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

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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
Review of the South Texas Project, Units 1 and 2,
License Renewal Application – Set 29 and Set 30 (TAC Nos. ME4936 and ME4937)

References:
1. Letter from G. T. Powell, STP, to NRC Document Control Desk, "License Renewal Application", dated October 25, 2010 (NOC-AE-10002607) (ML103010257)
2. Letter from NRC to STP, "Requests for Additional Information for the Review of the South Texas Project, Units 1 and 2, License Renewal Application – Set 29", dated April 13, 2015 (TAC Nos. ME4936 and ME4937) (ML15083A304)
3. Letter from NRC to STP, "Requests for Additional Information for the Review of the South Texas Project, Units 1 and 2, License Renewal Application – Set 30", dated May 27, 2015 (TAC Nos. ME4936 and ME4937) (ML15131A219)

By Reference 1, STP Nuclear Operating Company (STP) submitted a License Renewal Application (LRA) for South Texas Project Units 1 and 2.

By Reference 2 and Reference 3, the NRC staff requested additional information for their review of the STP LRA. Requested information is related to STP's Aging Management. STP'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.

Regulatory commitment items 4, 8, and 13 in LRA Table A4-1 are revised and depicted as line-in/line-out pages provided in Enclosure 3. This letter does not contain any other regulatory commitments.

A147
NRR

Should you have any questions regarding this letter, please contact either 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 6/11/2015
Date

David W. Rencurrel
Senior Vice President

RJG

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

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Enclosure 1

STPNOC Response to Requests for Additional Information

SOUTH TEXAS PROJECT, UNITS 1 AND 2
REQUEST FOR ADDITIONAL INFORMATION, SET 29
(TAC NOS. ME4936 AND ME4937)

RAI B2.1.13-2, FWS

Background:

As amended by letter dated June 3, 2014, LRA Section B2.1.13 states that the interior of the fire water storage tanks will be inspected every 5 years. This response states that the LRA is revised to inspect the fire water storage tanks "in accordance with NFPA 25, 2011 Edition Sections 9.2.5.5, 9.2.6, and 9.2.7." Neither the LRA nor the UFSAR indicates whether these tanks are coated or not.

Issue:

National Fire Protection Association (NFPA) Section 9.2.6 states that uncoated tank interiors should be inspected every 3 years and coated tank interiors can be inspected every 5 years. It is not clear to the staff whether the fire water storage tanks are internally coated.

Request:

State whether the interior of the fire water storage tanks are coated; and if they are not coated, the basis for why inspecting the tank's interior every 5 years is adequate.

STP Response:

The interior of the fire water storage tank is coated. LRA Appendix A1.13, Appendix B2.1.13, Table A4-1 and LR Basis Documents AMP XI.M27, Fire Water System program are revised to state the fire water storage tank is coated.

Enclosure 2 provides the line-in/out revision to LRA Appendices A1.13 and B2.1.13
Enclosure 3 provides the line-in/out revision to LRA Table A4-1 for Commitment 8

RAI B2.1.13-3, FWS

Background:

As amended by letter dated June 3, 2014, LRA Section B2.1.13 references NFPA 25, 2011 Edition, Sections 9.2.5.5, 9.2.6, and 9.2.7, and states that bottom thickness ultrasonic tests of the fire water storage tanks will be conducted every 10 years. Section D, of the June 3, 2014, letter states that for fire water storage tank steel surfaces exposed to raw water, "[n]ondestructive ultrasonic readings are taken to evaluate the wall thickness where there is evidence of pitting or corrosion." In addition, in relation to steel tank bottom surfaces the LRA states, "[b]ottom thickness ultrasonic tests are performed on each tank during the first 10-year period of extended operation."

Issue:

NFPA 25, Sections 9.2.6.4 and 9.2.7 state that tank bottoms should be tested for metal loss (in conjunction with the internal inspections) whenever there is evidence of pitting, corrosion, or failure of the internal coating. It is not clear to the staff that bottom thickness measurements will be conducted whenever inspections detect pitting, corrosion, or failure of the internal coating of the tank bottom.

Request:

State whether bottom thickness measurements will be conducted whenever inspections detect pitting, corrosion, or failure of the internal coating of the tank bottom.

STP Response

STP will conduct testing in accordance with NFPA 25, 2011 Edition Section 9.2.7 whenever inspections detect pitting and corrosion below nominal wall depth or failure of the tank coatings.

LRA Appendix A1.13, Appendix B2.1.13, Table A4-1 and LR Basis Document AMP XI.M27, Fire Water System program, are revised to state; 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 tank coatings. Additionally, bottom thickness ultrasonic tests are done at least once every 10 years.

Enclosure 2 provides the line-in/out revision to LRA Appendices A1.13 and B2.1.13
Enclosure 3 provides the line-in/out revision to LRA Table A4-1 for Commitment 8

RAI B2.1.13-4, FWS

Background:

As amended by letter dated June 3, 2014, LRA Section B2.1.13 references NFPA 25, 2011 Edition, Section 13.2.5, and states that main drain tests will be conducted every 18 months.

Issue:

NFPA 25, Section 13.2.5 states that main drain tests should be conducted annually. A basis for why conducting main drain tests every 18 months is adequate was not provided.

Request:

State the basis for why conducting main drain tests every 18 months is adequate.

STP Response

Main Drain Testing is an existing activity performed every 18 months. A review of the last 10 years of main drain testing results identified no cases of flow obstructions in the fire system piping. The reviewed tests demonstrate that there are no significant changes in the condition of the piping system that could result in loss of intended function. Based on this review main drain testing performed on 18 months frequency is effective.

RAI B2.1.13-5, FWS

Background:

As amended by letter dated June 3, 2014, LRA Section B2.1.13 states that:

> Procedures will be enhanced to perform coating inspections of the coatings installed on the internals of 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. The coating tests performed are low voltage holiday test per ASTM D5162, dry film thickness test per ASTM D7091 and Steel Structures Painting Council, and (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.

The LRA also states that: (a) coatings will be monitored and trended; (b) the acceptance criteria for coatings will be, "[n]o erosion, corrosion, cavitation erosion, flaking or peeling of the coatings installed on the internals of in-scope fire water components is observed;" and (c) a condition report will be written for coatings that do not meet acceptance criteria. The response to RAI 3.0.3-2:

- Stated that visual inspections are conducted on 100 percent of the internal coated surface.
- Clarified that monitoring and trending will include a pre-inspection review of previous inspection results and the coatings specialist will prepare a post-inspection report that will include the location of all degraded coatings and where possible, photographs indexed to the locations.
- Stated that coatings that do not meet acceptance criteria "are repaired as needed."

Issue:

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," states the following:

a. When visual inspections detect peeling, delamination, blisters, or rusting, subsequent inspections should be conducted in 4 years. A basis for conducting inspections every 6 years regardless of the results of a previous inspection was not provided.
b. The training and qualification of individuals involved in coating inspections is conducted in accordance with an ASTM International standard endorsed in RG 1.54. SRP-LR Table 3.0-1, "FSAR Supplement for Aging Management of Applicable Systems," recommends that the training and qualification requirements for inspection personnel be included in the updated final safety analysis report (UFSAR) supplement. The qualification requirements for Coatings Surveillance Personnel who conduct coating inspections and tests were not provided in either the program or UFSAR Supplement.
c. The post-inspection report should include a prioritization of the repair areas into areas that must be repaired before returning the system to service and areas where repair can be postponed to the next refueling outage. The program does not provide this level of detail for areas requiring repair.
d. In regard to acceptance criteria, blisters are evaluated by a coatings specialist qualified in accordance with an ASTM International standard endorsed in RG 1.54 and are limited to a few intact small blisters that are completely surrounded by sound coating bonded to the substrate and the size and frequency should not be increasing between inspections. The program does not address acceptance criteria for blisters.
e. In regard to acceptance criteria, cracking and rusting are to be evaluated by a coating specialist qualified in accordance with an ASTM International standard endorsed in R G 1.54. The program does not address acceptance criteria for cracking or rusting.
f. Coatings that do not meet acceptance criteria are repaired, replaced, or removed; and testing or examination is conducted to ensure that the extent of repaired or replaced coatings encompasses sound coating/lining material. The response stated that repairs are conducted "as needed." It is not clear to the staff which degraded conditions that do not meet the acceptance criteria will be repaired. In addition, the program does not address followup testing to ensure that the extent of repaired or replaced coatings encompasses sound coating material.

Request:

State:

a. The basis for conducting inspections every 6 years regardless of the results of a previous inspection.
b. The training and qualification requirements for Coatings Surveillance Personnel who conduct coating inspections and revise the appropriate portions of the LRA accordingly.
c. Whether the post-inspection report will include a prioritization of the repair areas into areas that must be repaired before returning the system to service and areas where repair can be postponed to the next refueling outage.
d. The acceptance criteria for blisters.

e. The acceptance criteria for cracking and rusting.
f. Which degraded conditions that do not meet the acceptance criteria will be repaired. Also state what followup testing will be conducted to ensure that the extent of repaired or replaced coatings encompasses sound coating material.

STP Response

a. 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.

b. STP will use qualified Nuclear Coating Specialist (NCS) as defined by ASTM D7108 endorsed in RG 1.54 not Coating Surveillance Personnel to perform coating inspections and tests. LRA Appendix A1.13, Appendix B2.1.13, Table A4-1 and LR Basis Documents AMP XI.M27, Fire Water System are revised to state coating inspections and tests are performed by a qualified Nuclear Coating Specialist (NCS) as defined by ASTM D7108 endorsed in RG 1.54.

c. Coatings not meeting the acceptance criteria are considered degraded, removed to sound material and replaced with new coating. LRA Appendix LRA Appendix B2.1.13, and LR Basis Documents AMP XI.M27, Fire Water System are revised to state monitoring and trending of coatings is based on a pre-inspection review of the previous 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.

d. LRA Appendix B2.1.13, Table A4-1 and LR Basis Documents AMP XI.M27, Fire Water System are revised to state the acceptance criteria for coatings is 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. The as-found degraded condition is documented in the corrective action program for trending.

e. See d above

f. 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. The NCS oversees the replacement of the degraded coatings assuring the extent of repaired or replaced coatings encompasses sound coating material, thus no followup testing is required.

Enclosure 2 provides the line-in/out revision to LRA Appendices A1.13 and B2.1.13.
Enclosure 3 provides the line-in/out revision to LRA Table A4-1 for Commitment 8.

RAI B2.1.13-6, FWS

Background:

LRA Section A1.13, as amended by letter dated June 3, 2014, does not address the following recommendations from SRP-LR Table 3.0-1, as modified by LR-ISG-2012-02 and LR-ISG-2013-01:

- Fouling and flow blockage will be managed by the Fire Water System Program.
- Training and qualification requirements for the Coatings Surveillance Personnel who conduct the coating inspections. This is addressed in RAI B2.1.13-5, above.
- Followup testing requirements of coatings that are repaired.

Issue:

A basis for why these recommendations were not addressed in the licensing basis for the period of extended operation was not provided.

Request:

State the basis on how the UFSAR supplement does not include a statement that fouling and flow blockage will be managed by the Fire Water System Program, the qualifications for the Coatings Surveillance Personnel who conduct the coating inspections, and the followup testing requirements of coatings that are repaired. Please include applicable UFSAR supplement updates also.

STP Response

a) LRA Appendix A1.13, Appendix B2.1.13, and LR Basis Documents AMP XI.M27, Fire Water System program are revised to state that the Fire Water System program manages loss of material, fouling, flow blockage and loss of coating integrity.
b) See response to RAI B2.1.13-5 for qualifications for the Coatings Surveillance Personnel
c) See response to RAI B2.1.13-5 for the follow-up testing requirements of coatings that are repaired.

Enclosure 2 provides the line-in/out revision to LRA Appendices A1.13 and B2.1.13.

RAI B2.1.18-5, Buried Piping

Background:

As amended by letter dated June 26, 2014, the Buried Piping and Tanks Inspection program states that when the cathodic protection system has been installed but fails to meet acceptance criteria (LR ISG-2011-03, Table 4a, Category E under the "preventive action" column) that 5 percent of the associated steel piping, up to a maximum of 10 locations, will be inspected in the 10-year period prior to the period of extended operation. The GALL Report AMP XI.M41, "Buried and Underground Piping and Tanks," as modified by LR-ISG-2011-03, "Changes to the Generic Aging Lessons Learned (GALL) Report Revision 2 Aging Management Program (AMP) XI.M41, 'Buried and Underground Piping and Tanks'," Table 4a, "Inspection of Buried Pipe," states that up to a maximum of 7 inspections should be conducted at a single unit plant for inspection Category E. Element 4.b.vi. of LR-ISG-2011-03 states that for two-unit sites the number of inspections should be increased by 50 percent.

The Buried Piping and Tanks Inspection program also states that in order to conduct inspections in accordance with Category E that the soil will have been demonstrated (e.g., sample locations, periodicity of sampling, evaluation method) to be non-corrosive for the material type. Footnote 7 of Table 4a in LR-ISG-2011-03 provides recommendations related to demonstrating that the soil is not corrosive.

Issue:

a. The inspection criteria in the LRA AMP and LR-ISG-2011-03 are not consistent. The Buried Piping and Tanks Inspection program states that when the cathodic protection system fails to meet acceptance criteria that up to a maximum of 10 inspection locations will be inspected in the 10-year period prior to the period of extended operation. LR-ISG-2011-03 recommends that a two unit plant inspect up to 11 locations.
b. The program does not state how the soil will be demonstrated to be non-corrosive. LRA Section B2.1.18, as amended by letter dated June 26, 2014, does not state that the program will be consistent with GALL Report AMP XI.M41 and therefore the staff lacks sufficient information to understand how the soil will be demonstrated to be noncorrosive. In addition, SRP-LR Table 3.0-1, "FSAR Supplement for Aging Management of Applicable Systems," as modified by LR-ISG-2011-03, recommends that soil sampling be included in the FSAR Supplement when soil corrosivity is used to modify the number of inspections.

Request:

a. State the basis for why a maximum of 10 inspections will be conducted instead of 11.
b. State how the soil will be demonstrated to be non-corrosive and how soil sampling will be controlled in the current licensing basis.

STP Response

a. The maximum Category E inspection in years 30 to 40 should be 11 not 10. LRA Appendix B2.1.18, Table A4-1 and LR Basis Documents AMP XI.M34, Buried Piping and Tanks Inspection program, are revised to state;
Category E inspections are used when the cathodic protection system has been installed but portions of the piping covered by that system fail to meet the acceptance criteria. Category E inspections are 5 percent, NTE 11 inspections, in years 30 to 40; 6 percent, NTE 15 inspections, in years 40 to 50; and 7.5 percent, NTE 18 inspections, in years 50 to 60.
b. STP performs soil testing during excavations of buried piping as part of the existing Underground Piping and Tank Program. The goal of the Underground Piping and Tank Program is to maintain the effectiveness of the cathodic protection system. Category E inspections will only be used if portions of the installed cathodic protection system fail to meet the acceptance criteria. Where Category E inspections are used, STP will demonstrate that soil is not corrosive using the following.
    - A minimum of three sets of soil samples will be obtained in the vicinity where the cathodic protection system fails to meet the acceptance criteria.
    - The soil will be tested for soil resistivity, corrosion accelerating bacteria, pH, moisture, chlorides, sulfates, and redox potential.
    - The potential soil corrosivity will be determined for each material type of buried in-scope piping in the vicinity of the failed cathodic protection system. In addition to evaluating each individual parameter, the overall soil corrosivity will be determined.
    - If portions of the installed cathodic protection system fail to meet the acceptance criteria, soil testing will be conducted at a minimum of once in each 10-year period starting at the time when it was determined that the cathodic protection system failed to meet the acceptance.

    LRA Appendix A1.18 is revised to state that where the cathodic protection system fails 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.

    LRA Appendix B2.1.18, Table A4-1 and LR Basis Documents AMP XI.M34, Buried Piping and Tanks Inspection program, are revised to state If Category E inspections are used, STP will demonstrate that soil is not corrosive using the following.
    - A minimum of three sets of soil samples will be obtained in the vicinity where the cathodic protection system fails to meet the acceptance criteria.
    - The soil will be tested for soil resistivity, corrosion accelerating bacteria, pH, moisture, chlorides, sulfates, and redox potential.
    - The potential soil corrosivity will be determined for each material type of buried in-scope piping in the vicinity where the cathodic protection system fails to meet the acceptance criteria. In addition to evaluating each individual parameter, the overall soil corrosivity will be determined.

- If portions of the piping covered by that installed cathodic protection system fail to meet the acceptance criteria, soil testing will be conducted at a minimum of once in each 10-year period starting at the time when it was determined that the cathodic protection system failed to meet the acceptance.

Enclosure 2 provides the line-in/out revision to LRA Appendices B2.1.18.
Enclosure 3 provides the line-in/out revision to LRA Table A4-1 Commitment 13.

RAI B.2.1.22-6, Volumetric Inspections of Tanks

Background:

Gall Report AMP XI.M29, "Aboveground Metallic Tanks," as revised by LR-ISG-2012-02, states that verification of the effectiveness of the AMP is performed to ensure that degradation is not occurring in inaccessible locations, such as exterior portions of the tanks in contact with concrete. Table 4a, "Tank Inspection Recommendations," in LR-ISG-2012-02 recommends that volumetric inspections be conducted on the external surfaces of tank bottoms and shells exposed to concrete to manage the aging effect of loss of material.
By letter dated June 3, 2014, the Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Components AMP was amended in response to LR-ISG-2012-02. The amended AMP states that volumetric examination will be performed on tanks within the scope of license renewal to confirm that bottoms that are in contact with concrete are not degrading. It also states that the outdoor stainless steel auxiliary feedwater storage tank is completely enclosed in concrete and not exposed to the outdoor environment. Section D of Enclosure 1 in this letter includes an excerpt of LRA Table 3.4.2-6. The excerpt of this table contains partial line items for the stainless steel auxiliary feedwater storage tank side walls and bottom. The aging effect, AMP, and inspections are different for the stainless steel tank side walls and bottom exposed to concrete.

Issue:

It is unclear to the staff how the AMP ensures that degradation is not occurring in inaccessible locations of the auxiliary feedwater storage tank, specifically the external surfaces of the tank shell. The aging effect for the stainless steel tank side walls (shell) exposed to concrete is stated as "none" in Enclosure 1. However, the aging effect for the stainless steel tank bottom exposed to concrete is loss of material and managed using volumetric examinations.

Request:

State the basis for ensuring that degradation is not occurring in the exterior surfaces of the side walls of the auxiliary feedwater storage tank.

STP Response

Volumetric examination of the auxiliary feedwater storage tank sidewalls from inside the tank will be performed during the volumetric examination of the tank bottom. LRA Appendix A1.22, Appendix B2.1.22 and LRA Basis Document XI.M38 (B2.1.22), Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components are revised to perform a volumetric examination on 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. The aging effect for the AMR line in LRA Table 3.4.2-6 that states the aging effect for the stainless steel tank sidewalls exposed to concrete is "None" is revised to "Loss of material". The "Loss of material" aging effect will be managed using AMP Inspection of Internal Surfaces in Miscellaneous Piping and Ducting (B2.1.22).

Enclosure 2 provides the line-in/out revision to LRA Appendices A1.22 and B2.1.22 and LRA Table 3.4.2-6.

RAI B.2.1.22-7, Aboveground Metallic Tanks' AMR Items

This RAI has been dropped since the associated information was found to be already submitted on the docket (ADAMS Accession Nos. ML11319A026, ML12069A024, and ML11172A096).

RAI 3.0.3-1a, Followup on Recurring Internal Corrosion, Part A (STP)

Background:

By letter dated June 3, 2014, STPNOC provided its responses to the aging management recommendations in NRC Interim Staff Guidance LR-ISG-2012-02, "Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation." This update of the LRA identifies that recurring internal corrosion (i.e., recurring loss of material) has occurred in specific carbon steel, ductile iron, and cast iron components of the fire protection systems that are exposed to a raw water environment. The response also states that recurring internal corrosion of these components will be managed by the Fire Water System Program (LRA AMP B2.1.13).

Issue:

The response is not clear in identifying the specific mechanism or mechanisms that induced the recurring loss of material in these components. Without this information, the staff cannot verify that the Fire Water System Program is a valid AMP to use for management of loss of material that is recurring in these fire protection system components. For example, the Fire Water System Program may not be the appropriate AMP to use for recurring internal corrosion (loss of material) that is induced by a selective leaching mechanism.

Request:

For those fire protection system components that are made from each of the indicated materials and have had recurring instances of corrosion, identify the specific type(s) of aging mechanism or mechanisms that lead to loss of material in the components. Justify why the Fire Water System AMP is considered to be capable of detecting and managing the recurring loss of material in these fire protection system component materials, as induced by the applicable aging mechanism or mechanisms.

1. Carbon steel
2. Cast iron
3. Ductile iron

In addition, please clarify whether recurring internal corrosion occurs in the FWS only in those portions that are characterized as "normally dry, periodically wetted, and not easily drained," as opposed to potentially also occurring in other components which do not fall into that category.

STP Response

The operating experience (OE) review for internal recurring corrosion used OE from 2014 to 1998. A review of this OE for the fire water system components determined that recurring internal corrosion occurred in cast iron and carbon steel components that are characterized as normally dry, periodically wetted, and not easily drained. Six occurrences of internal corrosion in normally dry components occurred during the period between 2003 and 1998. There were no occurrences of internal corrosion in normally dry components during the 10-year period between 2014 and 2004.

The OE review did not find recurring internal corrosion, as defined in LR-ISG-2012-002, occurring in the fire water system wetted components. The review determined that there were two occurrences of internal corrosion during the period between 2003 and 1998 in components that are characterized as wetted and one occurrence in the period between 2014 and 2004.

The aging mechanism found in the OE review is loss of material due to general, pitting and crevice corrosion (recurring internal corrosion). There are no ductile iron components subject to recurring internal corrosion.

The Fire Water System AMP is considered capable of detecting and managing the recurring loss of material due to general, pitting and crevice corrosion because the Fire Water System AMP B2.1.13 was revised, see STPNOC Letter date June 3, 2014, to require augmented inspections and testing beyond those that are identified in LR-ISG-2012-02 Appendix D table 4a. Augmented inspections and testing will be 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. Additionally, Augmented volumetric wall thickness inspections will be 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 will be in different location than previously inspected piping.

RAI 3.0.3-1b, Followup on Corrosion Under Insulation, Part E

This RAI has been deleted as agreed to in the conference call for Set 29 (call number 2) dated February 25, 2015 (ADAMS Accession No. ML15035A280).

RAI Set 30

RAI 3.0.3-2a, 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"

Background

The staff reviewed the response to RAI 3.0.3-2 (loss of coating integrity), dated June 3, 2014, as it relates to 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," and needs clarification on some parts of the response. Specifically, the response states the following:

a. Inspection intervals: visual inspections are conducted every 6 years, testing is conducted every 6 years after 12 years of service, and the EW pumps are inspected at a nominal frequency of every 10 years. [The staff notes that the acronym "EW" is not defined in the LRA or RAI response; since it is used as a system acronym for the essential cooling water system in the drawings submitted by the applicant (e.g., LR-STP-EW-5R289F05038#1-1 in LRA Section 2.3.3.4), the staff understands this to refer to that system]

b. The Nuclear Coatings Specialist is qualified in accordance with ASTM D7108.

c. Coatings are inspected for blistering, cracking, peeling, delamination physical damage and erosion.

d. The acceptance criterion is the absence of indications of erosion, corrosion, cavitation erosion, flaking or peeling of the coatings is observed. Coatings that do not meet acceptance criteria are considered degraded and a condition report is initiated to document and resolve the concern. Coatings that do not meet acceptance criteria are repaired "as needed."

LR-ISG-2013-01 was issued on November 14, 2014.

Issue

a. LR-ISG-2013-01 recommends a baseline inspection in the 10-year period prior to the period of extended operation. In addition, it recommends that inspections be conducted every 4 years if degraded coatings are detected during prior inspections. The response did not state the basis for conducting inspections every 6 years regardless of the results of prior inspections or the basis for inspecting the EW pumps every 10 years.

b. LR-ISG-2013-01 recommends that inspection personnel be qualified in accordance with ASTM standards endorsed in Regulatory Guide 1.54. The response does not state the minimum qualification requirements of inspectors working under the direction of a Nuclear Coatings Specialist.

c. The response did not provide a basis for not inspecting for flaking and rusting.

d. LR-ISG-2013-01 recommends that indications of peeling and delamination are not acceptable. It also recommends that the other indications of degradation be evaluated by a Nuclear Coatings Specialist.

   It further recommends that coatings that do not meet acceptance criteria are repaired, replaced, or removed. Based on the RAI response statements that: (a) indications of erosion, corrosion, cavitation erosion, flaking or peeling are not acceptable; (b) coatings that do not meet acceptance criteria are documented with a condition report; and (c) coatings that do not meet acceptance criteria are repaired "as needed," it is unclear to the staff what conditions of degraded coatings will result in repair, replacement, or removal.

Request

a. State the basis for not conducting a baseline inspection in the 10-year period prior to the period of extended operation and for the subsequent 6-year and 10-year inspection intervals.

b. State the minimum qualification requirements for inspectors working under the direction of a Nuclear Coatings Specialist.

c. State the basis for not inspecting for flaking and rusting.

d. State what indications of coating degradation will be found unacceptable and those that will be evaluated by a Nuclear Coatings Specialist for acceptability. State what indications of coating degradation will be repaired, replaced, or removed prior to returning a component to service.

Please include any appropriate changes to the applicable aging management programs and UFSAR Supplement based upon the responses to the above requests.

STP Response

a. Coating inspections are currently performed and LR commitments require coating inspection be performed in the 10-year period prior to the period of extended operation. The following summarizes each program coatings commitment.

   - The B2.1.9 Open-Cycle Cooling Water System, LRA Table A4-1 commitment 4 commits to perform coating inspections beginning the date the renewed operating license is issued. Except for the EW pump internals, current coatings are visual inspected every six years, and tested after 12 years of service at a six-year frequency. The basis for the inspection intervals is in accordance with Table 4A of ISG-LR-ISG-2013-01. The current program inspects the EW pump internals and discharge piping

reducer during the nominal 10-year refurbishment periodicity. Since inspections are presently being performed, these inspections satisfy the requirement for baseline visual inspections conducted in the 10 years prior to the period of extended operation.

- B2.1.13 Fire Water System, LRA Table A4-1 commitment 8 commits to having inspections completed no later than six months prior to the PEO or the end of the last refueling outage prior to the PEO, whichever occurs later.
- B2.1.22 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components, Table A4-1 commitment 17 commits to having inspections completed no later than six months prior to the PEO or the end of the last refueling outage prior to the PEO, whichever occurs later.

b. STP will use qualified Nuclear Coating Specialist (NCS) as defined by ASTM D7108 endorsed in RG 1.54 not Coating Surveillance Personnel to perform coating inspections and test. LRA Appendices A1.9, A1.22 B2.1.9, B2.1.22, Table A4-1 and LR Basis Documents AMP XI.M20, Open Cycle Cooling Water System program and AMP XI.M38, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program, are revised to state coating inspections and tests are performed by a qualified Nuclear Coating Specialist (NCS) as defined by ASTM D7108 endorsed in RG 1.54.

c. Coatings will be inspected for flaking and rusting. LRA Appendices A1.9, A1.22 B2.1.9, B2.1.22 and LR Basis Documents AMP XI.M20, Open Cycle Cooling Water System program and AMP XI.M38, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program, are revised to state the acceptance criteria for coatings is that 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. The as-found degraded condition is documented in the corrective action program for trending.

d. When visual inspections detect any blistering, cracking, erosion, cavitation erosion, flaking, peeling, delamination, rusting and physical damage the coating is considered degraded. Degraded coatings are removed to sound material and replaced with new coating. The as-found degraded condition is documented in the corrective action program for trending. The NCS oversees the replacement of the degraded coatings assuring the extent of repaired or replaced coatings encompasses sound coating material. 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.

Enclosure 2 provides the line-in/out revision to LRA Appendices A1.9, A1.22, B2.1.9 and B2.1.22.
Enclosure 3 provides the line-in/out revision to LRA Table A4-1 for Commitment 4.

Enclosure 2

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

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) as defined by ASTM D7108 endorsed in RG 1.54 ~~or by Coatings Surveillance Personnel under the technical direction of the NCS~~. Monitoring and trending of coatings is based on a pre-inspection review of the previous inspections results including any subsequent ~~repairs~~ replacement activities.

A1.13 FIRE WATER SYSTEM

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 interior visual inspections every 5 years per NFPA 25, 2011 Edition Section 9.2.6 and 9.2.7, and bottom thickness ultrasonic tests every 10 years~~
- 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.

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. Coating inspections and tests will be performed by a qualified Nuclear Coating Specialist (NCS) as defined by ASTM D7108 endorsed in RG 1.54 ~~or by Coatings Surveillance Personnel under the technical direction of the NCS~~. Monitoring and trending of coatings is based on a pre-inspection review of the previous inspections results including any subsequent replacement ~~repairs~~ 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.

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 MISCELLANEOUS 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.

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 each 10-year period stating 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.

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.

The coating tests performed are low voltage holiday test, dry film thickness test and pull off adhesion test. Coating inspections and tests will be performed by a qualified Nuclear Coating Specialist (NCS) as defined by ASTM D7108 endorsed in RG 1.54 ~~or by Coatings Surveillance Personnel under the technical direction of the NCS~~. Monitoring and trending of the coatings are to be based on a pre-inspection review of the previous inspections results including any subsequent replacement ~~repairs~~ 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.

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 endorsed in RG 1.54 ~~or by Coatings Surveillance Personnel (CSP) under the technical direction of the NCS~~.

Monitoring and trending of coatings is based on a pre-inspection review of the previous two inspections results including any subsequent repairs 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 be obtained.

The acceptance criteria for coatings are that no blistering, cracking, erosion, corrosion, cavitation erosion, flaking, or 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. and The as-found degraded condition is documented in the corrective action program for trending. a condition report is initiated to document and resolve the concern.

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,) 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. 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, and (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 endorsed in RG 1.54 ~~or by Coatings Surveillance Personnel (CSP) under the technical direction of the NCS~~.

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, ~~corrosion,~~ cavitation erosion, flaking, ~~or~~ 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. 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 interior visual inspections every 5 years per NFPA 25, 2011 Edition Section 9.2.6 and 9.2.7, and bottom thickness ultrasonic tests every 10 years~~
- 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.

Coatings installed on the internals of 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 per ASTM D5162, dry film thickness test per ASTM D7091 and Steel Structures Painting Council, and (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 endorsed in RG 1.54 ~~or by Coatings Surveillance Personnel (CSP) under the technical direction of the NCS~~.

Monitoring and trending of coatings is based on a pre-inspection review of the previous two inspections results including any subsequent ~~repairs~~ 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 ~~be~~ obtained.

The acceptance criteria for coatings are that no blistering, cracking, erosion, ~~corrosion,~~ cavitation erosion, flaking, ~~or~~ 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. ~~and~~ The as-found degraded condition is documented in the corrective action program for trending ~~a condition report is initiated to document and resolve the concern~~.

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. STP performs power block hose station gasket inspections at least once every 18 months, rather than annually as specified by NFPA-25. 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.

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 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 interior visual inspections every 5 years per NFPA 25, 2011 Edition Section 9.2.6 and 9.2.7, and bottom thickness ultrasonic tests every 10 years~~
- 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 of the coatings installed on the internals of 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. The coating tests performed are low voltage holiday test per ASTM D5162, dry film thickness test per ASTM D7091 and Steel Structures Painting Council, and (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 endorsed in RG 1.54 ~~or by Coatings Surveillance Personnel (CSP) under the technical direction of the NCS~~.

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 enhances 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. 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. ~~and~~ The as-found degraded condition is documented in the corrective action program for trending. ~~a condition report is initiated to document and resolve the concern.~~

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.

B2.1.18 Buried Piping and Tanks Inspection

Program Description

The Buried Piping and Tanks Inspection program manages the loss of material on external surfaces of buried and underground components.

The Buried Piping and Tanks Inspection program includes inspections or flow testing of buried steel, stainless steel, copper alloy piping, underground steel, stainless steel piping within the Auxiliary Feedwater System, the Lighting Diesel Generator System, the Essential Cooling Water (ECW) and ECW Screen Wash System, the Fire Protection System, and the Oily Waste System (OW).

Preventive and mitigative actions are taken to ensure the pipe is coated, backfilled and cathodically protected. The buried steel and copper alloy piping managed by this program is cathodically protected. The cathodic protection system is designed in accordance with NACE RP-01-69 1972. The performance of the cathodic protection system is consistent with the guidelines of NACE SP0169-2007. An annual survey ensures that the pipe-to-soil potential is acceptable.

Cathodic protection is operational (available) at least 85 percent of the time from either 10 years prior to the period of extended operation or from installation or refurbishment, whichever is shorter. Cathodic protection is 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, whichever is shorter.

Opportunistic and directed visual inspections monitor the condition of the external surfaces, backfill, protective coatings and wrappings of steel, and copper alloy buried components. Inspection locations are selected based on susceptibility to degradation and consequences of failure. A minimum of 10 feet of pipe of each material type is inspected. The inspections consist of a 100 percent visual inspection of the exposed pipe.

Category C inspections are used when the external cathodic protection system for buried steel or copper alloy pipe meets the acceptance criteria. Category C inspections are 0.5 percent Not-to-Exceed (NTE) two inspections of that piping per inspection period.

Category E inspections are used when the cathodic protection system has been installed but portions of the piping covered by that system fail to meet the acceptance criteria. Category E inspections are 5 percent, NTE ~~10~~ 11 inspections, in years 30 to 40; 6 percent, NTE 15 inspections, in years 40 to 50; and 7.5 percent, NTE 18 inspections, in years 50 to 60. Where Category E inspections are used, STP will demonstrate that soil is not corrosive using the following.

- A minimum of three sets of soil samples will be obtained in the vicinity where the cathodic protection system fails to meet the acceptance criteria.
- The soil will be tested for soil resistivity, corrosion accelerating bacteria, pH, moisture, chlorides, sulfates, and redox potential.
- The potential soil corrosivity will be determined for each material type of buried in-scope piping in the vicinity of the failed cathodic protection system. In addition to evaluating each individual parameter, the overall soil corrosivity will be determined.

- If portions of the installed cathodic protection system fail to meet the acceptance criteria, soil testing will be conducted at a minimum of once in each 10-year period starting at the time when it was determined that the cathodic protection system failed to meet the acceptance.

The Auxiliary Feedwater system has stainless steel pipe underground in a vault outside of the Auxiliary Feedwater Storage tank. This stainless steel pipe will undergo two directed visual inspections each 10-year inspection period.

The OW system has steel pipe underground in sumps located in the yard. This underground pipe will undergo 2% NTE 4 directed visual inspection each 10-year inspection period.

In lieu of visual inspections of the fire protection system, STP credits flow testing of the fire mains as described in Section 7.3 of NFPA 25, 2011 Edition.

Inspections will begin during the 10-year period prior to entering the period of extended operation. Upon entering the period of extended operation, inspections will occur every 10 years.

Visual inspections of metallic components are supplemented with surface or volumetric nondestructive testing (NDT) if significant indications are observed to determine local area wall thickness. If adverse indications are detected, inspection sample sizes within the affected piping categories are doubled. If adverse indications are found in the expanded sample, further increases in inspection sample size is based on an analysis of extent of cause and extent of condition.

Hydrostatic test of 25 percent of the subject piping on an interval is not to exceed 5 years, or 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.

There are no components fabricated with polymeric, cementitious, or concrete materials within the scope of license renewal that credit this program for aging management. . There are no buried or underground tanks within the scope of license renewal.

Any evidence of aging effects, such as loss of material, or changes in material properties, requires initiation of corrective actions.

Aging management of the internal surfaces of buried and underground piping is accomplished through the use of the Open-Cycle Cooling Water System program (B2.1.9), Closed-Cycle Cooling Water System program (B2.1.10), Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.22), Fuel Oil Chemistry program (B2.1.14), Fire Water System program (B2.1.13) and Water Chemistry program (B2.1.2). Selective leaching of buried or underground components is managed by the Selective Leaching of Materials program (B2.1.17) or the Selective Leaching of Aluminum Bronze program (B2.1.37).

NUREG-1801 Consistency

The Buried Piping and Tanks Inspection program is an existing program that, following enhancement, will be consistent with exception to NUREG-1801, Section XI.M41, Buried and Underground Piping and Tanks.

Exceptions to NUREG-1801

Preventive Actions (Element 2)

Section XI.M41 Table 2a of NUREG-1801 Revision 2, requires the backfill to be consistent with NACE SP0169 Section 5.2.3. NACE SP0169 Section 5.2.3.5 states that pipe should be lowered carefully into the ditch to avoid external coating damage. The original installation specification does not include this practice. However the subgrade of the trench was prepared by removing all debris and unsuitable material, and the subgrade consists of fine clay and sand that makes up the natural soil or backfill. The backfill used is consistent with the ASTM D 448-08 size 67 standard. The subgrade preparation, and small grain size backfill used in the original installation, which provide soft bedding for piping set into the trench, are not expected to have damaged the coating of the piping. Plant procedures will be enhanced to ensure that the piping is lowered carefully into a trench to avoid damage to the external coatings.

Section XI.M41 Table 2a of NUREG-1801 Revision 2, requires that backfill be consistent with NACE SP0169 Section 5.2.3. NACE SP0169 Section 5.2.3.6 states that care should be taken during backfilling so that rocks and debris do not strike and damage the pipe coating. The original installation specification for backfilling piping does not include this practice, with the exception of the ECW piping. However a fine grain size backfill was used that met the ASTM D 448-08 size 67 standard. The use of this backfill during backfilling is not expected to damage the pipe coating. Plant procedures will be enhanced so that, during backfill repair or replacement, care is taken to avoid damage to pipe coatings while backfilling the trench.

Section XI.M41 Table 2a of NUREG-1801 Revision 2, requires coating of pipe in accordance with NACE SP0169-2007, Table 1. Table 1 recommends that coal tar coatings are in accordance with AWWA C-203, and that prefabricated films are in accordance with AWWA C-214 or C-209. These standards were not referenced in STP installation specifications. However, the coatings were applied in accordance with plant-defined specifications. Plant specifications are consistent with the intent of the AWWA coating standards called out in NACE SP 0169-2007. Installation specifications ensure that any defects in the coatings were repaired prior to backfilling over the pipe.

Enhancements

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

Preventive Actions (Element 2)

Plant specifications will be enhanced to include the following:

- Indicate that pipe should be lowered carefully into the ditch to avoid external coating damage.

- Proper storage and handling must be used to prevent damage to pipe coating prior to installation. These practices include padded storage, use of proper slings for installation and ultraviolet light-resistant topcoats.

- Over-excavate trenches and use qualified backfill for bedding piping. Take care during backfilling to prevent rocks and debris from striking and damaging the pipe coating.

- Include the coating used for copper alloy buried piping in the coating database. The coating system must be in accordance with NACE SP0169-2007, Table 1, and will be used for repair or for new coatings of the buried copper alloy piping in the essential cooling water system.

- Indicate that the portion of the essential cooling water system copper alloy piping directly embedded in backfill or directly encased in concrete must be coated, extending the coating 2 feet or more above grade.

Plant procedures will be enhanced to include the following:

- Backfill that is located within 6 inches of the pipe that is consistent with ASTM D 448-08 size number 67 is considered acceptable. Backfill quality is determined through examination during the inspections conducted by this program. Backfill that does not meet the ASTM criteria during the initial and subsequent inspections of this program is considered acceptable if the inspections of buried piping do not reveal evidence of mechanical damage to the pipe coatings due to the backfill.

- The cathodic protection system engineer is responsible for ensuring the cathodic protection system survey is performed annually, and the rectifier current is checked and recorded every 2 months.

- Monitor cathodic protection system rectifier output every 2 months. The measured current at each rectifier is recorded and compared against a target value. Following completion of the plant yard cathodic protection system annual survey, record the current of the rectifier used to achieve an acceptable pipe/soil potential. That current will be the target current for the rectifier. If the current measured at the rectifier during the bimonthly monitoring deviates significantly from the target value, a condition report should be created. The rectifier current should be adjusted to an acceptable value. The results of the survey will be documented and trended to identify degrading conditions. When degraded rectifier performance is identified, corrective actions are required to be initiated. The system should not be operated outside of established acceptable limits for longer than 90 days.

- During the plant yard cathodic protection system annual survey, evaluate the effectiveness of isolating fittings, continuity bonds and casing isolation. This may be accomplished through electrical measurements (NACE SP016-2007, Section 10.4.4).

- The personnel performing the plant yard cathodic protection system annual survey must be NACE-certified, certified by a site-approved training procedure consistent with the NACE requirements, or supervised by a NACE-certified inspector.

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

- Plant procedures will be enhanced to indicate that piping in this program is inspected using visual inspections and, if significant indications of degradation are observed, the visual inspections are supplemented by surface and/or volumetric non-destructive testing.

Detection of Aging Effects (Element 4)

Plant procedures will be enhanced to include the following:

- The inspections of this program are conducted every 10 years, beginning in the 10 year interval prior to the beginning of the period of extended operation.
- Buried and underground piping inspection locations are to be selected based on risk, considering susceptibility to degradation and consequences of failure.
- The risk ranking for buried piping should consider characteristics such as coating type, coating condition, cathodic protection efficiency, backfill characteristics, soil resistivity, pipe contents, and pipe function.
- The risk ranking for underground piping should consider characteristics such as coating type, coating condition, exact external environment, pipe contents, pipe function, and flow characteristics within the pipe.
- The risk ranking should generally give piping systems that are backfilled using compacted aggregate a higher inspection priority than comparable systems that are completely backfilled using controlled low strength material.
- External Corrosion Direct Assessment, as described in NACE Standard Practice SP0502-2010, is recommended for use in identifying inspection locations. It has been demonstrated to be an effective method for identification of pipe locations that merit further inspection.
- Opportunistic examinations of non-leaking pipes may be credited toward the required examinations, if they meet the risk-ranking selection criteria.
- Guided wave ultrasonic techniques or other advanced inspection techniques should be used, if practical, for determining piping locations that should be inspected. However, these inspections may not be used as substitutes for inspections required by this program.
- An inspection of piping shared between Units 1 and 2 may be credited toward the required inspections. Inspection quantities are increased by 50 percent as STP has two units.
- Any piping, valves, or closure bolting exposed during inspections should be examined. Examine bolting for loss of material and loose or missing fasteners.
- There are two alternatives to directed inspections of the buried or underground piping that is within the scope of license renewal. The first alternative is a hydrostatic test of 25 percent of the subject piping to 110 percent of the design pressure of any component within the boundary with test pressure being held for

eight hours on an interval not to exceed 5 years. The second is an internal inspection of 25 percent of the subject piping by a method capable of accurately determining pipe wall thickness. The inspection must also include methods capable of detecting both general and pitting corrosion, and must be qualified by the plant, and approved by the NRC. UT examinations can be considered approved by the NRC. Guided wave inspection does not currently satisfy these inspection technique requirements. Internal inspections are to be conducted every 10 years beginning 10 years prior to the period of extended operation.

- In lieu of visual inspection of the fire protection system, this program relies on flow testing of the fire mains as described in Section 7.3 of NFPA 25, 2011 Edition to detect degradation of the buried pipe.

- Each inspection will examine either the entire length of a run of pipe, or a minimum of 10 feet. If the entire run of pipe of that material type is less than 10 feet in total length, then the entire run of pipe should be inspected. The inspection consists of a 100 percent visual inspection of the exposed pipe.

- Category C inspections are used when the external cathodic protection system for buried steel or copper alloy pipe meets the acceptance criteria. Category C inspections are 0.5 percent Not-to-Exceed (NTE) two inspections of that piping per inspection period are performed.

- Category E inspections are used when the cathodic protection system has been installed but the portions of the piping covered by that system fail to meet the acceptance criteria. Category E inspections are 5 percent, NTE ~~10~~ 11 inspections, in years 30 to 40; 6 percent, NTE 15 inspections, in years 40 to 50; and 7.5 percent, NTE 18 inspections, in years 50 to 60. The following condition must be present.

  a) Coatings and backfill are provided in accordance with STP backfill specification.

  b) There have been no leaks in buried piping due to external corrosion and no significant coating degradation or metal loss in more than 10 percent of inspections conducted.

  c) Soil has been demonstrated to be not corrosive for the material type.

- Where Category E inspections are used, STP will demonstrate that soil is not corrosive using the following.
  - A minimum of three sets of soil samples will be obtained in the vicinity where the cathodic protection system fails to meet the acceptance criteria.
  - The soil will be tested for soil resistivity, corrosion accelerating bacteria, pH, moisture, chlorides, sulfates, and redox potential.
  - The potential soil corrosivity will be determined for each material type of buried in-scope piping in the vicinity of the failed cathodic protection system. In addition to evaluating each individual parameter, the overall soil corrosivity will be determined.
  - If portions of the installed cathodic protection system fail to meet the acceptance criteria, soil testing will be conducted at a minimum of once in

each 10-year period starting at the time when it was determined that the cathodic protection system failed to meet the acceptance.

- The inspection scope for piping that does not meet Category C or E inspection schedule requirements is 10 percent, NTE 23 inspections, in years 30 to 40; 12 percent, NTE 30 inspections, in years 40 to 50; and 15 percent, NTE 38 inspections, in years 50 to 60.
- The AF system underground stainless steel piping located in a vault will undergo two inspections each 10-year inspection period.
- The OW system underground piping will undergo 2% NTE 4 inspection each 10-year inspection period.
- Cathodic protection shall be operational (available) at least 85 percent of the time since either 10 years prior to the period of extended operation or since installation or refurbishment, whichever is shorter.
- Cathodic protection shall provide effective protection for buried piping at least 80 percent of the time since either 10 years prior to the period of extended operation or since installation or refurbishment, whichever is shorter.
- As found results of annual surveys are to be used to demonstrate locations within the plant's population of buried pipe where cathodic protection acceptance criteria have, or have not, been met.
- Indicate that adverse indications discovered during the monitoring of the cathodic protection system may warrant increased monitoring of the cathodic protection system and/or additional inspections.
- Include examples of adverse indications discovered during piping inspections including leaks, material thickness less than minimum, and general or local degradation of coatings that exposes the base material. The presence of coarse backfill within 6 inches of a coated pipe or tank, with accompanying coating degradation, is considered an adverse condition.
- Adverse indications that fail to meet the acceptance criteria described in this program require corrective actions for the repair or replacement of the affected component.
- If adverse indications are detected inspection sample sizes within the affected piping categories are doubled. If adverse indications are found in the expanded sample, an analysis is conducted to determine the extent of condition and extent of cause. The size of the follow-on inspections will be determined based on the extent of condition and extent of cause. The timing of the additional examinations should be based on the severity of the degradation identified and should be commensurate with the consequences of a leak or loss of function, but in all cases, the expanded sample inspections should be completed within the 10-year interval in which the original adverse condition was identified. Expansion of the sample size may be limited by the extent of piping subject to the observed degradation mechanism. If adverse conditions are extensive, inspections may be halted in an area of concern that is planned for replacement, provided continued operation does not pose a significant hazard.

- During the inspection of buried piping, observe for brittle failure at flanges, connections, and joints due to frost heaving, soil stresses, or ground water effects.

Monitoring and Trending (Element 5)

Plant procedures will be enhanced to include the following

- Direct the cathodic protection system engineer to trend results of the plant yard cathodic protection system annual surveys, so that changes in the effectiveness of the cathodic protection system and coating of buried piping can be verified.
- Where wall thickness measurements are conducted, the results should be trended if follow-up examinations are conducted.

Acceptance Criteria (Element 6)

Plant procedures will be enhanced to include the following:

- The cathodic protection system pipe-to-soil potential when using a saturated copper/copper sulfate reference electrode must be between -850 mV instant off and -1200 mV. 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.
- For coated piping, there should be no evidence of coating degradation. If coating degradation is present, it may be considered acceptable if it is determined to be insignificant by an individual possessing a NACE Coating Inspector Program Level 2 or 3 inspector qualification, or an individual has attended the Electric Power Research Institute (EPRI) Comprehensive Coatings Course and completed the EPRI Buried Pipe Condition Assessment and Repair Training Computer Based Training Course.
- Where damage to the coating has been evaluated as significant and the damage was caused by non-conforming backfill, an extent of condition evaluation should be conducted to ensure that the as-left condition of backfill in the vicinity of observed damage will not lead to further degradation.
- Backfill is acceptable if it is consistent with SP0169-2007 Section 5.2.3. Backfill that is located within 6 inches of steel pipe that meets ASTM D 448-08 size number 67 is consistent with the objectives of SP0169-2007.
- For any hydrostatic tests credited by this program, the condition acceptance criteria is no visible indications of leakage and no drop in pressure within the isolated portion of the piping that is not accounted for by a temperature change in the test media or quantified leakage across test boundary valves

Operating Experience

A 10-year review of plant operating experience shows 30 events which were associated with buried piping. Nine of these events were related to systems or components in scope of license renewal. All of these events were leaks shown to not be a result of corrosion of

materials, making them not relevant to this program. The program includes availability, reliability, maintainability, and capacity measurement analyses, published in bi-annual Health Reports. The events described in the Health Reports are all attributed to causes other than corrosion due to contact with an aggressive environment (most leaks were associated with mechanical joints).

The need to enhance the STP Buried Piping program was initially identified by INPO as an area for improvement. Since that time, involvement with the industry has identified areas for program enhancement. Enhancement of the program is ongoing, utilizing guidance from NEI 09-14 Revision 1, Guideline for the Management of Buried Piping Integrity, and industry operating experience.

The following industry operating experience was reviewed to identify aging effects applicable to STP.

In February 2005, a leak was detected in a 4-inch condensate storage supply line. The cause of the leak was microbiologically influenced corrosion (MIC) or under deposit corrosion. MIC and under deposit corrosion are typically internal corrosion, and managed by the Water Chemistry program (B2.1.2) and verified with the One-Time Inspection program (B2.1.16).

In September 2005, a service water leak was discovered in a buried service water header. The header had been in service for 38 years. The cause of the leak was either failure of the external coating or damage caused by improper backfill. STP has a very fine grain of the natural soil, and the installation specifications for backfilling require a backfill that is consistent with ASTM D-448 08 size number 67. Considering this, there is a low probability that pipe coatings have sustained damage due to backfill. The cathodic protection system is operated in accordance with NACE SP0169 and will assure that the piping has a low probability of corrosion, even in the event of coating degradation or failure.

In October 2007, degradation of essential service water piping was reported. The riser pipe leak was caused by a loss of pipe wall thickness due to external corrosion induced by the wet environment surrounding the unprotected carbon steel pipe. This degradation is not expected at STP, as all steel and copper alloy piping managed by this program are coated and cathodically protected.

In February 2009, a leak was discovered on the return line to the condensate storage tank. The cause of the leak was coating degradation, probably due to the installation specification not containing restrictions on the type of backfill, allowing rocks in the backfill. STP has a very fine grain of the natural soil, and the installation specifications for backfilling require a backfill that is consistent with ASTM D-448 08 size number 67. Considering this, there is a low probability hat pipe coatings have sustained damage due to backfill. Plant specifications will be enhanced to prevent rocks and debris from striking the pipe coatings during the backfill of piping. The cathodic protection system is operated in accordance with NACE SP0169 and will assure that the piping has a low probability of corrosion, even in the event of coating degradation or failure.

In April 2009, a leak was discovered in an aluminum pipe where it went through a concrete wall. This leak is not relevant to STP, as the plant has no buried aluminum piping that requires management by this program.

In June 2009, an active leak was discovered in buried piping associated with the condensate storage tank. The leak was discovered because elevated levels of tritium were detected. The cause of the through-wall leak was determined to be degradation of the protective moisture barrier wrap, which allowed moisture to come in contact with the piping, resulting in external corrosion. STP inspected pipe coatings during installation, and verified an acceptable condition of wrap as it was installed. The cathodic protection system is operated in accordance with NACE SP0169 and will assure that the piping has a low probability of corrosion, even in the event of coating degradation or failure. The inspection of high risk piping by this program can be used to verify that this degradation is unlikely at STP.

The Buried Piping and Tanks Inspection program requires review of plant and industry operating experiences for impacts to the program. This program ensures long-term strategies to address Buried Piping and Tank Inspection are developed and implemented.

Conclusion

The continued implementation of the Buried Piping and Tanks Inspection program provides reasonable assurance that aging effects are 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 Inspection 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 each 10-year period stating 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 (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.

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. The coating tests performed are low voltage holiday test per ASTM D5162, dry film thickness test per ASTM D7091 and Steel Structures Painting Council, and (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 endorsed in RG 1.54 ~~or by Coatings Surveillance Personnel (CSP) under the technical direction of the NCS~~.

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 ~~repairs~~ 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 ~~be~~ obtained.

The acceptance criteria for coatings are that no blistering, cracking, erosion, ~~corrosion,~~ flaking, ~~or~~ 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. ~~and~~ The as-found degraded condition is documented in the corrective action program for trending~~a condition report is initiated to document and resolve the concern~~.

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.

Table 3.4.2-6 Steam and Power Conversion System – Summary of Aging Management Evaluation – Auxiliary Feedwater System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tank	PB	Stainless Steel	Concrete (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	None	None	G, 5
Tank	PB	Stainless Steel	Encased in Concrete (Ext)	~~None~~ Loss of material	~~None~~ Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	~~VIII.I-11~~ None	~~3.4.1.43~~ None	~~C~~ G, 8
Tank	PB	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.G-32	3.4.1.16	C

Plant Specific Notes:

8 A visual inspection of the external surface of the tank sidewalls encased in concrete cannot be performed. A volumetric examination from the inside of the tank is performed in lieu of an external inspection.

Enclosure 3

STPNOC Regulatory Commitments with Line-in/Line-out Annotations

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 the coating applied on the essential chiller water box	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

Item #	Commitment	LRA Section	Implementation Schedule
	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, • require coating inspections and tests be performed by a qualified Nuclear Coating Specialist (NCS) as defined by ASTM D7108 endorsed in RG 1.54 or by Coatings Surveillance Personnel (CSP) under the technical direction of the NCS. • 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, corrosion, cavitation erosion, flaking, or 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.		license is issued
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.	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

Item #	Commitment	LRA Section	Implementation Schedule
	• 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 interior visual inspections every 5 years per NFPA 25, 2011 Edition Section 9.2.6 and 9.2.7 and bottom thickness ultrasonic tests every 10 years,~~ • 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 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 Section 11.3.2.6,		prior to the PEO, whichever occurs later. CR 10-23260

Item #	Commitment	LRA Section	Implementation Schedule

	• 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 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 coatings installed on the internals of in-scope fire water		

Item #	Commitment	LRA Section	Implementation Schedule
	components 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, and (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 endorsed in RG 1.54 ~~or by Coatings Surveillance Personnel (CSP) under the technical direction of the NCS~~; • 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. • specify the acceptance criteria for coatings as no blistering, cracking erosion, ~~corrosion,~~ cavitation erosion, flaking, ~~or~~ peeling, delamination, rusting or physical damage of the coatings installed on the internals of in-scope fire water components is observed; ~~and~~ • 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.		
13	Enhance plant specifications to: • Lower coated piping carefully into a trench to avoid external coating damage. • Use proper storage and handling practices to prevent damage to pipe coating prior to installation. These practices include padded storage, use of proper slings for installation and ultraviolet light resistant topcoats. • Over excavate trenches and use qualified backfill for bedding piping. Take care during backfilling to prevent rocks and debris from striking and damaging the pipe coating. • Include the coating used for copper alloy buried piping in the coating database. The coating system must be in accordance with NACE SP0169-2007, and will be used for repair or for new coatings of the buried copper alloy piping in the essential cooling water system. • Coat the portion of the essential cooling water system copper alloy piping directly embedded in backfill or directly encased in concrete, extending the coating 2 feet or more above grade.	B2.1.18	Start implementation during the 10 years 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

Item #	Commitment	LRA Section	Implementation Schedule
	Enhance the Buried Piping and Tanks Inspection program procedures to: • Consider backfill located within 6 inches of the pipe, and consistent with ASTM D 448-08 size number 67, acceptable. Backfill quality is determined through examination during the inspections conducted by the program. Backfill that does not meet the ASTM criteria, during the initial and subsequent inspections of the program, is considered acceptable if the inspections of buried piping do not reveal evidence of mechanical damage to the pipe coatings due to the backfill. • Ensure the cathodic protection system survey is performed annually. • Monitor the output of the cathodic protection system rectifiers every 2 months. The measured current at each rectifier is recorded and compared against a target value. Following the completion of the plant yard cathodic protection system annual survey, record the current of the rectifier used to achieve an acceptable pipe/soil potential. That current will be the target current for the rectifier until the next annual survey. If the current measured at the rectifier during the bimonthly monitoring deviates significantly from the target value, a condition report should be created. The rectifier current should be adjusted to an acceptable value. The results of the survey will be documented and trended to identify degrading conditions. When degraded rectifier performance is identified, documentation is required in accordance with the corrective action program. The system should not be operated outside of established acceptable limits for longer than 90 days. • Recommend increased monitoring of the cathodic protection system and/or additional inspections if adverse indications are discovered during the monitoring of the cathodic protection system. • Evaluate the effectiveness of isolating fittings, continuity bonds and casing isolation, during the plant yard cathodic protection system annual survey. This may be accomplished through electrical measurements. • The personnel performing the plant yard cathodic protection system annual survey must be NACE-certified, certified by a site-approved training procedure consistent with the NACE requirements, or supervised by a NACE-certified inspector. • Visually inspect buried piping and, if significant indications of degradation are observed, the visual inspections are supplemented by surface and/or volumetric non-destructive testing.		prior to the PEO, whichever occurs later. CR 10-23268

Item #	Commitment	LRA Section	Implementation Schedule
	• Define the inspection interval for the program directed inspections as every 10 years, beginning the 10 year interval prior to the period of extended operation. • Select the buried and underground piping inspection locations based on risk, considering susceptibility to degradation and consequences of failure. • The risk ranking for underground piping should consider characteristics such as coating type, coating condition, exact external environment, pipe contents, pipe function, and flow characteristics within the pipe. • The risk ranking should generally give piping systems that are backfilled using compacted aggregate a higher inspection priority than comparable systems that are completely backfilled using controlled low strength material. • External Corrosion Direct Assessment, as described in NACE Standard Practice SP0502-2010, will be considered for use in identifying inspection locations. • Credit opportunistic examinations of non-leaking pipes toward required examinations, only if they meet the risk ranking selection criteria. • Guided wave ultrasonic, or other advanced inspection techniques should be used, if practical, for the purpose of determining piping locations that should be inspected. These inspections may not be used as substitutes for inspections required by the program. • Credit an inspection of piping shared between Units 1 and 2 toward the required inspections. • Examine any piping, valves and closure bolting exposed during inspections. • Examine bolting for loss of material and loose or missing fasteners. • Include two alternatives to directed inspections of the buried or underground piping that is safety-related, hazmat or both. The first alternative is to hydrostatically test 25 percent of the subject piping to 110 percent of the design pressure of any component within the boundary with test pressure being held for eight hours on an interval not to exceed 5 years. The second is an internal inspection of 25 percent of the subject piping by a method capable of accurately determining pipe wall thickness on an interval of every 10 years. • Flow testing of the fire mains, as described in NFPA 25, to detect degradation of the buried pipe in lieu of visual inspections of the fire protection system buried and underground piping. • Specify that each inspection will examine either the entire length of a run of pipe, or a minimum of 10 feet. If the entire run of pipe of that material type is less than 10 feet in		

Item #	Commitment	LRA Section	Implementation Schedule

	total length, then the entire run of pipe should be inspected. The inspection consists of a 100 percent visual inspection of the exposed pipe.
	• Specify that Category C inspections be used when the external cathodic protection system for buried steel or copper alloy pipe meets the acceptance criteria. Category C inspections are 0.5 percent Not-to-Exceed (NTE) two inspections of that piping per inspection period performed.
	• Specify that Category E inspections be used when the cathodic protection system has been installed but the portions of the piping covered by that system fail to meet the acceptance criteria. Category E inspections are 5 percent, NTE 10 11 inspections, in years 30 to 40; 6 percent, NTE 15 inspections, in years 40 to 50; and 7.5 percent, NTE 18 inspections, in years 50 to 60. The following condition must be present.
	  o Coatings and backfill are provided in accordance with STP backfill specification.
	  o There have been no leaks in buried piping due to external corrosion and no significant coating degradation or metal loss in more than 10 percent of inspections conducted.
	  o Soil has been demonstrated to be not corrosive for the material type using the following.
	    ▪ A minimum of three sets of soil samples will be obtained in the vicinity where the cathodic protection system fails to meet the acceptance criteria.
	    ▪ The soil will be tested for soil resistivity, corrosion accelerating bacteria, pH, moisture, chlorides, sulfates, and redox potential.
	    ▪ The potential soil corrosivity will be determined for each material type of buried in-scope piping in the vicinity of the failed cathodic protection system. In addition to evaluating each individual parameter, the overall soil corrosivity will be determined.
	    ▪ If portions of the installed cathodic protection system fail to meet the acceptance criteria, soil testing will be conducted at a minimum of once in each 10-year period starting at the time when it was determined that the cathodic protection system failed to meet the acceptance.
	• Specify that inspection scope for piping that does not meet Category C or E inspection schedule requirements is 10 percent, NTE 23 inspections, in years 30 to 40; 12 percent, NTE 30 inspections, in years 40 to 50; and 15 percent, NTE 38 inspections, in years 50 to 60.		

Item #	Commitment	LRA Section	Implementation Schedule
	• Specify that the AF system underground stainless steel piping located in a vault will undergo two inspections each 10-year inspection period. • Specify that the OW system underground piping will undergo 2% NTE 4 inspection each 10-year inspection period. • Include acceptance criteria for the cathodic protection to be operational (available) at least 85 percent of the time since either 10 years prior to the period of extended operation or since installation or refurbishment, whichever is shorter. • Include acceptance criteria for the cathodic protection system to provide protection for buried piping at least 80 percent of the time since either 10 years prior to the period of extended operation or since installation or refurbishment, whichever is shorter. • Include examples of adverse indications discovered during piping inspections. • Repair or replacement of the affected component when adverse indications failing to meet the acceptance criteria described in the program are discovered. • Double inspection sample sizes within the affected piping categories, when adverse indications are detected during inspection of piping. If adverse indications are found in the expanded sample, an analysis is conducted to determine the extent of condition and extent of cause. The size of the follow-on inspections will be determined based on the extent of condition and extent of cause. The timing of the additional examinations should be based on the severity of the degradation identified and should be commensurate with the consequences of a leak or loss of function, but in all cases, the expanded sample inspections should be completed within the 10-year interval in which the original adverse condition was identified.. If adverse conditions are extensive, inspections may be halted in an area of concern that is planned for replacement, provided continued operation does not pose a significant hazard. Expansion of sample size may be limited to the piping subject to the observed degradation mechanism. • Observe for brittle failure at flanges, connections, and joints due to frost heaving, soil stresses, or ground water effects during inspection of buried piping. • Require trending cathodic protection system annual surveys results. • Where wall thickness measurements are conducted, the results should be trended if follow-up examinations are conducted. • Specify that the cathodic protection system pipe-to-soil potential when using a saturated copper/copper sulfate reference electrode must be between -850 mV instant off and -1200 mV. • Indicate that for coated piping, there should be no evidence of coating degradation. If		

Item #	Commitment	LRA Section	Implementation Schedule
	coating degradation is present, it may be considered acceptable if it is determined to be insignificant by an individual possessing a NACE Coating Inspector Program Level 2 or 3 inspector qualification, or an individual has attended the Electric Power Research Institute (EPRI) Comprehensive Coatings Course and completed the EPRI Buried Pipe Condition Assessment and Repair Training Computer Based Training • Specify where damage to the coating has been evaluated as significant and the damage was caused by non-conforming backfill, an extent of condition evaluation should be conducted to ensure that the as-left condition of backfill in the vicinity of observed damage will not lead to further degradation. • Specify that backfill is acceptable if it is consistent with SP0169-2007 Section 5.2.3. Backfill that is located within 6 inches of steel pipe that meets ASTM D 448-08 size number 67 is consistent with the objectives of SP0169-2007. • Indicate that for any hydrostatic tests credited by the program, the condition acceptance criteria is no visible indications of leakage and no drop in pressure within the isolated portion of the piping that is not accounted for by a temperature change in the test media or quantified leakage across test boundary valves.		