Progress Energy

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March 31, 2005

SERIAL: BSEP 05-0044 10 CFR 54

U. S. Nuclear Regulatory Commission
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Washington, DC 20555-0001

Subject: Brunswick Steam Electric Plant, Unit Nos. 1 and 2
Docket Nos. 50-325 and 50-324/License Nos. DPR-71 and DPR-62
Response to Request for Additional Information - License Renewal

References:
1. Letter from Cornelius J. Gannon to the U. S. Nuclear Regulatory Commission (Serial: BSEP 04-0006), "Application for Renewal of Operating Licenses," dated October 18, 2004
2. Letter from Sikhindra K. Mitra to Cornelius J. Gannon, "Request for Additional Information (RAI) for the Review of the Brunswick Steam Electric Plant, Units 1 and 2, License Renewal Application," dated March 17, 2005 (ML050760084)

Ladies and Gentlemen:

On October 18, 2004, Carolina Power & Light Company, now doing business as Progress Energy Carolinas, Inc., requested the renewal of the operating licenses for the Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2, to extend the terms of their operating licenses an additional 20 years beyond the current expiration dates.

By letter dated March 17, 2005, the Nuclear Regulatory Commission (NRC) provided a request for additional information (RAI) concerning License Renewal Aging Management Programs and Time-Limited Aging Analyses. Enclosure 1 provides responses to the NRC RAI and also to Audit Question B.2.7-1, which was raised during the NUREG-1801 Consistency Audit of BSEP conducted during the weeks of January 10 to 14, 2005, and February 7 to 11, 2005. Enclosure 2 provides the summary list of regulatory commitments supporting License Renewal modified, as necessary, to reflect the information provided in the enclosed responses.

Please refer any questions regarding this submittal to Mr. Mike Heath, Supervisor - License Renewal, at (910) 457-3487.

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I declare, under penalty of perjury, that the foregoing is true and correct. Executed on March 31, 2005.

Sincerely,

Cornelius J. Gannon

MHF/mhf

Enclosures:

1. Responses to RAI and Audit Question B.2.7-1
2. BSEP License Renewal Commitments, Revision 2

cc:

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Responses to Request for Additional Information dated March 17, 2005 and to Audit Question B.2.7-1

Background

On October 18, 2004, Carolina Power & Light Company, now doing business as Progress Energy Carolinas, Inc., submitted a License Renewal Application (LRA) that requested the renewal of the operating licenses for the Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2, to extend the terms of their operating licenses an additional 20 years beyond the current expiration dates.

By letter dated March 17, 2005, the Nuclear Regulatory Commission (NRC) provided a request for additional information (RAI) concerning Aging Management Programs (AMPs) and Time-Limited Aging Analyses (TLAAs).

This enclosure provides responses to the NRC RAI and also to Audit Question (AQ) B.2.7-1, which was raised during the NUREG-1801, Generic Aging Lessons Learned (GALL) Consistency Audit of BSEP conducted during the weeks of January 10 to 14, 2005, and February 7 to 11, 2005. The NRC staff has requested a written response to this question.

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Audit Question B.2.7-1

Background

AMP B.2.7, (LRA Appendix B) states that the OCCW Program relies on the implementation of the recommendations of GL 89-13. At BSEP, GL 89-13 requirements are implemented via Engineering Procedure OENP-2704, "Administrative Control of NRC Generic Letter (GL) 89-13

Requirements." A review of OENP-2704 (Rev. 8) found it to provide a suitable means of assuring conformance to GL 89-13 requirements.

Discussion

Both GL 89-13 and GALL (Element 5 Monitoring and Trending) specify that testing be conducted to verify the heat transfer capability of all safety-related heat exchangers cooled by service water. OENP-2704 (Rev.8) states that in addition to cleaning and inspection, testing of heat exchangers suspected or known to have a low heat transfer margin (i.e., margin <10%) will be performed. Contrary to these requirements, AMP B.2.7 credits the performance of regular inspections and cleaning in lieu of performing a test of the heat transfer capabilities.

NRC Audit Team Recommendation

Revise LRA and AMP B.2.7 as necessary to achieve consistency with GL-89-13 implementation procedure (OENP-2704) or provide a technical basis for not performing the heat transfer tests described in the procedure prior the period of extended operation.

AQ B.2.7-1 Response

The BSEP Open Cycle Cooling Water (OCCW) Program will be revised to include performance testing of the Residual Heat Removal (RHR) and Emergency Diesel Generator Jacket Water heat exchangers prior to the period of extended operation. The results from these testing activities will be evaluated and used to prescribe testing / inspection requirements needed to ensure system functionality during the period of extended operation. This response results in a change to the enhancements provided in the second paragraph of the description of the OCCW Program in LRA, Appendix A, Section A.1.1.7. The change would incorporate new enhancement number six to read:

> (6) Performance testing of the RHR and Emergency Diesel Generator Jacket Water heat exchangers will be performed to verify heat transfer capability.

NRC RAI 4.7.4-1

The torus liner and the ASME, Section XI, ISI component supports are dispositioned through 10 CFR 54.21(c)(1)(ii). In its description of the analyses, the applicant states:

> The corrosion rate in the immersion zone was determined to be 0.00116 inch/year based on plant calculations and measurements. The general corrosion rate for the vapor zone is conservatively assumed to be the same as the immersion zone.
>
> ...[For ASME, Section XI, ISI Component Supports the evaluation considered], the number of sides of the component exposed to the Torus environment and the time at which the component had been installed.

The staff requests the applicant to describe the most recent significant inspection findings for the selected ASME, Section XI, ISI components, and the Code inspection requirements for these components.

The staff requests the applicant to provide details of the plant calculations and measurements to support the use of the 0.00116 inch/year corrosion rate.

The additional information should include a description of the corrosion monitoring program (discussed during the January 12, 2005, teleconference call) from which the 0.00116 inches/year corrosion rate was determined. In addition, the applicant should indicate the number and frequency of coupons removed and tested.

The staff also requests the applicant to discuss the frequency and results of the wall thickness measurements in the vapor zone to support the assertion that the corrosion rate for the immersion zone is a conservative assumption for the corrosion rate in the vapor zone.

NRC RAI 4.7.4-1 Response

Recent Significant Inspection Findings

The subject components are identified as an additional inspection under the Vent Header (Exterior Surfaces), American Society of Mechanical Engineers (ASME) Code, Section XI, Category E-A, using a general visual examination method. No significant inspection findings have been identified for the subject components. The inspection results indicated a tightly adhering corrosion, scattered rust stains, and mechanical marks.

Justification of Corrosion Rate

Two separate methods had been used to determine the long term corrosion rate of 0.00116 inches/year that was subsequently used in the TLAAs to project future corrosion. The first method utilized ultrasonic test (UT) wall thickness measurements made directly on the Torus liner below the waterline when these surfaces were accessible while the Torus was drained for installation of modifications during the early 1980s. The second method evaluated removable corrosion coupons that had been installed on racks at and below the waterline in each unit.

It should be noted that the Unit 2 Torus coatings remained intact from original construction until 1980, when Mark I Program modifications were installed that involved the removal of liner coatings from locations where new structural components were to be welded to the liner plates. In 1980, coatings were also removed from 16 control locations below the waterline, spaced at equal intervals around the Torus. Three UT measurements were made in each spot, giving a total of 48 measurements of baseline liner thickness during each inspection. The next set of Unit 2 liner thickness measurements was made in May, 1982, and the third set was made in May, 1984. Similar measurements were made in Unit 1 in 1983, and 1985. The average corrosion rate determined from these UT thickness measurements of the Torus liner plates was 0.00105 inches/year.

Since the Torus was not expected to be drained after the Mark I Program modifications were completed in the mid-1980s, further direct measurement of the liner plate below the waterline was not considered practical. Therefore, a Corrosion Monitoring Program was implemented which installed racks of removable specimens conforming to American Society for Testing and Materials (ASTM) G 4-68 specifications. In September, 1982, these racks were installed in Unit 2 at various depths below the waterline and at the surface. In August, 1983, similar racks were installed in Unit 1. Each rack contained 10 coupons, which were bare carbon steel discs approximately 6 inches in diameter and ¼ inch in thickness. The discs had a hole in the center which was used for mounting them on an axle affixed to the rack. Nylon spacers were used to separate the discs and dielectrically insulate them from stray currents.

Racks were removed and sets of coupons were examined after the following exposure durations: 1 month, 3 months, 6 months, 1 year, 3 years, 5 1/2 years, 7 years, and 8 2/3 years. The evaluation of these specimens was also performed in accordance with ASTM G 4 methods, including measurement of weight loss, thickness and diameter of each coupon. In addition, samples were sectioned, mounted, and polished for visual examination under a microscope. Corrosion rates were determined based upon the average results for the set of 10 coupons per evaluation. The data obtained show that the corrosion rate decreased significantly as the exposure time increased, and stabilized to an average rate of 0.00116 inches/year after 8 2/3 years. This is because the corrosion byproduct film matures with increasing exposure time, retarding the reaction rate at the carbon steel surface beneath the corrosion byproduct film.

Linear regression analysis of the corrosion data was performed which predicted a general wall loss of 40 mils after 40 years of exposure. The initial liner thickness measurements that showed a corrosion rate of 0.00105 inches/year compared favorably with the 0.00116 inch/year corrosion rate determined from examining the removable corrosion coupons over a nine year period. The higher rate of 0.00116 inch/year was used in corrosion loss calculations prepared in the mid-1990s, and this rate is considered to remain conservative based upon corrosion monitoring program trending described above.

It should also be noted that the original coatings in the immersion zones of each Torus were completely removed and new coatings were applied to all accessible surfaces below the waterline between 1994 and 1996. The corrosion monitoring program was discontinued at that time because the installed samples had been evaluated and the long term general corrosion rate had been established.

Frequency/Results of Wall Thickness Measurements

The reason the 0.00116 inch/year corrosion rate is also considered to be conservative for the vapor zone of the Torus is that the primary containment atmosphere is inerted with nitrogen to limit the oxygen concentration to less than four percent volume in accordance with Technical Specifications during operational periods. The corrosion rate of steel is significantly reduced in low oxygen environments. This conclusion is also supported by visual examination of the surface films present in the vapor zone locations, which have been characterized as magnetite by their dark brownish-black color and tightly adherent nature. The Corrosion Monitoring Program did not include measurements of the liner above the waterline since this zone was considered to be conservatively represented by the results from below the waterline.

NRC RAI 4.7.4-2

The non-ASME, Section XI, ISI component supports are dispositioned through 10 CFR 54.21(c)(1)(iii). In its description of the analyses, the applicant states:

> The aging management activities will be predicated on the results of volumetric measurements performed on the components. Therefore, prior to the period of extended operation, the One-Time Inspection Program will be used to perform volumetric measurements to determine the actual rate of corrosion of the Vent Header Lower Column Support in the immersed and vapor space of the Torus, and platform steel and miscellaneous supports in the vapor space of the Torus.

The staff requests the applicant to describe the baseline inspection performed and the results of the inspection for each of the non-ASME, Section XI, ISI components, from which the actual rate of corrosion will be determined.

The staff requests the applicant to discuss how the one-time inspection (OTI) Program is defined such that all the non-ASME, Section XI, ISI component supports are included within the scope of the OTI program, ultrasonically inspected, and the inspection results analyzed and evaluated for the period of extended operation.

The staff requests the applicant clarify that the description and scope for the non-ASME, Section XI, ISI component supports applies to Unit 1 or Unit 2 or both and to list the components and the environments in which these components are found (i.e., vapor zone or immersed zone or both).

RAI 4.7.4-2 Response

No baseline inspections were performed for the subject components, the original design thickness plus the mill tolerance will be used for the baseline value. The actual member thickness from the One-Time Inspection will be subtracted from the stated baseline value in order to determine a conservative corrosion rate. Alternatively, UT of a set of coated locations adjacent to uncoated locations may be utilized to determine a representative corrosion rate, provided a sufficient number of these control locations are identified.

The One-Time Inspection associated with Torus corrosion is only applicable to those components that could not be qualified for 60 years of operation based on a historical corrosion rate. The only non-ASME, Section XI, Inservice Inspection (ISI) components affected by the One-Time Inspection are: Vent Header Lower Support Columns, Torus Platform Upper Column, Structure, & Grating, and Miscellaneous Supports which include: High Pressure Coolant Injection (HPCI)

Turbine Exhaust Line Pipe Supports, Reactor Core Isolation Cooling (RCIC) Turbine Exhaust Line Pipe Supports, RHR Test Line Pipe Supports, RHR Containment Cooling Line (Torus Spray Header) Supports, and Miscellaneous Small Bore Pipe and Conduit Supports. Based on observations of the Torus corrosion by the BSEP Materials Engineer, the existing corrosion is passive and tightly adhering, which would indicate the previous corrosion rate is excessively conservative. The results of the One-Time Inspection will provide an updated corrosion rate, which will replace the historical corrosion rate used in the TLAA evaluation for the subject components. Corrective actions will be applied if any components are projected to be below the minimum required thickness prior to the end of the period of extended operation.

The non-ASME, Section XI, ISI component supports subject to the One-Time Inspection, associated with the Torus corrosion TLAA, are applicable to both Unit 1 and Unit 2 and consist of the following:

- Vent Header Lower Support Columns, in both the vapor and immersion zones,
- Torus Platform Grating in the vapor zone,
- Torus Platform Structure in the vapor zone,
- Torus Platform Upper Column in the vapor zone,
- HPCI Turbine Exhaust Line Pipe Supports in the immersion zone,
- RCIC Turbine Exhaust Line Pipe Supports in both the vapor and immersion zones,
- RHR Test Line Pipe Supports in both the vapor and immersion zones,
- RHR Containment Cooling Line (Torus Spray Header) Supports in vapor zone, and
- Miscellaneous Small Bore Pipe and Conduit Supports in the vapor zone.

NRC RAI B.2.29-1

The applicant stated that the Systems Monitoring Program is an existing, plant-specific program and there is no comparable NUREG-1801 program in place. The applicant further stated that the implementation of the Systems Monitoring Program will be accomplished by a new procedure to be developed before the period of extended operation. The applicant is requested to provide the following information:

(A) Since the Systems Monitoring Program is an existing program, what is the frequency of inspection, and what are the inspection criteria for the current program?

(B) Among the 10 elements for the program, many element descriptions are relying on a new procedure to be developed prior to the period of extended operation. For example, the applicant stated, in the "Monitoring and Trending," that the new procedure to be developed will include guidance on inspection frequency, inspection criteria that focus on detection of aging effects, and trending to provide predictability of component degradation. The applicant is requested to clarify the differences between those elements to be developed in the new procedure and those in the existing program.

RAI B.2.29-1 Response, Part (A)

The Systems Monitoring Program requires that systems crediting the program are inspected on a frequency sufficient to identify age-related degradation prior to loss of intended function. While license renewal systems are typically inspected on a quarterly basis, an extended frequency can be justified for some systems. In general, inspections are scheduled and performed so the entire system is fully walked down at least once per operating cycle. Portions of systems not accessible due to reactor operation are inspected during refueling outages.

The BSEP systems monitoring implementation procedure incorporates a checklist of inspection attributes associated with the item being inspected and potentially applicable degradation mechanisms. For example, piping and fittings are inspected for:

- Pinhole leaks or seepage,
- Exterior corrosion, scaling, or rust,
- Missing or not fully engaged flange nuts, studs, or bolts,
- Excessive sweating or condensation collecting on pipes,
- Leaking on threaded connections,
- Excessive pipe vibration or pipe movement, and
- No appreciable loss of material or cracking.

RAI B.2.29-1 Response, Part (B)

Since the LRA was submitted, BSEP has developed a new procedure directing activities of the Systems Monitoring Program. This procedure incorporates the following attributes relative to the ten elements of an aging management program:

Scope: The program addresses systems in the scope of license renewal that credit the Systems Monitoring Program for aging management.

Preventive Actions: Not applicable– the Systems Monitoring Program is a condition monitoring program.

Parameter Monitored / Inspected: Inspection parameters are specified that are pertinent to relevant aging effects and intended functions.

Detection of Aging Effects: A checklist is provided that addresses aging effects identified by license renewal aging management reviews. See discussion of inspection criteria in part A of this RAI for additional information.

Monitoring and Trending: A matrix provides inspection frequency requirements on a system specific basis. Guidance is provided for monitoring and trending to permit early detection of degradation.

Acceptance Criteria: Acceptance criteria identify conditions indicative of degradation. Responsibility for evaluation of indications is assigned to engineering to ensure that intended function(s) are maintained.

Corrective Actions: Degradation deemed to be unacceptable is subject to the Corrective Action Program.

Confirmation Process / Administrative Controls: The Systems Monitoring Procedure is part of the BSEP Plant Operating Manual. This procedure and the Corporate Corrective Action Program are subject to the requirements of 10 CFR 50, Appendix B.

Operating Experience: The Systems Monitoring Program has been subject to internal and external assessments. In general, these assessments support the effectiveness of the Systems Monitoring Program, and confirm that it is subject to ongoing review and verification of program effectiveness. See the response to RAI B.2.29-3 for additional details on these assessments.

Based on the above, the differences cited in Part (B) of this RAI have been addressed by the issuance of the new Systems Monitoring Program implementing procedure.

NRC RAI B.2.29-2

In the program element, "Parameters Monitored/Inspected," the applicant stated that engineering and other plant personnel will continue to inspect the surface conditions of mechanical system components including closure bolting through visual inspection and examination for evidence of defects and age-related degradation. The applicant further stated that identified aging effects include loss of material and cracking. The applicant is requested to provide justification for not identifying loss of preload as an aging effect for closure bolting in various plant systems.

RAI B.2.29-2 Response

The Bolting Integrity Program is being revised to address NRC concerns raised during GALL consistency audits. The revised program considers that loss of preload is applicable to bolting, and manages this aging effect by incorporating program elements consistent with those described in GALL (i.e., torquing / installation guidance, materials control, ASME Section XI inspections, etc.)

NRC RAI B.2.29-3

The applicant is requested to provide some examples of actual plant-specific operating experience when appropriate actions were taken to demonstrate and ensure the effectiveness of the existing Systems Monitoring Program.

RAI B.2.29-3 Response

The World Association of Nuclear Operators (WANO) performed a peer review of BSEP in August, 2003. The peer review team observed the following strengths:

> The system engineering organization has embraced a culture of identifying degrading system problems through system trending and monitoring. Problems are often identified before equipment failure through the use of advanced monitoring and trending software, process computer data and system engineering walkdowns. Trending successes are celebrated and rewarded to emphasize the culture. The use of advanced electronic system notebooks allows engineers to retrieve and store all trending and system information from many sources in one location, and provides a historical record for long-term monitoring.

An assessment of the Brunswick Engineering Support Section (BESS) at BSEP was performed on September 9 through September 20, 2002. The Brunswick Nuclear Assessment Section (BNAS) conducted an assessment of activities to determine the effectiveness of Engineering personnel in support of BSEP and the performance monitoring of systems. This assessment was accomplished through performance-based, real-time observations, technical reviews, and interviews with personnel. As a basis for the assessment, the team used Institute for Nuclear Power Operations (INPO) 97-002, "Performance Objectives and Criteria for Operating and Near-Term Operating License Plants." The team's assessment concluded that BESS was effective in support of the operation of BSEP.

BNAS Report B-ES-02-01 provided the following details on the conduct of the BESS:

- Verified that Engineering personnel monitor and evaluate equipment and system performance through examination and trending of condition monitoring activities, reviewing equipment failure history, analyzing availability and reliability information, and performing system walkdowns,
- Reviewed the process, status, and use of the Electronic System Notebook,
- Reviewed the age and number of work tickets on hold pending engineering resolution for timeliness and adequacy of Engineering support, and
- Verified that Engineering personnel support the effective maintenance of the plant, and that personnel are aware of, and proactively pursue, maintenance issues.

In a more recent self-assessment, BNAS Report B-ES-04-01 supports that BSEP System Engineering activities were effective in support of the operation of the BSEP, but noted several instances wherein walkdowns and trending were not properly performed and documented. The assessment identified the use of informal guidelines rather than procedural controls to ensure that system trending and monitoring is effectively implemented as a contributing factor in these findings. BSEP has addressed this issue by development of a formal site procedure for systems monitoring, including inspection frequency requirements, acceptance criteria, monitoring and trending, corrective actions and documentation.

NRC RAI B.2.32-1

This inspection program includes monitoring parameters (as described in element "Parameters Monitored") as well as monitoring prestressing force levels in the girders. The applicant is requested to provide its justification as to why the element "Acceptance Criteria" does not incorporate the acceptance criteria related to the tendon hardware components and corrosion protection medium (CPM) similar to those in Subsection IWL of Section XI of the ASME Code.

RAI B.2.32-1 Response

The subject tendons are not associated with the containment structure and do not support any pressure boundary intended function; as such, ASME Section XI, Subsection IWL is not applicable. However, previous inspections of the tendons were performed using criteria based on ASME Section XI, Subsection IWL, and inspections performed in accordance with the BSEP AMP will continue to use guidance based on IWL.

NRC RAI B.2.32-2

This RAI is related to the element "Operating Experience." In order for the staff to make a reasonable assurance conclusion regarding the present and future condition of the prestressing system in the fuel pool girders, the applicant is requested to provide a summary of the results of the last two inspections for Unit 1, and Unit 2 girders. As a minimum, the summary should include: (1) the minimum required prestressing forces, (2) the sample size of the tendons inspected, (3) a table of measured prestressing forces, (4) chemical composition of grease (CPM), and free water in the grease, (5) strength values of the wires tested during inspections, and (6) condition of anchorages, and the concrete around the anchorages.

RAI B.2.32-2 Response

The tendon surveillance consists of an inspection of the physical condition of a selected sample of in-place tendons. Physical tendon surveillance consists of sheathing filler inspection, anchorage inspection, tendon lift-off, inspection and tensile testing of removed wire samples, and tendon retensioning with the tendons being resealed after completion of all inspections. Two surveillances have been performed on the tendons; the twenty-year surveillance performed in 1995, and the twenty-five year surveillance performed in 2000.

1) Three values are provided for the minimum required prestressing forces based on the three stages of tendons used for each girder. The prestressing forces are Stage I: 582 kips, Stage II: 595 kips, and Stage III: 602 kips.

2) The 1995 tendon inspection selected six tendons on each of the two girders per unit for visual examination. Three of the six tendons per girder were selected for lift-off. One of the lift-off tendons was de-tensioned for wire removal, visual examination, and tensile testing. Provisions for sample expansion were included based on

inspection results. The 2000 tendon inspection sampled three tendons on each unit for physical inspection and three tendons for visual inspection. One tendon was selected for detensioning and wire removal.

3)

Summary of Tendon Inspection Average Prestressing Values (kips)

	Stage I		Stage II		Stage III	
	1995	**2000**	**1995**	**2000**	**1995**	**2000**
Unit 1	658	664	645.5	659	661.2	673
	648.1		655.5		660.7	
			646.6			
	Stage I		**Stage II**		**Stage III**	
	1995	**2000**	**1995**	**2000**	**1995**	**2000**
Unit 2	642.9	651	671.6	701	652.1	660
	710.9		682.5		666.7	
	647.9		706.5			
	610.8		681.4			
	641.6		666.4			
			656.4			

4) Chemical Composition - 1995 Inspection

The sheathing filler grease samples tested for water soluble ions showed acceptable levels of chloride, nitrate, and sulfide ions. Water content of grease in all tendons, except one tendon, was found to be acceptable. The old grease in the unacceptable tendon was replaced by pumping through with new Visconorust 2090 P4 grease.

Chemical Composition - 2000 Inspection

The sheathing filler grease samples tested for water soluble ions showed acceptable levels of chloride, nitrate, and sulfide ions and water content.

5) The tensile tests of both the 1995 and 2000 inspections found the wire samples exhibited acceptable yield strength, ultimate strength, and elongation. All samples exceeded the yield and ultimate strength minimum values of 192,000 psi and 240,000 psi, respectively.

6) Physical Condition - 1995 Inspection

For Unit 1, no sign of significant corrosion was found in the anchorheads, shims, or bearing plates of any of the tendon samples inspected. Concrete adjacent to the bearing plates was found covered with a steel plate and could not be inspected. For Unit 2, data gathered during this in-service inspection supports the conclusion that no abnormal degradation of the Unit 2 post-tensioning system affecting the structural integrity of the Unit 2 fuel pool girders has occurred during the first twenty years of service. Structural integrity has been maintained despite visual indications at the anchorage of grease leakage from defective grease cans and visual indications of corrosion on some of the anchorage components and surveillance wires.

Physical Condition - 2000 Inspection

Acceptable corrosion levels were found on all the tendon ends except for the buttonheads on one tendon. No cracks were found on any anchorage components. Concrete surrounding the bearing plates was covered with a steel plate and could not be inspected for cracks.

NRC RAI B.2.32-3

In Section A.1.1.34 of the LRA, the applicant provides a summary of the inspection program. The summary, in part, states: "Inspection results are used to ensure that the tendon prestressing values do not fall below the minimum design requirements." To be meaningful, the summary should include the minimum prestressing force values required for the girders to perform their intended function.

RAI B.2.32-3 Response

The loss of prestress is relatively steep from the initial loading to the first surveillance at 20 years and then levels off between the 20 and 25-year surveillance. No meaningful information can be derived for a 60-year prestress value from two data points less than half-way through the 60-year period. The 40 and 60-year values have been determined analytically and the following table provides those values compared to the minimum required.

	Minimum Required Prestress	Initial Prestress	Predicted 40 year Prestress	Predicted 60 year Prestress
Stage I Tendons	581.6 kips	776.9 kips	616 kips	568 kips
Stage II Tendons	595.2 kips	783 kips	635.7 kips	587.7 kips
Stage III Tendons	602.2 kips	780 kips	639.7 kips	591.7 kips

Brunswick Steam Electric Plant (BSEP) License Renewal Commitments, Revision 2		
License Renewal Commitment Subject	**LRA, Appendix A, Section**	**Scope of Commitment**
Quality Assurance (QA)	A.1.1	Prior to the period of extended operation, the elements of corrective action, confirmation process, and administrative controls in the BSEP QA Program will be applied to required aging management activities for both safety related and non-safety related structures and components subject to aging management review.
Flow-Accelerated Corrosion (FAC) Program	A.1.1.5	Prior to the period of extended operation, the BSEP FAC susceptibility analyses will be updated to include additional components potentially susceptible to FAC.
Bolting Integrity Program	A.1.1.6	Prior to the period of extended operation, a precautionary note will be added to plant bolting guidelines to limit the sulfur content of compounds used on bolted connections.
Open-Cycle Cooling Water System Program Revised commitment	A.1.1.7	Prior to the period of extended operation, the Open-Cycle Cooling Water System Program will be enhanced to require that: (1) Program scope include portions of the Service Water (SW) System credited in the Aging Management Review, including non-safety related piping, (2) the Residual Heat Removal (RHR) Heat Exchangers will be subject to eddy current testing with results compared to previous testing to evaluate degradation and aging, (3) A representative sampling of SW Pump casings be inspected, (4) Program procedures be enhanced to include verification of cooling flow and heat transfer effectiveness of SW Pump Oil Cooling Coils, inspections associated with SW flow to the Diesel Generators (including inspection of expansion joints), and inspection and replacement criteria for RHR Seal Coolers, (5) Piping inspections will include locations where throttling or changes in flow direction might result in erosion of copper-nickel piping, and (6) Performance testing of the RHR and Emergency Diesel Generator Jacket Water heat exchangers will be performed to verify heat transfer capability.
Closed-Cycle Cooling Water System Program	A.1.1.8	Prior to the period of extended operation, Closed-Cycle Cooling Water System Program activities will be enhanced to assure that Preventive Maintenance activities include inspections of DG combustion air intercoolers and heat exchangers.
Inspection of Overhead Heavy Load and Light Load Handling	A.1.1.9	Administrative controls for the Program will be enhanced, prior to the period of extended operation to: (1) include in the Program all cranes/platforms within the scope of License Renewal, (2) specify an annual inspection frequency for the Reactor Building Bridge Cranes and the Intake Structure Gantry Crane, and every fuel cycle for the Refuel Platforms, (3) allow use of maintenance crane inspections as input for the condition monitoring of License Renewal cranes, (4) require maintenance inspection reports to be forwarded to the responsible engineer, and (5) include inspection of structural component corrosion and monitoring crane rails for abnormal wear.

Brunswick Steam Electric Plant (BSEP) License Renewal Commitments, Revision 2		
License Renewal Commitment Subject	**LRA, Appendix A, Section**	**Scope of Commitment**
Fire Water System Program	A.1.1.11	Prior to the period of extended operation, Fire Water System Program administrative controls will be enhanced to require assessing results from the initial 40-year service life tests and inspections to determine whether a representative sample of such results has been collected and whether expansion of scope and use of alternate test/inspection methods are warranted.
Aboveground Carbon Steel Tanks Program	A.1.1.12	The Aboveground Carbon Steel Tanks Program is a new aging management program that will be implemented prior to the period of extended operation.
Fuel Oil Chemistry Program	A.1.1.13	Prior to the period of extended operation: (1) Fuel Oil Chemistry Program administrative controls will be enhanced to add a requirement to trend data for water and particulates, (2) the condition of the in-scope fuel oil tanks will be verified by means of thickness measurements under the One-Time Inspection Program, and (3) an internal inspection of the Main Fuel Oil Storage Tank will be performed under the One-Time Inspection Program.
Reactor Vessel Surveillance Program	A.1.1.14	The Reactor Vessel Surveillance Program will be enhanced to ensure that any additional requirements that result from the NRC review of Boiling Water Reactor Vessel Internals Program (BWRVIP)-116 are addressed prior to the period of extended operation.
One-Time Inspection Program	A.1.1.15	This is a new aging management program that requires procedural controls for implementation and tracking of One-Time Inspection Program activities. The One-Time Inspection Program will be implemented prior to the period of extended operation.
Selective Leaching of Materials Program	A.1.1.16	The Selective Leaching of Materials Program is a new aging management program that requires a sample population of susceptible components to be selected for inspection. The Selective Leaching of Materials Program will be implemented prior to the period of extended operation.
Buried Piping and Tanks Inspection Program	A.1.1.17	The Buried Piping and Tanks Inspection Program is a new aging management program that will be implemented prior to the period of extended operation and will include procedural requirements to (1) ensure an appropriate as-found pipe coating and material condition inspection is performed whenever buried piping within the scope of the Buried Piping and Tanks Inspection Program is exposed, or, as a minimum, once every 10 years, (2) add precautions concerning excavation and use of backfill to the excavation procedure to include precautions for License Renewal piping, (3) add a requirement that coating inspection shall be performed by qualified personnel to assess its condition, and (4) add a requirement that a coating engineer or other qualified individual should assist in evaluation of any coating degradation noted during the inspection.
ASME Section XI, Subsection IWF Program	A.1.1.20	Prior to the period of extended operation, the ASME Section XI, Subsection IWF Program will be enhanced to include the torus vent system supports within the scope of the Program.

Brunswick Steam Electric Plant (BSEP) License Renewal Commitments, Revision 2		
License Renewal Commitment Subject	**LRA, Appendix A, Section**	**Scope of Commitment**
Masonry Wall Program	A.1.1.22	Prior to the period of extended operation, the administrative controls for the Masonry Wall Program will be enhanced to require inspecting all accessible surfaces of the walls for evidence of cracking.
Structures Monitoring Program	A.1.1.23	Prior to the period of extended operation, the Structures Monitoring Program will be enhanced to: (1) identify License Renewal systems managed by the Program and inspection boundaries between structures and systems, (2) require notification of the responsible engineer regarding availability of exposed below-grade concrete for inspection and require that an inspection be performed, (3) identify specific license renewal commodities and inspection attributes, (4) require responsible engineer review of groundwater monitoring results, (5) specify that an increase in sample size for component supports shall be implemented (rather than should be) commensurate with the degradation mechanisms found, (6) improve training of system engineers in condition monitoring of structures, (7) include inspections of the submerged portions of the Service Water Intake Structure on a frequency not to exceed five years, (8) specify an annual groundwater monitoring inspection frequency for concrete structures, and (9) specify the inspection frequency for the Service Water Intake Structure and Intake Canal to not exceed five years. Following enhancement, the Structures Monitoring Program will be consistent with the corresponding program described in NUREG-1801.
Protective Coating Monitoring an Maintenance Program	A.1.1.24	Prior to the period of extended operation, the Protective Coating Monitoring an Maintenance Program administrative controls will be enhanced to: (1) add a requirement for a walk-through, general inspection of containment areas during each refueling outage, including all accessible pressure-boundary coatings not inspected under the ASME Section XI, Subsection IWE Program, (2) add a requirement for a detailed, focused inspection of areas noted as deficient during the general inspection, (3) assure that the qualification requirements for persons evaluating coatings are consistent among the Service Level I coating specifications, inspection procedures, and application procedures, and meet the requirements of ANSI N 101.4, "Quality Assurance for Protective Coatings Applied to Nuclear Facilities," and (4) document the results of inspections and compare the results to previous inspection results and to acceptance criteria.
Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program	A.1.1.25	The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a new aging management program that will be implemented prior to the period of extended operation.

Brunswick Steam Electric Plant (BSEP) License Renewal Commitments, Revision 2		
License Renewal Commitment Subject	**LRA, Appendix A, Section**	**Scope of Commitment**
Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program	A.1.1.26	The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program is a new aging management program that will be implemented prior to the period of extended operation.
Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program	A.1.1.27	The Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a new aging management program that will be implemented prior to the period of extended operation.
Reactor Coolant Pressure Boundary (RCPB) Fatigue Monitoring Program	A.1.1.28	Prior to the period of extended operation, the Program will be enhanced to: (1) expand the Program scope to include an evaluation of each reactor coolant pressure boundary component included in NUREG/CR-6260, (2) provide preventive action requirements including requirement for trending and consideration of operational changes to reduce the number or severity of transients affecting a component, (3) include a requirement to reassess the locations that are monitored considering the RCPB locations that were added to the Program scope, (4) specify the selection criterion to be locations with a 60-year CUF value (including environmental effects where applicable) of 0.5 or greater, other than those identified in NUREG/CR-6260, (5) address corrective actions for components approaching limits, with options to include a revised fatigue analysis, repair or replacement of the component, or in-service inspection of the component (with prior NRC approval), and (6) address criteria for increasing sample size for monitoring if a limiting location is determined to be approaching the design limit.
Reactor Vessel and Internals Structural Integrity Program	A.1.1.30	Prior to the period of extended operation, the Reactor Vessel and Internals Structural Integrity Program will be enhanced to: (1) incorporate augmented inspections of the top guide using enhanced visual examination that will focus on the high fluence region and (2) establish inspection criteria for the VT-3 examination of the Core Shroud Repair Brackets.

Brunswick Steam Electric Plant (BSEP) License Renewal Commitments, Revision 2		
License Renewal Commitment Subject	**LRA, Appendix A, Section**	**Scope of Commitment**
Systems Monitoring Program	A.1.1.31	Prior to the period of extended operation, a procedure will be developed to implement: 1) inspection of in-scope License Renewal components for identified aging effects, 2) guidelines for establishing inspection frequency requirements, 3) listing of inspection criteria in checklist form, 4) recording of extent of condition during system walkdowns and 5) addressing of appropriate corrective action(s) for degradations discovered.
Preventive Maintenance (PM) Program	A.1.1.32	Prior to the period of extended operation, preventive maintenance activities will be incorporated into the PM Program, as needed, to satisfy aging management reviews of components that rely on the PM Program for management of aging effects.
Phase Bus Aging Management Program	A.1.1.33	The Phase Bus Aging Management Program is a new aging management program that will be implemented prior to the period of extended operation.
Fuel Pool Girder Tendon Inspection Program	A.1.1.34	Prior to the period of extended operation, the Fuel Pool Girder Tendon Inspection Program will be enhanced to: (1) specify inspection frequencies, numbers of tendons to be inspected, and requirements for expansion of sample size, (2) identify test requirements and acceptance criteria for tendon lift-off forces, measurement of tendon elongation, and determination of ultimate strength, (3) specify inspections for tendons, tendon anchor assemblies, surrounding concrete, and grease, (4) require prestress values to be trended and compared to projected values, and (5) identify acceptable corrective actions for tendons that fail to meet testing criteria.
Time Limited Aging Analysis (TLAA) – Core Plate Plug Spring Stress Relaxation	A.1.2.1.7 A.1.1.30	Management of Core Plate Plug Spring Stress Relaxation will be performed by means of the Reactor Vessel and Internals Structural Integrity Program.
TLAA – Fuel Pool Girder Tendon Loss of Prestress	A.1.2.6 A.1.1.34	Prior to the period of extended operation, a Fuel Pool Girder Tendon Inspection Program will be implemented to assure design basis anchor forces required for the tendons to perform their intended function will continue to be maintained.
TLAA – Torus Component Corrosion Allowance	A.1.2.8 A.1.1.15	Prior to the period of extended operation, measurements are planned, using the One-Time Inspection Program, to verify by volumetric measurements the actual rate of corrosion of the supports and platform steel in the Torus.