



South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

August 21, 2012  
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File: G25  
STI: 33582020

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

South Texas Project  
Units 1 and 2  
Docket Nos. STN 50-498, STN 50-499  
Response to Requests for Additional Information for the  
South Texas Project License Renewal Application  
Aging Management Program, Set 22 (TAC Nos. ME4936 and ME4937)

- References:
1. STPNOC letter dated October 25, 2010, from G. T. Powell to NRC Document Control Desk, "License Renewal Application" (NOC-AE-10002607) (ML103010257)
  2. NRC letter dated July 12, 2012, "Requests for Additional Information for the Review of the South Texas Project, Units 1 and 2 License Renewal Application – Aging Management, Set 22(TAC Nos. ME4936 and ME 4937)"(ML12185A031)

By Reference 1, STP Nuclear Operating Company (STPNOC) submitted a License Renewal Application (LRA) for South Texas Project (STP) Units 1 and 2. By Reference 2, the NRC staff requests additional information for review of the STP LRA. STPNOC's response to the requests for additional information is provided in Enclosure 1 to this letter. Changes to LRA pages described in Enclosure 1 are depicted as line-in/line-out pages provided in Enclosure 2.

One regulatory commitment in Table A4-1 of the LRA is revised and is provided in Enclosure 3 to this letter. There are no other regulatory commitments in this letter.

Should you have any questions regarding this letter, please contact either Arden Aldridge, STP License Renewal Project Lead, at (361) 972-8243 or Ken Taplett, STP License Renewal Project regulatory point-of-contact, at (361) 972-8416.

A147  
NRC

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

Executed on August 21, 2012  
Date



G. T. Powell  
Vice President,  
Generation

KJT

- Enclosures:
1. STPNOC Response to Requests for Additional Information
  2. STPNOC LRA Changes with Line-in/Line-out Annotations
  3. STPNOC Revised Regulatory Commitment

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**Enclosure 1**

**STPNOC Response to Requests for Additional Information**

**SOUTH TEXAS PROJECT, UNITS 1 AND 2  
REQUEST FOR ADDITIONAL INFORMATION  
AGING MANAGEMENT, SET 22  
(TAC NOS. ME4936 AND ME4937)**

**RAI B2.1.9-3c (021)**

Background:

During a telephone conference call on April 24, 2012, NRC staff and South Texas Project Nuclear Operating Company (the applicant) discussed Draft RAI B2.1.9-3b, which addressed aging management activities associated with internal coatings where intended functions of downstream components could be affected by coating failures. The Draft RAI cited the applicant's previous responses to RAI B2.1.9-3 that noted operating experience from CR 07-16847, and stated that a) foreign material was found in one of the intercoolers, b) the engineering evaluation determined that some of the foreign material was consistent with erosion of the coating material used for the intercooler ribs, and c) the majority of the particles were smaller than the 3/8-inch tube diameter. The Draft RAI also cited the applicant's previous response to RAI B2.1.9-3 that noted operating experience from CR 11-1218, and stated that pieces of coatings were found in the ends of some tubes in the reactor containment building chiller 11B.

The draft RAI also noted recent industry operating experience that revealed some internal linings or coatings are considered limited-life installations with a service life of less than 20 years, and noted that as the end of service life is approached, past performance of the coating may not accurately predict the coating's future behavior. Further, the draft RAI discussed inspection techniques in addition to visual inspections to detect delamination, such as some form of physical manipulation, and increasing the frequency of inspections as the service life of the coating is approached. After discussions during the telephone conference, the applicant and the staff agreed that the draft RAI was not needed, and by letter dated May 10, 2012, the applicant subsequently supplemented its previous responses to RAI B2.1.9-3.

The May 10, 2012, response provides the aging management review (AMR) items that are used to manage the heat exchangers exposed to raw water which have a potential for macroscopic fouling due to coating degradation. These include component cooling water (CCW) heat exchangers, the CCW pump room heat exchangers, the air handling unit (AHU) condenser heat exchangers, and the three heat exchangers associated with each standby diesel generator, all of which are managed for reduction of heat transfer.

The response states that the vendor's application data sheets do not specify the use of a physical-mechanical contact type of test for cure or adhesion verification, and that although testing, such as a pull-off adhesion test, can be used to prove that the coating has not lost any adhesive or cohesive properties, such testing results in destruction of the coating. Regarding the need to increase the frequency of inspections as the service life of a coating is approached, the response does not specifically address whether the coatings are considered limited-life installations, but in summarizing, it refers to them as "permanent coatings" applied at South Texas Project. The response states that the coatings are not expected to delaminate in large flakes or sheets between inspection intervals and that operating experience

demonstrates that the effects of aging are being adequately managed by the Open Cycle Cooling Water System program.

Based on the staff's review of plant-specific operating experience, coatings have degraded and released material into the system. Although the applicant does not believe coatings will delaminate in large flakes, plant-specific operating experience exists which indicates that some coatings have broken off in pieces that apparently were too large to pass through the downstream heat exchanger tubes. The staff acknowledges that, to date, the amount of material has not adversely affected heat exchanger intended function.

Issue:

The staff has identified three issues:

- 1) The inspection frequency of the coatings should consider the service life of the installed coating as well as the trending of ongoing coating inspections. As the end of service life approaches, past performance of the coating may not accurately predict the coating's future behavior. Recent industry operating experience reviews indicate that coating failures were caused by operation of the coatings beyond their qualified service life without appropriate justification. In that regard, the service life, as described in EPRI 1019157, "Guideline on Safety-Related Coatings," should initially be identified from the process that installed the coating, and if, during the period of extended operation, the coatings will be operated beyond the qualified service life, then an appropriate justification should be provided. Since the applicant's response refers to the coatings as "permanent coatings," the applicant should document what that expected life is (e.g., whether for 10 years, 20 years, the remaining life of the unit, etc.). Furthermore, if the coatings in question have a finite life (otherwise known as a service life), it is not clear to the staff how operation that approaches or exceeds the service life will be adequately managed during the period of extended operation.
- 2) Although visual examination of coatings can identify degradation indicative of delamination, EPRI 1019157, states that "*lightly tapping the exposed coating may indicate disbondment that may not be evident with visual inspection.*" In addition, with regard to adhesion testing, ASTM D4541, "Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers," which is discussed in EPRI 1019157, indicates that the testing determines either the force that a surface area can bear before a plug of material is detached or whether the surface remains intact at a prescribed force. As such, adhesion testing does not necessarily result in the destruction of the coating as stated in the applicant's response. Since the vendor's application data sheets did not specify the use of a physical-mechanical contact type of test for adhesion verification, it is not clear to the staff how adhesion degradation will be adequately identified, other than being revealed after the fact.
- 3) For visual inspections of the coatings performed through this program, EPRI 1019157 states that Coatings Surveillance Personnel should meet applicable plant licensing commitments and be approved by the utility Nuclear Coating Specialist. The qualification recommendations of a Nuclear Coating Specialist are defined in ASTM D7108, "Standard Practice for Establishing Qualifications for a Nuclear Coating Specialist." It is not clear to the staff whether the personnel performing the coatings assessment visual inspections are properly qualified to industry recommendations.

**RAI Request:**

For those locations where coating failures may adversely affect the safety function of downstream components, or result in an 10 CFR 54(a)(2) function not being met:

- 1) For each location, provide the service life as established by the coating vendor or by an engineering evaluation for the first installation of the coating, and for locations where the coating may be operated approaching or beyond the qualified service life during the period of extended operation, explain the actions that the current program contains to ensure downstream components are not adversely affected.

STPNOC Response:

Locations where coating failures may adversely affect the safety function of downstream components, or result in an 10 CFR 54(a)(2) function not being met, are listed in Table 1 below:

- The essential chiller water box covers, standby diesel generator (SDG) lube oil coolers, SDG jacket water coolers, and SDG intercooler water boxes could affect heat exchanger performance and are currently inspected every five years.
- Interconnecting piping between SDG intercooler water boxes could affect downstream heat exchanger performance and is currently inspected every five years as part of the periodic intercooler inspection.

**Table 1**

Component	Coating	Service Life	Initial Coating In-service Date
3V111VCH004 ESSENTIAL CHILLED WATER CHILLER WATER BOX COVERS UNIT 12A	Belzona	20yr	4/28/93
3V111VCH005 ESSENTIAL CHILLED WATER CHILLER WATER BOX COVERS UNIT 12B	Belzona	20yr	3/18/95
3V111VCH006 ESSENTIAL CHILLED WATER CHILLER WATER BOX COVERS UNIT 12C	Belzona	20yr	3/21/95
3V112VCH004 ESSENTIAL CHILLED WATER CHILLER WATER BOX COVERS UNIT 22A	Belzona	20yr	10/10/91

Component	Coating	Service Life	Initial Coating In-service Date
3V112VCH005 ESSENTIAL CHILLED WATER CHILLER WATER BOX COVERS UNIT 22B	Belzona	20yr	11/2/91
3V112VCH006 ESSENTIAL CHILLED WATER CHILLER WATER BOX COVERS UNIT 22C	Belzona	20yr	9/28/91
<b>Separator</b>			
3Q151MHX0136 SDG LUBE OIL COOLER	Belzona	20yr	9/3/93
3Q152MHX0136 SDG LUBE OIL COOLER	Belzona	20yr	5/13/93
3Q151MHX0236 SDG LUBE OIL COOLER	Belzona	20yr	5/14/91
3Q152MHX0236 SDG LUBE OIL COOLER	Belzona	20yr	3/18/93
3Q151MHX0336 SDG LUBE OIL COOLER	Belzona	20yr	1/22/91
3Q152MHX0336 SDG LUBE OIL COOLER	Belzona	20yr	6/2/93
<b>Separator</b>			
3Q151MHX0134 SDG JACKET WATER COOLER	Belzona	20yr	9/3/93
3Q152MHX0134 SDG JACKET WATER COOLER	Belzona	20yr	5/6/93
3Q151MHX0234 SDG JACKET WATER COOLER	Belzona	20yr	5/14/91 (Note 1)
3Q152MHX0234 SDG JACKET WATER COOLER	Belzona	20yr	3/11/93
3Q151MHX0334 SDG JACKET WATER COOLER	Belzona	20yr	4/2/91
3Q152MHX0334 SDG JACKET WATER COOLER	Belzona	20yr	6/2/93

Component	Coating	Service Life	Initial Coating In-service Date
3Q151MDG0134 DIESEL GENERATOR #11 INTERCOOLER WATER BOXES	Belzona	20yr	2/14/91
3Q152MDG0134 DIESEL GENERATOR #21 INTERCOOLER WATER BOXES	Belzona	20yr	10/16/91
3Q151MDG0234 DIESEL GENERATOR #12 INTERCOOLER WATER BOXES	Belzona	20yr	03/06/91
3Q152MDG0234 DIESEL GENERATOR #22 INTERCOOLER WATER BOXES	Belzona	20yr	11/20/91
3Q151MDG0334 DIESEL GENERATOR #13 INTERCOOLER WATER BOXES	Belzona	20yr	01/23/91
3Q152MDG0334 DIESEL GENERATOR #23 INTERCOOLER WATER BOXES	Belzona	20yr	10/21/91
3Q151MDG0134 DIESEL GENERATOR #11 INTERCOOLER WATER BOX INTERCONNECTING PIPING	Plasticap with Plasite 7122 repair	12 to 15 yrs	02/89 (Note 2)
3Q152MDG0134 DIESEL GENERATOR #21 INTERCOOLER WATER BOX INTERCONNECTING PIPING	Plasticap with Plasite 7122 repair	12 to 15 yrs	02/89 (Note 2)
3Q151MDG0234 DIESEL GENERATOR #12 INTERCOOLER WATER BOX INTERCONNECTING PIPING	Plasticap with Plasite 7122 repair	12 to 15 yrs	02/89 (Note 2)
3Q152MDG0234 DIESEL GENERATOR #22 INTERCOOLER WATER BOX INTERCONNECTING PIPING	Plasticap with Plasite 7122 repair	12 to 15 yrs	02/89 (Note 2)
3Q151MDG0334 DIESEL GENERATOR #13 INTERCOOLER WATER BOX INTERCONNECTING PIPING	Plasticap with Plasite 7122 repair	12 to 15 yrs	02/89 (Note 2)
3Q152MDG0334 DIESEL GENERATOR #23 INTERCOOLER WATER BOX INTERCONNECTING PIPING	Plasticap with Plasite 7122 repair	12 to 15 yrs	02/89 (Note 2)

**Table notes:**

- (1) Record of application of coating could not be located. However, similar records indicate that the coating to the component jacket water cooler was applied at approximately the same timeframe as coating application to the component lube oil cooler.
- (2) Record of application of coating could not be located. Modification for replacing the interconnecting piping was approved in July 1987. Requisition for coating services for the replaced piping was approved in February 1989. STP is reasonably certain that coatings were applied in 1989 following the approval of the requisition. February 1989 is conservatively established as the date of the application of initial coating.

The service life of Belzona products utilized in the Essential Cooling Water system that services the components in Table 1 has been established by the vendor to be approximately 20 years. Updated Belzona inspection guidance, recently received, recommends the following

expanded inspection and testing protocol for in-service coatings of 12 years and beyond at a six year frequency:

- Visual
- Low voltage holiday test (based on ASTM D5162 requirements)
- Dry film thickness test (based on ASTM D7091 & SSPC PA-2 requirements)
- Pull off adhesion test (based on ASTM D4541 requirements)

Following inspection, testing and required repairs, the coating can be recertified for an additional six years of service.

Plasticap 400 Epoxy Phenolic was originally applied to the internals of the interconnecting piping for the SDG intercooler water boxes. Plasticap 400 does not have a documented service life. The interconnecting piping was modified with piping coated with Plasite 7122. The vendor provides average expected service life for Plasite 7122 of 12-15 years.

To provide assurance that coatings for the components listed in Table 1 will not adversely affect the safety function of downstream components, or result in an 10 CFR 54(a)(2) function not being met, the following expanded inspection and testing protocol for in-service coatings of 12 years and beyond will be performed at a six year frequency:

- Visual
- Low voltage holiday test (based on ASTM D5162 requirements)
- Dry film thickness test (based on ASTM D7091 & SSPC PA-2 requirements)
- Pull off adhesion test (based on ASTM D4541 requirements)

The current inspection interval of five years is being revised to a six-year interval. This revision is based on industry and STP operating experience to align with six-year major equipment outage and inspection intervals. The six-year inspection interval aligns with vendor inspection guidance for the in-service coatings.

LRA Sections 3.3.2.1.9 and 3.3.2.1.20 and Tables 2.3.3.9, 2.3.3.20, 3.3.2.9, and 3.3.2.20 are revised to add aging management review (AMR) line items for component type "Coating" that is managed for loss of coating integrity.

LRA Appendix A1.9, Appendix B2.1.9, Table A4-1 Commitment No.4 and LRA Basis Document AMP X.M20 (B2.1.9), Open Cycle Cooling Water System program are revised to require in-scope coatings be visually inspected every six years, and tested after 12 years of service at a six year frequency. The coating tests performed are low voltage holiday test per ASTM D5162, dry film thickness test per ASTM D7091 and Steel Structures Painting Council (SSPC) PA-2, and pull off adhesion test per ASTM D4541. Coating inspections and tests will be performed by a qualified Nuclear Coating Specialist (NCS), as defined by ASTM D7108, or by Coatings Surveillance Personnel (CSP) under the technical direction of the NCS.

Enclosure 2 provides the line-in/line-out revision to LRA Sections 3.3.2.1.9 and 3.3.2.1.20, Tables 2.3.3.9, 2.3.3.20, 3.3.2.9, and 3.3.2.20, Appendix A1.9, and Appendix B2.1.9

Enclosure 3 provides the line-in/line-out revision to Commitment No.4

**RAI Request:**

- 2) Since physical-mechanical testing was not initially performed to verify cure or adhesion of coatings and the current program does not include any physical-mechanical testing, provide information justifying why some type of physical test does not need to be periodically performed to verify coating adhesion, during the period of extended operation.

**STPNOC Response:**

As discussed in response 1) above, the Open Cycle Cooling Water System program will be enhanced to include additional inspections and tests (including physical-mechanical testing) of coatings whose failures may adversely affect the safety function of downstream components, or result in an 10 CFR 54(a)(2) function not being met.

The enhanced program will ensure downstream components are not adversely affected through the following attributes:

- The use of internal component coatings is controlled by the South Texas Project (STP) design configuration control process and is managed by the preventive maintenance or corrective action programs.
- On-going NRC Generic Letter 89-13 heat exchanger performance monitoring and trending surveillances.
- On-going operating experience related to coating challenges is evaluated and enhancements made to the Open-Loop Cooling Water System aging management program, as appropriate.
- Six year periodic inspections of the coating and heat exchanger tubes
  - o Damaged coatings are repaired or replace coatings that are degraded.
  - o Trending is documented in the periodic inspections
- Following 12 years of service, use of an expanded inspection and inspection protocol described in the response to 1) above.

**RAI Request:**

- 3) Provide information regarding the qualifications of individuals that will perform coatings assessment during the period of extended operation. In addition, state whether coatings in this program will be under the technical direction of a Nuclear Coating Specialist, with responsibilities and qualifications as described in EPRI 1019157, or provide technical bases describing why oversight by such an individual is not needed.

**STPNOC Response:**

Coating inspections during PMs will be performed by a qualified Nuclear Coating Specialist (NCS) as defined by ASTM D7108 or by a Coatings Surveillance Personnel (CSP) under the technical direction of the NCS.

The AMP Implementation procedure 0PMP06-ZD-0001 will be revised to reflect NCS and CSP qualification recommendations. The coating PMs will be revised to require coatings inspection by NCS or CSP under supervision of NCS.

Enclosure 3 provides the line-in/line-out revision to Commitment No.4.

**Enclosure 2**

**STPNOC LRA Changes with Line-in/Line-out Annotations**

**List of Revised LRA Sections**

<b>Affected LRA Sections</b>
LRA Table 2.3.3.9
LRA Table 2.3.3.20
LRA Section 3.3.2.1.9
LRA Section 3.3.2.1.20
LRA Table 3.3.2.9
LRA Table 3.3.2.20
Appendix A1.9
Appendix B2.1.9

*Table 2.3.3-9 Chilled Water HVAC System*

<b>Component Type</b>	<b>Intended Function</b>
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
<u>Coatings</u>	<u>Maintain Coating Integrity</u>
Compressor	Pressure Boundary

*Table 2.3.3-20 Standby Diesel Generator and Auxiliaries Systems*

<b>Component Type</b>	<b>Intended Function</b>
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
<u>Coatings</u>	<u>Maintain Coating Integrity</u>
Expansion Joint	Pressure Boundary

### **3.3.2.1.9 Chilled Water HVAC System**

#### **Materials**

The materials of construction for the chilled water HVAC system component types are:

Belzona

- Carbon Steel
- Carbon Steel (Galvanized)
- Cast Iron (Gray Cast Iron)
- Copper Alloy
- Copper Alloy (> 15 percent Zinc)
- Glass
- Stainless Steel
- Titanium

#### **Environment**

The chilled water HVAC system component types are exposed to the following environments:

- Borated Water Leakage
- Closed-Cycle Cooling Water
- Demineralized Water
- Dry Gas
- Lubricating Oil
- Plant Indoor Air
- Raw Water

#### **Aging Effects Requiring Management**

The following chilled water HVAC system aging effects require management:

- Loss of coating integrity
- Loss of material
- Loss of preload
- Reduction of heat transfer
- Wall Thinning

#### **Aging Management Programs**

The following aging management programs manage the aging effects for the chilled water HVAC system component types:

- Flow-Accelerated Corrosion (B2.1.6)

Bolting Integrity (B2.1.7)  
Boric Acid Corrosion (B2.1.4)  
Closed-Cycle Cooling Water System (B2.1.10)  
External Surfaces Monitoring Program (B2.1.20)  
Lubricating Oil Analysis (B2.1.23)  
One-Time Inspection (B2.1.16)  
Open-Cycle Cooling Water System (B2.1.9)  
Selective Leaching of Materials (B2.1.17)  
Water Chemistry (B2.1.2)

### **3.3.2.1.20 Standby Diesel Generator and Auxiliaries System**

#### **Materials**

The materials of construction for the standby diesel generator and auxiliaries system component types are:

- Aluminum
- Belzona
- Carbon Steel
- Cast Iron (Gray Cast Iron)
- Copper Alloy
- Glass
- Plasticap/Plasite
- Stainless Steel
- Titanium

#### **Environment**

The standby diesel generator and auxiliaries system component types are exposed to the following environments:

- Closed-Cycle Cooling Water
- Diesel Exhaust
- Dry Gas
- Fuel Oil
- Lubricating Oil
- Plant Indoor Air
- Raw Water

#### **Aging Effects Requiring Management**

The following standby diesel generator and auxiliaries system aging effects require management:

- Cracking
- Loss of coating integrity
- Loss of material
- Loss of preload
- Reduction of heat transfer

## **Aging Management Programs**

The following aging management programs manage the aging effects for the standby diesel generator and auxiliaries system component types:

- Bolting Integrity (B2.1.7)
- Closed-Cycle Cooling Water System (B2.1.10)
- External Surfaces Monitoring Program (B2.1.20)
- Fuel Oil Chemistry (B2.1.14)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)
- Lubricating Oil Analysis (B2.1.23)
- One-Time Inspection (B2.1.16)
- Open-Cycle Cooling Water System (B2.1.9)
- Selective Leaching of Materials (B2.1.17)

Table 3.3.2-9 Auxiliary Systems – Summary of Aging Management Evaluation – Chilled Water HVAC System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	VII.I-4	3.3.1.43	B
Coating	MCI	Belzona	Raw Water	Loss of Coating Integrity	Open-Cycle Cooling Water System (B2.1.9)	None	None	J, 2
Compressor	PB	Cast Iron (Gray Cast Iron)	Dry Gas (Int)	None	None	VII.J-23	3.3.1.97	A

Notes for Table 3.3.2-9:

Standard Notes:

- A Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
- B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
- E Consistent with NUREG-1801 for material, environment, and aging effect, but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.
- F Material not in NUREG-1801 for this component.
- H Aging effect not in NUREG-1801 for this component, material and environment combination.
- J Neither the component nor the material and environment combination is evaluated in NUREG-1801

Plant Specific Notes:

- 1 Wall thinning due to erosion-corrosion is managed by the Flow-Accelerated Corrosion program (B2.1.6)
- 2 Coatings are managed for loss of coating integrity to provide assurance that the coatings will not adversely affect the safety function of downstream heat exchangers due to fouling. No credit is taken for the coatings to protect the base metal from loss of material. NUREG-1801 does not provide a line to manage coating for loss of coating integrity.

Table 3.3.2-20 Auxiliary Systems – Summary of Aging Management Evaluation – Standby Diesel Generator and Auxiliaries  
 (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	None	None	H, 1
Coating	MCI	Belzona	Raw Water	Loss of Coating Integrity	Open-Cycle Cooling Water System (B2.1.9)	None	None	J, 4
Coating	MCI	Plasticap/ Plasite	Raw Water	Loss of Coating Integrity	Open-Cycle Cooling Water System (B2.1.9)	None	None	J, 4
Expansion Joint	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.H2-23	3.3.1.47	

Notes for Table 3.3.2-20:

Standard Notes:

- A Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
- B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
- C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
- D Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
- E Consistent with NUREG-1801 for material, environment, and aging effect, but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.
- F Material not in NUREG-1801 for this component
- G Environment not in NUREG-1801 for this component and material.
- H Aging effect not in NUREG-1801 for this component, material, and environment combination.
- J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

- 1 Loss of preload is conservatively considered to be applicable for all closure bolting.
- 2 Reduction in heat transfer due to fouling is a potential aging effect/mechanism for cast iron (gray cast iron) turbocharger components in closed cycle cooling water.

- 3 B2.1.22, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components, is used because this is an aging mechanism which occurs on the internal surfaces of these components.
- 4 Coatings are managed for loss of coating integrity to provide assurance that the coatings will not adversely affect the safety function of downstream heat exchangers due to fouling. No credit is taken for the coatings to protect the base metal from loss of material. NUREG-1801 does not provide a line to manage coating for loss of coating integrity.

## A1.9 OPEN-CYCLE COOLING WATER SYSTEM

The Open-Cycle Cooling Water System program manages loss of material and reduction of heat transfer for components within the scope of license renewal and exposed to the raw water of the essential cooling water system. Included are components of the essential cooling water (ECW) system that are within the scope of license renewal, the component cooling water heat exchangers and the other safety related heat exchangers cooled by the essential cooling water system. The program includes chemical treatment and control of biofouling, periodic inspections, flushes and physical and chemical cleaning, and heat exchanger performance testing/ inspections to ensure that the effects of aging will be managed during the period of extended operation. The program also includes inspections of a sample of ECW piping for wall thickness prior to the period of extended operation. Subsequent inspections will be scheduled based on the results of the initial inspections. The plant specific configuration of the aluminum-bronze piping inserted inside the slip-on flange downstream of the Component Cooling Water (CCW) heat exchanger is inspected at a nominal 216 week interval. An engineering evaluation is performed after each inspection. Corrective action in accordance with the corrective action program will be initiated if the calculated wear over the next inspection interval indicates that the aluminum-bronze piping wall will reduce to a thickness of less than minimum wall thickness plus margin (four years of wear at the actual yearly wear rate). The program is consistent with STP commitments as established in responses to NRC Generic Letter 89-13, *Service Water System Problems Affecting Safety-Related Components*.

Coating installed to mitigate corrosion of the essential chiller water box covers, standby diesel generator (SDG) jacket water coolers, SDG lube oil coolers, SDG intercooler water boxes and interconnection piping are inspected and tested to assure coating integrity. The coatings are visually inspected every six years, and tested after 12 years of service at a six year frequency. The coating tests performed are low voltage holiday test, dry film thickness test and pull off adhesion test. Coating inspections and tests are performed by a qualified Nuclear Coating Specialist (NCS) or by Coatings Surveillance Personnel under the technical direction of the NCS.

## B2.1.9 Open-Cycle Cooling Water System

### Program Description

The Open-Cycle Cooling Water (OCCW) System program manages loss of material and reduction of heat transfer for components in scope of license renewal and exposed to the raw water of the essential cooling water (ECW) and essential cooling water screen wash system. The program includes surveillance techniques and control techniques to manage aging effects caused by biofouling, corrosion, erosion, cavitation erosion, protective coating failures and silting in components of the ECW system, and structures and components serviced by the ECW system, that are in scope of license renewal. The program also includes periodic inspections to monitor aging effects on the OCCW structures, systems and components, component cooling water heat exchanger performance testing, and inspections of the other safety related heat exchangers cooled by the ECW System, to ensure that the effects of aging on OCCW components are adequately managed for the period of extended operation. The program also includes inspections of a sample of ECW piping for wall thickness prior to the period of extended operation. Subsequent inspections will be scheduled based on the results of the initial inspections. The plant specific configuration of the aluminum-bronze piping inserted inside the slip-on flange downstream of the CCW heat exchanger is inspected at a nominal 216 week interval. An engineering evaluation is performed after each inspection. If the calculated wear over the next inspection interval indicates that the aluminum-bronze piping wall will reduce to a thickness of less than minimum wall thickness plus margin (four years of wear at the actual yearly wear rate), then the pipe will be repaired or replaced in accordance with the corrective action program. Components within the scope of the OCCW System program are: 1) components of the ECW system that are in scope of license renewal and 2) the safety-related heat exchangers cooled by the ECW system: component cooling water heat exchangers, standby diesel generator (SDG) jacket water heat exchangers, (SDG) diesel generator lube oil coolers, (SDG) diesel generator intercoolers, essential chiller condensers, and component cooling water pump supplementary coolers. The program is consistent with STPNOC commitments established in responses to NRC Generic Letter 89-13, *Service Water System Problems Affecting Safety-Related Components*.

The surveillance techniques utilized in the Open-Cycle Cooling Water System program include visual inspection, volumetric inspection, and thermal and hydraulic performance monitoring of heat exchangers. The control techniques utilized in the Open-Cycle Cooling Water System program include (1) water chemistry controls to mitigate the potential for the development of aggressive cooling water conditions, (2) flushes and (3) physical and/or chemical cleaning of heat exchangers and of the ECW pump suction bay to remove fouling and to reduce the potential sources of fouling.

Coating installed to mitigate corrosion of the essential chiller water box covers, SDG jacket water coolers, SDG lube oil coolers, SDG intercooler water boxes and interconnection piping are inspected and tested to assure coating integrity. The coatings are visually inspected every six years, and tested after 12 years of service at a six year frequency. The coating tests performed are low voltage holiday test per ASTM D5162, dry film thickness test per ASTM D7091 and Steel Structures Painting Council (SSPC) PA-2 and pull off adhesion test per ASTM D4541. Coating inspections and tests are performed by a qualified Nuclear Coating Specialist (NCS) as defined by ASTM D7108 or by Coatings Surveillance Personnel (CSP) under the technical direction of the NCS.

Additional measures used to manage loss of material due to selective leaching for aluminum bronze components in the ECW system are detailed in the plant-specific aging management program Selective Leaching of Aluminum Bronze (B2.1.37).

### **NUREG-1801 Consistency**

The Open-Cycle Cooling Water System program is an existing program that, following enhancement, will be consistent with exception to NUREG-1801, Section XI.M20, Open-Cycle Cooling Water System.

### **Exceptions to NUREG-1801**

#### Program Elements Affected:

*Preventive Actions (Element 2), Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4)*

NUREG-1801, Section XI.M20, Elements 2, 3 and 4, provide for a program of flushing and inspection to confirm that fouling and degradation of surfaces is not occurring. An exception is taken to flushing the ECW train cross-tie dead legs and inspecting the interior of these lines. Instead, the external surfaces of the cross-tie lines are included in the six month dealloying visual external inspection walkdowns. The cross-tie valves and piping are also included in the essential cooling water system inservice pressure test, which includes VT-2 inspections of these components. Measures used to manage loss of material due to selective leaching are detailed in the Selective Leaching of Aluminum Bronze program (B2.1.37). These inspections and tests provide confidence in the ability to detect leakage in the piping and valves. The cross-tie lines do not have an intended function and are not required for any accident scenario within the design basis of the plant. The cross-tie valves are maintained locked closed.

### **Enhancements**

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

*Parameters Monitored or Inspected (Element 3) and Detection of Aging Effects (Element 4)*

Procedures will be enhanced to include visual inspection of the strainer inlet area and the interior surfaces of the adjacent upstream and downstream piping. Material wastage, dimensional change, discoloration, and discontinuities in surface texture will be identified. These inspections will provide visual evidence of loss of material and fouling in the ECW system and serve as an indicator of the condition of the interior of ECW system piping components otherwise inaccessible for visual inspection. Procedures will also be enhanced to include the acceptance criteria for this visual inspection.

*Scope (Element 1), Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4), and Monitoring and Trending (Element 5)*

Procedures will be enhanced to require a minimum of 25 ECW piping locations be measured for wall thickness. Selected areas will include locations that are considered to have the highest corrosion rates, such as areas with stagnant flow.

Procedures will be enhanced to require an engineering evaluation after each inspection of the aluminum-bronze piping inserted inside the slip-on flange downstream of the CCW heat exchanger. The engineering evaluation will calculate wear over the next inspection interval using a margin of four years of wear at the actual yearly wear rate. Corrective action in accordance with the corrective action program will be initiated if the calculated wear indicates that the aluminum-bronze piping wall will reduce to a thickness of less than minimum wall thickness plus margin (four years of wear at the actual yearly wear rate).

*Corrective Actions (Element 7)*

Procedures will be enhanced to require loss of material in piping and protective coating failures be documented in the corrective action program. The resolution will include an engineering evaluation of the condition.

Prior to the next scheduled inspection in 2013 the following enhancements to coatings will be implemented

*Parameters Monitored or Inspected (Element 3) and Detection of Aging Effects (Element 4)*

Procedures will be enhanced to inspect and test coatings for loss of coating integrity. The coatings installed to mitigate corrosion of the essential chiller water box covers, SDG jacket water coolers, SDG lube oil coolers, SDG intercooler water boxes and interconnection piping are visually inspected every six years, and tested after 12 years of service at a six year frequency. The coating tests performed are low voltage holiday test per ASTM D5162, dry film thickness test per ASTM D7091 and Steel Structures Painting Council.

(SSPC) PA-2 and pull off adhesion test per ASTM D4541. Coating inspections and tests are performed by a qualified Nuclear Coating Specialist (NCS) as defined by ASTM D7108 or by Coatings Surveillance Personnel (CSP) under the technical direction of the NCS.

**Operating Experience**

Industry operating experience evaluations, Maintenance Rule Periodic Assessments, and OCCW component performance testing results have shown that the effects of aging are being adequately managed.

A review of the STP plant specific operating experience indicates that macrofouling, general corrosion, erosion corrosion, and cavitation erosion have been observed in aluminum bronze components.

In 2001, plant inspections of the ECW pumps revealed signs of flow erosion and corrosion on the pump internal and external surfaces. The pump vendor recommended application of Belzona coating to provide protection against erosion and corrosion and the coating was applied to the internal wetted surfaces of all ECW pumps. Use of Belzona has improved pump performance and service life of the components.

In May 2005, damage was discovered in the slip-on flange immediately downstream of the component cooling water heat exchanger 1B ECW return throttle valve. The damage was due

to cavitation erosion. The corresponding locations in the other ECW trains were inspected. The damaged areas of all six trains were replaced or reworked in accordance with the applicable codes and piping specifications. A design modification was performed to coat the affected areas with Belzona, and PMs were generated to perform regular inspections. The use of Belzona for mitigating cavitation erosion has been successful in prolonging service life of the components.

The OCCW System program operating experience information provides objective evidence to support the conclusion that the effects of aging are adequately managed so that the structure and component intended functions are maintained during the period of extended operation.

NRC Generic Letter 89-13 was based on industry operating experience and forms the basis for the STP OCCW System program.

### **Conclusion**

The continued implementation of the Open-Cycle Cooling Water System program will provide reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

**Enclosure 3**  
**Revised Regulatory Commitment**

## A4 LICENCE RENEWAL COMMITMENTS

Table A4-1 identifies proposed actions committed to by STPNOC for STP Units 1 and 2 in its License Renewal Application. These and other actions are proposed regulatory commitments. This list will be revised, as necessary, in subsequent amendments to reflect changes resulting from NRC questions and STPNOC responses. STPNOC will utilize the STP commitment tracking system to track regulatory commitments. The Condition Report (CR) number in the Implementation Schedule column of the table is for STPNOC tracking purposes and is not part of the amended LRA.

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
4	<p>Enhance the Open-Cycle Cooling Water System program procedures to:</p> <ul style="list-style-type: none"> <li>• include visual inspection of the strainer inlet area and the interior surfaces of the adjacent upstream and downstream piping. Material wastage, dimensional change, discoloration, and discontinuities in surface texture will be identified. These inspections will provide visual evidence of loss of material and fouling in the ECW system and serve as an indicator of the condition of the interior of ECW system piping components otherwise inaccessible for visual inspection.</li> <li>• include the acceptance criteria for this visual inspection.</li> <li>• require a minimum of 25 ECW piping locations be measured for wall thickness prior to the period of extended operation. Selected areas will include locations considered to have the highest corrosion rates, such as areas with stagnant flow.</li> <li>• require an engineering evaluation after each inspection of the aluminum-bronze piping inserted inside the slip-on flange downstream of the CCW heat exchanger,               <ul style="list-style-type: none"> <li>○ require the engineering evaluation calculated wear over the next inspection interval using a margin of four years of wear at the actual yearly wear rate,</li> <li>○ require corrective action in accordance with the corrective action program be initiated if the calculated wear indicates that the aluminum-bronze piping wall will reduce to a thickness of less than minimum wall thickness plus margin (four years of wear at the actual yearly wear rate),</li> </ul> </li> <li>• require loss of material in piping and protective coating failures be documented in the</li> </ul>	B2.1.9	<p>Prior to the period of extended operation</p> <p style="text-align: center;">CR 10-23256</p>

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
	<p>corrective action program, and</p> <ul style="list-style-type: none"> <li>require an engineering evaluation be performed when loss of material in piping or protective coating failures is identified.</li> </ul> <p><u>Enhance the Open-Cycle Cooling Water System program procedures to:</u></p> <ul style="list-style-type: none"> <li><u>visually inspect every six years, and test after 12 years of service at a six year frequency the coating applied on the essential chiller water box covers, standby diesel generator (SDG) jacket water coolers, SDG lube oil coolers, SDG intercoolers and interconnection piping. The coating test performed are low voltage holiday test per ASTM D5162, dry film thickness test per ASTM D7091 and Steel Structures Painting Council (SSPC) PA-2 and pull off adhesion test per ASTM D4541.</u></li> <li><u>require coating inspections and tests be performed by a qualified Nuclear Coating Specialist (NCS) as defined by ASTM D7108 or by Coatings Surveillance Personnel (CSP) under the technical direction of the NCS.</u></li> </ul>		<p><u>Prior to the next scheduled inspection in 2013</u></p>