Progress Energy

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May 11, 2005

SERIAL: BSEP 05-0055 10 CFR 54

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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
(NRC TAC Nos. MC4639 and MC4640)

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 (ML043060406)

2. Letter from Sikhindra K. Mitra, to Cornelius J. Gannon, "Request for Additional Information for the Review of the Brunswick Steam Electric Plant, Units 1 and 2, License Renewal Application," dated April 25, 2005 (ML051150161)

3. Advisory Committee on Reactor Safeguards letter to the Chairman, U. S. Nuclear Regulatory Commission, "Report on the Safety Aspects of the License Renewal Application for the Dresden 2 and 3 and Quad Cities 1 and 2 Nuclear Power Stations," dated September 16, 2004

Ladies and Gentlemen:

On October 18, 2004, Carolina Power & Light Company, now doing business as Progress Energy Carolinas, Inc. (PEC), requested the renewal of the operating licenses for 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 April 25, 2005, the Nuclear Regulatory Commission (NRC) provided a request for additional information (RAI) concerning the BSEP License Renewal Application. Enclosure 1 to this letter provides responses to the NRC RAI.

Enclosure 2 is the summary list of regulatory commitments for License Renewal. A new commitment has been added to address concerns expressed by the NRC's Advisory Committee on Reactor Safeguards (ACRS) regarding the potential impact of power uprate on aging effects and mechanisms. The commitment addresses the recommendations

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expressed in an ACRS letter dated September 16, 2004, related to the License Renewal review of Dresden and Quad Cities Nuclear Power Stations.

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

I declare, under penalty of perjury, that the foregoing is true and correct. Executed on May 11, 2005.

Sincerely,

Cornelius J. Gannon

MHF/mhf

Enclosures:

1. Responses to Request for Additional Information dated April 25, 2005
2. BSEP License Renewal Commitments, Revision 4

cc:

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Responses to Request for Additional Information dated April 25, 2005

Background

On October 18, 2004, Carolina Power & Light Company, now doing business as Progress Energy Carolinas, Inc. (PEC), submitted a License Renewal Application (LRA) that requested the renewal of the operating licenses for 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 April 25, 2005, the Nuclear Regulatory Commission (NRC) provided a request for additional information (RAI) concerning the LRA. Responses to the RAI are provided in this enclosure.

Table of Contents

The following table contains the acronyms and abbreviations used in this enclosure.

TABLE OF ACRONYMS AND ABBREVIATIONS	
AMP	Aging Management Program
AMR	Aging Management Review
AOV	Air-Operated Valve
ASME	American Society of Mechanical Engineers
AST	Auxiliary Surge Tank
BSEP	Brunswick Steam Electric Plant
BWR	Boiling Water Reactor
CST	Condensate Storage Tank
CW	Circulating Water
CWIS	Circulating Water Intake Structure
DG	Diesel Generator
EDB	(PassPort) Equipment Database
EMD	Electro-Motive Division
FAC	Flow-Accelerated Corrosion
GALL	Generic Aging Lessons Learned (the GALL Report is NUREG-1801)
GL	Generic Letter
HPCI	High Pressure Coolant Injection
IA	Instrument Air
IEB	(NRC Office of) Inspection and Enforcement Bulletin
IGSCC	Intergranular Stress Corrosion Cracking
IN	(NRC) Information Notice
LO	Lubricating Oil
LR	License Renewal
LRA	License Renewal Application
MIC	Microbiologically Induced Corrosion
NPS	Nominal Pipe Size
NRC	Nuclear Regulatory Commission
OE	Operating Experience
PEC	Progress Energy Carolinas
PM	Preventive Maintenance
PVC	Polyvinylchloride
RAI	Request for Additional Information
RCS	Reactor Coolant System
RCPB	Reactor Coolant Pressure Boundary
RMCSB	Radioactive Material Container Storage Building
RPV	Reactor Pressure Vessel
RWCU	Reactor Water Cleanup System
SA	Service Air
SCC	Stress Corrosion Cracking
SCW	Screen Wash Water
SW	Service Water
SWIS	Service Water Intake Structure
TLAA	Time-Limited Aging Analysis
UFSAR	Updated Final Safety Analysis Report

NRC RAI 2.4-1

BSEP primary containment encloses the reactor vessel and a number of other structures, such as the concrete pedestal and seismic bracing for the drywell. Table 2.4.1-1 does not include these structures in the scope of license renewal. They perform safety-related functions per 10 CFR 50.54(a)(1). If they are not included as an oversight, please provide a description of their scope and aging management review. If they are covered somewhere else in the LRA, please indicate the location. If they are excluded from the scope of license renewal, please provide the basis for excluding these items from the scope of license renewal.

RAI 2.4-1 Response

The concrete pedestal is within the scope of License Renewal and is addressed within the "Concrete Above Grade" commodity group. Seismic Stabilizers are utilized between the Reactor Pressure Vessel (RPV) and the biological shield wall, are within the scope of License Renewal, and are addressed within the "RPV Support" commodity group. Seismic Ties are utilized between the biological shield wall and the drywell wall, are in the scope of License Renewal, and are addressed within the "Structural Steel" commodity group.

NRC RAI 2.4-2

Based on information provided in LRA Section 2.4.1, it is not clear if all drywell and torus supports are within the scope of license renewal. If they are not included as an oversight, please provide a description of their scope and aging management review. If they are covered somewhere else in the LRA, please indicate the location. If they are excluded from the scope of license renewal, please provide the basis for excluding these items from the scope of license renewal.

RAI 2.4-2 Response

All drywell and torus supports are within the scope of License Renewal. The subject supports are addressed within a variety of commodity groups such as: "Electrical Support," "Equipment Support," "HVAC Support," "Instrument Support," "Pipe Support," "Structural Steel," and "Whip Restraints," as shown on Table 2.4.1-1 of the LRA. Although Pipe Supports are identified by a single commodity group in Table 2.4.1-1, they are sub-categorized by American Society of Mechanical Engineers (ASME) Code Class designation in Table 3.5.2-1.

NRC RAI 2.4-3

It is not clear from Table 2.4.2-7 if the BWR reactor building with steel superstructure (enclosure building) including the metal structure, metal panels, is within the scope of LR. Please clarify the extent to which the enclosure building is within the scope of license renewal, and indicate the location(s) where all its components are included in the LRA.

RAI 2.4-3 Response

The entire Reactor Building, including the metal superstructure, is within the scope of License Renewal. The structural steel associated with the superstructure is addressed within the "Structural Steel" commodity group, the metal panels are addressed within the "Siding" and "Blow-Out Panel" commodity groups, and the roof is addressed within the "Roof-Membrane/Built-Up" commodity group, within Table 2.4.2-7.

NRC RAI 2.4-4

LRA Section 2.4, "Scoping and Screening Results - Structures," identifies structures that are in the scope of license renewal. As indicated in LRA Figure 2.2-1, some structures are not considered in the scope of license renewal and are not listed in LRA Section 2.4. These structures include Circulating Water Intake Structure, Chlorination Building, Auxiliary Boiler House, Auxiliary Surge Tank, Diesel Generator Fuel Oil Tank Vault, Radioactive Material Container Storage, and Service Building. It is not obvious to the staff that all these structures serve no intended function as defined in 10 CFR 54.4(a)(1). The staff cannot evaluate whether these structures are correctly excluded from the license renewal scope. Additional descriptive information is needed for these structures before a determination can be made. Therefore, the applicant is requested to submit a more detailed description of these structures, define their function, and describe the technical bases for their exclusion from the license renewal scope. Also verify that none of these structures serves a seismic II/I intended function as defined in 10 CFR 54.4(a)(2).

RAI 2.4-4 Response

As stated in Section 2.1.1 of the LRA, the Civil/Structural scoping process utilized design information found in the Updated Final Safety Analysis Report (UFSAR), Design Basis Documents, EDB (i.e., PassPort Equipment Database), Maintenance Rule Database, and License Renewal scoping evaluations to determine whether a structure was in the scope of License Renewal. As such, if a structure was found to contain any components within the scope of License Renewal or if the structure supported a License Renewal intended function, that structure itself would be in the scope of License Renewal. Those structures that contained no License Renewal components and supported no License Renewal intended functions were identified as outside the scope of License Renewal. The following provides a more detailed basis for the exclusion of the subject structures.

Circulating Water Intake Structure

The Circulating Water (CW) Intake Structure (CWIS) is directly south of the Service Water (SW) Intake Structure (SWIS) and is approximately 171 feet long by 105 feet wide. It consists of two sets of four pump bays, one set for each unit, separated by one of three 84-inch diameter backwash pipes. Each pump bay includes a coarse bar rack, traveling screen, provisions for stop logs, and a CW pump. The pumps discharge into discharge chambers, which are supported on the west wall of the pump bays by structural fill.

The intake bays of the CW System are classified in the BSEP EDB as non-safety related structures; the UFSAR classifies the structure as Seismic Class II. Additionally, UFSAR Section 3.3.4.3 states that:

> Seismic Class II structures, such as the Office, Service, Maintenance Shop and Warehouse Buildings, and the Circulating Water Intake and Discharge structures, are located a sufficient distance from safety related (Class I) structures such that failure of the Class II structures during a hurricane or tornado will not affect Class I structures.

As such, the CWIS does not contain any components that are within the scope of License Renewal nor does it support a License Renewal intended function and is therefore not within the scope of License Renewal.

Chlorination Building

The Chlorination Building is approximately 18 feet wide by 45 feet long, located within the protected area south of the SWIS and north of the CWIS. The building consists of an insulated sheet metal structure, supported by reinforced concrete spread footings and the reinforced concrete south wall of the SWIS. The Chlorination Building houses the Chlorination System and chlorine detectors, which will alarm in the control room on high chlorine concentration. The Chlorination Building is an unclassified structure shared between the units and supports no safety related functions. The Chlorination System is used to control marine growth and slime formation in the SW System; however, it is not credited with operability of the SW System. The Chlorination Building does not contain any components that are within the scope of License Renewal nor does it support a License Renewal intended function and is therefore not within the scope of License Renewal.

Auxiliary Boiler House

The Auxiliary Boiler House is approximately 20 feet wide by 55 feet long, located inside the protected area southeast of the Diesel Generator (DG) Building. The Auxiliary Boiler House is a steel frame structure with insulated metal siding and built-up roofing. The building is constructed on a reinforced concrete mat at Elevation 17'-9", is founded on structural backfill, and is an isolated structure (i.e., not adjacent to any other structure). The Auxiliary Boiler House contains the boiler feedwater pumps, fuel oil pumps, water treatment equipment and control and electrical equipment. The roof supports a feedwater storage tank and deaerator. The Auxiliary Boiler System is described in the UFSAR; however, it is an unclassified structure. Systems, Structures, and Components within the building do not support License Renewal intended functions based on review of their EDB safety classifications. Therefore this building is not within scope for License Renewal.

Auxiliary Surge Tank

The Auxiliary Surge Tank (AST) is located south of the Unit 2 Railroad Bay and is not directly adjacent to any Class I Structure. The civil components associated with the AST are the

foundation and anchorage arrangement. The AST is one of the options for the surge system to act as a bulk storage facility for quantities of radioactive waste in excess of normal operational quantities. Refer to UFSAR, Section 11.2.2.6 for further information. The surge system is part of Liquid Waste Processing System, which incorporates parallel treatment paths to the Waste Collector System. The AST is fabricated from stainless steel and mounted on a concrete slab. Radioactivity levels within the AST are procedurally controlled to a limit of less than 10 curies in accordance with Technical Specification 5.5.8; as such, failure of the AST would not exceed limits associated with 10 CFR 54.4(a)(1)(iii). Therefore, the AST, foundations, and support arrangements have been determined to support no License Renewal intended function and are outside the scope of License Renewal.

DG Fuel Oil Tank Vault

The DG Fuel Oil Tank Vault is within the scope of License Renewal and is addressed within the DG Building. See the discussion in Section 2.4.2.10 of the LRA.

Radioactive Material Container Storage Building

The Radioactive Material Container Storage Building (RMCSB) is located north of the Unit 1 Turbine and Reactor Buildings and is not adjacent to any Class I Structure. The RMCSB is a sheet metal fabricated building supported by a concrete slab. The RMCSB is a non-system related service facility, which does not contain any components that are within the scope of License Renewal; nor does it support a License Renewal intended function and is, therefore, not within the scope of License Renewal.

Service Building

The Service Building is shared between the units and is in the protected area located south of the Turbine Building, east of the Office Building, and west of the Shop, Warehouse, and Stockroom Building. The Service Building is not adjacent to any Class I structure. The Service Building is a pre-engineered steel frame building with insulated metal siding and roof panels, 60 feet wide by 148 feet long, with a 30 foot by 60 foot penthouse. The building is constructed on reinforced concrete spread footings and grade beams with a reinforced concrete slab on grade and is structurally independent from the Turbine Building. The Service Building contains plant personnel offices, locker rooms, shower rooms, clothes handling and storage room, and a laboratory including counting room, ventilation hoods, file room, and chemical storage room. The Service Building supports no safety related functions or components and is, therefore, classified as non-safety related, seismic class II. UFSAR Section 9.4.8 discusses the ventilation system for the Service Building as it relates to habitability of the offices inside; however, based on that discussion, it does not support any safety related functions. The Service Building does not contain any components that are within the scope of License Renewal nor does it support a License Renewal intended function and is, therefore, not within the scope of License Renewal.

NRC RAI 2.4-5

LRA Section 2.4.1.1 discusses the scoping and screening results for the Primary Containment Structure. It is the staff's understanding that this LRA section addresses not only the primary containment (drywell, pressure suppression chamber, and the vent system connecting the two structures), but also all the structures inside the primary containment, all attachments to the containment, and the containment supports. LRA Table 2.4.1-1 identifies the primary containment component types requiring aging management review and the associated component intended function(s). Since LRA Table 2.4.1-1 combines many components under a single component type, the staff requests that the applicant identify, as appropriate, which component type is intended to cover the specific components listed in (a) through (f) below, or identify the location in the LRA where these specific components are addressed. If these specific components are not considered to be within the scope of license renewal, the staff requests the applicant to provide the technical bases for their exclusion:

(a) Reactor Vessel to Biological Shield Stabilizers

(b) Biological Shield to Containment Stabilizer

(c) Biological Shield Wall Anchor Bolts

(d) Reactor Vessel Anchor Bolts

(e) Reactor Vessel Support Ring Girder including Anchor Bolts and Reactor Vessel Support Pedestal

(f) The drywell head closure bolts and double gasket, tongue-and-groove seal arrangement

RAI 2.4-5 Response

(a) Reactor Vessel to Biological Shield Stabilizers

RPV stabilizers are located between the RPV and the biological shield wall, are within the scope of License Renewal, and are addressed within the "RPV Support" commodity group.

(b) Biological Shield to Containment Stabilizer

Seismic Ties are located between the biological shield wall and the drywell wall, are within the scope of License Renewal, and are addressed within the "Structural Steel" commodity group.

(c) Biological Shield Wall Anchor Bolts

Anchor bolts associated with the biological shield wall are considered sub-components of the "Sacrificial Shield Wall" commodity group which is in scope for License Renewal.

(d) Reactor Vessel Anchor bolts

Anchor bolts associated with the reactor vessel support are considered sub-components of the "RPV Support" commodity which is in scope for License Renewal.

(e) Reactor Vessel Support Ring Girder and Anchor Bolts and Reactor Vessel Support Pedestal

The Reactor Vessel Support Ring Girder and Anchor Bolts are sub-components of the "RPV Support" commodity group.

The Reactor Vessel Support Pedestal is addressed within the "Concrete Above Grade" commodity group which is in scope for License Renewal.

(f) The drywell head closure bolts and double gasket, tongue-and-groove seal arrangement

The drywell head closure bolts and tongue-and groove seal arrangement are sub-components of the "Drywell Head" commodity group which is in scope for License Renewal. The associated seals are for the Drywell Head are addressed within the "Seals and Gaskets" commodity group which is in scope for License Renewal.

NRC RAI 2.4-6

As described in UFSAR Section 10.4.5.2, an expanded metal fence, and eight traveling screens (four for each unit) are installed in the intake canal to prevent marine lives and debris from entering the system. From its review of LRA Section 2.4.2.1, the staff found that these items are not subject to aging management. The applicant is requested to submit a more detailed description of these items, define their functions, and describe the technical bases for their exclusion from the license renewal scope.

RAI 2.4-6 Response

The expanded metal fence is associated with the fish diversion structure; the fish diversion structure is addressed within the Intake and Discharge Canal System. A fish diversion screen is located across the intake canal at Snows Marsh to keep fish from entering the intake canal, thus minimizing impingement and improving traveling screen reliability. There are no credible design basis events associated with the structure that would prevent or mitigate the completion of a safety related function or that are relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the NRC regulations for fire protection, environmental qualification, pressurized thermal shock, anticipated transients without scram, and

station blackout. As such, the fish diversion structure, along with the expanded metal fence, supports no License Renewal function and are outside the scope of License Renewal.

The eight traveling screens identified in UFSAR Section 10.4.5.2 are associated with the CW System and are located in the CWIS. As discussed in the response to RAI 2.4-4, the CWIS does not contain any components that are within the scope of License Renewal nor does it support a License Renewal intended function; therefore, it is not within the scope of License Renewal.

NRC RAI 2.4-7

LRA Table 2.4.2-7, "Component Commodity Groups requiring Aging Management Review and Their Intended Functions: Reactor Building," presents a list of component groups. However, for certain components, the staff needs further information and explanation to complete its evaluation. The staff requests the applicant to provide a description of the "Neutron-Absorbing Sheets" used for Brunswick spent fuel storage racks and confirm that they are part of the spent fuel storage racks.

RAI 2.4-7 Response

Boral plates are an integral non-structural part of the basic fuel storage tube. These plates are sandwiched between the inner and outer wall of the storage tube and are not subject to dislocation, deterioration, or removal. Boral is considered a sub-component of the "Spent Fuel Storage Rack" commodity group; see LRA Table 3.5.2-8 for identification of Boral as a material within the Spent Fuel Storage Rack commodity group.

NRC RAI 2.4-8

LRA Tables 2.4.2-1 through 2.4.2-14 lists component commodity groups requiring aging management review. Some of these tables indicate that structural steel includes platforms, stairways, mezzanines, and hardware. The applicant is requested to respond to the following questions: (1) what is covered under the word "hardware"? (2) which structural steel components are considered as "hardware," (3) are the major structural steel components (e.g., beams, columns, roof frames, other steel frames, etc.) considered as hardware? and (4) if not, in which table (or tables) are these structural components listed for the aging management.

RAI 2.4-8 Response

The term hardware is associated with connection components, such as, nuts, bolts, washers, etc. Major structural steel components, such as, beams, columns, roof frames, other steel frames, etc., are considered to be structural steel and are addressed within the "Structural Steel" commodity group.

NRC RAI 2.4-9

Clarify whether the Brunswick's Reactor Building pipe penetrations include some type of silicone rubber seals that allow for pipe movement while providing a seal between the pipe and the Reactor Buildings to maintain the differential pressure. As applicable, confirm whether these penetration seals are designated within the scope of AMR and are included in Table 2.4.2.7 of the LRA.

RAI 2.4-9 Response

The BSEP Reactor Building pipe penetrations are provided with a seal around the piping by installation of an expandable rubber seal or other suitable fill material.

The subject penetrations are within the scope of the aging management review (AMR) and included in Table 2.4.2-7 of the LRA within the "Penetration" commodity group.

NRC RAI 2.4-10

As described in LRA Section 2.4, masonry walls located in the Service Water Intake Structure, Reactor Building, Augmented Off-Gas Building, Diesel Generator Building, Control Building, and Turbine Building are within the scope of license renewal. The applicant is requested to identify whether there are masonry walls located in other building structures within the LR scope, such as the Radwaste Building, Water Treatment Building, HPCI CO_2 Bottle Storage Building, etc. If yes, the applicant is requested to include these masonry walls in the component commodity groups requiring aging management review or provide justification for their exclusion from the scope.

RAI 2.4-10 Response

There are no masonry walls in the High Pressure Coolant Injection (HPCI) CO_2 Bottle Storage Building. There are masonry walls in the Radwaste Building; however, those walls do not support any License Renewal intended function and have therefore been screened out of License Renewal. The License Renewal disposition of masonry walls in the Radwaste Building is consistent with evaluations performed under NRC Office of Inspection and Enforcement Bulletin (IEB) 80-11, "Masonry Wall Design." There is a masonry wall in the Water Treatment Building that acts as a fire protection impingement barrier between the diesel fire pump and the fuel oil tank. The subject wall is not addressed as part of IEB 80-11, is not safety related, and does not support a non-safety affecting safety function. However, it does support a regulatory fire protection intended function and is managed by the Fire Protection Program as a fire barrier. See RAI 2.3.3.15-7 in PEC's RAI Response (i.e., Serial: BSEP 05-0050) dated May 4, 2005, for additional information.

NRC RAI 2.4-11

Regarding the scope and screening of crane/rail systems, the applicant is requested to clarify the treatment of cranes and hoists in the scoping and screening, and in the aging management review. Please submit the following information:

(a) A list of all cranes/hoists/rails and associated components in the scope of License Renewal.

(b) A list of all cranes/hoists/rails and associated components requiring aging management review (i.e., passive, long-lived).

(c) A list of all cranes/hoists/rails and associated components requiring aging management and/or time-limited aging analysis (TLAA).

RAI 2.4-11 Response

Although not specifically identified in Section 2.4.2.2 of the LRA as a crane, the Unit 1 and 2 Refueling Platforms are considered cranes in the scope of License Renewal.

As stated in Section 2.4.2.4, Monorail Hoists, of the LRA, monorail hoists are categorized as "Structural Steel" for the purpose of License Renewal and are managed by the Structures Monitoring Program.

As stated in Section 2.4.2.5, Bridge Cranes, of the LRA and summarized below, the following Bridge Cranes are in the scope of License Renewal:

- Unit 1 – Reactor Building Bridge Crane,
- Unit 2 – Reactor Building Bridge Crane,
- Unit 1 – Turbine Building Bridge Crane; screened out in the License Renewal review/performs no License Renewal intended function,
- Unit 2 – Turbine Building Bridge Crane; screened out in the License Renewal review/performs no License Renewal intended function,
- Unit 1 – Refueling Jib Crane; removed from service, no longer in the plant,
- Unit 2 – Refueling Jib Crane; removed from service, no longer in the plant,
- Unit 1 – Jib Crane; screened as structural steel with monorail hoists, and
- 4 (Four) - DG Bridge Cranes, one for each diesel; screened as structural steel with the monorail hoists.

As stated in Section 2.4.2.6, Gantry Cranes, of the LRA and summarized below, the following Gantry Cranes are in the scope of License Renewal:

- Intake Structure Gantry Crane, and
- Heater Bay Gantry Crane; screened out as performing no License Renewal intended function.

Based on the preceding information the following bridge cranes, gantry cranes, and monorails have been identified as requiring aging management:

- Unit 1 and 2 Refueling Platforms,
- Unit 1 and 2 Reactor Building Bridge Cranes,
- Intake Structure Gantry Crane,
- DG Bridge Cranes; Managed under "Structural Steel" in the DG Building,
- Monorail Hoists; Managed under "Structural Steel" in their respective buildings, and
- Unit 1 – Jib Crane; screened as structural steel with monorail hoists.

As stated in Section 4.7.3 of the LRA, the following Cranes and Monorails have been identified as involving a TLAA:

- Unit 1 and 2 Refueling Platforms,
- Unit 1 and 2 Reactor Building Bridge Cranes,
- Intake Structure Gantry Crane,
- DG Bridge Cranes; Managed as "Structural Steel" under the Structures Monitoring Program, and
- Miscellaneous Monorails/Hoists; Managed as "Structural Steel" under the Structures Monitoring Program.

As shown on Tables 3.5.2-3, 3.5.2-5, and 3.5.2-6 of the LRA, and stated within Section B.2.9 of the LRA, the Unit 1 and 2 Refueling Platforms, Unit 1 and 2 Reactor Building Bridge Cranes, and the Intake Structure Gantry Crane are managed by the Inspection of Overhead Heavy Load and Light Load Handling Systems Program.

Miscellaneous Monorails/Hoists, Unit 1 Jib Crane, and the DG Bridge Cranes are managed as "Structural Steel" under the Structures Monitoring Program.

NRC RAI 2.4-12

Provide additional information regarding the following Class I Group 6 Structures:

(a) With respect to the Intake Pumping Station, identify items such as hatches and plugs; structural steel embedments; carbon steel boltings; reinforced concrete foundation footings; grouted concrete; and water proofing membrane materials that require an AMR.

(b) Regarding the Condensate Water Storage Tanks Foundation and Trenches, confirm that the equipment supports and foundations as well as the trenches consist of reinforced concrete components. As appropriate, identify items such as structural steel embedments; carbon steel boltings; grouted concrete; and water proofing membrane materials that require an AMR.

RAI 2.4-12 Response

(a) Hatches and plugs associated with the SWIS are considered sub-components of the "Concrete Above Grade" commodity group. Structural steel embedments are addressed within the "Anchorage/Embedment- Embedded" commodity group. Carbon steel bolting is addressed as a sub-component of the respective commodity group; such as, "Electrical Support," "Equipment Support," "HVAC Support," etc. Reinforced concrete foundation footings are addressed within the "Concrete Below Grade" commodity group. Grouted concrete is addressed within the "Concrete Above Grade" commodity group. Water proofing membranes are addressed within the "Roof-Membrane/Built-Up" commodity group. These commodities are listed on Tables 2.4.2-6 and 3.5.2-7 of the LRA and require an AMR.

(b) The Condensate Storage Tank (CST) foundation was correlated to a GALL Group 8 structure, not Group 6, and is addressed in Section 2.4.2.15 of the LRA. The commodity groups associated with the CST are: "Anchorage/Embedment –Embedded," "Anchorage/Embedment- Exposed," "Tank Foundation," "Electrical Enclosure," and "Instrument Support." There is no water proofing membrane associated with CST foundation.

NRC RAI 2.4-13

Based on information provided in LRA Section 2.4, the staff cannot identify the insulation and insulation jacketing included in the license renewal scope nor the specific subsets of insulation and insulation jacketing that are included in Section 2.4 tables. It is also unclear whether insulation and jacketing on the reactor coolant system has been included.

In order to complete the screening review for insulation and insulation jacketing, the staff requests the applicant to provide the following information:

(a) Specifically identify the structures and structural components, designated within the license renewal scope, that have insulation and/or insulation jacketing, and identify their location in the plant.

(b) List all insulation and insulation jacketing materials associated with item (a) above that require an aging management review and results of the aging management review for each. Also, identify the aging management program(s) credited to manage aging.

(c) List insulation and insulation jacketing materials associated with item (a) above that do not require aging management, and include your justification for their exclusion in relation to plant-specific operating experience.

RAI 2.4-13 Response

The only insulation credited within Section 2.4 of the LRA is associated with the drywell hot penetrations. See Table 2.4.1-1 of the LRA. Insulation and jacketing of the Reactor Coolant System was not credited in Section 2.4 of the LRA, drywell internal temperatures are controlled by Technical Specifications. The drywell bulk average temperature is managed under Technical Specification 3.6.1.4, which requires the plant enter Limiting Condition for Operation actions if the drywell bulk average temperature exceeds 150°F.

The subject insulation on hot penetrations was identified for aging management review, see Table 3.5.2-1 of the LRA. No aging effects were identified, based on operating experience; as such, no aging management program was specified. Hot penetration temperatures, recorded on chart paper, were reviewed back to 1997. No penetration temperatures exceeded 200°F, with the highest recorded temperature of 185°F, occurring between June and August of 2003, on one of the main steam lines. As such, the insulation has been proven effective in maintaining hot penetration temperatures below 200°F.

NRC RAI 2.4-14

For some of the in-scope building structures, the applicant identified the "Fire Barrier Assembly" as one of the commodity groups requiring aging management review. The applicant is requested to provide a list of in-scope Brunswick buildings with fire proofing material applied to some of their structural steel members or components as part of fire barriers. Discuss how and where these fire proofing materials are included in the AMR as part of the fire barrier review.

RAI 2.4-14 Response

The BSEP in-scope buildings with fire proofing material applied to some of their structural steel members or components are the SWIS, Reactor Buildings, DG Building, and Control Building. The item is addressed within the "Sprayed on Coatings" commodity group and is managed by the Fire Protection Program. Refer to LRA Tables 2.4.2-6, 2.4.2-7, 2.4.2-9, and 2.4.2-10.

NRC RAI 3.3-1

In LRA Table 3.3.2-5 for the screen wash water system and in Table 3.3.2-6 for the service water system, cracking is identified as an aging effect for plastics/polymer piping exposed to a raw water (internal) environment. Table 3.3.2-5 credits the one-time inspection and Table 3.3.2-6 credits the open-cycle cooling water system program to manage cracking caused by exposure to raw water. LRA Table 3.0-1 describes raw water as water that enters the plant from a river, lake, pond, ocean, or bay that has not been demineralized and has been rough filtered to remove large particles. Small particles in raw water may cause erosion in materials susceptible to erosion. For example, LRA Table 3.3.2-6 identifies copper alloy materials exposed to raw water as being susceptible to loss of material due to erosion and the open-cycle cooling water system program is credited with managing this aging effect. The applicant is requested to clarify why loss of

material from erosion is not identified for plastics/polymer piping in a raw water environment, and why one-time inspections rather than periodic inspections are proposed to manage aging effects for plastics/polymer piping in the screen wash water system. Industry and plant operating experience should be considered in determining appropriate aging effects and programs to manage this material.

RAI 3.3-1 Response

The components represented by this line item are elastomeric (i.e., butyl rubber) expansion joints. This material is extremely resistant to erosion and is commonly used in fluid applications where abrasive components are present. Operating experience, to date, has not identified degradation of these components due to erosion or abrasion. BSEP has conservatively predicted cracking may occur as a result of aging. This aging effect, driven by age related hardening of the rubber expansion joint element, would be a slowly occurring phenomenon for which a one time inspection would be appropriate.

NRC RAI 3.3-2

The auxiliary systems 3.3.2 AMR tables do not include bolting and the bolting integrity AMP is not credited in the 3.3.2 AMR tables. In LRA Table 3.3.1, Item 3.3.1-24 indicates that the bolting integrity program is not applicable to Non-Class 1 closure bolting and bolting materials are not itemized as a separate component. This table further states that the AMP, Systems Monitoring Program, credited for visual identification of external general corrosion will also address bolting materials. The applicant is requested to explain (1) why crack initiation and growth due to cyclic loading, and loss of preload are not identified as aging effects for auxiliary systems bolting; (2) explain the conditions under which certain sizes of cracks can be identified visually in the closure bolting for auxiliary system components; and (3) clarify why the bolting integrity AMP, currently designated for Class 1 closure bolting only, is not credited for managing cracking, loss of preload, and other aging effects for closure bolting in auxiliary system components.

RAI 3.3-2 Response

(1) BSEP has revised its position on bolting in response to NRC concerns raised during the Aging Management Program (AMP) portion of the GALL Consistency Audit. The revised Bolting Integrity Program addresses bolting integrity for each of the NUREG-1800, "Standard Review Plan for the Review of License Renewal Applications for Nuclear Power Plants," system groupings (i.e., Reactor Vessel and Internals and Reactor Coolant System/Class 1, Engineered Safety Features, Auxiliary, and Steam and Power Conversion Systems). Aging management reviews for each these groupings treat bolting as potentially susceptible to loss of material, cracking and loss of preload consistent with NUREG-1800. BSEP uses the Bolting Integrity Program, ASME Section XI Inservice Inspection, Subsection IWB, IWC and IWD Program, and Systems Monitoring for aging management.

(2) Physical inspections (i.e., surface and volumetric exams) of Auxiliary System bolting for cracking are performed, to the extent applicable, under the ASME Section XI Inservice Inspection, Subsection IWB, IWC and IWD Program, as noted in the NUREG-1801, "Generic Aging Lessons Learned (GALL) Report," description of the Bolting Integrity Program, XI.M18. Inspection methods and acceptance criteria for these inspections are specified by the ASME Code. BSEP Auxiliary Systems do not utilize high strength pressure boundary bolting, and direct visual examinations for cracking is not considered necessary. The Bolting Integrity Program does contain elements of materials control, consumables control, and installation/torquing that are preventive in nature and are generally applied to pressure boundary bolting, as well as physical inspections for leakage under the ASME Section XI Inservice Inspection, Subsection IWB, IWC and IWD Program and the Systems Monitoring Program, as applicable.

(3) See the response to item (1), above.

NRC RAI 3.3-3

In LRA Tables 3.3.2-6 and 3.3.2-8, the applicant did not identify aging effects for certain carbon steel and copper alloy components in a lube oil environment. Carbon steel and copper alloy materials may experience loss of material in an oil environment if exposed to contaminants and/or moisture. For example, Table 3.3.2-8 identified certain carbon steel materials in a fuel oil environment are susceptible to loss of material. GALL Item VII G.7.2 identifies loss of material for copper alloy materials in a lube oil environment with contaminants and/or moisture. In LRA Table 3.0-1, the description of a lubricating oil environment includes the statement that water contamination of lubricating oil is not assumed unless indicated by operating experience or design review. The applicant is requested to clarify if leakage of raw water or the absence of a chemistry control AMP for the lubricating oil may result in contamination of the lube oil environment such that aging effects could occur. If such aging effects could occur, the applicant is requested to identify an appropriate AMP to manage the aging effect. Industry and plant specific operating experience should be addressed for this aging effect.

RAI 3.3-3 Response

The components in question are the "Heat Exchanger (Service Water Pump Motor Cooler Coils)," Lube Oil side, on Table 3.3.2-6, and components of the DG Engines and Lube Oil Systems, on Table 3.3.2-8.

GALL item VII.G7.2 identifies loss of material for copper alloy materials in a lubricating oil (LO) environment for Reactor Coolant Pump Oil Collection System components. Contamination is expected and water intrusion is possible in this system. The environment described in GALL item VII.G7 is not applicable to the SW and DG components in question.

Metals are not corroded by the hydrocarbon components of lubricants. LO is not a good electrolyte, and the oil film on the lubricated surfaces of components tends to minimize the potential for corrosion. Moisture contamination and the use of additives can, however, cause

corrosion. Copper and copper alloys, for example, may be attacked by oxidized oil and active sulfur compounds, especially in the presence of water. One of the functions of almost all lubricants is the prevention of corrosion in the lubricating system by water. The purity of the LO for major BSEP components is maintained and sampled regularly.

Fuel oil can present a much more corrosive environment if there should be an intrusion of water during transportation and storage. Microbiologically-induced corrosion (MIC) is also a potential concern in fuel oil systems. Water and other contaminants, such as chlorides and sulfides, occur naturally in crude oil. While fuel oil in its purest refined form contains little if any moisture, water contamination can occur during storage and transportation. This water contamination, naturally occurring contaminants, and any fuel additives, can produce an environment which is corrosive. Several forms of fungus and other microorganisms can survive and multiply in hydrocarbon fuels. These organisms can occur in all areas of the fuel handling system and need only trace amounts of minerals and water to sustain their growth.

As noted in LRA Table 3.0-1, the BSEP LO environment is defined as oil used in diesel engines, pumps, air compressors, the main turbine, and various LO storage tanks. Water contamination of LO is not assumed unless indicated by operating experience or design review. Loss of material for carbon steel and copper alloys in a LO environment is not observed without contaminants and/or moisture.

Industry Lube Oil Operating Experience

A majority of the significant generic operating experience (OE) correspondence was concerned with either water intrusion or lack of adequate oil and fuel oil purity control. Water intrusion into oil or fuel oil systems can result in a corrosive environment. NRC Information Notice (IN) 79-23, "Emergency Diesel Generator Lube Oil Coolers," and NRC Circular 80-11, "Emergency Diesel Generator Lube Oil Cooler Failures," dealt with specific failures of LO coolers.

NRC Circular #80-11: Emergency Diesel Generator Lube Oil Cooler Failures

Diesel generator LO cooler failures were reported. The DGs were manufactured by Electro-Motive Division (EMD) of General Motors. The failures were caused by severe corrosion of the solder, which sealed the tubes to the tube sheets. These failures occurred in the water side of the coolers. The corrosion inhibitor in use was Calgon CS, a borated-nitrite type inhibitor. The manufacturer of this type of inhibitor has recommended the use of hard solder in CS treated systems. EMD does not recommend the use of Calgon CS since the puddle solder used in EMD radiators and oil coolers is a soft solder of lead-tin composition.

IN 79-23: Emergency Diesel Generator Lube Oil Coolers

Water intrusion in the LO system resulted in trips of both diesel generator units during their surveillance tests. The water intrusion was caused by tube sheet failure in the LO coolers. The failures were cracks around the outer periphery of the tube sheets. Coolers were replaced; however, the failure mechanism was not determined.

Both of these failures were a result of degradation on the treated water side of the LO coolers and provide no evidence of an aging effect requiring management for metals in contact with LO.

BSEP Lube Oil Operating Experience

The LO in major BSEP components is subject to periodic sampling and corrective action. DG engine LO is sampled monthly for water and quarterly for a spectrum of contaminants. Service water pump LO is sampled during routine lubrication. This sampling provides no evidence of water contamination in these components under normal operation.

A review of non-conformance reports over the past 10 years found only one case of water contamination of LO in major components:

> A non-conformance report documented the identification of water in the oil of the Unit 2 Reactor Core Isolation Cooling System. The most probable cause was determined to be addition of oil mixed with water when the oil was added during maintenance. Significant water leakage was not considered likely because subsequent oil checks did not show an increase in level. Testing of the LO cooler confirmed that there was no leakage from the tube (i.e., water) side to the shell (i.e., oil) side.

This is considered to be an isolated event that was identified, corrected and is not representative of normal operation for the components in question.

In summary, LO systems generally do not suffer appreciable degradation by cracking or loss of material since the environment is not conducive to corrosion mechanisms. There are some conditions, however, in which moisture intrusion into the systems can result in an aggressive environment. Aging effects requiring management for carbon steel and copper alloy materials in LO are not anticipated unless water contamination is present. A review of maintenance practices and operating experience indicts that the normal LO environment for the BSEP "Heat Exchanger (Service Water Pump Motor Cooler Coils)" and the DG Engine and LO Systems is free of water and harmful contaminants. LO sampling is performed by maintenance on a periodic basis such that leakage of water would be identified and corrected prior to component age related degradation.

NRC RAI 3.3-4

For various component commodities in the following LRA tables, the applicant did not identify aging effects for various materials exposed to dry air/gas (internal) environment:

> Table 3.3.2-10, Instrument Air System (p. 74, 75)
> Table 3.3.2-11, Pneumatic Nitrogen System (p. 76)
> Table 3.3.2-12, Fire Protection System (p. 83)
> Table 3.3.2-14, Radioactive Floor Drains System (p. 91)
> Table 3.3.2-15, Radioactive Equipment Drains System (p. 95)
> Table 3.3.2-19, Liquid Waste Processing System (p. 104)

Table 3.3.2-21, HVAC Diesel Generator Building (p. 108)
Table 3.3.2-22, HVAC Reactor Building (p. 113)

However, it should be noted that in the dry air/gas system, components that are located upstream of the air dryers are generally exposed to wet air/gas environment and therefore, may be subject to aging effect of loss of material due to general and pitting corrosion. In addition, it is reasonable to assume that components downstream of the dryers are exposed to dry air/gas environment. However, this may not be supported by the operating experience. For an example, NRC IN 87-28, "Air Systems Problems at U.S. Light Water Reactors," provides the following: "A loss of decay heat removal and significant primary system heat up at Palisades in 1978 and 1981 were caused by water in the air system." This experience implies that the air/gas system downstream of the dryer may not be dry. The applicant is requested to provide technical basis for not identifying loss of material as an aging effect for these components including a discussion of the plant specific operating experience related to components that are exposed to air environment to support its conclusion.

RAI 3.3-4 Response

Dry air/gas (internal) environments identified in the above-referenced LRA tables can be dry gases and/or dry instrument air. The discussions below are for these dry gas and dry instrument air environments.

Dry Gases - Examples of a dry gas environment include nitrogen, carbon dioxide and halon-containing components in the Pneumatic Nitrogen System and the Fire Protection System. Experience has shown that commercial grade gases are provided as a high quality product with little if any external contaminants. Based upon nitrogen, carbon dioxide, and halon environments not being subject to wetting, the BSEP methodology predicted no aging effects for these dry gases.

Dry Instrument Air - The following discussion of the BSEP Instrument Air (IA) System and the Service Air (SA) System provides background for the assignment of no aging effects to in-scope component internal surfaces exposed to dry instrument air. BSEP dry instrument air is neither saturated nor moist. It is noted that all in-scope components served by dry instrument air are located downstream of the IA System and SA System air dryers. There are no in-scope components located upstream of the air dryers. The IA System air compressors, air dryer and SA System air dryers are not in the scope of License Renewal.

Instrument Air System Design

By design, the IA System provides a medium which is dry, oil-free, and free of foreign materials to pneumatically operated instruments and controls throughout the plant. The SA System air dryers dry both SA and IA, while the IA dryer dries only IA. The IA dryer is normally bypassed when the SA dryers are in service. The IA dryer is placed in service if the SA dryers are removed from service or have degraded.

IA and SA are filtered and dried by means of electrically heat reactivated desiccant type dryers, efficient at removing moisture. The inlet of a SA dryer has a coalescing filter capable of removing 90% of the entrained liquid moisture. The SA and IA dryers are described as follows:

- Unit 1 SA Dryer: The Unit 1 SA dryer is a heat reactivated vertical dual tower desiccant type designed to supply air dried to a dewpoint of -40°F. This dryer has a bank of electric heaters (i.e., in individual heater tubes) embedded within the desiccant.

- Unit 2 SA Dryer: The Unit 2 SA dryer is a heat regenerative vertical dual tower desiccant type designed to supply air dried to a dewpoint of -40°F. The electrically heated dryer is external to the desiccant.

- IA dryer: The IA dryer is a dual tower desiccant type dryer with a fully automatic regeneration cycle. This dryer is capable of supplying air dried to a dew point of -40°F.

BSEP is currently in the process of upgrading the air dryers for the Unit 1 and 2 SA Systems.

BSEP Response to Generic Letter 88-14

NRC Generic Letter (GL) 88-14, "Instrument Air Supply System Problems," was issued after several years of study of problems, including those in NRC IN 87-28, and failures of IA systems. GL 88-14 recommended extensive design and operations review and verification of IA systems. Progress Energy has met the intent of GL 88-14. The NRC review of the BSEP response to GL 88-14 stated:

> The staff has reviewed your response and finds that you have addressed all points stated in the GL.

NUREG-1801 states:

> ...as a result of Generic Letter 88-14, performance of air systems has improved significantly.

Operating Experience Review

The aging management review methodology applied at BSEP included use of OE to confirm the set of aging effects that had been identified through material/environment evaluations. Plant-specific and industry OE was identified and reviewed.

BSEP site-specific OE reviews included a review of PassPort EDB and Maintenance Rule databases and Nuclear Assessment Section records. The BSEP Periodic System Review for the IA System examined system aspects such as equipment performance, material indicators, trending results, outstanding modifications, plant workarounds, performance problems and corrosion concerns. The review noted that air sampling for dewpoint had been satisfactory.

The BSEP Air Operated Valves (AOV) Program Health Report was reviewed for health status of green, yellow or red. The results show the program to be in green condition. There were no transients or power reductions caused by AOVs that should have been prevented by the program. There were no systems/components placed in a(1) Maintenance Rule status due to an AOV failure. No corrective actions were recommended. The plant-specific OE review identified no additional unpredicted or unique aging effects requiring management.

Industry OE reviews included those in NUREG-1801. An evaluation of industry OE published since the effective date of NUREG-1801 was also performed to identify any additional aging effects requiring management using the Progress Energy internal OE review process. OE sources subject to review under this process include Institute of Nuclear Power Operations and World Association of Nuclear Operators items, NRC documents (i.e., INs, GLs, Notices of Violation, and staff reports), 10 CFR 21 reports, and vendor bulletins, as well as corporate internal OE information from Progress Energy nuclear sites. The industry OE review identified no additional unpredicted aging effects requiring management.

The IA and SA System Engineer was interviewed. During every refueling outage, the IA System Engineer performs a walkdown of the drywell to inspect for component material condition. No additional information related to aging effects/mechanisms which might affect the components of the IA System within the scope of License Renewal were identified by the System Engineer. A review of operating experience did not identify a pattern of degradation due to moisture for in-scope IA components.

Dry IA Summary

By design, IA is filtered and dried by means of electrically heat reactivated desiccant type dryers, efficient at removing moisture. There are no in-scope components located upstream of the air dryers. To verify dry IA, BSEP currently uses procedures to periodically test air quality, review trend data and initiate corrective actions as appropriate for the IA System and has met the intent of GL 88-14.

A review of operating experience at BSEP did not identify a pattern of degradation due to moisture for in-scope components exposed to the IA environment. Based on the delivery of dry air by the IA System, no aging effects/mechanisms due to IA moisture were identified for IA System in-scope components. Dry air is provided by system design, and is maintained by system operation and testing requirements. The above discussion provides the technical basis for not identifying loss of material as an aging effect for components exposed to an IA environment.

NRC RAI 3.3.2-1-1

In LRA Table 3.3.2-1 for Reactor Water Cleanup (RWCU) System, piping and fittings (small bore piping less than NPS 4), are identified but the location or class of the piping is not identified. The applicant is requested to clarify if this piping includes small bore piping beyond the second containment isolation valve that are addressed in GALL Section VII E3 or is this

piping limited to the Class 1 piping within the RCPB that is addressed in GALL Section IV under the RCS?

RAI 3.3.2-1-1 Response

Components in this line item are inside ASME Class 1 boundaries, as denoted by the reference to GALL IV.C1.1 in column seven.

NRC RAI 3.3.2-1-2

In LRA Table 3.3.2-1 for Reactor Water Cleanup (RWCU) System, a treated water environment with steam is identified for various stainless steel components in the RWCU system beyond the second isolation valve. For these components, cracking due to SCC is identified as one aging effect and the water chemistry combined with the one-time inspection are credited with managing this aging effect. In LRA Table 3.3.1, Item 3.3.1-26 states that different programs apply and the water chemistry program combined with the ASME Section XI program are credited with managing SCC and IGSCC. The applicant is requested to further explain why the BWR reactor water cleanup system AMP identified in GALL is not applied. For example, clarify if the combination of the two credited programs are consistent with the BWR reactor water cleanup system AMP or are there specific exceptions the applicant is taking to GALL. The applicant should also clarify which program (one-time inspections identified in Table 3.3.2-1 or Section XI inspections identified in Table 3.3.1) is used to verify chemistry control. Also clarify if the stainless steel piping beyond the second containment isolation valve has been replaced with material not susceptible to IGSCC.

RAI 3.3.2-1-2 Response

The Boiling Water Reactor (BWR) RWCU AMP described in GALL relies upon the requirements of GL 88-01, "NRC Position on IGSCC in BWR Austenitic Stainless Steel Piping," and NUREG-0313, "Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping," for mitigation of stress corrosion cracking (SCC) and intergranular stress corrosion cracking (IGSCC). The NRC Safety Evaluation Report accepting BSEP compliance with GL 88-01 details the extensive mitigative activities implemented at BSEP (i.e., piping replacement, stress improvement and overlays, and upgrade leak detection capabilities), as well as ongoing requirements relating to water chemistry and inspections. For the purposes of License Renewal, these ongoing requirements are implemented under the Water Chemistry and ASME Section XI Subsection IWB, IWC and IWD Programs. BSEP considers that the mitigative measures already implemented in response to GL 88-01, in conjunction with these aging management programs, are the equivalent of the BWR Reactor Water Cleanup System Aging Management Program.

Regarding verification of water chemistry effectiveness, BSEP uses the ASME Section XI, Subsection IWB, IWC and IWD Program where volumetric inspections are specified. This encompasses 4-inch and larger Class 1 piping and components and additional components subject to specific regulatory requirements and commitments. One-time inspections are

generally specified for water chemistry effectiveness verification where volumetric examinations are not otherwise performed.

BSEP replaced those portions of RWCU piping that were deemed to be susceptible to IGSCC on the basis of NUREG-0313 with non-susceptible materials.

NRC RAI 3.3.2-1-3

In LRA Table 3.3.2-1 for Reactor Water Cleanup (RWCU) System, a treated water environment with steam is identified for various carbon steel components in the RWCU system beyond the second isolation valve. For these components, loss of material due to crevice corrosion, general corrosion and pitting corrosion is identified as the aging effect and the water chemistry combined with the one-time inspection are credited with managing this aging effect. For this two phase environment, the applicant is requested to explain why loss of material due to FAC managed by the flow-accelerated corrosion AMP is not identified as an aging effect for carbon steel components beyond the second isolation valve.

RAI 3.3.2-1-3 Response

The BSEP aging management review methodology used the environment "treated water (includes steam)" to represent components that may be in a treated water environment or a steam environment. It is not intended to indicate that two phase conditions are present. The BSEP methodology for predicting flow-accelerated corrosion (FAC) is described in the LRA in Appendix B, Section B.2.5, and is based on site specific evaluations using accepted methodology.

NRC RAI 3.3.2-3-1

In LRA Table 3.3.2-3 for Reactor Building Sampling System, stainless steel piping and fittings are identified as being managed by either the water chemistry and Section XI inservice inspection programs or the water chemistry and one-time inspection programs. LRA Section 2.3.3.3 states that portions of this system comprise part of the RCPB, but it is not clear in Table 3.3.2-3 which piping is part of the RCPB as addressed by GALL Section IV and which piping is not part of the RCPB as addressed in GALL Section VII. The applicant is requested to clarify which stainless steel piping and their aging management programs are part of the RCPB and which piping and their aging management programs are not part of the RCPB. The applicant is also requested to clarify if this piping is less than 4" NPS.

RAI 3.3.2-3-1 Response

The Reactor Coolant Pressure Boundary (RCPB) portions of the Reactor Building Sampling System are the 3/4 inch stainless steel reactor sample lines, 1/2-RXS-1. These components are listed as "Piping and Fittings (Sample Lines)" on LRA Table 3.3.2-3. The Class 1, RCPB boundary for these lines is shown on D-25018-LR, Sheet 1A, and D-02518-LR, Sheet 1A,

Location D-3, at valves 1/2-B21-F020 for Units 1 and 2, respectively. None of the components shown on the Reactor Building Sampling System drawings D-70070, Sheets 1 and 2, or D-07070, Sheets 1 and 2, are within the RCPB. The Class 1 portion of 1/2-RXS-1 will be managed with the Water Chemistry, ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD, and One-Time Inspection programs as specified in GALL IV.C1.1-i.

NRC RAI 3.3.2-5-1

In LRA Table 3.3.2-5 for Screen Wash Water System, various components exposed to a raw water environment are identified as being managed by the one-time inspection. One-time inspection is appropriate where either an aging effect is not expected to occur but there is insufficient data to completely rule it out or the aging effect is occurring very slowly so as not to affect the component intended function. Periodic inspections are appropriate where degradation is expected such as in service water systems containing raw water that are managed by the open-cycle cooling water program. Industry and plant specific operating experience should be considered in determining if there is sufficient data and which type of inspection is appropriate for each material. The applicant is requested to explain why one-time inspections rather than periodic inspections are proposed to manage various components exposed to raw water in the screen wash water system.

RAI 3.3.2-5-1 Response

The Screen Wash Water (SCW) System performs no safety related function and is in scope in accordance with 10CFR54.4 (a)(2) for potential spatial interaction considerations. The original design of the SCW System utilized stainless steel and cement lined carbon steel piping components. After several years of operation, it became apparent that stainless steel was susceptible to pitting or galvanic attack, whereas the cement lining on carbon steel piping was difficult to maintain, particularly around welded connections. As a result, problematic portions of the SCW System piping were replaced with copper-nickel, a material that has proven itself to be well suited to raw water service at BSEP. Approximately 20 years of operating experience supports that age related degradation of copper-nickel piping components in the SCW System is sufficiently slow to utilize a one time inspection for aging management. Portions of the System that are constructed of stainless steel or carbon steel are either maintained in accordance with Maintenance Rule requirements or have not been problematic. The remaining in-scope stainless steel piping is limited to small diameter, low pressure lines used to periodically flush the self-cleaning strainers.

In summary, operating experience with the current SCW System materials has been favorable. All in-scope components within the SCW System are subject to the One-Time Inspection Program. In the event that age related degradation is found during inspection activities, the extent of the condition will be evaluated under the Corrective Action Program and appropriate follow-up activities will be planned.

NRC RAI 3.3.2-6-1

In LRA Table 3.3.2-6 for Service Water System, copper alloy underground piping and fittings are identified with an environment of indoor air (external). Note 332 states that copper alloys in an indoor environment have no aging effects in the absence of sustained wetting. In LRA Table 3.0-2 a buried/below grade/submerged environment is described as exposed to soil/fill, ground water, or water from the intake Canal. In LRA Table 3.0-2, aggressive intake water is identified in the immediate vicinity of the service water intake. The applicant is requested to clarify whether the underground piping is in a tunnel or buried, and explain why this environment is considered an indoor environment with no sustained wetting.

RAI 3.3.2-6-1 Response

The piping represented by this line item supplies cooling water to the Emergency DGs. These copper nickel lines connect to the underground Nuclear SW Header in a protected enclosure in the east yard, then run for a short distance underground before emerging into the basement of the DG Building. Note 332 pertains to the external surfaces of piping in the DG Building basement. While a separate line item is not provided to represent the external buried surfaces of the piping, BSEP aging management review methodology considers that raw water and buried environments generally produce comparable aging effects. In this application, crevice corrosion, pitting corrosion and MIC would be considered potentially applicable aging effects. Consistent with the treatment of the buried portion of the Nuclear SW Header, BSEP will apply the Buried Piping and Tanks Inspection Program to manage aging effects on the external surfaces of buried portions of this piping.

NRC RAI 3.3.2-8-1

In LRA Table 3.3.2-8 for Diesel Generator System, the materials for strainer (basket) and filter (media) are identified as filter media and strainer element, respectively. The applicant is requested to identify the specific materials (carbon steel, stainless, etc.) for the strainer (basket) and filter (media).

RAI 3.3.2-8-1 Response

Strainers and filters with re-usable components subject to the Preventive Maintenance (PM) Program are utilized in three sub-systems within the DG System: Lube Oil, Starting Air, and Intake Air.

The basic approach to strainer/filter type components was to split them into separate pressure boundary (i.e., M-1) and filtration element (i.e., M-2) components. Aging effects requiring management for the pressure boundary components were identified based on the material and environment as noted in the LRA. The strainer/filter elements were then evaluated for periodic replacement. Those that were evaluated as short-lived were not identified as requiring an AMR. The remaining strainer/filter elements subject to the PM Program were assumed to be properly

designed by the original equipment manufacturer for the particular application, likely made of numerous materials and subject to replacement if found to be degraded.

The five different configurations of strainers/filters in the Lube Oil System are assumed to be made of carbon steel where a coarse straining is required and a stainless steel where a fine mesh is used. The Starting Air System "Y" strainer baskets are Monel. The Intake Air System utilizes an oil bath intake filter with a stainless steel filter media. A loss-of-material aging effect is not predicted by BSEP methodology for these material and environment combinations.

NRC RAI 3.3.2-21-1

In LRA Table 3.3.2-21 for HVAC Diesel Generator Building, the applicant credited the Preventive Maintenance Program for managing the aging effect of cracking due to various degradation mechanisms for piping (piping and fittings) made of plastics/polymers exposed to indoor air (internal). However, in the same table, no aging effect was identified for the same material exposed to the same environment for duct (duct, fittings, fan housing, damper housing, access doors, and closure bolts). The applicant is requested to explain the difference between these two cases.

RAI 3.3.2-21-1 Response

While the material in both cases appears to be the same, they are actually different materials in a group of materials called Plastics/Polymers.

The components represented by LRA Table 3.3.2-21, HVAC Diesel Generator Building System, on page 3.3-137, Component Commodity "Piping (Piping and Fittings)," made from Plastics/ Polymers are polyethylene tubing, located indoors. For polyethylene in an Indoor Air environment, the BSEP methodology predicted the aging effect/mechanism of cracking due to various degradation mechanisms.

The components represented by LRA Table 3.3.2-21, HVAC Diesel Generator Building System, on page 3.3-137, Component Commodity "Duct, (Duct, Fittings, Fan Housings, Damper Housings, Access Doors, and Closure Bolts)," made from Plastics/Polymers, are tornado venting rupture disks constructed of Teflon, located indoors. This Teflon is not expected to be subject to extreme environmental conditions of adverse chemicals, severe thermal stress, high radiation field or continuous ultraviolet rays. For Teflon in this Indoor Air environment, the BSEP methodology predicted no aging effect/mechanism based upon the above and a review of industry guidance.

In summary, the subject materials are different, thus the aging effect/mechanism is different, and there is no inconsistency between the two items.

NRC RAI 3.3.2-22-1

In LRA Table 3.3.2-21 for Diesel Generator Building HVAC, the applicant credited the System Monitoring Program for managing the aging effect of cracking due to various degradation mechanisms for non-carbon steel components made of plastics/polymers exposed to indoor air (external). However, in LRA Table 3.3.2-22 for Reactor Building HVAC, no aging effect was identified for the same component commodity where the same material is exposed to the same environment. The applicant is requested to explain the inconsistency between these two items.

RAI 3.3.2-22-1 Response

While the material in both cases appears to be the same, they are actually different materials in a group of materials called Plastics/Polymers.

The components represented by LRA Table 3.3.2-21, HVAC Diesel Generator Building System, on page 3.3-139, Component Commodity "Non-Carbon Steel Components (External Surfaces)," made from Plastics/Polymers, are polyethylene tubing located indoors. For polyethylene in an Indoor Air environment, the BSEP methodology predicted the aging effect/mechanism of cracking due to various degradation mechanisms.

The components represented by LRA Table 3.3.2-22, HVAC Reactor Building System, on page 3.3-142, Component Commodity "Non-Carbon Steel Components (External Surfaces)," made from Plastics/Polymers, are ductwork viewing panels, constructed of polycarbonate and located indoors. This polycarbonate is not expected to be subject to extreme environmental conditions of adverse chemicals, severe thermal stress, high radiation field or continuous ultraviolet rays. For polycarbonate in this Indoor Air environment, the BSEP methodology predicted no aging effect/mechanism based upon the above and a review of industry guidance.

In summary, the subject materials are different, thus the aging effect/mechanism is different, and there is no inconsistency between the two items.

NRC RAI 3.3.2-24-1

In LRA Table 3.3.2-24 for Civil Structure Auxiliary System, no aging effects were identified for piping (piping and fittings) made of plastics/polymers exposed to indoor air (External) and raw water (Internal). However, different conclusions were reached for the same components of same material exposed to the same environments as described in Table 3.3.2-5 and Table 3.3.2-6. The applicant is requested to explain the apparent inconsistencies cited above. The applicant is also requested to clarify why loss of material from erosion is not identified for plastics/polymer piping and fittings exposed to raw water (internal), and what AMP will be used to manage this aging effect (Refer to RAI 3.3-1 above).

RAI 3.3.2-24-1 Response

The plastics/polymer piping noted in LRA Table 3.3.2-24 for Civil Structure Auxiliary Systems is polyvinylchloride (PVC) piping associated with the SWIS sump pumps. These pumps only operate periodically and do not create the high flow velocities needed for erosion. BSEP methodology does not predict aging effects requiring management for PVC exposed to "indoor air (external)" and "raw water (internal)." In actual practice, this piping will be visible for inspection as part of the PM activities associated to the SWIS sump pumps.

The butyl rubber expansion joints noted in Table 3.3.2-5 and Table 3.3.2-6 were conservatively evaluated as potentially susceptible to the cracking due to aging. See the response to RAI 3.3-1 for further information. The SCW System is subject to continuous, high flow, high vibration operation in a brackish water environment. The SW coupling to the Diesel Service Water System noted in Table 3.3.2-6 is of the same design but used infrequently. Aging effects for these expansion joints are expected to be more likely in the SCW System application.

In summary, the material composition and operating conditions are different between the plastics/polymers components noted in Table 3.3.2-24 and Table 3.3.2-5 and 3.3.2-6, hence warranting differing assessments of aging effects requiring management.

Brunswick Steam Electric Plant (BSEP) License Renewal Commitments, Revision 4		
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	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.
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.

Brunswick Steam Electric Plant (BSEP) License Renewal Commitments, Revision 4		
License Renewal Commitment Subject	**LRA, Appendix A, Section**	**Scope of Commitment**
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.
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.

Brunswick Steam Electric Plant (BSEP) License Renewal Commitments, Revision 4		
License Renewal Commitment Subject	**LRA, Appendix A, Section**	**Scope of Commitment**
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.
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.

Brunswick Steam Electric Plant (BSEP) License Renewal Commitments, Revision 4		
License Renewal Commitment Subject	**LRA, Appendix A, Section**	**Scope of Commitment**
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.
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.

Brunswick Steam Electric Plant (BSEP) License Renewal Commitments, Revision 4		
License Renewal Commitment Subject	**LRA, Appendix A, Section**	**Scope of Commitment**
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) - RPV Operating Pressure-Temperature (P-T) Limits	A.1.2.1.3	P-T limit curves for the period of extended operation will be submitted for NRC review and approval in accordance with the license amendment process at least one year prior to expiration of the 32 EFPY P-T limit curves that are currently approved in the Technical Specifications.
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.
Potential Aging Effects/Mechanisms Resulting from Power Uprate New commitment	None, refer to ACRS letter report on Dresden/Quad Cities, dated September 16, 2004	An evaluation of plant and industry operating experience will be submitted for NRC review at least one year prior to the period of extended operation. The purpose of the evaluation will be to assure that relevant aging effects caused by operation at power uprate conditions are adequately addressed by aging management programs.