



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION I  
475 ALLENDALE ROAD  
KING OF PRUSSIA, PA 19406-1415

May 23, 2011

Mr. Paul Freeman  
Site Vice President  
NextEra Energy Seabrook LLC  
P. O. Box 300  
Seabrook, NH 03874

SUBJECT: NEXTERA ENERGY SEABROOK - NRC LICENSE RENEWAL INSPECTION  
REPORT 05000443/2011007

Dear Mr. Freeman:

On April 8, 2011, the NRC completed the onsite portion of the inspection of your application for license renewal of Seabrook Station. The NRC inspection is one of several inputs into the NRC review process for license renewal applications. The enclosed report documents the results of the inspection, which were discussed on March 28<sup>th</sup> and April 8<sup>th</sup> with members of your staff.

The purpose of this inspection was to examine the plant activities and documents that support the application for a renewed license of Seabrook Station. Inspectors reviewed the screening and scoping of non-safety related systems, structures, and components, as required in 10 CFR 54.4(a)(2), to determine if the proposed aging management programs are capable of reasonably managing the effects of aging.

The inspection team concluded screening and scoping of non-safety related systems, structures, and components, was implemented as required in 10 CFR 54.4(a)(2), and the aging management portion of the license renewal activities were conducted as described in the License Renewal Application.

We noted that your staff continued to develop an appropriate initial response to the aging effect of the alkali-silica reaction in certain concrete structures of Seabrook Station. Because your investigation and testing was ongoing and you were not currently in a position to propose a new or revised aging management program, the inspection team was unable to arrive at a conclusion about the adequacy of your aging management review for the alkali-silica reaction issue. As part of the ongoing review of your application for a renewed license, you should continue to inform the Division of License Renewal as you develop your response to the alkali-silica reaction issue. With assistance from our Headquarters Office, Region I will review those key points in the implementation of your project plan associated with this issue to ensure the current licensing bases is maintained, a key assumption in the license renewal process.

Except for the alkali-silica reaction issue, the inspection results support a conclusion of reasonable assurance with respect to managing the effects of aging in the systems, structures, and components identified in your application. The inspection also concluded the documentation supporting the application was in an auditable and retrievable form.

P. Freeman

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Sincerely,



Richard J. Conte, Chief  
Engineering Branch 1  
Division of Reactor Safety

Docket No. 50-443  
License No. NPF-86

Enclosure: Inspection Report 05000443/2011007

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Sincerely,

/RA/

Richard J. Conte, Chief  
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U. S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket No: 50-443

License No: NPF-86

Report No: 05000443/2011007

Licensee: NextEra Energy Seabrook LLC

Facility: Seabrook Station

Location: Seabrook, NH

Dates: March 7-11, 21-25, and April 4-8, 2011

Inspectors: M. Modes, Team Leader, Division of Reactor Safety (DRS)  
G. Meyer, Sr. Reactor Inspector, DRS  
S. Chaudhary, Reactor Inspector, DRS  
J. Lilliendahl, Reactor Inspector, DRS

Approved By: Richard J. Conte, Chief  
Engineering Branch 1  
Division of Reactor Safety

## SUMMARY OF FINDINGS

IR 05000443/2011007; March 7-11, 21-25, and April 4-8, 2011, Seabrook Station; Inspection of the Scoping of Non-Safety Systems and the Proposed Aging Management Procedures for the NextEra Energy Seabrook LLC Application for Renewed License for Seabrook Station.

This inspection of license renewal activities was performed by four regional office engineering inspectors. The inspection was conducted in accordance with NRC Manual Chapter 2516 and NRC Inspection Procedure 71002. This inspection did not identify any "findings" as defined in NRC Manual Chapter 0612. The inspection team concluded screening and scoping of non-safety related systems, structures, and components, were implemented as required in 10 CFR 54.4(a)(2), and the aging management portions of the license renewal activities were conducted as described in the License Renewal Application. Except for the alkali-silica reaction issue, the inspection results support a conclusion of reasonable assurance with respect to managing the effects of aging in the systems, structures, and components identified in your application. The inspection concluded the documentation supporting the application was in an auditable and retrievable form.

## REPORT DETAILS

40A2 Other - License Renewala. Inspection Scope

This inspection was conducted by NRC Region I based inspectors in order to evaluate the thoroughness and accuracy of the screening and scoping of non-safety related systems, structures, and components, as required in 10 CFR 54.4(a)(2) and to evaluate whether aging management programs will be capable of managing the identified aging effect in a reasonable manner.

The team selected a number of systems for review, using the NRC accepted guidance; in order to determine if the methodology applied by the applicant appropriately captured the non-safety systems affecting the safety functions of a system, component, or structure within the scope of license renewal.

The team selected a sample of aging management programs to verify the adequacy of the applicant's documentation and implementation activities. The selected aging management programs were reviewed to determine whether the proposed aging management implementing process would adequately manage the effects of aging on the system.

The team selected risk significant systems and conducted a review of the Aging Management Basis documents for each selected system to determine if the applicant had adequately applied the Aging Management Programs to ensure that reasonable assurance exists for the monitoring of aging effects on the selected systems.

The team reviewed supporting documentation and interviewed applicant personnel to confirm the accuracy of the license renewal application conclusions. For a sample of plant systems and structures, the team performed visual examinations of accessible portions of the systems to observe aging effects.

a.1. Scoping of Non Safety-Related Systems, Structures, and Components under 10 CFR 54.4 (a) (2)

For scoping the team reviewed program guidance procedures and summaries of scoping results for Seabrook Station to assess the thoroughness and accuracy of the methods used to bring systems, structures, and components within the scope of license renewal into the application, including non-safety-related systems, structures, and components, as required in 10 CFR 54.4 (a)(2). The team determined that the procedures were consistent with the NRC accepted guidance in Sections 3, 4, and 5 of Appendix F to Nuclear Energy Institute (NEI) 95-10, Rev. 6, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54," (Section 3: non-safety-related systems, structures, and components within scope of the current licensing basis; Section 4: non-safety-related systems, structures, and components directly connected to safety-related systems, structures, and components; and Section 5: non-safety-related systems, structures, and components not directly connected to safety-related systems, structures, and

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components). The team noted that scoping guidance was not clear regarding structural descriptions. By drawing reviews and in-plant walk-downs, the team identified that the few scoping errors related to the guidance inconsistencies were conservative, i.e., components were placed within the scope of license renewal which were not required to be included. Subsequently, the applicant revised the scoping guidance, and the team reviewed the revised guidance.

The team reviewed the set of license renewal drawings submitted with the Seabrook Station License Renewal Application, which was color-coded to indicate non-safety related systems and components in scope for license renewal. The drawings included numerous explanatory notes, which described the basis for scoping determinations on the drawings. The team interviewed personnel, reviewed license renewal program documents, and independently inspected numerous areas within Seabrook Station, to confirm that appropriate non-safety-related systems, structures, and components had been included within the license renewal scope; that systems, structures, and components excluded from the license renewal scope had an acceptable basis; and that the boundary for determining license renewal scope within the systems, including seismic supports and anchors, was appropriate.

The Seabrook Station in-plant areas reviewed included the following:

- Turbine Building
- Primary Auxiliary Building
- East Main Steam & Feedwater Pipe Chase
- West Main Steam & Feedwater Pipe Chase
- Control Building
- Service Water Pumphouse
- Emergency Feedwater Pumphouse and Pre-Action Valve Building
- Steam Generator Blowdown Building
- Emergency Diesel Generator Room B
- RCA Tunnel
- Tank Farm Area

For systems, structures, and components selected regarding spatial interaction (failure of non-safety-related components adversely affecting adjacent safety-related components), the team determined the in-plant configuration was accurately and acceptably categorized within the license renewal program documents. The team determined the personnel involved in the process were knowledgeable and appropriately trained.

For systems, structures, and components selected regarding structural interaction (seismic design of safety-related components dependent upon non-safety-related components), the team determined that structural boundaries had been accurately determined and categorized within the license renewal program documents. The team determined that the applicant had thoroughly reviewed applicable isometric drawings to determine the seismic design boundaries and had correctly included the applicable components in the license renewal application, based on the inspector's independent

review of a sample of the isometric drawings and the seismic boundary determinations combined with in-plant review of the configurations.

In summary, the team concluded that the applicant had implemented an acceptable method of scoping of non-safety-related systems, structures, and components and that this method resulted in accurate scoping determinations.

a. 2. Programs

B.2.1.9 Bolting Integrity

The Seabrook Station Bolting Integrity Program is an existing program that manages the aging effects of cracking due to stress corrosion cracking, loss of material due to general, crevice, pitting, and galvanic corrosion; Microbiologically induced corrosion, fouling and wear; and loss of preload due to thermal effects, gasket creep, and self-loosening associated with bolted connections. The program manages these aging effects through the performance of periodic inspections. The program also includes repair/replacement controls for ASME Section XI related bolting and generic guidance for material selection, thread lubrication and assembly of bolted joints.

The inspector reviewed the program basis documents, program description, baseline inspection results, subsequent inspection results for trending, and implementing procedures to determine the scope and technical adequacy of the Program. Also, the team reviewed action requests (ARs) to assess the adequacy of evaluations of findings, and resolution of concerns, if any, identified in these inspections.

The inspector noted that the program follows the guidelines and recommendations provided in NUREG-1339, "Resolution of Generic Safety Issue 29; Bolting Degradation or Failure of Bolting in Nuclear Power Plants", EPRI NP-5769, "Degradation and Failure of Bolting in Nuclear Power Plants" (with the exceptions noted in NUREG- 1339), and EPRI TR-104213, "Bolted Joint Maintenance and Application Guide" for comprehensive bolting maintenance. However, indications of aging identified in ASME pressure retaining bolting during In-service Inspection are evaluated per ASME Section XI, Subsections 3600. Indications of aging identified in other pressure retaining bolting, nuclear steam supply system component supports, or structural bolting are evaluated through the Corrective Action Program.

This program covers bolting within the scope of license renewal, including:

1. safety- related bolting,
2. bolting for nuclear steam supply system component supports,
3. bolting for other pressure retaining components, including non-safety related bolting; and,
4. structural bolting.

The aging management of reactor head closure studs is addressed by Seabrook Station Reactor Head Closure Studs Program (B.2.1.3) and is not part of this program

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### B.2.1.13 Inspection of Overhead Heavy Load And Light Load (Related To Refueling) Handling Systems

The Seabrook Station Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program is an existing program that will be enhanced to manage the aging effects of loss of material due to general corrosion and due to wear of structural components of lifting systems and the effects of loss of material due to wear on the rails in the rail system, for lifting systems within the scope of license renewal. Included in scope are those cranes encompassed by the Seabrook Station commitments to NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," plus two cranes related to fuel handling.

The team reviewed the program basis documents, program description, baseline inspection results, subsequent inspection results for trending, and implementing procedures to determine the scope and technical adequacy of the Program. Also, the team reviewed ARs and work orders to assess the adequacy of evaluations of findings, and resolution of concerns, if any, identified in these inspections.

The team noted that the program manages loss of material due to general corrosion on structural steel members and rails of the cranes within the scope of license renewal including the structural steel members of the bridges, trolleys and monorails. The program also manages loss of material due to wear on rails. Only the structural portions of the in-scope cranes and monorails are in the scope of this program. The individual components of these overhead handling systems that are subject to periodic replacement, or those which perform their intended function through moving parts or a change in configuration, are not in the scope of this program.

Structural inspections are conducted under the Seabrook Station lifting systems manual. Periodic inspections are conducted at the frequencies, and include the applicable items, delineated in ANSI B30.2, "Overhead and Gantry Cranes," ANSI B30.11, "Monorails and Under hung Cranes," ANSI B30.16, "Overhead Hoists (Under-hung)," and ANSI B30.17, "Overhead and Gantry Cranes (Top Running Bridge, Single Girder, Under-hung Hoist)" for a periodic inspection and in accordance with the manufacturer's recommendations. Inspections are conducted yearly. All periodic inspections are documented on work orders.

The enhancement to the program includes:

1. The Seabrook Station Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program Lifting System Manual will be enhanced to include monitoring of general corrosion on the crane and trolley structural components and the effects of wear on the rails in the rail system;
2. The Seabrook Station Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program Lifting Systems Manual will be enhanced to list additional cranes related to the refueling handling system.

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### B.2.1.16 Fire Water System

The Fire Water System Program is an existing program modified to manage the effects of aging on fire water system components through detailed inspections. Specifically, the program manages the following aging effects: loss of material due to general, crevice, pitting, galvanic, and microbiologically influenced corrosion; fouling; and reduction of heat transfer due to fouling of the Fire Water System components.

The Seabrook Station Fire Water System Program manages aging of the following system components: sprinklers, nozzles, fittings, filters, valves, hydrants, hose stations, flow gages and flow elements, pumps, standpipes, aboveground and underground piping and components, water storage tanks, and heat exchangers.

The Seabrook Station Fire Protection Manual incorporates activities, such as inspections, flushing, and testing, that serve to prevent or manage aging of the fire water system. Specific examples include: inspections of fire hydrants, fire hydrant hose hydrostatic tests, gasket inspections, and fire hydrant flow tests.

The Seabrook Station procedures are being enhanced to require the following: inspection sampling or replacing of sprinklers after 50 years of service, flow testing of the fire water system in accordance with National Fire Protection Association (NFPA) 25 guidelines, and periodic visual or volumetric inspection of the internal surface of the fire protection system.

The team interviewed the system engineer to understand historical and current conditions of the system. The team reviewed the current program and existing maintenance/surveillance procedures to verify the adequacy of the program for detecting and managing aging effects. The team reviewed condition reports to verify that all known aging effects will be managed by the new program. The team conducted a walkdown of accessible portions of system including the electrical penetration area, cable spreading room, water storage tanks, and fire pumps to assess the material condition of the accessible fire water system piping.

Based on questions from the team, the applicant modified the application to specify that the flow testing will be done in accordance with the 2002 version of NFPA 25. (License Renewal Application change letter SBK-L-11063). Also, based on questions from the team, the applicant modified the application to correct the types of fire water buried piping. The original application stated that the fire water piping was polyvinylchloride and carbon steel. The correct materials were determined to be fiberglass and carbon steel (License Renewal Application change letter SBK-L-11054).

#### B.2.1.17 Aboveground Steel Tanks

The Aboveground Steel Tanks aging management program is a new program used to manage the aging effects of the external surfaces of five aboveground steel tanks within the scope of license renewal. The five tanks within scope are:

- Auxiliary Boiler Fuel Oil Storage Tank 1-AB-TK-29
- Fire Protection Fuel Oil Tank 1-FP-TK-35-A
- Fire Protection Fuel Oil Tank 1-FP-TK-35-B
- Fire Protection Water Storage Tank 1-FP-TK-36-A
- Fire Protection Water Storage Tank 1-FP-TK-36-B

The Auxiliary Boiler Fuel Oil Storage Tank 1-AB-TK-29 has been abandoned. It is included in the application as part of the planning to renovate the tank and return it to service. All the tanks have protective coatings. The Fire Protection Water Storage Tanks are placed on a concrete pad, leveled using oiled sand, and the edges caulked.

The inspector walked-down each of the above tanks. The path chosen by NextEra to monitor this area was tank level monitoring. For example, blistered paint, with rust and rust stains was noted on Fire Protection Storage Tanks. The tank bottom to concrete pad intersection was caulked; however, there was evidence of cracking and peeling of the caulk. Moisture was present at this intersection and it was not possible to tell if the water was from the tank or local inclement weather conditions. The inspector verified the blistered paint with rust, and rust staining was noted in the corrective action program. The inspector also determined, as evidenced by the documented results, that daily operator surveillance included the water level of the Fire Protection Storage Tanks. If the moisture at the bottom of the tank represented a leak, it would be reflected in an unanticipated change in level.

The Aboveground Steel Tanks program is credited with managing loss of material on the tank external surfaces including the exterior bottom surface of tanks that is not accessible for direct visual inspection. The outer surfaces of the tanks, up to the surface in contact with the concrete foundation, are managed by visual inspection. Ultrasonic thickness gauging will be used to monitor loss of material on the inaccessible tank bottom external surfaces.

#### B.2.1.20 One-Time Inspection

The One-Time Inspection Program is a new, one-time program for Seabrook Station that will be implemented prior to the period of extended operation. The program will verify the effectiveness of other aging management programs, including Water Chemistry, Fuel Oil Chemistry, and Lubricating Oil Analysis Programs, by reviewing various aging effects for impact. Where corrosion resistant materials and/or non-corrosive environments exist, the One-Time Inspection Program is intended to verify that an aging management program is not needed during the period of extended operation by confirming that aging effects are not occurring or are occurring in a manner that does not affect the safety function of systems, structures, and components. Non-destructive examinations will be performed

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by qualified personnel using procedures and processes consistent with the approved plant procedures and appropriate industry standards.

The team reviewed application section B.2.1.20, results of the NRC aging management program audit, and applicant responses to requests for additional information (RAIs). The team reviewed the aging management program basis document and draft implementing guidance, discussed the planned activities with the responsible staff, including sampling plan, and reviewed a sample of corrective action program documents for applicable components.

#### B.2.1.21 Selective Leaching of Materials

The Selective Leaching of Materials Program is a new, one-time program for Seabrook Station that will be implemented prior to the period of extended operation. The program is credited with managing the aging of components made of gray cast iron, copper alloys with greater than 15% zinc, and aluminum bronze with greater than 8% aluminum, exposed to raw water, treated water, and soil environments, which may lead to the selective leaching of material constituents, e.g., graphitization and dezincification. The program will include a one-time visual inspection and hardness measurement test of selected components that may be susceptible to selective leaching to determine whether loss of material due to selective leaching is occurring, and whether the leaching process will affect the ability of the components to perform their intended function during the period of extended operation. In 1998 Seabrook operating experience identified selective leaching on aluminum bronze components in sea water. As such, Seabrook will include periodic inspections for selective leaching of aluminum bronze as part of this aging management program.

The team reviewed application section B.2.1.21, results of the NRC aging management program audit, and applicant responses to requests for additional information (RAIs). The team reviewed the aging management program basis document and draft implementing guidance, discussed the planned activities with the responsible staff, including sampling plan, and reviewed a sample of corrective action program documents for applicable components and for corrective actions to the selective leaching of aluminum bronze.

#### B.2.1.22 Buried Piping and Tanks Inspection

The Seabrook Station Buried Piping and Tanks Inspection Program is a new program that includes coating, cathodic protection, and backfill quality as preventive measures to mitigate corrosion. Periodic inspections manage the aging effects of corrosion on buried piping in the scope of license renewal. Buried steel and stainless piping has an external protective coating consisting of coal-tar primer, coal-tar enamel, asbestos felt or fibrous glass mat, and a wrapping of kraft paper or coat of whitewash. Some hot-applied tape coating was also used. Coatings were fabricated and applied in accordance with the requirements of American Water Works Association specification C203 and this required "holiday" (flaws in coating) testing.

Backfill was applied in accordance with Seabrook Specification 9763-8-1, "Bedding, Backfilling and Compaction for Miscellaneous Non Safety Related Piping" and 9763-8-5 "Bedding, Backfilling and Compaction for Safety Related Systems and Structures". Except for the allowance of backfill at a size of 1 ½" the backfill is equal to or better than the GALL Revision 2 proposal of ASTM D 448-08 Size 67. As a consequence, NextEra is proposing inspection in conformance with an acceptable backfill limit until a discovery is made of coating damage. For steel with cathodic protection, they propose 1 inspection. If backfill damage is discovered, they will increase this by another 3 samples. For steel without cathodic protection, they propose 4 inspections; and if backfill damage is discovered, they will expand by another 4 inspections.

The team reviewed cathodic protection system reports and determined the system was in disrepair since being identified as unreliable in 1993. The system was not restored until 2007 when a survey found that only 62% of the areas surveyed were being mitigated by cathodic protection. During the first quarter of 2009 the cathodic protection system was finally categorized as green (or satisfactory condition). The cathodic protection system was made a Maintenance Rule (10 CFR 50.65) System during the same quarter.

There is an adequate historical basis to conclude that buried piping was adequately protected, and the backfill correctly specified and filled, during construction. There is an absence of buried piping problems at the site. Because there was an absence of a consistent cathodic protection for a period of 1993 to 2009, it is appropriate for NextEra to inspect buried piping by excavation to corroborate the historical basis.

#### B.2.1.23 One-Time Inspection of ASME Code Class 1 Small Bore Piping

The One-Time Inspection of ASME Code Class 1 Small Bore Piping Program is a new program that manages the aging effect of cracking in stainless steel small-bore ASME Code Class 1 piping less than 4 inches nominal pipe size, including pipe, fittings, and branch connections. Seabrook has not experienced a small bore piping failure due to stress corrosion or thermal and mechanical loading. The small bore piping selected for insonification is based on EPRI Report 1011955, "Management of Thermal Fatigue in Normally Stagnant Non-Isolable Reactor Coolant System Branch Lines (MRP-146)", issued June 2005 and the supplemental guidance issued in EPRI Report 1018330, "Management of Thermal Fatigue in Normally Stagnant Non-isolable Reactor Coolant System Branch Lines – Supplemental Guidance (MRP-146S) issued December of 2008.

Using these criteria the applicant has identified 448 welds, of which 157 are socket welds (including 58 in-core instrument guide tube welds) and 291 butt welds. In this population there are 6 small bore stagnant segments susceptible to thermal fatigue. These are in the two charging lines and four high head safety injection lines. These locations are monitored.

Twenty-Nine (29) welds (4 socket and 25 butt welds) have been identified in the 448 candidates as vulnerable to cracking. These will be tested using ultrasonic inspection not sooner than 10 years before the extended period of operation.

#### B.2.1.25 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (Internal Surfaces) Program is a new program that will inspect the internals of piping, piping components, ducting, and other components of various materials to manage the aging effects of cracking, loss of material, reduction of heat transfer, and hardening of elastomers. The inspections of opportunity will occur during maintenance and surveillance activities when systems are opened.

The team reviewed application section B.2.1.25, draft NRC aging management program audit, and applicant responses to requests for additional information (RAIs). The team reviewed the aging management program basis document, operating experience review documents, draft implementing guidance, and relevant condition reports. The team interviewed applicable plant personnel.

#### B.2.1.26 Lubricating Oil Analysis

The Lubricating Oil Analysis Program is an existing program, which maintains oil systems free of contaminants (primarily water and particulates), thereby preserving an environment that is not conducive to loss of material, cracking, or fouling. The applicant performs sampling, analysis, and trending of results on numerous systems to provide an early indication of adverse equipment condition in the lubricating oil environment. The applicant samples the lubricating oil for most of the affected equipment on frequencies recommended by the vendor.

The team reviewed application section B.2.1.26, draft NRC aging management program audit, and applicant responses to requests for additional information (RAIs). The team reviewed the aging management program basis document, operating experience review documents, existing procedures, relevant condition reports, and system health reports. The team interviewed plant personnel and sampled oil measurement results and trending within the applicant's database. Further, the team performed walk downs of the lubricating oil components of B emergency diesel generator.

The team identified an issue regarding the existing lubricating oil practice on testing for water content. Specifically, the applicant tests for water content on lubricating oil for pumps and motors when these components are water-cooled and have the potential for water contamination. Nonetheless, the team identified that the lubricating oil and hydraulic fluid samples of charging pump 1-CS-P-128 were not being tested for water content despite the pump being water-cooled. The applicant issued Action Request 01632769 to correct the testing for water content on this pump, to confirm test packages for other components are correct, and to review the testing for water content of all pumps and motors as part of the enhancement to the program to provide a program attachment with the required equipment and the specified sample analyses and frequency.

#### B.2.1.27 ASME Section XI, Subsection IWE

The ASME Section XI, Subsection IWE aging management program is an existing program, credited in the LRA, which provides for inspecting the reactor building liner plate and related components for loss of material, loss of pressure retaining bolting preload, cracking due to cyclic loading, loss of sealing, and leakage through seals, gaskets and moisture barriers in accordance with ASME Section XI. Areas of the reactor building adjacent to the moisture barrier and the moisture barrier are subject to augmented examination.

The team reviewed applicable procedures, the latest Inservice Inspection program results and interviewed the Inservice Inspection program manager. The team reviewed a sample of recent corrective action reports from Section IWE examinations.

The team concluded that the Inservice Inspection program was in place, had been implemented, was an on-going program subject to NRC review, and included the elements identified in the license renewal application.

#### B.2.1.28 ASME Section XI, Subsection IWL

The Seabrook Station ASME Section XI, Subsection IWL Program is an existing program that manages the aging effects of cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel, expansion and cracking due to reaction with aggregates, increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack, and increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide.

The team reviewed the program basis documents, program description, baseline inspection results, subsequent inspection results for trending, and implementing procedures to determine the scope and technical adequacy of the Program. Also, the team reviewed ARs to assess the adequacy of evaluations of findings, and resolution of concerns, if any, identified in these inspections.

The team observed that the program complies with the requirements of ASME Section XI, Sub-Section IWL, "Requirements for Class CC Concrete Components of Light-Water Cooled Power Plants". The components examination contained in 10 CFR 50.55a in accordance with ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWL managed by the program include steel reinforced concrete for the Seabrook Station containment building and complies with the requirement for examination contained in 10 CFR 50.55a in accordance with ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWL.

The primary inspection method used at Seabrook Station is VT-1C visual examination, VT-3C visual examination, and alternative examination methods (in accordance with IWA-2240). The Seabrook Station ASME Section XI, Subsection IWL Program provides acceptance criteria and corrective actions for each exam type. The team noted, for this program and the structures monitoring program, a technically acceptable trending system was not implemented to establish the status of observed cracks (stable or active), and

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qualification and certification of inspectors/examiners was not explicitly established and documented to assure assignment of qualified individuals for inspection. The inspection personnel selection is left to the supervisor of the group. Also, there was a lack of clear quantitative acceptance/evaluation criteria established by the procedure to assure consistency in observation, evaluation, and assessment of inspection results by different inspectors and technical personnel/engineers and at different times. This program will be further enhanced with revised implementing procedures to include definition of "Responsible Engineer" (letter SBK-L-10204, RAI B.2.1.28-3, Commitment No. 31) and trending information and acceptance criteria (same letter, RAI B.2.1.28-1).

Concrete degradation due to alkali-silica reaction is an aging effect that was recently discovered for Seabrook Station. In addition to the control building, it had been noted in other buildings such as Emergency Diesel Generator Building, and the Residual Heat Removal Vault (see additional details in the section b of this report). The Team reviewed applicant photographs of pattern cracking on the primary containment wall in the annulus region. The annulus region appears to have had approximately six feet of water for an extended period of time due to groundwater infiltration. NextEra plans to keep the area drained (Letter SBK-L-11063 commitment No. 52) and to review, analyze, and assess the effect of this condition in order to determine the cause on the primary containment (AR 01641413, Cracked Crack Pattern On Containment In Annulus Area).

#### B.2.1.31 Structures Monitoring Program

The Structures Monitoring Program at Seabrook Station is an existing program that is to be further enhanced to be consistent with guidance set forth in 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants", NUMARC 93-01, "Industry Guidelines for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants", and Regulatory Guide 1.160, Rev. 2, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants". This program is described in Appendix B, Section 2.39 for the license renewal application. The applicant uses the structural monitoring program to monitor the condition of structures and structural components within scope of the Maintenance Rule, thereby providing reasonable assurance that there is no loss of intended function of structure or structural component. As noted in the application, the program will be enhanced to include: additional structures and structural components identified in the license renewal aging management review, add aging effects, additional locations, inspection frequency, and ultrasonic test requirements and enhancements for procedures to include inspection opportunities when planning excavation work that would expose inaccessible concrete. Enhancements to the Structural Monitoring Program will be implemented prior to the period of extended operation.

Aging effects or material degradation in concrete identified within the scope of the Structures Monitoring Program such as loss of material, cracking, change in material properties, and loss of form are detected by visual inspection of external surfaces prior to the loss of the structure's or component's intended function.

The team reviewed the Aging Management Program description for the Structural Monitoring Program, the Program Evaluation Document for the Structural Monitoring Program, engineering documents, inspection reports, condition reports, corrective action

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documents, work request documents, site procedures, and related references used to manage the aging effects on the structures. During the inspection the team conducted a general walkthrough inspection of the site, including the turbine building, reactor containment building, diesel generator building, control room, the intake structure, and other applicable structures, systems, and components related to the Structural Monitoring Program. The team held discussions with applicant's supervisory and technical personnel to verify that areas where signs of degradation, such as spalling, cracking, leakage through concrete walls, corrosion of steel members, deterioration of structural materials and other aging effects, had been identified and documented. Also, the team verified that the applicant maintains appropriate (photographic and/or written) documentation of these inspections to facilitate effective monitoring and trending of structural deficiencies and degradations.

Through the review of documents, walkthrough inspections, and discussions with engineering and plant personnel, the inspector identified some weaknesses in the structural aging management program. Similar to the IWL program, the inspector observed the need for clarification on acceptance criteria and the responsible engineer performing inspections. The applicant agreed to the needed changes as noted in the IWL program B.2.1.27 (previous section).

As noted in the IWL program, concrete degradation due to alkali-silica reaction is an aging effect that was recently discovered for Seabrook Station (see additional details in the section b of this report).

#### B.2.1.32 Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements

The Electrical Cables and Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements Program is a new program that will manage the aging effects of embrittlement, cracking, discoloration or surface contamination leading to reduced insulation resistance or electrical failure of accessible cables and connections due to exposure to an adverse localized environment caused by heat, radiation or moisture in the presence of oxygen. This program applies to accessible cables and connections installed in in-scope structures.

This program will visually inspect accessible electrical cables and connections installed in adverse localized environments at least once every 10 years. The first inspection for license renewal is to be completed before the period of extended operation. An adverse localized environment is defined as a condition in a limited plant area that is significantly more severe than the specified service environment (i.e. temperature, radiation, or moisture) for the cable or connections.

The team conducted walkdowns to observe cable and connector conditions in potential adverse localized environments. The team reviewed condition reports and interviewed plant personnel to assess historical and current conditions. The team reviewed the draft program documents to verify the program will be able to manage aging effects.

#### B.2.1.34 Inaccessible Power Cables Not Subject To 10 CFR 50.49 EQ Requirements

The Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a new program that will manage the aging effects of localized damage and breakdown of insulation leading to electrical failure of inaccessible power cables (400V and higher) due to adverse localized environments caused by exposure to significant moisture. Seabrook Station defines an adverse localized environment for power cables as exposure to moisture for more than a few days.

The Seabrook Station program includes periodic inspections of manholes containing in-scope cables. The inspection focuses on water collection in cable manholes, and draining water, as needed. The frequency of manhole inspections for accumulated water and subsequent pumping will be based on plant specific operating experience. The maximum time between inspections will be no more than one year.

In addition to periodic manhole inspections, in-scope cables are tested to provide an indication of the condition of the conductor insulation. The specific type of test performed will be determined prior to the initial test, and is a proven test for detecting deterioration of the insulation system due to wetting, such as power factor, partial discharge, or polarization index or other testing that is state-of-the-art at the time the test is performed. Cable testing will be performed prior to entering the period of extended operation and at least every six years thereafter.

Overall actions are to test cables and keep them dry. Seabrook has had, and continues to get, some water in their manholes. NextEra is taking corrective actions by increasing the inspection frequency and pumping frequently to prevent submergence of safety-related cables. They are committing to having initial inspections done and adjust inspection/pumping frequencies based on experience.

The team interviewed the responsible system engineer to understand the proposed program and power cable operating experience at Seabrook. The team reviewed data from previous manhole inspections to verify the established inspection frequencies are commensurate with operating experience. The team observed the inspection of a below-ground manhole at Seabrook to assess the process for inspections and the material condition of the manhole. The team reviewed system health reports and condition reports for historical operating experience and program guidance for cable condition monitoring to assess the adequacy of the proposed program to manage aging effects.

#### B.2.1.35 Metal Enclosed Bus

The Metal Enclosed Bus Program is a new program that will manage the following aging effects of in-scope metal enclosed buses: loosening of bolted connections due to thermal cycling and ohmic heating; hardening and loss of strength due to elastomer degradation; loss of material due to general corrosion; and embrittlement, cracking, melting, swelling, or discoloration due to overheating or aging degradation

This new program will be implemented prior to entering the period of extended operation and at least once every 10 years thereafter.

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The internal portions of the in-scope metal enclosed bus enclosures will be visually inspected for aging degradation of insulating material and for cracks, corrosion, foreign debris, excessive dust buildup, and evidence of moisture intrusion. The bus insulation will be visually inspected for signs of embrittlement, cracking, melting, swelling, or discoloration, which may indicate overheating or aging degradation. The internal bus supports will be visually inspected for structural integrity and signs of cracks. The accessible bus sections will be inspected for loose connections using thermography from outside the metal enclosed bus through the viewport, while the bus is energized.

The team reviewed previous work orders for inspection and cleaning activities for metal enclosed buses. The team interviewed the associated system engineer and reviewed condition reports to assess the historical and current condition of the metal enclosed buses. The team conducted a walkdown of accessible portions of the metal enclosed buses to evaluate the exterior condition of the buses and the operating environment.

#### B.2.2.1 34 5 kV SF<sub>6</sub> Bus

The Seabrook Station 345kV SF<sub>6</sub> Bus Program is a new plant-specific program that will manage the following aging effects on the 345kV SF<sub>6</sub> Bus: loss of pressure boundary due to elastomer degradation; loss of material due to pitting; crevice and galvanic corrosion; and loss of function due to unacceptable air, moisture or sulfur dioxide (SO<sub>2</sub>) levels.

Sulfur Hexafluoride (SF<sub>6</sub>) is an inert gas used to insulate bus conductors. The program will inspect for corrosion on the exterior of the bus duct housing, test for leaks at elastomers, and periodically test gas samples to determine air, moisture and SO<sub>2</sub> levels. Inspections, leak testing, and gas sampling will be done prior to entering the period of extended operation and at least once every six months thereafter.

The team reviewed previous work orders for maintenance activities associated with inspections of the SF<sub>6</sub> buses and SF<sub>6</sub> gas monitoring. The team interviewed the associated system engineer and reviewed condition reports to assess the historical and current condition of the SF<sub>6</sub> buses. The team reviewed system health reports to verify that any aging effects are being adequately managed. The team conducted a walkdown of the SF<sub>6</sub> buses to evaluate the exterior condition of the buses and the operating environment.

#### B.2.2.2 Boral Monitoring

The Boral Monitoring Program is an existing program used to monitor the condition of the material used in spent fuel pools for reactivity control. Boral is the brand name for a sheet of uniformly distributed boron carbide in an alloy 1100 aluminum matrix with a thin aluminum clad on both sides. The predecessor to Boral is Boraflex, a similar material susceptible to radiolytic degradation. Boraflex is used in the first six sets of racks at Seabrook. The Boraflex utilized in the initial six racks is not credited in the criticality analyses and is not credited for license renewal.

The aging affect requiring management is a reduction in neutron absorbing capacity, a change in dimensions, and a loss of material due to the affects of the spent fuel pool environment. Boral exposed to treated borated water is the subject of Draft LR-ISG-2009-01, "Staff Guidance Regarding Plant Specific Aging Management Review and Aging Management Program for Neutron-Absorbing Material in Spent Fuel Pools"

The team reviewed the program documents, reviewed various corrective actions, and interviewed the responsible engineers.

#### B.2.2.3 Nickel-Alloy Nozzles and Penetrations

The Nickel-Alloy Nozzles and Penetrations Program is an existing program that manages cracking, due to primary water stress corrosion, of the nickel based alloy pressure boundary and structural components exposed to the reactor coolant. This includes Pressurizer Nozzles, Steam Generator Channel Head Drain Tube and Welds, Reactor Vessel Core Support Pan/Lug, and Clevis Inserts, Reactor Vessel Hot and Cold Leg Nozzles, and the Reactor Vessel Bottom Mounted Instrumentation Penetrations. The program has been in existence, in various forms, since 2004 when Seabrook responded to NRC Bulletin 2004-01 "Inspection of Alloy 82/182/600 Materials Used in the Fabrication of Pressurizer Penetrations and Steam Space Piping Connections at Pressurized Water Reactors". The management of this aging affect has been refined since the phenomena was first described and has culminated in the Electric Power Research Institute sponsored program MRP-139 "Material Reliability Program: Primary System Piping Butt Weld Inspection and Evaluation Guideline".

Seabrook's draft "Reactor Coolant System Materials Degradation Management Program" is structured around the primary goal of mitigating material degradation of the reactor coolant system pressure boundary and reactor vessel internals. The program is intended to manage the "Steam Generator Program", Thermal Fatigue Management Program", "Alloy 600 Program", "Boric Acid Program", "Reactor Vessel Internals Program", and the "ASME Section XI Program (NDE, ISI, Repair/Replacement)". The management program includes an appendix titled "Westinghouse Proprietary Information", which identifies potential Alloy 600/82/182 locations in the primary pressure boundary components of the Westinghouse designed Nuclear Steam Supply System.

#### a.3. System Review

In distinction to the above noted program review, a system review was chosen by the team as a different approach to ensure comprehensive coverage of aging effects. The Residual Heat Removal System was chosen since the most likely initiating event, at Seabrook, is a station black out and a dominate system for station black out response is the Residual Heat Removal System. The approach is to walk down the system in the plant and question how aging effects are covered and verify that coverage based on a review of the application, program descriptions, and if available implementing procedures.

Materials identified for this system are Cast Austenitic Stainless Steel, Glass, Stainless Steel, and Steel in the external environments of indoor air that may included borated and

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non-borated water leakage and Closed Cycle Cooling Water. The internal environments are various treated and untreated water, lubricating oil, and reactor coolant.

This results in the possible or experienced aging affects of cracking, (cyclic, stress corrosion, thermal, loaded, and fatigue) and corrosion (boric acid, crevice, galvanic, general, and pitting), loss of preload, and fouling.

The applicant, in turn, proposes the following aging management programs:

- ASME Section XI Subsections IWB, IWC, and IWD Program
- Bolting Integrity Program
- Boric Acid Program
- Closed-Cycle Cooling Water System Program
- External Surfaces Monitoring Program
- Lubricating Oil Analysis Program
- One-Time Inspection of ASME Code Class Small Bore Piping
- One-Time Inspection Program
- Water Chemistry Program

The ASME Section XI Subsections IWB, IWC, and IWD program, the Boric Acid Program are reviewed at every outage under the NRC's Reactor Oversight Program using inspection procedure IP71111.08P "ISI Inspection". The Water Chemistry Program is part of the same procedure by way of the Steam Generator inspection portion. The Bolting Integrity Program, One-Time Inspection of Code Class Small Bore Piping, and One-Time Inspection are covered elsewhere in this report.

Of interest was a note in the System Walk-down Report, in 2008, recording the presence of water intrusion associated with "several supports in the vault stairwell" and the observation the "conditions are slowly becoming worse as calcium accumulates." WO 0844358 was initiated to verify the bolting integrity. The work order incorrectly compared the testing of anchors submerged in raw water in a manhole with the anchors supporting the RHR piping inserted into a calcium carbonate degraded wall and concluded, based on the submerged bolting, that the bolting in the RHR anchors were acceptable (AR 01633206). This comparison did not take into account the additional concern of a recently discovered alkaline silica degradation associated with the calcium carbonate degraded wall and the issue of anchor bolting integrity was not revisited subsequent to the discovery of alkali silica degradation. WO 0844358 was translated, during a database change, into Condition Report 08-15902 and closed on the basis of the comparison (two different material environmental conditions) even though the condition report contained a proposal to randomly sample the bolts and perform a calibrated torque test. The implications of the NRC Bulletin 79-02 anchor bolt integrity program were never considered during the evolution. Initially, these erroneous comparisons, and incomplete analysis, indicate a weakness in the NextEra's program for identifying and tracking the recently discovered aging effects at the site. The revised analysis resulted in satisfactory conditions and the learning needed in dealing with aging effects to support license renewal (AR 01633206).

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The inspector walked-down the RHR system from the outlet of RHR Pump P-8A, at elevation 54"-4", to the inlet of RHR Heat Exchanger E-9A, at elevation -31"-0", pausing at each support to carefully inspect the visual appearance of the bare piping revealed by the gaps in insulation. The inspector did not identify any evidence of aging that was not already considered by the applicant and adequately covered by an existing or proposed program.

b. Observations and Findings

Alkali-Silica Reaction Aging Effect at Seabrook Station

To assess the material condition of concrete structures in the plant; and to acquire, verify, and validate the design basis of structural design, the applicant personnel performed civil/structural walk-down inspections. The Residual Heat Removal Equipment Vaults, A and B Electrical Tunnels, Radiological Controlled Area Walkway, and Service Water pump house was included in the walk-down inspection and assessment. The observations and findings were documented in the License Renewal Project issue tracking report number 15. The walk-down inspections discovered the following plant material conditions; (a) large amount of groundwater infiltration, (b) large amount of calcium carbonate deposits, (c) corroded steel supports, base plates and piping, (d) corroded anchor bolts, (e) pooling of water and (f) cracking and spalling of concrete.

The inspection further noted that the below grade, exterior walls in the Control Building B Electrical Tunnel at elevation (-) 20' - 00" have random cracking and for several years have been saturated by groundwater infiltration. The severity of the cracking and groundwater infiltration varies from location to location. The groundwater infiltration has produced large, tightly adherent deposits of calcium oxide/carbonate at certain locations on the walls and pooling of groundwater on the floor slab sometimes to a depth of 2-inches. The groundwater has also produced smaller, loose deposits of calcium salts at most other crack locations.

The observations and findings from the walk-down inspections were reviewed by applicant's Design Engineering Organization and it was determined that the concrete walls in the B-Electrical Tunnel exhibited the most extensive distressed condition as determined by the applicant and required further investigation. Specifically, the below grade exterior walls in the Control Building B Electrical Tunnel at elevation (-) 20' - 00" were selected due to the presence of fine, random cracking and, because, for over 10 to 15 years had remained in saturated condition by groundwater infiltration. The severity of the cracking and groundwater infiltration varied from location to location. The groundwater infiltration had produced large, tightly adherent deposits of calcium oxide at certain locations on the walls and pooling of groundwater on the floor slab sometimes to a depth of 2-inches. The groundwater has also produced smaller, loose deposits of calcium oxide at most other crack locations.

To assess the integrity of cracked concrete and prolonged groundwater saturation, the applicant contracted with vendors to perform Penetration Resistance Testing (also referred to as Windsor Probe Test), and also to obtain concrete core specimens at designated locations in four below grade, exterior walls of the B Electrical Tunnel. The concrete core

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specimens were subjected to compressive testing by the vendor and selected sections of the core specimens were provided to another vendor for Petrographic examinations.

The results Penetration Resistance Tests (PRT) for the control building indicated an average concrete compressive strength of 5340 psi and the concrete core testing indicated an average compressive strength of 4790 psi. PRT performed in 1979 indicated an average concrete compressive strength of 6750 psi and the concrete test cylinders that were cast during the placement of the walls in February 1979 indicated an average 28-day compressive strength of 6120 psi. At each of the six (6) locations, three (3) individual replicate Penetration Resistance Tests as recommended per ACI 228.1R, Tables 5.2 and 5.5 has been performed for a total of eighteen (18) Penetration Resistance Tests. Each of the eighteen (18) PRTs required three (3) firmly embedded probes as recommended in ASTM C 803-03, paragraph 8.1.2 for a total of fifty-four (54) probes. The PRTs shall be performed per ASTM C 803-03 standard, utilizing Windsor Probe Test System per foreign print no. 100561.

At each of six (6) locations, core drilled and removed two (2), 4-inch nominal diameter concrete core specimens as recommended in ACI 228.1R, paragraph 4.3.2. A total of twelve (12) concrete core specimens will be obtained as recommended in ACI 228.1R paragraph 4.3.2 to develop an adequate strength relationship between the PRTs and the in-situ compressive strength of the concrete. The concrete core specimens has been obtained per the method specified in ASTM C 42-04 and compression tested in the ME&T laboratory per ASTM C 39-09. The length of the concrete core specimens "as removed" were 12 to 16-inches maximum. This provided adequate specimen lengths for compression testing and Petrographic examinations. All of the walls in the B Electrical Tunnel included in this study were 2-foot in thickness per drawing 101345, thus the concrete core drilling did not penetrate through the walls or contacted the two layers of reinforcement on the outer-face of the walls.

A comparison of the 2010 concrete compression test results to the 1979 concrete compression test results indicated a 21.7 percent reduction in the compressive strength of the concrete. The reduction in compressive strength is most likely due to alkali-silica reaction in the concrete which was detected in Petrographic examinations of four of the concrete core samples removed from the CB walls. It was reported that the four concrete core samples had moderate to severe Alkali-Silica Reaction in the concrete. Alkali-Silica Reaction is a reaction that occurs over time in concrete between the alkaline cement paste and reactive non-crystalline silica which is found in many common coarse aggregates. The reaction produces a gel substance which expands and causes micro-cracking or fissures in and surrounding the coarse aggregates. The micro-cracking typically progresses and extends into the cement paste thus compromising the quality and integrity of the concrete. The presence of water, irrespective of water chemistry (i.e., aggressive or non-aggressive), is required for Alkali-Silica Reaction to develop and to continue to propagate in the hardened concrete. Without the presence of water, Alkali-Silica Reaction will not develop or continue to propagate in hardened concrete. Alkali-Silica Reaction often results in a reduction in both strength and elasticity of the concrete; both of which were noted in the sample concrete cores analyzed for Seabrook.

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The reduction in compressive strength raises questions regarding the effect on modulus of elasticity, and flexural and shear capacity of concrete structural members. In addition the modulus of elasticity affects the dynamic response of Structures. The applicant is considering the structure dynamic response in their analyses.

In accordance with Inspection Procedure 71002 and Inspection Manual Chapter 2516, a key assumption of license renewal is that the current licensing bases is to be maintained. The above discussion indicated that this may not be true if operability of the safety related structures cannot be maintained. The NRC inspection report 05000443/2011002, issued May 12, 2011, addresses current licensing bases issues along with an extent of condition review planned by the applicant.

With respect to the aging management review for this aging effect at the station, the applicant provided a summary of their plans in a response for additional information associated with the Division of License Renewal review in a letter dated April 14, 2011 (letter SBK-L-11063).

#### Overall Findings

The team concluded screening and scoping of non-safety related systems, structures, and components, was implemented as required in 10 CFR 54.4(a)(2), and the aging management portion of the license renewal activities were conducted as described in the License Renewal Application. The inspection concluded the documentation supporting the application was in an auditable and retrievable form. Except for the alkali-silica reaction issue, the inspection results support a conclusion of reasonable assurance with respect to managing the effects of aging in the systems, structures, and components identified in the application.



**ATTACHMENT**

**SUPPLEMENTAL INFORMATION**

**KEY POINTS OF CONTACT**

Applicant Personnel

E. Metcalf	Plant Manager
M. Collins	Design Engineering Manager
M. O'Keefe	Seabrook Station Licensing Manager
R. Cliche	License Renewal Project Manager
P. Tutinas	License Renewal Project Electrical Lead
A. Kodal	License Renewal Project Mechanical Lead
K. Chew	License Renewal Project Civil Structural Lead

**LIST OF DOCUMENTS REVIEWED**

General License Renewal Documents

NRC Inspection Procedure 71002; License Renewal Inspection

NRC AMP Audit Report (results)

SBK-L-10192, Seabrook Station, Response to RAIs, Set ?, X, 2010  
SBK-L-10204, Seabrook Station, Response to RAIs, Set ?, December 17, 2010  
SBK-L-11002, Seabrook Station, Response to RAIs, Set 4, January 13, 2011  
SBK-L-11003, Seabrook Station, Response to RAIs, Set 5, January 13, 2011  
SBK-L-11015, Seabrook Station, Response to RAIs, Set ?, X, 2011  
SBK-L-11027, Seabrook Station, Response to RAIs, Set 9, X, 2011

Updated Final Safety Analysis Report, Section 3.7(B).3.13

License Renewal Basis Documents

LRAM-ELEC, Aging Management Review Report: Electrical Components and Commodities,  
Rev 1

LRAP-E1, Aging Management Program Basis Document: Electrical Cables and Connections Not  
Subject to 10 CFR 50.49 Environmental Qualification Requirements, Rev 2 and Rev 3

LRAP-E3, Aging Management Program Basis Document: Inaccessible Power Cables Not  
Subject to 10 CFR 50.49 Environmental Qualification Requirements Program, Rev 2

LRAP-E3, Aging Management Program Basis Document: Metal Enclosed Bus, Rev 1

LRAP-M027, Aging Management Program Basis Document: Fire Water System, Rev 1

LRAP-M032, Aging Management Program Basis Document: One-Time Inspection, Revision 1

LRAP-M033, Aging Management Program Basis Document: Selective Leaching of Materials,  
Revision 1

LRAP-M033, Aging Management Program Basis Document: Selective Leaching of Materials,  
Revision 2 (Draft)

LRAP-M038, Aging Management Program Basis Document: Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components, Revision 1  
LRAP-M039, Aging Management Program Basis Document: Lubricating Oil Analysis, Revision 1  
LRAP-SF6, Aging Management Program Basis Document: 345kV SF6 Bus, Rev 1  
LRSP-ELEC, Scoping and Screening Report: Electrical Systems, Components, and Commodities, Rev 2  
  
LRTR-NSAS, Technical Report – Non-Safety Affecting Safety, Revision 3  
LRTR-NSAS, Technical Report – Non-Safety Affecting Safety, Revision 4

Implementing Procedures

CP 3.3, Closed Cooling Water Systems, Chemistry Control Program, Rev 20  
ER-AA-106, Cable Condition Monitoring Program, Rev 1  
ES1807.020, Machinery Oil Analysis, Revision 0  
FP 3.1, Fire Protection Maintenance and Surveillance Testing, Rev 3  
LN0560.10, SF6 Dewpoint Check, Rev 2  
LN0560.11, SF6 SO2 and Purity Sample, Rev 7  
ON0443.54, Non-safety Related Deluge and Sprinkler Systems 18 Month Inspection, Rev 4, Change 8  
ON1242.01, Loss of Instrument Air, Revision 12  
OS0443.66, Safety Related Spray and Sprinkler Systems 18 Month Flow and System Alarms Test, Rev 4, Change 9  
OX0443.04, Fire Protection System Annual Flush, Rev 6 Change 8  
OX0443.12, Fire Protection Dry Pipe Spray and Sprinkler Systems 18 Month Inspection, Rev 6, Change 4  
OX0443.19, Yard Hydrant Hose House Monthly Inspection, Rev 6 Change 4  
OX0443.20, Yard Hydrant Semi-Annual Inspection and Functional Test, Rev 6, Change 6  
OX0443.21, Yard Fire Hydrant Hose Houses Annual Hose Replacement and Gasket Inspection, Rev 6, Change 2  
PEG-10, System Walkdowns, Rev 18  
PEG-265, Cable Condition Monitoring, Rev 0  
SSCP, Chemistry Manual, Rev 64

Draft Implementing Procedures

LRTR-INT, Technical Report – Inspection of Internal Surfaces, Revision 0 (Draft)  
LRTR-OTI, Technical Report – One-Time Inspection, Revision 0 (Draft)  
LRTR-SEL, Technical Report – Selective Leaching of Materials, Revision 0 (Draft)

Technical Reports

EE-07-018, Response to GL 2001-01, Rev 0  
Engineering Evaluation 94-41, Submerged Electrical Cables and Supports, Dated 1/30/95  
Technical Report “Buried Piping and Tanks Inspection Program” LRTR-BP Revision 0

Work Orders

00B0886  
01B1964  
01B7223  
0234295  
0242456  
0301311  
0310880  
0317696  
0401697  
0401699  
0401728  
0406534  
0414066  
0417588  
0431657  
0443640  
0444321  
0519953  
0526073  
0603042  
0702705  
0716257  
0716258  
0718994  
0719543  
0720390  
0727117  
0727135  
0727136  
0727137  
0727138  
0813420  
0827061  
0827184  
0827185  
0831312  
0831313  
0831583  
0835656  
98C3889  
99A5575

Work Order Package 00611225 01, "Reference Maintenance – Auxilliary Boiler Tank Manway Leakage"

Work Order Package 00616970 01, "The Outside of FP-TK-36A Has Peeling Paint and Rust TK"

Work Order Package 00616971 01, "The Outside of FP-TK-36B Has Peeling Paint and Rust TK"

Work Order Package 00791046 01, "Diesel Fire Pump Fuel Oil Tank Water Removal"

Work Order Package 00791057 01, "Diesel Fire Pump Fuel Oil Tank Water Removal"

Action Request 00207755 "Seabrook Station License Renewal Implementation Actions"

#### Completed Surveillance Tests

12 oil sample analysis results from Herguth Labs

#### Reference Documents

Materials Reliability Program: Primary System Piping Butt Weld Inspection and Evaluation Guidelines (MRP-139) 1010087, August 2005

NEI 96-03, Guideline for Monitoring the Condition of Structures at Nuclear Power Plants, 1996

ACI 201.1R-92, Guide for Making a Condition Survey of Concrete in Service, American Concrete Institute

ACI 349.3R-96, Evaluation of Existing Nuclear Safety- Related Concrete Structures,

American Concrete Institute ACI 531-79, Concrete Masonry Structures, Design and Construction, American Concrete Institute

Hope Creek Update Final Safety Analysis Report, Section 7.2.1.36

Materials Reliability Program: Primary System Piping Butt Weld Inspection and Evaluation Guidelines (MRP-139) 1010087, August 2005

NEI 09-14, Revision 0; Guidelines For The Management Of Buried Piping Integrity, 01/10

EPRI Final Report 1016456, 12/08; Recommendations for an Effective Program to Control the Degradation of Buried Piping

#### Drawings

Complete set of submitted license renewal drawings

1-AS-2301-2, Auxiliary Steam Piping, Revision 4

1-AS-5198-02, Auxiliary Steam Piping, Revision 3

1-DM-D20355, Demineralized Water Distribution Detail, Revision 17

9763-F-310248, Underground Duct Plan, Rev 13

9763-F-802807-641.20C, Piping – Combustible Gas Isometric, Revision 0

9763-F-802807S, Sheets 15, 15S, 16; Pipe Support Details, Revision 6B

9763-F-202753-610.60, Service Air Isometric, Revision 0

9763-M-202751S, Sheets 43, 43S, 74, 74S, 74A; Support Details, Revision 25A

9763-M-212368S, Sheets 15, 15S, 16; Support Details, Revision 11B  
 9763-M-212368S, Sheets 17, 17S, 18, 18A; Support Details, Revision 23A  
 9763-M-212368S, Sheets 19, 19S; Support Details, Revision 20B  
 9763-M-212368S, Sheets 36, 36S, 37; Support Details, Revision 12B  
 9763-M-212368S, Sheets 53, 53S, 54 - 57; Support Details, Revision 24A  
 9763-M-802913S, Sheets 49, 49S, 50, 51, 52; Support Details, Revision 11B  
 1-NHY-310002, Unit Electrical Distribution One Line Diagram, Rev 40  
 1-NHY-505084, Instrument Air Installation – Dual Air Supply, Revision 6  
 PID-1-WLD-B20224, Waste Processing Liquid Drains – RCA Walkway Details, Revision 7  
 License Renewal PID Drawing PID-1-RH-LR20663  
 License Renewal PID Drawing PID-1-SI-LR20446  
 License Renewal PID Drawing PID-1-SI-LR20447  
 License Renewal PID Drawing PID-1-SI-LR20448  
 License Renewal PID Drawing PID-1-SI-LR20449  
 License Renewal PID Drawing PID-1-SI-LR20450  
 License Renewal PID Drawing PID-1-WLD-LR20221  
 License Renewal PID Drawing PID-1-VSL-LR20776  
 License Renewal PID Drawing PID-1-CBS-LR20233  
 License Renewal PID Drawing PID-1-CS-LR20722  
 License Renewal PID Drawing PID-1-CS-LR20725  
 License Renewal PID Drawing PID-1-RC-LR20841  
 License Renewal PID Drawing PID-1-RC-LR20844  
 License Renewal PID Drawing PID-1-RH-LR20662  
Corrective Action Documents

198495	02-17027
95-33705	03-03536
98-00804	03-07418
98-01661	04-11389
99-12562	04-12631
00-05286	05-04768
01-04204	05-05078
01-04373	05-07548
01-07417	05-07730
01-08751	05-09832
01-08770	05-13056
01-02389	05-15093
01-13429	05-04115
02-01989	06-08855
02-02211	06-11121
02-03132	07-03741
02-05112	07-05144
02-05698	07-09377
02-08670	07-12356
02-08671	07-14158
02-13425	07-15599
02-15177	07-14047

08-05795  
08-06033  
08-06080  
08-06088  
08-13173  
08-01461  
08-01468  
08-13706  
08-15277  
09-01489  
09-01520  
09-207352  
00-216968  
00-590824  
01-63276

Apparent Cause Evaluation for B EDG rocker arm lube oil tank fuel dilution  
Apparent Cause Evaluation for supply jug oil contamination with water  
Apparent Cause Evaluation for aluminum bronze fittings in sea water piping systems

Miscellaneous

09CAR029, Change Authorization Request: De-Watering System for Safety Related Cable  
Vaults, Dated 6/25/09  
Keyword searches of CRs for Karl Fischer, water contamination, cast iron, graphitization,  
dezincification, de-alloy, and leaching  
Fire Protection System Walk Down Report  
Plant Engineering Guidelines System Walkdowns PEG-10 Revision 19  
Roving NSO Log Operations Routine Tours, 02/09/2011  
Buried Piping Program ER-AA-102  
Buried Piping Program ER-AA-102-1000  
Mechanical Maintenance Procedure "Application of Repair and Protective Coating(s)"  
MS0517.12 Rev. 04, Chg. 03

System Health Reports

System Health Reports, Switchyard System, Dated 1/1/09 through 12/31/10  
Cable Program Health Report, Dated 10/1/08 through 12/31/10  
Predictive Maintenance Program Health Report, Quarter 4, 2007 to Quarter 3, 2008  
Predictive Maintenance Program Health Report, Quarter 4, 2009 to Quarter 2, 2010  
Buried Piping Program Health Report – 4<sup>th</sup> Quarter 2008 through 3<sup>rd</sup> Quarter 2010  
Cathodic Protection System Health Report 1<sup>st</sup> Quarter 2004 through 3<sup>rd</sup> Quarter 2010  
Above Ground Steel Tanks Program Health Report 10/01/2008 – 12/31/2008  
Above Ground Steel Tanks Program Health Report 01/01/2009 – 03/31/2009  
Above Ground Steel Tanks Program Health Report 04/01/2009 – 06/30/2009  
Above Ground Steel Tanks Program Health Report 07/01/2009 – 09/30/2009  
Above Ground Steel Tanks Program Health Report 10/01/2009 – 12/31/2009  
Above Ground Steel Tanks Program Health Report 01/01/2010 – 03/31/2010  
Above Ground Steel Tanks Program Health Report 04/01/2010 – 06/30/2010

Above Ground Steel Tanks Program Health Report 07/01/2010 – 09/30/2010  
Above Ground Steel Tanks Program Health Report 10/01/2010 – 12/31/2010  
RHR System Health Report 10/01/2010 – 12/31/2010  
RHR System Health Report 2010-04  
RHR System Walk-Down Report 02/08/2011  
RHR System Walk-Down Report 04/01/2010  
RHR System Walk-Down Report 06/30/2010