's basis documentation, LRAP-M013, it states that the Hull's equivalent factors were used to calculate the ferrite content in their plant-specific CASS material. The applicant used 0.0 weight percent for molybdenum and 0.04 weight percent for nitrogen in their calculations. The applicant did not provide basis for the use of the molybdenum concentration and only indicated that the nitrogen concentration came from NUREG/CR-4513, Rev. 1. The GALL Report AMP states that the method to determine susceptibility includes evaluating the ferrite content of the material. The GALL Report continues to explain that it is acceptable to evaluate the ferrite content by using the Hull's equivalent factors as described in NUREG/CR-4513, Rev. 1. It is not clear to the staff why the applicant uses 0.0 weight percent for the molybdenum concentration when the maximum concentration could be as high as 0.5 weight percent, which would be more conservative. It is also not clear to the staff why the applicant chose to use 0.04 weight percent for nitrogen concentration because NUREG/CR-4513, Rev. 1 indicates that CASS material could have lower nitrogen concentrations, which would be more conservative;

In Element 4 of the applicant's basis documentation, LRAP-M013, it states that the aging management program will use enhanced VT-1 visual inspections, which would be able to detect the critical flaw size for this degradation process with adequate margin. The GALL Report indicates that an example of a supplemental examination is enhancement of the visual VT-1 examination that could include the ability to achieve a 0.0005-in. resolution, with the conditions (e.g., lighting and surface cleanliness) of the inservice examination bounded by the conditions used to demonstrate the resolution of the inspection technique. It is not clear to the staff from the technical basis document that the applicant's aging management program would be able to detect an embrittlement flaw because there is no information that supports this claim.

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 sufficient 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 Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program FSAR

Supplement, described in Section 18.1.38. 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 Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program FSAR Supplement program description, the staff will consider issuing an RAI for the following subject:

> The applicant's License Renewal Commitment states that the Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program will be established prior to the period of extended operation. The GALL Report indicates that this program should be implemented prior to the period of extended operation. It is not clear to the staff if the applicant's decision to establish the program prior to the period of extended operation is consistent with the GALL Report guidance to implement the program prior to the period of extended operation.

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 sufficient to detect and manage aging;
>
> Identified a need for additional information regarding the adequacy of the program description in the FSAR Supplement.

LRA AMP B.3.39, Water Chemistry Program

In the DAEC LRA, the applicant states that AMP B.3.39, "Water Chemistry Program" 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 Water Chemistry FSAR Supplement, described in Section 18.1.39. Program elements 7 - 9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

During its audit, the staff conducted a walkdown of the applicant's water chemistry laboratory, 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: "pH," "Dissolved Oxygen," "Fluoride," "Sulfate," "Chloride," "NMCA," "Noble Metal," "Zinc," "Silica," "Hydrogen," "Sodium," "Potassium," "Nitrate," "Chromate," and "Borate."

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. LRAP-M002	Water Chemistry	Revision 3 3/16/09
2. LRTR-CHEM	Chemistry Dissolved Oxygen Levels	Revision 1 6/23/09
3. PCP 1.9	Water Chemistry Guidelines	Revision 40
4. PCP 1.16	Chemistry BWRVIP Program	Revision 2 1/30/2009
5. ACP 1411.10	Water Chemistry Control	Revision 8
6.	Strategic Chemistry Plan	Revision 6
7. RCEM	Root Cause Evaluation Manual	Revision 17
8. CAP005480	Two Linear Indications Found in Recirc Riser Nozzle N2B, Weld # RRB-F002	11/15/1999
9. CAP005535	Indications Indicative of IGSCC Found in Recirculation Inlet Nozzle N2F Weld #	11/10/1999
10. CAP025376	Multiple Chemistry Parameters Exceeded Action Levels Per PCP 1.9	2/1/2003
11. CAP025632	Exceeded Action Level 3 for Sulfates in Reactor Water	2/14/2003
12. CAP036173	Conductivity > PCP 1.9 Action Level 2 for > 24 Hours (Value is 1.083 µS/cm)	4/27/2005
13. CAP048495	Reactor Water Chlorides and Sulfates Exceeded Action Level 3 Values	3/18/2007
14. CAP058018	NCAQ - Condensate Service Water Chloride > PCP 1.9 Recommended Limit	5/30/2008
15. CAP061735	NCAQ – FW Zinc Value Exceeds Chemistry Action/Abnormal Limit of > 0.4 ppb	11/13/2008
16. CAP061735	NCAQ – Zinc Analysis for FW Total Metals Exceeded Expected Range Per PCP Form 207	12/23/2008
17. CAP065601	NCAQ – Elevated Rx Sulfate and Hotwell Conductivities	3/5/2009
18. CAP066217	NCAQ – Elevated Feedwater Zinc	4/1/2009
19. CAP067771	NCAQ – Feedwater Metals Samples had Higher Than Expected Total Zinc Concentration	6/8/2009

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

> Elements 1, 2, 4, and 6 (Scope of Program, Preventive Actions, Detection of Aging Effects, and Acceptance Criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP;
>
> Sufficient information was not available to determine whether elements 3 and 5 (Parameters Monitored or Inspected 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 3 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 3 of the applicant's basis document, LRAP-M002, it states that DAEC uses EPRI BWR Water Chemistry Guidelines as the basis for plant water chemistry control. This is consistent with the GALL Report, which states that the concentration of controlled water chemistry parameters can follow the guidance provided in the EPRI BWR Water Chemistry Guidelines. While the EPRI BWR Water Chemistry Guidelines indicate that the condensate dissolved oxygen concentration should be monitored, it is not clear to the staff if the applicant monitors the condensate dissolved oxygen concentration consistent with the EPRI guidelines;

In element 5 of the applicant's basis document, LRAP-M002, it states that DAEC does not contain specific guidance on increasing sampling after corrective actions have been taken to address an abnormal chemistry condition. The GALL Report AMP states that if corrective actions are taken to address an abnormal chemistry condition, it is suggested to increase the sampling to verify that the corrective actions are being effective. It is not clear to the staff that these statements are consistent, because the applicant will not be changing its monitoring frequency to verify the effectiveness of any corrective actions.

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 sufficient to detect and manage aging effects during the period of extended operation. Furthermore, staff determined that there is a process at DAEC through the RCEM document that provides the procedure to determine how an excursion in the water chemistry affects the other aging management programs.

The staff also audited the description of the LRA AMP provided in the Water Chemistry FSAR Supplement, described in Section 18.1.39. 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 sufficient to detect and manage aging;

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

LRA AMP B.4.1, Environmental Qualification Program

In the DAEC LRA, the applicant states that AMP B.4.1, "Environmental Qualification Program" is an existing program that is consistent with the program elements in GALL Report AMP X.E1, "Environmental Qualification (EQ) of Electric Components." 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 UFSAR Supplement Appendix A, Section 18.2.1 and 18.3.3. Program elements 7 - 9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

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: "EQ," "Qualification," "Environmental," "Electrical," "Cable," Component," and "Program."

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. NUREG 1801	Generic Lessons Learned (GALL) Report Chapter X, "Time-Limited Aging Analysis Evaluation of Aging Management Programs Under 10 CFR 54.21(c)(1)(iii)," AMP X.E1, "Environmental Qualification of Electric Components."	Vol. 2, Revision 1 09/2005
2. Regulatory Guide 1.89	Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants	Revision 1 11/20/2008
3. LRAP-XE01	Environmental Qualification of Electrical Components	Revision 3 06/18/09
4.PDA-08-001	FPLE Duane Arnold Nuclear Oversight Quality Report	Revision N/A 03/03/08
5. OTH018631	EQ Program Requires a Self-Assessment to be Performed in 2007	04/05/2007
6. 2004-003-1-013	Nuclear Oversight Observation Report	Revision N/A 08/18/2004
7. OTH021460	NCAQ Cable Replacements Required due to EQ Qualified Life Issues – License Renewal Project	Revision N/A 08/20/2007
8. PI-AA-102	Operating Experience Program	Revision 0 05/06/09
9. A662359S	Work Order - Electric Cables Inside Flex Damaged	Revision N/A 04/17/2005
10. LRTR-EOE	Duane Arnold Energy Center License Renewal Project Electrical Operating Experience Review	Revision 1 07/09/09

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

Elements 1 - 6 (Scope of Program, Preventive Actions, Parameters Monitored/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 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 sufficient 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 UFSAR 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;

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

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

LRA AMP B.4.2, Metal Fatigue of Reactor Coolant Pressure Boundary Program

In the DAEC LRA, the applicant states that AMP B.4.2, "Metal Fatigue of Reactor Coolant Pressure Boundary Program" is an existing program with an enhancement that is consistent with the program elements in GALL Report AMP X.M1, "Metal Fatigue of Reactor Coolant Pressure 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 (LRA Section A.18.2.2). Program elements 7 - 9 (Corrective Actions, Confirmation Process, and Administrative Controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

The enhancement affects LRA program element 1 (Scope). This enhancement expands on the existing program element by adding the NUREG/CR-6260 locations in the implementing procedure for the DAEC Metal Fatigue of Reactor Coolant Pressure Boundary Program.

In Section A.18.4 of the LRA, the applicant committed to implement this enhancement 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: "CUF," "fatigue," "dissolved oxygen."

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. LRAP-XM01	Aging Management Program Basis Document Metal Fatigue of Reactor Vessel Coolant Pressure Boundary	Revision 1 8/05/2009
2. CAP007334	Rapid temperature drop in bottom head drain following SCRAM	Rev. 0 6/24/2000
3. CAP054741	CAQ-Reactor bottom head drain line cooldown and heatup rate limits exceeded	Rev. 0 01/11/1008
4. OTH009762	Structural Integrity Associates, Inc. review of "RPV Thermal Transient" due To Scram on 6/23/2000	Rev. 0 10/02/2000
5. CAP045469	Inconsistencies in assumptions for various calcs W.R.T. fatigue cycles	Rev. 0 11/16/2006
6. CA044534	NCAQ Inconsistencies in assumptions for various calcs W.R.T. fatigue cycles	Rev. 0 11/20/2006
7. DAEC-20Q-301	SIA calculation package, "40-year and 60-year cycle projections"	Rev. 1 02/22/2008
8. AEC-20Q-316	SIA calculation package, "RPV fatigue analysis for 60 year plant life"	Rev. 0 03/11/2008

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

> Elements 1, 2, 3, 5, 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 element 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 element of the GALL Report AMP, the staff will consider issuing an RAI for the following subject:

> In Element 4 of the LRA AMP, it states that the DAEC thermal cycle monitoring program is performed periodically on a frequency of at least once every fuel cycle. In the GALL Report AMP, it states that the program provides for periodic update of fatigue usage calculations. It is not clear to the staff that these statements are consistent because tracking cycles alone, as Element 4 indicated it will do, is insufficient in situations in which unanticipated events occurred or structural geometry/configuration was modified.

Under these circumstances, stress state is most likely changed, which will affect fatigue usage. Therefore, updating cycles alone is not enough fully meeting the AMP requirements.

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 sufficient 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 (LRA Section A.18.2.2). The staff found that sufficient information was not available to determine whether the description provided in the FSAR Supplement (LRA Section A.18.2.2) was an adequate description of the LRA AMP.

In order to obtain the information necessary to verify the sufficiency of the FSAR Supplement (LRA Section A.18.2.2) program description, the staff will consider issuing RAI for the following subject:

The applicant devoted the entire section for discussing environmental fatigue evaluation. While addressing the reactor water environment on fatigue life is important, the most vital part of the Metal Fatigue of Reactor Coolant Pressure Boundary Program is to track the transient cycles and fatigue usage. However, this important part of the program is missing in the program description.

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 sufficient to detect and manage aging;
identified a need for additional information regarding the adequacy of the program description in the FSAR Supplement.