NEXTera ENERGY
DUANE ARNOLD

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U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Duane Arnold Energy Center
Docket 50-331
License No. DPR-49

Response to Request for Additional Information for the Review of the Duane Arnold Energy Center License Renewal Application - Batch 3

References:

1. Letter, Richard L. Anderson (FPL Energy Duane Arnold, LLC) to Document Control Desk (USNRC), "Duane Arnold Energy Center Application for Renewed Operating License (TSCR-109)," dated September 30, 2008, NG-08-0713 (ML082980623)
2. Letter, Richard L. Anderson (FPL Energy Duane Arnold, LLC) to Document Control Desk (USNRC), "License Renewal Application, Supplement 1: Changes Resulting from Issues Raised in the Review Status of the License Renewal Application for the Duane Arnold Energy Center," dated January 23, 2009, NG-09-0059 (ML090280418)
3. Letter, Brian K. Harris (USNRC) to Christopher Costanzo (NextEra Energy Duane Arnold, LLC), "Request for Additional Information for the Review of the Duane Arnold Energy Center License Renewal Application - Batch 3 (TAC No. MD9769)", dated January 6, 2010 (ML093630034)

By Reference 1, FPL Energy Duane Arnold, LLC submitted an application for a renewed Operating License (LRA) for the Duane Arnold Energy Center (DAEC). Reference 2 provided Supplement 1 to the application. By Reference 3 the U.S. Nuclear Regulatory Commission Staff (Staff) requested additional information for the review of the LRA.

Enclosure 1 contains the DAEC responses to the NRC Requests for Additional Information.

The need for certain LRA clarifications or changes has also been identified through interactions with the Staff and other NextEra Energy activities. These clarifications and changes are provided in Enclosure 2.

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During a conference call on January 22, 2010, the Staff requested additional information regarding the ten element review of the Flow Accelerated Corrosion (FAC) Program. This information is provided in Enclosure 3.

Enclosure 4 provides a revised LRA Appendix A, Section 18.4, Table A-1, Duane Arnold License Renewal Commitments, updated to reflect the license renewal commitment changes made in DAEC correspondence to date.

If you have any questions or require additional information, please contact Mr. Kenneth Putnam at (319) 851-7238.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on February 2, 2010.

Christopher R. Costanzo

Christopher R. Costanzo
Vice President, Duane Arnold Energy Center
NextEra Energy Duane Arnold, LLC

Enclosures:
1. DAEC Responses to NRC Requests for Additional Information
2. Miscellaneous LRA Clarifications and Changes
3. Ten Element Review of Flow-Accelerated Corrosion Program
4. Updated LRA Section 18.4, Table A-1, Duane Arnold License Renewal Commitments

cc: Administrator, Region III, USNRC
Project Manager, DAEC, USNRC
Senior Resident Inspector, DAEC, USNRC
License Renewal Project Manager, USNRC
License Renewal Inspection Team Lead, Region III, USNRC
M. Rasmusson (State of Iowa)

RAI 3.3.2.2.3.1.-1

Background:

LRA and Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants (SRP-LR) Table 3.3.1, Item 4 addresses cracking due to stress corrosion cracking (SCC) of stainless steel piping, piping components and piping elements of the BWR standby liquid control system exposed to sodium pentaborate solution greater than 60°C. These items recommend further evaluation on the part of the staff and refer to LRA and SRP Sections 3.3.2.2.3.1. The applicant proposes to manage this aging process through the use of its AMPs "Water Chemistry" (LRA B.3.39) and American Society of Mechanical Engineers (ASME) Section XI, Subsections IWB, IWC, IWD In-service Inspection (LRA B.3.3). The GALL Report recommends that this aging process be managed through the use of "Water Chemistry" (GALL Vol. 2 XI.M2) and "One Time Inspection" (GALL Vol. 2 XI.M32) AMPs.

Issue:

The staff reviewed LRA Table 3.3.1, Item 4 in accordance with SRP-LR Section 3.3.2.2.3.1. In this review, the staff noted that both the LRA and the GALL Report propose using Water Chemistry AMPs. The staff also noted that the LRA proposes using the ASME in-service inspection program while the GALL Report recommends using one time inspection. The staff considers the in-service inspection program to be both more rigorous and more frequent than the one time inspection program and, therefore, has no objection to this substitution. However, in the conduct of its review, the staff was not able to find LRA Table 2 line items associated with Table 3.3.1, Item 4. Additionally the staff conducted a search of the LRA for "sodium pentaborate solution." This search identified several instances in the LRA where sodium pentaborate solution appeared but none were associated with cracking of stainless steel at temperatures above 60°C. The lack of Table 2 items associated with Table 3.3.1, Item 4 could be interpreted to mean that this item is not applicable. Alternatively it could indicate items missing from the LRA.

Request:

Please explain the apparent lack of Table 2 items associated with Table 3.3.1, Item 4 and provide any missing information.

DAEC Response to RAI 3.3.2.2.3.1.-1

LRA Table 3.3.1, Item 4, addresses "Stainless steel piping, piping components, and piping elements exposed to sodium pentaborate solution >60°C (>140°F)." The discussion for this item states, "Not applicable at DAEC. Further evaluation is provided in LRA Subsection 3.3.2, NUREG-1800 Section 3.3.2.2.3, Item 1."

In LRA Section 3.3.2.2.3, the second paragraph of Item 1 states, "At Duane Arnold, the Standby Liquid Control System piping containing sodium pentaborate is <140°F.

However, the piping upstream of the containment isolation valves normally is an operating temperature >140°F and is managed by the ASME Section XI Inservice Inspection, IWB, IWC, and IWD Program and the Water Chemistry Program."

The portion of the Standby Liquid Control (SBLC) System that contains sodium pentaborate includes the sodium pentaborate tank with associated pumps, valves and injection piping out to two squib valves that maintain positive isolation. This part of the system is at <140°F and is represented by those line items in Table 3.3.2-30 that have the environment "Sodium pentaborate solution (internal)". These include Component Types Accumulator, pulsation damper, low pressure tank; Instrumentation, indication/ recorder (level gauge); Pipe, pipe fittings, hoses, tubes, rupture disk; Pumps, positive pressure devices (except blowers); and Valve, damper.

A pipe segment of the system downstream of the two squib valves, toward the reactor vessel, is pipe class ECB-8 up to the inboard containment isolation check valve (V26-0008). This segment of pipe is Class 2, <140°F, and is considered to have a sodium pentaborate environment. This stainless steel pipe is included in Table 3.3.2-30 with the environment "Sodium pentaborate solution (internal)."

Downstream of the inboard containment isolation check valve, V26-0008, toward the reactor vessel, there is a change of pipe class. This pipe segment includes V26-0008 and the remaining injection piping that extends to vessel penetration N-10. The pipe class of this segment is DCA-013, and this segment is Class 1. Pipe segment DCA-013 is at >140°F, but the environment is reactor coolant, not sodium pentaborate. This segment is addressed in Table 3.3.2-30 with an environment of "Reactor Coolant (internal)."

The segment of pipe from the outboard containment isolation check valve, V26-0009, to the reactor vessel is at >140°F in a Reactor Coolant (Internal) environment, and therefore, would be subject to cracking and loss of material. These stainless steel items are addressed in Table 3.3.2-30 under Component Types, "Pipe Class 1, pipe fittings, tubing" and "Valve Class 1" with Aging Effects Requiring Management of Cracking and Loss of Material.

Therefore, there are no items associated with Table 3.3.1, Item 4, to be addressed in the LRA.

RAI B.3.4-6

Background:

The U. S. Nuclear Regulatory Commission has previously issued Information Notices (IN) 2006-01 and IN 92-20 concerning problems associated with the Boiling Water Reactor (BWR) Mark I torus.

IN 2006-01 was issued to inform the owners of BWR Mark I containments about the occurrence and potential causes of the through-wall cracking of a torus in a BWR Mark I containment. Recipients were expected to review the information for applicability to their facilities and consider appropriate actions to avoid similar problems.

IN 92-20 was issued to inform the holders of operating licenses for nuclear plants about problems involving local leak rate testing (LLRT) of containment penetrations under Part 50 of Title 10 of *the Code of Federal Regulations* (10 CFR 50), Appendix J. One of the reasons for failures of LLRT of containment penetrations identified was the leakage thru the containment penetration bellows.

Issue:

It is not clear from the review of Duane Arnold Energy Center (DAEC) license renewal application (LRA) if the applicant has reviewed and addressed the issues identified in IN 2006-01 and IN 92-20.

Request:

Provide operating experience and explain what actions were taken at DAEC to address issues identified in IN 2006-01 and IN 92-01. The staff needs the above information to confirm that the effects of aging of the DAEC torus and containment penetration bellows will be adequately managed so that that it's intended function will be maintained consistent with the current licensing basis for the period of extended operation as required by 10 CFR 54.21(a)(3).

DAEC Response to RAI B.3.4-6

DAEC reviewed and addressed the issues identified in IN 2006-01 and IN 92-20, as discussed below.

IN 2006-01 discusses the occurrence and potential causes of through-wall cracking in Fitzpatrick's torus. The Fitzpatrick root cause evaluation identified condensation oscillation-induced fatigue as the physical root cause. Condensation oscillation loads would induce cyclic stresses in the area of the Torus shell localized at the HPCI exhaust.

The Fitzpatrick HPCI exhaust line is in close proximity to the torus ring girder gusset, and the steam exhaust is directed on this area. Relative to the Fitzpatrick configuration, the DAEC HPCI exhaust line is not close to the torus ring girder gusset, and the steam exhaust is below the torus ring girder gusset elevation. Thus, the cyclic stresses in the area of the torus ring girder gusset caused by condensation oscillation loads during HPCI operation at DAEC are judged to be significantly less than at Fitzpatrick. Visual inspections of this area have identified no evidence of fatigue cracking or through-wall leakage.

As stated in the question, IN 92-20 discusses problems involving local leak rate tests (LLRTs) of containment penetrations. One of the reasons identified for failures of containment penetration LLRTs was leakage through the containment penetration bellows. In 1992, as a result of the issuance of the information notice, DAEC reviewed the testing procedures for expansion bellows. A review of the test procedures used at that time indicated that the procedure may have been inadequate; therefore, a temporary procedure change was written to gather information regarding inter-ply restrictions and to verify previous test results for a representative sample of the bellows. The information gathered from the revised test showed the integrity of the expansion bellows to be intact, and also yielded information regarding inter-ply restrictions. As a result all bellows were determined to be capable of being adequately tested at DAEC.

An assessment of the 10 CFR 50 Appendix J Program performed in 2003 raised the concern that the testing performed in 1992 in response to the information notice had not addressed the potential problem of the two plies being very close together. A proper test would have been to flow air into one port and out of the other while at the same time measuring the change in pressure across the two ports for various flow rates. If the plies could be shown to have an adequate gap, the test method used at DAEC would be confirmed to be valid.

Therefore, the Type B LLRT procedure for expansion bellows testing was revised to require recording the time needed to pressurize the expansion bellows penetration. The test procedure pressurizes the test equipment to accident pressure conditions and then records the pressure. Then the expansion bellows penetration volume is opened to the test equipment, and the time to reach accident condition pressure in the bellows penetration is recorded. Testing was performed in 2005 with acceptable results.

RAI B.3.28 (Revised November 18, 2009)

Background:

The LRA Section AMP (Aging Management Program) B.3.28, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program," commits to consistency with the Generic Aging Lessons Learned (GALL) Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," with no exceptions or enhancements. GALL Report AMP XI.M38 is applicable to steel (carbon steel) components, in an internal environment such as indoor controlled air, condensation, and steam, to detect material degradation, evidence of corrosion to indicate possible loss of material with the use of visual inspections.

Issue:

The applicant's LRA program basis documents and aging management review (AMR) line items stated that the LRA AMP B.3.28 is relied upon to manage the aging effect of loss of materials in materials beyond the scope of the GALL Report AMP XI.M38, including stainless steel, cast austenitic stainless steel, galvanized steel, bronze, brass,

admiralty brass, copper and copper alloy, aluminum alloy, and nickel in a variety of environments, in particular, diesel exhaust. The DAEC LRA has also expanded the scope of aging effects managed by this AMP to include cracking in stainless steel components and heat transfer degradation. The proposed expansion of AMP B.2.28 is beyond the scope of GALL Report AMP XI.M38, which was meant for steel components and loss of material in an internal environment such as indoor controlled air, condensation, and steam. The staff is not convinced that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program using visual inspection per B.3.28 provides adequate aging management for these aging effects on these materials and environments.

Request:

- Provide justification that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is adequate for managing the aging effects of cracking in stainless steel, heat transfer degradation, and loss of material in the stainless steel, cast austenitic stainless steel, galvanized steel, bronze, brass, admiralty brass, copper and copper alloy, aluminum alloy, and nickel components in the environments including diesel exhaust as stated in the DAEC LRA.

- Identify and justify the inspection techniques used by this program that will be capable of detecting cracking for stainless steel components and heat transfer degradation added to the scope of this program or please provide an appropriate program to manage these aging effects for the applicable components.

DAEC Response to RAI B.3.28 (Revised November 18, 2009)

The Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Components Program has been assigned as the Aging Management Program for the components in question in cases where the GALL either called for a plant specific program or the program listed in the GALL was not appropriate for the components. This typically occurs when the GALL does not specifically address the system being reviewed; and another system containing the correct component, material, environment, and aging effect is available in the GALL, but the specified AMP is not appropriate. For example, Table 3.X.2 line items for components in the Auxiliary Boiler System (not in GALL) could reference GALL information for the Condensate System, since it has the same components, materials, environments and aging effects. However, the use of Water Chemistry and One-Time Inspection Programs as specified in GALL for the Condensate System would not be appropriate, since the Auxiliary Boiler System does not contain reactor-grade water that is managed by the Water Chemistry Program.

To ensure that an appropriate program would be used to manage aging, external and internal operating experience (OE) was reviewed. The review included generic industry information (e.g., NRC Information Notices) as well as the DAEC Corrective Action Program (CAP) Database. In addition, OE specific to the license renewal process was reviewed, including License Renewal Safety Evaluation Reports, other plant LRAs, and

the GALL. This data was utilized to determine appropriate aging mechanisms that may be managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program.

Adequacy of Program for Aging Effects of Interest

Regarding the question of using the Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Components Program to age manage cracking in stainless steel, it is noted that the entire component population with this material and aging effect that is assigned to this program includes only two components - a non-safety related heat loop flow element in the Control Building Ventilation System and a commodity for tubing in the Plant Ventilation System. DAEC has concluded that visual inspection via the Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Components Program is adequate to age manage any potential cracking problem in these component types, and no other GALL AMP was found to be as appropriate.

For the aging effect of heat transfer degradation in copper components, the components assigned to this program include two heat exchangers on the diesel fire pump and the air sides of six room coolers in the reactor building. The tubes in the two diesel fire pump coolers are admiralty brass, and an appropriate reference is not provided in GALL Section VII.G for this material. The appropriate component, material, environment, and aging effect are listed in GALL VII.C1 and VII.C2. The Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Components Program was chosen for aging management of these components because the AMPs listed in GALL sections VII.C1 and VII.C2 are not appropriate for these components. The diesel engine is tested weekly to demonstrate operability, and the jacket water cooler (cooled by raw water) is opened, inspected and cleaned semi-annually. These actions have proven to be adequate to ensure continued operability and reliability. Including these cooler inspections in the Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Components Program will ensure the components are properly age managed during the period of extended operation.

Regarding the six reactor building room coolers, these coolers are inspected and cleaned as necessary on an annual basis. The inspection procedure includes coil cleaning and leak checking from the air side. Including these cooler inspections in the Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Components Program will ensure the inspections continue and the coolers are properly age managed.

The only stainless steel components with a diesel exhaust environment are two expansion joints on the exhaust lines from each of the two Standby Diesel Generators. These components normally are exposed to diesel exhaust only when the generators are tested on a monthly basis. During the last refueling outage (RFO21), in conjunction with replacement of the engine turbochargers, the "B" Standby Diesel Generator expansion joints were removed and reinstalled with no problems noted. The turbochargers on the "A" Standby Diesel Generator are scheduled to be replaced during refueling outage 23, and the expansion joints for that unit will be inspected at that time. Performing visual inspections of these components in accordance with the Inspection of

Internal Surfaces of Miscellaneous Piping and Ducting Components Program provides adequate assurance that these components are properly age managed.

Inspection Techniques for Detection of Aging Effects of Interest

With regard to the question of performing visual inspections to age manage materials other than steel, as discussed in the response to RAI 3.3.2.2.7-1 (letter NG-09-0825 dated December 14, 2009), the visual inspections conducted under the Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Components Program are fully capable of identifying and managing loss of material for the components in the scope of the program, whether made of steel or other metallic materials. The presence of corrosion or fouling on the internal surfaces of metallic components will be identifiable as surface discontinuities and imperfections or localized discoloration. Surface discontinuities include indications such as rust, scale/deposits, pitting and coating degradation. Metal components including aluminum alloy, copper alloy, brass, bronze, nickel, CASS, as well as stainless steel, would exhibit indications of loss of material on the surface similar to a steel component, and visual inspections are capable of detecting surface-breaking flaws (cracks and loss of material) that develop on the surfaces being examined.

For the two stainless steel components subject to this program that have an environment of treated water >140°F, and therefore, would be subject to cracking, the inspections will be performed using the techniques of the DAEC NDE Procedure for VT-1 Visual Examinations. This procedure specifies the program requirements, equipment, visual aids, examination standards, and acceptance standards.

Follow-up RAI B.3.37-2

Background:

In letter NG-09-0764, dated October 13, 2009, the applicant responded to RAI B.3.37-2 related to the inspection interval of groundwater sampling conducted under the Structures Monitoring Program. The applicant explained that river and groundwater chemistry has been stable for many years and sampling results do not indicate an aggressive environment that might warrant more frequent monitoring.

Issue:

The staff does not agree that historical values can be reliable indicators for future conditions, as chemistry conditions in the groundwater can change due to a various number of causes that are beyond the applicant's control or that cannot be readily verified. In addition, the proposed sampling interval of 10 years (over a 20-year period of extended operation) would only provide 2 data points–not enough to establish a trend. Most applicants are monitoring the groundwater chemistry at an interval between three months and five years.

Request:

Please supplement the application to propose a sampling frequency within a five-year interval, or provide rationale for how the applicant intends to ensure that groundwater chemistry will not change during the period of extended operation.

DAEC Response to Follow-up RAI B.3.37-2

DAEC will perform ground water sampling at a five year frequency during the period of extended operation. To reflect this revised sampling frequency, the following LRA changes are provided:

In LRA Section B.3.37, Structures Monitoring Program, Subsection B.3.37.1, Program Description, on page B-70, the last sentence of the second complete paragraph is changed to read as follows:

> The procedure will monitor groundwater for chloride concentration, sulfate concentration and pH on a 5 year basis.

In LRA Section B.37.4, Enhancements to Duane Arnold Program, on page B-71, the second sentence is revised to read:

> The procedure will be enhanced to include periodic sampling of groundwater for chloride concentration, sulfate concentration and pH on a 5 year basis.

In LRA Appendix A, Section 18.4, Table A-1, Duane Arnold License Renewal Commitments, Commitment 31 is changed to appear as follows:

Item No.	System, Component or Program	Commitment	Section	Schedule
31.	Structures Monitoring Program	Enhance procedures to include periodic sampling of groundwater for pH, chloride and sulfate concentration on a 5 year periodicity.	18.1.37	Prior to entering the period of extended operation

RAI BF75-1

Background:

In LRA Supplement 1, Table 3.3.2-27, pages 3.3-218 and 3.3-221, for filter, screens, strainer, valve, and damper made of zinc exposed to an air-indoor uncontrolled or dried air environment, no aging effects requiring management are identified. The LRA uses Note F, along with a plant-specific note that states "Material/environment combination

and/or aging effect/mechanism not identified in NUREG-1801. The aging management program(s) referenced are appropriate for the aging effects/mechanisms identified and provide assurance that the aging effects/mechanisms are effectively managed through the period of extended operation."

Issue:

The GALL Report recommends no aging effects requiring management for galvanized steel piping, piping components, and piping elements in an air-indoor uncontrolled environment (GALL item VII.J-6) and for steel piping, piping components, and piping elements in dried air (GALL item VII.J-22). A Justification was not provided for how these GALL items are applicable to the AMR items referenced above.

Request:

Provide justification to explain how aging management of the galvanized steel and steel components in GALL Items VII.J-6 and VII.J-22 is applicable to the material/environment combinations identified above.

DAEC Response to RAI BF75-1

This RAI is a duplicate of RAI BF76-6. See the response to RAI BF76-6 below.

RAI BF75-2

Background:

The GALL Report, Table 2, Item 9, indicates that boiling water reactor/pressurized water reactor copper alloy heat exchanger tubes exposed to lubricating oil are subject to reduction of heat transfer due to fouling as an aging effect/mechanism. The GALL Report states that the aging effect/mechanism can be managed by the Lubricating Oil Analysis and One-Time Inspection Programs. The GALL Report, Table 3, Item 26, indicates that copper alloy components exposed to lubricating oil can result in loss of material due to pitting and crevice corrosion. The GALL Report indicates that this aging effect/mechanism can be managed by the Lubricating Oil Analysis and One-Time Inspection Programs.

Issue:

The DAEC LRA, Supplement 1, Table 3.3.2-29, page 3.3-232, indicates that when brass heat exchangers, condensers, coolers, and fan coil components are exposed to external lubricating oil, both loss of material and heat transfer degradation will occur. Aging management programs include the Lubricating Oil Analysis, One-Time Inspection, and Selective Leaching of Materials Programs. However, neither the DAEC LRA, Supplement 1, Table 3.3.2-29, nor the DAEC LRA, Table 3.3.2-22, indicates any aging effects of copper alloy exposed to internal lubricating oil. The staff is unclear why

the applicant does not include aging effect requiring management for internal lubricating oil environment.

Request:

Provide additional information justifying why copper alloys exposed to internal lubricating oil do not have any aging degradation effect that requires an aging management program.

DAEC Response to RAI BF75-2

LRA Tables 3.3.2-22 and 3.3.2-29 both contain listings for copper alloy components that have a lubricating oil internal environment.

The component addressed in Table 3.3.2-22 on page 3.3-188 is a heat exchanger component with a lubricating oil internal environment. This component does not list any aging effects requiring aging management or a required aging management program because the copper alloy of this copper alloy component contains less than 15 percent zinc and is not susceptible to crevice or pitting corrosion. Note I was applied to this listing because NUREG-1801 Volume 2 does not provide a specific listing for copper alloy that contains less than 15 percent zinc such that a loss of material due to pitting and crevice corrosion does not apply. Note 232 was incorrectly assigned to this line item. The correct note should have been 225 that states "Crevice and pitting corrosion are not applicable aging mechanisms for copper alloy component with less than 15% zinc and aluminum bronze components with less than 8% aluminum in fuel oil and lube oil environments at Duane Arnold." Fouling is not an aging effect that requires aging management for this heat exchanger because heat transfer is not an intended function for this heat exchanger shell component. This component is in the scope of license renewal only for a leakage boundary (spatial)(a)(2) function. The correction of note 232 to note 225, as well as the inapplicability of loss of material due to crevice and pitting corrosion (due to the copper alloy containing less than 15 percent zinc), have been previously addressed in the DAEC response to RAI 3.3.2.3-1 included in letter NG-0825 dated December 14, 2009.

The listings for copper alloy components with an internal lubricating oil environment in Table 3.3.2-29 are a valve, damper component type on page 3.3-244 and a pipe, pipe fittings, hoses, tubes, rupture disk component type on page 3.3-239. Both of these line items cite note 225 to indicate these components are constructed of a copper alloy material that contains less than 15 percent zinc, so a loss of material due to pitting and crevice corrosion does not apply. The piping component with a lubrication oil internal environment was determined to have a potential for a loss of material due to microbiological influenced corrosion, and was assigned to the Lubricating Oil Analysis and One-Time Inspection Programs as specified by NUREG-1801 Volume 2 line item VII.H2-10 (AP-47). The valve component was analyzed to have a potential for a loss of material due to microbiological influenced corrosion and galvanic corrosion and was assigned to the Lubricating Oil Analysis and One-Time Inspection Programs as specified by NUREG-1801 Volume 2 line item VII.H2-10 (AP-47). Note 202 was

assigned to indicate that the potential for loss of material due to galvanic corrosion and microbiological influence corrosion are in addition to the aging effects listed in the NUREG 1801 Volume 2 line item.

RAI BF76-1

Background:

In LRA Supplement 1, Section 3.3.2.2.11, pp. 3.3-42 and 3.3-43, the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is credited to manage loss of material due to pitting, crevice, and galvanic corrosion for copper alloy piping, piping components, and piping elements exposed to a treated water environment.

Issue:

SRP–LR Section 3.3.2.2.11 states that loss of material due to pitting, crevice, and galvanic corrosion could occur for copper alloy piping, piping components, and piping elements exposed to treated water. The GALL Report recommends managing the aging effect using the Water Chemistry Program augmented by the One-Time Inspection Program to verify the effectiveness of the chemistry control program.

Request:

Provide justification for the effectiveness of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program in managing the aging effect of loss of material in the identified copper alloy components exposed to a treated water environment.

DAEC Response to RAI BF76-1

NUREG-1800, Rev. 1, Section 3.3.2.2.11, addresses loss of material for copper alloy components exposed to treated water and recommends the Water Chemistry and One-Time Inspection Programs. GALL AMP XI.M2, Water Chemistry, provides water chemistry control of reactor coolant grade water in systems which communicate with the reactor. A review of the LRA Section 3.3.2 Tables indicated that all of the copper alloy components exposed to treated water with an Aging Management Program of Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program are system components which, while exposed to treated water, are not exposed to reactor coolant. The GALL line items referred to in these LRA tables are from the Spent Fuel Pool Cooling and Cleanup (BWR), Reactor Water Cleanup, and Steam Turbine Systems, all of which communicate with the reactor and contain reactor coolant grade water. These GALL line items were referenced because they contained the appropriate component, material, environment, and aging effect. The assigned AMP differs from GALL AMP because the Water Chemistry Program, as cited in GALL, does not apply to the systems in which the copper alloy components are installed.

As discussed in the response to RAI 3.3.2.2.7-1 in letter NG-09-0825 dated December 14, 2009, the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program relies on established visual examination techniques for the detection of loss of material due to corrosion and loss of material due to fouling. Inspections are performed at a frequency sufficient for the detection of aging effects prior to the loss of component intended function. The presence of corrosion or fouling on the internal surfaces of metallic materials will be identifiable as surface discontinuities and imperfections or localized discoloration. Surface discontinuities include indications such as rust, scale/deposits (debris), pitting, and coating degradation. For painted or coated surfaces, the visual inspections will confirm the integrity of the coating as a method to manage the effects of corrosion of the underlying metal surface. Inspection locations will be chosen to include conditions that create the potential for the aging effects of concern (e.g., stagnant and/or low flow locations). Inspections are conducted on an ongoing basis at established intervals to assure timely detection of degradation.

Based on the discussion above, the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is capable of managing loss of material in the identified copper alloy components which are subject to the program.

For related discussions see the DAEC responses to RAI Copper Alloy and RAI 3.3.2.2.10.2-1 in letter NG-09-0825 dated December 14, 2009, and the response to RAI B.3.28 above.

RAI BF76-2

Background:

In LRA Supplement 1, Section 3.4.2.2.7.1, pages 3.4-9 and 3.4-10, the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is credited to manage loss of material due to crevice and pitting corrosion for stainless steel and copper alloy components exposed to treated water or steam.

Issue:

SRP-LR Section 3.4.2.2.7.1 states that loss of material due to pitting and crevice corrosion could occur for stainless steel, aluminum, and copper alloy piping, piping components and piping elements; and stainless steel tanks and heat exchanger components exposed to treated water. The GALL Report recommends the use of the Water Chemistry Program augmented by the One-Time Inspection Program to manage the aging effect.

Request:

Provide justification for the effectiveness of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program in managing the aging effect of loss of material due to crevice and pitting corrosion in the identified stainless steel and copper alloy components exposed to treated water or steam.

DAEC Response to RAI BF76-2

LRA Section 3.4.2.2.7.1, contains two paragraphs concerning stainless steel and copper alloy components exposed to treated water. The first credits the Water Chemistry and One-Time Inspection Programs for management of loss of material. The second paragraph credits the Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Components Program for management of loss of material.

A review of LRA Tables 3.4.2-1, 3.4.2-2, 3.4.2-3, 3.4.2-4, and 3.4.2-5 indicates that no credit is taken for the Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Components Program for managing loss of material for stainless steel and copper alloy components in a treated water or steam environment in the applicable systems. The second paragraph of Section 3.4.2.2.7.1 was included in the LRA in error. LRA Section 3.4.2.2.7.1 is therefore revised to delete that paragraph.

Accordingly, LRA Section 3.4.2.2.7.1, on pages 3.4-9 and 3.4-10, is revised to read as follows:

<u>3.4.2.2.7 Loss of Material Due to Pitting and Crevice Corrosion</u>

1. Loss of material due to pitting and crevice corrosion could occur in stainless steel, aluminum, and copper alloy piping, piping components and piping elements and for stainless steel tanks and heat exchanger components exposed to treated water.

   At Duane Arnold, aluminum alloy, copper, copper alloy, and stainless steel piping components exposed to treated water are managed for loss of material due to pitting and crevice corrosion by the Water Chemistry Program. The effectiveness of the Water Chemistry Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program, including susceptible locations, such as areas of low or stagnant flow and areas of high concentrations of impurities.

RAI BF76-3

Background:

In LRA Supplement 1, Table 3.2.2-4, pages 3.2-47, for heat exchanger, condenser, cooler, and fan coil made of brass or bronze in a lubricating oil environment, no aging effects requiring management are identified. The LRA uses Note I, along with a plant-specific note that states "the component does not have the potential for water contamination."

Issue:

The GALL Report recommends the use of the Lubricating Oil Analysis Program augmented by the One-Time Inspection Program to manage the aging effect of loss of material due to pitting and crevice corrosion of copper alloy piping, piping components, and piping elements exposed to lubricating oil (e.g., GALL Item V.D2-22). Loss of material due to pitting and crevice corrosion in a lubricating oil environment is not addressed.

Request:

Provide additional information that demonstrates brass or bronze is not subject to pitting and crevice corrosion in a lubricating oil environment.

DAEC Response to RAI BF76-3

The brass and bronze heat exchanger components in a lubricating oil environment listed in LRA Table 3.2.2-4, on page 3.2-47, are for heat exchanger components that have a potential for water contamination. However, the brass and bronze material used in these components contain less than 15 percent zinc, making them resistant to pitting and crevice corrosion; therefore, there are no aging effects requiring management. It is noted that these two line items were incorrectly assigned Note 232 rather than Note 225, which states, "Crevice and pitting corrosion are not applicable aging mechanisms for copper alloy components with less than 15% zinc and aluminum bronze components with less than 8% aluminum in fuel oil and lube oil environments at Duane Arnold."

Accordingly, in LRA Table 3.2.2-4, Summary of Aging Management Review Results, Reactor Core Isolation Cooling System, on page 3.2-47, for the two line items "Heat exchanger, condenser, cooler, fan coil" of materials Brass and Bronze in a Lube oil (internal) environment, the Notes entries are changed from "232, I" to "225, I."

RAI BF76-4

Background:

In LRA Supplement 1, Tables 3.3.2-1, 3.3.2-6, 3.3.2-18, 3.3.2-23, 3.3.2.-28, and 3.3.2-32, the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is credited to manage loss of material for many carbon steel components exposed to a treated water environment. The LRA uses Note E, which indicates that the AMR results are consistent with the GALL Report for material, environment, and aging effect, but a different Aging Management Program (AMP) is credited.

Issue:

The GALL Report recommends the use of the Water Chemistry Program augmented by the One-Time Inspection Program to manage the aging effect of loss of material due to various corrosion mechanisms for steel components in treated water (e.g., GALL Items VII.E3-18 and VIII.E-40). The One-Time Inspection Program provides measures to verify the effectiveness of the Water Chemistry Program. It is not clear to the staff how the applicant's Internal Surfaces in Miscellaneous Piping and Ducting Components Program is consistent with the GALL Report and how the credited AMP provides adequate aging management for this aging effect in these components.

Request:

Provide justification for the effectiveness of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program in managing the aging effect of loss of material in the identified steel components exposed to a treated water environment

DAEC Response to RAI BF76-4

GALL AMP XI.M2, Water Chemistry, and the DAEC Water Chemistry Program, apply to water chemistry control of reactor coolant in systems which communicate with the reactor. LRA Table 3.3.2-1 concerns the Auxiliary Heating Boiler, Table 3.3.2-6 concerns Control Building Heating, Ventilation, and Air Conditioning, Table 3.3.2-18 concerns Plant Ventilation, Table 3.3.2-23 concerns Reactor Building Heating, Ventilation, and Air Conditioning, Table 3.3.2-28 concerns Solid Radwaste, and Table 3.3.2-32 concerns Well Water. While some components in these systems are exposed to treated water, none of these systems contain reactor coolant grade water. GALL item VII.E3-18 applies to the Reactor Water Cleanup System and GALL item VIII.E-40 applies to the Condensate System, both of which contain reactor coolant grade water.

These GALL items were referenced in the above tables because they contained the appropriate component, material, environment, and aging effect. The Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Components Program was listed

for the Aging Management Program because the Water Chemistry Program, as cited in GALL, does not apply to the systems contained in the above listed tables.

As discussed in the response to RAI 3.3.2.2.7-1 in letter NG-09-0825 dated December 14, 2009, the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program relies on established visual examination techniques for the detection of loss of material due to corrosion and loss of material due to fouling. Inspections are performed at a frequency sufficient for the detection of aging effects prior to the loss of component intended function. The presence of corrosion or fouling on the internal surfaces of metallic materials will be identifiable as surface discontinuities and imperfections or localized discoloration. Surface discontinuities include indications such as rust, scale/deposits (debris), pitting, and coating degradation. For painted or coated surfaces, the visual inspections will confirm the integrity of the coating as a method to manage the effects of corrosion of the underlying metal surface. Inspection locations will be chosen to include conditions that create the potential for the aging effects of concern (e.g., stagnant and/or low flow locations). Inspections are conducted on an ongoing basis at established intervals to assure timely detection of degradation.

Based on the discussion above, the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is capable of managing loss of material in the identified steel components which are subject to the program.

RAI BF76-5

Background:

In LRA Supplement 1, Tables 3.3.2-9, 3.3.2-13, and 3.3.2-21, for pipe, pipe fitting, hoses, tubes, and rupture disk made of poly vinyl chloride (PVC) exposed to a raw water or air-indoor uncontrolled environment, no aging effects requiring management are identified. The LRA uses Note J, along with a plant-specific note that states "non-metallic (fiberglass, PVC, CPVC [Chlorinated Poly vinyl chloride]) in this environment was evaluated and contained no aging effects."

Issue:

The GALL Report indicates that aging effects of embrittlement, cracking, melting, discoloration, or swelling could occur in polymer and plastic electrical components (e.g., GALL Items VI.A-6 and VI.A-14). The LRA does not provide sufficient information to ensure that degradation of PVC plastic will not occur in a raw water or air-indoor uncontrolled environment.

Request:

Provide information that demonstrates PVC/plastic is not subject to degradation resulting from various aging mechanisms identified in the GALL Report in a raw water or air-indoor uncontrolled environment.

DAEC Response to RAI BF76-5

Aging effects for mechanical systems that use PVC piping having a raw water or treated water internal environment and an air-indoor uncontrolled exterior environment were determined by consulting the information provided in EPRI 1010639, "Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools," Revision 4. The PVC aging effects listed in GALL Items VI.A-6 and VI.A-14 for electrical fuse holders or metal enclosed bus insulators were not used, since these aging effects were targeted toward the loss of insulating capability and do not correlate directly to pressure boundary or leakage boundary (spatial) effects that are applicable to the mechanical PVC piping components.

EPRI 1010639 discusses the potential for loss of material, change in properties, or cracking of thermoplastic PVC if the material or design application is selected improperly. It states that the thermoplastic PVC used for applications in nuclear power plant raw water and treated water systems is not expected to degrade. This conclusion is based on industry operating experience with PVC materials that were properly selected and applied.

According to EPRI 1010639, factors related to improper selection or design application may contribute to the degradation of thermoplastics such as PVC by exposing the material to UV radiation, chemical degradation, elevated temperatures, and solvents which cause oxidation reactions. For external surfaces of thermoplastics, such as PVC located in outdoor and indoor environments, chemical attack due to UV radiation, ozone or ionizing radiation is an applicable aging mechanism.

Given these potential aging effects, and confidence that the proper materials were selected for the particular raw water or treated water applications at DAEC, the specific PVC components that are in the scope of license renewal were evaluated for cracking or changes in material properties due to accumulated ionizing radiation, cracking or changes in material properties for thermal exposure, and for loss of material due to aggressive chemical attack. The external surfaces of the thermoplastic PVC piping components were evaluated for reduction in strength due to excessive ozone exposure or ultraviolet exposure due to direct sunlight.

The evaluations concluded that none of the raw water or treated water internal environments contained chemicals that were incompatible with the design application of the installed thermoplastic PVC piping. None of the external surfaces of the PVC piping is subject to the ultraviolet exposure of direct sunlight or ionizing radiation exceeding 10E6 rads total integrated dose over the period of extended operation, nor are they exposed to high levels of ozone that might be associated with high voltage electrical

equipment. Finally none of the internal raw or treated water environments was found to exceed 95°F that could lead to thermal degradation.

As a result of the evaluations, it was determined that the thermoplastic PVC piping components contained within LRA Tables 3.3.2-9, 3.3.2-13 and 3.3.2-21 do not have any aging effects that require management.

RAI BF76-6

Background:

In LRA Supplement 1, Table 3.3.2-27, pages 3.3-218 and 3.3-221, for filter, screens, strainer, valve, and damper made of zinc exposed to an air-indoor uncontrolled or dried air environment, no aging effects requiring management are identified. The LRA uses Note F, along with a plant-specific note that states "Material/environment combination and/or aging effect/mechanism not identified in NUREG-1801. The aging management program(s) referenced are appropriate for the aging effects/mechanisms identified and provide assurance that the aging effects/mechanisms are effectively managed through the period of extended operation."

Issue:

The GALL Report recommends no aging effects requiring management for galvanized steel piping, piping components, and piping elements in an air-indoor uncontrolled environment (GALL Item VII.J-6) and for steel piping, piping components, and piping elements in dried air (GALL Item VII.J-22). A Justification was not provided for how these GALL items are applicable to the AMR items referenced above.

Request:

Provide justification to explain how aging management of the galvanized steel and steel components in GALL Items VII.J-6 and VII.J-22 is applicable to the material/environment combinations identified above.

DAEC Response to RAI BF76-6

The LRA Table 3.3.2-27 line items for "Filter, screens, strainer" of material zinc on page 3.3-218 represent a filter housing for the safety related air system that has an external environment of air indoor uncontrolled and an internal environment of dried air. The line items for "valve, damper" of material zinc on page 3.3-221 represent a pressure control valve in the safety related air system that also has an external environment of air indoor uncontrolled and an internal environment of dried air. No listing was identified in the GALL Report for the material zinc; therefore, Note F was applied to these line items.

The GALL Report does have a listing for galvanized steel in air indoor uncontrolled (GALL item VII.J-6) and steel in dried air (GALL item VII.J-22). These items indicate

there are no aging effects requiring management and no aging management program is required. The galvanized steel and steel materials would be conservative references for the zinc components in similar environments. Therefore, the Table 3.3.2-27 line items for these zinc components that identify no aging effects requiring management and require no aging management program are validated by these GALL Report line items. No changes are required in the LRA.

RAI BF101-1

Background:

The GALL Report, Table 5, indicates that stainless steel penetration sleeves, penetration bellows, dissimilar metal welds, and vent line bellows exposed to uncontrolled air may undergo SCC.

Issue:

The DAEC LRA Supplement 1, Section 3.5.2.2.1.7, indicates that stainless steel penetration sleeves, penetration bellows, dissimilar metal welds, and vent line bellows can potentially undergo SCC. However, the same section also indicates that aging management is not needed for SCC for the air/gas environment because the environment is not aggressive and the material temperature is below 60°C [140°F]. Because these statements are conflicting, it is not clear to the staff whether the applicant will manage the aging effect of SCC for stainless steel components described in Section 3.5.2.2.1.7.

Request:

Provide additional information that indicates whether the applicant will be using an aging management program to manage SCC of the above stainless steel components exposed to uncontrolled air as described in Section 3.5.2.2.1.7. If these materials will not be managed under an aging management program, provide additional information on how these materials may be protected from corrosive environments contacting their surface.

DAEC Response to RAI BF101-1

GALL Report, Table 5, Items 10 and 11, list stainless steel penetration sleeves, penetration bellows, dissimilar metal welds, and vent line bellows, but do not specify an environment for the listed aging effect/mechanism of cracking due to stress corrosion cracking. It is not apparent that this aging effect/mechanism is applicable to an air environment.

NUREG-1800, Rev.1, section 3.5.2.2.1.7, states, "Cracking due to stress corrosion cracking of stainless steel penetration sleeves, penetration bellows, and dissimilar metal welds could occur in all types of PWR and BWR containments". Neither this section nor

Table 3.5-1, items 10 and 11, specify the environment that leads to this aging effect. Again, it is not apparent that this aging effect/mechanism is applicable to an air environment.

As discussed in EPRI 1010639, "Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools," Revision 4, stress corrosion cracking (SCC) occurs through the combination of high stress, a corrosive environment, and a susceptible material. It also states that SCC of austenitic stainless steels is not a significant aging mechanism below 140°F. The DAEC review for the potential of cracking due to stress corrosion cracking of stainless steel penetration sleeves, penetration bellows, and dissimilar metal welds concluded that normal design conditions do not contain aggressive contaminants, and the material temperatures are less than 140°F. Therefore, the stainless steel penetration sleeves, penetration bellows, and dissimilar metal welds are not considered to be susceptible to stress corrosion cracking.

LRA Appendix A, Section 18.2.1

It has been noted that LRA Appendix A, Section 18.2.1, erroneously refers to NUREG-1801 AMP XI.E1 rather than X.E1. The LRA is changed to correct this typographical error, as follows:

In LRA Appendix A, Section 18.2.1, Environmental Qualification Program, the last sentence is revised to read:

> The program is consistent with the ten elements of NUREG-1801 X.E1 and takes no exception to NUREG-1801 X.E1.

Aging Management of Treated Wood Stop Logs

In a conference call on January 13, 2010, the Staff discussed the DAEC response to RAI 2.4.2-1 provided in letter NG-09-0753 dated October 1, 2009. The response provided LRA changes that indicated that the treated wood stop logs, which are impregnated with creosote and stored as staged equipment in a protected warehouse, are not subject to aging effects requiring management. The Staff communicated the position that the stop logs may be subject to aging effects and should be included in an aging management program. DAEC agreed to revise the LRA changes included in the RAI response.

Accordingly, the changes to LRA Table 3.5.2-5 and Note 514 provided in the response to RAI 2.4.2-1 are withdrawn and replaced with the following:

In LRA Table 3.5.2-5, Summary of Aging Management Review Results – Miscellaneous Yard Structures, on page 3.5-73, a new line item is added to appear as follows:

Component Type	Intended Function	Material	Environment	Aging Effects Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Line Item	Table 3.x-1 Item	Notes
Stop Logs	Flood Barrier	Treated Wood	Air-indoor uncontrolled	Loss of material	Structures Monitoring Program			J, 514

In the Notes for Tables 3.5.2-1 through 3.5.2-11, under Plant-Specific Notes on page 3.5-127, a new Note 514 is added to read as follows:

> 514 Treated wood stoplogs are creosoted for their preservation and are stored inside a warehouse.

Gypsum Wall Subdividing the Control Room Fire Area

In the response to RAI 2.3.3.11-4 in letter NG-09-0646 dated September 3, 2009, DAEC described a wall constructed of metal studs covered with gypsum board and a partition made of glass as not being in the scope of license renewal, because they merely subdivide the control room complex fire area and are not fire barriers that separate fire areas. This response was discussed during a conference call on January 12, 2010. DAEC agreed to revise the LRA to include the gypsum wall and glass partition in scope of license renewal and to provide the results of an aging management review. Therefore, the LRA is revised as follows:

In LRA Section 3.5.1.2, Control Building, the following bullets are added under "Materials"

- Gypsum
- Glass

In the Notes for Tables 3.5.2-1 through 3.5.2-11, under Plant-Specific Notes, on page 3.5-127, a new Note 515 is added to read as follows:

515. Gypsum is used as a 1 hour fire rated partition between the control room computer room and control panel areas. The partition is inspected by fire protection personnel.

In Table 3.5.2-2, Summary of Aging Management Review Results, Control Building, the following line entries are added for "Control room 1 hour fire rated smoke and heat partition wall" and "Control room wire embedded glass smoke and heat partition wall."

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 line Item	Table 3.X.1 item	Notes
Control room 1 hour fire rated smoke and heat partition wall	Fire Barrier	Gypsum	Air indoor controlled (exterior)	Cracking	Fire Protection Program			515, J
Control room wire embedded glass smoke and heat partition wall	Fire Barrier	Glass	Air indoor controlled (exterior)	None	None	VII.J-8 (AP-14)	3.3.1-93	C

In LRA Appendix A, Section 18.4, Duane Arnold License Renewal Commitments, a new license renewal commitment number 49 is also provided, as follows:

Item No.	System, Component or Program	Commitment	Section	Schedule
49.	Fire Protection Program	Enhance procedures to inspect the 1 hour fire rated gypsum board wall that separates the control room computer room area from the front panel area for aging due to cracking.	18.1.22	Prior to the period of extended operation

RAI B.4.2-1 Part 2

An additional clarification regarding RAI B.4.2-1 is provided below in response to Staff requests during conference calls on December 14, 2009 and January 21, 2010.

As discussed in the response to RAI B.4.2-1 in letter NG-09-0764 dated October 13, 2009, in order to determine the numbers of thermal cycles that had occurred between the time when the plant began operation and the time the surveillance test procedure (STP) was instituted, historical plant records and documents, including operator logs, were thoroughly reviewed. The DAEC Technical Specifications (TS) have contained pressure-temperature operating limits, including a 100°F/hr heatup/cooldown rate limit, since initial plant startup. Events such as startups, shutdowns and significant transients, including the exceedance of TS limits, would have been documented in operator logs.

This transient information obtained by the review was an input to the 1998 reassessment that is discussed in LRA Section 4.3.1 and associated RAI responses. During this reassessment, no actual transients were identified which exceeded the bounds of the design transients.

Boral Program

By letter NG-10-0009 dated January 14, 2010, the LRA was revised to incorporate a program for the aging management of Boral. The LRA revision added Section B.3.41, Boral Surveillance Program. The Boral Surveillance Program was discussed during a conference call on January 22, 2010. Based on this discussion, LRA Section B.3.41.11 is revised as follows:

B.3.41.11 CORRECTIVE ACTIONS

Corrective actions are initiated if the results from measurements and analysis indicate that the 5% criticality margin cannot be maintained because of the current or

projected future degradation of the neutron absorbing material. Corrective actions consist of providing additional neutron-absorbing capacity with an alternate material, or applying other options which are available to maintain a subcriticality margin of 5%. The FPL Quality Assurance Program as described in the Quality Assurance Topical Report (FPL-1) will be utilized to meet Element 7, Corrective Actions. As discussed in NUREG-1800, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the corrective actions, confirmation process, and administrative controls.

Draft Follow-up RAI on Inspection of Internal Surfaces

In an email dated January 22, 2010, a draft Follow-up RAI was transmitted to DAEC. The NRC draft RAI and DAEC response are provided below:

Background: The Duane Arnold Energy Center LRA Section (AMP) B3.36, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program, commits to consistency with the GALL Report AMP XI.M33 with no exceptions or enhancements. The DAEC Aging Management Program Basis Document Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program, LRAP-M033, Revision 3, 04/06/09, quotes the GALL Report XI.M33 wording for the AMP Element 10, Operating Experience, and briefly describes the corresponding DAEC AMP element.

Issue:
The GALL Report AMP XI.M33, for the AMP element of Operating Experience states that the elements that comprise these one-time inspections (e.g., the scope of the inspections and inspection techniques) are consistent with industry practice and staff expectations. LRAP-M033 addresses plant specific operating experience, but does not address other industry experience and practices sufficiently for the staff to evaluate the acceptability of the AMP.

Request:
For AMP B.3.28, provide a description of the industry operating experience searched and reviewed, and how it will be utilized for the basis and actions for implementation of the DAEC Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP. Also provide specifics as to data bases, sources and documents searched, key search terms, and time periods.

DAEC Response to Draft Follow-up RAI on Inspection of Internal Surfaces

OE Sources, Documents & Databases

Operating experience (OE) - both external and internal - was reviewed to support aging management review and program development for the License Renewal Project. DAEC Operating Experience for the period from 1/1/1997 to 9/18/06 was reviewed for relevant information in accordance with project guidelines. The review included the DAEC Corrective Action Program (CAP) Database which includes both industry (e.g., NRC Information Notices) as well as plant-specific information. In addition, OE specific to the

license renewal process was reviewed, including License Renewal Safety Evaluation Reports, other plant LRAs, and the GALL (reflects OE up to 2005). This data was utilized to determine appropriate aging effects that may be managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP.

Key Search Terms

Key terms used for OE searches included fail, failure, corrosion, thinning, crack, cracking, MIC, short, break, split, impact, degradation, wear, scratch, scale, aging, FAC, fouling, loss of, rust, leak, impinge, separation, weep, overflow, vibration and rupture.

RAI 3.3.2.2.7-1 Follow-up Question

In an email dated January 7, 2010, a follow-up question regarding the response to RAI 3.3.2.2.7-1 was transmitted to DAEC. The NRC question and DAEC response are provided below:

Background

In RAI 3.3.2.2.7-1, the staff requested the applicant to justify why the expansion of the scope of GALL AMP XI.M38 to include stainless steel material was not considered an enhancement or an exception.

Issue:

In its letter dated December 14, 2009, in response to RAI 3.3.2.1-5, the applicant stated that even though materials other than steel are not explicitly mentioned in NUREG-1801 for this program, the visual inspections conducted under this program are capable of identifying and managing loss of material for all the components within the scope of the program, whether made of steel or other metallic materials. The applicant further stated that going beyond the NUREG-1801 description to apply the program to additional metallic materials is not considered an exception or an enhancement to NUREG-1801 as these terms are defined in SRP-LR NUREG-1800, Section 3.0.1.

The staff considers the expansion of GALL AMP XI.M38 to include stainless steel and other metallic or non-metallic material as an enhancement or an exception. SRP-LR, Section 3.0-1 defines enhancement as additions to existing aging management programs, and further states that enhancements may expand, but not reduce, the scope of an AMP.

Request:

Please justify why the expansion of the GALL AMP XI.M38 is not considered an enhancement as defined by SRP-LR, Section 3.0.1.

DAEC Response to RAI 3.3.2.2.7-1 Follow-up Question

As listed in LRA Table B.2.2-1 and in Section B.3.28.1, the Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Components Program is a new program. As discussed in NUREG-1800, Section 3.0.1, enhancements are only applicable to existing plant programs. Therefore, enhancements are not applicable to this new program. This new program will use visual inspections to monitor the condition of the interior surfaces of mechanical components of several metal types within the scope of license renewal which are not covered by other aging management programs. The aging effects to be monitored are equally detectable for the identified metal types as well as steel. This position is consistent with the Staff conclusions contained in the SER for Prairie Island Nuclear Generating Plant Units 1 and 2 dated June 2009, Section 3.0.3.1.13, on page 3-48.

Drywell Radiation Monitors

It has been determined that the Drywell Radiation Monitors should be addressed in the LRA as an electrical system in scope for license renewal rather than a not-in-scope mechanical system. Accordingly, the following LRA changes are made.

In LRA Table 2.2-2, Plant level Scoping Results - Mechanical Systems - Not in Scope, on page 2.2-5, the line item for the Drywell Radiation Monitor System is deleted.

In LRA Table 2.2-5, Plant Level Scoping Results - Electrical / I&C Systems - In Scope, on page 2.2-17, a new line item is added to appear as follows:

System Name	In License Renewal Scope	Screening Results LRA Section
Drywell Radiation Monitor System	Yes	2.5

In letter NG-10-0009 dated January 14, 2010, DAEC provided changes to LRA Section B3.24, Flow-Accelerated Corrosion Program, to reflect a program update to the latest EPRI standard. In a telephone conference call on January 22, 2010, the NRC requested additional background information regarding the Flow-Accelerated Corrosion (FAC) Program, including its management of erosion. In addition, in an email dated January 25, 2010, the Staff requested additional operating experience related to the treatment of erosion within the program.

In response, a ten element discussion for the Flow-Accelerated Corrosion Program is provided below.

FLOW ACCELERATED CORROSION PROGRAM ELEMENTS

1.0 SCOPE OF PROGRAM

1.1 NUREG-1801 XI.M17 SCOPE OF PROGRAM

The FAC program, described by the EPRI guidelines in NSAC-202L-R2, includes procedures or administrative controls to assure that the structural integrity of all carbon steel lines containing high-energy fluids (two phase as well as single phase) is maintained. Valve bodies retaining pressure in these high-energy systems are also covered by the program. The FAC program was originally outlined in NUREG-1344 and was further described through the Nuclear Regulatory Commission (NRC) Generic Letter (GL) 89-08. A program implemented in accordance with the EPRI guidelines predicts, detects, and monitors FAC in plant piping and other components, such as valve bodies, elbows and expanders. Such a program includes the following recommendations: (a) conducting an analysis to determine critical locations, (b) performing limited baseline inspections to determine the extent of thinning at these locations, and (c) performing follow-up inspections to confirm the predictions, or repairing or replacing components as necessary. NSAC-202L-R2 (April 1999) provides general guidelines for the FAC program. To ensure that all the aging effects caused by FAC are properly managed, the program includes the use of a predictive code, such as CHECWORKS, that uses the implementation guidance of NSAC-202L-R2 to satisfy the criteria specified in 10 CFR Part 50, Appendix B, criteria for development of procedures and control of special processes.

1.2 DAEC SCOPE OF PROGRAM

The Flow-Accelerated Corrosion Program manages aging effects (loss of material) due to flow-accelerated corrosion (FAC) on the internal surfaces of carbon or low alloy steel piping, elbows, reducers, expanders, heat exchangers and valve bodies which contain high energy fluids (both single phase and two phase). The program implements the EPRI guidelines in NSAC-202L-R3 for an effective FAC program and includes: (a) an analysis to determine FAC susceptible locations; (b) performance of

limited baseline inspections to determine the extent of thinning at these locations; (c) follow-up inspections to confirm the predictions; and (d) repairing or replacing components, as necessary.

The DAEC Flow-Accelerated Corrosion program determines susceptible locations, and monitors, detects, and mitigates flow-accelerated corrosion of susceptible components.

The Flow Accelerated Corrosion Program manages loss of material due to erosion based on site specific operating experience. Locations identified are selected based on operating experience and inspected for wall thinning. Inspection results are trended and corrective measures are initiated prior to loss of intended function. The corrective measures are tracked to assure that the corrective action has been effective to resolve the erosion issue.

1.3 NUREG-1801 XI.M17 CONSISTENCY

This element is consistent with one exception to NUREG-1801 XI.M17 Element 1, Scope of Program.

1.4 ENHANCEMENTS

No enhancements to the scope of the DAEC FAC Program are necessary.

1.5 EXCEPTIONS

The DAEC program implements the guidance provided in EPRI NSAC-202L-R3 , "Recommendation for an Effective Flow-Accelerated Corrosion Program," May 2006, in lieu of the NUREG-1801 recommendation of EPRI NSAC-202L-R2, "Recommendation for an Effective Flow-Accelerated Corrosion Program," April 1999.

2.0 PREVENTIVE ACTIONS

2.1 NUREG-1801 XI.M17 PREVENTIVE ACTIONS

The FAC program is an analysis, inspection, and verification program; thus, there is no preventive action. However, it is noted that monitoring of water chemistry to control pH and dissolved oxygen content, and selection of appropriate piping material, geometry, and hydrodynamic conditions, are effective in reducing FAC.

2.2 DAEC PREVENTIVE ACTIONS

The DAEC FAC Program is an analysis, inspection, and verification program; thus, there is no preventive action. The DAEC water chemistry program is utilized to control pH and dissolved oxygen. When the FAC

Program identifies components to be repaired or replaced, use of FAC resistant materials and or configuration changes are considered.

Locations that are inspected for erosion due to operating experience are evaluated to determine if modifications are practical to eliminate or reduce the identified erosion issues.

2.3 NUREG-1801 XI.M17 CONSISTENCY

This element is consistent with NUREG-1801 XI.M17 Element 2, Preventive Actions.

2.4 ENHANCEMENTS

No enhancements to the preventive actions of the DAEC FAC Program are necessary.

2.5 EXCEPTIONS

There are no exceptions to the NUREG-1801 XI.M17 Element 2, Preventive Actions.

3.0 PARAMETERS MONITORED OR INSPECTED

3.1 NUREG-1801 XI.M17 PARAMETERS MONITORED OR INSPECTED

The aging management program (AMP) monitors the effects of FAC on the intended function of piping and components by measuring wall thickness.

3.2 DAEC PARAMETERS MONITORED OR INSPECTED

This aging management program monitors the effects of flow-accelerated corrosion on the intended function of piping and components by measuring wall thickness using non-destructive examination and performing analytical evaluations. The DAEC FAC Program stipulates ultrasonic or radiographic testing of susceptible locations based on operating conditions. Analytical models developed with computer programs, including CHECWORKS, are used to predict flow-accelerated corrosion in piping systems based on specific plant data including material, hydrodynamic conditions, and operating conditions.

The Flow Accelerated Corrosion Program manages loss of material due to erosion based on site specific operating experience. There are no predictive tools used for determining locations for erosion; locations are selected based on operating experience.

3.3 NUREG-1801 XI.M17 CONSISTENCY

This element is consistent with NUREG-1801 XI.M17 Element 3, Parameters Monitored or Inspected.

3.4 ENHANCEMENTS

No enhancements to the parameters monitored or inspected by the DAEC FAC Program are necessary.

3.5 EXCEPTIONS

There are no exceptions to the NUREG-1801 XI.M17 Element 3, Parameters Monitored or Inspected.

4.0 DETECTION OF AGING EFFECTS

4.1 NUREG-1801 XI.M17 DETECTION OF AGING EFFECTS

Degradation of piping and components occurs by wall thinning. The inspection program delineated in NSAC-202L-R2 consists of identification of susceptible locations as indicated by operating conditions or special considerations. Ultrasonic and radiographic testing is used to detect wall thinning. The extent and schedule of the inspections assure detection of wall thinning before the loss of intended function.

4.2 DAEC DETECTION OF AGING EFFECTS

The DAEC FAC Program, which uses the guidelines of NSAC-202L-R3 and CHECWORKS, identifies susceptible locations in piping systems based on specific plant data, including material, configuration, hydrodynamic conditions, and operating conditions. Inspections and analytical evaluations are performed in accordance with the FAC Program. Components are inspected for wall thinning due to flow-accelerated corrosion using ultrasonic (UT), or radiography (RT) techniques. UT provides more complete data for measuring the remaining wall thickness. RT is commonly used on small-bore piping because it provides broad coverage with a visual indication of any wall loss and can be performed without removing pipe insulation and during plant operation. By utilizing the predictive code of CHECWORKS, inspections are performed at frequencies sufficient to detect degradation prior to loss of intended function.

Locations identified for erosion are selected based on operating experience and inspected for wall thinning using the same techniques as used for measuring for FAC. Inspection results are trended and corrective measures are initiated prior to loss of intended function.

4.3 NUREG-1801 XI.M17 CONSISTENCY

This element is consistent with one exception to NUREG-1801 XI.M17 Element 4, Detection of Aging Effects.

4.4 ENHANCEMENTS

No enhancements to the detection of aging effects by the DAEC FAC Program are necessary.

4.5 EXCEPTIONS

The DAEC program implements the guidance provided in EPRI NSAC-202L-R3 , "Recommendation for an Effective Flow-Accelerated Corrosion Program," May 2006, in lieu of the NUREG-1801 recommendation of EPRI NSAC-202L-R2, "Recommendation for an Effective Flow-Accelerated Corrosion Program," April 1999.

5.0 MONITORING AND TRENDING

5.1 NUREG-1801 XI.M17 MONITORING AND TRENDING

CHECWORKS or a similar predictive code is used to predict component degradation in the systems conducive to FAC, as indicated by specific plant data, including material, hydrodynamic, and operating conditions. CHECWORKS is acceptable because it provides a bounding analysis for FAC. CHECWORKS was developed and benchmarked by using data obtained from many plants. The inspection schedule developed by the licensee on the basis of the results of such a predictive code provides reasonable assurance that structural integrity will be maintained between inspections. Inspection results are evaluated to determine if additional inspections are needed to assure that the extent of wall thinning is adequately determined, assure that intended function will not be lost, and identify corrective actions.

5.2 DAEC MONITORING AND TRENDING

The DAEC FAC Program developed in accordance with NSAC-202L-R3 and using CHECWORKS as a predictive code identifies susceptible locations in piping systems based on specific plant data including material, configuration, hydrodynamic conditions, and operating conditions. Inspections and analytical evaluations are performed in accordance with the FAC Program. The FAC inspection schedule is developed based on the CHECWORKS predictive code, re-examinations from previous outages, susceptible (but not modeled), plant specific and industry operating experience. The predicted extent of wall thinning for susceptible components is updated after each refueling outage. The component examination data is compiled and maintained with identification of the

specific outage or time of inspection. The next scheduled inspection is based on the remaining service life which is recalculated after each inspection.

Locations identified for erosion are selected based on operating experience and inspected for wall thinning. Inspection results are trended and corrective measures are initiated prior to loss of intended function.

5.3 NUREG-1801 XI.M17 CONSISTENCY

This element is consistent with NUREG-1801 XI.M17 Element 5, Monitoring and Trending.

5.4 ENHANCEMENTS

No enhancements to the monitoring and trending by the DAEC FAC Program are necessary.

5.5 EXCEPTIONS

There are no exceptions to NUREG-1801 XI.M17 Element 5, Monitoring and Trending.

6.0 ACCEPTANCE CRITERIA

6.1 NUREG-1801 XI.M17 ACCEPTANCE CRITERIA

Inspection results are input for a predictive computer code, such as CHECWORKS, to calculate the number of refueling or operating cycles remaining before the component reaches the minimum allowable wall thickness. If calculations indicate that an area will reach the minimum allowed wall thickness before the next scheduled outage, the component is to be repaired, replaced, or reevaluated.

6.2 DAEC ACCEPTANCE CRITERIA

The DAEC FAC Program inspection results are input into analytical models (CHECWORKS) to calculate the number of operating cycles remaining before the component reaches minimum allowable wall thickness. If calculations indicate that an area will reach the minimum wall thickness before the next inspection interval, the component must be repaired, replaced, or re-evaluated.

Locations identified for erosion are selected based on operating experience and inspected for wall thinning. Inspection results are trended and corrective measures are initiated prior to loss of intended function.

6.3 NUREG-1801 XI.M17 CONSISTENCY

This element is consistent with NUREG-1801 XI.M17 Element 6, Acceptance Criteria.

6.4 ENHANCEMENTS

No enhancements to the acceptance criteria of the DAEC FAC Program are necessary.

6.5 EXCEPTIONS

There are no exceptions to the NUREG-1801 XI.M17 Element 6, Acceptance Criteria

7.0 CORRECTIVE ACTIONS

7.1 NUREG-1801 XI.M17 CORRECTIVE ACTIONS

Prior to service, components for which the acceptance criteria are not satisfied are reevaluated, repaired, or replaced. Long-term corrective actions could include adjusting operating parameters or selecting materials resistant to FAC. As discussed in the appendix to this report, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the corrective actions.

7.2 DAEC CORRECTIVE ACTIONS

The FPL Quality Assurance Program as described in FPL-1 Quality Assurance Topical Report will be utilized to meet Element 7 Corrective Actions. As discussed in the appendix to NUREG-1801 Volume 2, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the corrective actions.

7.3 NUREG-1801 XI.M17 CONSISTENCY

This element is consistent with NUREG-1801 XI.M17 Element 7, Corrective Action.

7.4 ENHANCEMENTS

No enhancements to the corrective actions of the DAEC FAC Program are necessary.

7.5 EXCEPTIONS

There are no exceptions to the NUREG-1801 XI.M17 Element 7, Acceptance Criteria.

8.0 CONFIRMATION PROCESS

8.1 NUREG-1801 XI.M17 CONFIRMATION PROCESS

Site quality assurance (QA) procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B. As discussed in the appendix to this report, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the confirmation process and administrative controls.

8.2 DAEC CONFIRMATION PROCESS

The FPL Quality Assurance Program as described in FPL-1 Quality Assurance Topical Report will be utilized to meet Element 8 Confirmation Process. As discussed in the appendix to NUREG-1801 Volume 2, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the confirmation process.

8.3 NUREG-1801 XI.M17 CONSISTENCY

This element is consistent with NUREG-1801 XI.M17 Element 8, Confirmation Process.

8.4 ENHANCEMENTS

No enhancements to the confirmation process of the DAEC FAC Program are necessary.

8.5 EXCEPTIONS

There are no exceptions to the NUREG-1801 XI.M17 Element 8, Confirmation Process.

9.0 ADMINISTRATIVE CONTROLS

9.1 NUREG-1801 XI.M17 ADMINISTRATIVE CONTROLS

See Subsection 8.1, above.

9.2 DAEC ADMINISTRATIVE CONTROLS

The FPL Quality Assurance Program as described in FPL-1 Quality Assurance Topical Report will be utilized to meet Element 9 administrative Controls. As discussed in the appendix to NUREG-1801 Volume 2, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the administrative controls.

9.3 NUREG-1801 XI.M17 CONSISTENCY

This element is consistent with NUREG-1801 XI.M17 Element 9, Administrative Controls.

9.4 ENHANCEMENTS

No enhancements to the administrative controls of the DAEC FAC Program are necessary.

9.5 EXCEPTIONS

There are no exceptions to the NUREG-1801 XI.M17 Element 9, Administrative Controls.

10.0 OPERATING EXPERIENCE

10.1 NUREG-1801 XI.M17 OPERATING EXPERIENCE

Wall-thinning problems in single-phase systems have occurred in feedwater and condensate systems (NRC IE Bulletin No. 87-01; NRC Information Notices [INs] 81-28, 92-35, 95-11) and in two-phase piping in extraction steam lines (NRC INs 89-53, 97-84) and moisture separation reheater and feedwater heater drains (NRC INs 89-53, 91-18, 93-21, 97-84). Operating experience shows that the present program, when properly implemented, is effective in managing FAC in high-energy carbon steel piping and components.

10.2 DAEC OPERATING EXPERIENCE

The Flow-Accelerated Corrosion Program has been effective in managing aging effects. Wall thinning problems in single-phase systems have occurred throughout the industry in feedwater and condensate systems, and in two-phase piping in extraction steam lines and moisture separator reheater and Feedwater heater drains. Application of the program at DAEC has resulted in the identification and replacement of susceptible piping sections with materials more resistant to flow-accelerated corrosion (e.g., extraction steam system piping and piping downstream of the moisture separators). The FAC Program was originally outlined in NUREG-1344 and implemented through GL 89-08. The DAEC program has evolved through industry experience and is now implemented using the guidelines of NSAC-202L-R3 and CHECWORKS as a predictive tool. Monitoring locations and inspection methods have improved over time based on industry and plant experience and through development of new techniques.

To identify OE related to FAC and erosion, a key word search was performed on the DAEC Corrective Action system database. The key words used for the search were FAC, flow-Accelerated, erosion/corrosion, and erosion. The search identified documents which documented the need to replace carbon steel pipe components due to FAC, changing plant conditions that may lead to FAC, a self assessment, and reviews of Operating Experience from other utilities and organizations such as INPO. The conclusion of the review was that DAEC is actively involved in internally and externally identified FAC Program issues. Recent OE and a FAC Program assessment, performed in September 2007, revealed no significant program deficiencies and support a conclusion that the FAC program effectively manages FAC in high-energy carbon steel piping and components.

Several years ago, in response to OE related to erosion, a review was performed to identify locations downstream of flow control devices, including control valves, motor operated valves, flow orifices, y strainers, and steam traps, for potential thinning immediately downstream of the flow control devices. The resulting list of erosion-susceptible locations has been incorporated into the Corrosion Monitoring Program Manual. This list is in addition to components currently within the FAC program. During preparation for refuel outage examinations for FAC, the list of locations to be examined is augmented with locations identified in this list as being potentially susceptible to erosion. Therefore a sample of erosion-susceptible locations is examined each refueling outage.

Examples of OE related to FAC and erosion are provided below.

Extraction Steam Elbows

In RFO-19 (2005), during a FAC Program examination, it was discovered that Piping Elbow HBD-20-E11 (extraction steam to low pressure feedwater heaters) had a wall thickness indication less than 60% of nominal thickness. This is a FAC program trigger point to have an Engineering Analysis performed to ensure the component is acceptable for continued use.

The pipe is 6" schedule 40 which equates to 0.280" nominal wall thickness. The thinnest reading was 0.164", which is only slightly under the 60% screening criteria of 0.168". A calculation was performed which indicated the minimum wall thickness required to meet ANSI B31.1.0 is 0.086". This component was acceptable for continued service.

In RFO20 (2007), FAC exams occurred on 6" schedule 40 elbows HBD-20-E12 and HBD-20-E13 (extraction steam to low pressure feedwater heaters). UT exams indicated the wall thickness had thinned from the nominal wall thickness of 0.280" down to 0.133" and 0.138" respectively.

The evaluation from the previous refueling outage indicated a minimum required design wall thickness of 0.086" for an adjacent elbow.

Based on the exam results, the wear rate for HBD-20-E12 was 0.008" per year, which would give a projected thickness at RFO21 (2009) of 0.117". The wear rate for HBD-20-E13 was 0.007" per year and would give a projected thickness of 0.124" at the next refuel outage in 2009 (RFO21). The projected wall thickness for GBD-20-E12 and E13 at RFO21 is greater than the design minimum wall thickness of 0.086". Both components were determined to be acceptable for continued service to RFO21.

The piping was replaced during RFO21 with chrome-moly material.

Extraction Drain Piping

In 1993, a UT inspection of HBD038 (Low pressure feedwater extraction drains to condenser) 24 x20 reducer indicated wall thinning down to 0.208 (0.375 nominal). This reducer was between the turbine nozzle and the expansion joint and was replaced with chrome-moly. This line was replaced below the expansion joint.

RHR & Core Spray Test Lines

HLE013, HLE015 and HLE016 (RHR & Core Spray test lines to torus) were examined in RFO19 (2005) as an expansion of scope for thinned piping found on HLE014 (RHR test line to torus), and as an extent of condition evaluation. A corrective action was initiated to track the run time of the B RHR Suppression Pool cooling run time to insure the 144 hour yearly average is not exceeded. The inspections for HLE-013-P01, HLE-15-P01, & HLE-16-P01 during RFO19 were evaluated and the lines were found acceptable for continued service. Actions were also initiated to insure inspections for HLE-013-P01, HLE-15-P01, & HLE-16-P01 were scheduled for RFO20.

The inclusion of the HLE-014 exam in the RFO19 scope was a result of similar wall thinning discovered at Monticello in its 2003 outage. Monticello had inspected both similar lines during the 2003 outage. One of the Monticello lines was replaced in 2005. The remaining Monticello RHR exam was evaluated for continued operation to the 2005 outage when the piping was replaced. The other DAEC exams are a result of sample expansion from the HLE-014 exam.

An examination was completed in November of 2004 on line HLE-014 piping downstream of MO2007. This exam had a measured wall thickness down to 0.181". A CAP was initiated to document the thinned area and resulting evaluations. As an extent of condition evaluation, work requests were initiated to UT the piping immediately downstream of MO1934, the similar valve on the B train, and the 24" of piping

downstream of MO2112 and MO2132, the Core Spray Test Bypass valves.

HLE-013

The average MO1934 open time for1995 thru 2005 indicated an average open time of 144 hours. An inspection revealed a thickness of 0.193". The calculated minimum wall was 0.120". The projected thickness results for the HLE-013 piping indicated a 0.0133" margin between the extrapolated wall thickness at RFO20 and the calculated minimum wall. The piping did not require replacement during RFO19. The piping was replaced in RFO20 in 2007.

HLE-014

The average MO2007 open time for1995 thru 2005 indicated an average open time of 123 hours. The November 2004 inspection thickness was 0.181." The calculated minimum wall thickness using Code Case 597-1 methodology was 0.150". The projected thickness results for the HLE-014 piping indicated a negative 0.0313" margin between the predicted wall thickness at RFO20 and the calculated minimum wall. Based on the negative margin for the HLE-014 piping, approximately two feet of piping downstream of MO2007 was replaced in RFO19.

HLE-015

The average MO2112 open time for 1995 thru 2005 indicated an average open time of 11 hours. The inspection thickness was 0.204". The calculated minimum wall thickness was 0.142". The projected thickness results for the HLE-015 piping indicated a 0.051" margin between the predicted wall thickness at RFO20 and the calculated minimum wall. Based on the margin for the HLE-015 piping, this piping was acceptable for continued service and was re-inspected in RFO20. HLE015 piping was replaced in RFO20.

HLE-016

The average MO2132 open time for 1995 thru 2005 indicated an average open time of 9 hours. The inspection thickness was 0.234". The calculated minimum wall thickness was 0.135". The projected thickness results for the HLE-016 piping indicated a 0.090" margin between the predicted wall thickness at RFO20 and the calculated minimum wall. Based on the margin for the HLE-015 piping, this piping was acceptable for continued service and was re-inspected in RFO20.

10.3 NUREG-1801 XI.M17 CONSISTENCY

This element is consistent with NUREG-1801 XI.M17 Element 10, Operating Experience.

10.4 ENHANCEMENTS

No enhancements to the operating experience of the DAEC FAC Program are necessary.

10.5 EXCEPTIONS

There are no exceptions to the NUREG-1801 XI.M17 Element 10, Operating Experience.

TABLE A-1
DUANE ARNOLD LICENSE RENEWAL COMMITMENTS[1]

Item No.	System, Component or Program	Commitment[2]	Section	Schedule
1.	Buried Piping and Tanks Inspection Program	Implement Buried Piping and Tank Program [Revised in DAEC letter NG-09-0764 in response to New Program Commitments RAI]	18.1.7	Prior to the period of extended operation
2.	BWR Vessel Internals Program	Perform an EVT-1 inspection of 5% of the top guide locations	18.1.14	Within six years of entering the period of extended operation
3.	BWR Vessel Internals Program	Perform an EVT-1 inspection of an additional 5% of the top guide locations	18.1.14	Within 12 years of entering the period of extended operation
4.	Electrical Cables and Connections Program	Implement an Electrical Cables and Connections Program and complete the first inspection prior to the period of extended operation. [Revised in DAEC letter NG-09-0764 in response to New Program Commitments RAI]	18.1.17	Prior to the period of extended operation

TABLE A-1
DUANE ARNOLD LICENSE RENEWAL COMMITMENTS[1]

Item No.	System, Component or Program	Commitment[2]	Section	Schedule
5.	Electrical Cables and Connections Used in Instrumentation Circuits Program	Implement an Electrical Cables and Connections Used in Instrumentation Circuits Program and complete the first inspection prior to the period of extended operation. [Revised in DAEC letter NG-09-0764 in response to New Program Commitments RAI]	18.1.18	Prior to the period of extended operation
6.	Electrical Connections Program	Implement an Electrical Connections Program and complete the one time inspection prior to the period of extended operation. [Revised in DAEC letter NG-09-0764 in response to New Program Commitments RAI]	18.1.19	Prior to the period of extended operation
7.	Electrical Penetration Assemblies Program	Implement an Electrical Penetration Assemblies Program. [Revised in DAEC letter NG-09-0764 in response to new Program Commitments RAI]	18.1.20	Prior to the period of extended operation
8.	External Surfaces Monitoring Program	Revise the inspection program to address inspector qualifications, types of components, degradation mechanisms, aging effects, acceptance criteria, inspection frequency, and periodic reviews to determine program effectiveness. The program will also specifically address inaccessible areas and include inspections of opportunity for possible corrosion under insulation. [Revised in DAEC letter NG-09-0764 in response to RAI B.3.21-2]	18.1.21	Prior to the period of extended operation

TABLE A-1
DUANE ARNOLD LICENSE RENEWAL COMMITMENTS[1]

Item No.	System, Component or Program	Commitment[2]	Section	Schedule
9.	Fire Protection Program	The DAEC Fire Barrier Penetration Seal Inspection surveillance procedure will be enhanced to include criteria for visual inspections of fire barrier wall, ceiling 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. [Revised in DAEC letter NG-09-0764 in response to RAI B.3.22-1]	18.1.22	Prior to the period of extended operation
10.	Fire Protection Program	Enhance procedures to inspect the entire diesel driven fire pump fuel supply line for age related degradation.	18.1.22	Prior to the period of extended operation
11.	Fire Water System Program	Implement maintenance activities to perform volumetric examinations for pipe wall thinning of fire protection piping periodically during the period of extended operation. [Revised in DAEC letter NG-09-0764 in response to New Program Commitments RAI]	18.1.23	Prior to the period of extended operation
12.	Fire Water System Program	Enhance procedures to include NFPA 25 criteria for sprinklers regarding replacing or testing	18.1.23	Prior to the period of extended operation

TABLE A-1
DUANE ARNOLD LICENSE RENEWAL COMMITMENTS[1]

Item No.	System, Component or Program	Commitment[2]	Section	Schedule
13.	Fire Water System Program	Enhance procedures to perform visual inspection of fire hydrants annually	18.1.23	Prior to the period of extended operation
14.	Fuel Oil Chemistry Program	Revise the program to require particulate testing of fuel oil samples from the diesel fire pump day tank	18.1.25	Prior to the period of extended operation
15.	Fuel Oil Chemistry Program	Enhance procedures to require sampling and testing of new fuel oil delivered to the diesel fire pump day tank; and to require that purchase orders and sampling procedures for diesel fuel delivered to and stored in the diesel fire pump day tank prohibit the delivery and use of biodiesel fuel. [Revised in letter NG-09-0764 in response to RAI B.3.25-1]	18.1.25	Prior to the period of extended operation
16.	Fuel Oil Chemistry Program	Enhance procedures to perform periodic (10 year) draining, cleaning and visual inspection of the diesel fuel oil day tanks, diesel fire pump day tank, and diesel driven air start air compressor fuel oil tanks. [Revised in letter NG-09-0764 in response to RAI B.3.25-4]	18.1.25	Prior to the period of extended operation

TABLE A-1
DUANE ARNOLD LICENSE RENEWAL COMMITMENTS[1]

Item No.	System, Component or Program	Commitment[2]	Section	Schedule
17.	Fuel Oil Chemistry Program	Implement procedures to require bottom thickness testing of the Standby Diesel Generator Day Tanks and the Diesel Fire Pump Day Tank. [Revised in DAEC letter NG-09-0764 in response to New Program Commitments RAI]	18.1.25	Prior to the period of extended operation
18.	Fuse Holders Program	Implement a Fuse Holders Program and complete the first test prior to the period of extended operation. [Revised in DAEC letter NG-09-0764 in response to RAI B.3.26-1 and New Program Commitments RAI]	18.1.26	Prior to the period of extended operation
19.	Inaccessible Medium Voltage Cable Program	Implement an Inaccessible Medium Voltage Cable Program and complete the first inspection or test prior to the period of extended operation. [Revised in DAEC letter NG-09-0764 in response to New Program Commitments RAI]	18.1.27	Prior to the period of extended operation
20.	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program	Implement an Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program. [Revised in DAEC letter NG-09-0764 in response to New Program Commitments RAI]	18.1.28	Prior to the period of extended operation

TABLE A-1
DUANE ARNOLD LICENSE RENEWAL COMMITMENTS[1]

Item No.	System, Component or Program	Commitment[2]	Section	Schedule
21.	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program	Enhance procedures to monitor for corrosion and wear of the supporting steel and rails	18.1.29	Prior to the period of extended operation
22.	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program	Enhance procedures to record usage of the reactor building and turbine building cranes	18.1.29	Prior to the period of extended operation
23.	Lubricating Oil Analysis Program	Enhance procedures to include diesel fire pump	18.1.30	Prior to the period of extended operation
24.	Metal Enclosed Bus Program	Implement a Metal Enclosed Bus Program and complete the first inspection prior to the period of extended operation. [Revised in DAEC letter NG-09-0764 in response to New Program Commitments RAI]	18.1.31	Prior to the extended operation
25.	One-Time Inspection Program	Implement a One-Time Inspection Program and complete the one-time inspections prior to the period of extended operation. [Revised in DAEC letter NG-09-0764 in response to New Program Commitments RAI]	18.1.32	Prior to the period of extended operation

TABLE A-1
DUANE ARNOLD LICENSE RENEWAL COMMITMENTS[1]

Item No.	System, Component or Program	Commitment[2]	Section	Schedule
26.	Reactor Vessel Surveillance Program	Implement a procedure to evaluate the BWRVIP ISP data as it becomes available. [Revised in DAEC letter NG-09-0764 in response to New Program Commitments RAI]	18.1.35	Prior to the period of extended operation
27.	Reactor Vessel Surveillance Program BWRVIP-74-A BWR PRV Inspection and Flaw Evaluation Guidelines for License Renewal	Revise the Reactor Vessel Surveillance Program to implement the recommendations of BWRVIP-116 BWR Vessel and Internals Project Integrated Surveillance Program Implementation for License Renewal.	18.1.35	Prior to the period of extended operation
28.	Reactor Vessel Surveillance Program	Implement BWRVIP-116 with the conditions documented in Sections 3 and 4 of the NRC Staff's SE dated March 1, 2006 for BWRVIP-116	18.1.35	Prior to the period of extended operation
29.	Selective Leaching of Materials Program	Implement and complete a program to include one-time visual inspection and hardness measurement of selected components susceptible to selective leaching [Revised in DAEC letter NG-09-0764 in response to New Program Commitments RAI]	18.1.36	Prior to the period of extended operation
30.	Structures Monitoring Program	Enhance procedures to include structures and structural components not currently in Maintenance Rule Program	18.1.37	Prior to the period of extended operation

TABLE A-1
DUANE ARNOLD LICENSE RENEWAL COMMITMENTS[1]

Item No.	System, Component or Program	Commitment[2]	Section	Schedule
31.	Structures Monitoring Program	Enhance procedures to include periodic sampling of groundwater for pH, chloride and sulfate concentration on a 5 year periodicity. [Revised in letter NG-10-0043 in response to Follow-up RAI B.3.37-2]	18.1.37	Prior to the period of extended operation
32.	Structures Monitoring Program	Enhance procedures to include a elastomer inspection to prevent leakage through containment penetration.	18.1.37	Prior to the period of extended operation
33.	Structures Monitoring Program	Enhance procedures to include a requirement to contact the proper personnel to allow opportunistic inspection of the buried concrete foundation.	18.1.37	Prior to the period of extended operation
34.	Structures Monitoring Program	Enhance procedures to include opportunistic inspections of the buried concrete foundation on a 10 year periodicity.	18.1.37	Prior to the period of extended operation
35.	Metal Fatigue of Reactor Vessel Coolant Pressure Boundary Program	Enhance procedures to incorporate the requirements of NUREG/CR-6260 locations into the implementing procedures.	18.2.2	Prior to the period of extended operation

TABLE A-1
DUANE ARNOLD LICENSE RENEWAL COMMITMENTS[1]

Item No.	System, Component or Program	Commitment[2]	Section	Schedule
36.	Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program	Implement a Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program. [Revised in DAEC letter NG-09-0764 in response to New Program Commitment RAI]	18.1.38	Prior to the period of extended operation
37.	BWR Vessel Internals Program	Inspect a sample of the rim hold-down bolts by VT-3 until an expanded technical basis for not inspecting is approved by the NRC.	18.1.14	Prior to the period of extended operation
38.	Reactor Vessel Circumferential Weld TLAA	Submit a relief request to address the frequency requirements of the inservice inspection of the RPV circumferential welds. (BWRVIP-05).	18.3.1.4	Prior to the period of extended operation
39.	Quality Assurance Program (Corrective Action, Confirmation Process, Administrative Controls)	Expand the scope of its 10 CFR Part 50, Appendix B Quality Assurance program to include non-safety-related structures and components subject to an AMR for license renewal.	UFSAR 17.1.2	Prior to the period of extended operation
40.	Operating Experience	Perform an operating experience review of extended power uprate and its impact on aging management programs for systems, structures, and components (SSCs) before entering the period of extended operation.		Prior to the period of extended operation

TABLE A-1
DUANE ARNOLD LICENSE RENEWAL COMMITMENTS[1]

Item No.	System, Component or Program	Commitment[2]	Section	Schedule
41.	Bolting Integrity Program	Revise the implementing procedures for the ASME Section XI Inservice Inspection Subsections IWB, IWC, and IWD Program; ASME Section XI Inservice Inspection, Subsection IWF Program; External Surfaces Monitoring Program; Structural Monitoring Program; and Buried Piping and Tanks Program such that they specifically address the inspection of fasteners (bolting, washers, nuts, etc.) for signs of leakage, corrosion/loss of material, cracking, and loss of preload/loss of prestress, as applicable. [Added in letter NG-09-0764 in response to RAI B.3.6-02]	18.1.6	Prior to the period of extended operation
42.	BWR Penetrations Program	The implementing document for the BWR Penetrations Program will be revised to specify that guidance in BWRVIP-14, -59 and -60 will be used, as appropriate, depending on material, in the evaluation of crack growth in stainless steel, nickel alloys and low-alloy steels, respectively, when flaws are identified and evaluation required. [Added in letter NG-09-0764 in response to RAI B.3.10-5] [Revised in letter NG-10-0009]	18.1.10	Prior to the period of extended operation
43.	Fire Protection Program	The DAEC Fire Barrier Penetration Seal Inspection surveillance procedure will be enhanced to ensure a approximately 10% of each type of penetration seal is included in the 35 percent selection of fire penetration seals that are visually inspected at an 18 month interval. [Added in letter NG-09-0764 in response to RAI B.3.22-1]	18.1.22	Prior to the period of extended operation

TABLE A-1
DUANE ARNOLD LICENSE RENEWAL COMMITMENTS[1]

Item No.	System, Component or Program	Commitment[2]	Section	Schedule
44.	Fire Protection Program	The DAEC Surveillance Procedure for the CO2 Cardox System Operability Annual Test will be enhanced to include a step to perform an inspection for corrosion and mechanical damage to system components. [Added in letter NG-09-0764 in response to RAI B.3.22-1]	18.1.22	Prior to the period of extended operation
45.	ASME Class 1 Small-bore Piping Inspection Program	Implement an ASME Code Class 1 Small-bore Piping Inspection Program. [Added in letter NG-09-0764 in response to RAI B.3.3-2]	18.1.40	Prior to the period of extended operation
46.	BWR Vessel Internals Program	The BWR Vessel Internals Program will incorporate the crack growth rate evaluations specified in the BWRVIP-100-A report. Plant-specific inspection intervals will be developed for DAEC core shroud welds that are exposed to a neutron fluence value equal to or greater than 1×10^{21} n/cm^2 (E > 1 MeV), as needed. [Added in letter NG-09-0663 in response to RAI B.3.14-5]	18.1.14	Prior to the period of extended operation
47.	Reactor Internals	DAEC will submit an analysis for loss of preload in core plate hold-down bolts due to stress relaxation to the NRC for Staff review. The analysis will use projected neutron fluence values for the end of the period of extended operation. The analysis will be submitted 2 years prior to entering the period of extended operation. [Added in letter NG-09-0663 in response to RAI 4.2.7-1]	18.3.1.7	Two years prior to entering the period of extended operation

TABLE A-1
DUANE ARNOLD LICENSE RENEWAL COMMITMENTS[1]

Item No.	System, Component or Program	Commitment[2]	Section	Schedule
48.	Boral Surveillance Program	Implement a Boral Surveillance Program and complete the first in-situ neutron attenuation test of the PaR spent fuel racks. [Added in letter NG-10-0009]	18.1.41	Prior to the period of extended operation
49	Fire Protection Program	Enhance procedures to inspect the 1 hour fire rated gypsum board wall that separates the control room computer room area from the front panel area for aging due to cracking. [Added in letter NG-10-0043]	18.1.22	Prior to the period of extended operation

[1]Table is updated to reflect DAEC correspondence through 2/2/2010.
[2]In the table, the term "implement" means that the program is described in an approved procedure or other approved formal document; the test, inspection or monitoring procedure has been developed and approved; and the first test, inspection or monitoring activity has been scheduled.