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LR-N10-0444

U.S. Nuclear Regulatory Commission
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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 December 20, 2010, related to the Buried Piping Inspection Program associated with the Salem Nuclear Generating Station, Units 1 and 2 License Renewal Application

References:

1. 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 ME 1836)", dated October 12, 2010

2. Letter from Mr. Paul Davison, PSEG Nuclear LLC to USNRC, "Response to NRC Request for Additional Information, dated October 12, 2010, related to the Buried Piping Inspection Program associated with the Salem Nuclear Generating Station, Units 1 and 2 License Renewal Application," dated November 10, 2010

3. 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 (TAC NOS. ME1834 AND ME1836)", dated December 20, 2010

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In Reference 1, the staff requested additional information related to the Buried Piping Inspection Program associated with the Salem Nuclear Generating Station, Units 1 and 2 License Renewal Application (LRA). In Reference 2, PSEG responded to that request for information. After review of that submittal and further discussions between NRC staff and PSEG, the staff requested additional information (Reference 3).

Enclosure A contains the responses to that request for additional information. Enclosure B provides updates to affected sections of the LRA.

Enclosure C contains updates to LRA Appendix A, Section A.5, the License Renewal Commitment List. There are no other new or revised regulatory commitments contained in this letter.

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

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

Executed on 1/18/11

Sincerely,

Paul J. Davison

Paul J. Davison
Vice President, Operations Support
PSEG Nuclear LLC

Enclosures: A. Response to Request for Additional Information

B. Salem License Renewal Application Updates

C. LRA Appendix A, Section A.5, License Renewal Commitment List Update

cc: William M. Dean, Regional Administrator – USNRC Region I
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Enclosure A

Response to Request for Additional Information

RAI B.2.1.22-03

RAI B.2.1.22-03

Background:

In request for additional information (RAI) B.2.1.22-02, the U.S. Nuclear Regulator Commission (NRC or the staff) requested that the applicant justify their aging management plan for buried in-scope steel piping given that the site does not have any cathodic protection of buried steel piping. The applicant stated that inspections will occur every ten years starting ten years prior to the period of extended operation. The applicant also stated that three of four inspections of steel piping would occur in the auxiliary feedwater, service water, and compressed air systems, with the fourth inspection occurring in the fire protection system. The applicant further stated that because the inspections of the auxiliary feedwater, service water and compressed air systems will be performed on safety-related segments, they will be biased towards systems that perform more safety significant functions. The applicant stated that based on the original construction backfill specifications, recent inspection results which indicate no coating damage due to coarse backfill, and procedure requirements to document coating degradation, the planned inspections are adequate to detect potential degradation of buried piping and damage to coatings.

Issue:

The staff noted that the applicant has three instances of degradation of buried piping: (1) a 2004 fuel oil leak due to missing wrap on the pipe, (2) a 2010 control air line leak due to damaged coating, and (3) the 2010 identification of significant corrosion of auxiliary feedwater system piping. Given this plant-specific operating experience and the information provided in the RAI response, the staff lacks sufficient information to conclude that the applicant aging management strategy for buried steel piping will be sufficient to provide a reasonable assurance that in-scope buried (steel pipe) will meet its current license basis function(s). Specifically, the staff is concerned with the following:

a. Given an effective buried in-scope "population" of 350 feet of safety related auxiliary feedwater piping, 1700 (60 feet is safety-related) feet of service water piping, and 2350 (1700 feet is safety-related) feet of compressed air system piping, a sample size of three eight-foot excavated steel piping inspections every ten years starting ten years prior to the period of extended operation may not provide a reasonable basis for assurance that the piping will meet or exceed the minimum design wall thickness throughout the period of extended operation.

b. It is not apparent that the applicant has informed its inspection quantities or locations with localized soil data (e.g., pH, composition of the soil, water table, chemical runoff probability, soil resistivity, potential for stray currents) or localized corrosion rates.

Request:

Although gray cast iron and ductile cast iron are included within the scope of the GALL Report Section IX definition of steel, the below request does not apply to piping segments constructed of these materials in the fire protection system.

Respond to the following for buried in-scope steel piping:

a. Provide details on plant-specific data of localized soil conditions (e.g., pH, composition of the soil, water table, chemical runoff probability, soil resistivity, potential for stray currents) and localized corrosion rates that will be utilized to inform the inspection population size and locations. If this data does not exist, state what samples will be taken and how they will be utilized in selecting inspection locations and population size.

b. For the auxiliary feedwater, service water, and compressed air system piping, justify the basis of the inspection population size (i.e., linear feet of buried pipe) in relation to standard industrial sampling methods so as to provide a reasonable assurance that the pipe wall thickness will meet or exceed design minimum values throughout the period of extended operation.

PSEG Response:

a. As part of the existing Buried Pipe Program (BPP) and in an effort to obtain additional information relative to the soil environment to which buried piping is exposed at Salem, soil sampling is typically conducted in the vicinity of buried piping when it becomes exposed. These soil samples are generally analyzed for characteristics such as pH, resistivity, composition, moisture, chlorides, and sulfates. Over the last couple years, Salem has collected soil data at four separate excavation locations in the vicinity of in-scope safety-related piping. The resistivity values for these locations ranged from approximately 13,000 - 72,000 ohm-cm with pH values ranging from 6.6 - 7.2 and only trace amounts of chlorides and sulfates, suggesting that the corrosivity of the soil is negligible. The soil composition at these locations was found to typically be sandy in nature and containing controlled backfill within six inches of the pipe, consistent with site backfill specifications and NACE SP0169-2007 guidelines. In addition, as excavations of buried piping occur, the pipes are generally backfilled with Controlled Low Strength Material (CLSM), which provides enhanced corrosion protection.

   In order to more comprehensively characterize the condition of soil on site, Salem is committing to perform a Soil Characterization Study prior to entering the period of extended operation (PEO). The study will concentrate on characteristics such as soil composition, pH, moisture, resistivity, and soil chemistry parameters (e.g. sulfate, sulfide, and chloride ion concentrations). Soil corrosiveness determinations will be based on the integrated effects of these characteristics using industry methodologies such as those found in Table A.1 "Soil-test evaluation" in Appendix A of the American Water Works Association (AWWA) Standard C105, *Polyethylene Encasement for Ductile-Iron Pipe Systems*, and Table 20.1, "Assessment of Overall Soil Corrosivity to

Steel", C.P. Dillon *Corrosion Control in the Chemical Process Industries,* Materials Technology Institute of Chemical Process Industries, 1994.

If, based on the results of the soil study, it is determined that the soil in the vicinity of in-scope buried piping is considered corrosive, additional inspections will be scheduled as detailed below in the response to subsection "b". Soil data collected during excavation and inspection of buried piping may be credited in the study if obtained within ten years prior to entry into the period of extended operation.

If, based on the results of the initial soil study, it is determined that the soil in the vicinity of any of the in-scope buried piping is not considered corrosive, Salem will perform a second Soil Characterization Study within approximately 15 years of the original study. The results of the second soil study will be entered into the Corrective Action Program to verify and evaluate if any changes have occurred with respect to soil corrosivity and determine the appropriate actions required with respect to the need for any additional inspections. The results will also be used as further input into the BPP risk ranking methodology to ensure inspections are performed at the locations of highest risk.

The additional enhancement to the Buried Piping Inspection (Salem LRA Appendix B, Section B.2.1.22) aging management program to perform these Soil Characterization Studies is further described in Enclosures B and C of this letter.

b. As stated in the response to RAI B.2.1.22, PSEG letter LR-N10-0322 submitted September 7, 2010, Salem buried piping systems do not have dedicated cathodic protection systems installed. The lack of cathodic protection is an input into the BPP risk ranking. However, recognizing the importance and benefits of having a dedicated cathodic protection system, Salem will commit to perform a cathodic protection study on buried piping prior to entering the period of extended operation. The intent of the study will be to assess and evaluate the possibility of installing a cathodic protection system and compare the findings against other mitigative and preventive options available to PSEG. Other mitigative and preventive options could include, but are not limited to, proactive replacement of buried piping, rerouting of pipe above ground, excavation and backfilling using CLSM, and increased periodic inspection. The additional enhancement to the Buried Piping Inspection (Salem LRA Appendix B, Section B.2.1.22) aging management program to perform a cathodic protection study on buried piping is further described in Enclosures B and C of this letter.

Provided below is a discussion of activities that have been conducted or are planned to be performed on the buried pipe populations in the Auxiliary Feedwater, Service Water, and Compressed Air systems.

Auxiliary Feedwater

As of August 18, 2009, the date the Salem License Renewal Application (LRA) was submitted, there was approximately 600 feet of buried safety-related carbon steel Auxiliary Feedwater (AFW) piping within the scope of license renewal. Since that time, the following actions have been taken on the 600 feet population:

- Approximately 125 feet located inside the Unit 1 Fuel Transfer Tube Area (FTTA) was rerouted above ground with new, coated, carbon steel pipe.

- Approximately 175 feet located outside the Unit 1 Containment Building was excavated, replaced with new, coated, carbon steel pipe and backfilled in CLSM.

Prior to entering the period of extended operation, Salem is committing to replace and reroute above ground, approximately 125 feet of AFW pipe inside the Unit 2 FTTA. The effects of aging for the carbon steel AFW piping located above ground inside the Unit 1 and Unit 2 FTTA will be managed by the External Surfaces Monitoring (Salem LRA Appendix B, Section B.2.1.24) aging management program.

As a result of the above activities, only 175 feet of original carbon steel AFW pipe, located outside the Unit 2 Containment Building, will remain buried and exposed to soil. Approximately 50 feet of this remaining population is scheduled for excavation and inspection during the upcoming Unit 2 Spring 2011 refueling outage.

If, as a result of the initial Soil Characterization Study, it is determined that the soil in the vicinity of this buried piping is not considered corrosive, Salem will perform one inspection of AFW pipe every ten years, beginning ten years prior to entering the PEO. These inspections, as well as the previously mentioned activities, will result in approximately 84% of the original Auxiliary Feedwater System population being either inspected, replaced, or proactively rerouted above ground by the end of the 60 year operating period.

If, as a result of the initial Soil Characterization Study, it is determined that the soil in the vicinity of this buried piping is considered corrosive, Salem will perform one inspection of AFW piping in the ten years prior to the PEO and two inspections in each ten year period during the PEO. Additionally, the results of the Soil Characterization Study will be used as input into the BPP such that inspections of AFW piping will be performed at the highest risk locations.

The additional enhancements, as described above, to the Buried Piping Inspection aging management program can be seen in Enclosures B and C of this letter.

Service Water

There are approximately 60 feet of buried safety-related carbon steel Service Water (SW) piping within the scope of license renewal. This 60 feet of piping is composed of 28 individual wall penetration spool pieces and 4 connections of Service Water into Circulating Water (CW) discharge. Since the date of the Salem LRA submittal, the following actions have been taken on the 60 feet population:

- One Unit 1 SW spool piece at the Service Water Intake Structure was excavated and inspected during the Spring 2010 outage. This section of piping, including all bolting and apertures, was found in excellent condition and was subsequently backfilled in CLSM.

In order to further address the population of high risk ranked carbon steel SW piping, Salem is committing to perform at least three direct excavations and inspections of safety-related carbon steel SW piping prior to entering the period of extended operation. The results of the Soil Characterization Study will be used as input into the BPP such that inspections of SW piping will be performed at the highest risk locations.

If, as a result of the initial Soil Characterization Study, it is determined that the soil in the vicinity of this buried piping is not considered corrosive, Salem will perform at least three inspections of SW piping in the ten years prior to entering the PEO and at least one inspection during each ten year period during the PEO.

If, as a result of the initial Soil Characterization Study, it is determined that any of the soil in the vicinity of this buried piping is considered corrosive, Salem will perform at least three inspections of SW piping in the ten years prior to entering the PEO and at least two inspections in each ten year period during the PEO.

This additional enhancement to the Buried Piping Inspection aging management program is further described in Enclosures B and C of this letter.

Based on previously performed inspections and currently planned activities on the Service Water System, it is estimated that approximately 15% of the overall length of the buried, carbon steel, safety-related SW population will be externally inspected by the end of the 60 year operating period.

Due to plant configurations, such as building foundations and areas that are inaccessible for excavation equipment to reach, preliminary engineering assessment has determined that only eight of the 28 safety-related SW wall penetration spools and all four SW connections to CW are considered accessible for excavation and direct inspection. In order to address the remaining externally inaccessible, safety-related, carbon steel portions of the SW system, alternative actions are being taken to understand the condition of these high risk segments. These actions include pulsed eddy current testing from the internal surface of the pipe. Pulsed eddy current testing, in particular broadband electromagnetic methods, provide substantial information and are a strong indicator of the overall condition of these short (approximately 2 foot) SW segments. Any deficiencies identified by the performance of these inspections and tests will be entered into the Corrective Action Program. The corrective actions developed as a result of any deficiencies identified would include ultrasonic thickness measurements, if appropriate, to ensure the carbon steel pipe wall meets minimum design thickness values.

Therefore, based on the actions described above, there is reasonable assurance that the effects of aging on the buried, safety-related, carbon steel portions of the Service Water System will be managed such that the piping will maintain its intended function through the period of extended operation.

Although the 30 inch diameter carbon steel SW lines running from the Service Water Intake Structure to the Turbine Building are not safety-related, they are risk ranked "High" in accordance with the BPP risk ranking methodology and are within the scope of license renewal. In following the actions outlined in the Nuclear Energy Institute (NEI)

Industry Initiative on buried piping, Salem conducted pulsed eddy current testing during the Unit 1 Spring 2010 outage from the internal surface of the pipe over a length of approximately 550 feet in order to assess this population of "High" risk ranked Unit 1 piping. The inspection did not identify any indications of degradation of the carbon steel pipe. The approximately 1050 feet of 30 inch diameter carbon steel SW pipe running from the Service Water Intake Structure to the Turbine Building for Unit 2 is currently scheduled to have similar pulsed eddy current testing performed during the upcoming Unit 2 Spring 2011 outage.

Compressed Air

There is approximately 1700 feet of buried safety-related carbon steel Compressed Air (CA) piping within the scope of license renewal. Since the date of the Salem LRA submittal, the following actions have been taken:

- Approximately 175 feet located outside the Unit 1 FTTA and Containment Building was excavated and inspected during the Spring 2010 outage. This section of piping was found to be in good condition, meeting design thickness, and was subsequently backfilled in CLSM.

- Approximately 60 feet located outside the Unit 1 Fuel Handling Building running to the Service Water Intake Structure was excavated and inspected in the Summer of 2009. The coating on this section of piping and its pipe sleeve was found in excellent condition and was subsequently backfilled in concrete.

In addition, approximately 50 feet of CA piping outside the Unit 2 Containment Building is planned for excavation and inspection during the upcoming Unit 2 Spring 2011 outage.

If, as a result of the initial Soil Characterization Study, it is determined that the soil in the vicinity of this buried piping is not considered corrosive, Salem will perform one inspection of CA piping every ten years, beginning ten years prior to entering the PEO. These inspections, as well as the previously mentioned activities, will result in approximately 18.5% of the buried safety-related Compressed Air System population being inspected by the end of the 60 year operating period.

If, as a result of the initial Soil Characterization Study, it is determined that any of the soil in the vicinity of this buried piping is considered corrosive, Salem will perform one inspection of CA piping in the ten years prior to entering the PEO and two inspections in each ten year period during the PEO.

This additional enhancement to the Buried Piping Inspection aging management program is further described in Enclosures B and C of this letter.

The buried CA pipe population of concern is composed of 1" and 1.5" diameter pipes that contain significant pipe wall thickness margin with respect to maintaining their minimum design wall thickness. In particular, it has been calculated that the pipes can withstand approximately 50% general wall loss and still stay above minimum wall thickness, while also maintaining the system pressure boundary with as much 95%

localized wall loss due to accelerated or pitting corrosion. It should be noted that all CA piping is "Low" risk ranked in accordance with the BPP risk ranking methodology.

Therefore, with inspections being performed at locations of highest risk based on inputs from the results of the Soil Characterization Study and the margins that exist above the minimum design piping thicknesses, the inspection plan specified above will provide reasonable assurance that the in-scope CA piping will perform its intended function through the period of extended operation.

Summary:

Recognizing the importance of and benefits afforded by having an installed and dedicated cathodic protection system to protect buried piping, Salem will perform a cathodic protection study on buried piping prior to the period of extended operation to evaluate the best course of action to ensure that the in-scope buried piping will continue to perform its intended function through the period of extended operation. In addition, to better understand the condition and characteristics of the soil surrounding its buried piping, Salem will perform a site Soil Characterization Study prior to entering the period of extended operation. The results of the study will be used as input into the BPP such that inspections will be performed at the highest risk locations.

During the ten years prior to entering the period of extended operation, Salem will perform at least one opportunistic or direct excavation and inspection of the buried, safety-related, carbon steel portions of the Auxiliary Feedwater and Compressed Air systems and at least three opportunistic or direct excavations and inspections of the buried, safety-related, carbon steel portions of the Service Water System.

If, as a result of the Soil Characterization Study, it is determined that the soil is not corrosive in the vicinity of all of the Auxiliary Feedwater, Service Water, and Compressed Air systems, Salem will perform at least one opportunistic or focused excavation and inspection on each of the respective systems every ten years during the period of extended operation.

If, as a result of the Soil Characterization Study, it is determined that the soil is corrosive in the vicinity of the Auxiliary Feedwater, Service Water, or Compressed Air systems, Salem will perform at least two opportunistic or focused excavations and inspections on the respective susceptible system(s) every ten years during the period of extended operation.

If, based on the results of the initial soil study, it is determined that the soil in the vicinity of any of the above in-scope systems is not considered corrosive, Salem will perform a second Soil Characterization Study within approximately 15 years of the original study. The results of the second soil study will be entered into the Corrective Action Program to verify and evaluate if any changes have occurred with respect to soil corrosivity and determine the appropriate actions required with respect to the need of any additional inspections. The results will also be used as further input into the BPP risk ranking methodology to ensure inspections are performed at locations of highest risk.

Additionally, Salem will replace and reroute above ground, approximately 125 feet of buried Auxiliary Feedwater System piping located inside the Unit 2 Fuel Transfer Tube Area prior to entering the period of extended operation.

Based on Salem's commitment to follow the NEI Industry Initiative and the focusing of inspections in areas of highest risk utilizing the results from a soil characterization study, the relative amounts of piping that will be inspected, replaced, rerouted above ground or mitigated through some other means (e.g. coating, backfill), will provide reasonable assurance that the carbon steel safety-related portions of the Auxiliary Feedwater, Service Water, and Compressed Air systems will continue to perform their intended functions through the period of extended operation.

Enclosure B

Salem Generating Station 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 Appendix A, Section A.2.1.22, "Buried Piping Inspection" on pages A-20 and A-21 is revised as shown below. These revisions supersede the revisions in PSEG's response to Salem RAI B.2.1.22-02, contained in PSEG letter LR-N10-0372 dated November 10, 2010, as shown below. Revisions are indicated with strikethroughs for deleted text and ***bolded italics*** for inserted text.

A.2.1.22 Buried Piping Inspection

The Buried Piping Inspection aging management program is an existing program that manages the external surface aging effects of loss of material for piping and components in a soil or groundwater (external) environment. The Salem buried component activities consist of preventive and condition-monitoring measures to manage, detect and monitor the loss of material due to external corrosion for piping and components in the scope of license renewal that are in a soil environment.

External inspections of buried components will occur opportunistically when they are excavated during maintenance.

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

1. ***A study will be performed prior to entering the period of extended operation to assess the possibility and benefits of installing a cathodic protection system, versus other mitigative and preventive actions.***

2. ***A soil characterization study will be performed prior to entering the period of extended operation to determine soil corrosivity in the vicinity of buried piping. The results of the study will be used as an input to the program so that inspections will be performed at the locations of highest risk.***

~~1~~***3.*** At least one (1) opportunistic or focused excavation and inspection will be performed on each of the ***Fire Protection System*** 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 safety-related portions of the Auxiliary Feedwater, Service Water, and Compressed Air systems within the scope of license renewal that have high-risk buried piping. A different segment for each system will be inspected in each ten year period.~~

4. ***The following inspections apply to buried, carbon steel, safety-related portions of the specified systems. A different segment for each system will be inspected in each ten year period.***

a. ***At least one (1) opportunistic or focused excavation and inspection on each of the Auxiliary Feedwater and Compressed Air systems during the ten (10) years prior to entering the period of extended operation.***

b. ***At least three (3) opportunistic or focused excavations and inspections of the Service Water System during the ten (10) years prior to entering the period of extended operation.***

c. ***If, as a result of the soil characterization study, it is determined that the soil is not corrosive in the vicinity of all of the Auxiliary Feedwater, Service Water, and Compressed Air systems, Salem will perform at least one (1) opportunistic or focused excavation and inspection on each of the respective systems every ten (10) years during the period of extended operation.***

d. ***If, as a result of the soil characterization study, it is determined that the soil is corrosive in the vicinity of the Auxiliary Feedwater, Service Water, or Compressed Air systems, Salem will perform at least two (2) opportunistic or focused excavations and inspections on the respective susceptible system(s) every ten (10) years during the period of extended operation.***

5. ***If, based on the results of the initial soil characterization study, it is determined that the soil is not corrosive in the vicinity of the Auxiliary Feedwater, Service Water, or Compressed Air systems, Salem will perform a second Soil Characterization Study within approximately fifteen (15) years of the original study. The results of the second soil study will be entered into the Corrective Action Program for evaluation.***

6. ***The buried Auxiliary Feedwater System piping located inside the Unit 2 Fuel Transfer Tube Area (approximately 125 feet) will be replaced and rerouted above ground prior to entering the period of extended operation.***

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

LRA Appendix B, Section B.2.1.22, "Buried Piping Inspection" on pages B-110 through B-113 is revised as shown below. These revisions supersede the revisions in PSEG's response to Salem RAI B.2.1.22-02, contained in PSEG letter LR-N10-0372 dated November 10, 2010, as shown below. Revisions are indicated with strikethroughs for deleted text and ***bolded italics*** for inserted text.

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.

Prior to entering the period of extended operation, Salem will perform a study to assess the possibility and benefits of installing a cathodic protection system, versus other mitigative and preventive actions. Salem will also perform a soil characterization study prior to entering the period of extended operation to determine information relating to soil corrosivity. Soil data collected during excavation and inspection of buried piping may be credited in the study if obtained within ten years prior to entry into the period of extended operation. The results of the study will be used as an input to the program so that inspections will be performed at the locations of highest risk.

External inspections of buried components using visual techniques will occur opportunistically when they are excavated during maintenance. 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 ***Fire Protection System*** 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 one (1) opportunistic or focused excavation and inspection will be performed on safety-related carbon steel portions of each of the Auxiliary Feedwater and Compressed Air systems during the ten (10) years prior to entering the period of extended operation.

At least three (3) opportunistic or focused excavations and inspections will be performed on safety-related carbon steel portions of the Service Water System during the ten (10) years prior to entering the period of extended operation.

If, as a result of the soil characterization study, it is determined that the soil is not corrosive in the vicinity of all of the Auxiliary Feedwater, Service Water, and Compressed Air systems, Salem will perform at least one (1) opportunistic or focused excavation and inspection on each of the respective systems every ten (10) years during the period of extended operation.

If, as a result of the soil characterization study, it is determined that the soil is corrosive in the vicinity of the Auxiliary Feedwater, Service Water, or Compressed Air systems, Salem will perform at least two (2) opportunistic or focused excavations and inspections on the respective susceptible system(s) every ten (10) years during the period of extended operation.

If, based on the results of the initial soil characterization study, it is determined that the soil in the vicinity of any of the in-scope buried piping is not considered corrosive, Salem will perform a second Soil Characterization Study within approximately fifteen (15) years of the original study. The results of the second soil study will be entered into the Corrective Action Program to verify and evaluate if any changes have occurred with respect to soil corrosivity and determine the appropriate actions required with respect to the need for any additional inspections. The results of the study will be used as an input to the program so that inspections will be performed at the locations of highest risk.

The above inspections will be performed such that a different segment will be inspected during each ten year period.

Additionally, Salem will replace and reroute above ground, approximately 125 feet of buried Auxiliary Feedwater System piping located inside the Unit 2 Fuel Transfer Tube Area prior to entering 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 safety-related portions of the Auxiliary Feedwater, Service Water, and Compressed Air systems within the scope of license renewal. A different segment for each system will be inspected in each ten year period.~~

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, with activities performed in accordance with the schedule as described below:

1. ***A study will be performed prior to entering the period of extended operation to assess the possibility and benefits of installing a cathodic protection system, versus other mitigative and preventive actions. Program Elements Affected: Preventive Actions (Element 2)***

2. ***A soil characterization study will be performed prior to entering the period of extended operation to determine soil corrosivity in the vicinity of buried piping. The results of the study will be used as an input to the program so that inspections will be performed at the locations of highest risk. Program Elements Affected: Detection of Aging Effects (Element 4)***

~~1~~3. ***At*** least one (1) opportunistic or focused excavation and inspection on each of the ***Fire Protection System*** 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 safety-related portions of the Auxiliary Feedwater, Service Water, and Compressed Air systems within the scope of license renewal. A different segment for each system will be inspected in each ten year period. **Program Elements Affected: Detection of Aging Effects (Element 4)**~~

4. ***The following inspections apply to buried, carbon steel, safety-related portions of the specified systems. A different segment for each system will be inspected in each ten year period.***

    a. ***At least one (1) opportunistic or focused excavation and inspection on each of the Auxiliary Feedwater and Compressed Air systems during the ten (10) years prior to entering the period of extended operation. Program Elements Affected: Detection of Aging Effects (Element 4))***

    b. ***At least three (3) opportunistic or focused excavations and inspections of the Service Water System during the ten (10) years prior to entering the period of extended operation.***

    c. ***If, as a result of the soil characterization study, it is determined that the soil is not corrosive in the vicinity of all of the Auxiliary Feedwater, Service Water, and Compressed Air systems, Salem will perform at least one (1) opportunistic or focused excavation and inspection on each of the respective systems every ten (10) years during the period of extended operation. Program Elements Affected: Detection of Aging Effects (Element 4)***

    d. ***If, as a result of the soil characterization study, it is determined that the soil is corrosive in the vicinity of the Auxiliary Feedwater, Service Water, or Compressed Air systems, Salem will perform at least two (2) opportunistic or focused excavations and inspections on the respective susceptible system(s) every ten (10) years during the period of extended operation. Program Elements Affected: Detection of Aging Effects (Element 4)***

5. ***If, based on the results of the initial soil characterization study, it is determined that the soil is not corrosive in the vicinity of the Auxiliary Feedwater, Service Water, or Compressed Air systems, Salem will perform a second Soil Characterization Study within approximately fifteen (15) years of the original study. The results of the second soil study will be entered into the Corrective Action Program for evaluation.***

6. ***The buried Auxiliary Feedwater System piping located inside the Unit 2 Fuel Transfer Tube Area (approximately 125 feet) will be replaced and rerouted above ground prior to entering the period of extended operation. Program Elements Affected: Preventive Actions (Element 2)***

Operating Experience

Operating experience shows that the program described is effective in managing corrosion of external surfaces of buried steel piping. As the inspection frequency is plant-specific and depends on the plant operating experience, the Salem plant-specific operating experience is further evaluated for the extended period of operation. Demonstration that the effects of aging are effectively managed is achieved through objective evidence that shows that loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion are being adequately managed. The following

examples of operating experience provide objective evidence that the Buried Piping Inspection program will be effective in assuring that intended function(s) would be maintained consistent with the CLB for the period of extended operation:

1. In 2004, buried carbon steel piping in the Salem Unit 1 Fuel Oil System was excavated to repair leakage at a welded joint. The socket-welded joint was not properly wrapped with a protective tape. The wrap for this joint was originally missing altogether and the leakage was caused by direct exposure to groundwater and subsequent corrosion, not by aging. The joint was repaired and proper wrapping was applied. No further problem has been identified with this or any other portions of the buried carbon steel piping of the Fuel Oil System. The affected portion of the Fuel Oil System was not in scope for license renewal. This example provides objective evidence that buried piping is opportunistically inspected whenever they are excavated for maintenance, and that corrective actions are taken prior to loss of intended function.

2. In 2001, a section of the buried No. 12 service water piping at Salem Unit 1 was excavated to determine the cause of leakage. The cause of leakage was a break in the steel bell ring, which is installed over one pipe joint section of the service water piping. The apparent cause of this break was due to external loads from the road surface, and not caused by age-related degradation. The break was repaired and the external concrete coating was reapplied. Additionally, a Ram-Neck sealant was reapplied over the entire section of the bell, to prevent water intrusion. This sealant had to be replaced because of being displaced at the leak site. Additionally, the Ram-Neck sealant was top-coated with a flexible paint. Also, a WEKO seal was installed (internally) over the steel bell ring. An extent of condition study, as well as internal corrosion of some other bell-and-spigot joints, resulted in installation of WEKO seals on bell-and-spigot joints for all service water headers internally. With the exception of No. 11 service water header, all service water header joints now incorporate WEKO seals. Work on No. 11 service water header joints is planned for 2010.

   During this excavation, a section of coated carbon steel piping that discharges the backwash of the service water strainers was excavated and no deficiencies were identified.

   This provides objective evidence that excavation and inspection of piping and components have been occurring opportunistically at Salem.

3. In 2008, risk ranking of buried piping at Salem revealed that portions of the carbon steel Service Water piping were determined to be high risk. As a result, a plan was developed to conduct inspection of the external coated carbon steel through-wall penetrations of the 24-inch service water underground spools at the Service Water Intake Structure, entrance and exit of the pipe tunnel, entrance to the Auxiliary Building and entrance to the Diesel Building. Further evaluation is underway to determine if this inspection can be performed using non-destructive examination of piping (from the inside diameter) or if excavation will be required.

This inspection, which is scheduled to take place during a refueling outage in October of 2009, provides objective evidence that an appropriate risk ranking methodology is in place and that focused inspection of the outer coating of the buried steel piping was planned as part of this aging management program.

A review of plant operating experience showed that excavation of buried piping has occurred, and no instances of significant age related deficiencies were documented. Problems identified would not cause significant impact to the safe operation of the plant, and adequate corrective actions were taken to prevent recurrence. There is sufficient confidence that the implementation of the Buried Piping Inspection program will effectively identify degradation prior to failure. The work planning process provides instructions to do exterior surface inspections when excavations occur. Appropriate guidance for re-evaluation, repair, or replacement is provided for locations where degradation is found. Assessments of the Buried Piping Inspection program are planned, to identify the areas that need improvement to maintain the quality performance of the program.

Conclusion

The enhanced Buried Piping Inspection aging management program will provide reasonable assurance that loss of material aging effects will be adequately managed so that the intended functions of components within the scope of license renewal will be maintained consistent with the current licensing basis during the period of extended operation.

Enclosure C

Salem Generating Station License Renewal Commitments Updates

Note: To facilitate understanding, portions of the original LRA Appendix A, Table A.5, License Renewal Commitment List", have been repeated in this Enclosure, with revisions indicated. Existing text is shown in normal font. Changes are highlighted with ***bolded italics*** for inserted text and strikethroughs for deleted text.

LRA Appendix A, Table A.5, "License Renewal Commitment List", commitment 22 on page A-65 is revised as shown below. These revisions supersede the revisions in PSEG's response to Salem RAI B.2.1.22-02, contained in PSEG letter LR-N10-0372 dated November 10, 2010, as shown below. Any other actions described in this submittal represent intended or planned actions. They are described for the NRC's information and are not regulatory commitments. Revisions are indicated with strikethroughs for deleted text and ***bolded italics*** for inserted text.

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	Buried Piping Inspection is an existing program that will be enhanced to include: ***1. A cathodic protection study will be performed prior to entering the period of extended operation to assess the possibility and benefits of installing a system, versus other mitigative and preventive actions.*** ***2. A soil characterization study will be performed prior to entering the period of extended operation to determine soil corrosivity in the vicinity of buried piping. The results of the study will be used as an input to the program so that inspections will be performed at the locations of highest risk.*** ~~1~~***3.*** At least one (1) opportunistic or focused excavation and inspection will be performed on each of the ***Fire Protection System*** 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.	A.2.1.22	Program to be enhanced prior to the period of extended operation. Inspection Schedule identified in Commitment	Section B.2.1.22 Salem Letter LR-N10-0322 RAI B.2.1.22 Salem Letter LR-N10-0372 RAI B.2.1.22-02 ***Salem Letter LR-N10-0444 RAI B.2.1.22-03***

NO.	PROGRAM OR TOPIC	COMMITMENT	UFSAR SUPPLEMENT LOCATION (LRA APP. A)	ENHANCEMENT OR IMPLEMENTATION SCHEDULE	SOURCE
		~~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 safety-related portions of the Auxiliary Feedwater, Service Water, and Compressed Air systems within the scope of license renewal. A different segment for each system will be inspected in each ten year period.~~ ***4. The following inspections apply to buried, carbon steel, safety-related portions of the specified systems. A different segment for each system will be inspected in each ten year period.*** ***a. At least one (1) opportunistic or focused excavation and inspection on each of the Auxiliary Feedwater and Compressed Air systems during the ten (10) years prior to entering the period of extended operation.*** ***b. At least three (3) opportunistic or focused excavations and inspections of the Service Water System during the ten (10) years prior to entering the period of extended operation.***			

NO.	PROGRAM OR TOPIC	COMMITMENT	UFSAR SUPPLEMENT LOCATION (LRA APP. A)	ENHANCEMENT OR IMPLEMENTATION SCHEDULE	SOURCE
		c. If, as a result of the soil characterization study, it is determined that the soil is not corrosive in the vicinity of all of the Auxiliary Feedwater, Service Water, and Compressed Air systems, Salem will perform at least one (1) opportunistic or focused excavation and inspection on each of the respective systems every ten (10) years during the period of extended operation. *d. If, as a result of the soil characterization study, it is determined that the soil is corrosive in the vicinity of the Auxiliary Feedwater, Service Water, or Compressed Air systems, Salem will perform at least two (2) opportunistic or focused excavations and inspections on the respective susceptible system(s) every ten (10) years during the period of extended operation.* *5. If, based on the results of the initial soil characterization study, it is determined that the soil is not corrosive in the vicinity of the Auxiliary Feedwater, Service Water, or Compressed Air systems, Salem will perform a second Soil Characterization Study within*			

NO.	PROGRAM OR TOPIC	COMMITMENT	UFSAR SUPPLEMENT LOCATION (LRA APP. A)	ENHANCEMENT OR IMPLEMENTATION SCHEDULE	SOURCE
		approximately fifteen (15) years of the original study. The results of the second soil study will be entered into the Corrective Action Program for evaluation. *6. The buried Auxiliary Feedwater System piping located inside the Unit 2 Fuel Transfer Tube Area (approximately 125 feet) will be replaced and rerouted above ground prior to entering the period of extended operation.*			