



SEP 7 2010

10 CFR 50  
10 CFR 51  
10 CFR 54

LR-N10-0322

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

Salem Nuclear Generating Station, Unit No. 1 and Unit No. 2  
Facility Operating License Nos. DPR-70 and DPR-75  
NRC Docket Nos. 50-272 and 50-311

Subject: Response to NRC Request for Additional Information, dated August 6, 2010, related to the Buried Piping Inspection Program associated with the Salem Nuclear Generating Station, Units 1 and 2 License Renewal Application

Reference: Letter from Ms. Bennett Brady (USNRC) to Mr. Thomas Joyce (PSEG Nuclear, LLC) "REQUEST FOR ADDITIONAL INFORMATION FOR SALEM NUCLEAR GENERATING STATION UNITS 1 AND 2 LICENSE RENEWAL APPLICATION FOR BURIED PIPING INSPECTION PROGRAM (TAC NOS. ME1834 AND ME1836)", dated August 6, 2010

In the referenced letter, the NRC requested additional information regarding the Buried Piping Inspection Program associated with the Salem Nuclear Generating Station, Units 1 and 2 License Renewal Application. Enclosure A to this letter provides the response to this request for additional information.

Enclosure B provides updates to the Salem LRA associated with this RAI response. Included within this submittal are updates to license renewal commitments 22 (Buried Piping Inspection) and 44 (Buried Non-Steel Piping Inspection) on pages 6 and 14 of Enclosure B, respectively. There are no other new or revised regulatory commitments associated with this submittal.

If you have any questions, please contact Mr. Ali Fakhar, PSEG Manager - License Renewal, at 856-339-1646.

A141  
MRR

SEP 7 2010

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

Executed on 9/7/10

Sincerely,



Robert C. Braun  
Senior Vice President, Operations  
PSEG Nuclear LLC

Enclosures: A. Response to Request for Additional Information related to Salem Buried  
Piping

B. LRA Updates Associated with Response to Request for Additional Information

cc: Regional Administrator – USNRC Region I  
B. Brady, Project Manager, License Renewal – USNRC  
R. Ennis, Project Manager - USNRC  
NRC Senior Resident Inspector – Salem  
P. Mulligan, Manager IV, NJBNE  
L. Marabella, Corporate Commitment Tracking Coordinator  
Howard Berrick, Salem Commitment Tracking Coordinator

**Enclosure A**

**Response to Request for Additional Information regarding the Buried Piping Inspection Program associated with the Salem Nuclear Generating Station, Units 1 and 2 License Renewal Application**

RAI B.2.1.22

Note: For clarity, portions of the original LRA text are repeated in this Enclosure. Added text is shown in ***Bold Italics***, and deletions are shown with strikethrough text.

## RAI B.2.1.22

### Background:

The license renewal application (LRA) states that the aging management program (AMP) B.2.1.22, Buried Piping Inspection Program, is an existing program with one enhancement and is consistent with the program elements in GALL AMP XI.M34. This AMP addresses buried piping (i.e., piping in direct contact with soil). The LRA also states that AMP B.2.1.24, External Surfaces Monitoring Program, is a new program and is consistent with the program elements in GALL AMP XI.M36. This AMP addresses aging management of the external surfaces of piping exposed to air, which would normally include underground inaccessible piping (i.e., piping not in direct contact with soil, but located below grade in a vault, pipe chase, or other structure where it is exposed to air and where access is limited).

There have been a number of recent industry events involving leakage from buried and underground piping and tanks.

### Issue:

In light of this recent industry operating experience (OE), the staff is concerned about the continued susceptibility to failure of buried and/or underground piping that are within the scope of 10 CFR 54.4 and subject to aging management for license renewal. In reviewing the AMPs cited above along with the applicable aging management review (AMR) items associated with them, the staff is not clear whether: (1) the components addressed by these AMPs clearly include both buried and underground piping (piping which is below grade and contained in a vault or other structure where it is exposed to air and where access is limited); and (2) whether such programs are being updated to incorporate lessons learned from these recent events as well as any OE from the applicant's own history.

### Request:

1. Provide a list and a brief summary of any leaks or adverse conditions discovered during inspections (e.g., coating damage that directly exposes the piping or tank to the environment, presence of any coarse material in backfill within six inches of the pipe or tank, unexpected corrosion or damage to piping walls or component pressure boundaries) which have occurred in buried or underground piping or tanks at the station in the past five years that were entered in your corrective action program but are not included in your LRA. Describe how your current AMPs or proposed changes to the AMPs address these issues.
2. Provide a discussion of how the AMPs used in managing the aging of buried and underground piping and tanks within the scope of license renewal will address recent industry OE as well as any OE from the applicant's own history.

**PSEG Response:**

**Background Information**

The Salem Buried Piping Inspection aging management program (Salem LRA Appendix B, Section B.2.1.22) and the Salem Buried Non-Steel Piping Inspection aging management program (Salem LRA Appendix B, Section B.2.2.4) are existing programs that are consistent with NUREG-1801, Revision 1, Section XI.M34, "Buried Piping and Tanks Inspection," and NUREG-1800, Revision 1, Appendix A, Position A.1.2.3. These two (2) aging management programs are implemented under one site program which is referred to as the Salem Buried Pipe Program (BPP). There are no buried tanks at Salem which are within the scope of license renewal.

**1. Salem Specific Operating Experience**

Summarized below by the associated Salem systems are two (2) events that have occurred within the past five (5) years and were not previously described in the Salem LRA.

**Salem Unit 1 Auxiliary Feedwater (AFW) Piping**

As a result of a high risk ranking, inspections were performed on two (2) sections of Unit 1 buried Auxiliary Feedwater (AFW) System piping during the April 2010 refueling outage. Initially, this piping was partially excavated to allow access for installation of indirect inspection technology collars for the purpose of performing indirect inspections on sections of this piping which remained buried. Once the piping was partially exposed it became apparent that the protective coating on the exposed pipe was missing. The indirect inspections indicated that the coating on buried sections of this piping was degraded or missing and in some areas, pipe wall was less than nominal thickness. These findings were entered into the Corrective Action Program (CAP). These areas were then excavated and UT pipe wall examinations were performed. The resulting UT pipe wall examinations validated the indirect inspection readings and the missing coating. Therefore, a decision was made to excavate all Unit 1 AFW buried piping to perform a thorough UT examination.

Although the analyzed pipe wall as-found conditions concluded the piping to be operable, all of the Unit 1 buried AFW piping was replaced during the April 2010 outage.

As part of the extent of condition review (driven by the Corrective Action Program), a portion of the Unit 2 AFW piping in an Auxiliary Building penetration was visually examined and found to be coated. Excavation and inspection of buried portions of the Unit 2 AFW System is planned for the next Unit 2 refueling outage, scheduled for the spring of 2011.

The apparent cause of this event was that the "X-Tru-coat" pipe coating (which is a yellow polyethylene material) was mistakenly removed during original installation. Construction photos show that prior to burial, the pipe and the "X-Tru-coat" were covered with a yellow herculite type material. During the removal of the yellow herculite type material the "X-Tru-coat" protective coating underneath, which was also yellow, was most likely inadvertently removed as well, leaving uncoated pipe.

The Unit 1 and 2 Auxiliary Feedwater (AFW) System buried piping is within the scope of license renewal.

### **Salem Unit 1 Station Air and Control Air Piping Inspections**

During the April 2010 excavation of the Unit 1 buried AFW System piping, two (2) Station Air System buried piping lines and two (2) Control Air System buried piping lines were exposed. The external pipe coating was inspected as required by Buried Pipe Program (BPP) procedures. A small pipe leak was found on a 1-inch Control Air System pipe buried in sand in the Fuel Transfer Tube Area (FTTA). The through wall leak was located at a location where the protective coating on an elbow was damaged. The apparent cause of the coating damage was that personnel previously stepped on the pipe thus damaging the coating. The buried portion of the Control Air System described above is within the scope of license renewal. These findings were entered into the Corrective Action Program. The remainder of the coating on the four exposed Station Air and Control Air System piping lines was in good condition.

## **2. Operating Experience Impact on Aging Management Reviews and Aging Management Programs**

Salem has considered site specific and recent industry operating experience related to buried and underground piping for its impact on aging management reviews and aging management programs. Results of this review are provided below.

### **Aging Management Reviews**

Salem has evaluated aging management review results to confirm an appropriate program has been credited to manage the effects of aging of buried piping within the scope of license renewal. Salem has also confirmed that aging management review results are appropriate for underground piping (e.g. pipe that is located within below grade vaults and pipe tunnels) within the scope of license renewal.

During the preparation of this RAI response, an error was found in LRA Table 3.3.2-2, "Chemical & Volume Control System." Short sections of stainless steel outdoor piping that connect the outdoor Salem Unit 1 and 2 Primary Water Storage Tanks to the system piping, located below grade within the Pipe Tunnel, were not captured within the LRA table. Therefore, LRA Table 3.3.2-2, "Chemical & Volume Control System", on pages 3.3-131 and 3.3.-141 of the LRA are revised to add a line item which addresses stainless steel pipe in an "Air – Outdoor (External)" environment, as shown in Enclosure B of this letter.

### **Aging Management Program**

The Buried Piping Inspection and Buried Non-Steel Piping Inspection aging management programs manage aging effects of buried piping of the following systems within the scope of license renewal: Service Water, Auxiliary Feedwater, Circulating Water, Fire Protection, Non-radioactive Drain, Compressed Air, and the Demineralized Water System. The Salem Buried Pipe Program (BPP) manages aging effects for sixteen (16) systems including those within the scope of license renewal.

The program has risk ranked all buried piping sections, based on National Association of Corrosion Engineers (NACE) and Electric Power Research Institute (EPRI) guidance,

according to their relative risk of failure. Based on the risk rankings, inspections are scheduled and performed to assess pipe wall conditions. Planned direct visual inspections of excavated piping typically include the entire circumference and a length of approximately eight (8) feet (based on a standard shoring box size), when practical. Planned inspections are expected to occur periodically throughout the period of extended operation.

Aging effects of underground pipe (e.g. pipe that is located within below grade vaults or pipe tunnels) will be managed by the following programs:

- The External Surfaces Monitoring aging management program (Salem LRA Appendix B, Section B.2.1.24), which performs visual inspection for loss of material of carbon steel component surfaces at least once per refueling cycle, and
- The Periodic Inspection aging management program (Salem LRA Appendix B, Section B.2.2.2), which performs visual inspections for loss of material of non-carbon steel component surfaces at frequencies based on plant and industry operating experience.

#### **Industry Operating Experience**

Salem has an operating experience review program that monitors industry-wide operating experience from a number of sources (e.g. INPO reports and NRC Information Notices). These items are reviewed by the program managers for applicability to Salem. Applicable items are entered into the Corrective Action Program and assigned to a responsible individual.

#### **Corrective Action Program**

Lessons learned from internal and external industry experience are input and addressed in the Corrective Action Program. Deficiencies or abnormal findings are entered into the Corrective Action Program. For deficiencies assessed to be adverse to quality, the cause is determined and corrective actions are developed to preclude recurrence. In addition, extent of condition evaluations are performed based on the inspection results for similar configurations and environments. The CAP assures proper evaluation of operating experience and is consistent with NUREG-1801, Revision 1, AMP XI.M34, "Buried Pipe and Tanks Inspection."

#### **Cathodic Protection**

Salem Unit 1 and 2 buried piping systems do not have cathodic protection installed. None of the seven (7) above systems within the scope for license renewal have dedicated cathodic protection systems. The lack of cathodic protection is an input to the risk ranking methodology.

#### **NEI Initiative**

In response to industry operating experience with buried and underground piping, the Nuclear Energy Institute (NEI) established an industry initiative on buried piping integrity (NEI 09-14), which was adopted by the NEI Nuclear Strategic Issues Advisory Committee on November 18, 2009. PSEG is participating in this industry initiative. Summarized below are key elements of the initiative and the associated schedule.

- Establish procedures and oversight for a buried pipe program (Complete)
- Perform risk ranking of buried piping (Scheduled for completion by 12/31/2010)
- Develop an inspection plan, which includes the following key attributes:
  - Identification of piping segments to be inspected
  - Inspection techniques
  - An inspection schedule for buried piping segments based on risk ranking

Under the timeline established for the NEI initiative, Salem intends to complete the inspection plan by June 30, 2011, and commence inspections under the inspection plan no later than June 30, 2012. Salem is currently performing inspections under the existing Salem Buried Pipe Program.

#### **Recent and Planned Inspections**

Over the past two (2) years, Salem has performed direct inspections on four (4) of the seven (7) LRA systems within the scope of license renewal, including all high risk systems. Therefore, Salem has already selected, inspected, and addressed aging effects (as necessary) on the high ranking LRA in scope systems, independently of LRA commitments. In addition, the program has performed ten (10) inspections on systems that are not in scope. These results demonstrate the effectiveness of the Buried Pipe Program.

During the next Unit 2 refueling outage, Salem plans on excavating and inspecting two (2) buried Service Water System piping segments, in addition to the Unit 2 AFW System. These two (2) segments currently have high risk rankings. The pipe segments will be excavated to permit direct visual inspection from the external surface. Additionally, the piping which is not exposed by excavation will be inspected using a Broadband Electromagnetic (BEM) system and a Remote Field Transformer Coupling (RFTC) system.

#### **License Renewal Enhanced Inspections**

In the LRA submitted on August 18, 2009, Salem committed to perform enhanced inspections on five (5) opportunistic or focused excavations and direct inspections within the ten (10) years prior to entering the PEO and five (5) opportunistic or focused excavations and direct inspections in the first ten (10) years of the PEO. These inspections will investigate all five (5) of the different piping component materials. NUREG-1801, Revision 1, AMP XI.M34 and NUREG 1800, Revision 1, Appendix A, Position A.1.2.3 element four, "Detection of Aging Affects", state that inspections should be performed in areas with the highest likelihood of corrosion problems and in areas with a history of corrosion problems. The risk ranking methodology employed at Salem accounts for likely and known corrosion problems and for the consequences of leakage. Therefore, relying on the risk ranking methodology and results from previous inspections to select the enhanced inspection locations is consistent with the NUREG-1801, Revision 1, AMP XI.M34 and NUREG 1800, Revision 1, Appendix A, Position A.1.2.3 guidance.

In addition to the existing five (5) enhanced inspections being performed by the Buried Piping Inspection and Buried Non-Steel Piping Inspection aging management programs during both the ten (10) years prior to and ten (10) years following entry into the PEO, Salem will also perform an additional five (5) opportunistic or focused excavations and direct inspections in the second ten (10) year period of the PEO per this RAI response. As is the case of the existing ten (10) committed inspections, these additional five (5) inspections will investigate all five (5) of the different piping component materials types.

Recent operating experience indicates that carbon steel buried piping may warrant additional inspections. Therefore, as part of this RAI response, Salem will enhance its Buried Piping Inspection program to perform at least three (3) additional opportunistic or focused excavations and direct inspections of carbon steel piping and components during each ten (10) year period, beginning ten (10) years prior to entry into the PEO. These inspections will be on buried piping segments in systems within the scope of license renewal that have high-risk buried piping.

With these commitment changes, the total number of enhanced excavations and inspections will be: at least eight (8) within the ten (10) years prior to entering the PEO, at least eight (8) in the first ten (10) years of the PEO, and at least eight (8) in the second ten (10) years of the PEO.

These additional inspections will add to the program knowledge base and result in a broad characterization of systems within the scope of license renewal. The risk ranking methodology may change and improve as the NEI initiative is completed. Salem will use the NEI guidelines and update the program and the risk ranking methodology, if necessary, for selecting the location of the above committed inspections in the Buried Piping Inspection and Buried Non-Steel Piping Inspection aging management programs.

In summary, the Buried Piping Inspection and Buried Non-Steel Piping Inspection aging management programs are revised to specify the performance of at least one (1) excavation and direct inspection of each buried piping component material type during each ten (10) year period, beginning ten (10) years prior to the period of extended operation. This results in the performance of at least five (5) direct buried piping inspections during each ten year interval, beginning 10 years prior to the period of extended operation. In addition, to address recent operating experience associated with buried steel piping, the Buried Piping Inspection program will also be enhanced to perform at least three (3) additional excavations and direct inspections of carbon steel piping during each ten (10) year period, beginning ten (10) years prior to the period of extended operation. Therefore, the total number of enhanced inspections will be at least eight (8) during each ten year interval, beginning 10 years prior to the period of extended operation.

Revisions to the Buried Piping Inspection program contained in LRA Appendix A, Section A.2.1.22, Appendix B, Section B.2.1.22, and line item 22 of the Table A.5 License Renewal Commitment List are shown in Enclosure B of this letter. Revisions to the Buried Non-Steel Piping Inspection program contained in LRA Appendix A, Section A.2.2.4, Appendix B, Section B.2.2.4, and line item 44 of the Table A.5 License Renewal Commitment List are shown in Enclosure B of this letter.

## Enclosure B

### Salem Generating Station Units 1 and 2 License Renewal Application Updates

Note: To facilitate understanding, portions of the original LRA have been repeated in this Enclosure, with revisions indicated. Existing LRA text is shown in normal font. Changes are highlighted with ***bolded italics*** for inserted text and strikethroughs for deleted text.

LRA Table 3.3.2-2, "Chemical & Volume Control System", on pages 3.3-131 and 3.3-141, are revised as shown below to add a line item which addresses stainless pipe in an "Air-Outside (External)" environment. Revisions are indicated with bolded italics for inserted text.

**Table 3.3.2-2 Chemical & Volume Control System**

<b>Component Type</b>	<b>Intended Function</b>	<b>Material</b>	<b>Environment</b>	<b>Aging Effect Requiring Management</b>	<b>Aging Management Programs</b>	<b>NUREG-1801 Vol.2 Item</b>	<b>Table 1 Item</b>	<b>Notes</b>
<i>Piping and Fittings</i>	<i>Pressure Boundary</i>	<i>Stainless Steel</i>	<i>Air - Outdoor (External)</i>	<i>Loss of Material/Pitting and Crevice Corrosion</i>	<i>Periodic Inspection</i>	<i>III.B2-7</i>	<i>3.5.1-50</i>	<i>E, 8</i>

**Plant Specific Notes:**

***8. The Periodic Inspection program is substituted to manage the aging effect(s) applicable to this component type, material, and environment combination.***

As a result of changes to the Buried Piping Inspection aging management program identified in the response to RAI B.2.1.22, LRA Appendix A, Section A.2.1.22, pages A-20 and 21, Appendix B, Section B.2.1.22, pages B-110 (3<sup>rd</sup> paragraph), page B-111 (enhancements), and line item 22 of the Table A.5 License Renewal Commitment List, page A-65, are revised as shown below. Revisions are indicated with bolded italics for inserted text and strikethroughs for deleted text.

#### **A.2.1.22 Buried Piping Inspection**

The Buried Piping Inspection aging management program will be enhanced to include:

- ~~1. At least one opportunistic or focused excavation and inspection of carbon steel, ductile cast iron and gray cast iron piping and components within ten years prior to entering the period of extended operation. Also, upon entering the period of extended operation, a focused excavation and inspection of each of the above materials shall be performed within the first ten years, unless an opportunistic inspection occurs within this ten-year period.~~
- 1. At least one (1) opportunistic or focused excavation and inspection will be performed on each of the material groupings, which include carbon steel, ductile cast iron, and gray cast iron piping and components during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation.**
- 2. At least three (3) additional opportunistic or focused excavations and inspections will be performed on carbon steel piping and components during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation. These inspections will be on buried piping segments in systems within the scope of license renewal that have high-risk buried piping.**

~~This enhancement~~ **These enhancements** will be implemented prior to the period of extended operation, with the inspections performed in accordance with the schedule described above.

## B.2.1.22 Buried Piping Inspection

### Program Description

The Buried Piping Inspection aging management program is an existing program that includes preventive measures such as coating and wrapping to mitigate corrosion and periodic inspection of external surfaces for loss of material to detect and monitor the effects of corrosion on the external surface of buried steel piping and components in a soil or groundwater (external) environment. The program provides for managing loss of material due to general corrosion, pitting, crevice corrosion and microbiologically-influenced corrosion (MIC). Preventive measures are in accordance with standard industry practices for maintaining external coatings and wrappings.

Salem does not have any buried tanks in the scope of license renewal.

External inspections of buried components using visual techniques will occur opportunistically when they are excavated during maintenance. ~~Inspection of at least one carbon steel, one ductile cast iron and one gray cast iron piping and components will be performed in the ten years prior to the period of extended operation. Upon entering the period of extended operation, a focused excavation and inspection of each of the above materials shall be performed within the first ten years, unless an opportunistic inspection occurs within this ten-year period.~~ ***The Buried Piping Inspection aging management program will be enhanced to include at least one (1) opportunistic or focused excavation and inspection on each of the material groupings, which include carbon steel, ductile cast iron, and gray cast iron piping and components during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation.***

***At least three (3) additional opportunistic or focused excavations and inspections will be performed on carbon steel piping and components during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation. These inspections will be on buried piping segments in systems within the scope of license renewal that have high-risk buried piping.***

Any coating and wrapping degradation is reported and evaluated according to site corrective actions procedures. External component degradation is reported and evaluated whenever buried commodities are uncovered during yard excavation activities, which includes bolting. The Bolting Integrity program addresses the aging management of buried bolting. In addition, evidence of metal surface corrosion and any leakage detected through periodic testing and visual inspections will be evaluated and used to confirm the system and components ability to perform their intended functions. Any leakage identified is evaluated and appropriate corrective actions are implemented.

The program will be enhanced as described below to provide reasonable assurance that buried piping and components of all steel materials that are in scope of the Buried Piping Inspection program, including carbon steel, ductile cast iron, and gray cast iron at Salem will perform their intended function during the period of extended operation.

## NUREG-1801 Consistency

There are no buried tanks at Salem units that are in scope for license renewal. The Buried Piping Inspection aging management program is consistent with the ten elements of aging management program XI.M34, "Buried Piping and Tanks Inspection," specified in NUREG-1801.

## Exceptions to NUREG-1801

None.

## Enhancements

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

- ~~1. The Buried Piping Inspection aging management program will be enhanced to include at least one opportunistic or focused excavation and inspection of carbon steel, gray cast iron, and ductile cast iron piping and components within ten years prior to entering the period of extended operation. Upon entering the period of extended operation, a focused inspection of each of the above materials shall be performed within the first ten years, unless an opportunistic inspection occurs within this ten year period. Program Elements Affected: Detection of Aging Effects (Element 4)~~
- 1. The Buried Piping Inspection aging management program will be enhanced to include at least one (1) opportunistic or focused excavation and inspection on each of the material groupings, which include carbon steel, ductile cast iron, and gray cast iron piping and components during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation. Program Elements Affected: Detection of Aging Effects (Element 4)**
- 2. At least three (3) additional opportunistic or focused excavations and inspections will be performed on carbon steel piping and components during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation. These inspections will be on buried piping segments in systems within the scope of license renewal that have high-risk buried piping. Program Elements Affected: Detection of Aging Effects (Element 4)**

**A.5 License Renewal Commitment List**

No.	Program or Topic	Commitment	UFSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule	Source
22	Buried Piping Inspection	<p>Buried Piping Inspection is an existing program that will be enhanced to include:</p> <ol style="list-style-type: none"> <li>1. <del>At least one opportunistic or focused excavation and inspection of carbon steel, ductile cast iron and gray cast iron piping and components within ten years prior to entering the period of extended operation. Also, upon entering the period of extended operation, a focused excavation and inspection of each of the above materials shall be performed within the first ten years, unless an opportunistic inspection occurs within this ten-year period.</del></li> <li>1. <b>At least one (1) opportunistic or focused excavation and inspection will be performed on each of the material groupings, which include carbon steel, ductile cast iron, and gray cast iron piping and components during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation.</b></li> <li>2. <b>At least three (3) additional opportunistic or focused excavations and inspections will be performed on carbon steel piping and components during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation. These inspections will be on buried piping segments in systems within the scope of license renewal that have high-risk buried piping.</b></li> </ol>	A.2.1.22	<p>Program to be enhanced prior to the period of extended operation.</p> <p>Inspection Schedule identified in Commitment</p>	<p>Section B.2.1.22</p> <p><i>Salem letter LR-N10-0322</i></p> <p><b>RAI B.2.1.22</b></p>

As a result of changes to the Buried Non-Steel Piping Inspection aging management program identified in the response to RAI B.2.1.22, LRA Appendix A, Section A.2.2.4, page A-32, Appendix B, Section B.2.2.4, page B-203 (2<sup>nd</sup> paragraph), page B-204 (4<sup>th</sup> paragraph), page B-205 (3<sup>rd</sup> paragraph), page B-206 (2<sup>nd</sup> paragraph) and pages B-210 and B-211 (Enhancements 1 and 2), and line item 44 of the Table A.5 License Renewal Commitment List, pages A-72 and A-73, are revised as shown below. Revisions are indicated with bolded italics for inserted text and strikethroughs for deleted text.

#### A.2.2.4 Buried Non-Steel Piping Inspection

The Buried Non-Steel Piping Inspection ***aging management program*** will be enhanced to include:

- ~~1. At least one opportunistic or focused excavation and inspection of buried reinforced concrete piping and components will be performed within ten years prior to entering the period of extended operation. Upon entering the period of extended operation at least one focused excavation and inspection of buried reinforced concrete piping and components will be performed within the first ten years, unless an opportunistic excavation and inspection occurs within this ten year period.~~
- ~~2. At least one opportunistic or focused excavation and inspection of buried stainless steel penetration bellows between the Containment Structure and the Fuel Handling Building, including the penetration sleeves, will be performed within ten years prior to entering the period of extended operation. Upon entering the period of extended operation at least one focused excavation and inspection of buried stainless steel penetration bellows between the Containment Structure and the Fuel Handling Building, including the penetration sleeves, will be performed within the first ten years, unless an opportunistic excavation and inspection occurs within this ten year period.~~
- 1. At least one (1) opportunistic or focused excavation and inspection will be performed on buried reinforced concrete piping and components during each ten (10) year period beginning 10 years prior to entry into the period of extended operation.***
- 2. At least one (1) opportunistic or focused excavation and inspection will be performed on buried stainless steel penetration bellows between the Containment Structure and the Fuel Handling Building, including the penetration sleeves, during each ten (10) year period beginning ten (10) years prior to entry into the period of extended operation.***
3. Guidance for inspection of concrete aging effects.

These enhancements will be implemented prior to the period of extended operation, with the inspections performed in accordance with the schedule described above.

#### B.2.2.4 Buried Non-Steel Piping Inspection

##### Program Description

The Salem Buried Non-Steel Piping Inspection program is an existing condition monitoring program that manages buried reinforced concrete piping and components in the Service Water System and Circulating Water System that are exposed to an external soil or groundwater environment for cracking, loss of bond, increase in porosity and permeability, and loss of material. The Salem Buried Non-Steel Piping Inspection aging management program also inspects the buried stainless steel penetration bellows between the Containment Structure and the Fuel Handling Building, including the penetration sleeves, which are exposed to an external soil or groundwater environment. The program relies on inspections of the external surfaces of piping and components to identify cracking, loss of bond, increase in porosity and permeability, and loss of material. Opportunistic and focused inspections are performed to manage the effects of exterior surface and coating degradation on the pressure-retaining capacity of buried piping and components. Buried piping and components are inspected when they are excavated for maintenance or any other reason. Inspection of buried components identifies coating degradation, if coated, or base metal corrosion, if uncoated.

~~At least one opportunistic or focused excavation and inspection of buried piping and components within the scope of this program will be performed within ten years prior to entering the period of extended operation. Upon entering the period of extended operation at least one focused excavation and inspection of buried piping and components within the scope of this program will be performed within the first ten years, unless an opportunistic excavation and inspection occurs within this ten year period.~~

***At least one (1) opportunistic or focused excavation and inspection will be performed on buried reinforced concrete piping and components during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation. In addition, at least one (1) opportunistic or focused excavation and inspection will be performed on buried stainless steel penetration bellows between the Containment Structure and the Fuel Handling Building, including the penetration sleeves, during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation.***

Areas with high susceptibility of exterior surface degradation, consequence of failure and areas with a history of exterior surface degradation problems are identified and prioritized. Probabilistic arguments were not used in the development of the Buried Non-Steel Piping Inspection aging management program. Aging effects are managed by a condition monitoring program.

##### Aging Management Program Elements

The results of an evaluation of each element against the 10 elements described in Appendix A of the Standard Review Plan of License Renewal Applications for Nuclear Power Plants, NUREG-1800, are provided below.

## Scope of Program – Element 1

The Salem Buried Non-Steel Piping Inspection aging management program is an existing program that manages cracking, loss of bond, loss of material and increase in porosity and permeability, through the use of opportunistic or focused inspections. The program relies on condition monitoring inspections of the external surfaces of piping and components to identify external surface degradation and detect the aging effects listed above. Opportunistic or focused inspections are performed when the components are excavated for maintenance or for any other reason. The program directs engineering to perform inspections of piping and components exposed during excavation. Inspection of buried components identifies coating degradation, if coated, or base metal corrosion, if uncoated.

The Salem Buried Non-Steel Piping Inspection aging management program inspects system piping and components within the scope of license renewal that are buried and included in the Circulating Water System and the Service Water. This includes the reinforced concrete Circulating Water System piping that begins underground leaving the Turbine Building and ending at the discharge in the Delaware River. This also includes the reinforced concrete piping in the Service Water System. At Salem Unit 2 the reinforced concrete piping in the Service Water System continues from the Service Water Intake Structure to the service water pipe tunnel and continuing to the Auxiliary Building. At Salem Unit 1 the buried Service Water piping goes straight from the Service Water Intake Structure to the Auxiliary Building.

Also included in the Salem Buried Non-Steel Piping Inspection aging management program is a small section (less than three feet long) of the fuel transfer tube assembly that is below grade and extends between the reactor cavities (Unit 1 and Unit 2) to the corresponding transfer pool located in each Fuel Handling building. The stainless steel, fuel transfer tube is encapsulated by carbon steel sleeves, with the ends of the carbon steel sleeves exposed (about 4 inches) at each end, and the stainless steel bellows connecting the two carbon steel sleeves. A galvanized sheet metal protective cover covers the stainless steel bellows. The carbon steel penetration sleeves are included in the scope of this program and not in the Buried Piping Inspection program because the inspection of the stainless steel bellows and carbon steel sleeves will be performed at the same time. This program inspects this buried, encapsulated section of carbon and stainless steel piping for loss of material.

The Salem Buried Non-Steel Piping Inspection aging management program will be enhanced to include **at least one (1) opportunistic or focused excavation and inspection of buried reinforced concrete piping and components during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation. In addition, at least one (1) opportunistic or focused excavation and inspection will be performed on buried stainless steel penetration bellows between the Containment Structure and the Fuel Handling Building, including the penetration sleeves, during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation.** ~~at least one opportunistic or focused excavation and inspection of the stainless steel penetration bellows between the Containment Structure and the Fuel Handling Building, including the penetration sleeves, and buried reinforced concrete piping and components within ten years prior to~~

~~entering the period of extended operation. Upon entering the period of extended operation at least one focused excavation and inspection the stainless steel penetration bellows between the Containment Structure and the Fuel Handling Building, including the penetration sleeves, and of buried reinforced concrete piping and components will be performed within the first ten years, unless an opportunistic excavation and inspection occurs within this ten years period.~~

Areas with high susceptibility of exterior surface degradation, consequence of failure and areas with a history of exterior surface degradation problems are identified and prioritized. Probabilistic arguments were not used in the development of the Buried Non-Steel Piping Inspection aging management program. Aging effects are managed by a condition monitoring program.

### **Preventive Actions – Element 2**

The Salem Buried Non-Steel Piping Inspection aging management program is not a preventive or mitigation program. The Buried Non-Steel Piping Inspection aging management program is a condition monitoring program that relies on opportunistic or focused inspections of the buried reinforced concrete piping and components in the Circulating Water System and Service Water System that are exposed to an external soil or groundwater environment for cracking, loss of bond, increase in porosity and permeability, and loss of material.

The Salem Buried Non-Steel Piping Inspection aging management program also relies on opportunistic inspections of the buried stainless steel penetration bellows between the Containment Structure and the Fuel Handling Building, including the penetration sleeves, which are exposed to an external soil or groundwater environment for loss of material.

### **Parameters Monitored/Inspected – Element 3**

The Salem Buried Non-Steel Piping Inspection aging management program is a condition monitoring program that relies on opportunistic or focused inspections of the buried reinforced concrete piping and components in the Circulating Water System and Service Water System that are exposed to an external soil or groundwater environment for cracking, loss of bond, increase in porosity and permeability, and loss of material. The Salem Buried Non-Steel Piping Inspection aging management program also relies on opportunistic or focused inspections of the buried stainless steel penetration bellows between the Containment Structure and the Fuel Handling Building, including the penetration sleeves, which are exposed to an external soil or groundwater environment for loss of material. These aging effects will be identified through visual inspections of the external surfaces of the piping and components. Opportunistic and focused inspections are performed when the piping is excavated for maintenance or for any other reason. External surfaces are inspected by visual techniques whenever buried components are uncovered during station excavation activities. Inspection of buried components identifies coating degradation, if coated, or base material degradation, if uncoated. At least one opportunistic or focused excavation and inspection of buried piping and components within the scope of this program will be performed **during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation.** ~~within ten years prior to entering the period of extended~~

~~operation. Upon entering the period of extended operation at least one focused excavation and inspection of buried piping and components within the scope of this program will be performed within the first ten years, unless an opportunistic excavation and inspection occurs within this ten year period.~~ These inspection activities provide reasonable assurance that significant aging effects will be detected and corrective actions taken prior to loss of intended function.

The Salem Buried Non-Steel Piping Inspection aging management program is not a performance monitoring program nor is it a preventive or mitigation program.

#### **Detection of Aging Effects – Element 4**

The Salem Buried Non-Steel Piping Inspection aging management program is a condition monitoring program that performs opportunistic or focused inspections on the buried piping and components in the scope of this program to detect and inspect for cracking, loss of bond, increase in porosity and permeability, and loss of material and will detect degradation of the component prior to loss of its intended function. Opportunistic or focused inspections to detect cracking, loss of bond, increase in porosity and permeability, and loss of material will be specified by engineering through specific procedures and will be based on accepted industry practices. Inspection for cracking, loss of bond, increase in porosity and permeability, and loss of material will be performed on the buried reinforced concrete piping in the Circulating Water System and Service Water System. Inspection for loss of material will be performed on the buried stainless steel penetration bellows between the Containment Structure and the Fuel Handling Building, including the penetration sleeves. Examination methods include visual inspections of the external surface of buried piping and components. The methods used to inspect for degradation are performed in accordance with accepted industry standards. These inspections are an effective method to ensure that degradation of external surfaces has not occurred and the intended function is maintained. External inspections of buried components will occur opportunistically when they are excavated during maintenance, in addition to focused inspections. The inspections will be performed on all of the areas made accessible to support the maintenance activity.

At least one opportunistic or focused excavation and inspection of buried piping and components within the scope of this program will be performed **during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation.** ~~within ten years prior to entering the period of extended operation. Upon entering the period of extended operation at least one focused excavation and inspection of buried piping and components within the scope of this program will be performed within the first ten years, unless an opportunistic excavation and inspection occurs within this ten year period.~~

Areas with high susceptibility of exterior surface degradation, consequence of failure and areas with a history of exterior surface and coating degradation problems are identified and prioritized. If necessary, engineering will determine expanded inspection scope based on technical evaluations if the initial inspection results are unacceptable.

Operating experience supports this frequency of inspection. A review of plant operating experience at Salem shows that there have been no underground leaks that developed as a result of failure of the external surface of buried reinforced concrete piping.

Although failure of buried piping has occurred, it was determined that the buried piping leaks were caused by degradation of the inside of the buried piping or non-age related conditions. In 2001, a section of the buried No. 12 service water reinforced concrete piping at Salem Unit 1 was excavated to determine the cause of leakage. The apparent cause of the leakage was determined to be a non-age related break in the steel bell ring.

Focused visual inspections will be performed on a representative sample of components, material and environment combinations. Visual inspections will be performed on external piping and component surfaces that are made accessible during opportunistic or focused excavations and inspections. Visual inspections will be performed on a representative sample of piping and component external surfaces in the scope of this program.

Significant degradation identified during inspection activities are entered into the corrective action program. The degraded condition is evaluated, and corrective actions are established if necessary to preclude recurrence.

### Enhancements

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

- ~~1. At least one opportunistic or focused excavation and inspection of buried reinforced concrete piping and components will be performed within ten years prior to entering the period of extended operation. Upon entering the period of extended operation at least one focused excavation and inspection of buried reinforced concrete piping and components will be performed within the first ten years, unless an opportunistic excavation and inspection occurs within this ten year period. **Program Elements Affected: Scope of Program (Element 1), Parameters Monitored or Inspected (Element 3) and Detection of Aging Effects (Element 4)**~~
- ~~2. At least one opportunistic or focused excavation and inspection of buried stainless steel penetration bellows between the Containment Structure and the Fuel Handling Building, including the penetration sleeves, will be performed within ten years prior to entering the period of extended operation. Upon entering the period of extended operation at least one focused excavation and inspection of buried stainless steel penetration bellows between the Containment Structure and the Fuel Handling Building, including the penetration sleeves, will be performed within the first ten years, unless an opportunistic excavation and inspection occurs within this ten year period. **Program Elements Affected: Scope of Program (Element 1), Parameters Monitored or Inspected (Element 3) and Detection of Aging Effects (Element 4)**~~
- 1. At least one (1) opportunistic or focused excavation and inspection will be performed on buried reinforced concrete piping and components during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation. Program Elements Affected: Scope of Program (Element 1), Parameters Monitored or Inspected (Element 3) and Detection of Aging Effects (Element 4)**

- 2. At least one (1) opportunistic or focused excavation and inspection will be performed on buried stainless steel penetration bellows between the Containment Structure and the Fuel Handling Building, including the penetration sleeves, during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation. Program Elements Affected: Scope of Program (Element 1), Parameters Monitored or Inspected (Element 3) and Detection of Aging Effects (Element 4)**

**A.5 License Renewal Commitment List**

No.	Program or Topic	Commitment	UFSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule	Source
44	Buried Non-Steel Piping Inspection	<p>Buried Non-Steel Piping Inspection is an existing program that will be enhanced to include:</p> <ol style="list-style-type: none"> <li>1. <del>At least one opportunistic or focused excavation and inspection of buried reinforced concrete piping and components will be performed within ten years prior to entering the period of extended operation. Upon entering the period of extended operation at least one focused excavation and inspection of buried reinforced concrete piping and components will be performed within the first ten years, unless an opportunistic excavation and inspection occurs within this ten year period.</del></li> <li>2. <del>At least one opportunistic or focused excavation and inspection of buried stainless steel penetration bellows between the Containment Structure and the Fuel Handling Building, including the penetration sleeves, will be performed within ten years prior to entering the period of extended operation. Upon entering the period of extended operation at least one focused excavation and inspection of buried stainless steel penetration bellows between the Containment Structure and the Fuel Handling Building, including the penetration sleeves, will be performed within the first ten years, unless an opportunistic excavation and inspection occurs within this ten year period.</del></li> </ol>	A.2.2.4	<p>Program to be enhanced prior to the period of extended operation.</p> <p>Inspection Schedule identified in Commitment</p>	Section B.2.2.4

No.	Program or Topic	Commitment	UFSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule	Source
		<ol style="list-style-type: none"> <li>1. <i>At least one (1) opportunistic or focused excavation and inspection will be performed on buried reinforced concrete piping and components during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation.</i></li> <li>2. <i>At least one (1) opportunistic or focused excavation and inspection will be performed on buried stainless steel penetration bellows between the Containment Structure and the Fuel Handling Building, including the penetration sleeves, during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation.</i></li> <li>3. Guidance for inspection of concrete aging effects.</li> </ol>			<p><i>Salem letter LR-N10-0322</i></p> <p><i>RAI B.2.1.22</i></p>