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

November 12, 2015
NOC-AE-15003303
10 CFR 54
File No. G25

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 Request for Additional Information for the
Review of the South Texas Project, Units 1 and 2,
License Renewal Application – Set 32 (TAC Nos. ME4936 and ME4937)

References:

1. Letter; G. T. Powell to USNRC Document Control Desk; "License Renewal Application;" NOC-AE-10002607; dated October 25, 2010 (ML103010257)
2. Letter; J. W. Daily to G. T. Powell; "Request for Additional Information for the Review of the South Texas Project, Units 1 and 2, License Renewal Application – Set 32 (TAC Nos. ME4936 and ME4937);" AE-NOC-15002734; dated October 5, 2015 (ML15251A485)

By Reference 1, STP Nuclear Operating Company (STPNOC or STP) submitted a License Renewal Application (LRA). By Reference 2, the NRC staff requested additional information (RAI) for their review of the STPNOC LRA. STP is also providing supplemental information regarding a B2.1.13-5a, LR-ISG-2013-01 inspection frequency follow-up topic. STPNOC's response to the RAIs are provided in Enclosure 1 to this letter. Enclosure 2 provides supplemental information regarding B2.1.13-5a, LR-ISG-2013-01 Inspection Frequency Follow-up. Changes to LRA pages described in Enclosure 1 and 2 are depicted as line-in/line-out pages provided in Enclosure 3.

Regulatory commitment items 4 and 8 in LRA Table A4-1 have been revised and are depicted as line-in/line-out pages provided in Enclosure 4. There are no other commitments in this letter.

A147
NRR

STI: 34232897

If there are any questions, please contact Arden Aldridge, STP License Renewal Project Lead, at (361) 972-8243 or Rafael Gonzales, STP License Renewal Project regulatory point-of-contact, at (361) 972-4779.

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

Executed on November 12, 2015
Date

G. T. Powell
Site Vice President

rjg

Enclosures:

1. STPNOC Response to RAI
2. Supplemental Information - B2.1.13-5a, LR-ISG-2013-01 Inspection Frequency Follow-up
3. STPNOC LRA Changes with Line-in/Line-out Annotations
4. STPNOC Regulatory Commitments

cc:
(paper copy)

Regional Administrator, Region IV
U.S. Nuclear Regulatory Commission
1600 East Lamar Boulevard
Arlington, TX 76011-4511

Lisa M. Regner
Senior Project Manager
U.S. Nuclear Regulatory Commission
One White Flint North (MS 8 G9A)
11555 Rockville Pike
Rockville, MD 20852

NRC Resident Inspector
U. S. Nuclear Regulatory Commission
P. O. Box 289, Mail Code: MN116
Wadsworth, TX 77483

John W. Daily
License Renewal Project Manager (Safety)
U.S. Nuclear Regulatory Commission
One White Flint North (MS O11-F1)
Washington, DC 20555-0001

Tam Tran
License Renewal Project Manager
(Environmental)
U. S. Nuclear Regulatory Commission
One White Flint North (MS O11F01)
Washington, DC 20555-0001

(electronic copy)

Morgan, Lewis & Bockius LLP
Steve Frantz

U.S. Nuclear Regulatory Commission
Lisa M. Regner
John W. Daily
Tam Tran

NRG South Texas LP
John Ragan
Chris O'Hara
Jim von Suskil

CPS Energy
Kevin Pollo
Cris Eugster
L. D. Blaylock

Crain Caton & James, P.C.
Peter Nemeth

City of Austin
Cheryl Mele
John Wester

Texas Dept. of State Health Services
Richard A. Ratliff
Robert Free

Enclosure 1

STPNOC Response to RAI

RAI B2.1.18-5a, Buried piping – soil sampling periodicity

Background:

The response to RAI B2.1.18-5, dated June 11, 2015, states that in order to demonstrate that the soil is not corrosive; soil sampling will be conducted every 10 years. LRA Section A1.18 was revised to state that soil sampling will be conducted; however, the periodicity of the sampling was not stated.

SRP-LR Table 3.0-1, as modified by LR-ISG-2011-03 states "[i]f a reduction in the number of inspections recommended in Table 4a is claimed based on a lack of soil corrosivity as determined by soil testing, the UFSAR program description should state that soil testing should be conducted once in each 10-year period starting 10 years prior to the period of extended operation."

Issue:

Given that soil conditions can change over time, the staff lacks sufficient information to conclude that the licensing basis during the period of extended operation will be adequate. As amended by letter dated June 11, 2015, the licensing basis could result in only one set of soil samples being conducted.

Request:

State the basis for why the licensing basis during the period of extended operation will be adequate in regard to the periodicity of soil sampling.

STP Response

LRA Appendix A1.18 is revised to state: If the cathodic protection system doesn't meet the acceptance criteria, soil testing should be conducted once in each 10-year period starting 10 years prior to the period of extended operation.

Enclosure 3 provides the line-in/out revision to LRA Appendix A1.18.

RAI B2.1.13-6a, Followup testing on repaired components

Background:

The responses to RAI 3.0.3-2a and RAI B2.1.13-6, dated June 11, 2015, revised LRA Sections A1.9, A1.13, and A1.22, the licensing basis for the Open-Cycle Cooling Water System, Fire Water System, and Internal Surfaces in Miscellaneous Piping and Ducting Components Programs during the period of extended operation.

SRP-LR, Table 3.0-1, "FSAR Supplement for Aging Management of Applicable Systems," as modified by LR-ISG-2013-01 states, "[f]or coated/lined surfaces determined to not meet the acceptance criteria, physical testing is performed where physically possible (i.e., sufficient room to conduct testing) in conjunction with repair or replacement of the coating/lining"

Issue:

LRA Sections A1.9, A1.13, and A1.22 were not revised to address performing physical testing where physically possible in conjunction with repair or replacement of coatings. Therefore, the licensing basis for the programs will not be consistent with SRP-LR, Table 3.0-1, "FSAR Supplement for Aging Management of Applicable Systems." The staff cannot conclude that the licensing basis during the period of extended operation will be adequate without addressing physical testing associated with coating repairs or replacement.

Request:

State the basis for why the licensing basis for the Open-Cycle Cooling Water System, Fire Water System, and Internal Surfaces in Miscellaneous Piping and Ducting Components Programs during the period of extended operation will not include a statement related to followup testing requirements of coatings that are repaired.

STP Response

LRA Appendix A1.9, A1.13, A1.22, B2.1.9, B2.1.13, B2.1.22, are revised to address performing physical testing where physically possible in conjunction with replacement of coatings.

Enclosure 3 provides the line-in/out revision to LRA Appendices A1.9, A1.13, A1.22, B2.1.9, B2.1.13, and B2.1.22.

Enclosure 4 provides the line-in/out revision to LRA Table A4-1 for LRA Commitments 4 and 8.

RAI 3.0.3-2b, Extent of internally-coated components inspection

Background:

LRA Section B2.1.9 was revised to state, "[c]oating installed to mitigate corrosion of the essential chiller water box covers, Standby Diesel Generator (SDG) jacket water coolers, SDG lube oil coolers, SD intercooler water boxes and interconnection piping are inspected and tested to assure coating integrity.

Issue:

It is not clear to the staff whether internal coatings installed for purposes other than corrosion (e.g., prevention of erosion damage) will be inspected.

Request:

State the basis for limiting coating inspections in the Open-Cycle Cooling Water System Program to those locations where the coatings were installed to mitigate corrosion.

STP Response

LRA Appendix A1.9, A1.13, A1.22, B2.1.9, B2.1.13, and B2.1.22 are revised to state that 100 percent of coatings installed on internal surfaces of coated components will be inspected.

Enclosure 3 provides the line-in/out revision to LRA Appendices A1.9, A1.13, A1.22, B2.1.9, B2.1.13, and B2.1.22.

Enclosure 4 provides the line-in/out revision to LRA Table A4-1 for LRA Commitments 4 and 8.

RAI 3.0.3-2c, Standard for holiday testing

Background:

The response to RAI 3.0.3-2, dated June 3, 2014, cited several standards to conduct holiday testing, dry-film thickness measurements, and adhesion testing.

Issue:

The response did not state the specific edition of the standards that will be used. The staff cannot complete its evaluation of the RAI response without the program stating the specific year of the standard. For example, the staff has endorsed the 2009 edition when conducting adhesion testing in accordance with ASTM D4541, "Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers." During its review of the RAI response, the staff used the following editions:

- ASTM D5162-08, "Standard Practice for Discontinuity (Holiday) Testing of Nonconductive Protective Coating on Metallic Substrates"
- ASTM D7091-13, "Standard Practice for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals
- SSPC PA-2 – January 2015, "Procedure for Determining Conformance to Dry Coating Thickness Requirements"

Request:

State the specific edition that will be used for the cited ASTM and SSPC standards.

STP Response

LRA Appendix B2.1.9, B2.1.13, and B2.1.22 are revised to state the following:

- ASTM D5162-08
- D7091-13,
- SSPC PA-2-January 2015 Revision
- ASTM D4541-09

Enclosure 3 provides the line-in/out revision to LRA Appendices B2.1.9, B2.1.13, and B2.1.22.

Enclosure 4 provides the line-in/out revision to LRA Table A4-1 for LRA Commitments 4 and 8.

Enclosure 2

Supplemental Information - B2.1.13-5a, LR-ISG-2013-01 Inspection Frequency Follow-up

Supplemental Information - B2.1.13-5a, LR-ISG-2013-01 inspection frequency follow-up

Regarding LR-ISG-2013-01, STP is providing supplemental information based on the following background information and issues.

Background

1) The response to RAI 3.0.3-2a Part (a), dated June 11, 2015, states:

> When visual inspections detect blistering, cracking, flaking, peeling, delamination, rusting and physical damage the degraded coating, under the guidance of the Nuclear Coating Specialist (NCS), is removed to sound base material and new coating applied. The as-found degraded condition is documented in the corrective action program for trending. Since the degraded coating has been removed and replaced with new coating the inspection interval is not changed. Review of STP's existing coating inspection program operating history demonstrates that the remediation of degraded coating conditions prior to returning the coating back in service is effective in managing the coating performance from one inspection to the next, with no change in inspection interval.

2) In regard to follow-up testing conducted to ensure that the extent of repaired or replaced coatings encompasses sound coating material, the responses to RAI 3.0.3-2a Part (d) and RAI B2.1.13-5a state that the nuclear coatings specialist's oversight of the replacement of the degraded coatings ensures that the extent of repaired or replaced coatings encompasses sound coating material.

3) Letters dated March 29, 2012, and May 10, 2012, state that the essential cooling water (ECW) pump internal coatings will be inspected on a nominal 10-year frequency. The May 10, 2012, letter states that ECW pumps are located upstream of self-cleaning strainers and the strainer size is sufficient to preclude tube blockage of downstream heat exchangers. The March 29, 2012, letter states that blistering of the coatings has been found on the pump diffuser, flanges, and discharge elbow that are constructed of aluminum bronze alloy castings.

Issue:

1) LR-ISG-2013-01, "Aging Management of Loss of Coating or Lining Integrity for Internal Coatings/Linings on In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," recommends that when peeling, delamination, blisters, or rusting are observed during inspections or when cracking and flaking that does not meet acceptance criteria is observed during inspections, the subsequent inspection interval is 4 years instead of 6 years. The responses to RAI 3.0.3-2a Part (d) and RAI B2.1.13-5a state that the specific degraded coatings will be replaced. However, with a known degradation mechanism potentially occurring in other locations with the same coating and environment, the staff concluded that inspections should be conducted more frequently than if no degradation was noted in prior inspections. The staff lacks sufficient information to conclude that a 6-year inspection interval is adequate when the extent of coating degradation, similar to the observed degradation that was repaired, is not known.

2) The "corrective actions" program element of LR-ISG-2013-01, "Aging Management of Loss of Coating or Lining Integrity for Internal Coatings/Linings on In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," AMP XI.M42, "Internal

Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," recommends that testing or examination be conducted to ensure that the extent of repaired coatings/linings encompasses sound material. The "corrective actions" program element also states that if a blister [that does not meet acceptance criteria] is not repaired, physical testing is conducted to ensure that the blister is completely surrounded by sound coating bonded to the surface. The extent of blistering, peeling, and delamination is not typically detectable by visual inspection alone. The staff lacks sufficient information to conclude what follow-on testing or examination will be directed to be performed by the NCS.

3) Although the ECW pumps are located upstream of self-cleaning strainers, this in and of itself is not a sufficient basis to justify a nominal 10-year inspection frequency. The staff lacks sufficient information to conclude that the strainers will provide an effective barrier to flow blockage of downstream heat exchangers. Plant-specific operating experience of the ECW coatings has revealed degraded coatings. Degraded coatings can lead to loss of material of the base material. A basis was not provided for how loss of material will be monitored given that the coatings will be inspected on a nominal 10-year frequency.

Supplemental Information:

1) With the exception of the internal coatings for the fire water storage tanks, STP is providing justification for the basis for how the extent of coatings that were repaired could be experiencing similar degradation. This information also includes details of how they will be determined in a reasonable time frame.
2) STP is providing information stating whether testing and examinations will be conducted prior to, and during the repair to ensure that replaced coatings encompasses sound coating material.
3) Given that prior plant-specific inspections of the ECW pump internal coatings have revealed degradation:
    a. STP will provide the backup indications to demonstrate that fouling is not occurring on the self-cleaning strainers.
    b. STP will provide the interval of inspections on the strainer elements of the self-cleaning strainers.

STP Supplemental Information

1) STP has 6 trains of essential cooling water and inspects the coatings on each train on a 6 year interval. One of the six trains of coated components is inspected every year. This provides timely inspections to assure the coatings that could be experiencing similar degradation or any unexpected increased degradation rate are identified and replaced.

   The Belzona and Plasticap coatings installed to mitigate corrosion of the essential chiller water box covers, Standby Diesel Generator (SDG) jacket water coolers, SDG lube oil coolers, SD intercooler water boxes and interconnection piping are the same on all 6 trains. STP response to RAI B2.1.9-3d dated February 27, 2014, provides the operating experience from previous inspections. This operating experience demonstrates that the coatings performance is similar and the degradation is minor with no impact on the intended function of the downstream components. As stated in STP's response to RAI B2.1.9-3d, which is backed up by operating experience, the 6 year inspection interval, even for replaced

coatings, is effective in identifying degraded conditions prior to any adverse impacts on the system's intended functions.

LRA Appendix A1.9 is revised to state coatings not meeting the acceptance criteria are considered degraded, and are removed to sound material and replaced with new coating.

The coating re-inspection interval for the Fire Water System and Internal Surfaces in Miscellaneous Piping and Ducting Components AMPs are revised as follows.

1. The Fire Water System program is revised to inspect the coatings installed on the internals of non-tank in-scope fire water components every 4 years after the coating has been replaced until there are three consecutive inspections with no change in the coating condition. Following three consecutive inspections with no change in the coating condition, the 6 year inspection interval can be restored.
2. The internal surfaces in the Miscellaneous Piping and Ducting Components Program is revised to inspect the coatings every 4 years after the coating has been replaced until there are three consecutive inspections with no change in the coating condition. Following three consecutive inspections with no change in the coating condition, the 6 year inspection interval can be restored.

LRA Appendices A1.13, A1.22, B2.13 and B2.1.22 are revised to reflect a 4 year inspection interval after the coating has been replaced until there are three consecutive inspections with no change in the coating condition. Following three consecutive inspections with no change in the coating condition the 6 year inspection interval can be restored.

Enclosure 3 provides the line-in/out revision to LRA Appendices A1.9, A1.13, A1.22, B2.13 and B2.1.22.

Enclosure 4 provides the line-in/out revision to LRA Table A4-1 for LRA Commitments 4 and 8.

2) When testing is scheduled to be performed, it is performed prior to any repairs. Repairs are overseen by a NACE certified coating specialist who utilizes visual and physical techniques to determine when sound coating material is achieved prior to repair. No post repair testing is performed. See RAI response B2.1.13-6a in Enclosure 1 for more information.

3)a. Indications available to determine that fouling is not occurring on the self-cleaning strainers are the high strainer differential pressure computer alarm in the control room and operator observations of the strainer operation during watch standing rounds.

3)b. The plant operator observes the strainer operation and parameters during watch standing rounds. A strainer internal inspection/overhaul preventive maintenance activity is performed every 155 weeks (3 years) to assure proper condition of the internal components. The strainer is also managed under the Maintenance Rule guidelines.

Enclosure 3

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

List of Revised LRA Sections

RAI	Affected LRA Section
B2.1.18-5a	A1.18
B2.1.13-5a	A1.9, A1.13, A1.22, B2.13, B2.1.22
B2.1.13-6a	A1.9, A1.13, A1.22, B2.1.9, B2.1.13, B2.1.22
3.0.3-2b	A1.9, A1.13, A1.22, B2.1.9, B2.13, B2.1.22
3.0.3-2c	B2.1.9, B2.13, B2.1.22

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.*

100 percent of internal ~~C~~coating installed on ~~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) as defined by ASTM D7108 endorsed in RG 1.54. Coatings not meeting the acceptance criteria are considered degraded, removed to sound material and replaced with new coating. Physical testing is performed where physically possible in conjunction with repair or replacement of coatings. Monitoring and trending of coatings is based on a pre-inspection review of the previous inspections results including any subsequent repairs activities.

A.1.13 FIRE WATER SYSTEM

The Fire Water System program manages loss of material and loss of coating integrity for water-based fire protection systems consisting of piping, fittings, valves, sprinklers, nozzles, hydrants, hose stations, standpipes and fire water storage tanks. The internal surfaces of water-based fire protection system piping that is normally drained, such as dry-pipe sprinkler system piping, are included within the scope of the program. Periodic inspections, testing, and cleaning are performed on the following.

- Sprinkler inspections every 18 months per NFPA 25, 2011 Edition Section 5.2.1.1
- 50-year sprinkler replacement or testing per NFPA 25, 2011 Edition Section 5.3.1
- Standpipe and hose systems flow tests every 3 years per NFPA 25, 2011 Edition Section 6.3.1
- Underground and exposed piping flow tests every 3 years per NFPA 25, 2011 Edition Section 7.3.1
- Hydrants flow testing and visually inspection annually per NFPA 25, 2011 Edition Section 7.3.2
- Fire pumps suction screens cleaning and inspections per NFPA 25, 2011 Edition Section 8.3.3.7
- Fire water storage tank exterior inspections annually per NFPA 25, 2011 Edition Section 9.2.5.5
- Fire water storage tank coated interior surfaces are inspected every 5 years per NFPA 25, 2011 Edition Sections 9.2.6. Testing is performed in accordance with NFPA 25, 2011 Edition Section 9.2.7 whenever there is evidence of pitting and corrosion below nominal wall depth or failure of tanks coatings. Additionally, bottom thickness ultrasonic tests are done at least once every 10 years.
- Main drain testing every 18 months per NFPA 25, 2011 Edition Section 13.2.5
- Deluge Valve testing annually per NFPA 25, 2011 Edition Sections 13.4.3.2.2 through 13.4.3.2.5
- Water Spray Fixed System strainers cleaning and inspections per NFPA 25, 2011 Edition Section 10.2.1.6, 10.2.1.7, 10.2.7
- Spray/sprinkler nozzles full flow test every 18 months per NFPA 25, 2011 Edition Section 10.3.4.3
- Foam water sprinkler systems spray nozzle strainers per NFPA 25, 2011 Edition Section 11.2.7.1
- Foam water sprinkler systems operational test discharge patterns annually per NFPA 25, 2011 Edition Section 11.3.2.6
- Foam water sprinkler systems storage tank visual inspection for internal corrosion once every 10 years
- Internal surface of piping and branch lines obstruction inspections every 5 years per NFPA 25, 2011 Edition Sections 14.2 and 14.3

The fire water system pressure is continuously monitored such that loss of system pressure is immediately detected and corrective actions are initiated.

Internal and external visual inspections are performed on accessible exposed portions of fire water piping during plant maintenance activities. The inspections detect loss of material due to corrosion, ensure that aging effects are managed, and detect surface irregularities that could indicate wall loss below nominal pipe wall thickness. When surface irregularities are detected, follow-up volumetric wall thickness examinations are performed.

Augmented inspections are performed on the portions of water-based fire protection components that have been wetted but are normally dry or piping segments that cannot be drained or segments that allow water to collect. The augmented inspections are either flow tested or flushed sufficient to detect flow blockage or 100 percent visually inspected in each 5-year interval, beginning 5 years prior to the period of extended operation.

Augmented volumetric wall thickness inspections are performed on 20 percent of the length of piping segments that cannot be drained or piping segments that allow water to collect in each 5-year interval of the prior to the period of extended operation. The 20 percent of piping inspected in each 5-year interval shall be in different location than previously inspected piping.

100 percent of the coatings installed on the internals of in-scope fire water components are inspected and tested to assure coating integrity. The coatings are ~~visual~~ 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. Coatings not meeting the acceptance criteria are considered degraded, removed to sound material and replaced with new coating. Physical testing where physically possible is performed in conjunction with replacement of coatings. Replaced coatings are inspected every four years until there are three consecutive inspections with no change in the coating condition. Following three consecutive inspections with no change in the coating condition the 6 year inspection interval can be restored. Coating inspections and tests will be performed by a qualified Nuclear Coating Specialist (NCS) as defined by ASTM D7108 endorsed in RG 1.54. Monitoring and trending of coatings is based on a pre-inspection review of the previous inspections results including any subsequent replacement activities.

A1.18 BURIED PIPING AND TANKS INSPECTION

The Buried Piping and Tanks Inspection program manages the loss of material on external surfaces of buried and underground components. Preventive and mitigative measures, including verification of coatings quality, backfill requirements, and cathodic protection, are employed to manage aging of buried components. Underground components are protectively coated where required.

The cathodic protection system is operated consistent with the guidance of NACE SP0169-2007 for piping and is monitored to ensure that protection is being provided. The cathodic protection system is operational (available) at least 85 percent of the time and provides effective protection for buried piping as evidenced by meeting the acceptance criteria at least 80 percent of the time since either 10 years prior to the period of extended operation or since installation or refurbishment. An annual cathodic protection survey is performed consistent with NACE SP0169-2007. If portions of the installed cathodic protection system fail to meet the acceptance criteria; soil testing is performed to demonstrate the soil is non-corrosive for each material type of buried in-scope piping located in the vicinity of the failed cathodic protection system. If the cathodic protection system fails to meet the acceptance criteria, soil testing should be conducted at a minimum of once in each 10-year period starting 10 years prior to the period of extended operation.

Opportunistic and directed visual inspections will monitor the condition of external surfaces, protective coatings and wrappings found on steel, stainless steel and copper alloy components. Any evidence of damaged wrapping or coating defects will be an indicator of possible corrosion damage to the external surface of the components.

Hydrostatic tests of 25 percent of the subject piping will be performed on an interval not to exceed 5 years, or an internal inspection of 25 percent of the subject piping by a method capable of accurately determining pipe wall thickness every 10 years may be performed as an alternate to directed inspections. Flow testing of the fire mains as described in Section 7.3 of NFPA 25, 2011 Edition is credited in lieu of visual inspections.

A1.22 INSPECTION OF INTERNAL SURFACES IN MISCELANEOUS PIPING AND DUCTING COMPONENTS

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program manages cracking, loss of material, and hardening and loss of strength of the internal surfaces of piping, piping components, ducting, tanks, and other components that are not inspected by other aging management programs.

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is a new program that uses the work control process for preventive maintenance and surveillance to conduct and document inspections. The program performs visual inspections to detect aging effects that could result in a loss of component intended function. Visual inspections of internal surfaces of plant components are performed by qualified personnel during the conduct of periodic maintenance, predictive maintenance, surveillance testing, and corrective maintenance. Opportunistic inspections will be supplemented with scheduled inspections if at a minimum in each 10-year period during the period of extended operation 20 percent up to a maximum of 25 components with the same combination of material, environment and aging effect are not opportunistically inspected. Where practical, the locations for these supplemental inspections will be selected from components most susceptible to aging. Opportunistic inspections will continue to be performed when the minimum sample size is reached.

Visual inspections of flexible polymeric components are performed whenever the component surface is accessible. Visual inspections are augmented by physical manipulation of at least 10 percent of accessible surface area of elastomers within the scope of the program, when appropriate for the component configuration and material, to detect hardening and loss of strength of internal surfaces of elastomers. In cases where internal surfaces are not available for visual inspection, an internal visual inspection may be substituted with a volumetric examination.

The program also includes the following.

Vvolumetric examination of the tank bottoms of the auxiliary feedwater storage tanks the reactor makeup-water storage tanks, and the safety injection refueling water storage tanks from inside the tanks each 10-year period starting 10 years before entering the period of extended operation, to confirm the absence of loss of material due to corrosion.

Volumetric examination of a minimum of 20 percent of the auxiliary feedwater storage tank sidewalls from inside the tank each 10-year period starting 10 years before entering the period of extended operation.

Volumetric evaluation to detect stress corrosion cracking of the internal surfaces of stainless steel components exposed to diesel exhaust.

Visual inspections of the floating seals in the reactor makeup water storage tanks.

100 percent of the Ccoatings installed on the internals of in-scope components are inspected and tested to assure coating integrity. The coatings are visual 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. Coatings not meeting the acceptance criteria are considered degraded, removed to sound material and replaced with new coating. Physical testing where physically possible is performed in conjunction with replacement of coatings. Replaced coatings are inspected every four years until there are three consecutive inspections with no change in the coating condition. Following three consecutive inspections with no change in the coating condition the 6 year inspection interval can be restored. Coating inspections and tests will be performed by a qualified Nuclear Coating Specialist (NCS) as defined by ASTM D7108 endorsed in RG 1. Monitoring and trending of the coatings are to be based on a pre-inspection review of the previous inspections results including any subsequent replacement activities.

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program will be implemented prior to the period of extended operation. Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.

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) lube oil coolers, (SDG) 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.

100 percent of the ~~C~~coatings installed on ~~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 D5162-08, dry film thickness test per ASTM D7091-13 and Steel Structures Painting Council (SSPC) PA-2 January 2015, and pull off adhesion test per ASTM D4541-09.

Coating inspections and tests are performed by a qualified Nuclear Coating Specialist (NCS) as defined by ASTM D7108 endorsed in RG 1.54.

Monitoring and trending of coatings is based on a pre-inspection review of the previous two inspections results including any subsequent replacement activities. The coatings specialist will prepare a post-inspection report that includes a list and location of all areas of deterioration that were remediated. Where possible, photographic documentation indexed to inspection locations are obtained.

The acceptance criteria for coatings are that no blistering, cracking, erosion, cavitation erosion, flaking, peeling, delamination, rusting or physical damage of the coatings is observed. Coatings not meeting these criteria are considered degraded removed to sound material and replaced with new coating. Physical testing where physically possible is performed in conjunction with replacement of coatings. The as-found degraded condition is documented in the corrective action program for trending.

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. Coatings not meeting the acceptance criteria are replaced with new coating.

No later than the date the renewed operating licenses are issued the following enhancements to coatings will be implemented

Parameters Monitored or Inspected (Element 3) and Detection of Aging Effects (Element 4) Monitoring and Trending (Element 5), and Acceptance Criteria (Element 6)

Procedures will be enhanced to inspect and test coatings for loss of coating integrity. 100 percent of ~~T~~the coatings installed on ~~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 D5162-08, dry film thickness test per ASTM D7091-13 and Steel Structures Painting Council ~~and~~ (SSPC) PA-2 January 2015, and pull off adhesion test per ASTM D4541-09. Coating inspections and tests are performed by a qualified Nuclear Coating Specialist (NCS) as defined by ASTM D7108 endorsed in RG 1.54.

Procedures will be enhanced to monitor and trend coatings installed on the internals of in-scope components.

Procedures will be enhanced to specify the acceptance criteria for coatings as no blistering, cracking, erosion, cavitation erosion, flaking, peeling, delamination, rusting or physical damage of the coatings installed on the internals of in-scope components is observed. Coatings not meeting these criteria are considered degraded, removed to sound material and replaced with new coating. Physical testing where physically possible is performed in conjunction replacement

of coatings. The as-found degraded condition is documented in the corrective action program for trending.

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.

B2.1.13 Fire Water System

Program Description

The Fire Water System program manages loss of material, fouling, flow blockage and loss of coating integrity for water-based fire protection systems consisting of piping, fittings, valves, sprinklers, nozzles, hydrants, hose stations, standpipes and fire water storage tanks. The internal surfaces of water-based fire protection system piping that is normally drained, such as dry-pipe sprinkler system piping, are included within the scope of the program. Periodic inspections, testing, and cleaning are performed on the following.

- Sprinkler inspections every 18 months per NFPA 25, 2011 Edition Section 5.2.1.1
- 50-year sprinkler replacement or testing per NFPA 25, 2011 Edition Section 5.3.1
- Standpipe and hose systems flow tests every 3 years per NFPA 25, 2011 Edition Section 6.3.1
- Underground and exposed piping flow tests every 3 years per NFPA 25, 2011 Edition Section 7.3.1
- Hydrants flow testing and visually inspection annually per NFPA 25, 2011 Edition Section 7.3.2
- Fire pumps suction screens cleaning and inspections per NFPA 25, 2011 Edition Section 8.3.3.7
- Fire water storage tank exterior inspections annually per NFPA 25, 2011 Edition Section 9.2.5.5
- Fire water storage tank coated interior surfaces are inspected every 5 years per NFPA 25, 2011 Edition Section 9.2.6. Testing is performed in accordance with NFPA 25, 2011 Edition Section 9.2.7 whenever there is evidence of pitting and corrosion below nominal wall depth or failure of tanks coatings. Additionally, bottom thickness ultrasonic tests are done at least once every 10 years.
- Main drain testing every 18 months per NFPA 25, 2011 Edition Section 13.2.5
- Deluge Valve testing annually per NFPA 25, 2011 Edition Sections 13.4.3.2.2 through 13.4.3.2.5
- Water Spray Fixed System strainers cleaning and inspections per NFPA 25, 2011 Edition Section 10.2.1.6, 10.2.1.7, 10.2.7
- Spray/sprinkler nozzles full flow test every 18 months per NFPA 25, 2011 Edition Section 10.3.4.3
- Foam water sprinkler systems spray nozzle strainers per NFPA 25, 2011 Edition Section 11.2.7.1
- Foam water sprinkler systems operational test discharge patterns annually per NFPA 25, 2011 Edition Section 11.3.2.6
- Foam water sprinkler systems storage tank visual inspection for internal corrosion once every 10 years
- Internal surface of piping and branch lines obstruction inspections every 5 years per NFPA 25, 2011 Edition Sections 14.2 and 14.3

STP monitors the fire water system's ability to maintain pressure and flow rates. The fire water system pressure is continuously monitored such that loss of system pressure is immediately detected and corrective actions initiated.

Internal and external visual inspections are performed on accessible exposed portions of fire water piping during plant maintenance activities. The inspections detect loss of material due to corrosion, ensure that aging effects are managed, and detect surface irregularities that could

indicate wall loss below nominal pipe wall thickness. When surface irregularities are detected, follow-up volumetric wall thickness examinations are performed.

Augmented inspections are performed on the portions of water-based fire protection components that have been wetted but are normally dry or piping segments that cannot be drained or segments that allow water to collect. The augmented inspections are either flow tested or flushed sufficient to detect flow blockage or 100 percent visually inspected in each 5-year interval, beginning 5 years prior to the period of extended operation.

Augmented volumetric wall thickness inspections are performed on 20 percent of the length of piping segments that cannot be drained or piping segments that allow water to collect in each 5-year interval of the prior to the period of extended operation. The 20 percent of piping inspected in each 5-year interval shall be in different location than previously inspected piping.

The Fire Water Storage Tank coatings are inspected every 5 years as outlined by NFPA-25, 2011 Edition. 100 percent of the ~~C~~coatings installed on the internals of non-tank fire water components are inspected and tested to assure coating integrity. The coatings are ~~visual~~ inspected every six years, and tested after 12 years of service at a six-year frequency. Replaced coatings are inspected every 4 years until there are three consecutive inspections with no change in the coating condition. Following three consecutive inspections with no change in the coating condition the 6 year inspection interval can be restored. The coating tests performed are low voltage holiday test per ASTM D5162-08, dry film thickness test per ASTM D7091-13 and Steel Structures Painting Council~~, and~~ (SSPC) PA-2 January 2015, and pull off adhesion test per ASTM D4541-09. Coating inspections and tests are performed by a qualified Nuclear Coating Specialist (NCS) as defined by ASTM D7108 endorsed in RG 1.54.

Monitoring and trending of coatings is based on a pre-inspection review of the previous two inspections results including any subsequent replacement activities. The coatings specialist will prepare a post-inspection report that includes a list and location of all areas of deterioration that were remediated. Where possible, photographic documentation indexed to inspection locations are obtained.

The acceptance criteria for coatings are that no blistering, cracking, erosion, cavitation erosion, flaking, peeling, delamination, rusting or physical damage of the coatings is observed. Coatings not meeting these criteria are considered degraded removed to sound material and replaced with new coating. Physical testing where physically possible is performed in conjunction with replacement of coatings. The as-found degraded condition is documented in the corrective action program for trending.

Where material and environment conditions for above grade and below grade piping are similar, the results of the inspections of the internal surfaces of the above grade fire protection piping can be extrapolated to evaluate the condition of the internal surfaces of the below grade fire protection piping. If not, additional inspection activities are needed to ensure that the intended function of below grade fire protection piping will be maintained consistent with the current licensing basis.

Results of the flow testing are monitored and trended. Degradation identified by flow testing or visual inspection is evaluated in accordance with the corrective action program.

The acceptance criteria for the fire water system are the system maintains the required pressure and flow. The fire water piping minimum wall thickness is maintained and no fouling is observed during inspections of sprinklers and associated piping. Sprinklers that show signs of leakage or

corrosion shall be replaced. If the presence of sufficient foreign organic or inorganic material to obstruct pipe or sprinklers is detected, the material is removed and the source is determined and corrected.

NUREG-1801 Consistency

The Fire Water System program is an existing program that, following enhancement, will be consistent, with exception to NUREG-1801, Section XI.M27, Fire Water System.

Exceptions to NUREG-1801

Program Elements Affected:

Scope of Program (Element 1)

NUREG-1801 provides a program for managing carbon steel and cast iron components in fire water systems. The fire water system contains additional materials of construction, specifically, copper alloy and stainless steel. The Fire Water System program manages aging effects of copper alloy and stainless steel fire water system components with an internal environment of water.

Detection of Aging Effects (Element 4)

NUREG-1801 requires inspection of fire protection systems in accordance with the guidance of NFPA-25, 2011 Edition. STP performs power block hose station gasket inspections at least once every 18 months, rather than annually as specified by NFPA-25, 2011 Edition. STP has been inspecting at an 18 month frequency for over 10 years, and no degradation leading to a loss of function has occurred. A visual inspection of hose stations is conducted every six months for accessible locations and 18 months for stations that are not accessible during normal operations. These hoses are also hydrostatically tested every three years. Hoses are replaced when indications of deterioration are observed either by visual inspection or failure of a hydrostatic test, this replacement includes inspection of the gasket. Since aging effects are typically manifested over several years, differences in inspection and testing frequencies are insignificant.

Enhancements

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

Scope (Element 1)

Procedures will be enhanced to manage coatings installed on the internals of in-scope fire water components for loss of coating integrity.

Parameters Monitored or Inspected (Element 3,)

Procedures will be enhanced to perform flow testing of the each fire water loops is performed at least once every three five years, consistent with NFPA 25, 2011 Edition Section 6.3.1

Procedures will be enhanced to follow-up volumetric wall thickness examinations when surface irregularities are detected.

Procedures will be enhanced to perform volumetric wall thickness inspections on portions of water-based components that are periodically subject to flow but are normally dry.

Procedures will be enhanced to manage coatings installed on the internals of in-scope fire water components for loss of coating integrity.

Detection of Aging Effects (Element 4)

Procedures will be enhanced to perform periodic inspections, testing, and cleaning on the following

- Sprinkler inspections every 18 months per NFPA 25, 2011 Edition Section 5.2.1.1
- 50-year sprinkler replacement or testing per NFPA 25, 2011 Edition Section 5.3.1
- Standpipe and hose systems flow tests every 3 years per NFPA 25, 2011 Edition Section 6.3.1
- Underground and exposed piping flow tests every 3 years per NFPA 25, 2011 Edition Section 7.3.1
- Hydrants flow testing and visually inspection annually per NFPA 25, 2011 Edition Section 7.3.2
- Fire pumps suction screens cleaning and inspections per NFPA 25, 2011 Edition Section 8.3.3.7
- Fire water storage tank exterior inspections annually per NFPA 25, 2011 Edition Section 9.2.5.5

- Fire water storage tank coated interior surfaces are inspected every 5 years per NFPA 25, 2011 Edition Sections 9.2.6. Testing is performed in accordance with NFPA 25, 2011 Edition Section 9.2.7 whenever there is evidence of pitting and corrosion below nominal wall depth or failure of tanks coatings. Additionally, bottom thickness ultrasonic tests are done at least once every 10 years.
- Main drain testing every 18 months per NFPA 25, 2011 Edition Section 13.2.5
- Deluge Valve testing annually per NFPA 25, 2011 Edition Sections 13.4.3.2.2 through 13.4.3.2.5
- Water Spray Fixed System strainers cleaning and inspections per NFPA 25, 2011 Edition Section 10.2.1.6, 10.2.1.7, 10.2.7
- Spray/sprinkler nozzles full flow test every 18 months per NFPA 25, 2011 Edition Section 10.3.4.3
- Foam water sprinkler systems spray nozzle strainers per NFPA 25, 2011 Edition Section 11.2.7.1
- Foam water sprinkler systems operational test discharge patterns annually per NFPA 25, 2011 Edition Section 11.3.2.6
- Foam water sprinkler systems storage tank visual inspection for internal corrosion once every 10 years
- Internal surface of piping and branch lines obstruction inspections every 5 years per NFPA 25, 2011 Edition Sections 14.2 and 14.3

Procedures will be enhanced to perform follow-up volumetric wall thickness examinations when surface irregularities are detected.

Procedures will be enhanced to perform either flow testing or flushing sufficient to detect flow blockage or 100 percent visually inspection in each 5-year interval, beginning 5 years prior to the period of extended operation on portions of water-based fire protection components that have been wetted but are normally dry or piping segments that cannot be drained or segments that allow water to collect.

Procedures will be enhanced to perform volumetric wall thickness inspection are performed on 20 percent of the length of piping segments that cannot be drained or piping segments that allow water to collect in each 5-year interval of the prior to the period of extended operation. The 20 percent of piping inspected in each 5-year interval shall be in different location than previously inspected piping.

Procedures will be enhanced to perform coating inspections on the Fire Water Storage Tank every 5 years as outlined by NFPA-25, 2011 Edition.

Procedures will be enhanced to perform coating inspections on 100 percent of the coatings installed on the internals of non-tank in-scope fire water components. The coatings are ~~visual~~ inspected every six years, and tested after 12 years of service at a six-year frequency. Replaced coatings are inspected every four years until there are three consecutive inspections with no change in the coating condition. Following three consecutive inspections with no change in the coating condition the 6 year inspection interval can be restored. The coating tests performed are low voltage holiday test per ASTM D5162-08, dry film thickness test per ASTM D7091-13 and Steel Structures Painting Council~~, and~~ (SSPC) PA-2 January 2015, and pull off adhesion test per ASTM D4541-09. Coating inspections and tests are performed by a qualified Nuclear Coating Specialist (NCS) as defined by ASTM D7108 endorsed in RG 1.54.

Monitoring and Trending (Element 5)

Procedures will be enhanced to monitor and trend fire water piping flow parameters recorded during fire water flow tests.

Procedures will be enhanceds to monitor and trend coatings installed on the internals of in-scope fire water components.

Procedures will be enhanced to state monitoring and trending of coatings is based on a pre-inspection review of the previous two inspections results including any subsequent replacement activities. The coatings specialist will prepare a post-inspection report that includes a list and location of all areas of deterioration that were remediated. Where possible, photographic documentation indexed to inspection locations are obtained.

Acceptance Criteria (Element 6)

Procedures will be enhanced to specify the following acceptance criteria.

Minimum design fire water piping wall thickness is maintained.

Fouling shall not be observed during inspections of sprinklers and associated piping in the sprinkler system that could cause flow blockage.

Sprinklers that show signs of leakage or corrosion shall be replaced. If any sprinklers fails the representative sample testing required for sprinkler in service for 50 years, all sprinklers within the are represented by the sample will be replaced.

The acceptance criteria for coatings are that no blistering, cracking, erosion cavitation, erosion, flaking, peeling, delamination, rusting or physical damage of the coatings is observed. All coatings not meeting these criteria are considered degraded, removed to sound material and replaced with new coating. Where physically possible, physical testing is performed in conjunction with replacement of coatings. The as-found degraded condition is documented in the corrective action program for trending.

No erosion, corrosion, cavitation erosion, flaking or peeling of the coatings installed on the internals of in-scope fire water components is observed.

Sufficient foreign organic or inorganic material obstructing pipe or sprinklers is removed and its source is determined and corrected.

Corrective Action (Element 7)

Procedures will be enhanced to specify the following corrective action.

Coatings not meeting the acceptance criteria are considered degraded, removed to sound material and replaced with new coating. The as-found degraded condition is documented in the corrective action program for trending.

Operating Experience

A review of the past 12 years of plant operating experience showed no signs of gasket degradation or fire hose degradation due to inspection intervals of 18 months and three years, respectively.

The review of operating experience contained in STP condition reports (CRs) were evaluated for aging effects associated with the Fire Water System program. Of these CRs, 45 were determined to have applicable aging effects associated with the Fire Water System program. The following is a summary of the aging effects reported in these CRs.

Leakage has been discovered coming from supply line piping connections. The associated connections were repaired by replacing the gasket and no further leakage has been observed from these locations. Leakage from fire hydrants has been observed at hydrant barrel connections. The hydrants were evaluated and replaced. Drain valves have leaked by causing corrosion to the associated surface. The valves were replaced and the problem was corrected. Leakage has been observed from the threaded connections to installed relief valves. These connections were repaired and no further leakage has been observed from the threaded connections. Valve packing leakage in supply line valves has caused corrosion of the associated packing follower and retaining bolts. The leakage was corrected and degraded components were evaluated and replaced where required.

While performing the five year inspection of a fire water storage tank it was noted that the base of the tank needed repainted, that a weld located at the top of the tank between the roof and sidewall needed to be repaired and a recirculation line pipe hanger needed to be replaced. The base of the tank was repainted, the weld was repaired and the hanger was replaced. No loss of intended function occurred.

Based on this review of STP operating experience, the Fire Water System program effectively identifies and corrects the fire water system components aging effects prior to the loss of intended function.

Conclusion

The continued implementation of the Fire Water System program provides 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.

B2.1.22 Inspections of Internal Surfaces in Miscellaneous Piping and Ducting Components

Program Description

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program manages cracking, loss of material, and hardening and loss of strength of the internal surfaces of piping, piping components, ducting, tanks, and other components that are not inspected by other aging management programs. The program also manages the coating installed on the inside of the instrument air receiver tanks for loss of coating integrity.

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is a new program that uses the work control process for preventive maintenance and surveillance to conduct and document inspections. The program performs visual inspections to detect aging effects that could result in a loss of component intended function. Visual inspections of internal surfaces of plant components are performed by qualified personnel during periodic maintenance, predictive maintenance, surveillance testing and corrective maintenance. Opportunistic inspections will be supplemented with scheduled inspections if at a minimum in each 10-year period during the period of extended operation 20 percent up to a maximum of 25 components with the same combination of material, environment and aging effect are not opportunistically inspected. Where practical, the locations for these supplemental inspections will be selected from components most susceptible to aging. Opportunistic inspections will continue to be performed when the minimum sample size is reached. This program will be initiated prior to entering the period of extended operation and provides for periodic inspection of a selected set of sample components within the scope of this program.

Visual inspections of flexible polymeric components are performed whenever the component surface is accessible. Visual inspections are augmented by physical manipulation of at least 10 percent of accessible surface area of elastomers within the scope of the program, when appropriate for the component configuration and material, to detect hardening and loss of strength of internal surfaces of elastomers. In cases where internal surfaces are not available for visual inspection, an internal visual inspection may be substituted with a volumetric examination.

The program also includes the following.

Volumetric examination of the tank bottoms of the auxiliary feedwater storage tanks the reactor makeup-water storage tanks and the safety injection refueling water storage tanks from inside the tanks to confirm the absence of loss of material due to corrosion.

Volumetric examination of a minimum of 20 percent of the auxiliary feedwater storage tank sidewalls from inside the tank each 10-year period starting 10 years before entering the period of extended operation.

Volumetric evaluation (ultrasonic examination) to detect stress corrosion cracking of the internal surfaces of stainless steel components exposed to diesel exhaust.

Visual inspections of the floating seals in the reactor makeup water storage tanks. The first inspection is to be accomplished within five years prior to the period of extended operation with follow-up inspections every five years thereafter.

100 percent of the ~~C~~coatings installed on the internals of in-scope components are inspected and tested to assure coating integrity. The coatings are ~~visual~~ inspected every six years, and tested after 12 years of service at a six-year frequency. Replaced coatings are inspected every 4 years until there are three consecutive inspections with no change in the coating condition. Following three consecutive inspections with no change in the coating condition the 6 year inspection interval can be restored.

The coating tests performed are low voltage holiday test per ASTM D5162-08, dry film thickness test per ASTM D7091-13 and Steel Structures Painting Council~~, and~~ (SSPC) PA-2 January 2015, and pull off adhesion test per ASTM D4541-09. Coating inspections and tests are performed by a qualified Nuclear Coating Specialist (NCS) as defined by ASTM D7108 endorsed in RG 1.54.

Monitoring and trending of the coatings are to be based on a pre-inspection review of the previous two inspections results including any subsequent replacement activities. The coatings specialist will prepare a post-inspection report that includes a list and location of all areas of deterioration that were remediated. Where possible, photographic documentation indexed to inspection locations are obtained.

The acceptance criteria for coatings are that no blistering, cracking, erosion, flaking, peeling, delamination, rusting or physical damage of the coatings is observed. Coatings not meeting these criteria are considered degraded, removed to sound material and replaced with new coating. Physical testing where physically possible is performed in conjunction with replacement of coatings. The as-found degraded condition is documented in the corrective action program for trending.

NUREG-1801 Consistency

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is a new program that, when implemented, will be consistent with exception to NUREG-1801, Section XI.M38, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components.

Exceptions to NUREG-1801

Program Elements Affected:

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

NUREG-1801 Section XI.M38 provides for a program of visual inspections of the internal surfaces of miscellaneous steel piping and ducting components to ensure that existing environmental conditions are not causing material degradation that could result in a loss of component intended functions. The exceptions to NUREG-1801, Section XI.M38 are an increase to the scope of the materials inspected to include stainless steel, aluminum, copper alloy, stainless steel-cast austenitic, nickel alloys, glass and elastomers, in addition to steel, and an increase to the scope of aging effects to include hardening and loss of strength for elastomers.

Additionally, visual inspections will be augmented (1) by physical manipulation of at least 10 percent of available surface area of elastomers within the scope of the program to detect hardening and loss of strength of elastomers when appropriate for the component configuration

and material, (2) volumetric examinations of the tank bottoms of the auxiliary feedwater storage tanks the reactor makeup-water storage tanks, and the safety injection refueling water storage tanks from inside the tanks, to confirm the absence of loss of material due to corrosion, and (3) volumetric evaluation to detect stress corrosion cracking of the internal surfaces of stainless steel components exposed to diesel exhaust.

Enhancements

None

Operating Experience

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is a new program; therefore, plant-specific operating experience to verify the effectiveness of the program is not available. However, visual inspections were conducted during periodic maintenance, predictive maintenance, surveillance testing and corrective maintenance. These records provided evidence of STP using maintenance opportunities to conduct internal inspections during normal plant activities. Industry operating experience that forms the basis for this program is included in the operating experience element of the corresponding NUREG-1801 aging management program. A review of plant condition reporting documents, as well as other STP current licensing basis documents, since 1998, was performed to ensure that there is no unique, plant-specific experience in addition to that in NUREG-1801. The review identified no unique operating experience.

Many of the plant condition reporting documents discussed above concerned corrosion found in HVAC systems. The corrective actions for these conditions generally included removal of the corrosion and painting to prevent recurrence.

As additional industry and plant-specific applicable operating experience becomes available, it will be evaluated and incorporated into the program through the STP condition reporting and operating experience programs.

Conclusion

The implementation of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components 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 4

STPNOC Regulatory Commitments

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
4	Enhance the Open-Cycle Cooling Water System program procedures 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. • include the acceptance criteria for this visual inspection, • 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, • require an engineering evaluation after each inspection of the aluminum-bronze piping inserted inside the slip-on flange downstream of the CCW heat exchanger, • 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, • 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), • require loss of material in piping and protective coating failures be documented in the corrective action program, and • require an engineering evaluation be performed when loss of material in piping or protective coating failures is identified. Enhance the Open-Cycle Cooling Water System program procedures to: • ~~visually~~ inspect every six years, and test after 12 years of service at a six year frequency 100 percent of 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 D5162-08, dry film thickness test per ASTM D7091-13 and Steel Structures Painting Council (SSPC) PA-2 January 2015, and pull off adhesion test per ASTM D4541-09,	B2.1.9	Complete no later than six months prior to the period of extended operation Inspections to be complete no later than six months prior to the PEO or the end of the last refueling outage prior to the PEO, whichever occurs later. CR 10-23256 Complete no later than the date the renewed operating license is issued

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
	• require coating inspections and tests be performed by a qualified Nuclear Coating Specialist (NCS) as defined by ASTM D7108 endorsed in RG 1.54 • require monitoring and trending of coatings installed on the internals of in-scope components. • require coatings specialist prepare a post-inspection report that includes a list and location of all areas of deterioration that were remediated. • specify the acceptance criteria for coatings as no blistering, cracking, erosion, cavitation erosion, flaking, peeling delamination, rusting or physical damage of the coatings installed on the internals of in-scope components is observed. • require coatings not meeting these criteria be considered degraded and a condition report be initiated to document and resolve the concern and • require degraded coating be removed to sound material and replaced with new coating; • require physical testing where physically possible be performed in conjunction with repair or replacement of coatings.		
8	Enhance the Fire Water System program procedures to perform periodic inspections, testing, and cleaning on the following: • include volumetric examinations or direct measurement on representative locations of the fire water system to determine pipe wall thickness, • replace sprinklers prior to 50 years in service or field service test a representative sample and test every 10 years thereafter to ensure signs of degradation are detected in a timely manner, and • trending of fire water piping flow parameters recorded during fire water flow tests. • Sprinkler inspections every 18 months per NFPA 25, 2011 Edition Section 5.2.1.1, • 50-year sprinkler replacement or testing per NFPA 25, 2011 Edition Section 5.3.1, • Standpipe and hose systems flow tests every 3 years per NFPA 25, 2011 Edition Section 6.3.1, • Underground and exposed piping flow tests every 3 years per NFPA 25, 2011 Edition Section 7.3.1, • Hydrants flow testing and visually inspection annually per NFPA 25, 2011 Edition Section 7.3.2,	B2.1.13	Complete no later than six months prior to the period of extended operation. Inspections to be complete no later than six months prior to the PEO or the end of the last refueling outage prior to the PEO, whichever occurs later. CR 10-23260

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
	• Fire pumps suction screens cleaning and inspections per NFPA 25, 2011 Edition Section 8.3.3.7, • Fire water storage tank exterior inspections annually per NFPA 25, 2011 Edition Section 9.2.5.5, • Fire water storage tank coated interior surfaces are inspected every 5 years per NFPA 25, 2011 Edition Section 9.2.6. Testing is performed in accordance with NFPA 25, 2011 Edition Section 9.2.7 whenever there is evidence of pitting and corrosion below nominal wall depth or failure of tank coatings. Additionally, bottom thickness ultrasonic tests are done at least once every 10 years. • Main drain testing every 18 months per NFPA 25, 2011 Edition Section 13.2.5, • Deluge Valve testing annually per NFPA 25, 2011 Edition Sections 13.4.3.2.2 through 13.4.3.2.5, • Water Spray Fixed System strainers cleaning and inspections per NFPA 25, 2011 Edition Section 10.2.1.6, 10.2.1.7, 10.2.7, • Spray/sprinkler nozzles full flow test every 18 months per NFPA 25, 2011 Edition Section 10.3.4.3, • Foam water sprinkler systems spray nozzle strainers per NFPA 25, 2011 Edition Section 11.2.7.1, • Foam water sprinkler systems operational test discharge patterns annually per NFPA 25, 2011 Edition Section 11.3.2.6, • Foam water sprinkler systems storage tank visual inspection for internal corrosion once every 10 years, and • Internal surface of piping and branch lines obstruction inspections every 5 years per NFPA 25, 2011 Edition Sections 14.2 and 14.3. Procedures will be enhanced to: • perform follow-up volumetric wall thickness examinations when surface irregularities are detected; • perform either flow testing or flushing sufficient to detect flow blockage or 100 percent visually inspection in each 5-year interval, beginning 5 years prior to the period of extended operation on portions of water-based fire protection		

components that have been wetted but are normally dry or piping segments that cannot be drained or segments that allow water to collect;

- perform volumetric wall thickness inspection are performed on 20 percent of the length of piping segments that cannot be drained or piping segments that allow water to collect in each 5-year interval of the prior to the period of extended operation. The 20 percent of piping inspected in each 5-year interval shall be in different location than previously inspected piping;
- monitor and trend fire water piping flow parameters recorded during fire water flow tests;
- specify the acceptance criteria to be:
  - Minimum design fire water piping wall thickness is maintained.
  - Fouling shall not be observed during inspections of sprinklers and associated piping in the sprinkler system that could cause flow blockage.
  - Sprinklers that show signs of leakage or corrosion shall be replaced. If any sprinklers fails the representative sample testing required for sprinkler in service for 50 years, all sprinklers within the are represented by the sample will be replaced.
  - Sufficient foreign organic or inorganic material obstructing pipe or sprinklers is removed and its source is determined and corrected;
- manage coatings installed on the internals of in-scope fire water components for loss of coating integrity;
- visually inspect the coatings on fire water storage tank every 5 years as outlined by NFPA-25, 2011 Edition;
- ~~visually~~ inspect 100 percent of the coatings installed on the internals of non-tank in-scope fire water components every six years, and tested after 12 years of service at a six-year frequency. Replaced coatings are inspected every 4 years until there are three consecutive inspections with no change in the coating condition. Following three consecutive inspections with no change in the coating condition the 6 year inspection interval can be restored. The coating tests performed are low voltage holiday test per ASTM D5162-08, dry film thickness test per ASTM D7091-13 and Steel Structures Painting Council~~, and~~ (SSPC) PA-2 January 2015, and pull off adhesion test per ASTM D4541-09. Coating inspections and tests are performed by a qualified Nuclear Coating Specialist (NCS) as defined by ASTM D7108 endorsed in RG 1.54;
- monitor and trend coatings installed on the internals of in-scope fire water components;
- require coatings specialist prepare a post-inspection report that includes a list and location of all areas of deterioration that were remediated.

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
	• specify the acceptance criteria for coatings as no blistering, cracking, erosion, cavitation erosion, flaking, peeling , delamination, rusting or physical damage of the coatings installed on the internals of in-scope fire water components is observed; • require coatings not meeting the acceptance criteria be considered degraded and a condition report be initiated to document and resolve the concern and, • require degraded coating be removed to sound material and replaced with new coating; • require physical testing where physically possible in conjunction with repair or replacement of coatings.		