November 13, 2009

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

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE DUANE ARNOLD ENERGY CENTER LICENSE RENEWAL APPLICATION – AGING MANAGEMENT REVIEW LINE ITEMS (TAC NO. MD9769)

Dear Mr. Costanzo:

By letter dated September 30, 2008, as supplemented by letter dated January 23, 2009, FPL Energy Duane Arnold, LLC, submitted an application pursuant to Title 10 of the *Code of Federal Regulations* Part 54 (10 CFR Part 54) for renewal of Operating License No. DPR-49 for the Duane Arnold Energy Center. The staff of the U.S. Nuclear Regulatory Commission (the staff) is reviewing this application in accordance with the guidance in NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants." During its review from August 10, 2009 through August 14, 2009, the staff has identified areas where additional information is needed to complete the review. The staff's requests for additional information are included in the enclosure. Further requests for additional information may be issued in the future.

Items in the enclosure were discussed with Mr. Ken Putnam, of your staff, and a mutually agreeable date for the response is within 30 days from the date of this letter. If you have any questions, please contact me by telephone at 301-415-2277 or by e-mail at Brian.Harris2@nrc.gov.

Sincerely,

/RA/

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

Docket No. 50-331

Enclosure:
As stated

cc w/encl: See next page

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Vice President, Nuclear Plant Support
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DATE:	11/13/09	10/30/09	11/12/09	11/13/09

OFFICIAL AGENCY RECORD

Letter to Christopher Costanzo from Brian K. Harris dated November 13, 2009

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DUANE ARNOLD ENERGY CENTER
LICENSE RENEWAL APPLICATION
REQUEST FOR ADDITIONAL INFORMATION

RAI 4.7.5

Background

License renewal application (LRA) Section 4.7.5 presents fatigue evaluations and cumulative usage factor (CUF) for the control rod drive mechanism (CRDM).

Issue

However, the analysis methodology used by the applicant for the CRDM fatigue analysis is not adequately described in the application. Additionally, in the LRA the applicant stated that for the scram headers, acceptable 60-year CUF can not be obtained by raising the 40-year CUF by 1.5. The applicant then stated that "since the design number of scram cycles is being reduced from 200 to 150, and the earthquake assumptions remain unchanged, the 60-year CUF values remain below 1.0 and are therefore acceptable." However, there is insufficient information provided in the application to draw such a conclusion.

Request

1. Provide the reference (e.g., U.S. Nuclear Regulatory Commission document) which was used as the basis for the fatigue analysis for CRDM at extended power uprate (EPU) conditions. Also describe the input data relevant to the analysis, and the thermal/mechanical conditions of the EPU that were used for the fatigue analysis.

2. Provide the calculation that demonstrates that reducing the design cycles of scram from 200 to 150 will lead to an acceptable 60-year CUF for the scram headers.

3. Provide the basis to support the conclusion that the fatigue analysis exemption for the SDV vent and drain valves will remain bounding for a 60-year life. Also, define the acronym SDV, which is not included in the abbreviation table of the LRA.

4. Analyses for the CRDM were placed in mixed categories of Title 10 of the *Code of Federal Regulations* Part 54.21(c)(1)(i) (10 CFR 54.21(c)(1)(i)) and 10 CFR 54.21(c)(1)(ii). Please separate the dispositions appropriately for different components and/or systems.

ENCLOSURE

RAI 3.3.2.2-1

Background

In LRA Tables 3.3.2-18 (pages 3.3-172, 174 and 175) and 3.3.2-23 (pages 3.3-195, 196 and 198), the applicant addresses the aging management review (AMR) items of loss of material due to pitting, crevice and galvanic corrosion in the copper and copper alloy heat exchanger, condenser, cooler, fan coil, pipe, pipe fitting, hoses, tubes, rupture disk, valve, and damper in the plant ventilation system and reactor building heating, ventilation and air conditioning system, respectively.

The applicant states that the components of the AMR items are exposed to treated water (internal) and related with LRA Table 3.3-1, Item 3.3.1-31 that requires further evaluation of detection of aging effects. Using plant-specific Note 219, the applicant also states that galvanic corrosion is not applicable to the components since it is not in contact with metal higher in the galvanic series.

The staff noted that whereas the Generic Aging Lessons Learned (GALL) Report recommends GALL Aging Management Program (AMP) XI.M2, "Water Chemistry" and GALL AMP XI.M32, "One-Time Inspection" for acceptable verification of the water chemistry program's effectiveness, the applicant credits the "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program" (LRA Section B.3.28).

Issue

The applicant's aging management described in the LRA does not include water chemistry control to minimize adverse effects of the environment on the degradation of the components.

Request

1. Clarify whether the applicant's aging management for the AMR items includes water chemistry control to minimize adverse effects of the environment on the degradation of the components. If the water chemistry is controlled to manage the aging effects of the AMR items, provide how the water chemistry is controlled to manage the aging effects.

2. If water chemistry control is not performed to minimize the environmental effect on loss of material in the components, justify why the aging management approach without water chemistry control is adequate to manage the aging effects. Please, include the operating experience as part of the RAI response if applicable.

RAI 3.3.2.3-1

Background

In LRA Table 3.3.2-22 (page 3.3-188), the applicant addresses the AMR item of copper alloy heat exchanger, condenser, cooler and fan coil of the reactor building closed cooling water system in the auxiliary systems that are subject to no aging effect in a lubricating oil (internal) environment. The applicant also indicates that the consistency note for the AMR item is Note I, which means that aging effect in the GALL Report for this component, material and environment is not applicable.

The staff reviewed the AMR item and related information in comparison with GALL Report Vol. 2, Items VII.C1-8 (AP-47) and VII.C2-5 (AP-47) for the copper alloy piping, piping components and piping elements of the open-cycle cooling water system and closed-cycle cooling water system, respectively, in the auxiliary systems. The staff noted that the two AMR items of the GALL Report indicate that the copper alloy components exposed to lubricating oil are subject to loss of material due to pitting and crevice corrosion.

Issue

In relation to the aging effect of loss of material, the staff noted that using plant-specific Note 232, the applicant states that the component does not have the potential for water contamination. The staff found a need to further clarify the technical basis of the applicant's statement.

Request

1. Clarify why the components of the AMR item do not have the potential for water contamination in the lubricating oil. In conjunction to the foregoing request, clarify why the AMR item is not subject to loss of material.

2. If applicable, provide the operating experience that supports the applicant's statement that no potential exists for the water contamination in the lubricating oil. If applicable, include the operating experience in terms of the occurrence of loss of material in the components as part of the RAI response.

RAI 3.3.2.2-2

Background

In LRA Table 3.2.2-4 (page 3.2-46), the applicant addresses the AMR item of reduction of heat transfer due to fouling in the admiralty brass heat exchanger, condenser, cooler and fan coil of the reactor core isolation cooling system in the engineered safety features. The applicant states that the components of the AMR item are exposed to treated water (internal) and related with LRA Table 3.4-1, Item 3.4.1-9 that requires further evaluation of detection of aging effects. The applicant also states that the consistency note for the AMR item is Note A, which means that the AMR item is consistent with the GALL item for component, material, environment and aging effect and the applicant's AMP is consistent with the GALL AMP.

Issue

However, the staff noted that where the GALL Report recommends GALL AMP XI.M2, "Water Chemistry" and GALL AMP XI.M32, "One-Time Inspection" for acceptable verification of the water chemistry program effectiveness, the applicant credits the Lubricating Oil Analysis Program (LRA Section B.3.30) and the One-Time Inspection Program (LRA Section B.3.32) in contrast with the consistency Note A the applicant claimed for the AMR item.

Request

1. Clarify why the Lubricating Oil Analysis Program is credited for the AMR item instead of the Water Chemistry Program in contrast with the consistency Note A that the applicant claimed for the AMR item.

RAI 3.3.2.2-3

Background

In LRA Table 3.3.2-1 (pages 3.3-67 and 69), the applicant addresses the AMR items of loss of material due to pitting and crevice corrosion in the copper alloy components of the auxiliary heating boiler. The applicant states that the components of the AMR items are exposed to treated water (internal) and related with LRA Table 3.4-1, Item 3.4.1-15 that requires further evaluation of detection of aging effects.

In relation to LRA Table 3.4-1, Item 3.4.1-15, the applicant states that the consistency note for the AMR items is Note E, which means that the material, environment, and aging effect are consistent with the GALL Report, but a different AMP is credited. The staff noted that where the GALL Report recommends GALL AMP XI.M2, "Water Chemistry" and GALL AMP XI.M32, "One-Time Inspection" for acceptable verification of the water chemistry program effectiveness, the applicant credits the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program (LRA Section B.3.28).

Issue

The staff found a need to clarify whether water chemistry control is performed to minimize the adverse effect of the treated water environment on loss of material in the components.

Request

1. Clarify whether water chemistry control is performed to minimize the adverse effect of the environment on loss of material in the copper alloy components of the auxiliary heating boiler as recommended in the GALL Report.

2. If water chemistry control is not performed to minimize the environmental effect on loss of material in the components, justify why the aging management approach without water chemistry control is adequate to manage the aging effects. Also include the operating experience as part of the RAI response if applicable.

RAI 3.3.2.1.x-1

Background

In LRA Table 3.3.2-27 (page 3.3-219), the applicant addressed an AMR item for the stainless steel heat exchanger, condenser, cooler and fan coil of the safety related air system, which are subject to loss of material due to pitting and crevice corrosion in a condensation (internal) environment in relation with LRA Table 1, Item 3.3.1-54. Similarly, in LRA Table 3.3.2-29 (pages 3.3-232, 239 and 246), the applicant addressed AMR items for the stainless steel components (including pipe, pipe fittings and valve damper) of the standby diesel generators, which are subject to loss of material due to pitting and crevice corrosion in a condensation (internal) environment in relation with LRA Table 1, Item 3.3.1-54.

As indicated by the applicant's consistency Note E, the applicant credited the "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program" for the AMR items in lieu of GALL AMP XI.M24, "Compressed Air Monitoring," which is recommended by the GALL Report.

Issue

The staff found a need to clarify why the "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program" is credited in lieu of GALL AMP XI.M24 and how the credited program can adequately manage the aging effect of loss of material for the AMR items.

Request

1. Clarify why the "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program" is credited for the AMR items of the safety-related air system and standby diesel generators instead of GALL AMP XI.M24, "Compressed Air Monitoring," which is recommended by the GALL Report.

2. Provide justification why the credited program can adequately manage loss of material for the AMR items of the safety-related air system and standby diesel generators.

RAI 3.5.2.1-1

Background

In LRA Table 3.5.2-8, on page 3.5-93, the applicant has credited the Fire Protection Program to manage cracking of concrete masonry units in air-indoor uncontrolled exterior environment. The applicant referenced GALL Report Item III.A3-11, LRA Table 3.5.1, Item 3.5.1-43 and Footnote E.

Issue

In LRA Table 3.5.1, line 3.5.1-43, discussion column states that this program is consistent with NUREG-1801 and that the Structures Monitoring Program will confirm the absence of aging effects requiring management. However, there is no mention of the Fire Protection Program. Furthermore, GALL Report Item III.A3-11, recommends GALL AMP XI.S5, "Masonry Wall Program."

Request

1. Please resolve the discrepancy between LRA Tables 3.5.1 and 3.5.2-8 and confirm if the Fire Protection Program should have been included in Table 3.5.1, Item 3.5.1-43 discussion column.

2. Since GALL AMP XI.S5 does not recommend a specific frequency, please confirm that if the Fire Protection Program is used in lieu of GALL AMP XI.S5, that a frequency of once every refueling outage as recommended by GALL AMP XI.M26, "Fire Protection," is maintained for visual inspection of concrete masonry units.

3. The acceptance criteria of GALL AMP XI.S5 are different than the acceptance criteria of Fire Protection Program. However, the Fire Protection Program has not been enhanced to include the acceptance criteria of GALL AMP XI.S5, which includes observing degradation of steel edge supports and bracing so as not to invalidate the evaluation basis. Please provide information on what acceptance criteria will be used, if the Fire Protection Program is credited to manage cracking of concrete masonry walls.

4. GALL AMP XI.S5 recommends that visual examination of the masonry walls by qualified inspection personnel is sufficient. GALL AMP XI.M26 recommends visual inspection by fire protection qualified inspectors to perform inspections of fire barrier walls. Please confirm if the fire protection qualified inspectors are also qualified to inspect concrete masonry walls.

RAI 3.3.2.1-A

Background

In LRA Table 3.3.1, Item 3.3.1-61, discussion column states that increased hardness, shrinkage and loss of strength of elastomer fire barrier penetration seals exposed to indoor and outdoor air is managed by the Fire Protection and the Structures Monitoring Programs at Duane Arnold Energy Center (DAEC) (in Section 3.5). In LRA Tables 3.5.2-8, 3.5.2-9, and 3.5.2.11, the applicant has referenced Footnote E for lines where the Structures Monitoring Program is credited. These lines also reference GALL Report Items VII.G-1 and VII.G-2, which recommends GALL AMP XI.M26, "Fire Protection" program only to manage the aging effects of elastomer fire barrier penetration seals.

Issue

It is not clear how these two programs will be used to manage the aging effects. There are different frequencies and acceptance criteria recommended in these two programs.

Request

Please clarify how these two programs will be used to manage the aging effects of elastomer fire barrier penetration seals. Please clearly indicate what will be the frequency of the inspection and what acceptance criteria will be used.

RAI 3.5.2.3.2-1

Background

In LRA Table 3.5.2.2-2, on page 3.5-50, the applicant is crediting the Fire Protection Program to manage cracking and delamination of non-metallic fire proofing in an indoor uncontrolled external environment. The applicant has referenced Footnote H, which states that aging effect not in NUREG-1801 for this component, material and environment combination. The applicant has also referenced plant-specific Footnote 506, which states that component is cementitious fire proofing/insulating material and will exhibit similar aging effects as concrete.

Issue

The applicant references Table 3.3.1, Item 3.3.1-65 and GALL Report Item VII.G-28. Footnote H implies that this line item is not consistent with or not included in the GALL Report.

Request

Since this line is not consistent with the GALL Report, please justify why a GALL Report line item is referenced. Please also justify how the Fire Protection Program will manage the aging effect of cracking and delamination, and provide inspection methods and acceptance criteria to detect delamination.

RAI 3.2.2.1-1

Background

In LRA Table 3.2.2-6, standby gas treatment system, on page 3.2-68, the applicant has identified one line item for steel valve damper in a raw water internal environment with aging effect of loss of material. The applicant credited the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program with a Footnote E, and referenced GALL Report Item VII.G-24.

Issue

In the same Table, on page 3.2-68, for another line item for steel valve damper in the same environment and the same aging effect, the applicant has credited the Fire Water System Program.

Request

Please justify why two different programs are credited for the same material, environment, and aging effect combination.

RAI 3.3.2.1-2

Background

In LRA Table 3.3.1, line Item 3.3.1-63, the applicant stated in the discussion column that wear of steel fire doors exposed to air is managed by the Fire Protection Program at DAEC, and that this is addressed in Section 3.5. In LRA Table 3.5.2-8, for the two line items for carbon steel fire door in air-indoor uncontrolled environment that reference line Item 3.3.1-63, the applicant has credited the Fire Protection Program in one line item, and the Structures Monitoring Program in the other line item and referenced Footnote E. The Footnote E indicates that this line is consistent with NUREG-1801 item for material, environment, and aging effect, but a different AMP is credited.

Issue

LRA Table 3.3.1, Item 3.3.1-63 does not identify Structures Monitoring Program. It only identifies Fire Protection Program.

Request

Please resolve the discrepancy between the discussion column of LRA Table 3.3.1, line 3.3.1-63 and LRA Table 3.5.2-8; and if Structures Monitoring Program is also used, then clarify how these two programs will be used to manage the aging effect of loss of material of steel fire doors.

RAI 3.3.2.1-3

Background

In LRA Table 3.3.1, line Item 3.3.1-64, the applicant has proposed Fuel Oil Chemistry and One-Time Inspection Program to manage the aging effect of loss of material due to general, pitting, and crevice corrosion of steel piping, piping components, and piping elements exposed to fuel oil. This line item is referenced in Table 3.3.2-11, fire protection system, page 3.3-128, for component type accumulator, pulsation damper, low pressure tank, and GALL Report Volume 2 Item VII.G-21 is referenced. This line item also references plant-specific Footnote 202, which states that additional aging mechanisms such as galvanic corrosion, Microbiologically-Influenced Corrosion (MIC), wear and/or selective leaching are also included.

Issue

GALL Report Volume 2 Item VII.G-21 recommends Fuel Oil Chemistry and Fire Protection Programs to manage the aging effect of loss of material due to general, pitting, and crevice corrosion of steel piping, piping components, and piping elements exposed to fuel oil. The Fire Protection Program is used to verify the effectiveness of the Fuel Oil Chemistry Program. It is not clear whether the One-Time Inspection Program is used to verify the effectiveness of the Fuel Oil Chemistry Program. Furthermore, it is not clear if the applicant expects selective leaching to be an issue in carbon steel components in a fuel oil environment.

Request

Please justify the use of One-Time Inspection Program in lieu of the periodic inspections as recommended by the Fire Protection Program. Also, please provide the basis for considering selective leaching to be an aging mechanism for carbon steel material in a fuel oil environment.

RAI 3.3.2.1-4

Background

LRA Table 3.3.1, Item 3.3.1-65 states in the discussion column that this line is not applicable to the Auxiliary Systems at DAEC, however, cracking and spalling, aggressive chemical attack of reinforced concrete structural fire barriers exposed to indoor air is managed by the Fire Protection and Structural Monitoring Programs at DAEC (in Section 3.5).

Issue

The staff reviewed LRA Section 3.5, Table 2 and could not find any line item that referenced Table 3.3.1, Item 3.3.1-65 where Structures Monitoring Program was credited.

Request

Please confirm if Structures Monitoring Program is used in addition to the Fire Protection Program in Table 3.3.1, Item 3.3.1-65. If not used, please justify the inclusion of Structures Monitoring Program in the discussion column.

RAI 3.3.2.1-5

Background

LRA Table 3.3.1, Item 3.3.1-66 states in the discussion column that cracking and spalling of reinforced concrete structural fire barriers exposed to outdoor air is managed by the Structural Monitoring Programs at DAEC (in Section 3.5). This line item is referenced in LRA Table 3.5.2-2 for one component type concrete on page 3.5-47, and in LRA Table 3.5.2-5 for four component types on pages 3.5-61, 3.5-66 and 3.5-67. These lines also reference GALL Report Item VII.G-30.

Issue

All lines in LRA Tables 3.5.2-2 and 3.5.2-5 that reference Table 3.3.1, Item 3.3.1-66 as identified above, credit the Fire Protection Program to manage cracking and spalling, and not the Structures Monitoring Program, and reference Footnote B. The GALL Report Item VII.G-30 recommends Fire Protection and Structures Monitoring Programs.

Request

Please resolve the discrepancy between the discussion column of LRA Table 3.3.1, line 3.3.1-66 and LRA Tables 3.5.2-2 and 3.5.2-5. Also, please confirm if Fire Protection Program is only used, then justify why Footnote E is not used, instead of Footnote B.

RAI 3.3.2.1-6

Background

LRA Table 3.3.1, Item 3.3.1-68 states in the discussion column that loss of material of steel piping, piping components, and piping elements exposed to raw water is managed by the Fire Water System, Bolting Integrity and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Programs.

LRA Table 3.3.2-11, fire protection system, references line Item 3.3.1-68 for carbon steel fastener, bolting, washer and nuts in a raw water external environment and credits the Bolting Integrity Program. Footnote E is referenced indicating that a different program is credited than what the GALL Report recommends. The staff noted that this component is in an external environment of raw water, implying that this component is under water.

Issue

LRA Section B.3.28 states in its Bolting Integrity Program that the DAEC External Surfaces Monitoring Program provides the requirements for the inspection of bolting for steel components such as piping, piping components, ducting and other components within the scope of license renewal. The staff noted that the External Surface Monitoring Program utilizes visual inspection at periodic intervals to detect age related degradation.

Request

Please confirm how and at what frequency the visual inspection will be performed on bolting in raw water external environment to detect age related degradation.

RAI Steel-Other

Background

The GALL Report, Table 2, Item 31, states that external surfaces of steel components exposed to indoor uncontrolled air are subject to loss of material due to general corrosion. The GALL Report states that the aging effect/mechanism can be managed by the External Surfaces Monitoring Program.

Issue

The DAEC LRA Supplement 1, Table 3.4.2-4, page 3.4-55, indicates that when carbon steel valve operators and damper operators are exposed to indoor uncontrolled air (external), loss of material due to corrosion is not an applicable aging effect, because system temperatures are greater than 100°C [212°F]. In the LRA Supplement 1, the applicant also indicates that the aging effect for this component, material, and environment combination is not applicable. These statements are not consistent with the GALL Report, which states that external surfaces of steel components exposed to indoor uncontrolled air are subject to loss of material due to general corrosion. The general corrosion rates due to uncontrolled air exposure tend to increase at higher temperatures. It is not clear to the staff why an AMP for carbon steel components exposed to indoor uncontrolled air was not included.

Request

Provide additional information justifying why carbon steel valve dampers and damper operators exposed to indoor uncontrolled air do not have aging degradation effects that require an AMP.

RAI Stainless Steel

Background

NUREG-1833, “Technical Bases for Revision to the License Renewal Guidance Documents, Table II.B, Item TP-6, indicates that stainless steel exposed to an outdoor air environment could result in loss of material, pitting, and crevice corrosion due to constant wetting and drying conditions. The report also states that the aging effect can be managed by the implementation of the AMP, Chapter XI.S6, “Structures Monitoring Program.”

Issue

The DAEC LRA Supplement 1, Table 3.4.2-1, pages 3.4-22, 3.4-27, and 3.4-28, indicates that when stainless steel components are exposed to external atmosphere/weather, there is no aging effect requiring management.

Request

Provide additional information justifying why stainless steel components exposed to external atmosphere/weather do not have any aging degradation effect that requires an AMP.

RAI Copper Alloy

Background

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 copper alloy components in treated water (e.g., GALL Items VII.A4-7, VII.E3-9, and VIII.A-5). The One-Time Inspection Program provides measures to verify the effectiveness of the Water Chemistry Program.

Issue

For some of the Table 3.X-1 items, identified as 3.3.1-25, 3.3.1-31, and 3.4.1-15, the DAEC LRA Supplement 1, Section B.3.28, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program" is credited for managing the loss of material for copper alloy components exposed to a treated water environment. In these situations, the LRA Supplement 1 indicates that the AMR results are consistent with the GALL Report for material, environment, and aging effect, but a different AMP is credited. There is insufficient information to determine how the applicant's "Inspection of 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 copper alloy components exposed to a treated water environment.

RAI 3.3.2.2.10.2-1

Background

LRA and SRP Table 3.3.1, Item 23 address loss of material due to general, pitting, and crevice corrosion of stainless steel and steel with stainless steel cladding heat exchanger components exposed to treated water. LRA and SRP Table 3.3.1, Item 24 address loss of material due to general, pitting, and crevice corrosion of stainless steel and aluminum piping, piping components and piping elements exposed to treated water. These items recommend further evaluation on the part of the staff and refer to LRA and SRP Sections 3.3.2.2.10.2. The applicant proposes to manage this aging process through the use of its AMPs "Water Chemistry" (LRA B.3.39), "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components" (LRA B.3.28), and "One Time Inspection" (LRA B.3.32). 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. The applicant proposes that the aging management review items associated with Table 3.3.1, Items 23 and 24 are fully consistent with the GALL Report (Generic Note A), consistent with the GALL report except some exceptions are taken (Generic Note B), or consistent with the GALL Report for material, environment, and aging effect but a different AMP is credited (Generic Note E).

Issue

The staff reviewed LRA Table 3.3.1 Item 23 in accordance with SRP Section 3.3.2.2.10.2. The staff noted that the applicant applied Generic Note B to these items. This generic note states that exceptions have been taken to the AMP. The staff checked both of the proposed AMPs, Water Chemistry and One Time Inspection, and found that both indicate that no exception has been taken. While the staff accepts the concept of using these to AMPs to manage the aging under consideration, it cannot concur with this proposal until the issue of exceptions has been resolved.

The staff reviewed subordinate items to LRA Table 3.3.1, Item 24 for which the applicant assigned Generic Note E in accordance with SRP Section 3.3.2.2.10.2. The staff noted that the water chemistry programs are limited to high purity water, i.e., boiling-water reactor (BWR) water chemistry, pressurized water reactor (PWR) primary water chemistry, and PWR secondary water chemistry. The staff also noted that the definition of treated water as contained in both the GALL Report and the LRA is less restrictive, i.e., it is possible to have water which meets the definition of treated water which does not meet the scope of the Water Chemistry programs. The staff further noted that the systems for which the applicant assigned Generic Note E may contain treated water but may not contain water meeting the scope of the water treatment program. While the staff would normally consider this sufficient to agree with the applicant's proposal to use an AMP other than Water Chemistry, in this case the staff notes that there are items in the systems where the staff does not expect high purity water, e.g., heating and ventilation systems, where the applicant proposes to manage aging through the use of the Water Chemistry program. This apparent contradiction merits further inquiry on the part of the staff. If the Generic Note E items are components exposed to treated water other than that in scope of the Water Treatment AMP, the staff concurs with the applicant's proposal to manage aging using the Inspection of Internal surfaces program because the aging effects under consideration can be detected by visual inspection and the proposed program contains appropriate visual inspection procedures.

Request

Please identify the exceptions being taken to the Water Chemistry and/or One Time Inspection AMPs, as indicated in Table 3.3.2-24 and justify why such exceptions do not affect the ability of these AMPs to manage aging in the present case or correct the generic note for these items.

Please clarify whether the "Water Chemistry" program is being used only for items exposed to high purity water and the Inspection of Internal Surfaces is being used only to address items exposed to treated water of lesser purity. If this is not the case, justify the use of these programs for the specific situations being considered.

RAI 3.4.2.2.4.1-1

Background

LRA and SRP Table 3.4.1, Item 9 address reduction of heat transfer due to fouling of stainless steel and copper alloy heat exchanger tubes exposed to treated water. These items recommend further evaluation on the part of the staff and refer to LRA and SRP Sections 3.4.2.2.4.1. In Section 3.4.2.2.4.1, the applicant states that the steam and power conversion systems at DAEC have no stainless steel or copper alloy heat exchanger tubes in a treated water environment with an intended function of heat transfer and associated aging effect of fouling. The applicant also states that LRA Section 3.4.2.2.4.1 is applied to the High Pressure Coolant Injection and Reactor Core Isolation Cooling Engineered Safety Features Systems which have copper alloy heat exchanger tubes exposed to water. The applicant further states that aging effect loss of heat transfer due to fouling is managed for these heat exchanger tubes 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 stagnant flow.

Issue

The staff reviewed LRA Table 3.4.1, Item 9 in accordance with SRP Section 3.4.2.2.4.1. In this review the staff noted that two table 2 line items are associated with Table 3.4.1, Item 9. These items are contained in LRA Table 3.2.2-2. Both components are designated heat exchanger, condenser, cooler, fan coil. Both items are admiralty brass and are exposed to treated water. The AMPs for one are Water Chemistry and One Time Inspection. The AMPs for the other are Lubricating Oil Analysis and One Time Inspection. It is unclear to the staff whether the applicant actually proposes to manage the aging of the component which is exposed to water with the Lubricating Oil Analysis program or whether the applicant erred in designating the proposed AMP or whether the applicant erred in designating the environment.

Request

Please clarify the use of the Lubricating Oil Analysis program for components exposed to treated water.

RAI 3.4.2.2.4.2-1

Background

LRA and SRP Table 3.4.1, Item 10 address reduction of heat transfer due to fouling of steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil. These items recommend further evaluation on the part of the staff and refer to LRA and SRP Sections 3.4.2.2.4.2. In Section 3.4.2.2.4.2, the applicant states that the steam and power conversion systems have no heat exchanger tubes in a lubricating oil environment with an intended function of heat transfer and associated aging affect of fouling.

Issue

The staff reviewed LRA Table 3.4.1, Item 10 in accordance with SRP Section 3.4.2.2.4.2. In this review the staff noted that there are no subordinate items to LRA Table 3.4.1, Item 10. However, the staff recalls that Table 3.4.1, Item 9 contains an item which uses the Lubricating Oil Analysis program for aging management for a treated water environment (see RAI 3.4.2.2.4.1). The staff questions whether the appropriate environment for this component is water (in which case the AMP cited is in error) or lube oil (in which case the environment is incorrect and the item may belong in 3.4.1, Item 10).

Request

Please clarify whether the environment and proposed AMP for this component and, based on this clarification whether LRA section is applicable or not.

RAI 3.5.2.1-a

Background

LRA and SRP Table 3.5.1, Item 49 address the loss of material due to general, pitting, and crevice corrosion of support members, welds, bolted connections, support anchorage to building structure. Although not specifically stated it is assumed that this GALL item refers to steel materials exposed to treated water. LRA and SRP Table 3.3.1, Item 39 address cracking due to stress corrosion cracking of stainless steel BWR spent fuel storage racks exposed to treated water at temperatures greater than 60^{o}C. The applicant proposes to manage this aging process through the use of its AMP "ASME Section XI Subsection IWF" (LRA B.3.5) and "Water Chemistry" (LRA B.3.39). For Table 3.5.1, Item 49, the GALL Report recommends that this aging process be managed through the use of the AMP "Water Chemistry" (GALL Report Vol. 2 XI.M2) and "ASME Section XI, Subsection IWF" (GALL Report Vol. 2 XI.S2). For Table 3.3.1, Item 39, the GALL Report recommends that this aging process be managed through the use of the AMP "Water Chemistry" (GALL Report Vol. 2 XI.M2). The applicant proposes that these AMR items are consistent with the GALL Report except that a different component is named (Generic Note C) or are consistent with the GALL Report in terms of material, environment, and aging effect but a different AMP is credited (Generic Note E).

Issue

In its review, the staff noted that two items for the component "defective fuel storage container" are listed in Table 3.5.1, Item 49 in the spreadsheet of AMR items and in Table 3.3.1, Item 39 in the LRA. The staff also noted that for one of these items the generic note was C and the proposed AMP was Water Chemistry and that for the other item the generic note was E and the proposed AMP was ASME Section XI Subsection IWF. Taken individually neither of these items meets the recommendation contained in the GALL Report. Taken together, as the staff believes was intended, they at least meet the recommendations contained in both Table 3.5.1, Item 49 and Table 3.3.1, Item 39 of the GALL Report. Despite the fact that the applicant appears to have met the recommendations of the GALL Report, the staff remains confused regarding the classification of this aging effect, i.e., is it being addressed under Table 3.5.1 or Table 3.3.1 or is some other table/item combination more appropriate.

Request

Please describe the aging issues associated with the defective fuel storage container, justify the selection of an AMR item, and justify why the selected AMPs are sufficient to manage aging of this component.

RAI 3.3.2.1-a

Background

LRA and SRP Tables 3.3.1, Item 76 address the loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, fouling, and lining-coating degradation of steel piping, piping components, and piping elements exposed to raw water. The applicant proposes to manage this aging process for the component under consideration through the use of its AMP "External Surfaces Monitoring" (LRA B.3.21). The GALL Report recommends that this aging process be managed through the use of the AMP "Open Cycle Cooling Water System" (GALL Report Vol. 2 XI.M20). The applicant proposes that the aging management review items are consistent with the GALL Report in terms of material, environment, and aging effect but a different AMP is credited (Generic Note E).

Issue

In its review of LRA components subordinate to Table 3.3.1, Item 76 for which the applicant assigned Generic Note E and for which the applicant proposes to use the LRA AMP "External Surfaces Monitoring," the staff noted that the applicant selected a GALL Report item for which the Open Cycle Cooling Water AMP was the recommended AMP. The staff also noted that for the subordinate item the applicant identifies the component as traveling screens. The staff further noted that at least some portions of the intakes and traveling screens are scoped into license renewal as safety related components. In the absence of evidence to the contrary, the staff must find that the applicant appropriately selected an AMR item for which the recommended AMP is "Open Cycle Cooling Water". The Open Cycle Cooling Water AMP implements Generic Letter (GL) 89-13 for license renewal. GL 89-13 contains 5 actions to be undertaken by license holders. Two of these actions, monitoring for corrosion and monitoring for the presence of biofouling appear to be specifically applicable to traveling screens.

Enclosure 1 to GL 89-13 specifically cites inspection of the intake structure, of which the traveling screens appear to be a part, to detect biofouling. While it is clear to the staff that the applicant's external surfaces monitoring program is designed to detect loss of material from external surfaces such as the traveling screen and it is also clear that in the process of inspecting the screens for loss of material, the presence of biofouling would be detected, it is not clear to the staff that the external surfaces monitoring program will be fully effective in managing the aging of these components.

Request

Please revise the AMR items to indicate that the aging of the components under consideration will be managed using the Open Cycle Cooling Water AMP or describe why the Open Cycle Cooling Water AMP is not applicable to these components or justify why the External Surfaces Monitoring Program will be fully effective in managing the aging of these components.

RAI 3.3.2.1-d1

Background

LRA Table 3.3.1, Item 3.3.1-79 and SRP-LR Table 3.3-1 ID 79 address the loss of material due to pitting and crevice corrosion as well as fouling of stainless steel piping, piping components, and piping elements exposed to raw water. In Item 3.3.1-79, the applicant proposes to manage this aging process through the use of its AMP "Open Cycle Cooling Water" (LRA B 3.33). In items subordinate to Item 3.3.1-79, the applicant proposes to manage this aging process through the use of its AMPs "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components" (LRA B.3.28), "External Surfaces Monitoring" (LRA B.3.21), "Bolting Integrity" (LRA B.3.6) and Open Cycle Cooling Water (LRA B 3.33).

Issue

In its comparison of LRA Item 3.3.1-79 with its subordinate items the staff noted LRA Item 3.3.1-79 lists "Open Cycle Cooling Water" as the only AMP used for this LRA item. The staff also noted that subordinate items list other AMPs. It is not clear to the staff whether LRA Item 3.3.1-79 is missing AMPs or whether the subordinate items contain AMPs which are not being used.

Request

Please modify LRA Item 3.3.1-79 to include all AMPs being utilized or modify the subordinate items to indicate that only the Open Cycle Cooling Water AMP is being used.

RAI 3.3.2.1-d2

Background

LRA and SRP Tables 3.3.1, Item 79, address the loss of material due to pitting and crevice corrosion as well as fouling of stainless steel piping, piping components, and piping elements exposed to raw water. The applicant proposes to manage this aging process through the use of its AMP "External Surfaces Monitoring" (LRA B.3.21). The GALL Report recommends that this aging process be managed through the use of the AMP "Open Cycle Cooling Water System" (GALL Report Vol. 2 XI.M20). The applicant proposes that the aging management review items are consistent with the GALL Report in terms of material, environment, and aging effect but a different AMP is credited (Generic Note E).

Issue

In its review of LRA components subordinate to Table 3.3.1, Item 79 for which the applicant assigned Generic Note E and for which the applicant proposes to use the LRA AMP "External Surfaces Monitoring" the staff noted that the applicant selected a GALL Report item for which the Open Cycle Cooling Water AMP was the recommended AMP. The staff also noted that for the subordinate item the applicant identifies the component as filter, screens, and strainer. These components are included in LRA Table 3.3.2-16 which includes the intake and traveling screens. The staff further noted that at least some portions of the intakes and traveling screens are scoped into license renewal as safety related components. In the absence of evidence to the contrary, the staff must find that the applicant appropriately selected an AMR item for which the recommended AMP is "Open Cycle Cooling Water". The Open cycle cooling water AMP implements GL 89-13 for license renewal. GL 89-13 contains five actions to be undertaken by license holders. Two of these actions, monitoring for corrosion and monitoring for the presence of biofouling appear to be specifically applicable to traveling screens. Enclosure 1 to GL 89-13 specifically cites inspection of the intake structure, of which the traveling screens appear to be a part, to detect biofouling. While it is clear to the staff that the applicant's external surfaces monitoring program is designed to detect loss of material from external surfaces such as the traveling screen and it is also clear that in the process of inspecting the screens for loss of material, the presence of biofouling would be detected, it is not clear to the staff that the external surfaces monitoring program will be fully effective in managing the aging of these components.

Request

Please revise the AMR items to indicate that the aging of the components under consideration will be managed using the Open Cycle Cooling Water AMP or describe why the Open Cycle Cooling Water AMP is not applicable to these components or justify why the External Surfaces Monitoring program will be fully effective in managing the aging of these components.

RAI 3.1.2.2.7-1

Background

In LRA Section 3.1.2.2.7, Cracking Due to Stress Corrosion Cracking, Item 2 states that cracking, due to stress-corrosion cracking (SCC) in Class 1 PWR cast austenitic stainless steel (CASS) reactor coolant system piping, piping components, and piping elements exposed to reactor coolant is not applicable for Duane Arnold because this is only applicable to pressurized water reactors.

However, in the LRA Table 3.4.2-4 the applicant credits the One Time Inspection Program and the Water Chemistry Program to manage cracking of cast austenitic stainless steel Class 1 flow elements that are exposed to reactor coolant. LRA Table 3.4.2-4 points to LRA Table 3.1.1, Item 41 where the BWR Stress Corrosion Cracking and Water Chemistry Programs are credited for management of cracking.

Issue

The GALL Report recommends in Item IV.C1-9 (R-20), GALL AMPs XI.M7, "BWR Stress Corrosion Cracking," and XI.M2, "Water Chemistry," to manage cracking of CASS components in reactor coolant environment. The staff noted that one time inspection is used for verification that an aging effect is not occurring or occurring at such a slow rate that it will not cause the loss of intended function during the period of extended operation. The staff does not consider cracking of CASS in reactor water unlikely. The staff noted that GALL AMP XI.M7 element 5 "monitoring and trending" recommends additional sampling in accordance with GL 88-01 or approved BWRVIP-75 guidelines. Additionally the staff noted that the applicant's One Time Inspection Program does not specify the method to be used to detect cracking whereas GALL AMP XI.M7 recommends detection of cracking in accordance with GL 88-01 or approved BWRVIP-75.

Request

Please provide additional information demonstrating that cracking of CASS in reactor coolant is unlikely or occurring very slowly such that one time inspection is appropriate.

RAI 3.1.2.2.4-1

Background

In LRA Section 3.1.2.2.4, "Cracking due to SCC and IGSCC", Item 1 states that cracking due to SCC and IGSCC in the stainless steel and nickel alloy BWR top head enclosure vessel flange leak detection lines does not apply at Duane Arnold because the reactor vessel flange leak-off line is made of carbon steel and no program is therefore required to manage stress corrosion cracking or intergranular stress corrosion cracking.

Issue

However, in the LRA Table 3.1.2-1 the applicant credits the One Time Inspection Program and the Water Chemistry Program to manage cracking of the nickel alloy leakage detection line which is exposed to reactor coolant. LRA Table 3.1.2-1 points to LRA Table 3.1.1, Item 19 where a plant-specific program is credited for management of cracking.

The GALL Report recommends in Item IV.A1-10 (R-61) for the applicant to develop a plant-specific program to manage cracking of nickel alloy in reactor coolant. The staff noted that one time inspection is used for verification that an aging effect is not occurring or occurring at such a slow rate that it will not cause the loss of intended function during the period of extended operation. The staff does not consider cracking of nickel alloy in reactor water unlikely. Additionally the staff noted that the applicant's One Time Inspection Program does not specify the method to be used to detect cracking.

Request

Please provide consistency between LRA Section 3.1.2.2.4, LRA Table 3.1.2-1 and LRA Table 3.1.1 Item 19. Please also provide the correct material for the leak line and if it is nickel alloy provide the plant-specific program. Please provide additional information demonstrating that cracking of nickel alloy in reactor water is unlikely or occurring very slowly such that one time inspection is appropriate if the plant-specific program is based on one time inspection.

RAI 3.3.2.2.12-1

Background

In LRA Section 3.3.2.2.12, "Loss of Material Due to Pitting, Crevice, and Microbiologically-Influenced Corrosion", Item 1 states that loss of material for copper alloys exposed to fuel oil is managed using the Fuel Oil Chemistry and One Time Inspection Programs. In the LRA Table 3.3.1, Item 3.3.1-32, the applicant credits the One Time Inspection Program and the Fuel Oil Chemistry Program to manage loss of material of copper alloy and bronze pipe, pipe fittings, hoses, tubes, rupture disks, valves, exposed to fuel oil, and references plant-specific Notes 202 and 225. Additionally, in LRA Section 3.2.2.2.3, "Loss of Material Due to Pitting, Crevice, and Microbiologically-Influenced Corrosion", Item 4 states that loss of material for copper alloys exposed to lubricating oil is managed using the Lubricating Oil Analysis and One Time Inspection Programs. In the LRA, the applicant credits the One Time Inspection Program and the Oil Analysis Program to manage loss of material of copper alloy and bronze pipe, pipe fittings, hoses, tubes, rupture disks, valves, exposed to lubricating oil, and references plant-specific Note 225.

Issue

However, the plant-specific Note 225 of LRA page 3.3-268 states that 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 lubricating oil environments at DAEC. Also, plant-specific Note 202 on LRA page 3.3-267 states that aging mechanism is in addition to aging mechanisms in NUREG-1801. This may include galvanic corrosion, MIC, wear and/or selective leaching.

Request

Please provide additional information demonstrating that crevice and pitting corrosion of bronze and copper alloys exposed to fuel oil and lube oil are not applicable at DAEC. Also, please justify if selective leaching mechanism could occur, why the LRA Appendix B.3.36, Selective Leaching of Materials Program is not credited.

RAI 3.3.2.13-1

Background

In the LRA Table 3.3.2-13 the applicant credits the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program to manage loss of material of nickel piping, piping components, and piping elements exposed to raw water.

Issue

However, the GALL Report recommends in VII.C1-13 (AP-53), GALL AMP XI.M20 “Open-Cycle Cooling Water System” to manage loss of material for nickel in raw water. The staff noted that GALL AMP XI.M20 recommends, in the “scope of program”, “preventive actions”, monitoring and trending”, “operating experience” elements, the provisions of NRC GL 89-13. These provisions include visual and nondestructive inspection introduction of biocides, chemical treatments and periodic flushing to manage loss of material in accordance with the applicant commitments under GL 89-13. The staff noted that GALL AMP XI.M38, “Internal Surfaces in Miscellaneous Piping and Ducting Components Program” provides for only visual examinations of components during maintenance procedures for components that are not covered by other AMPs. Additionally the staff noted that GALL AMP XI.M38 provide for preventive actions because it is an inspection program.

Request

Provide justification for not using GALL AMP XI.M38 to manage loss of material nickel components exposed to raw water.

RAI 3.4.2.4-1

Background

In the LRA Table 3.4.2-4, the applicant credits the One Time Inspection Program to manage loss of fracture toughness of cast austenitic stainless steel that are exposed to reactor coolant >250^{o}C (>482^{o}F).

Issue

However, the GALL Report recommends in IV.C1-2 (R-52) GALL AMP XI.M12, "Thermal Aging Stress Corrosion Cracking," to manage loss of fracture toughness of cast austenitic stainless steel in reactor coolant >250^{o}C (>482^{o}F). GALL AMP XI.M12 provides for characterization and evaluation of loss of fracture. The staff noted that one time inspection is used for verification that an aging effect is not occurring or occurring at such a slow rate that it will not cause the loss of intended function during the period of extended operation. The staff does not consider loss of fracture toughness of CASS in reactor coolant unlikely. The staff noted that the applicant's One Time Inspection Program does not indicate how loss of fracture toughness will be detected and how loss of fracture toughness, if discovered, will be evaluated.

Request

Provide justification for not subjecting components to the recommendations of GALL AMP XI.M12.

RAI 3.3.2.2.9-1

Background

LRA Section 3.3.2.2.9, Loss of Material Due to General, Pitting, Crevice, Microbiologically Influenced Corrosion (MIC) and Fouling, Item 1 states that carbon steel piping, piping components, piping elements, and tanks exposed to fuel oil using the Fuel Oil Chemistry Program and One Time Inspection Programs. In the LRA Table 3.3-1, Item 3.3.1-20 the applicant credits the One Time Inspection Program and the Fuel Oil Chemistry program to manage loss of material of Steel piping, piping components, piping elements, and tanks exposed to fuel oil. Further evaluation is provided in LRA Subsection 3.3.2.

Issue

However, the Plant-Specific Note 230 of LRA page 3.3-268 states that loss of material due to fouling does not apply to carbon steel components exposed to fuel oil that are not tanks and do not have a potential for particulate fouling (sediment, silt, dust, and corrosion products). The staff noted that the sources of fuel oil for carbon steel components exposed to fuel oil that are not tanks are various tanks where particulate and water have been present and therefore there is the potential that contaminants could accumulate in piping systems etc., particularly in crevices, that could promote fouling.

Request

Please provide additional information demonstrating that fouling does not apply to carbon steel components exposed to fuel oil that are not tanks and do not have a potential for particulate fouling are not applicable at DAEC.

RAI 3.3.2.2.3.2-1

Background

SRP-LR Section 3.3.2.2.3.2 states that cracking due to SCC could occur in stainless steel and stainless clad steel heat exchanger components exposed to treated water greater than 60°C (>140°F) and the GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR.) In the LRA the applicant credits the One Time Inspection and Water Chemistry programs for management of SCC.

Issue

The staff noted that one-time inspection is used to verify that material degradation is not occurring or is occurring so slowly such that the component will be able to perform its intended function during the period of extended operation.

Request

Please provide additional information demonstrating that SCC is not expected or occurring slowly such that the intended function of heat exchangers is not compromised during the period of extended operation and therefore a one-time inspection is adequate to manage SCC and a plant-specific program in accordance with Technical Position RLSB-1 is not necessary.

RAI 3.3.2.2.7-1

Background

In LRA Section 3.3.2.2.7.3, the applicant stated that loss of material due to general, pitting and crevice corrosion for carbon steel and stainless steel diesel exhaust piping and components exposed to diesel exhaust is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program.

Issue

In LRA B.3.28, the applicant stated that its new Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is consistent with GALL AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components,” with no exceptions or enhancements. However, the GALL AMP XI.M38 only addresses steel material.

Request

Please justify why the inclusion of stainless steel material in the scope of the program is not considered an exception or an enhancement to the GALL AMP XI.M38. Also please provide the acceptance criteria used for detecting loss of material in stainless steel material.

RAI Table 3.4.2-1-01

Background

LRA Tables 3.4.2-1 (page 3.4-24) provides an AMR result line for stainless steel bolting in an environment of atmosphere/weather. The aging effect is identified as loss of preload, and the Bolting Integrity Program is credited to manage this aging effect.

Issue

LRA Table 3.0-1 (Service Environments) describes atmosphere/weather as moist air, ambient temperature and humidity, exposure to weather, including precipitation. For other stainless steel components in a moist (or intermittently wet) environment, the GALL Report identifies loss of material due to pitting or crevice corrosion as a potential aging effect.

Request

Explain why loss of material due to pitting or crevice corrosion is not included as an aging effect requiring management for stainless steel bolting in an environment of atmosphere/weather.

RAI Table 3.3.2-25-01

Background

In the LRA Tables 3.3.2-10, -11, -16, -25 and -26 (pages 3.3-123, -129, -161, -209, and -213, respectively), there are AMR result lines for stainless steel or carbon steel bolting in a raw water environment with an aging effect of loss of preload. The AMR results credit the Bolting Integrity Program with managing the aging effect of loss of preload for bolts in a raw water environment.

Issue

The LRA does not provide sufficient information for the staff to understand how the Bolting Integrity Program can effectively manage loss of preload for bolts in a raw water environment where signs of closure bolt loosening such as indications of seepage around a flange or gasket would not be readily noticed.

Request

1. Explain what specific features or activities of the Bolting Integrity Program will manage the aging effect of loss of preload for the bolting that is in a raw water environment.

2. As part of your response clarify whether the subject bolting is pressure boundary closure bolting or structural bolting.

RAI 3.3.2.2.5.1-01

Background

GALL Report, Volume 1, Table 3, Item 11, and SRP-LR Subsection 3.3.2.2.5.1 state that hardening and loss of strength due to elastomer degradation may occur in elastomer seals and components in heating and ventilation systems exposed to air-indoor uncontrolled (internal/external). The GALL Report recommends further evaluation of a plant-specific program to ensure that these aging effects are adequately managed.

In lieu of providing a plant-specific program to manage these aging effects in elastomer seals and components in heating, ventilation, and air conditioning (HVAC) systems, the LRA Section 3.3.2.2.5, parapraph 1, states that this item is not applicable because elastomer flexible connections of heating and ventilation systems exposed to air – indoor uncontrolled (internal/external) are periodically replaced.

Issue:

Information provided in the LRA does not provide sufficient detail for the staff to determine whether the periodic replacement of elastomer flexible connections in heating and ventilation systems is sufficient to ensure that these components will remain capable of performing their intended function during the period of extended operation.

Request:

1. Describe the basis used to determine the periodicity upon which these components are replaced (e.g., manufacturer's recommendation, plant operating experience, material qualification, examination of component condition).

2. Please make your response sufficiently broad to encompass a similar issue in LRA Section 3.3.2.2.13, where the aging effect is loss of material due to wear in elastomer seals and components in the HVAC systems.

RAI Table Item 3.3.1-52-01

Background

GALL Report Volume 1, Table 1, line ID 52, and in the LRA, Table 3.1-1, Item Number 3.1.1-52 provide summaries of aging management evaluation results for steel and stainless steel reactor coolant pressure boundary (RCPB) pump and valve closure bolting, manway and holding bolting, flange bolting, and closure bolting in high pressure and high temperature systems. Both documents show aging effects of cracking due to stress corrosion cracking, loss of material due to wear, and loss of preload due to thermal effects, gasket creep, and self-loosening. Both documents show the aging effect managed by Bolting Integrity Program.

In the GALL Report unique Items IV.C1-10, IV.C1-12, and IV.C1-13 for BWRs all refer to GALL Report, Volume 1, Table 1, line ID 52. The unique items are:

- pump and valve closure bolting made of low alloy steel SA 193, Gr. B7 in an environment of "system temperature up to 288^{o}C (550^{o}F)" with an aging effect of loss of preload due to thermal effects, gasket creep, and self-loosening;

- pump and valve closure bolting made of steel in an environment of "system temperature up to 288^{o}C (550^{o}F)" with an aging effect of loss of material due to wear; and

- pump and valve seal flange closure bolting made of steel or stainless steel in an environment of "system temperature up to 288^{o}C (550^{o}F)" with an aging effect of loss of material due to wear.

Issue

The staff noted that in LRA Table 3.1.2-1 (Summary of AMR Review Results for Nuclear Boiler) and in LRA Table 3.1.2-2 (Summary of AMR Review Results for Reactor Vessel Recirculation System) there are no AMR result lines that refer to LRA Table 3.1-1, Item Number 3.1.1-52. The staff also noted that the only AMR result line that refers to Item Number 3.1.1-52 is a line for fasteners, bolting, washers, nuts in LRA Table 3.3.2-30 (page 3.3-250), in the standby liquid control system, which is not a high temperature system. The staff also noted that AMR results for carbon steel fasteners, bolting, washers, nuts in Tables 3.1.2-1 and 3.1.2-2 refer to LRA Items Number 3.2.1-23 and 3.2.1-24, where the Bolting Integrity program is credited to manage the aging effects of loss of material and loss of preload, respectively. Also, for stainless steel bolting in Tables 3.1.2-1 and 3.1.2-2, Generic Note F was cited indicating that the material is not in the GALL Report for this component. The staff does not understand why AMR results for bolting in the reactor vessel, internals, and reactor coolant system was presented in this way in the LRA.

Request

1. Explain why the AMR results for bolting and fasteners in the reactor vessel, internals, and reactor coolant system was referenced to LRA Table 3.2.1, Items 3.2.1-23 and -24, and why there was no reference to LRA Table 3.1.1, Item 3.1.1-52 for these components.

2. Explain why AMR results for bolting and fasteners in the standby liquid control system was referenced to LRA Table 3.1.1, rather than to LRA Table 3.3.1, Item 3.3.1-45.

RAI Table 3.3.2-23

Background

In LRA Table 3.3.2-23, the applicant assigned a Note E for carbon steel drip pans exposed to an air-indoor uncontrolled (external) environment. This AMR line item referenced Table 3.X-1 Item 3.3.1-58. According to the GALL Report it is to be inspected for rust through the External Surfaces Monitoring Program.

Issue

For this item (drip pans), the applicant credits the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Component Program. The staff compared GALL AMP XI.M38 (Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Component Program) to GALL AMP XI.M36 (External Surfaces Monitoring Program) and noted that there is no stated frequency of inspections under the program that is being proposed. GALL AMP XI.M36 recommends a visual inspection to be performed at least once per refueling cycle. GALL AMP XI.M38 states that inspection intervals are dependent on component material and environment, and take into consideration industry and plant-specific operating experience.

Request

Please provide the frequency of inspections for these drip pans. Please justify this frequency, if it is different than the maximum frequency recommended by GALL AMP XI.M36, External Surfaces Monitoring Program.

RAI 3.1.2.1-a

Background

LRA Table 3.1.1, Item 3.1.1-40 and GALL Report Volume 1 Table 1 ID 40 address cracking due to stress corrosion cracking, intergranular stress corrosion cracking, cyclic loading for stainless steel and nickel alloy penetrations for control rod drive stub tubes instrumentation, jet pump instrument, standby liquid control, flux monitor, and drain line exposed to reactor coolant. The applicant proposes to manage this aging process through the use of its AMPs “Water Chemistry” (LRA B.3.XX) and either “BWR penetration” (LRA B.3.XX) or “BWR vessel internals” (LRA B.3.XX) or “ASME Section XI” (LRA B.3.XX). The GALL Report recommends that this aging process be managed through the use of the AMPs “Water Chemistry” (GALL AMP XI.M2) and BWR Penetrations (GALL AMP XI.MXX). The applicant proposes that the aging management review items are either consistent with the GALL Report in all respects (Generic Note A) or are consistent with the GALL Report in terms of material, environment, and aging effect but a different AMP is credited (Generic Note E).

Issue

In its review of LRA components subordinate to LRA Item 3.1.1-40 for which the applicant assigned Generic Note E, the staff noted that GALL AMP refers to BWRVIP-49 and BWRVIP-27. The staff also noted that these BWRVIPs have been approved by the staff and that they contain inspection procedures for detection and sizing of cracks. The staff further noted that the GALL AMPs to which the applicant's proposed AMP claim consistency do not include references BWRVIP-49 and BWRVIP-27. The staff, therefore, assumes that the AMPs proposed by the applicant also do not refer to these BWRVIPs. Given that these BWRVIPs contain inspection procedures and recommendation, and given that it appears that the applicant's AMPs do not include these procedures and recommendations, it is not clear to the staff that the applicant's proposed AMPs will adequately inspect the components under consideration.

Request

For each component or group of components for which Generic Note E has been applied, please demonstrate that the AMP proposed will perform inspections and evaluations which are consistent with those recommended in the GALL Report AMP, or revise the proposed AMPs so that they are consistent with the AMP recommended by the GALL Report, or select the AMP recommended by the GALL Report.

RAI 3.6-1

Background

In LRA Section 3.6.2.2.2, the applicant stated that DAEC is located in an area with moderate rainfall and airborne particle concentrations are comparatively low and the rate of contamination buildup on the insulators is not significant.

Issue

The applicant did not address plant-specific operating experience with high-voltage insulator failures due to surface contamination.

Request

Review plant-specific operating experience to confirm that there have been no failures of high voltage insulators due to surface contamination.

RAI B.3.31-1

Background

The applicant proposed to perform a visual inspection of the metal-enclosed bus (MEB) connections on a six year frequency. This is less conservative than the five year frequency recommended by GALL AMP XI.E4, "Metal Enclosed Bus." Industry operating experience indicates that buses in MEBs may experience loosening of bolted connections resulting from repeated cycling of connected loads. This phenomenon can occur in heavy loaded circuits (i.e., those exposed to appreciable ohmic heating). NRC Information Notice 2000-14 identifies torque relaxation of splice plate connecting bolts as one potential cause of a MEB fault. In addition, Sandia Laboratory Report, SAND-0344 identifies instances of termination loosening at several plants due to thermal cycling.

Issue

It is not clear to the staff that the applicant's six year visual inspection frequency exception to GALL XI.E4 is adequately justified based on industry operating experience and the corresponding five-year recommended inspection frequency in GALL AMP XI.E4.

Request

Provide additional technical justification to demonstrate that inspecting MEB connections every six years will detect loosening of bolted connections resulting from repeated cycling of connected loads consistent with industry experience and the GALL AMP XI.E4 recommended inspection frequency.

RAI 3.4-7

Background

According to information provided in DAEC Relief Request MC-R001, 14,229 repairs have been performed on the torus shell surface until 2005. The torus shell was initially coated in 1973 and recoated in 1985.

Issue

The large number of repairs, excessive zinc depletion, pitting at more than 14,229 locations indicates that integrity of the torus coating cannot be relied upon during the period of extended operation. Normal life of the torus coating is less than 20 years. At the start of period of extended operation, it will be 29 years since the torus was recoated in 1985.

Request

Provide the following information:

1. How many repairs have been performed to the Duane Arnold torus shell coating until now.

2. How many of these repairs were performed at locations where the torus base metal thickness had been reduced by greater than 10 percent.

3. How many of the repairs required augmented inspection (including UT examination) in accordance with ASME Section XI, subsection IWE Code, Table 2500-1. Articles IWE-3122.3.b, IWE 3200, IWE 3511.3 and IWE-2420 of the ASME Code requires augmented examination of the area containing flaw or degradation if the base metal thickness is reduced by greater than 10 percent.

4. The bottom half of interior surface is not easily accessible for visual examination. Therefore, does Duane Arnold has any plans to perform UT examination from the torus exterior surface at a number of randomly selected locations to demonstrate with 95 percent confidence that 95 percent of the torus surface has base metal thickness greater than 90 percent of the nominal thickness?

5. Are there any plans to recoat the torus since the last recoating was performed 24 years ago?

The staff needs the above information to confirm that the effects of aging of the torus 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).

RAI 3.5.2.2-1

Background

SRP-LR Sections 3.5.2.2.2.2.1 and 3.5.2.2.2.4.2 recommend further evaluation of the aging effect loss of material and cracking due to freeze-thaw for plants located in moderate to severe weathering conditions. The SRP-LR further states that existing concrete with air content of 3% to 6% and water-to-cement ratio of 0.35 – 0.45 did not exhibit degradation related to freeze-thaw during subsequent inspections.

Issue

DAEC is located in a severe weathering region; however, the corresponding LRA sections make no mention of the water-to-cement ratio of DAEC concrete.

Request

1. Provide the water-to-cement ratio (w/c) for the concrete used in Groups 1-3, 4-6, and 7-9 structures.

2. If the ratio (w/c) is outside the range provided in the SRP-LR, explain how the aging effect will be managed during the period of extended operation. Focus on additional inspections or evaluations that may be necessary, or explain why the current Structures Monitoring AMP is adequate.

RAI 3.5.2.1-2

Background

SRP-LR Table 3.5-1, Item 5 recommends the ASME Section XI, Subsection IWE to manage loss of material and general corrosion for steel elements of containment.

Issue

LRA Table 3.5.2-7 states that the Structures Monitoring Program manages loss of material for carbon steel in treated water, and references Table 3.5-1, Item 5. The staff is unclear how the Structures Monitoring Program meets or exceeds the recommendations of the IWE Program.

Request

Compare the Structures Monitoring Program to the IWE Program and explain how the Structures Monitoring Program will meet or exceed the requirements of the IWE Program in relation to the aging effect "loss of material/general and pitting corrosion." Include inspection methods and frequencies in the discussion.

RAI 3.5.2.2.1-1

Background

The SRP recommends a plant-specific program to manage corrosion in inaccessible areas if specific conditions in the GALL Report are not satisfied. One of the conditions is that water ponding on the containment concrete floor is not common and when detected is cleaned up in a timely manner.

Issue

LRA Section 3.5.2.2.1.4 does not mention water on the containment floor.

Request

Discuss plant-specific operating experience related to water ponding on the containment floor, including frequency and resulting corrective actions.

RAI 3.5.2.2.1-2

Background

SRP Section 3.5.2.2.1.7 list IWE and Appendix J as the appropriate AMPs to manage the aging effect of stress corrosion cracking of stainless steel penetration sleeves, bellows, vent lines, and dissimilar metal welds. The SRP also discusses the need for further evaluation to address the effectiveness of the inspections.

Issue

LRA Section 3.5.2.2.1.7 states that this aging effect does not apply to DAEC because the necessary environment does not exist. There are also no Table 2 items in the LRA which reference the corresponding SRP Table 1 items for this aging effect (i.e. Items 10 and 11). The staff is unclear whether or not the IWE and Appendix J inspections will continue to be carried out on the corresponding components.

Request

Explain how the Appendix J leak rate testing program, and IWE inspections will be conducted on the penetration sleeves, bellows, dissimilar metal welds, and vent line bellows during the period of extended operation.

RAI 3.5.2.2.2.1-1

Background

SRP-LR Section 3.5.2.2.2.1 recommends further evaluation of several structure/aging effect combinations if they are not covered by the Structures Monitoring Program.

Issue

Several subsections in LRA Section 3.5.2.2.2.1 state that the condition of accessible areas is used to evaluate the condition of inaccessible areas; however, the subsections also state that the aging effects do not require management for the period of extended operation. The LRA makes no mention of inspections under the Structures Monitoring Program or any other AMP. The staff is unclear whether or not inspections will be conducted on accessible areas for the applicable structure/aging effect combinations during the period of extended operation. This issue applies to Subsections 1, 2, 4, and 5.

Request

Explain whether or not the structure/aging effect combinations discussed in SRP-LR Section 3.5.2.2.2.1, Subsections 1, 2, 4, and 5 will be inspected for in accessible areas during the period of extended operation.

RAI 3.5.2.2.2.1-2

Background

SRP-LR Table 3.5-1, Items 52 and 56, discuss loss of mechanical function of sliding support surfaces due to corrosion, distortion, dirt, overload, or fatigue.

Issue

In LRA Table 3.5-1, Items 52 and 56, the applicant stated the no sliding bearing surfaces are subject to this aging affect. The staff is unclear why no sliding surfaces at DAEC are subject to loss of mechanical function.

Request

Explain why inspections to detect loss of mechanical function due to corrosion, distortion, dirt, overload, or fatigue are unnecessary for sliding support surfaces (i.e. components related to Table 3.5-1, Items 52 or 56). Include the drywell radial beam seats (sliding supports) in this discussion.