Nuclear Operating Company

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

May 19, 2016
NOC-AE-16003380
10 CFR 54
File No. G25

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

South Texas Project
Units 1 and 2
Docket Nos. STN 50-498, STN 50-499
Request for Additional Information Set 35 for the
Review of the South Texas Project, Units 1 and 2,
License Renewal Application (TAC Nos. ME4936 and ME4937)

References:

1. Letter; G. T. Powell to USNRC Document Control Desk; "License Renewal Application;" NOC-AE-10002607; dated October 25, 2010 (ML103010257)
2. Letter; G. T. Powell to USNRC Document Control Desk; "Response to Requests for Additional Information for the Review of the South Texas Project, Units 1 and 2, License Renewal Application – Set 27," NOC-AE-14003141; dated June 3, 2014 (ML14163A020)
3. Letter; G. T. Powell to USNRC Document Control Desk; "2014 Annual Update to the South Texas Project License Renewal Application;" NOC-AE-14003180; dated October 22, 2014 (ML14308A073)
4. Letter from NRC, Lois James to STP G.T. Powell; "Request for Additional Information Set 35 for the Review of the South Texas Project License Renewal Application," dated April 22, 2016 (ML16104A352)

By Reference 1, STP Nuclear Operating Company (STPNOC) submitted a License Renewal Application (LRA). By Reference 2, STPNOC provided a response to questions related to LR-ISG-2012-02, "Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation. By Reference 3, Table 3.3.2-19 referenced notes were updated. By Reference 4, Request for Additional Information (RAI) requested further clarification of STPNOC's management regarding reduced thermal insulation resistance due to moisture intrusion for jacketed fiberglass insulation. STPNOC's response to RAI Set 35 is provided in Enclosure 1, and changes to LRA pages are depicted as line-in/line-out pages provided in Enclosure 2.

Regulatory commitment item 13 in LRA Table A4-1 has been revised as provided in Enclosure 3. There are no other commitments in this letter.

A147
NRR

STI: 34317752

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

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

Executed on May 19, 2016
Date

James W. Connolly
Site Vice President

rjg

Enclosures:

1. STPNOC's response to RAI Set 35
2. STPNOC LRA Changes with Line-in/Line-out Annotations
3. STPNOC Revision of Regulatory Commitment Item 13

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Enclosure 1

STPNOC's response to the RAI Set 35

RAI 3.0.3-1c

Background:

By letter dated October 22, 2014, license renewal application (LRA) Table 3.3.2-19, "Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System," states that fiberglass insulation exposed to plant indoor air (external) has no aging effect requiring management (AERM) and no aging management program (AMP). In addition, the line item cites a plant specific note 5, but there is no description of the note. By letter dated June 3, 2014, the same line item entry in LRA Table 3.3.2-19 states that the AERM is reduced thermal insulation resistance due to moisture intrusion and the AMP is the External Surface Monitoring Program.

Issue:

LR-ISG-2012-02, "Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation," Table 3.3-1, item 3.3.1-64 recommends that reduced thermal insulation resistance due to moisture intrusion for jacketed fiberglass insulation be managed by Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components." No basis was provided for not being consistent with line item 3.3.1-64. In addition, the description of the plant-specific note 5 is not clear to the staff.

Request:

1. State the basis for not citing reduced thermal insulation resistance due to moisture intrusion for jacketed fiberglass insulation.
2. Provide a description of the plant-specific note 5 listed in Table 3.3.2-19.

STPNOC Response:

1. LRA Table 3.3.2-19 is updated to include the aging effect of reduced thermal insulation resistance due to moisture intrusion for fiberglass insulation.

   Enclosure 2 provides the line-in/line-out revision to LRA Table 3.3.2-19.

2. Description of plant specific note 5 listed in Table 3.3.2-19 was previously updated per correspondence NOC-AE-15003236, dated March 24, 2015 (ML15097A013) to reflect the correct Appendix C Item VIII.I.S-403. See enclosure 2 for the current LRA Table 3.3.2-19.

RAI B2.1.18-6

Background:

On February 4, 2016, the staff issued the final version of LR-ISG-2015-01, "Changes to Buried and Underground Piping and Tank Recommendations." The ISG replaces aging management program (AMP) XI.M41, "Buried and Underground Piping and Tanks," and the associated Updated Final Safety Analysis Report (UFSAR) Summary Description issued in 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'."
As amended by letter dated June 26, 2014, LRA Section B2.1.18, "Buried Piping and Tanks Inspection Program," and LRA Section A1.18 (associated UFSAR Summary Description) were revised to address the changes to AMP XI.M41 and the UFSAR Summary Description in LR-ISG-2011-03.

Issue:

The existing Buried Piping and Tanks Inspection Program and associated UFSAR Summary Description have not been evaluated against the changes to AMP XI.M41 and the UFSAR Summary Description issued in LR-ISG-2015-01.

Request:

Compare the existing Buried Piping and Tanks Inspection Program to AMP XI.M41 and the associated UFSAR Summary Description issued in LR-ISG-2015-01. State any changes to LRA Sections B2.1.18 and Section A1.18 necessary to be consistent with LR-ISG-2015-01. As necessary, state and justify exception(s) to recommendations that will not be incorporated into the existing Buried Piping and Tanks Inspection Program.

STPNOC Response:

LRA Appendix A1.18, Appendix B2.1.18, Table A4-1 and LR Basis Document AMP XI.M34, Buried Piping and Tanks Inspection, are updated to the requirements of LR-ISG-2015-01. The following is a summary of the gap analysis performed. All applicable LR-ISG-2012-01 recommendations are incorporated into the LR Basis Document AMP XI.M34, Buried Piping and Tanks Inspection. The following provides a summary of the LR-ISG-2015-01 changes with regards to the changes made in the LR Basis Document.

LR-ISG-2015-01 Change	Basis Document (AMP) Disposition
Scope of Program (Element 1) added; scope to include buried and underground piping and tanks constructed of any material, including metallic, polymeric, and cementitious materials and includes aging effects such as loss of material, cracking, and changes in material properties (for cementitious piping only).	There are no buried polymeric or cementitious components within scope of license renewal at STP.

LR-ISG-2015-01 Change	Basis Document (AMP) Disposition
Scope of Program (Element 1) added; The program also manages loss of material due to corrosion of piping system bolting within scope of this program.	The existing LR Basis Document AMP XI.M34 manages loss of material and loose or missing fasteners.
Preventive Actions (Element 2 a.) added; a. For buried stainless steel or cementitious piping or tanks, coatings are provided based on the environmental conditions.	The AMP is revised to state; Soil samples have shown that the uncoated stainless buried piping is not subject to environments that contains chloride. There are no buried cementitious components within scope of license renewal at STP.
Preventive Actions (Element 2 b.) added; b. For buried steel, copper alloy, and aluminum alloy piping and tanks, and underground steel and copper alloy piping and tanks, coatings are in accordance with Table 1 of NACE SP0169-2007 or Section 3.4 of NACE RP0285-2002.	Copper alloy and steel piping within the scope of license renewal at STP is coated. STP does not have any aluminum alloy piping and there are no buried tanks within the scope of license renewal.
Preventive Actions (Element 2 c.) added; c. The system monitoring interval discussed in Section 10.3 of NACE SP0169-2007 may not be extended beyond one year.	LR Appendix A1.18 states; An annual cathodic protection survey is performed consistent with NACE SP0169-2007.
Preventive Actions (Element 2 e.i.) added; e.i. To prevent damage to the coating, the limiting critical potential should not be more negative than 1200 mV.	The AMP is revised to state use of excessive cathodic protection polarized potential on coated piping should be avoided. The limiting critical potential should not be more negative than 1200 mV relative to a copper/copper sulfate reference electrode (CSE).
Parameters Monitored or Inspected (Element 3 b.ii,, 3.b.ii., 3.b.iii., 3.b.iv.) added; b. Visual inspections of buried or underground piping or tanks, or their coatings, are performed to monitor for; ii. loss of material due to wear for polymeric materials. iii. Cracking, spalling, and corrosion or exposure of rebar for asbestos cement pipe, and concrete pipe. iv. Cracking, blistering, change in color due to water absorption for high-density polyethylene (HDPE) and fiberglass components.	There are no buried polymeric or cementitious components within scope of license renewal at STP.

LR-ISG-2015-01 Change	Basis Document (AMP) Disposition
Parameters Monitored or Inspected (Element 3 d.) added; d. Inspections for cracking utilize a method that has been demonstrated to be capable of detecting cracking. Intact coatings do not have to be removed to inspect for potential cracking.	The AMP does not include any components with cracking as an aging effect. The AMP is revised to state "Soil samples have shown that the uncoated stainless buried piping is not subject to environments that contains chloride." There are no buried aluminum alloy within scope of license renewal at STP
Detection of Aging Effects (Element 4) added; For multi-unit sites the inspections are distributed evenly among the units	The AMP is revised to require inspections be distributed evenly among the units.
Detection of Aging Effects (Element 4 Table XI.M41-2) revised; Preventive Action Category C to require the smaller of 0.5% of the piping length or 1 inspection.	The existing AMP states; Category C inspections are 0.5 percent Not-to-Exceed (NTE) two inspections of that piping per inspection period.
Detection of Aging Effects (Element 4 Table XI.M41-2) revised; Preventive Action Category E to require the smaller of 5% of the piping length or 3 inspections.	The AMP is revised to require 5 percent NTE 5 inspections.
Detection of Aging Effects (Element 4 Table XI.M41-2 note E. a.) added; a. An analysis, conducted in accordance with the "preventive actions" program element of this AMP, has demonstrated that installation or operation of a cathodic protection system is impractical; or	The existing AMP states where Category E inspections are used, STP will demonstrate that soil is not corrosive using the following. STP is committed to providing cathodic protection that meets the acceptance criteria. See STP's response to RAI B2.1.18-5 in letter dated June 11, 2015 (ML15175A198).
Detection of Aging Effects (Element 4 Table XI.M41-2) revised; Preventive Action Category F of the program to require the smaller of 10% of the piping length or 6 inspections.	The AMP is revised to state inspection scope for piping that does not meet Category C or E inspection schedule requirements is 10 percent, NTE 9 inspections.

LR-ISG-2015-01 Change	Basis Document (AMP) Disposition
Detection of Aging Effects (Element 4 a.) added; Transitioning to a higher number of inspections	The AMP is revised to state if a transition from Category C to Category E or from Category E to Category F occurs in the latter half of the current 10-year interval, the timing of the additional examinations is based on the severity of the degradation identified and is commensurate with the consequences of a leak or loss of function. In all cases, the examinations are completed within 4 years after the end of the particular 10-year interval. These additional inspections conducted in an inspection interval cannot be credited towards the base number of inspections required for the 10-year interval.
Detection of Aging Effects (Element 4 b.i.) added; Where piping constructed of steel, copper alloy, or aluminum alloy has been coated with the same coating system and the backfill has the same requirements, the total inspections for this piping may be combined to satisfy the recommended inspection quantity.	The AMP is revised to state where steel or copper alloy piping has been coated with the same coating system and the backfill has the same requirements, the total inspections for this piping may be combined to satisfy the recommended inspection quantity. For example, for Category F, 10 percent of the total of the associated steel or copper alloy is inspected; or 9 10-foot segments of steel or copper alloy piping are inspected.
Detection of Aging Effects (Element 4 b.ii.) added; For buried piping, inspections may be reduced to one-half the number of inspections indicated in Table XI.M41-2 when performance of the indicated inspections necessitates excavation of piping that has been fully backfilled using controlled low strength material.	STP does not use controlled low strength material for backfill of the buried piping.
Acceptance Criteria (Element 6 f.) added; Backfill is acceptable if the inspections do not reveal evidence that the backfill caused damage to the component's coatings or the surface of the component (if not coated).	The AMP is revised to state backfill is acceptable if the inspections do not reveal evidence that the backfill caused damage to the component's coatings or the surface of the component.
Acceptance Criteria (Element 6 Table XI.M41-3) revised the cathodic protection acceptance criteria; Steel: -850 mV relative to a CSE, instant off Copper alloy: 100 mV minimum polarization	The AMP is revised to state the cathodic protection system pipe-to-soil potential when using a saturated copper/copper sulfate reference electrode must be between at least -850 mV instant off for steel piping. 100 mV minimum polarization is required for copper alloy piping.
Acceptance Criteria (Element 6 m.) added; Alternatives to the -850 mV criterion for steel piping.	The AMP is revised to allow the use of alternative acceptance criteria for steel piping.

LR-ISG-2015-01 Change	Basis Document (AMP) Disposition
Corrective Actions (Element 7 a.) added; Where damage to the coating has been evaluated as significant and the damage was caused by non-conforming backfill, an extent of condition evaluation is conducted to ensure that the as-left condition of backfill in the vicinity of the observed damage will not lead to further degradation.	The AMP is revised to state 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.
Corrective Actions (Element 7 b.) added; If coated or uncoated metallic piping or tanks show evidence of corrosion, the remaining wall thickness in the affected area is determined to ensure that the minimum wall thickness is maintained.	The AMP is revised to state if coated or uncoated metallic piping show evidence of corrosion, the remaining wall thickness in the affected area is determined to ensure that the minimum wall thickness is maintained.
Corrective Actions (Element 7 c.) added; Where the coatings, backfill, or the condition of exposed piping does not meet acceptance criteria, the degraded condition is repaired or the affected component is replaced. In addition, an expansion of sample size is conducted. The number of inspections within the affected piping categories are doubled or increased by 5, whichever is smaller	The AMP is revised to state where the coatings, backfill, or the condition of exposed piping does not meet acceptance criteria, the degraded condition is repaired or the affected component is replaced. The number of inspections within the affected piping categories is doubled or increased by 5, whichever is smaller.

Enclosure 2 provides the line-in/line-out revision to LRA Appendix A1.18 and Appendix B2.1.18.

Enclosure 3 provides the line-in/line-out revision to LRA Table A4-1.

Enclosure 2

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

Affected LRA Section
Table 3.3.2-19
Appendix A1.18
Appendix B2.1.18

Table 3.3.2-19 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Insulation	INS	Aluminum	Plant Indoor Air (Ext)	None	None	V.F-2	3.2.1.50	C
Insulation	INS	Insulation Calcium Silicate	Plant Indoor Air (Ext)	Reduced thermal insulation resistance due to moisture intrusion	External Surfaces Monitoring Program (B2.1.20)	None	None	H, 5
Insulation	INS	Insulation Fiberglass	Plant Indoor Air (Ext)	~~None~~ Reduced thermal insulation resistance due to moisture intrusion	~~None~~ External Surfaces Monitoring Program (B2.1.20)	None	None	H, 5
Orifice	PB, TH	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J-16	3.3.1.99	A

Notes for Table 3.3.2-19:
Standard Notes:

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

Plant Specific Notes:

1 NUREG-1801 does not address the aging effect of nickel-alloys in borated water leakage. Nickel-alloys subject to an air with borated water leakage environment are similar to stainless steel in a borated water leakage environment and do not experience aging effects due to borated water leakage.

2 The Water Chemistry program (B2.1.2) and the One-Time Inspection program (B2.1.16) manage loss of material due to pitting and crevice corrosion and cracking due to stress corrosion cracking. The One-Time Inspection program (B2.1.16) includes selected components at susceptible locations.

3 Non-inhibited copper alloy > 15% zinc SSCs with surfaces exposed to ventilation atmosphere (internal) or plant indoor air (internal) are subject to wetting due to condensation and thus are subject to loss of material due to selective leaching.

4 The reduction of heat transfer aging effect is not identified in NUREG-1801 for this component, material, and environment combination. Reduction of heat transfer is not expected in heat exchangers with reactor coolant or treated borated water environments as long as water chemistry is maintained. Reduction of heat transfer is managed with Water Chemistry (B2.1.2) and One Time Inspection (B2.1.16).

5 The aging effect of reduced thermal insulation resistance due to moisture intrusion is managed by AMP B2.1.20, External Surfaces Monitoring Program. Reference LR-ISG-2012-02 Appendix C Item VIII.I.S-403.

6 The External Surfaces Monitoring program (B2.1.20) is used to monitor insulated stainless steel components exposed to plant indoor air for loss of material. Reference LR-ISG-2012-02 Appendix C Line VII.A2.A-405

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, whichever is shorter. An annual cathodic protection survey is performed consistent with NACE SP0169-2007. If the cathodic protection system fails to meet the acceptance criteria of -850 mV relative to copper/copper sulfate reference electrode (CSE) instant off for steel components alternatives of -750 mV or -650 mV may be used, means to verify the effectiveness of the protection are used, loss of material rates are measured and soil testing will be conducted at a minimum of once in each 10-year period starting 10 years prior to the period of extended operation. The acceptance criterion for copper components is 100 mV minimum polarization.

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. Inspections are conducted by qualified individuals.

Where coatings, backfill, or the condition of exposed piping that does not meet acceptance criteria, the degraded condition is repaired or the affected component is replaced. In addition, an expansion of sample size is conducted.

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.

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 piping 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. If the cathodic protection system fails to meet the acceptance criteria of at least -850 mV relative to a CSE instant off for steel components the following alternatives may be used.

- 100 mV minimum polarization
- -750 mV relative to a CSE, instant off where soil resistivity is greater than 10,000 ohm-cm to less than 100,000 ohm-cm
- -650 mV relative to a CSE, instant off where soil resistivity is greater than 100,000 ohm-cm
- Verify less than 1 mil/year (mpy) loss of material.

Means to verify the effectiveness of the protection of the most anodic metal when alternatives are used are incorporated into the program. The external loss of material rate is verified by:

- Every year when verifying the effectiveness of the cathodic protection system by measuring the loss of material rate.
- Every 2 years when using the 100 mV minimum polarization.
- Every 5 years when using the -750 mV or -650 mV criteria associated with higher resistivity soils. The soil resistivity is verified every 5 years.

When electrical resistance corrosion rate probes are used the installation locations of the probes and the methods of use will be determined by qualified NACE CP4 Cathodic Protection Specialist. Additionally, the impact of significant site features (e.g., large cathodic protection current collectors, shielding due to large objects located in the vicinity of the protected piping) and local soil conditions will be factored into placement of the probes and use of probe data.

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. Inspections are conducted by qualified individuals.

Inspection of piping shared between STP Units 1 and 2 may be credited towards the required inspections. Inspection quantities are increased by 50 percent as STP has two units and inspections are distributed evenly among the units.

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 ~~11~~ 5 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 34 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.

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, an expansion of the sample size is conducted. The number of inspections within the affected piping categories is doubled or increased by 5, whichever is smaller. The expanded sample inspection is completed within the 10-year interval in which the original inspection was conducted or, if identified in the latter half of the current 10-year interval, within 4 years after the end of the 10-year interval.

Where damage to the coating has been evaluated as significant and the damage was caused by non-conforming backfill, an extent of condition evaluation is conducted to ensure that the as-left condition of backfill in the vicinity of the observed damage will not lead to further degradation.

Where the coatings, backfill, or the condition of exposed piping does not meet acceptance criteria, the degraded condition is repaired or the affected component is replaced.

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:

- In lieu of visual inspections of the fire protection system (FP), this program credits flow testing of the fire mains as described in Section 7.3 of NFPA 25, 2011 Edition.

- 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.

- Use of excessive cathodic protection polarized potential on coated piping should be avoided. The limiting critical potential should not be more negative than 1200 mV relative to a CSE.

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 and inspections are distributed evenly among the 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.

- If a transition from Category C to Category E or from Category E to Category F occurs in the latter half of the current 10-year interval, the timing of the additional examinations is based on the severity of the degradation identified and is commensurate with the consequences of a leak or loss of function. In all cases, the examinations are completed within 4 years after the end of the particular 10-year interval. These additional inspections conducted in an inspection interval cannot be credited towards the base number of inspections required for the 10-year interval.

- Where steel or copper alloy piping has been coated with the same coating system and the backfill has the same requirements, the total inspections for this piping may be combined to satisfy the recommended inspection quantity. For example, for Category F, 10 percent of the total of the associated steel or copper alloy is inspected; or 9 10-foot segments of steel or copper alloy piping are inspected.

- 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 ~~11~~ 5 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~~ 9 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 34 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, an expansion of the sample size is conducted. The number of inspections within the affected piping categories is doubled or increased by 5,

whichever is smaller. ~~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~~ However, in all cases, the expanded sample inspections should be completed within the 10-year interval in which the original ~~adverse condition was identified~~ inspection was conducted or, if identified in the latter half of the current 10-year interval, within 4 years after the end of the 10-year interval. Expansion of the sample size may be limited by the extent of piping subject to the observed degradation mechanism. If adverse conditions are extensive within the 10-year interval in which the inspections were conducted or, if identified in the latter half of the current 10-year interval, within 4 years after the end of the 10-year interval, 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~~ at least -850 mV instant off ~~and -1200 mV~~ for steel piping. 100 mV minimum polarization is required for copper alloy piping. 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, whichever is shorter.

- If the cathodic protection system fails to meet the acceptance criteria of at least -850 mV relative to a CSE instant off for steel components the following alternatives may be used.
  - 100 mV minimum polarization
  - -750 mV relative to a CSE, instant off where soil resistivity is greater than 10,000 ohm-cm to less than 100,000 ohm-cm
  - -650 mV relative to a CSE, instant off where soil resistivity is greater than 100,000 ohm-cm
  - Verify less than 1 mpy loss of material.

- Means to verify the effectiveness of the protection of the most anodic metal when alternatives are used are incorporated into the program. The external loss of material rate is verified by:
  - Every year when verifying the effectiveness of the cathodic protection system by measuring the loss of material rate.
  - Every 2 years when using the 100 mV minimum polarization.
  - Every 5 years when using the -750 mV or -650 mV criteria associated with higher resistivity soils. The soil resistivity is verified every 5 years.

- When electrical resistance corrosion rate probes are used the installation locations of the probes and the methods of use will be determined by qualified NACE CP4 Cathodic Protection Specialist.

- The impact of significant site features (e.g., large cathodic protection current collectors, shielding due to large objects located in the vicinity of the protected piping) and local soil conditions will be factored into placement of the probes and use of probe data.

- 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 the inspections do not reveal evidence that the backfill caused damage to the component's coatings or the surface of the component. ~~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.

Corrective Actions (Element 7)

Plant procedures will be enhanced to include the following:

- 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.

- If coated or uncoated metallic piping show evidence of corrosion, the remaining wall thickness in the affected area is determined to ensure that the minimum wall thickness is maintained.

- If the wall thickness meets minimum wall thickness requirements, recommendations for expansion of sample size do not apply.

- Where the coatings, backfill, or the condition of exposed piping does not meet acceptance criteria, the degraded condition is repaired or the affected component is replaced. The number of inspections within the affected piping categories is doubled or increased by 5, whichever is smaller.

- If the acceptance criteria are not met in any of the expanded samples, an analysis is conducted to determine the extent of condition and extent of cause. The number of the follow-on inspections is determined based on the extent of condition and extent of cause.

- The timing of the additional examinations is based on the severity of the degradation identified and is commensurate with the consequences of a leak or loss of function. However, in all cases, the expanded sample inspection is completed within the 10-year interval in which the original inspection was conducted or, if identified in the latter half of the current 10-year interval, within 4 years after the end of the 10-year interval. The number of inspections may be limited by the extent of piping subject to the observed degradation mechanism.

- The expansion of sample inspections may be halted in a piping system or portion of system that will be replaced within the 10-year interval in which the inspections were conducted or, if identified in the latter half of the current 10-year interval, within 4 years after the end of the 10-year interval.

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 that 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.

Enclosure 3

STPNOC Revision of Regulatory Commitment Item 13

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
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. Enhance the Buried Piping and Tanks Inspection program procedures to: • Specify that In lieu of visual inspections of the fire protection system (FP), this program credits flow testing of the fire mains as described in Section 7.3 of NFPA 25, 2011 Edition. • 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	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 prior to the PEO, whichever occurs later. CR 10-23268

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
	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. • Use of excessive cathodic protection polarized potential on coated piping should be avoided. The limiting critical potential should not be more negative than 1200 mV relative to a CSE. • 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. • 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 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		

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
	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 and inspections are distributed evenly among the units. • 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, 2011 Edition, 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 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 if a transition from Category C to Category E or from Category E to Category F occurs in the latter half of the current 10-year interval, the timing of the additional examinations is based on the severity of the degradation identified and is commensurate with the consequences of a leak or loss of function. In all cases, the examinations are completed within 4 years after the end of the particular 10-year interval. These additional inspections conducted in an inspection interval cannot be		

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
	credited towards the base number of inspections required for the 10-year interval. • Specify where steel or copper alloy piping has been coated with the same coating system and the backfill has the same requirements, the total inspections for this piping may be combined to satisfy the recommended inspection quantity. For example, for Category F, 10 percent of the total of the associated steel or copper alloy is inspected; or 9 10-foot segments of steel or copper alloy piping are inspected. • 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 ~~11~~5. ~~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		

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
	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~~9 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~~. • 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 43 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. • Specify that if adverse indications are detected, an expansion of the sample size is conducted. The number of inspections within the affected piping categories is doubled or increased by 5, whichever is smaller. ~~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~~ However, in all cases, the expanded sample inspections should be completed within the 10-year interval in which the original ~~adverse condition was identified~~ inspection was conducted or, if identified in the latter half of the current 10-year interval, within 4 years after the end of the 10-year interval. If adverse conditions are extensive within the 10-year interval in which the inspections were conducted or, if identified in the latter half of the current 10-year interval, within 4 years after the end of		

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	the 10-year interval, 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~~at least -850 mV relative to a CSE, instant off ~~and -1200 mV~~ for steel piping. 100 mV minimum polarization is required for copper alloy piping. • Specify that If the cathodic protection system fails to meet the acceptance criteria of at least -850 mV relative to a CSE instant off for steel components the following alternatives may be used. o 100 mV minimum polarization o -750 mV relative to a CSE, instant off where soil resistivity is greater than 10,000 ohm-cm to less than 100,000 ohm-cm o -650 mV relative to a CSE, instant off where soil resistivity is greater than 100,000 ohm-cm o Verify less than 1 mil/year (mpy) loss of material. • Specify means to verify the effectiveness of the protection of the most anodic metal when alternatives are used are incorporated into the program. The external loss of material rate is verified by: o Every year when verifying the effectiveness of the cathodic protection system by measuring the loss of material rate. o Every 2 years when using the 100 mV minimum polarization. o Every 5 years when using the -750 mV or -650 mV criteria associated with higher resistivity soils. The soil resistivity is verified every 5 years. • Specify where electrical resistance corrosion rate probes are used the installation locations of the probes and the methods of use will be determined by qualified NACE CP4 Cathodic Protection Specialist.		

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	• Require the impact of significant site features (e.g., large cathodic protection current collectors, shielding due to large objects located in the vicinity of the protected piping) and local soil conditions be factored into placement of the probes and use of probe data. • Indicate that 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. • 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 the inspections do not reveal evidence that the backfill caused damage to the component's coatings or the surface of the component. ~~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. • Specify that if coated or uncoated metallic piping show evidence of corrosion, the remaining wall thickness in the affected area is determined to ensure that the minimum wall thickness is maintained. • Specify where wall thickness meets minimum wall thickness requirements, recommendations for expansion of sample size does not apply.		