4.0 Time-Limited Aging Analyses

10 CFR 54 governs the issuance of renewed operating licenses for nuclear power plants and includes requirements for the performance of an integrated plant assessment (IPA) and the review of time-limited aging analyses (TLAA). The results of the IPA and TLAA evaluations form the technical bases upon which the Susquehanna Steam Electric Station (SSES) license renewal application is built.

This section provides the results of reviews of potential TLAA and exemptions specific to SSES for license renewal and documents evaluations of each identified item for the period of extended operation. The purpose is to demonstrate that the identified TLAA and exemptions will be maintained consistent with the current licensing basis (CLB), as required by 10 CFR 54.

The evaluations included in this section meet the requirements contained in 10 CFR 54.21(c) and allow the NRC to make the finding contained in 10 CFR 54.29(a)(2).

4.1 IDENTIFICATION OF TIME-LIMITED AGING ANALYSES

10 CFR 54.21(c) requires that an evaluation of time-limited aging analyses be provided as part of the application for a renewed operating license. Time-limited aging analyses are defined in 10 CFR 54.3 as those licensee calculations and analyses that:

(1) Involve systems, structures, and components within the scope of license renewal, as delineated in 10 CFR 54.4(a);
(2) Consider the effects of aging;
(3) Involve time-limited assumptions defined by the current operating term, for example, 40 years;
(4) Were determined to be relevant by the licensee in making a safety determination;
(5) Involve conclusions or provide the basis for conclusions related to the capability of the system, structure, and component to perform its intended functions, as delineated in 10 CFR 54.4(b); and
(6) Are contained or incorporated by reference in the current licensing basis.

4.1.1 Time-Limited Aging Analyses Identification Process

The major emphasis in the License Renewal Rule (10 CFR 54) is that the CLB must be maintained during the period of extended operation. Time-limited aging analyses that are contained or incorporated by reference in the CLB at SSES are identified, as required by 10 CFR 54. The CLB documentation that was searched to identify potential TLAA includes the following:

- Final Safety Analysis Report (FSAR)
- Quality Assurance Program
- Inservice Inspection (ISI) Program
- Fire Protection Review Report (FPRR)
- Docketed licensing correspondence
- Code Exemptions and Relief Requests
- NRC Safety Evaluation Reports (SERs)
- Technical Specifications
- Operating Licenses
- Design Calculations and Design Reports

Industry documents that list generic time-limited aging analyses were also reviewed to provide additional assurance of the completeness of the plant-specific list. These documents included NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," Revision 1, NUREG-1801, "Generic Aging Lessons Learned (GALL) Report," Revision 1, NEI 95-10, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule," Revision 6 and recent license renewal applications for boiling water reactor designs.

Each potential TLAA identified is reviewed to determine if it meets the definition of a TLAA in accordance with 10 CFR 54.3. SSES analyses and calculations that meet the TLAA definition are evaluated in accordance with the options provided in 10 CFR 54.21(c)(1).

4.1.2 Evaluation of Time-Limited Aging Analyses

As required by 10 CFR 54.21(c)(1), an evaluation of SSES-specific TLAA must be performed to demonstrate that:

(i) The analyses remain valid for the period of extended operation; or

(ii) The analyses have been projected to the end of the period of extended operation; or

(iii) The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

The results of these evaluations are summarized in Table 4.1-1 and Table 4.1-2 and discussed in Sections 4.2 through 4.7.

4.1.3 Identification of Exemptions

Pursuant to 10 CFR 54.21(c)(2), an applicant for license renewal must provide (1) a listing of plant-specific exemptions granted pursuant to 10 CFR 50.12 that are in effect and based on TLAA, and (2) an evaluation of these exemptions to justify their continuation for the period of extended operation. Docketed NRC correspondence, and other SSES current licensing basis documentation, identified in Section 4.1.1, was reviewed for exemptions.

As a result of the review, there were no exemptions identified as being associated with a TLAA.

Table 4.1-1
Time-Limited Aging Analyses

TLAA Category	Analysis	10 CFR 54.21(c)(1) Paragraph	LRA Section
1.	Reactor Vessel Neutron Embrittlement		4.2
	Neutron Fluence	Not a TLAA	4.2.1
	Upper Shelf Energy (USE)	(ii)	4.2.2
	Adjusted Reference Temperature (ART)	(ii)	4.2.3
	Pressure-Temperature (P-T) Limits	(ii)	4.2.4
	Reactor Vessel Circumferential Weld Examination Relief	(ii)	4.2.5
	Reactor Vessel Axial Weld Failure Probability	(ii)	4.2.6
	Reflood Thermal Shock	(i)	4.2.7
2.	Metal Fatigue		4.3
	Reactor Pressure Vessel Fatigue Analyses	(iii)	4.3.1
	Reactor Vessel Internals Fatigue Analyses	(ii), (iii)	4.3.2
	Effects of Reactor Coolant Environment on Fatigue Life of Components and Piping (GSI-190)	(iii)	4.3.3
	Reactor Coolant Pressure Boundary Piping and Component Fatigue Analyses	(iii)	4.3.4
	Non-Class 1 Component Fatigue Analyses	(i)	4.3.5
3.	Environmental Qualification of Electrical Equipment	(iii)	4.4
4.	Concrete Containment Tendon Prestress	Not Applicable	4.5
5.	Containment Liner Plate, Metal Containments, and Penetrations Fatigue Analyses		4.6
	ASME Class MC Components	(i)	4.6.1
	Downcomer Vents and SRV Discharge Piping	(i)	4.6.2
	Safety Relief Valve Quenchers	(i)	4.6.3

Table 4.1-1 (continued)
Time-Limited Aging Analyses

TLAA Category	Analysis	10 CFR 54.21(c)(1) Paragraph	LRA Section
6.	Other Plant-Specific Time-Limited Aging Analyses		4.7
	Main Steam Line Flow Restrictor Erosion Analyses	(ii)	4.7.1
	High Energy Line Break Cumulative Fatigue Usage Factors	(iii)	4.7.2
	Core Plate Rim Hold-down Bolts	(ii)	4.7.3

Table 4.1-2
Review of Generic TLAA Listed in Tables 4.1-2 and 4.1-3 of NUREG-1800

NUREG-1800 Generic TLAA Example	Applicability to SSES	LRA Section
NUREG-1800, Table 4.1-2		
Reactor Vessel Neutron Embrittlement	Yes	4.2
Concrete Containment Tendon Prestress	No	4.5
Metal Fatigue	Yes	4.3
Environmental Qualification of Electrical Equipment	Yes	4.4
Metal Corrosion Allowance	No – No explicit 40-year basis applies.	--
Inservice Flaw Growth Analyses that Demonstrate Structure Stability for 40 Years	No TLAA identified.	--
Inservice Local Metal Containment Corrosion Analyses	No – No explicit 40-year basis applies.	--
High-Energy Line-Break Postulation Based on Fatigue Cumulative Usage Factor	Yes	4.7.2
NUREG-1800, Table 4.1-3		
Intergranular Separation in the Heat-Affected Zone (HAZ) of Reactor Vessel Low-Alloy Steel Under Austenitic SS Cladding	No – No HAZ analysis was identified within the CLB.	--
Low-Temperature Overpressure Protection (LTOP) Analyses	No – No LTOP analysis was identified within the CLB.	--
Fatigue Analysis for the Main Steam Supply Lines to the Turbine-Driven Auxiliary Feedwater Pumps	No – Auxiliary Feedwater System is not applicable to SSES.	--
Fatigue Analysis of the Reactor Coolant Pump Flywheel	No – SSES Recirculation System pumps do not have flywheels.	--
Fatigue Analysis of Polar Crane	No – No explicit 40-year basis applies.	--
Flow-Induced Vibration Endurance Limit for the Reactor Vessel Internals	No – No analyses were identified within the CLB for the reactor vessel internals related to this topic.	--

Table 4.1-2 (continued)
Review of Generic TLAA Listed in Tables 4.1-2 and 4.1-3 of NUREG-1800

NUREG-1800 Generic TLAA Example	Applicability to SSES	LRA Section
NUREG-1800, Table 4.1-3 (continued)		
Transient Cycle Count Assumptions for the Reactor Vessel Internals	Yes	4.3.2
Ductility Reduction of Fracture Toughness for the Reactor Vessel Internals	No – No analyses were identified within the CLB for the reactor vessel internals related to this topic.	--
Leak Before Break	No – No explicit 40-year basis applies.	--
Fatigue Analysis for the Containment Liner Plate	No – No fatigue evaluations were performed.	--
Containment Penetration Pressurization Cycles	No – No fatigue evaluations were performed.	--
Reactor Vessel Circumferential Weld Inspection Relief (BWR)	Yes	4.2.5

4.2 REACTOR VESSEL NEUTRON EMBRITTLEMENT

Neutron embrittlement is the term used to describe changes in mechanical properties of reactor vessel materials that result from exposure to fast neutron flux (E>1.0 MeV) within the vicinity of the reactor core, called the beltline region. The most pronounced material change is a reduction in fracture toughness. As fracture toughness decreases with cumulative fast neutron exposure, the material's resistance to crack propagation decreases. Fracture toughness is also dependent on temperature. The reference nil-ductility temperature (RT_{NDT}) is the temperature above which the material behaves in a ductile manner and below which the material behaves in a brittle manner. As fluence increases, the reference nil-ductility temperature increases. This means higher temperatures are required for the material to continue to act in a ductile manner.

The regulations governing reactor vessel integrity are in 10 CFR Part 50. Section 50.60 requires that all light-water reactors meet the fracture toughness, pressure-temperature limits, and material surveillance program requirements for the reactor coolant pressure boundary as set forth in Appendices G and H of 10 CFR 50.

The SSES current licensing basis analyses evaluating reduction of fracture toughness of the SSES reactor pressure vessel for 40 years are TLAA. Neutron fluence, upper shelf energy, adjusted reference temperature (ART), and vessel pressure-temperature (P-T) limits are time dependent items that must be investigated to evaluate vessel embrittlement, i.e., fracture toughness of vessel materials.

The following sections address fluence, upper shelf energy, ART, P-T limits, circumferential welds, and axial welds for the reactor pressure vessel (RPV) beltline materials for the period of extended operation.

4.2.1 Neutron Fluence

To evaluate the effects of radiation on RPV material embrittlement, analyses were performed to determine neutron fluence for extended power uprate (EPU) conditions and for extended operation out to 54 effective full power years (EFPY), i.e., at the end of 60 years operation. Using actual reactor core power histories to-date and conservative estimates of future core designs for each unit, extended operation to 60 years will be bounded by 54 EFPY.

High energy (>1 MeV) neutron fluence for the welds and shells of the RPV beltline region was calculated using the RAMA fluence methodology. The RAMA methodology was developed for the Electric Power Research Institute and the Boiling Water Reactor Vessel and Internals Project. Use of this methodology for evaluations of fluence for the SSES units was performed in accordance with guidelines presented in Regulatory Guide 1.190 (Reference 4.8.1), as recommended in NUREG-1800, Section 4. The NRC has reviewed and approved RAMA for BWR RPV fluence predictions. The NRC

staff also concluded that the RAMA methodology is applicable to SSES (Reference 4.8.13). A summary of the highest calculated values of fluence for the RPV beltline shells and welds projected to 54 EFPY is shown in Table 4.2-1 for Unit 1 and Table 4.2-2 for Unit 2. Fluence was calculated at the inner surface (0T) of the vessel wall, at ¼ thickness (1/4T) depth into the vessel wall, and ¾ thickness (3/4T) depth into the vessel wall.

Table 4.2-1
Unit 1 RPV Beltline Fluence Values for 54 EFPY

Description	Fluence (n/cm^2)		
	0T	1/4T	3/4T
Shell Course #1[(1)]	1.17E+18	7.88E+17	2.86E+17
Shell Course #2[(2)]	1.41E+18	9.48E+17	3.41E+17
Shell Course #3	1.55E+16	1.08E+16	5.33E+15
Shell Course #1 Axial Weld BA	9.04E+17	6.09E+17	2.25E+17
Shell Course #1 Axial Weld BB	7.83E+17	5.30E+17	1.97E+17
Shell Course #1 Axial Weld BC	1.01E+18	6.79E+17	2.48E+17
Shell Course #2 Axial Weld BD	1.09E+18	7.34E+17	2.68E+17
Shell Course #2 Axial Weld BE	1.09E+18	7.34E+17	2.68E+17
Shell Course #2 Axial Weld BF	9.98E+17	6.81E+17	2.54E+17
Shell Course #3 Axial Weld BG	1.29E+16	8.98E+15	4.45E+15
Shell Course #3 Axial Weld BH	1.53E+16	1.06E+16	5.26E+15
Shell Course #3 Axial Weld BJ	1.53E+16	1.06E+16	5.26E+15
Circumferential Weld AB between Shell Courses #1 and #2	1.17E+18	7.88E+17	2.86E+17
Circumferential Weld AC between Shell Courses #2 and #3	1.55E+16	1.08E+16	5.33E+15

(1) Includes lower shell #1, #21-1, heat #B5083-1; lower shell #2, #21-2, heat #C0770-2; lower shell #3, #21-3, heat #C0814-2.
(2) Includes lower intermediate shell #1, #22-1, heat #C0803-1; lower intermediate shell #2, #22-2, heat #C0776-1; lower intermediate shell #3, #22-3, heat #C2433-1.

Table 4.2-2
Unit 2 RPV Beltline Fluence Values for 54 EFPY

Description	Fluence (n/cm^2)		
	0T	1/4T	3/4T
Shell Course #1[(1)]	1.18E+18	7.96E+17	2.89E+17
Shell Course #2[(2)]	1.42E+18	9.54E+17	3.43E+17
Shell Course #3	1.54E+16	1.08E+16	5.31E+15
Shell Course #1 Axial Weld BA	9.01E+17	6.06E+17	2.24E+17
Shell Course #1 Axial Weld BB	7.83E+17	5.30E+17	1.97E+17
Shell Course #1 Axial Weld BC	1.02E+18	6.82E+17	2.49E+17
Shell Course #2 Axial Weld BD	1.09E+18	7.35E+17	2.69E+17
Shell Course #2 Axial Weld BE	1.09E+18	7.35E+17	2.69E+17
Shell Course #2 Axial Weld BF	9.90E+17	6.76E+17	2.52E+17
Shell Course #3 Axial Weld BG	1.29E+16	8.97E+15	4.44E+15
Shell Course #3 Axial Weld BH	1.53E+16	1.05E+16	5.23E+15
Shell Course #3 Axial Weld BJ	1.53E+16	1.05E+16	5.23E+15
Circumferential Weld AB between Shell Courses #1 and #2	1.18E+18	7.96E+17	2.89E+17
Circumferential Weld AC between Shell Courses #2 and #3	1.54E+16	1.08E+16	5.31E+15

(1) Includes lower shell #1, #21-1, heat #6C956-1-1; lower shell #2, #21-2, heat #6C980-1-1; lower shell #3, #21-3, heat #6C1053-1-1.
(2) Includes lower intermediate shell #1, #22-1, heat #C2421-3; lower intermediate shell #2, #22-2, heat #C2929-1; lower intermediate shell #3, #22-3, heat #C2433-2.

NUREG-1801 indicates that ferritic materials for RPV beltline shells, welds, and assembly components must be evaluated for neutron irradiation embrittlement if high energy neutron fluence is greater than a threshold value of 1.0E+17 n/cm^2 (0T location) at the end of the license renewal term. As shown in Table 4.2-1 and Table 4.2-2, RPV shell courses #1 and #2 and axial welds in these shell courses will experience neutron fluence greater than the threshold value prior to the end of 54 EFPY operation. The circumferential weld between shell courses #1 and #2 will also be exposed to neutron fluence that exceed the threshold value during the extended lives of the plants. Shell course #3 and its associated welds will not experience neutron fluence exceeding the threshold value during the extended lives of the plants.

The only RPV assembly items, other than the shells and welds mentioned previously, within the beltline region that would experience neutron fluence greater than 1.0E+17 n/cm^2 during the period of extended operation would be instrumentation nozzles N16A and N16B. However, these nozzles are fabricated from Inconel SB-166, which is a non-ferritic material and is not a limiting material in the vessel beltline region. Therefore, nozzles N16A and N16B are not subject to 10 CFR 50, Appendix G evaluations for irradiation effects.

Therefore, within the beltline region, only Shell Courses #1 and #2, the associated axial welds, and the circumferential weld between Shell Courses # 1 and #2 require evaluation for neutron embrittlement for the period of extended operation.

Disposition: Neutron fluence is not a TLAA. It is a time-limited assumption used in various neutron embrittlement TLAA.

4.2.2 Upper Shelf Energy Evaluation

10 CFR 50, Appendix G requires that upper shelf energy (USE) values for RPV materials include the effects of neutron radiation. It states that USE for the beltline materials including plates and welds be maintained at no less than 50 ft-lb for the life of the reactor vessel. Calculated fluence values for EPU and extended operation to 54 EFPY exceed previously determined fluence based on materials surveillance program information for Units 1 and 2. Therefore, projections of changes in USE for the period of extended operation are required in accordance with 10 CFR 50, Appendix G.

BWRVIP-74-A (Reference 4.8.2) documents an equivalent margin analysis which establishes the minimum 54 EFPY USE limits for BWR/2-6 vessel beltline materials required for compliance with 10 CFR 50, Appendix G. The equivalent margin analysis assumes that the percent decreases in USE prescribed by Regulatory Guide (RG) 1.99 (Reference 4.8.3) are appropriate for a given vessel's beltline materials. The SSES Unit 1 and Unit 2 vessel beltline materials are bounded by the equivalent margin analysis. Limiting vessel beltline plates and welds were evaluated using data from surveillance capsule reports and 54 EFPY fluence values. Using this information the predicted decrease in USE was obtained from RG 1.99, Figure 2 and compared to the decreases assumed in the equivalent margin analysis. The evaluations utilized the equivalent margin analysis plant applicability verification forms from BWRVIP-74-A. The completed forms are presented in Table 4.2-3, Table 4.2-4, Table 4.2-5, and Table 4.2-6.

Table 4.2-3
Unit 1 RPV Beltline Weld USE Equivalent Margin Analysis for 54 EFPY

Equivalent Margin Analysis Plant Applicability Verification Form For SSES Unit 1 for 54 EFPY BWR/2-6 Weld
Surveillance Weld USE: **Heat # 411L3071/L311A27AF & 402K9171/K315A27AE**
% Cu = 0.03
Capsule Fluence = 1.4E+17 n/cm^2
Measured % Decrease = -3
RG 1.99 Predicted % Decrease = 4 – 6
Limiting Beltline Weld USE**: Heat # 494K2351/L307A27AD**
% Cu = 0.04
54 EFPY Fluence = 7.88E+17 n/cm^2 maximum at 1/4T
RG 1.99 Predicted % Decrease = 10.4 from RG 1.99, Figure 2 (0.05% Cu line was used)
Adjusted % Decrease = N/A from RG 1.99, Position 2.2
10.4% ≤ 39%
Therefore, the vessel welds are bounded by the BWRVIP-74-A equivalent margin analysis.

Table 4.2-4
Unit 1 RPV Beltline Plate USE Equivalent Margin Analysis for 54 EFPY

Equivalent Margin Analysis Plant Applicability Verification Form For SSES Unit 1 for 54 EFPY BWR/3-6 Plate
Surveillance Plate USE: **Heat # C2433-1**
% Cu = 0.10
Capsule Fluence = 1.4E+17 n/cm^2
Measured % Decrease = -2
RG 1.99 Predicted % Decrease = 6
Limiting Beltline Plate USE**: Heat # C2433-1**
% Cu = 0.10
54 EFPY Fluence = 9.48E+17 n/cm^2 maximum at 1/4T
RG 1.99 Predicted % Decrease = 10.9 from RG 1.99, Figure 2
Adjusted % Decrease = N/A from RG 1.99, Position 2.2
10.9% ≤ 23.5%
Therefore, the vessel plates are bounded by the BWRVIP-74-A equivalent margin analysis.

Table 4.2-5
Unit 2 RPV Beltline Weld USE Equivalent Margin Analysis for 54 EFPY

Equivalent Margin Analysis Plant Applicability Verification Form For SSES Unit 2 for 54 EFPY BWR/2-6 Weld
Surveillance Weld USE: **Heat # 411L3071/L311A27AF & 401S0371/B504B27AE**
% Cu = 0.03
Capsule Fluence = 1.3E+17 n/cm^2
Measured % Decrease = 4
RG 1.99 Predicted % Decrease = 5 – 6
Limiting Beltline Weld USE**: Heat # 624263/E204A27A**
% Cu = 0.06
54 EFPY Fluence = 7.96E+17 n/cm^2 maximum at 1/4T
RG 1.99 Predicted % Decrease = 10.8 from RG 1.99, Figure 2
Adjusted % Decrease = N/A from RG 1.99, Position 2.2
10.8% ≤ 39%
Therefore, the vessel welds are bounded by the BWRVIP-74-A equivalent margin analysis.

Table 4.2-6
Unit 2 RPV Beltline Plate USE Equivalent Margin Analysis for 54 EFPY

Equivalent Margin Analysis Plant Applicability Verification Form For SSES Unit 2 for 54 EFPY BWR/3-6 Plate
Surveillance Plate USE: **Heat # C2929-1**
% Cu = 0.13
Capsule Fluence = 1.3E+17 n/cm^2
Measured % Decrease = -4
RG 1.99 Predicted % Decrease = 8
Limiting Beltline Plate USE**: Heat # C2421-3**
% Cu = 0.13
54 EFPY Fluence = 9.54E+17 n/cm^2 maximum at 1/4T
RG 1.99 Predicted % Decrease = 13.8 from RG 1.99, Figure 2
Adjusted % Decrease = N/A from RG 1.99, Position 2.2
13.8% ≤ 23.5%
Therefore, the vessel plates are bounded by the BWRVIP-74-A equivalent margin analysis.

For the vessel beltline plates, the maximum decrease in USE was found to be 10.9% for Unit 1 and 13.8% for Unit 2. This is less than the assumed decrease of 23.5% in the equivalent margin analysis. Therefore, the maximum predicted decreases in USE for 54 EFPY for the beltline plates for both units are bounded by the generic equivalent margin analysis documented in BWRVIP-74-A, and the projected USE for the vessel beltline plates is acceptable for the period of extended operation.

For the welds associated with the vessel beltline plates, the maximum decrease in USE was found to be 10.4% for Unit 1 and 10.8% for Unit 2. This is less than the assumed decrease of 39% in the equivalent margin analysis. Therefore, the maximum predicted decreases in USE for the welds in the vessel beltline region are bounded by the BWRVIP-74-A equivalent margin analysis, and the projected USE for the welds is acceptable for the period of extended operation.

Disposition: 10 CFR 54.21(c)(1)(ii) – Reactor vessel upper shelf energy TLAA have been projected to the end of the period of extended operation.

4.2.3 Adjusted Reference Temperature (ART) Analysis

In addition to USE, the other key parameter which characterizes the fracture toughness of a material is the reference temperature for nil-ductility transition (RT_{NDT}). This reference temperature will change as its exposure to neutron radiation increases. The effects of neutron radiation on RT_{NDT} are reflected in the change in this reference temperature, ΔRT_{NDT}, and the resulting adjusted reference temperature, ART, is calculated by adding ΔRT_{NDT} to RT_{NDT} along with appropriate margin to account for uncertainties.

The methodology used to calculate ART for the vessel beltline plates and welds is provided in Regulatory Guide 1.99. Material properties and initial RT_{NDT} values were taken from analyses of reactor vessel surveillance materials. Data from the NRC's Reactor Vessel Integrity Database (RVID2) and the BWRVIP Integrated Surveillance Program (ISP) were reviewed, as well, and the highest limiting material property values were used in computations of ΔRT_{NDT} and ART to achieve conservative results.

Table 4.2-7 and Table 4.2-8 give 54 EFPY values of ΔRT_{NDT} and ART for the vessel beltline plates and the 3 most limiting welds for Unit 1 and Unit 2, respectively. It may be noted that ART values are well below the 200°F suggested in Section 3 of Regulatory Guide 1.99 and are, thus, acceptable for the period of extended operation.

Disposition: 10 CFR 54.21(c)(1)(ii) – Reactor vessel adjusted reference temperature TLAA have been projected to the end of the period of extended operation.

Table 4.2-7
Unit 1 ART Values for 54 EFPY

Description	Heat/Lot	Copper (Wt. %)	Nickel (Wt. %)	Estimated Initial ΔRT_{NDT} (°F)	ΔRT_{NDT} (°F)	Margin[(1)] (°F)	ART (°F)
Lower Shell #1 #21-1	B5083-1	0.14	0.48	-8	35.5	34.0	61.5
Lower Shell #2 #21-2	C0770-2	0.14	0.50	-20	35.9	34.0	49.9
Lower Shell #3 #21-3	C0814-2	0.13	0.51	-20	33.2	33.2	46.3
Lower Intermediate Shell #1 #22-1	C0803-1	0.09	0.53	-10	23.9	23.8	37.8
Lower Intermediate Shell #2 #22-2	C0776-1	0.12	0.48	6	33.2	33.2	72.4
Lower Intermediate Shell #3 #22-3	C2433-1	0.10	0.63	18	26.9	26.8	71.8
Weld #1[(2)]	629616/L320A27AG	0.04	0.99	-50	20.3	20.2	-9.4
Weld #2[(2)]	411L3071/L311A27AF	0.03	0.93	-50	15.4	15.4	-19.2
Weld #3[(2)]	494K2351/L307A27AD	0.04	1.10	-50	20.3	20.2	-9.4

(1) Margin = $2\sigma_{\sigma}$.
(2) Values for 3 most limiting welds provided.

Table 4.2-8
Unit 2 ART Values for 54 EFPY

Description	Heat/Lot	Copper (Wt. %)	Nickel (Wt. %)	Estimated Initial ΔRT_{NDT} (°F)	ΔRT_{NDT} (°F)	Margin[(1)] (°F)	ART (°F)
Lower Shell #1 #21-1	6C956-1-1	0.11	0.55	-20	27.7	27.8	35.5
Lower Shell #2 #21-2	6C980-1-1	0.10	0.56	-20	24.5	24.6	29.0
Lower Shell #3 #21-3	6C1053-1-1	0.10	0.58	10	24.5	24.6	59.0
Lower Intermediate Shell #1 #22-1	C2421-3	0.13	0.68	-10	38.4	34.0	62.4
Lower Intermediate Shell #2 #22-2	C2929-1	0.13	0.64	-20	38.0	34.0	52.0
Lower Intermediate Shell #3 #22-3	C2433-2	0.10	0.63	2	27.0	27.0	55.9
Weld #1[(2)]	629616/L320A27AG	0.04	0.99	-50	20.4	20.4	-9.3
Weld #2[(2)]	624263/E204A27A	0.06	0.89	-20	30.9	31.0	41.9
Weld #3[(2)]	09M057/C109A27A	0.03	0.89	-36	15.5	15.4	-5.1

(1) Margin = $2\sigma_\sigma$.
(2) Values for 3 most limiting welds provided.

4.2.4 Pressure-Temperature (P-T) Limits

To assure that adequate margins of safety are maintained for various modes of reactor operation, 10 CFR 50, Appendix G specifies pressure and temperature requirements for affected materials for the service life of the reactor vessel. The basis for these fracture toughness requirements is ASME Section XI, Appendix G. The ASME Code requires P-T limits be established for hydrostatic pressure tests and leak tests; for operation with the core not critical during heatup and cooldown; and for core critical operation.

Calculations were performed to develop P-T limit curves for SSES Units 1 and 2 for extended plant operation to 60 years (54 EFPY). The calculations, which were performed for the bounding regions of the reactor vessel, account for the 54 EFPY fluence projections discussed in Section 4.2.1, which include the effects of EPU conditions. The P-T curves were developed in accordance with 10 CFR 50, Appendix G and the methods of ASME Section XI, Appendix G, 1998 Edition, including the 2000 Addenda. The 54 EFPY P-T curves for Units 1 and 2 demonstrate that there is sufficient operating margin for hydrostatic tests, heatup, cooldown, and core critical operation to the end of the period of extended operation.

Technical Specification change requests with revised Pressure-Temperature (P-T) limits will be submitted to the NRC for approval when necessary to comply with 10 CFR 50 Appendix G.

Disposition: 10 CFR 54.21(c)(1)(ii) – Reactor vessel pressure-temperature limits TLAA have been projected to the end of the period of extended operation.

4.2.5 Reactor Vessel Circumferential Weld Examination Relief

BWRVIP-74-A (Reference 4.8.2) reiterated the recommendation of BWRVIP-05 (Reference 4.8.4) that RPV circumferential welds could be exempted from examination. The NRC SER for BWRVIP-74 agreed, but required that plants apply for this relief request individually. The relief request should demonstrate that at the expiration of the current license, the circumferential welds satisfy the limiting conditional failure probability for circumferential welds in the (BWRVIP-05) evaluation. This evaluation of circumferential weld parameters is a TLAA.

PPL applied for relief from circumferential vessel shell weld volumetric examinations in November 2000. Approval of the relief request was granted by the NRC in February 2001 (Reference 4.8.15). The SSES submittal included an analysis that showed that the reactor vessel parameters at 32 EFPY were within the bounding parameters for Chicago Bridge & Iron (CBI) vessels from the BWRVIP-05 SER. As such, there is a

lower conditional probability of failure for circumferential welds at SSES than that stated in the NRC's Final Safety Evaluation Report of BWRVIP-05.

The SSES reactor pressure vessel circumferential weld parameters at 54 EFPY will remain within the bounding parameters for CBI vessels at 64 EFPY from the BWRVIP-05 SER. As such, the conditional probability of failure for circumferential welds remains below that stated in the SER for BWRVIP-05.

PPL will process a relief request for circumferential vessel shell weld volumetric examinations prior to the period of extended operation in the same manner that has been the practice during the original licensing period.

Disposition: 10 CFR 54.21(c)(1)(ii) – Reactor vessel circumferential weld TLAA have been projected to the end of the period of extended operation.

4.2.6 Reactor Vessel Axial Weld Failure Probability

The NRC SER for BWRVIP-74-A (Reference 4.8.2) evaluated the failure frequency of axially oriented welds in BWR RPVs, and determined that this failure frequency is below 5.0E-06 per reactor year for 40 years of reactor operation. Applicants for license renewal must evaluate axially oriented RPV welds to show that their failure frequency remains below the 5.0E-06 calculated in the BWRVIP-74 SER. The SER states that an acceptable way to do this is to show that the mean RT_{NDT} of the limiting axial beltline weld at the end of the period of extended operation is less than the values specified in the SER.

The SSES axial weld mean RT_{NDT} at 54 EFPY is projected to be well below that in the SER, and thus the SSES axial weld failure frequency is well below the acceptable limit of 5.0E-06.

Disposition: 10 CFR 54.21(c)(1)(ii) – Reactor vessel axial weld TLAA have been projected to the end of the period of extended operation.

4.2.7 Reflood Thermal Shock Analysis

FSAR Section 3.13.1 documents a concern of possible brittle fracture of the reactor vessel resulting from reflooding of the vessel following a postulated loss of coolant accident. This concern is addressed in NEDO-10029, "An Analytical Study on Brittle Fracture of GE-BWR Vessels Subject to the Design Basis Accident" (Reference 4.8.12), in which a very conservative analysis is documented. That document provides an upper bound limit on brittle fracture failure for the materials and concludes that catastrophic

failure is not possible. The NEDO-10029 analysis assumed a neutron fluence of 1E+18 neutrons per square centimeter (n/cm^2) throughout the vessel with a corresponding shift in the reference temperature for nil-ductility transition (RT_{NDT}) of 50°F. For SSES, the predicted maximum fluence at one-quarter of the vessel wall thickness (¼ T) at 54 EFPY is 9.48E+17 n/cm^2 for Unit 1 and 9.54E+17 n/cm^2 for Unit 2 with a shift in RT_{NDT} of 35.9°F for Unit 1 and 38.4°F for Unit 2. Therefore, since the SSES 54 EFPY values are bounded by the values assumed in the NEDO-10029 analysis, the analysis remains valid for SSES for the period of extended operation.

Disposition: 10 CFR 54.21(c)(1)(i) – The reflood thermal shock TLAA remains valid for the period of extended operation.

4.3 METAL FATIGUE

Fatigue evaluations for mechanical components are identified as TLAA; therefore, the effects of fatigue must be addressed for license renewal. Fatigue is an age-related degradation mechanism caused by cyclic duty on a component by either mechanical or thermal loads.

The primary code governing design and construction of the systems, structures, and components (SSCs) of interest is the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code. The ASME Code requires evaluation of transient thermal and mechanical load cycles and determination of fatigue usage for Class 1 components. Design cycles and fatigue usage for SSES are provided in stress reports pertinent to the Class 1 components and summarized in FSAR Section 3.9 and FSAR Table 3.9-1.

PPL monitors fatigue via a plant transient and fatigue monitoring program, which uses a computer program, FatiguePro, to count transient cycles and calculate fatigue usage.

Fatigue is considered in the design of Class 1 SSCs. Class 1 SSCs include the reactor pressure vessel and reactor coolant pressure boundary components. Evaluation of fatigue for the reactor vessel and other Class 1 mechanical SSCs are provided in Section 4.3.1 of this report. Fatigue of the non-Class 1 reactor vessel internals is addressed in Section 4.3.2.

Calculation of fatigue usage values is not required for non-Class 1 SSCs. Instead, stress intensification factors and lower stress allowables are used to ensure components are adequately designed for fatigue.

Certain components enveloped by the Primary Containment are also required to be evaluated for fatigue. These include penetrations, hatches, the drywell head, downcomer vents, safety relief valve (SRV) discharge piping, and SRV quenchers. Results of evaluations are provided in Section 4.6.

The evaluation for the effect of the reactor coolant environmental on the fatigue of Class 1 components is provided in Section 4.3.3.

4.3.1 Reactor Pressure Vessel Fatigue Analyses

The reactor vessel assembly consists of the reactor pressure vessel (RPV), the vessel support skirt, the shroud support, nozzles, penetrations, stub tubes, head closure flanges, head closure studs, refueling bellows supports, and stabilizer brackets.

The materials, fabrication procedures, and testing methods used in the construction of the reactor pressure vessel meet the requirements of ASME Section III, 1968 Edition to and including the Summer 1970 Addenda and Paragraph NB-3338.2(d)(4) of the Winter

1971 Addenda, which supersedes Paragraph I-613(d) of the 1968 Edition. Codes and standards, design criteria, and specification definitions for reactor vessel assembly structures and components are provided in FSAR Tables 3.2-1 through 3.2-5.

The design transients for the RPV assembly are reported in FSAR Table 3.9-1. Normal, upset, and test conditions used in the fatigue analyses of the RPV assembly are summarized in Table 4.3-1. Design cumulative usage factors for the limiting RPV assembly locations are obtained from applicable design reports and are summarized in Table 4.3-2. These Cumulative Usage Factors (CUFs) were calculated based on the applicable design transients listed in Table 4.3-1. The projection of the number of occurrences of design transients to 60 years determined that selected transients (e.g., startup and shutdown) may be exceeded during the period of extended operation. However, CUFs at limiting RPV assembly locations are monitored using FatiguePro. The 60-year CUF projections for the limiting locations of the RPV assembly are listed in Table 4.3-2.

Metal fatigue for all RPV assembly components is managed by the SSES Fatigue Monitoring Program. This program includes requirements for continued monitoring and periodic updates to current and projected CUFs for the limiting RPV locations. The program will include an approach to address CUFs that will exceed the allowable before the end of the period of extended operation. The aging management approach will include one or more of the following, which is similar to the approach documented in ASME Code Section III Non-mandatory Appendix L:

- Further refinement of the fatigue analyses to lower the CUFs to less than the allowable
- Repair of the affected components
- Replacement of the affected components
- Management by an inspection program that has been reviewed and approved by the NRC (e.g., periodic non-destructive examination of the affected locations at intervals determined by a method accepted by the NRC)

The original RPV design report was not required to provide an explicit fatigue analysis for nozzles N6A, N6B, and N7, since the nozzles satisfied all requirements of ASME Section III, Paragraph N-415.1. As such, design CUFs were not calculated for these nozzles. The SSES Fatigue Monitoring Program will include a requirement to periodically determine if the requirements of N-415.1 remain satisfied, such that fatigue evaluations are not required for these nozzles prior to entering and during the period of extended operation.

Disposition: 10 CFR 54.21(c)(1)(iii) – The effects of aging on the intended function(s) of the RPV will be adequately managed for the period of extended operation.

The Fatigue Monitoring Program is credited for managing the effects of aging for the period of extended operation. The Fatigue Monitoring Program is evaluated in Appendix B Section B.3.1.

Table 4.3-1
Reactor Design Transients and 60-Year Cycle Projections

Transient Normal, Upset, and Test Conditions	No. of Design Cycles	60-Year Cycle Projections	
		Unit 1	Unit 2
Bolt Up	123	46	42
Design Hydrostatic Test	130	48	38
Startup (100°F/hr Heatup Rate)[1]	117	148	145
Daily Reduction to 75% Power	10,000	N/A[3]	N/A[3]
Weekly Reduction to 50% Power	2,000	N/A[3]	N/A[3]
Control Rod Pattern Change	400	N/A[3]	N/A[3]
Loss of Feedwater Heaters, Partial Feedwater Heater Bypass	70	44	67
50% Safe Shutdown Event at Rated Operating Conditions	10[2]	1[5]	1[5]
Scram: a. Turbine Generator Trip, Feedwater On, Isolation Valves Stay Open b. Other Scrams	180	50	26
Reduction to 0% power, hot standby with main condenser available, shutdown (100°F/hr cooldown)[1]	111	148	145
Unbolt	123	46	42
Blowdown	9	1[5]	1[5]
Natural Circulation Startup	3	0[4]	0[4]
Loss of AC Power, Natural Circulation Restart	5	1[5]	1[5]

(1) Bulk average vessel coolant temperature change of 100ºF in any 1-hour period.
(2) Includes 10 maximum load cycles per event. Not required to be considered in fatigue analysis due to low encounter frequency ($<10^{-2}$) and low number of cycles.
(3) This transient is tracked as a minor power reduction which has no significant fatigue impact. Power reductions which are fatigue-significant are conservatively counted as Partial Feedwater Heater Bypass transients.
(4) This transient is prohibited by SSES operating procedures.
(5) No cycles have occurred to-date. One cycle of this low probability transient is assumed for conservatism.

Table 4.3-2
Fatigue Usage for Limiting RCPB Locations

Component [1]	Design CUF	60-Year CUF Projections	
		Unit 1	Unit 2
Vessel Support Skirt	Unit 1 – 0.913 Unit 2 – 0.888	0.121	0.100
FW Nozzle (N4) Safe End	Unit 1 - 0.820 Unit 2 – 0.820	0.319	0.315
FW Nozzle (N4)	Unit 1 - 0.815 Unit 2 – 0.815	0.057	0.034
CRD Penetration	Unit 1 - 0.360 Unit 2 – 0.360	0.009	0.009
Recirculation Outlet Nozzle (N1)	Unit 1 - 0.475 Unit 2 – 0.475	0.401	0.349
Recirculation Inlet Nozzle (N2)	Unit 1 - 0.815 Unit 2 – 0.815	0.196	0.173
Main Steam Nozzle (N3)	Unit 1 - 0.841 Unit 2 – 0.841	0.448	0.382
Core Spray Nozzle (N5) Forging	Unit 1 - 0.815 Unit 2 – 0.815	0.220	0.185
Core Spray Nozzle (N5) Safe End	Unit 1 - 0.615 Unit 2 – 0.615	0.608	0.401
SLC/Core Plate DP Nozzle (N10)	Unit 1- 0.823 Unit 2 – 0.823	0.426	0.363
Head Closure Flange	Unit 1 - 0.920 Unit 2 – 0.920	0.697	0.567
Head Closure Studs	Unit 1 - 0.912 Unit 2 – 0.912	0.669	0.632
Refueling Bellows Support	Unit 1 - 0.468 Unit 2 – 0.468	0.709	0.700

Table 4.3-2 (continued)
Fatigue Usage for Limiting RCPB Locations

Component [1]	Design CUF	60-Year CUF Projections	
		Unit 1	Unit 2
Stabilizer Bracket	Unit 1 - 0.625 Unit 2 – 0.625	0.415	0.374
Vessel Shell (at shroud support)	Unit 1 - 0.358 Unit 2 – 0.358	0.312	0.297
Main Steam Piping	Unit 1 – 0.9396 Unit 2 – 0.9163	0.850	0.848
Recirculation Loop Suction Piping	Unit 1 Loop A – 0.5821 Unit 1 Loop B – 0.6402 Unit 2 Loop A – 0.5287 Unit 2 Loop B – 0.7502	A – 0.243 B – 0.457	A – 0.234 B – 0.445
RWCU Bottom Head Drain Piping	Unit 1 – 0.9256 Unit 2 – 0.1816	0.648	0.647
RWCU Supply Piping	Unit 1 – 0.4918 Unit 2 – 0.7013	0.756	0.740
RWCU Common Supply Piping in No-Break Zone	Unit 1 – 0.0635 Unit 2 – 0.0404	0.038	0.038
FW Piping	Unit 1 Loop A – 0.6891 Unit 1 Loop B – 0.9122 Unit 2 Loop A – 0.8829 Unit 2 Loop B – 0.8878	A – 0.165 B – 0.204	A – 0.148 B – 0.198
FW Piping in No-Break Zone	Unit 1 Loop A – 0.0988 Unit 1 Loop B – 0.0871 Unit 2 Loop A – 0.0918 Unit 2 Loop B – 0.0991	A – 0.082 B – 0.094	A – 0.106 B – 0.107
HPCI Steam Piping	Unit 1 – 0.1558 Unit 2 – 0.9281	0.324	0.309
RHR Supply Piping	Unit 1 – 0.8072 Unit 2 – 0.5198	0.822	0.822

Table 4.3-2 (continued)
Fatigue Usage for Limiting RCPB Locations

Component [1]	Design CUF	60-Year CUF Projections	
		Unit 1	Unit 2
RHR Head Spray Piping	Unit 1 – 0.4376 Unit 2 – 0.9195	0.609	0.591
RCIC Steam Piping	Unit 1 – 0.9585 Unit 2 – 0.9020	0.247	0.239

[1] FW = Feedwater
CRD = Control Rod Drive
SLC = Standby Liquid Control
RWCU = Reactor Water Cleanup
HPCI = High Pressure Coolant Injection
RHR = Residual Heat Removal
RCIC = Reactor Core Isolation Cooling

4.3.2 Reactor Vessel Internals Fatigue Analyses

The RPV internals are described in terms of two assemblies: Core Support Structures (CSS) and Reactor Internals (RI). Core Support Structures include the shroud, shroud support (part of the reactor vessel), core plate and hold-down bolts, top guide, fuel supports, control rod guide tube, and control rod drive housing. The Reactor Internals include the jet pump assemblies, feedwater spargers, vessel head spray nozzle, differential pressure and liquid control lines, incore flux monitor tubes, initial startup neutron sources (removed), surveillance sample holders, core spray line (in-vessel) and spargers, incore instrument housings, steam dryer, shroud head and steam separator assembly, guide rods and CRD thermal sleeves.

The Reactor Internals and Core Support Structures at SSES were designed in accordance with ASME Section III, Subsection NG. The fatigue evaluations performed to demonstrate the design adequacy of the internals for 40 years are TLAA.

Most recently, structural evaluations were performed to address the effects of operation under EPU conditions and the extended period of plant operation to 60 years. The evaluations determined that the fatigue usage factors for all RPV internals remain within the ASME Section III Subsection NG allowable limits.

PPL also monitors the design transients listed in Table 4.3-1 using FatiguePro, as described in Section 4.3.1. This monitoring allows PPL to continually assess the potential for plant operating anomalies that could impact the assumptions made in the fatigue evaluations of plant components. In addition to plant transient monitoring, PPL has effectively implemented the inspection requirements of the BWRVIP program at

SSES, as described in Appendix B Section B.2.9. These inspections provide further assurance that the aging effect of cracking due to fatigue of the RPV internals will be managed during the period of extended operation.

Disposition: **10 CFR 54.21(c)(1)(ii) – The TLAA associated with fatigue of the reactor vessel internals have been projected to the end of the period of extended operation; and,**

10 CFR 54.21(c)(1)(iii) – The effects of aging on the intended function(s) of the reactor vessel internals will be adequately managed for the period of extended operation.

The BWR Vessel Internals Program is credited for managing the effects of aging for the period of extended operation. The BWR Vessel Internals Program is evaluated in Appendix B Section B.2.9.

4.3.3 Effects of Reactor Coolant Environment on Fatigue Life of Components and Piping (GSI-190)

The NRC requires applicants for license renewal to address the reactor coolant environmental effects on fatigue of plant components [NUREG-1800 Section 4.3]. The minimum set of components is suggested to be the six components defined in NUREG/CR-6260 (Reference 4.8.6), as follows:

1. Reactor vessel shell and lower head
2. Reactor vessel feedwater nozzle
3. Reactor recirculation piping (including inlet and outlet nozzles)
4. Core spray line reactor vessel nozzle and associated Class 1 piping
5. Residual heat removal return line Class 1 piping
6. Feedwater line Class 1 piping

In NUREG-1800 the NRC mentions using the calculational approach whereby the fatigue life adjustment factor, F_{en}, is determined for each fatigue-sensitive component and applying those environmental fatigue life adjustment factors to the appropriate component CUFs to verify acceptability of the components for the period of extended operation. In NUREG-1800 the NRC further points out equations for calculating F_{en} values as being those contained in NUREG/CR-6583 (Reference 4.8.7) for carbon steel and low alloy steel components and in NUREG/CR-5704 (Reference 4.8.8) for austenitic stainless steel components.

Using fatigue data projected by the SSES Fatigue Monitoring Program and methodology accepted by the NRC, as noted above, PPL evaluated the limiting

locations (a total of eleven component locations corresponding to the six NUREG/CR-6260 components), as appropriate for the material for each component location. Seven of the eleven locations evaluated have an environmentally adjusted CUF of greater than 1.0 (see Table 4.3-3).

Prior to entering the period of extended operation, for each location that may exceed a CUF of 1.0 when considering environmental effects, SSES will implement one or more of the following:

- Further refinement of the fatigue analyses to lower the CUFs to less than the allowable
- Repair of the affected components
- Replacement of the affected components
- Management by an inspection program that has been reviewed and approved by the NRC (e.g., periodic non-destructive examination of the affected locations at intervals determined by a method accepted by the NRC)

Should PPL select the option to manage environmentally-assisted fatigue during the period of extended operation, details of the aging management program such as scope, qualification, method, and frequency will be provided to the NRC prior to the period of extended operation.

The effects of environmentally-assisted fatigue for the limiting locations identified in NUREG/CR-6260 have been evaluated. Cracking by environmentally-assisted fatigue of these locations will be addressed using one of the four approaches identified above, in accordance with 10 CFR 54.21(c)(1), prior to the period of extended operation.

Disposition: **10 CFR 54.21(c)(1)(iii) – The effects of environmentally-assisted fatigue on the intended functions of the limiting NUREG/CR-6260 locations will be adequately managed for the period of extended operation.**

The Fatigue Monitoring Program is credited for managing the effects of environmentally-assisted fatigue for the period of extended operation. The Fatigue Monitoring Program is evaluated in Appendix B Section B.3.1.

Table 4.3-3
CUFs Including Environmental Effects for NUREG/CR-6260 Locations

Equivalent NUREG/CR-6260 Location	Material[(1)]	60-Year Environmental CUF	Result
Reactor Vessel (Shell at Shroud Support)	Low Alloy Steel	Unit 1 – 4.070 Unit 2 – 3.695	Not Acceptable
Recirculation Inlet Nozzle Forging	Low Alloy Steel	Unit 1 – 2.551 Unit 2 – 2.158	Not Acceptable
Recirculation Outlet Nozzle Forging	Low Alloy Steel	Unit 1 – 5.225 Unit 2 – 4.344	Not Acceptable
Feedwater Nozzle Safe End	Carbon Steel	Unit 1 – 0.555 Unit 2 – 0.547	Acceptable
Feedwater Nozzle Forging	Low Alloy Steel	Unit 1 – 0.141 Unit 2 – 0.084	Acceptable
Core Spray Nozzle Forging	Low Alloy Steel	Unit 1 – 2.866 Unit 2 – 2.304	Not Acceptable
Core Spray Nozzle Safe End	Inconel	Unit 1 – 0.906 Unit 2 – 0.598	Acceptable
Class 1 Feedwater Piping, Loop B, Break, Node 35 (Tee, header to feedwater nozzle N4A)	Carbon Steel	Unit 1 – 0.502 Unit 2 – 0.485	Acceptable
Class 1 RHR Supply Line Piping, Break, Node 669 (Half-coupling on the supply line)	Stainless Steel	Unit 1 – 10.797 Unit 2 – 10.898	Not Acceptable
Class 1 Recirculation Suction Line Piping, Loop B, Break, Node 353 (Half-coupling on elbow before recirculation pump)	Stainless Steel	Unit 1 – 6.000 Unit 2 – 5.896	Not Acceptable
Class 1 Recirculation Suction Line Piping, Loop A, Break, Node 430 (Half-coupling on elbow before recirculation pump)	Stainless Steel	Unit 1 – 3.187 Unit 2 – 3.107	Not Acceptable

4.3.4 Reactor Coolant Pressure Boundary Piping and Component Fatigue Analyses

The Class 1 boundary encompasses all reactor coolant pressure boundary piping (pipe and fittings) and in-line components subject to ASME Section XI, Subsection IWB, inspection requirements. FSAR Tables 3.2-1 through 3.2-5 give codes and standards, design criteria, and specification definitions for Class 1 piping. These components are generally designed in compliance with ASME Section III, Subsection NB-3600.

FSAR Section 3.9 provides details on the design transients to be considered in the fatigue analyses of reactor coolant pressure boundary (RCPB) components. The FSAR identifies the following components as part of the Class 1 boundary: main steam piping inside containment, main steam isolation valves (MSIVs), MSIV drain piping inside primary containment, MSIV test connection piping, safety relief valves, recirculation loop piping, recirculation system valves, reactor water cleanup system piping inside primary containment, feedwater piping inside primary containment, HPCI steam piping inside primary containment, RHR piping inside primary containment, core spray piping inside containment, RCIC steam piping inside primary containment, standby liquid control piping inside primary containment, head spray piping, head vent piping, instrumentation piping, and flued head penetrations.

The SSES Fatigue Monitoring Program tracks the fatigue usage at the limiting locations throughout the RCPB. The use of FatiguePro and the SSES Fatigue Monitoring Program ensure that the fatigue of RCPB components is maintained below the ASME Code design limits. Design fatigue usage for 40 years of operation and projected fatigue usage for the period of extended operation are provided in Table 4.3-2 for the limiting RCPB components.

All Class 1 valves are required to have a fatigue analysis. A review of a representative sample of Class 1 valve stress reports found the fatigue analyses to be conservatively simplistic, and the predicted fatigue was extremely low (less than 0.1). The simplified analyses for the valves do not provide the detailed information required to track fatigue usage by cycle counting or similar means. As an alternative, since the fatigue usage is typically much higher on the associated piping systems, and fatigue monitoring is performed for the limiting piping locations, the fatigue usage on the Class 1 valves is assumed to be bounded by the Class 1 piping locations. The fatigue on the valves will be managed indirectly by monitoring fatigue on the piping. If a piping system accumulates sufficient fatigue usage to indicate that design values are being approached, the Fatigue Monitoring Program will require a review of the valve fatigue analyses and other fatigue-related TLAA (such as flued head analyses and high energy line break evaluations) to determine if additional actions are required to address any of these additional fatigue-related concerns on the affected piping system.

Metal fatigue for all Class 1 reactor coolant pressure boundary piping and in-line components (as listed in Table 4.3-2) is managed by the SSES Fatigue Monitoring Program. This program includes requirements for continued monitoring and periodic updates to current and projected CUFs for the limiting piping locations. The program will include an approach to address CUFs that will exceed the allowable before the end of the period of extended operation. The aging management approach will include one or more of the following, which is similar to the approach documented in ASME Code Section III Non-mandatory Appendix L:

- Further refinement of the fatigue analyses to lower the CUFs to less than the allowable
- Repair of the affected components
- Replacement of the affected components
- Management by an inspection program that has been reviewed and approved by the NRC (e.g., periodic non-destructive examination of the affected locations at intervals determined by a method accepted by the NRC)

Disposition: **10 CFR 54.21(c)(1)(iii) – The effects of aging on the intended function(s) of the RCPB piping and components will be adequately managed for the period of extended operation.**

The Fatigue Monitoring Program is credited for managing the effects of aging for the period of extended operation. The Fatigue Monitoring Program is evaluated in Appendix B Section B.3.1.

4.3.5 Non-Class 1 Component Fatigue Analyses

Non-Class 1 components include pipe, tubing, fittings, tanks, vessels, heat exchangers, valve bodies and bonnets, pump casings, and miscellaneous process components. FSAR Tables 3.2-1 through 3.2-5 give codes and standards, design criteria, and specification definitions for non-Class 1 components. Generally, these components were designed in accordance with appropriate ASME Section III subsections or American National Standards Institute (ANSI) B31.1, depending on their function. Some heat exchangers, tanks, pumps, and vessels were designed in compliance with ASME Section VIII, Division 1; Tubular Exchanger Manufacturers Association, Class C (TEMA C); or other specifications.

Calculation of cumulative fatigue usage, i.e., CUFs, is not required for non-Class 1 components designed in compliance with the codes and standards for Class 1 components. For non-Class 1 components, stresses due to thermal expansion and anchor movement, which are important for fatigue evaluations, are analyzed using

stress intensification factors and stress allowables. Allowable stresses are defined for 7000 full temperature cycles with reductions in allowable stresses as cycles increase beyond 7000. In addition, temperature thresholds above which fatigue should be considered are 220°F for carbon steel and 270°F for austenitic stainless steel.

The fatigue evaluation of non-Class 1 components determined whether the associated operating temperature exceeded threshold values for the affected materials and, if so, evaluated the number of transient cycles expected. In every case, the number of projected cycles for 60 years was found to be less than 7000 for piping and in-line components whose temperatures exceed threshold values. Therefore, fatigue for non-Class 1 piping and in-line components remains valid for the period of extended operation.

None of the non-Class 1 vessels, heat exchangers, storage tanks, or pumps were designed to ASME Section VIII, Division 2 or ASME Section III, Subsection NC-3200. Therefore, there is no fatigue TLAA for these components.

Disposition: 10 CFR 54.21(c)(1)(i) – The analyses remain valid for the period of extended operation.

4.4 ENVIRONMENTAL QUALIFICATION OF ELECTRIC EQUIPMENT

Environmental Qualification (EQ) analyses for those components with a qualified life of 40 years or greater are identified as TLAA for SSES. NRC regulation 10 CFR 50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants" requires licensees to identify electrical equipment covered under this regulation and to maintain a qualification file demonstrating that the equipment is qualified for its application and will perform its safety function up to the end of its qualified life. The SSES EQ Program implements the requirements of 10 CFR 50.49 and will be used to manage the effects of aging on the intended function(s) of the components associated with EQ TLAA for the period of extended operation.

4.4.1 Environmental Qualification Program Background

The Nuclear Regulatory Commission (NRC) has established nuclear station EQ requirements in 10 CFR Part 50, Appendix A, Criterion 4, and 10 CFR 50.49. 10 CFR 50.49 specifically requires that an EQ program be established to demonstrate that certain electrical components located in harsh plant environments (that is, those areas of the plant that could be subject to the harsh environmental effects of a loss of coolant accident [LOCA], high energy line breaks [HELBs] or post-LOCA environment) are qualified to perform their safety function in those harsh environments after the effects of inservice aging. 10 CFR 50.49 requires that the effects of significant aging mechanisms be addressed as part of environmental qualification.

SSES has established an EQ program that meets the requirements of 10 CFR 50.49 for certain electrical components important to safety. 10 CFR 50.49 defines the scope of components to be included, requires the preparation and maintenance of a list of in-scope components, and requires the preparation and maintenance of a qualification file that includes component performance specifications, electrical characteristics, and the environmental conditions to which the components could be subjected. 10 CFR 50.49(e)(5) contains provisions for aging that require, in part, consideration of all significant types of aging degradation that can affect component functional capability. 10 CFR 50.49(e) also requires replacement or refurbishment of components not qualified for the current license term prior to the end of designated life, unless additional life is established through ongoing qualification. 10 CFR 50.49(f) establishes four methods of demonstrating qualification for aging and accident conditions. 10 CFR 50.49(k) and (l) permit different qualification criteria to apply based on plant and component vintage. Supplemental EQ regulatory guidance for compliance with these different qualification criteria is provided in the Division of Operating Reactors (DOR) Guidelines (Reference 4.8.9), NUREG-0588 (Reference 4.8.10), and Regulatory Guide 1.89 (Reference 4.8.11). Compliance with 10 CFR 50.49 provides reasonable assurance that the component can perform its intended functions during accident conditions after experiencing the effects of inservice aging.

The SSES EQ program manages component thermal, radiation, and cyclical aging through the use of aging evaluations based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49, EQ components not qualified for the current license term will be refurbished, replaced or have their qualification extended prior to reaching the aging limits established in the evaluation. Aging evaluations for EQ components that specify a qualification of at least 40 years are considered time-limited aging analyses (TLAAs) for license renewal.

The SSES EQ program, which implements the requirements of 10 CFR 50.49 (as further defined and clarified by NUREG-0588, and Regulatory Guide 1.89, Revision 1), is an aging management program (AMP) for license renewal. This existing program is used to manage aging of components in the scope of 10 CFR 50.49 during the current license term and is used routinely to adjust (extend or reduce) qualified life via reanalysis and determine when replacement/refurbishment is needed.

A 40-year administrative limit was placed on qualified life of components in the SSES EQ Program, even when the original EQ analyses indicated a longer qualified life. For those components that do not show a minimum 60-year life after lifting the administrative limit, the SSES EQ Program will ensure qualified life is not exceeded by directing refurbishment, replacement or reanalysis to extend the qualification.

Reanalysis of an aging evaluation to extend the qualification of components under 10 CFR 50.49(e) is performed on a routine basis as part of the EQ program. Reanalysis may be applied to EQ components whose qualified life is less than that of the renewed operating license term. Important attributes for the reanalysis of an aging evaluation include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, and corrective actions (if acceptance criteria are not met).

4.4.2 EQ Component Reanalysis Attributes

The reanalysis of an aging evaluation is normally performed to extend the qualification by reducing excess conservatism incorporated in the prior evaluation. Reanalysis of an aging evaluation to extend the qualification of a component is performed on a routine basis pursuant to 10 CFR 50.49(e) as part of the SSES EQ program. While a component life limiting condition may be due to thermal, radiation or cyclical aging, the vast majority of component aging limits are based on thermal conditions. Conservatism may exist in aging evaluation parameters, such as the assumed ambient temperature of the component, an unrealistically low activation energy, or in the application of a component (de-energized versus energized). The reanalysis of an aging evaluation is documented according to the SSES quality assurance program requirements, which requires the verification of assumptions and conclusions. As already noted, important attributes of a reanalysis include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, and corrective actions (if acceptance criteria are not met). These attributes are discussed below.

Analytical Methods: The analytical models used in the reanalysis of an aging evaluation are the same as those previously applied during the prior evaluation. The Arrhenius methodology is an acceptable thermal model for performing a thermal aging evaluation. The analytical method used for a radiation aging evaluation is to demonstrate qualification for the total integrated dose (that is, normal radiation dose for the projected installed life plus accident radiation dose). For license renewal, one acceptable method of establishing the 60-year normal radiation dose is to multiply the 40-year normal radiation dose by 1.5 (that is, 60 years/40 years). The result is added to the accident radiation dose to obtain the total integrated dose for the component. For cyclical aging, a similar approach may be used. Other models may be justified on a case-by-case basis.

Data Collection and Reduction Methods: Reducing excess conservatism in the component service conditions (for example, temperature, radiation, cycles) used in the prior aging evaluation is the chief method used for a reanalysis. Temperature data used in an aging evaluation is to be conservative and based on plant design temperatures or on actual plant temperature data. When used, plant temperature data can be obtained in several ways, including monitors used for technical specification compliance, other installed monitors, measurements made by plant operators during rounds, and temperature sensors on large motors (while the motor is not running). A representative number of temperature measurements are conservatively evaluated to establish the temperatures used in an aging evaluation. Plant temperature data may be used in an aging evaluation in different ways, such as (a) directly applying the plant temperature data in the evaluation or (b) using the plant temperature data to demonstrate conservatism when using plant design temperatures for an evaluation. Any changes to material activation energy values as part of a reanalysis are to be justified on a plant-specific basis. Similar methods of reducing excess conservatism in the component service conditions used in prior aging evaluations can be used for radiation and cyclical aging.

Underlying Assumptions: EQ component aging evaluations contain sufficient conservatism to account for most environmental changes occurring due to plant modifications and events. When unexpected adverse conditions are identified during operational or maintenance activities that affect the normal operating environment of a qualified component, the affected EQ component is evaluated and appropriate corrective actions are taken, which may include changes to the qualification bases and conclusions.

Acceptance Criteria and Corrective Actions: The reanalysis of an aging evaluation could extend the qualification of the component. If the qualification cannot be extended by reanalysis, the component will be refurbished, replaced or requalified prior to exceeding the period for which the current qualification remains valid. Reanalysis is performed in a timely manner (that is, sufficient time is available to refurbish, replace or requalify the component if the reanalysis is unsuccessful).

4.4.3 Conclusion

The SSES EQ Program is in compliance with the requirements of 10 CFR 50.49, and is successfully being used to manage the aging of equipment in the EQ Program during the current license term. The existing SSES EQ Program will be used to manage aging of equipment in the EQ Program during the period of extended operation and includes provisions to ensure that the qualification bases are maintained and that components do not exceed their qualified lives. Continued effective implementation of the SSES EQ Program provides reasonable assurance that the effects of aging will be adequately managed and that EQ components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

The results of a comparison of the SSES EQ Program to the evaluation in NUREG-1801, Section X.E1 are documented in Appendix B of this Application.

Disposition: **10 CFR 54.21(c)(1)(iii) – The effects of aging on the intended function(s) of the EQ components will be adequately managed for the period of extended operation.**

The EQ Program is credited for managing the effects of aging for the period of extended operation. The EQ Program is evaluated in Appendix B Section B.3.2.

4.5 CONCRETE CONTAINMENT TENDON PRESTRESS

NUREG-1800 assigns TLAA Section 4.5 to the issue of Concrete Containment Tendon Prestress. Susquehanna Units 1 and 2 have Mark II primary containments, and these structures contain no pre-stressed tendons. Therefore, evaluations for tendon prestress are not applicable.

Disposition: TLAA for tendon prestress are not applicable to SSES.

4.6 CONTAINMENT LINER PLATE, METAL CONTAINMENTS, AND PENETRATIONS FATIGUE ANALYSES

4.6.1 ASME Class MC Components

FSAR Section 3.8.2.3.2.4 states the design thermal cycles for containment ASME Class MC stainless steel components, which includes the containment penetrations, hatches, and drywell head, to be 500 cycles for plant startup and shutdown and one cycle for a design basis accident. The reactor pressure vessel assembly and internal components are designed for 117 startups and 111 shutdowns for a combined total of 228 events. The maximum projected cycles for extended life to 60 years includes 148 startups and 148 shutdowns for a total of 296 events. Therefore, the Class MC component design value of 500 cycles for startups and shutdowns remains well above the projected value. Also, the one cycle allowed for a design basis accident is a value assumed in the design for a faulted condition for the life of the plant, whether that is 40 years or 60 years. Hence, the performance of these components will not be impacted by extending the life of the plant to 60 years.

Disposition: 10 CFR 54.21(c)(1)(i) – The TLAA for fatigue of the ASME Class MC components remain valid for the period of extended operation.

4.6.2 Downcomer Vents and Safety Relief Valve Discharge Piping

Downcomer vents and safety relief valve (SRV) discharge piping penetrate the drywell / suppression pool diaphragm slab with the purpose of transporting steam and non-condensable gases to the suppression pool from the reactor and from the drywell during SRV lifts and under accident conditions. To mitigate events, it is necessary that the downcomers and SRV piping deliver their discharges to the suppression pool water inventory. If cracks or breaks occur in the flow paths in the air space above the water in the suppression pool area, the suppression pool will not be capable of satisfying its design objectives. Such bypass would impact the safety of the plant. To ensure the integrity of the downcomers and SRV discharge piping for the original 40-year life of the plant, extensive analyses were performed. These analyses satisfy the definition for TLAA.

The significant area analyzed for the downcomers in the suppression pool air space was the downcomer penetration through the diaphragm slab. Structural analyses of all the SRV discharge lines from the diaphragm slab penetration to the quencher were performed, including flued head connections, elbows, and three-way restraint attachments.

The design rules, as set forth in the ASME Boiler and Pressure Vessel Code, Section III, Subsection NB were used for the fatigue assessment. The downcomers and SRV discharge lines were analyzed for the appropriate load combinations and their associated number of cycles. The combined stresses and corresponding equivalent stress cycles were computed to obtain the fatigue usage factors in accordance with the equations of Subsection NB-3600 of the ASME Code. A summary of the maximum cumulative usage factors for the downcomers and SRV discharge lines for the 40-year plant lifetime, as determined from these analyses, is provided in Table 4.6-1 and Table 4.6-2, respectively.

The minimum number of SRV actuations assumed in any of the fatigue analyses was 1100. Projections for 60 (40) years of operation are 429 (322.3) SRV actuations for Unit 1 and 344 (256) actuations for Unit 2. Because the projected number of events for 60 years is less than the number assumed in the design basis (40 year) analysis, the design basis analysis remains valid for the period of extended operation.

Disposition: 10 CFR 54.21(c)(1)(i) – The analyses remain valid for the period of extended operation.

Table 4.6-1
Maximum Cumulative Usage Factors for Downcomers

Operational Case[1]	Cumulative Usage Factor
	40 Years and 60 Years[8]
1-Normal/Upset –SRV1[2]+SRV2[3]+OBE[4]	0.0083
2-Normal/Upset –SRV1+SRV2+CHUG[7]	0.608
3-Normal/Upset –SRV1+SRV2	0.774
4-Emergency/Faulted –SBA:SRV[5]+CHUG	0.774
5-Emergency/Faulted –SBA:SRV[5]+CHUG+SSE[6]	0.791
6-Emergency/Faulted –SBA:SRV[5]+CHUG	0.782

[1] Design assessment report contains definitions of load cases.
[2] Submerged structure load.
[3] Building response load.
[4] Operating basis earthquake load.
[5] Combination of direct loads and building response loads.
[6] Safe shutdown earthquake load.
[7] Chugging load.
[8] Because the projected number of events for 60 years is less than the number assumed in the design basis (40-year) analysis, the design basis analysis remains valid for the period of extended operation.

Table 4.6-2
Maximum Cumulative Usage Factors for
SRV Discharge Piping in the Suppression Pool Area

SRV Discharge Line Component	Cumulative Usage Factor
	40 Years and 60 Years[1]
Flued Head	0.46
3-Way Restraint	0.51
Elbow	0.56

[1] Because the projected number of events for 60 years is less than the number assumed in the design basis (40-year) analysis, the design basis analysis remains valid for the period of extended operation.

4.6.3 Safety Relief Valve Quenchers

Quenchers provide proper dispersion of reactor steam into the suppression pool upon lifts of SRVs and discharge of the steam through the SRV discharge piping. The quenchers are located at the bottom end of the SRV discharge piping and are mounted to the floor of the suppression pool. Holes in the arms of the quenchers provide the dispersion of the steam into the suppression pool.

The component parts of a quencher installation are the sphere, arms, support stub, and base support. The quencher was designed in accordance with the requirements of ASME Section III, 1977 Edition, including Summer, 1977 Addenda. Code Paragraph NC-3200, Appendix XIII, and Appendix XIV were used in the design and analyses of all components of the quencher, except the base support, which was designed as a Code Paragraph NF component support.

Analyses for fatigue of the quenchers satisfy 10 CFR 54.3 criteria as TLAA. Fatigue evaluations for the original 40-year life of the plant list 7000 cycles as the expected number of cycles for each quencher component analyzed. The evaluations calculate the number of allowable cycles for the components and give the expected CUF for each analysis. Two analyses were conducted, one using design loading, and the other using test loading data. Results of these analyses are provided in Table 4.6-3.

Since a quencher can experience up to 7 cycles each time its associated SRV actuates (lifts), the worst case number of cycles is 7 times the number of actuations identified in Section 4.6.2. These projected cycles are shown in Table 4.6-3 for comparison with analysis data results.

As shown in Table 4.6-3, the design cycles exceed the number of cycles projected to 60 years for all components which were analyzed for the quencher. Therefore, the CUFs calculated in the fatigue evaluation remain valid for the period of extended operation.

Disposition: 10 CFR 54.21(c)(1)(i) – The analyses remain valid for the period of extended operation.

Table 4.6-3
Projected Quencher Cycles and CUFs

Quencher Component	Cycles		Cumulative Usage Factor
	40 Years	60 years	40 Years[1] and 60 Years[3]
Base Support Interface			
Design	7000[1]	7000[2]	0.58
Test	7000[1]	7000[2]	0.58
Quencher Arm Interface			
Design	7000[1]	7000[2]	0.93
Test	7000[1]	7000[2]	0.7
Quencher Arm			
Design	7000[1]	7000[2]	0.7
Test	7000[1]	7000[2]	0.7
Quencher			
FatiguePro	Unit 1 - 2256 Unit 2 - 1792	Unit 1 - 3003 Unit 2 - 2408	

[1] Design values from stress analysis.
[2] Design cycles from stress analysis bound 60-year projected FatiguePro cycles shown at bottom of table.
[3] Since design cycles bound FatiguePro cycles projected to 60 years, the design CUFs are valid for 60 years.

4.7 OTHER PLANT-SPECIFIC TIME-LIMITED AGING ANALYSES

4.7.1 Main Steam Line Flow Restrictor Erosion Analyses

A flow restrictor is incorporated in each main steam line to limit flow to 200 percent of rated flow in the event that a main steam line ruptures outside containment. Erosion of a flow restrictor is a safety concern since it could impair the ability of the flow restrictor to limit vessel blowdown following a main steam line break.

Since erosion is a time-related phenomenon, the analyses for the effect it has on the flow restrictors over the 40-year life of the plant are TLAA. According to FSAR Section 5.4.4, the cast stainless steel material of the flow restrictor has excellent resistance to erosion by high velocity steam. Only very slow erosion will occur with time, and such a slight enlargement of the flow restrictor opening will have no safety significance.

The FSAR states that after 40 years of operation the choke flow through the restrictor would increase by no more than 5 percent due to erosion, which implies an increase in the released radiological dose of 5 percent. This would be an insignificant increase for a postulated break in a main steam line outside containment.

Operating for another 20 years will allow further erosion and therefore, increased opening in the throat of the flow restrictors. The erosion can be linearly extrapolated from 40 to 60 years. This is conservative since the rate of erosion would be expected to decrease as the throat area of the restrictor increased due to erosion. (It has been determined that operation at Extended Power Uprate conditions will not significantly affect the erosion rate.) Therefore, it can be concluded that erosion for the 20 years of extended operation will be no more than half the erosion for the first 40 years, and the corresponding increase in steam flow will be no more than half of the increase in steam flow due to erosion at the end of 40 years (namely, 5 percent). This means that by the end of 60 years, the increase in flow compared to flow at the beginning of life will be no more than 7.5 percent. Therefore, the released dose for the accident case at 60 years would be no more than a 7.5 percent increase. Such an increase in dose over the analyzed case is insignificant and remains within regulatory limits, as indicated in FSAR Section 15.6.4.5.3.

Hence, the performance of the main steam line flow restrictors is not significantly impacted by the additional erosion during the period of extended operation, and the potential effect of the degraded performance has been shown to be acceptable.

Disposition: 10 CFR 54.21(c)(1)(ii) – The TLAA concerning the performance of the main steam line flow restrictors has been projected to the end of the period of extended operation.

4.7.2 High Energy Line Break Cumulative Fatigue Usage Factors

High energy line breaks (HELBs) have been postulated, and based on analyses performed for these breaks, means for avoiding damage to surrounding equipment and systems have been incorporated in the plant. Potential damage could arise from fluid jet impingement, flooding, compartment pressurization, environmental effects, and pipe whip. FSAR Section 3.6 addresses these effects, provides criteria for determining break locations and types of breaks that could occur, descriptions of analysis methodologies, and results for significant attached piping showing where breaks could develop and where restraints were to be installed. It is noted that cumulative fatigue usage factors (CUFs) for the high energy lines are included in the criteria to determine postulated breaks. The CUFs, as calculated in the design fatigue analyses, account for the design transients assumed for the original 40-year life of the plant.

The postulated breaks are in piping for systems important to safety and integrity of the reactor coolant pressure boundary. The restraints designed for these potential breaks are significant for protection of systems and equipment important to plant safety. Therefore, the CUF calculations used in the selection of postulated high energy line break locations are TLAA.

Tables in FSAR Section 3.6 give values from analyses for postulated pipe breaks for high energy lines inside the containment for SSES Units 1 and 2 for the following systems: main steam, feedwater, high pressure coolant injection, reactor core isolation cooling, core spray, residual heat removal, reactor water cleanup, head vent line, head spray, standby liquid control, main steam isolation valve drain lines, and recirculation.

Since these breaks are postulated to occur only once in the lifetime of the plants and restraints were installed appropriately to mitigate these potential breaks, the results of analyses for the potential breaks and the restraints installed in the plants remain unchanged for the extended life of 60 years. However, it is possible that other locations that had 40-year CUFs below the criteria for postulated breaks could exceed that CUF criteria in 60 years. The possibility of these additional postulated breaks will need to be managed based on the actual fatigue accumulation encountered as the plant ages.

Presently, SSES utilizes the EPRI FatiguePro software to monitor fatigue at the critical, bounding locations of piping systems in the plant. The SSES Fatigue Monitoring Program will identify when piping systems are approaching their original 40-year design CUFs. Prior to any piping system exceeding its' original maximum design CUF, the pertinent design calculations for the affected system will be reviewed to determine if any additional locations should be designated as postulated high energy line breaks under the original criteria of FSAR Section 3.6. If other locations are determined to require consideration as postulated break locations, appropriate actions will be taken to address the new break locations.

Disposition: **10 CFR 54.21(c)(1)(iii) – The aging effects associated with the fatigue of High Energy Line Break locations will be adequately managed for the period of extended operation.**

The Fatigue Monitoring Program is credited for managing the effects of aging for the period of extended operation. The Fatigue Monitoring Program is evaluated in Appendix B Section B.3.1.

4.7.3 Core Plate Rim Hold-Down Bolts

The NRC safety evaluation report that references BWRVIP-25, "BWR Core Plate Inspection and Flaw Evaluation Guidelines," (Reference 4.8.14) for license renewal identifies loss of preload on the core plate rim hold-down bolts as one of the TLAA that must be addressed by applicants seeking license renewal.

Appendix B of BWRVIP-25 (Reference 4.8.5), states that the core plate bolts will have at least 81 percent preload remaining at 54 EFPY. PPL analysis determined that loss of preload due to non-irradiation effects was negligible. GE analyses associated with Extended Power Uprate evaluated the core plate hold-down bolts and determined that the preload at the end of 60 years was adequate to prevent lateral motion of the core plate.

Disposition: **10 CFR 54.21(c)(1)(ii) – The TLAA associated with core plate rim hold-down bolt loss of preload has been projected to the end of the period of extended operation.**

4.8 REFERENCES

4.8.1 NRC Regulatory Guide 1.190, Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence, March 2001.

4.8.2 BWRVIP-74-A: "BWR Vessel and Internals Project, BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines for License Renewal," EPRI, Palo Alto, CA: 2003. 1008872. (EPRI Proprietary)

4.8.3 NRC Regulatory Guide 1.99, Radiation Embrittlement of Reactor Vessel Materials, Revision 2.

4.8.4 BWRVIP-05: "BWR Vessel and Internals Project, BWR Reactor Pressure Vessel Shell Weld Inspection Recommendations," EPRI, Palo Alto, CA. 1995. 105697. (EPRI Proprietary)

4.8.5 BWRVIP-25: "BWR Vessel and Internals Project, BWR Core Plate Inspection and Flaw Evaluation Guidelines," EPRI, Palo Alto, CA. 1996. 107284. (EPRI Proprietary)

4.8.6 NUREG/CR-6260, "Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components," March 1995.

4.8.7 NUREG/CR-6583, "Effects of LWR Coolant Environments on Fatigue Design Curves of Carbon and Low-Alloy Steels," March 1998.

4.8.8 NUREG/CR-5704, "Effects of LW Coolant Environments on Fatigue Design Curves of Austenitic Stainless Steels," April 1999.

4.8.9 Division of Operating Reactor (DOR) Guidelines, "Guidelines for Evaluating Environmental Qualification of Class 1E Electrical Equipment in Operating Reactors," U.S. Nuclear Regulatory Commission, June 1979.

4.8.10 NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety Related Electrical Equipment," July 1981.

4.8.11 NRC Regulatory Guide 1.89, Environmental Qualification of Certain Electrical Equipment Important to Safety for Nuclear Power Plants, Revision 1.

4.8.12 NEDO-10029, "An Analytical Study on Brittle Fracture of GE-BWR Vessels Subject to the Design Basis Accident," June 1969. (GE Proprietary)

4.8.13 NRC letter to Bill Eaton, BWRVIP Chairman, Safety Evaluation of Proprietary EPRI Reports, "BWRVIP, RAMA Fluence Methodology Manual (BWRVIP-114)," "BWRVIP, RAMA Fluence Methodology Manual – Evaluation of Regulatory Guide 1.190 Benchmark Problems (BWRVIP-115)," "BWRVIP, RAMA Fluence Methodology Susquehanna Unit 2 Surveillance Capsule Fluence Evaluation for Cycles 1-5 (BWRVIP-117," and "Hope Creek Flux Wire Dosimeter Activation Evaluation for Cycle 1 (TWE-PSE-001-R-001," dated May 13, 2005

4.8.14 NRC letter to Carl Terry, BWRVIP Chairman, “Safety Evaluation for Referencing of BWR Vessel and Internals Project, BWR Core Plate Inspection and Flaw Evaluation Guidelines (BWRVIP-25) Report for Compliance with The License Renewal Rule (10 CFR Part 54) and Appendix B, BWR Core Plate Demonstration of Compliance with the Technical Information Requirements of The License Renewal Rule (10 CFR 54.21),” dated December 7, 2000

4.8.15 NRC letter from M. Gamberoni to R.G. Byram (PPL), “Relief Request No. 22 (RR-22) from American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section XI, Susquehanna Steam Electric Station Units 1 and 2 (TAC Nos. MB0484 and MB0485),” February 28, 2001

APPENDIX A

FINAL SAFETY ANALYSIS REPORT SUPPLEMENT

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A.0 Final Safety Analysis Report Supplement

A.1 INTRODUCTION

This appendix provides the information to be submitted in a Final Safety Analysis Report Supplement as required by 10 CFR 54.21(d) for the SSES License Renewal Application. The License Renewal Application contains the technical information required by 10 CFR 54.21(a) and (c). Section 3 of the SSES License Renewal Application identifies the programs and activities that will manage the effects of aging for the period of extended operation, and Appendix B describes the programs and activities. Section 4 documents the evaluations of time-limited aging analyses for the period of extended operation. License Renewal Application Section 3, Section 4 and Appendix B have been used to prepare the program and activity descriptions that are contained in this appendix. In addition, this appendix contains a listing of commitments associated with license renewal. The information presented here will be incorporated into the SSES Final Safety Analysis Report (FSAR) following issuance of the renewed operating license.

A.1.1 New FSAR Section

The following information will be integrated into the FSAR to document aging management programs and activities credited in the SSES license renewal review and time-limited aging analyses evaluated for the period of extended operation.

A.1.2 Aging Management Program and Activities

The license renewal integrated plant assessment and evaluation of time-limited aging analyses (TLAA) identified existing and new aging management programs necessary to provide reasonable assurance that components within the scope of license renewal will continue to perform their intended functions consistent with the current licensing basis (CLB) for the period of extended operation. This section describes the aging management programs and activities identified during the integrated plant assessment that will be required. Except for one-time inspections, these programs will be implemented during the period of extended operation. One-time inspections will be conducted within the 10-year period prior to beginning the period of extended operation. The aging management programs associated with TLAA are described in Section A.1.3.

Three elements of an effective aging management program that are common to all aging management programs are corrective actions, confirmation process, and administrative controls. These elements are included in the SSES Operational Quality Assurance (OQA) Program, which implements the requirements of 10 CFR 50, Appendix B. Prior to the period of extended operation, the elements of corrective action, confirmation process, and administrative controls in the SSES OQA Program will be applied to required aging management programs for both safety-related and

nonsafety-related structures and components determined to require aging management during the period of extended operation.

A.1.2.1 Area-Based NSAS Inspection

The Area-Based NSAS Inspection detects and characterizes the conditions on the internal surfaces of nonsafety-related components exposed to non-radioactive equipment/area drainage water or potable water environments. The Area-Based NSAS Inspection also detects and characterizes specific conditions on the internal surface of copper alloys exposed to raw water from the spray pond/cooling tower. Components identified as non-safety affecting safety (NSAS) are those nonsafety-related components with the potential to prevent a safety-related system or component from performing its safety function. The conditions in these environments are not expected to result in sufficient degradation to cause spatial interaction with safety-related components or are expected to result in effects that progress very slowly. To ensure that spatial interactions do not occur that impair or prevent a safety-related function, a focused characterization of conditions is performed to provide confirmation of a lack of degradation or to serve as the basis for recurring actions during the period of extended operation, if required.

The Area-Based NSAS Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.2 Bolting Integrity Program

The Bolting Integrity Program is a combination of existing SSES activities that, in conjunction with other credited programs, addresses the management of aging for the bolting of subject mechanical components within the scope of license renewal. The Bolting Integrity Program relies on manufacturer/vendor information and industry recommendations for the proper selection, assembly and maintenance of bolting for pressure-retaining closures. The Bolting Integrity Program includes, through the Inservice Inspection (ISI) Program and System Walkdown Program, the periodic inspection of bolting for indication of degradation such as leakage, loss of material due corrosion, or cracking.

Prior to the period of extended operation, the Bolting Integrity Program will be enhanced to include a specific precaution against the use of sulfur (sulfide) containing compounds as a lubricant for bolted connections.

A.1.2.3 Buried Piping and Tanks Inspection Program

The Buried Piping and Tanks Inspection Program manages the effects of corrosion on the external surfaces of piping and tanks exposed to a buried environment. The Buried Piping and Tanks Inspection Program will be a combination of a prevention program

(consisting of protective coatings and wrappings, where appropriate) and a condition monitoring program (consisting of visual inspections).

The Buried Piping and Tanks Inspection Program is a new aging management program that will be implemented prior to the period of extended operation.

A.1.2.4 Buried Piping Surveillance Program

The Buried Piping Surveillance Program manages the effects of corrosion on the external surfaces of piping with damaged coatings exposed to a buried environment. The Buried Piping Surveillance Program will be a combination of a prevention program (consisting of cathodic protection) and a condition monitoring program (consisting of periodic testing).

The Buried Piping Surveillance Program is a new aging management program that will be implemented prior to the period of extended operation.

A.1.2.5 BWR CRD Return Line Nozzle Program

The BWR CRD Return Line Nozzle Program is an existing program that manages cracking of the control rod drive return line (CRDRL) nozzle, cap, and connecting weld. The program was developed in response to industry events involving the CRD return line nozzle.

SSES modified the CRD System by cutting the CRDRL and capping the nozzle prior to initial plant startup. The CRDRL was not rerouted. SSES has completed all of the requirements specified in NUREG-0619 for the CRD System modifications performed at SSES, including the final liquid penetrant testing (PT) inspection and system performance testing. The SSES BWR CRD Return Line Nozzle Program monitors the effects of cracking on the intended function of the CRDRL nozzle by performing inservice inspections in conformance with the ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWB, Table IWB 2500-1 (edition and addenda described in A.1.2.23). Any cracks that are detected will be dispositioned in accordance with the requirements of ASME Section XI.

A.1.2.6 BWR Feedwater Nozzle Program

The BWR Feedwater Nozzle Program is an existing program that manages cracking of the feedwater nozzles. The BWR Feedwater Nozzle Program is in accordance with ASME Section XI and Boiling Water Reactor Vessel and Internals Project (BWRVIP) guidelines.

The program includes (a) enhanced inservice inspection in accordance with the requirements of the ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWB, Table IWB 2500-1 (edition and addenda described in A.1.2.23) and the

recommendations of report GE-NE-523-A71-0594, and (b) system modifications (completed on the spargers prior to initial startup) to mitigate cracking. The program specifies periodic ultrasonic inspection of critical regions of the feedwater nozzles.

A.1.2.7 BWR Penetrations Program

The BWR Penetrations Program is an existing program that manages cracking of selected reactor vessel penetrations. The BWR Penetrations Program is implemented via the Inservice Inspection (ISI) Program in compliance with ASME Section XI and the Boiling Water Reactor Vessel and Internals Project (BWRVIP) guidelines.

The program includes (a) inspection and flaw evaluation in conformance with the guidelines of NRC-approved BWRVIP reports BWRVIP-49-A and BWRVIP-27-A, and (b) monitoring and control of reactor coolant water chemistry in accordance with the guidelines of BWRVIP-29 to ensure the long-term integrity and safe operation of reactor vessel internal components. The BWRVIP-49-A report provides guidelines for instrument penetrations, and the BWRVIP-27-A report addresses the standby liquid control system nozzle or housing.

A.1.2.8 BWR Stress Corrosion Cracking (SCC) Program

The BWR Stress Corrosion Cracking (SCC) Program is an existing program that manages stress corrosion cracking for stainless steel piping, valves, flow instruments, and pump casings. The program to manage stress corrosion cracking in pressure boundary piping made of stainless steel is delineated in NUREG-0313, Revision 2, and NRC Generic Letter 88-01 and its Supplement 1.

The program includes (a) preventive measures to mitigate intergranular stress corrosion cracking (IGSCC), and (b) inspection and flaw evaluation to monitor IGSCC and its effects. The NRC-approved report BWRVIP-75-A allows for modifications of inspection scope in the Generic Letter 88-01 program.

A.1.2.9 BWR Vessel ID Attachment Welds Program

The BWR Vessel ID Attachment Welds Program is an existing program that manages cracking of the welds for internal attachments to the reactor pressure vessel.

The program includes (a) inspection and flaw evaluation in accordance with the guidelines of the NRC-approved report BWRVIP-48-A, and (b) monitoring and control of reactor coolant water chemistry in accordance with the guidelines of BWRVIP-29 to ensure the long-term integrity and safe operation of the vessel inside diameter (ID) attachment welds. The BWR Vessel ID Attachment Welds Program is based on the inspection and flaw evaluation guidelines of the BWRVIP, and is implemented by the Inservice Inspection (ISI) Program in accordance with the ASME Code, Section XI, Table IWB 2500-1.

A.1.2.10 BWR Vessel Internals Program

The BWR Vessel Internals Program is an existing program that manages aging of the reactor vessel internals in accordance with the requirements of ASME Section XI and the BWRVIP documents. The purpose of the BWR Vessel Internals Program is to manage cracking, loss of material, and reduction of fracture toughness for various subcomponents of the reactor vessel internals.

The program includes (a) inspection and flaw evaluation in conformance with the guidelines of applicable and NRC-approved BWRVIP reports, and (b) monitoring and control of reactor coolant water chemistry in accordance with the guidelines of BWRVIP-29 to ensure the long-term integrity and safe operation of reactor vessel internal components.

Prior to the period of extended operation, the BWR Vessel Internals Program will be enhanced to require specific enhanced visual examinations of top guide locations subjected to high neutron fluence.

A.1.2.11 BWR Water Chemistry Program

The BWR Water Chemistry Program is an existing program that mitigates damage due to loss of material and cracking of plant components that are within the scope of license renewal and contain treated water. The program manages the relevant conditions that could lead to the onset and propagation of a loss of material or cracking through proper monitoring and control consistent with pertinent EPRI water chemistry guidelines. The SSES BWR Water Chemistry Program currently implements BWRVIP-29 and is in the process of incorporating the recommendations of BWRVIP-130. The relevant conditions are specific parameters such as sulfates, halogens, dissolved oxygen, and conductivity that could lead to or are indicative of conditions for, corrosion, erosion, or stress corrosion cracking (SCC) of susceptible materials. The BWR Water Chemistry Program is a mitigation program.

The BWR Water Chemistry Program is supplemented by the Chemistry Program Effectiveness Inspection which provides verification of the effectiveness of the BWR Water Chemistry Program in mitigating the effects of aging.

A.1.2.12 Chemistry Program Effectiveness Inspection

The Chemistry Program Effectiveness Inspection detects and characterizes the condition of materials in representative low flow and stagnant areas of plant systems influenced by the BWR Water Chemistry Program, the Closed Cooling Water Chemistry Program, and the Fuel Oil Chemistry Program. The inspection provides direct evidence as to whether, and to what extent, cracking or a loss of material has occurred. The Chemistry Program Effectiveness Inspection will provide confirmation of the

effectiveness of the BWR Water, Closed Cooling Water, and Fuel Oil Chemistry Programs in managing the effects of aging.

The Chemistry Program Effectiveness Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.13 Closed Cooling Water Chemistry Program

The Closed Cooling Water Chemistry Program is an existing program that mitigates damage due to loss of material and cracking of plant components that are within the scope of license renewal and that contain treated water in a closed cooling water system or component (e.g., a heat exchanger) served by a closed cooling water system. The program manages the relevant conditions that could lead to the onset and propagation of a loss of material or cracking through proper monitoring and control of corrosion inhibitor concentrations consistent with the pertinent EPRI water chemistry guideline. The Closed Cooling Water Chemistry Program is a mitigation program.

The Closed Cooling Water Chemistry Program is supplemented by the Chemistry Program Effectiveness Inspection and the Heat Exchanger Inspection which provide verification of the effectiveness of the Closed Cooling Water Chemistry Program in mitigating the effects of aging.

A.1.2.14 Condensate and Refueling Water Storage Tanks Inspection

The Condensate and Refueling Water Storage Tanks Inspection detects and characterizes the conditions on the bottom surfaces of the Condensate Storage Tanks and the Refueling Water Storage Tank. The inspection provides direct evidence through volumetric and/or visual examination as to whether, and to what extent, a loss of material due to crevice, general or pitting corrosion has occurred or is likely to occur in inaccessible areas (i.e., tank base/bottom) that could result in a loss of intended function.

The Condensate and Refueling Water Storage Tanks Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.15 Containment Leakage Rate Test Program

The Containment Leakage Rate Test Program is an existing program that manages aging effects for the Primary Containment and systems penetrating the Primary Containment, which are the containment liner and Primary Containment penetrations including personnel airlock, equipment hatches, and control rod drive hatch. The

Containment Leakage Rate Test Program provides assurance that leakage from the Primary Containment will not exceed maximum values for containment leakage.

A.1.2.16 Cooling Units Inspection

The Cooling Units Inspection detects and characterizes the condition of aluminum, carbon steel, copper alloy, and stainless steel cooling unit components that are exposed to a ventilation environment or to an uncontrolled raw water environment from cooling unit drain pans, and of certain heat exchanger components exposed to treated water or ventilation environments in the Control Structure Chilled Water, the Primary Containment Atmosphere Circulation, and the Control Structure and Reactor Building HVAC systems. The inspection provides direct evidence as to whether, and to what extent, a loss of material due to crevice, galvanic, general, or pitting corrosion, or reduction in heat transfer due to fouling of heat exchanger tubes and fins, has occurred or is likely to occur in these systems that could result in a loss of intended function.

The Cooling Units Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.17 Crane Inspection Program

The Crane Inspection Program is an existing program that manages loss of material for cranes (including bridge, trolley, rails, and girders), monorails, and hoists within the scope of license renewal. The Crane Inspection Program is based on guidance contained in ANSI B30.2 for overhead and gantry cranes, ANSI B30.11 for monorail systems and underhung cranes, and ANSI B30.16 for overhead hoists. The inspections monitor structural members for signs of corrosion other than minor surface corrosion.

A.1.2.18 Fire Protection Program

The Fire Protection Program is an existing program that is described in the Fire Protection Review Report (FPRR) and which is credited with aging management of components with fire barrier functions in the scope of license renewal. Periodic visual inspections and functional tests are performed, as appropriate, of fire dampers, fire barrier walls, ceilings and floors, fire rated penetration seals (fire stops), fire wraps, fireproofing, and fire doors to ensure that functionality and operability are maintained. The Fire Protection Program is a condition monitoring program, comprised of tests and inspections generally in accordance with the applicable National Fire Protection Association (NFPA) recommendations.

A.1.2.19 Fire Water System Program

The Fire Water System Program (sub-program of the overall Fire Protection Program) is an existing program that is described in the Fire Protection Review Report (FPRR) and

which is credited with aging management of the water suppression components in the scope of license renewal. Periodic inspection and testing of the water-based fire suppression systems provides reasonable assurance that the systems will remain capable of performing their intended function. Periodic inspection and testing activities include hydrant and hose station inspections, fire main flushing, flow tests, and sprinkler inspections. The Fire Water System Program is a condition monitoring program, comprised of tests and inspections generally in accordance with the applicable National Fire Protection Association (NFPA) recommendations.

Prior to the period of extended operation, the Fire Water System Program will be enhanced to incorporate sprinkler head sampling/replacements, in accordance with NFPA 25, and ultrasonic testing of representative above ground portions of water suppression piping that are exposed to water but which do not normally experience flow.

A.1.2.20 Flow-Accelerated Corrosion (FAC) Program

The Flow-Accelerated Corrosion (FAC) Program is an existing program that manages loss of material for carbon steel components located in systems that are susceptible to flow-accelerated corrosion, also called erosion/corrosion. The Flow-Accelerated Corrosion (FAC) Program is a condition monitoring program which ensures that the integrity of piping systems susceptible to flow-accelerated corrosion is maintained. The program was developed in response to NRC Bulletin 87-01 and NRC Generic Letter 89-08. The Flow-Accelerated Corrosion (FAC) Program follows the guidance and recommendations of EPRI NSAC-202L and combines the elements of predictive analysis, inspections (to baseline and monitor wall-thinning), industry experience, station information gathering and communication, and engineering judgment to monitor and predict flow-accelerated corrosion wear rates.

A.1.2.21 Fuel Oil Chemistry Program

The Fuel Oil Chemistry Program is an existing program that maintains fuel oil quality in order to mitigate damage due to loss of material and cracking of susceptible materials for plant components that are within the scope of license renewal and that contain fuel oil. The program manages the relevant conditions that could lead to the onset and propagation of loss of material or cracking through proper monitoring and control of fuel oil contamination consistent with pertinent plant technical specifications/requirements and American Society for Testing of Materials (ASTM) standards for fuel oil. The relevant conditions are specific contaminants such as water or microbiological organisms in the fuel oil that could lead to corrosion or stress corrosion cracking (SCC) of susceptible materials. Exposure to these contaminants is minimized by verifying the quality of new fuel oil before it enters the storage tanks and by periodic sampling to ensure that the tanks are free of water and particulates. The Fuel Oil Chemistry Program is a mitigation program.

The Fuel Oil Chemistry Program is supplemented by the Chemistry Program Effectiveness Inspection which provides verification of the effectiveness of the Fuel Oil Chemistry Program in mitigating the effects of aging.

A.1.2.22 Heat Exchanger Inspection

The Heat Exchanger Inspection detects and characterizes cracking due to stress corrosion cracking (SCC) and reduction in heat transfer due to fouling of heat exchanger tubes that are exposed to treated water in the Control Structure Chilled Water (CSCW), High Pressure Coolant Injection (HPCI), and Reactor Core Isolation Cooling (RCIC) systems.

The Heat Exchanger Inspection detects and characterizes the condition of the copper alloy tubes in the CSCW chiller oil cooler and chiller evaporator and the HPCI and RCIC lube oil coolers, and the stainless steel tubes in the RCIC lube oil coolers, that are exposed to a treated water environment. The inspection provides direct evidence as to whether, and to what extent, cracking due to SCC or reduction in heat transfer due to fouling has occurred or is likely to occur that could result in a loss of intended function.

The Heat Exchanger Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.23 Inservice Inspection (ISI) Program

The Inservice Inspection (ISI) Program is an existing program that manages cracking and loss of material of multiple reactor coolant system pressure boundary components, including the reactor vessel, a limited number of internals components, and the reactor coolant system pressure boundary. The Inservice Inspection (ISI) Program was developed as required by 10 CFR 50.55a. The program is in accordance with the requirements detailed in the 1998 Edition through the 2000 Addenda, of ASME Boiler and Pressure Vessel Code, Section XI, Division 1, Subsections IWA, IWB, IWC, IWD, IWE, IWF, IWL, Mandatory Appendices, Inspection Program B of IWA-2432, and approved ASME Code Cases.

The inservice inspections conducted throughout the service life of SSES will comply, to the extent practical, with the requirements of the ASME Code Section XI Edition and Addenda incorporated by reference in 10 CFR 50.55a(b) 12 months prior to the start of the inspection interval, subject to prior approval via letter from the NRC. This is consistent with NRC statements of consideration (SOC) for 10 CFR 54 associated with the adoption of new editions and addenda of the ASME Code in 10 CFR 50.55a.

A.1.2.24 Inservice Inspection (ISI) Program – IWE

The Inservice Inspection (ISI) Program – IWE is an existing program that establishes responsibilities and requirements for conducting IWE inspections as required by 10 CFR 50.55a. The Inservice Inspection (ISI) Program – IWE includes visual examination of all accessible surface areas of the steel liner for the reinforced concrete Primary Containment and its integral attachments, containment seals and gaskets, and containment pressure-retaining bolting in accordance with the requirements of the ASME Boiler and Pressure Vessel Code, Section XI, Division 1 (edition and addenda described in A.1.2.23) for Subsection IWE.

The inservice examinations conducted throughout the service life of SSES will comply, to the extent practical, with the requirements of the ASME Section XI Edition and Addenda incorporated by reference in 10 CFR 50.55a(b) 12 months prior to the start of the inspection interval, subject to prior approval via letter from the NRC. This is consistent with NRC statements of consideration (SOC), for 10 CFR 54, associated with the adoption of new editions and addenda of the ASME Code in 10 CFR 50.55a.

A.1.2.25 Inservice Inspection (ISI) Program – IWF

The Inservice Inspection (ISI) Program – IWF is an existing program that establishes responsibilities and requirements for conducting IWF Inspections for ASME Class 1, 2, and 3 component supports as required by 10 CFR 50.55a. The Inservice Inspection (ISI) Program – IWF visual examination for supports is based on sampling of the total support population. The sample size varies depending on the ASME Class. The largest sample size is specified for the most critical supports (ASME Class 1). The sample size decreases for the less critical supports (ASME Class 2 and 3). The primary inspection method employed is visual examination. Degradation that potentially compromises support function or load capacity is identified for evaluation. Supports requiring corrective actions are re-examined during the next inspection period in accordance with the requirements of ASME Section XI, Division 1 (edition and addenda described in A.1.2.23) for Subsection IWF.

The inservice examinations conducted throughout the service life of SSES will comply, to the extent practical, with the requirements of ASME Section XI Edition and Addenda incorporated by reference in 10 CFR 50.55a(b) 12 months prior to the start of the inspection interval, subject to prior approval via letter from the NRC. This is consistent with NRC statements of consideration (SOC), for 10 CFR 54, associated with the adoption of new editions and addenda of the ASME Code in 10 CFR 50.55a.

A.1.2.26 Inservice Inspection (ISI) Program - IWL

The Inservice Inspection (ISI) Program – IWL is an existing program that establishes responsibilities and requirements for conducting IWL Inspections as required by 10 CFR 50.55a. The Inservice Inspection (ISI) Program – IWL includes visual

examination of all accessible surface areas of the reinforced concrete Primary Containment in accordance with the requirements of ASME Section XI, Division 1 (edition and addenda described in A.1.2.23) for Subsection IWL.

No applicable aging effects have been identified for the Primary Containment concrete. However, the Inservice Inspection (ISI) Program – IWL will be used to confirm the absence of significant aging effects for the extended period of operation.

The inservice examinations conducted throughout the service life of SSES will comply, to the extent practical, with the requirements of ASME Section XI Edition and Addenda incorporated by reference in 10 CFR 50.55a(b) 12 months prior to the start of the inspection interval, subject to prior approval via letter from the NRC. This is consistent with NRC statements of consideration, for 10 CFR 54, associated with the adoption of new editions and addenda of the ASME Code in 10 CFR 50.55a.

A.1.2.27 Leak Chase Channel Monitoring Activities

The Leak Chase Channel Monitoring Activities is an existing program that consists of observation and surveillance activities to detect leakage from the spent fuel pool and the fuel shipping cask storage pool liners due to aging and age-related degradation. The Leak Chase Channel Monitoring Activities is a condition monitoring program.

A.1.2.28 Lubricating Oil Analysis Program

The Lubricating Oil Analysis Program is an existing program that mitigates damage due to loss of material and reduction of heat transfer due to fouling for plant components that are within the scope of license renewal and exposed to lubricating oil. The program manages the relevant conditions that could lead to the onset and propagation of a loss of material, or reduction in heat transfer for heat exchanger tubes, through proper monitoring consistent with manufacturer's recommendations, the equipment's importance to safe plant operation, equipment accessibility and American Society for Testing of Materials (ASTM) standards for lubricating oil. The relevant conditions are specific parameters including particulate and water concentrations, viscosity, neutralization number, and flash point that could lead to, or are indicative of, conditions for age-related degradation of susceptible materials. The Lubricating Oil Analysis Program is a mitigation program.

Prior to the period of extended operation, the Lubricating Oil Analysis Program will be enhanced to include sampling of the lubricating oil from the Control Structure Chiller when the oil is changed. The oil will be tested for water and for particle count.

The Lubricating Oil Analysis Program is supplemented by the Lubricating Oil Inspection which provides verification of the effectiveness of the Lubricating Oil Analysis Program in mitigating the effects of aging.

A.1.2.29 Lubricating Oil Inspection

The Lubricating Oil Inspection detects and characterizes the condition of materials in systems and components for which the Lubricating Oil Analysis Program is credited with aging management. The inspection provides direct evidence as to whether, and to what extent, a loss of material or a reduction in heat transfer due to fouling has occurred.

The Lubricating Oil Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.30 Main Steam Flow Restrictor Inspection

The Main Steam Flow Restrictor Inspection detects and characterizes reduction of fracture toughness of the cast austenitic stainless steel (CASS) subcomponents of the main steam flow restrictors. The inspection will detect cracking that is symptomatic of reduction of fracture toughness. Reduction of fracture toughness does not cause cracking, but the reduced toughness allows existing cracks to propagate at higher rates. This inspection provides direct evidence as to whether, and to what extent, cracking has occurred or is likely to occur in the main steam flow restrictors.

The Main Steam Flow Restrictor Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.31 Masonry Wall Program

The Masonry Wall Program is an existing program that consists of inspection activities to detect cracking of masonry walls within the scope of license renewal. Masonry walls that perform a fire barrier intended function are also managed by the Fire Protection Program. The Masonry Wall Program is implemented as part of the Structures Monitoring Program. The Masonry Wall Program performs visual inspection of external surfaces of masonry walls.

Prior to the period of extended operation, the Masonry Wall Program will be enhanced to specify that for each masonry wall, the extent of observed masonry cracking and/or degradation of steel edge supports/bracing be evaluated to ensure that the current evaluation basis is still valid.

A.1.2.32 Metal-Enclosed Bus Inspection Program

The Metal-Enclosed Bus Inspection Program manages the aging of the metal-enclosed bus within the scope of license renewal. The program provides for the periodic inspection of the applicable metal-enclosed bus, in order to determine if age-related degradation is occurring.

The Metal-Enclosed Bus Inspection Program is a new aging management program that will be implemented prior to the period of extended operation.

A.1.2.33 Monitoring and Collection System Inspection

The Monitoring and Collection System Inspection detects and characterizes the conditions on the internal surfaces of subject components that are exposed to equipment/area drainage water and other potential contaminants/fluids. The inspection provides direct evidence as to whether, and to what extent, a loss of material has occurred or is likely to occur in the Liquid Waste Management System that could result in a loss of intended function.

The Monitoring and Collection System Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.34 Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program

The Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program manages the age-related degradation associated with non-EQ, low-current instrumentation cables and connections within the scope of license renewal.

The program applies to in-scope, non-EQ electrical cables and connections used in neutron monitoring and radiation monitoring circuits with sensitive, low-current signals. The Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program will perform testing of the applicable cable systems to identify reduction in insulation resistance.

The Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program is a new aging management program that will be implemented prior to the period of extended operation.

A.1.2.35 Non-EQ Electrical Cables and Connections Visual Inspection Program

The Non-EQ Electrical Cables and Connections Visual Inspection Program manages the aging of non-EQ electrical cables and connections within the scope of license renewal. The program provides for the periodic visual inspection of accessible, non-EQ electrical cables and connections, in order to determine if age-related degradation is occurring, particularly in plant areas with high temperatures and/or high radiation levels.

The Non-EQ Electrical Cables and Connections Visual Inspection Program is a new aging management program that will be implemented prior to the period of extended operation.

A.1.2.36 Non-EQ Inaccessible Medium-Voltage Cables Program

The Non-EQ Inaccessible Medium-Voltage Cables Program manages the aging of non-EQ inaccessible medium-voltage electrical cables subject to wetting within the scope of license renewal. The program provides for the periodic testing of non-EQ inaccessible medium-voltage electrical cables, in order to determine if age-related degradation is occurring, and includes provision for the inspection of associated manholes to identify any collection of water.

The Non-EQ Inaccessible Medium-Voltage Cables Program is a new aging management program that will be implemented prior to the period of extended operation.

A.1.2.37 Non-EQ Electrical Cable Connections Program

The Non-EQ Electrical Cable Connections Program manages the aging for the metallic parts of non-EQ electrical cable connections within the scope of license renewal. The program addresses cable connections that are used to connect cable conductors to other cables or electrical devices. Aging management for the metallic parts of the non-EQ electrical cable connections that are subject to aging stressors will be provided by testing. A representative sample of non-EQ electrical cable connections will be selected for testing, considering the effects of their application (high, medium, and low voltage), circuit loading, and location with respect to electrical connection stressors. Thermography will be used to test a representative sample of cable connections to provide an indication of the integrity of the connections.

The Non-EQ Electrical Cable Connections Program is a new aging management program that will be implemented prior to the period of extended operation.

A.1.2.38 Piping Corrosion Program

The Piping Corrosion Program is an existing program that manages fouling due to particulates (e.g., corrosion products) and biological material (micro- and/or macro-organisms), and loss of material due to corrosion and erosion for components located in systems within the scope of the program that are exposed to a raw water environment. The program also manages the applicable aging effects for the internal environments of heat exchanger components within the scope of the program.

The Piping Corrosion Program is a combination of condition monitoring program (consisting of inspections, surveillances, and testing to detect the presence of, and to assess the extent of, fouling and loss of material) and a mitigation program (consisting of chemical treatments and cleaning activities to minimize fouling and loss of material).

A.1.2.39 Preventive Maintenance Activities – RCIC/HPCI Turbine Casings

The Preventive Maintenance Activities – RCIC/HPCI Turbine Casings is an existing program that manages loss of material on the internal surfaces of the Reactor Core Isolation Cooling (RCIC) and High Pressure Coolant Injection (HPCI) pump turbine casings, and on the internal surfaces of associated piping and piping components (rupture disks and valve bodies), that are constructed of carbon steel or cast iron.

The Preventive Maintenance Activities – RCIC/HPCI Turbine Casings is a condition monitoring program, consisting of inspections and surveillance activities to detect aging and age-related degradation.

A.1.2.40 Reactor Head Closure Studs Program

The Reactor Head Closure Studs Program is an existing program that manages cracking for the reactor head closure studs. The Reactor Head Closure Studs Program includes (a) inservice inspection in conformance with the requirements of ASME Code, Section XI, Subsection IWB (edition and addenda described in A.1.2.23), Table IWB 2500-1, and (b) preventive measures in accordance with Regulatory Guide 1.65 to mitigate cracking. The Reactor Head Closure Studs Program is implemented by the design of the plant and the Inservice Inspection (ISI) Program.

A.1.2.41 Reactor Vessel Surveillance Program

The Reactor Vessel Surveillance Program is an existing program that manages reduction of fracture toughness for the low alloy steel reactor vessel shell and welds in the beltline region. The Reactor Vessel Surveillance Program is a condition monitoring program developed in response to 10 CFR 50 Appendix H.

The SSES Reactor Vessel Surveillance Program is part of the Integrated Surveillance Program (ISP) described in BWRVIP-78, BWRVIP-86-A and BWRVIP-116, and approved by the NRC staff. BWRVIP-116 extends the ISP to cover the period of extended operation. SSES will follow the requirements of the BWRVIP ISP and will apply the ISP data to SSES Units 1 and 2. The NRC approved the use of the BWRVIP ISP in place of a unique plant program at SSES.

A.1.2.42 RG 1.127 Water-Control Structures Inspection

The RG 1.127 Water-Control Structures Inspection is an existing program that consists of inspection and surveillance activities to detect aging and age-related degradation. The RG 1.127 Water-Control Structures Inspection ensures the structural integrity and operational adequacy of the Spray Pond (including concrete liner, emergency spillway, and riser encasements), ESSW Pumphouse (including pump intake chambers, overflow weir and chamber, and structural components within the ESSW Pumphouse), and the earthen embankments along the Spray Pond.

Prior to the period of extended operation, the RG 1.127 Water-Control Structures Inspection will be enhanced to add the Spray Pond (including concrete liner, emergency spillway, riser encasements, and earthen embankments) to its scope for inspection. The program will be enhanced to include RG 1.127 inspection elements and degradation mechanisms for water-control structure inspection and to include acceptance criteria for water-control structures.

A.1.2.43 Selective Leaching Inspection

The Selective Leaching Inspection detects and characterizes the conditions on internal and external surfaces of subject components. The inspection provides direct evidence through a combination of visual examination and hardness testing of whether, and to what extent, a loss of material due to selective leaching has occurred or is likely to occur that could result in a loss of intended function.

The Selective Leaching Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.44 Small Bore Class 1 Piping Inspection

The Small Bore Class 1 Piping Inspection confirms the effectiveness of the BWR Water Chemistry Program in mitigating loss of material and cracking for small bore Class 1 piping. It will also verify, by inspections for cracking, that reduction of fracture toughness due to thermal embrittlement requires no additional aging management for small bore Class 1 piping. The Small Bore Class 1 Piping Inspection is applicable to small bore ASME Code Class 1 piping and systems less than 4 inches nominal pipe size (NPS 4), which includes pipes, fittings, and branch connections. The inspection provides additional assurance that either aging of small bore ASME Code Class 1 piping is not occurring or that the aging is insignificant, such that an additional aging management program is not warranted.

The Small Bore Class 1 Piping Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.45 Structures Monitoring Program

The Structures Monitoring Program is an existing program that manages age-related degradation of plant structures and structural components within its scope to ensure that each structure or structural component retains the ability to perform its intended function. Aging effects are detected by visual inspection of external surfaces prior to the loss of the structure's or component's intended function.

This program implements provisions of the Maintenance Rule, 10 CFR 50.65, that relate to structures, masonry walls, and water-control structures. Concrete and masonry walls that perform a fire barrier intended function are also managed by the Fire Protection Program.

Prior to the period of extended operation, the Structures Monitoring Program will be enhanced to include structures within the scope of license renewal. The program will be enhanced to specify inspections of a below grade structural wall or structural component that becomes accessible through excavation. The program will be enhanced to clarify the component types included as "structural components" and to specify degradation mechanisms. The Structures Monitoring Program will be enhanced to include RG 1.127 inspection elements for water-control structures and requirements for review of site groundwater and raw water parameters. The program will also be enhanced to specify inspection requirements for masonry walls.

A.1.2.46 Supplemental Piping/Tank Inspection

The Supplemental Piping/Tank Inspection detects and characterizes the condition of carbon and stainless steel components that are exposed to moist air environments, particularly the aggressive alternate wet/dry environment that exists at air-water interfaces. The inspection provides direct evidence as to whether, and to what extent, a loss of material has occurred or is likely to occur that could result in a loss of intended function.

The Supplemental Piping/Tank Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

A.1.2.47 System Walkdown Program

The System Walkdown Program is an existing program that manages the following aging effects for the external surfaces, and in some cases the internal surfaces, of mechanical components within the scope of license renewal:

- Loss of material for metals that are exposed to indoor air, outdoor air, or ventilation environments, including both the HVAC-type internal environments and ambient air internal environments, such as that found in the upper portion of a vented tank.

- Cracking and/or change in material properties for elastomers (neoprene and rubber) and polymers (Teflon) that are exposed to indoor air or ventilation environments.

The System Walkdown Program is a condition monitoring program, consisting of observation and surveillance activities to detect aging and age-related degradation.

Prior to the period of extended operation, the System Walkdown Program will be enhanced to include the license renewal systems that contain mechanical components whose external surfaces require aging management during the period of extended operation. The program will also be enhanced to address opportunistic inspections of normally inaccessible components (e.g., those that are insulated), and those that are accessible only during refueling outages.

A.1.2.48 Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program

The Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program augments the visual inspection of the reactor vessel internals done in accordance with the ASME Code, Section XI, Subsection IWB, Category B-N-1 and B-N-2. The inspection is augmented to detect the effects of loss of fracture toughness due to thermal aging and neutron irradiation embrittlement of cast austenitic stainless steel (CASS) reactor vessel internal components. The aging management program includes (a) identification of susceptible components determined to be limiting from the standpoint of thermal aging susceptibility (i.e., ferrite and molybdenum contents, casting process, and operating temperature) and/or neutron irradiation embrittlement (neutron fluence), and (b) for each potentially susceptible component, aging management is accomplished through either a supplemental examination of the affected component based on the neutron fluence to which the component has been exposed as part of the SSES 10-year Inservice Inspection (ISI) Program during the license renewal term, or a component-specific evaluation to determine its susceptibility to loss of fracture toughness.

The Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program is a new aging management program that will be implemented prior to the period of extended operation.

A.1.3 Evaluation of Time-Limited Aging Analyses

In accordance with 10 CFR 54.21(c), an application for a renewed operating license requires an evaluation of time-limited aging analyses (TLAA) for the period of extended operation. The following TLAA have been identified and evaluated to meet this requirement.

A.1.3.1 Reactor Vessel Neutron Embrittlement

The ferritic materials of the reactor vessel are subject to embrittlement due to high energy neutron exposure. Reactor vessel neutron embrittlement is a TLAA. Neutron fluence, upper shelf energy, adjusted reference temperature, and vessel pressure-temperature limits are time-dependent items that must be investigated to evaluate vessel embrittlement.

A.1.3.1.1 Neutron Fluence

High energy (>1 MeV) neutron fluence for the welds and shells of the reactor pressure vessel beltline region was calculated using the RAMA fluence methodology. The RAMA methodology was developed for the Electric Power Research Institute and the Boiling Water Reactor Vessel and Internals Project and is approved by the NRC for use at SSES Units 1 and 2. Use of this methodology for evaluations of fluence for the SSES units was performed in accordance with guidelines presented in Regulatory Guide 1.190. The evaluations determined values for neutron fluence for extended power uprate (EPU) conditions and for extended operation out to 54 effective full power years (EFPY), i.e., at the end of 60 years of operation. Using actual reactor core power histories to-date and conservative estimates of future core designs for each unit, extended operation to 60 years will be bounded by 54 EFPY.

Neutron fluence is not a TLAA, it is a time-limited assumption used in various neutron embrittlement TLAA.

A.1.3.1.2 Upper Shelf Energy Evaluation

10 CFR 50, Appendix G requires that upper shelf energy (USE) values for reactor pressure vessel materials include the effects of neutron radiation. It states that USE for the beltline materials including plates and welds be maintained at no less than 50 ft-lb for the life of the reactor vessel. Calculated fluence values for extended power uprate (EPU) and extended operation to 54 EFPY exceed previously determined fluence values based on materials surveillance program information for Units 1 and 2. Therefore, projections of changes in USE for the period of extended operation are required in accordance with 10 CFR 50, Appendix G.

BWRVIP-74-A documents an equivalent margin analysis that establishes the minimum 54 EFPY USE limits for BWR/2-6 vessel beltline materials required for compliance with 10 CFR 50, Appendix G. The equivalent margin analysis assumes that the percent

decreases in USE prescribed by Regulatory Guide (RG) 1.99 are appropriate for a given vessel's beltline materials. The SSES Unit 1 and Unit 2 vessel beltline materials are bounded by the equivalent margin analysis. Limiting vessel beltline plates and welds were evaluated using data from surveillance capsule reports and 54 EFPY fluence values. Using this information, the predicted decrease in USE was obtained from RG 1.99, Figure 2 and compared to the decreases assumed in the equivalent margin analysis.

The maximum predicted decreases in USE for 54 EFPY for the plates in the vessel beltline region for both units are bounded by the BWRVIP-74-A equivalent margin analysis, and the projected USE for the plates is acceptable for the period of extended operation.

The maximum predicted decreases in USE for the welds in the vessel beltline region for 54 EFPY are bounded by the BWRVIP-74-A equivalent margin analysis, and the projected USE for the welds is acceptable for the period of extended operation.

A.1.3.1.3 Adjusted Reference Temperature (ART) Analysis

In addition to USE, the other key parameter that characterizes the fracture toughness of a material is the reference temperature for nil-ductility transition (RT_{NDT}). This reference temperature will change as its exposure to neutron radiation increases. The effects of neutron fluence on RT_{NDT} are reflected in the change in this reference temperature, ΔRT_{NDT}, and the resulting adjusted reference temperature, ART, is calculated by adding ΔRT_{NDT} to RT_{NDT} along with appropriate margin to account for uncertainties.

The methodology used to calculate ART for the vessel beltline plates and welds is provided in Regulatory Guide 1.99. The 60-year projected ART values are well below the temperature limit provided in Section 3 of Regulatory Guide 1.99 and are, thus, acceptable for the period of extended operation.

A.1.3.1.4 Pressure-Temperature (P-T) Limits

To assure that adequate margins of safety are maintained for various modes of reactor operation, 10 CFR 50, Appendix G specifies pressure and temperature requirements for affected materials for the service life of the reactor vessel. The basis for these fracture toughness requirements is ASME Section XI, Appendix G. The ASME Code requires P-T limits be established for hydrostatic pressure tests and leak tests, for operation with the core not critical during heatup and cooldown, and for core critical operation.

Calculations were performed to develop P-T limit curves for SSES Units 1 and 2 for the period of extended operation (54 EFPY). The calculations were performed for the bounding regions of the reactor vessel to account for 54 EFPY fluence projections, which include the effects of EPU conditions. The P-T curves were developed in accordance with 10 CFR 50, Appendix G and the methodology in ASME Section XI, Appendix G. The P-T curves for Units 1 and 2 at 54 EFPY demonstrate that there is

sufficient operating margin for hydrostatic tests, heatup, cooldown, and core critical operation to the end of the period of extended operation.

A.1.3.1.5 Reactor Vessel Circumferential Weld Examination Relief

BWRVIP-74-A reiterated the recommendation of BWRVIP-05 that reactor pressure vessel circumferential welds could be exempted from examination. The NRC safety evaluation report for BWRVIP-74 agreed, but required that plants apply for this relief request individually. The relief request should demonstrate that at the expiration of the current license, the circumferential welds satisfy the limiting conditional failure probability for circumferential welds in the (BWRVIP-05) evaluation. This evaluation of circumferential weld parameters is a TLAA.

PPL requested and received relief from circumferential vessel shell weld volumetric examinations. The SSES submittal included an analysis that showed that the reactor vessel parameters at 32 EFPY were within the bounding parameters for Chicago Bridge & Iron (CBI) vessels from the BWRVIP-05 safety evaluation report. As such, there is a lower conditional probability of failure for circumferential welds at SSES than that stated in the NRC's Final Safety Evaluation Report of BWRVIP-05.

The SSES reactor pressure vessel circumferential weld parameters at 54 EFPY will remain within the bounding parameters for CBI vessels at 64 EFPY from the BWRVIP-05 safety evaluation report. As such, the conditional probability of failure for circumferential welds remains below that stated in the safety evaluation report for BWRVIP-05.

PPL will process a relief request for circumferential vessel shell weld volumetric examinations for the period of extended operation in the same manner that has been the practice during the original licensing period.

A.1.3.1.6 Reactor Vessel Axial Weld Failure Probability

The NRC safety evaluation report for BWRVIP-74-A evaluated the failure frequency of axially oriented welds in BWR reactor pressure vessels, and determined failure frequency acceptance criteria for 40 years of reactor operation. Applicants for license renewal must evaluate axially oriented RPV welds to show that their failure frequency remains below the acceptance criteria calculated in the safety evaluation report for BWRVIP-74. An acceptable way to do this is to show that the mean RT_{NDT} of the limiting axial beltline weld at the end of the period of extended operation is less than the values specified in the safety evaluation report for BWRVIP-74.

The SSES axial weld mean RT_{NDT} at 54 EFPY is projected to be well below that in the SER, and thus the SSES axial weld failure frequency is well within the acceptable criteria.

A.1.3.1.7 Reflood Thermal Shock Analysis

FSAR Section 3.13.1 documents a concern of possible brittle fracture of the reactor vessel resulting from reflooding of the vessel following a postulated loss of coolant accident. This concern is addressed in NEDO-10029, "An Analytical Study on Brittle Fracture of GE-BWR Vessels Subject to the Design Basis Accident," in which a very conservative analysis is documented. That document provides an upper bound limit on brittle fracture failure for the materials and concludes that catastrophic failure is not possible. The NEDO-10029 analysis assumed a neutron fluence of 1E+18 neutrons per square centimeter (n/cm^2) throughout the vessel. For SSES, the predicted values are below these criteria. Therefore, since the SSES 54 EFPY values are bounded by the values assumed in the NEDO-10029 analysis, the analysis remains valid for SSES for the period of extended operation.

A.1.3.2 Metal Fatigue

Fatigue evaluations for mechanical components are identified as TLAA; therefore, the effects of fatigue must be addressed for license renewal.

PPL monitors fatigue of the ASME Class 1 reactor coolant pressure boundary via the Fatigue Monitoring Program, which uses a computer program, FatiguePro, to count transient cycles and calculate fatigue usage.

Calculation of fatigue usage values is not required for non-Class 1 SSCs. Instead, stress intensification factors and lower stress allowables are used to ensure components are adequately designed for fatigue.

Certain components enveloped by the Primary Containment are also required to be evaluated for fatigue. These include penetrations, hatches, the drywell head, downcomer vents, safety relief valve (SRV) discharge piping, and SRV quenchers.

A.1.3.2.1 Reactor Pressure Vessel Fatigue Analysis

The design transients for the reactor pressure vessel (RPV) assembly are reported in FSAR Table 3.9-1. Design cumulative usage factors (CUFs) for the limiting reactor pressure vessel assembly locations are obtained from applicable design reports. These CUFs were calculated based on applicable design transients.

Metal fatigue for all reactor pressure vessel assembly components is managed by the existing SSES Fatigue Monitoring Program. This program includes requirements for continued monitoring and periodic updates to current and projected CUFs for the limiting reactor pressure vessel locations. The program will be enhanced to include an approach to address CUFs that will exceed the allowable before the end of the period of extended operation. The aging management approach will include one or more of the following, which is similar to the approach documented in ASME Code Section III Non-mandatory Appendix L:

- Further refinement of the fatigue analyses to lower the CUFs to less than the allowable
- Repair of the affected components
- Replacement of the affected components
- Management by an inspection program that has been reviewed and approved by the NRC (e.g., periodic non-destructive examination of the affected locations at intervals determined by a method accepted by the NRC)

The original RPV design report was not required to provide an explicit fatigue analysis for nozzles N6A, N6B, and N7, since the nozzles satisfied all requirements of ASME Section III, Paragraph N-415.1. As such, design CUFs were not calculated for these nozzles. The SSES Fatigue Monitoring Program will be enhanced to include a requirement to periodically determine if the requirements of N-415.1 remain satisfied, such that fatigue evaluations are not required for these nozzles prior to entering and during the period of extended operation.

A.1.3.2.2 Reactor Vessel Internals Fatigue Analyses

The Reactor Internals and Core Support Structures at SSES were designed in accordance with ASME Section III, Subsection NG. The fatigue evaluations performed to demonstrate the design adequacy of the internals for 40 years are TLAA.

Most recently, structural evaluations were performed to address the effects of operation under extended power uprate conditions and the extended period of plant operation to 60 years. The evaluations determined that the fatigue usage factors for all reactor pressure vessel internals remain within the ASME Section III Subsection NG allowable limits.

PPL also monitors the design transients using FatiguePro, as described above under Reactor Pressure Vessel Fatigue Analysis. This monitoring allows PPL to continually assess the potential for plant operating anomalies that could impact the assumptions made in the fatigue evaluations of plant components. In addition to plant transient monitoring, PPL has effectively implemented the inspection requirements of the BWRVIP program at SSES, as described in Section A.1.2.10 above. These inspections provide further assurance that the effects of aging due to fatigue of the RPV internals will be managed during the period of extended operation.

A.1.3.2.3 Effects of Reactor Coolant Environment on Fatigue Life of Components and Piping (Generic Safety Issue 190)

Applicants for license renewal are required to address the reactor coolant environmental effects on fatigue of plant components. The minimum set of components is suggested to be the six (6) components defined in NUREG/CR-6260, as follows:

1. Reactor vessel shell and lower head
2. Reactor vessel feedwater nozzle
3. Reactor recirculation piping (including inlet and outlet nozzles)
4. Core spray line reactor vessel nozzle and associated Class 1 piping
5. Residual heat removal return line Class 1 piping
6. Feedwater line Class 1 piping

Calculation of a fatigue life adjustment factor, F_{en}, is determined for each fatigue-sensitive component. The environmental fatigue life adjustment factors are applied to the appropriate component CUFs to verify acceptability of the components for the period of extended operation.

Using fatigue data projected by the SSES Fatigue Monitoring Program and methodology accepted by the NRC, as noted above, PPL evaluated the limiting locations (a total of eleven component locations corresponding to the six NUREG/CR-6260 components), as appropriate for the material for each component location. Seven of the eleven locations evaluated have an environmentally adjusted CUF of greater than 1.0.

Prior to entering the period of extended operation, for each location that may exceed a CUF of 1.0 when considering environmental effects, SSES will implement one or more of the following:

- Further refinement of the fatigue analyses to lower the CUFs to less than the allowable
- Repair of the affected components
- Replacement of the affected components
- Management by an inspection program that has been reviewed and approved by the NRC (e.g., periodic non-destructive examination of the affected locations at intervals determined by a method accepted by the NRC)

Should PPL select the option to manage environmentally-assisted fatigue during the period of extended operation, details of the aging management program such as scope, qualification, method, and frequency will be provided to the NRC prior to the period of extended operation.

The effects of environmentally-assisted fatigue for the limiting locations identified in NUREG/CR-6260 have been evaluated. The effects of environmentally-assisted fatigue for these locations is addressed using one of the four approaches identified above.

A.1.3.2.4 Reactor Coolant Pressure Boundary Piping and Component Fatigue Analyses

The Class 1 boundary encompasses all reactor coolant pressure boundary piping (pipe and fittings) and in-line components subject to ASME Section XI, Subsection IWB, inspection requirements.

FSAR Section 3.9 provides details on the design transients to be considered in the fatigue analyses of reactor coolant pressure boundary (RCPB) components.

The SSES Fatigue Monitoring Program tracks the fatigue usage at the limiting locations throughout the RCPB. The use of FatiguePro and the SSES Fatigue Monitoring Program ensure that the fatigue of RCPB components is maintained below the ASME Code design limits.

All Class 1 valves are required to have a fatigue analysis. A review of a representative sample of Class 1 valve stress reports found the fatigue analyses to be conservatively simplistic, and the predicted fatigue was extremely low (less than 0.1). The simplified analyses for the valves do not provide the detailed information required to track fatigue usage by cycle counting or similar means. As an alternative, since the fatigue usage is typically much higher on the associated piping systems, and fatigue monitoring is performed for the limiting piping locations, the fatigue usage on the Class 1 valves is assumed to be bounded by the Class 1 piping locations. The fatigue on the valves will be managed indirectly by monitoring fatigue on the piping. If a piping system accumulates sufficient fatigue usage to indicate that design values are being approached, the Fatigue Monitoring Program will require a review of the valve fatigue analyses and other fatigue-related TLAA (such as flued head analyses and high energy line break evaluations) to determine if additional actions are required to address any of these additional fatigue-related concerns on the affected piping system.

Metal fatigue for all Class 1 reactor coolant pressure boundary piping and in-line components is managed by the SSES Fatigue Monitoring Program. This program includes requirements for continued monitoring and periodic updates to current and projected CUFs for the limiting piping locations. The program will be enhanced to include an approach to address CUFs that will exceed the allowable before the end of the period of extended operation. The aging management approach will include one or more of the following, which is similar to the approach documented in ASME Code Section III Non-mandatory Appendix L:

- Further refinement of the fatigue analyses to lower the CUFs to less than the allowable
- Repair of the affected components
- Replacement of the affected components

- Management by an inspection program that has been reviewed and approved by the NRC (e.g., periodic non-destructive examination of the affected locations at intervals determined by a method accepted by the NRC)

A.1.3.3 Non-Class 1 Component Fatigue Analyses

Calculation of cumulative fatigue usage, i.e., CUFs, is not required for non-Class 1 components designed in compliance with the codes and standards for non-Class 1 components. For non-Class 1 components stresses due to thermal expansion and anchor movement, which are important for fatigue evaluations, are analyzed using stress intensification factors and stress allowables. Allowable stresses are defined for 7000 full temperature cycles with reductions in allowable stresses as cycles increase beyond 7000. In addition, temperature thresholds above which fatigue should be considered for carbon steel and austenitic stainless steel are established.

The fatigue evaluation of non-Class 1 components determined whether the associated operating temperature exceeded threshold values for the affected materials and, if so, evaluated the number of transient cycles expected. In every case, the number of projected cycles for 60 years was found to be less than 7000 for piping and in-line components whose temperatures exceed threshold values. Therefore, fatigue for non-Class 1 piping and in-line components remains valid for the period of extended operation.

None of the non-Class 1 vessels, heat exchangers, storage tanks, or pumps were designed to ASME Section VIII, Division 2 or ASME Section III, Subsection NC-3200. Therefore, there is no fatigue TLAA for these components.

A.1.3.4 Environmental Qualification of Electric Equipment

Environmental Qualification analyses for those components with a qualified life of 40 years or greater are identified as TLAA for SSES. NRC regulation 10 CFR 50.49, “Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants” requires licensees to identify electrical equipment covered under this regulation and to maintain a qualification file demonstrating that the equipment is qualified for its application and will perform its safety function up to the end of its qualified life. The SSES EQ Program is an existing program that implements the requirements of 10 CFR 50.49 and will be used to manage the effects of aging on the intended function(s) of the components associated with EQ TLAA for the period of extended operation.

A.1.3.5 Fatigue of Primary Containment, Attached Piping, and Components

A.1.3.5.1 ASME Class MC Components

FSAR Section 3.8.2.3.2.4 states the design thermal cycles for containment ASME Class MC stainless steel components, which includes the containment penetrations, hatches, and drywell head, to be 500 cycles for plant startup and shutdown and one cycle for a design basis accident. The reactor pressure vessel assembly and internal components are designed for 117 startups and 111 shutdowns for a combined total of 228 events. The maximum projected cycles for extended life to 60 years includes 148 startups and 148 shutdowns for a total of 296 events. Therefore, the Class MC component design value of 500 cycles for startups and shutdowns remains well above the projected value. Also, the one cycle allowed for a design basis accident is a value assumed in the design for a faulted condition for the life of the plant, whether that is 40 years or 60 years. Hence, the performance of these components will not be impacted by extending the life of the plant to 60 years.

A.1.3.5.2 Downcomer Vents and Safety Relief Valve Discharge Piping

Downcomer vents and safety relief valve (SRV) discharge piping penetrate the drywell / suppression pool diaphragm slab with the purpose of transporting steam and non-condensable gases to the suppression pool from the reactor and from the drywell during SRV lifts and under accident conditions. To ensure the integrity of the downcomers and SRV discharge piping for the original 40-year life of the plant, extensive analyses were performed. These analyses satisfy the definition for TLAA.

The significant area analyzed for the downcomers in the suppression pool air space was the downcomer penetration through the diaphragm slab. Structural analyses of all the SRV discharge lines from the diaphragm slab penetration to the quencher were performed, including flued head connections, elbows, and three-way restraint attachments.

The design rules, as set forth in the ASME Section III, Subsection NB were used for the fatigue assessment. The downcomers and SRV discharge lines were analyzed for the appropriate load combinations and their associated number of cycles. The combined stresses and corresponding equivalent stress cycles were computed to obtain the fatigue usage factors in accordance with the equations of Subsection NB-3600 of the ASME Code. The maximum cumulative usage factors for the downcomers and SRV discharge lines for the 40-year plant lifetime were determined from these analyses.

The minimum number of SRV actuations assumed in any of the fatigue analyses was 1100. The projected number of events for 60 years is less than the number assumed in the design basis (40 year) analysis. Therefore, the design basis analysis remains valid for the period of extended operation.

A.1.3.5.3 Safety Relief Valve Quenchers

Quenchers provide proper dispersion of reactor steam into the suppression pool upon lifts of SRVs and discharge of the steam through the SRV discharge piping.

Analyses for fatigue of the quenchers satisfy 10 CFR 54.3 criteria as TLAA. Fatigue evaluations for the original 40-year life of the plant list 7000 cycles as the expected number of cycles for each quencher component analyzed. The evaluations calculate the number of allowable cycles for the components and give the expected CUF for each analysis.

Since a quencher can experience up to seven cycles each time its associated SRV actuates (lifts), the worst case number of cycles is seven times the number of actuations projected for 40 years and for 60 years. These projected cycles were compared with analysis data results.

The design cycles exceed the number of cycles projected to 60 years for all components which were analyzed for the quencher. Therefore, the CUFs calculated in the fatigue evaluation remain valid for the period of extended operation.

A.1.3.6 Other Plant-Specific Time-Limited Aging Analyses

A.1.3.6.1 Main Steam Flow Restrictor Erosion Analyses

A flow restrictor is incorporated in each main steam line to limit flow to 200 percent of rated flow in the event that a main steam line ruptures outside containment. Erosion of a flow restrictor is a safety concern since it could impair the ability of the flow restrictor to limit vessel blowdown following a main steam line break.

FSAR Section 5.4.4.4 discusses an evaluation of the effect of potential erosion of main steam line flow restrictors on radiological dose resulting from a main steam line break accident.

Operating for another 20 years will allow further erosion and, therefore, increased opening in the throat of the flow restrictors. The erosion can be linearly extrapolated from 40 to 60 years. This is conservative since the rate of erosion would be expected to decrease as the throat area of the restrictor increased due to erosion. (It has been determined that operation at Extended Power Uprate conditions will not significantly affect the erosion rate.) Therefore, it can be concluded that erosion for the 20 years of extended operation will be no more than half the erosion for the first 40 years, and the corresponding increase in steam flow will be no more than half of the increase in steam flow due to erosion at the end of 40 years (namely, 5 percent). This means that by the end of 60 years, the increase in flow compared to flow at the beginning of life will be no more than 7.5 percent. Therefore, the released dose for the accident case at 60 years would be no more than a 7.5 percent increase. Such an increase in dose over the analyzed case remains within regulatory limits, as indicated in FSAR Section 15.6.4.5.3.

Hence, the performance of the main steam line flow restrictors is not significantly impacted by the additional erosion during the period of extended operation.

A.1.3.6.2 High Energy Line Break Cumulative Fatigue Usage Factors

High energy line breaks have been postulated and analyzed for potential effects on surrounding equipment and systems. FSAR Section 3.6 provides criteria for determining break locations and types of breaks that could occur, descriptions of analysis methodologies, and results for significant attached piping showing where breaks could develop and where restraints were to be installed. Cumulative fatigue usage factors (CUFs) for the high energy lines are included in the criteria to determine postulated breaks. The CUFs, as calculated in the design fatigue analyses, account for the design transients assumed for the original 40-year life of the plant.

The postulated breaks are in piping for systems important to safety and integrity of the reactor coolant pressure boundary. The restraints designed for these potential breaks are significant for protection of systems and equipment important to plant safety. Therefore, the CUF calculations used in the selection of postulated high energy line break locations are TLAA.

Since these breaks are postulated to occur only once in the lifetime of the plants and restraints were installed appropriately to mitigate these potential breaks, the results of analyses for the potential breaks and the restraints installed in the plants remain unchanged for the extended life of 60 years. However, it is possible that other locations that had 40-year CUFs below the criteria for postulated breaks, could exceed that CUF criteria in 60 years. The possibility of these additional postulated breaks will need to be managed based on the actual fatigue accumulation encountered as the plant ages.

Presently, SSES utilizes the EPRI FatiguePro software to monitor fatigue at the critical bounding locations of piping systems in the plant. The SSES Fatigue Monitoring Program will identify when piping systems are approaching their original 40-year design CUFs. Prior to any piping system exceeding its' original maximum design CUF, the pertinent design calculations for the affected system will be reviewed to determine if any additional locations should be designated as postulated high energy line breaks, under the original criteria of FSAR Section 3.6. If other locations are determined to require consideration as postulated break locations, appropriate actions will be taken to address the new break locations.

A.1.3.6.3 Core Plate Rim Hold-Down Bolts

The NRC safety evaluation report that references BWRVIP-25, "BWR Core Plate Inspection and Flaw Evaluation Guidelines," for license renewal identifies loss of preload on the core plate rim hold-down bolts as one of the TLAA that must be addressed by applicants seeking license renewal.

BWRVIP-25, Appendix B, states that the core plate bolts will have at least 81 percent preload remaining at 54 EFPY. PPL analysis determined that loss of preload due to non-irradiation effects was negligible. Analyses associated with Extended Power Uprate evaluated the core plate hold-down bolts and determined that the preload at the end of 60 years was adequate to prevent lateral motion of the core plate.

A.1.4 License Renewal Commitment List

A listing of commitments identified for SSES license renewal is provided in Table A-1. These commitments will be tracked within PPL's regulatory commitment management program. Any other actions discussed in the LRA represent intended or planned actions. They are described to the NRC for the NRC's information and are not regulatory commitments.

Table A-1
SSES License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
1) Inservice Inspection (ISI) Program	Existing program is credited.	A.1.2.23	Ongoing
2) BWR Water Chemistry Program	Existing program is credited.	A.1.2.11	Ongoing
3) Reactor Head Closure Studs Program	Existing program is credited.	A.1.2.40	Ongoing
4) BWR Vessel ID Attachment Welds Program	Existing program is credited.	A.1.2.9	Ongoing
5) BWR Feedwater Nozzle Program	Existing program is credited.	A.1.2.6	Ongoing
6) BWR CRD Return Line Nozzle Program	Existing program is credited.	A.1.2.5	Ongoing
7) BWR Stress Corrosion Cracking (SCC) Program	Existing program is credited.	A.1.2.8	Ongoing

Table A-1
SSES License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
8) BWR Penetrations Program	Existing program is credited.	A.1.2.7	Ongoing
9) BWR Vessel Internals Program	Existing program is credited with the following enhancement: • Include requirements to inspect five percent of the top guide locations within six years after entering the period of extended operation and an additional five percent of the top guide locations within twelve years after entering the period of extended operation. The top guide locations to be inspected are those subject to neutron fluence levels that exceed the IASCC threshold of 5.0E+20 n/cm^2. The inspections shall be performed using the enhanced visual inspection technique, EVT-1. The extent of the examination and its frequency will be based on a ten percent sample of the total population, which includes all grid beam and beam-to-beam crevice slots.	A.1.2.10	Prior to the period of extended operation.

Table A-1
SSES License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
10) Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program	Program is new. The new program for SSES will be consistent with the program described in NUREG-1801 Section XI.M13, Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program. The SSES program will identify susceptible components, evaluate those components to determine their susceptibility to loss of fracture toughness, and examine those components that are evaluated to be susceptible.	A.1.2.48	Prior to the period of extended operation.
11) Flow-Accelerated Corrosion (FAC) Program	Existing program is credited.	A.1.2.20	Ongoing
12) Bolting Integrity Program	Existing program is credited with the following enhancement: • Include specific precautions against the use of sulfur (sulfide) containing compounds as a lubricant for bolted connections.	A.1.2.2	Prior to the period of extended operation
13) Piping Corrosion Program	Existing program is credited.	A.1.2.38	Ongoing
14) Crane Inspection Program	Existing program is credited.	A.1.2.17	Ongoing

Table A-1
SSES License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
15) Fire Protection Program	Existing program is credited.	A.1.2.18	Ongoing
16) Buried Piping Surveillance Program	Program is new. The scope of the Buried Piping Surveillance Program includes only the portions of the buried piping in the Residual Heat Removal Service Water (RHRSW) and Emergency Service Water (ESW) common return header known to have damaged coatings. The program is credited for managing loss of material due to crevice, general, and pitting corrosion and microbiologically influenced corrosion (MIC) for buried steel piping components with damaged coatings.	A.1.2.4	Prior to the period of extended operation.

Table A-1
SSES License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
17) Condensate and Refueling Water Storage Tanks Inspection	Program is a new one-time inspection. The scope of the Condensate and Refueling Water Storage Tanks Inspection includes the base (bottom surface and foundation pad interface) of the Condensate Storage Tanks (CSTs) and Refueling Water Storage Tank (RWST) that are in the scope of license renewal and included in the Condensate Storage and Transfer and the Refueling Water Storage and Transfer systems. An appropriate combination of volumetric (including thickness measurement) and visual examinations will be conducted, for a unit's CST (or RWST), to detect evidence of a loss of material due to crevice, general, or pitting corrosion or to confirm a lack thereof. Results will be applied to the other unit's tank(s) based on engineering evaluation.	A.1.2.14	Within the 10-year period prior to the period of extended operation.
18) Reactor Vessel Surveillance Program	Existing program is credited.	A.1.2.41	Ongoing

Table A-1
SSES License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
19) Chemistry Program Effectiveness Inspection	Program is a new one-time inspection. The Chemistry Program Effectiveness Inspection includes the internal surfaces of aluminum, copper and copper alloy, carbon and low alloy steel, cast iron, and stainless steel components in systems that contain treated water or fuel oil. A representative sample of components in low flow and stagnant areas (i.e., locations that are isolated from the flow stream and possibly prone to gradual accumulation/concentration of contaminants) will be examined for evidence of a loss of material (due to crevice, galvanic, general, or pitting corrosion or to erosion, and to MIC in fuel oil), or to confirm a lack thereof, and the results applied to the rest of the system(s) based on engineering evaluation.	A.1.2.12	Within the 10-year period prior to the period of extended operation.
20) Cooling Units Inspection	Program is a new one-time inspection. The Cooling Units Inspection activities focus on a representative sample population of subject components at susceptible locations, to be defined in the implementing documents. These inspection activities provide symptomatic evidence of cracking, loss of material, or reduction in heat transfer at all other susceptible locations due to the similarities in materials and environmental conditions.	A.1.2.16	Within the 10-year period prior to the period of extended operation.

Table A-1
SSES License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
21) Heat Exchanger Inspection	Program is a new one-time inspection. The Heat Exchanger Inspection detects and characterizes conditions to determine whether, and to what extent a loss of heat transfer due to fouling is occurring (or likely to occur) for heat exchangers within the scope of license renewal. The Heat Exchanger Inspection is also credited for managing cracking due to stress corrosion cracking / inter-granular attack in the treated water (internal) environment of the admiralty brass tubes.	A.1.2.22	Within the 10-year period prior to the period of extended operation.
22) Main Steam Flow Restrictor Inspection	Program is a new one-time inspection. The Main Steam Flow Restrictor Inspection is credited for managing reduction of fracture toughness, as evidenced by cracking, for the main steam flow restrictors.	A.1.2.30	Within the 10-year period prior to the period of extended operation.

Table A-1
SSES License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
23) Monitoring and Collection System Inspection	Program is a new one-time inspection. The scope of the Monitoring and Collection System Inspection includes the internal surfaces of subject carbon steel (and low alloy steel) and cast iron piping and valve bodies that are exposed to potentially radioactive drainage water (untreated water) and potentially other contaminants/fluids during normal plant operations. A representative sample of components in the system, to be defined in the implementing documents, and to include containment isolation piping and/or valve bodies, will be examined for evidence of a loss of material (due to crevice, general, or pitting corrosion or to MIC), or to confirm a lack thereof, and the results applied to the rest of the system based on engineering evaluation.	A.1.2.33	Within the 10-year period prior to the period of extended operation.

Table A-1
SSES License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
24) Supplemental Piping/Tank Inspection	Program is a new one-time inspection. The Supplemental Piping/Tank Inspection is credited for managing loss of material due to crevice and pitting corrosion on carbon steel surfaces at air-water interfaces. The inspection is also credited for managing loss of material due to microbiologically influenced corrosion (MIC) at the air-water interface with the mist eliminator loop seal, which is filled with raw water from the Service Water System, and galvanic corrosion at points of contact between the mist eliminator housing and the SGTS filter enclosure, where condensation and water pooling may occur. Additionally, the Supplemental Piping/Tank Inspection detects and characterizes whether, and to what extent, a loss of material due to crevice and pitting corrosion is occurring (or is likely to occur) for stainless steel surfaces at air-water interfaces. The Supplemental Piping/Tank Inspection also detects and characterizes loss of material due to crevice, galvanic, general, and pitting corrosion on internal carbon steel surfaces within the scram discharge volume (piping and valve bodies) of the Control Rod Drive Hydraulic System, and within the air space of the condensate storage tanks to determine whether, and to what extent, degradation is occurring (or is likely to occur).	A.1.2.46	Within the 10-year period prior to the period of extended operation.

Table A-1
SSES License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
25) Selective Leaching Inspection	Program is a new one-time inspection. The Selective Leaching Inspection detects and characterizes conditions to determine whether, and to what extent a loss of material due to selective leaching is occurring (or likely to occur) for susceptible components including piping and tubing, valve bodies, pump and turbocharger casings, heat exchanger, cooler, and chiller components, hydrants, sprinkler heads, strainers, level gauges, orifices, and heater sheaths. The components within the scope of the program are formed of cast iron, brass, bronze, and copper alloy materials. The components are subject to raw water, treated water, groundwater (buried), indoor air with condensation, outdoor air, and fuel oil environments. The components within the scope of this program are located in twenty-five different plant systems.	A.1.2.43	Within the 10-year period prior to the period of extended operation.
26) Buried Piping and Tanks Inspection Program	Program is new. The scope of the Buried Piping and Tanks Inspection Program includes buried components that are within the scope of license renewal for SSES. The program is credited for managing loss of material due to crevice, galvanic, general, and pitting corrosion and microbiologically influenced corrosion (MIC) for buried steel piping components. In addition, the program is credited with managing loss of material for buried stainless steel piping components. The Buried Piping and Tanks Inspection Program is also credited for managing loss of material due to general corrosion for buried steel tanks in the Diesel Fuel Oil System.	A.1.2.3	Prior to the period of extended operation.

Table A-1
SSES License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
27) Small-Bore Class 1 Piping Inspection	Program is a new one-time inspection. The SSES program will include measures to verify that unacceptable degradation is not occurring in Class 1 small-bore piping, thereby validating the effectiveness of the Chemistry Program to mitigate aging-related degradation and confirming that no additional aging management programs are needed for the period of extended operation.	A.1.2.44	Within the 10-year period prior to the period of extended operation.
28) System Walkdown Program	Existing program is credited with the following enhancements: • The governing procedure for the System Walkdown Program must be revised to add the listing of systems crediting the program for license renewal. • The governing procedure for the System Walkdown Program must be enhanced to address the license renewal requirement for opportunistic inspections of normally inaccessible components (e.g., those that are insulated), and those that are accessible only during refueling outages.	A.1.2.47	Prior to the period of extended operation.
29) Inservice Inspection (ISI) Program – IWE	Existing program is credited.	A.1.2.24	Ongoing

Table A-1
SSES License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
30) Inservice Inspection (ISI) Program – IWF	Existing program is credited.	A.1.2.25	Ongoing
31) Inservice Inspection (ISI) Program - IWL	Existing program is credited.	A.1.2.26	Ongoing
32) Containment Leakage Rate Test Program	Existing program is credited.	A.1.2.15	Ongoing
33) Masonry Wall Program	Existing program is credited with the following enhancement: • Specify that for each masonry wall, the extent of observed masonry cracking and/or degradation of steel edge supports/bracing is evaluated to ensure that the current evaluation basis is still valid. Corrective action is required if the extent of masonry cracking and steel degradation is sufficient to invalidate the evaluation basis.	A.1.2.31	Prior to the period of extended operation.
34) Structures Monitoring Program	Existing program is credited with the following enhancements: • Include additional structures requiring aging management for license renewal to the scope of the inspections. • Specify that if a below grade structural wall or structural component becomes accessible through excavation; a follow-up	A.1.2.45	Prior to the period of extended operation.

Table A-1
SSES License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
	action is initiated for the responsible engineer to inspect the exposed surfaces for age-related degradation. • Clarify "structural component" for inspection includes each of the component types identified as requiring aging management. • Include degradation mechanisms for elastomer and earthen embankment inspection. • Include RG 1.127 inspection elements for water-control structure. • Specify that the responsible engineer shall review site groundwater and raw water pH, chlorides, and sulfates results prior to inspection to validate that the below-grade or raw water environment remain non-aggressive during the period of extended operation. • Specify that for each masonry wall, the extent of observed masonry cracking and/or degradation of steel edge supports/bracing is evaluated to ensure that the current evaluation basis is still valid. Corrective action is required if the extent of masonry cracking and steel degradation is sufficient to invalidate the evaluation basis.		

Table A-1
SSES License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
35) RG 1.127 Water-Control Structures Inspection	Existing program is credited with the following enhancements: • Add the Spray Pond (including concrete liner, emergency spillway, riser encasements and earthen embankments) to its scope for inspection. • Include RG 1.127 Revision 1 Section C.2 inspection elements and degradation mechanisms for water-control structure inspection. • Include acceptance criteria as delineated in NUREG-1801 Section XI.S7 for water-control structures. Evaluation criteria provided in Chapter 5 of ACI 349.3R-96 provides acceptance criteria (including quantitative criteria) for determining the adequacy of observed aging effects and specifies criteria for further evaluation.	A.1.2.42	Prior to the period of extended operation.
36) Non-EQ Electrical Cables and Connections Visual Inspection Program	Program is new. The Non-EQ Electrical Cables and Connections Visual Inspection Program is credited with detecting aging effects from adverse localized environments in non-EQ cables and connections at SSES. The program is applicable to non-EQ cables and connections found in the Reactor Buildings, Circulating Water Pumphouse and Water Treatment Building, Control Structure, Diesel Generator Buildings, Turbine Building, Engineered Safeguards Service Water Pumphouse, and various yard structures (manholes, duct banks, valve vaults, instrument pits, etc.).	A.1.2.35	Prior to the period of extended operation.

Table A-1
SSES License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
37) Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program	Program is new. The Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program is credited with identifying aging effects for sensitive, high-voltage, low-current signal applications that are in-scope for license renewal at SSES. These sensitive circuits are potentially subject to reduction in insulation resistance (IR) when found in adverse localized environments.	A.1.2.34	Prior to the period of extended operation.
38) Non-EQ Inaccessible Medium-Voltage Cables Program	Program is new. The Non-EQ Inaccessible Medium-Voltage Cables Program involves two parts: first, the actions to inspect the applicable plant manholes (and to drain them, if necessary) on a periodic basis; and second, the development of a testing program to confirm that the conductor insulation on the applicable cables is not degrading. This program applies to six cables associated with the offsite power supply for SSES. These are the only inaccessible medium-voltage cables at SSES that are within the scope of license renewal and are exposed to significant moisture simultaneously with significant voltage.	A.1.2.36	Prior to the period of extended operation.

Table A-1
SSES License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
39) Metal-Enclosed Bus Inspection Program	Program is new. The Metal-Enclosed Bus Inspection Program is credited with detecting aging effects for in-scope metal-enclosed bus at SSES. The applicable components for the metal-enclosed bus will be listed in the program implementing document(s), with their locations specified, as appropriate. The in-scope bus is limited to non-segregated metal-enclosed bus in the 13.8 kV and 4 kV electrical systems associated with the off-site power supply at SSES.	A.1.2.32	Prior to the period of extended operation.
40) Area-Based NSAS Inspection	Program is a new one-time inspection. The Area-Based NSAS Inspection includes confirming the environmental and/or internal surfaces conditions of subject nonsafety-related carbon steel (includes low alloy steel), cast iron, copper alloy and stainless steel components in systems that (frequently or continuously during normal plant operations) contain raw water, potable water, non-radioactive equipment/area drainage water, or in some select cases, treated water. The program is plant-specific.	A.1.2.1	Within the 10-year period prior to the period of extended operation.
41) Leak Chase Channel Monitoring Activities	Existing program is credited. The program is plant-specific.	A.1.2.27	Ongoing

Table A-1
SSES License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
42) Preventive Maintenance Activities – RCIC/HPCI Turbine Casings	Existing program is credited. The program is plant-specific.	A.1.2.39	Ongoing
43) Fatigue Monitoring Program	Existing program is credited with the following enhancements: • Provisions will be made in the Fatigue Monitoring Program to validate that components which have satisfied ASME Section III, Paragraph N-415.1 requirements (i.e., RPV nozzles N6A, N6B, and N7) continue to satisfy these requirements prior to and during the period of extended operation, thereby allowing fatigue to be continued to be addressed under N-415.1. • Provisions will be made in the Fatigue Monitoring Program to address environmental effects on fatigue at specified locations in accordance with NUREG/CR-6260. • The Fatigue Monitoring Program will include requirements to review Class 1 valve fatigue analyses and other fatigue-related TLAA, such as flued head analyses and high energy line break evaluations, when sufficient fatigue accumulation has occurred, to determine if additional actions are required to address fatigue-related concerns. • The Fatigue Monitoring Program will include requirements for continued monitoring and periodic updates to current and	A.1.3.2 A.1.3.3 A.1.3.5	Prior to the period of extended operation.

Table A-1
SSES License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
	projected CUFs for limiting locations. The program will include an approach to address CUFs that will exceed the allowable before the end of the period of extended operation. • The Fatigue Monitoring Program will include requirements to monitor NUREG/CR-6260 limiting locations prior to entering the period of extended operation. SSES will implement an approach to address CUFs projected to exceed the allowable before fatigue, including environmental effects, exceeds the allowable value of 1.0. Should PPL select the option to manage environmentally-assisted fatigue during the period of extended operation, details of the aging management program such as scope, qualification, method, and frequency will be provided to the NRC prior to the period of extended operation. • The Fatigue Monitoring Program does not have specific acceptance criteria that require corrective action if any CUFs are projected to exceed their allowable values prior to the end of the licensed period. The Fatigue Monitoring Program will be enhanced prior to the period of extended operation such that corrective action is procedurally required should any CUF projections be unacceptable. • The Fatigue Monitoring Program will include a requirement to immediately notify management if any component CUF is approaching its' design limit. • The Fatigue Monitoring Program projects allowable CUFs to the		

Table A-1
SSES License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
	end of the licensed period. If any projections exceed allowables, the program will require action to be taken, such as a Condition Report being written to require resolution. Resolution will consider more frequent monitoring of the data until another solution (reanalysis, component replacement, etc.) is implemented. The Fatigue Monitoring Program tracks transients and calculates cumulative fatigue usage factors (CUFs). If any projection exceeds allowable, then appropriate action is taken until the solution results in the projection being acceptable.		
44) Environmental Qualification (EQ) Program	Existing program is credited. For those EQ components that do not show a minimum 60-year life, the EQ Program will ensure qualified life is not exceeded by directing refurbishment, replacement, or reanalysis to extend the qualification.	A.1.3.4	Ongoing
45) Closed Cooling Water Chemistry Program	Existing program is credited.	A.1.2.13	Ongoing.

Table A-1
SSES License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
46) Fire Water System Program	Existing program is credited with the following enhancements: • The Fire Water System Program will be revised to incorporate sprinkler head sampling/replacements, in accordance with NFPA 25. • Ultrasonic testing of representative above ground portions of water suppression piping that are exposed to water but which do not normally experience flow.	A.1.2.19	Prior to the period of extended operation.
47) Fuel Oil Chemistry Program	Existing program is credited.	A.1.2.21	Ongoing
48) Lubricating Oil Analysis Program	Existing program is credited with the following enhancement: • The Lubricating Oil Analysis Program will be revised to include sampling of the lubricating oil from the Control Structure Chiller when the oil is changed. The oil will be tested for water and for particle count.	A.1.2.28	Prior to the period of extended operation.

Table A-1
SSES License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
49) Lubricating Oil Inspection	Program is new. The Lubricating Oil Inspection detects and characterizes the condition of materials in systems and components for which the Lubricating Oil Analysis Program is credited with aging management. The inspection provides direct evidence as to whether, and to what extent, a loss of material or a reduction in heat transfer due to fouling has occurred.	A.1.2.29	Prior to the period of extended operation.
50) Non-EQ Electrical Cable Connections Program	Program is new. The Non-EQ Electrical Cable Connections Program manages the aging for the metallic parts of non-EQ electrical cable connections within the scope of license renewal. The program addresses cable connections that are used to connect cable conductors to other cables or electrical devices. Aging management for the metallic parts of the non-EQ electrical cable connections that are subject to aging stressors will be provided by testing.	A.1.2.37	Prior to the period of extended operation.
51) New P-T Curves	Revised Pressure-Temperature (P-T) limits will be submitted to the NRC for approval when necessary to comply with 10 CFR 50 Appendix G.	A.1.3.1.4	Ongoing
52) OE Review at EPU Conditions	Perform an Operating Experience (OE) review for the period of operation at EPU conditions and its impact on aging management programs for systems, structures and components (SSCs).	----------	Prior to the period of extended operation.

Table A-1
SSES License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
53) Incorporate FSAR Supplement	Incorporate FSAR Supplement into the SSES FSAR as required by 10 CFR 54.21(d)	A.1.1	Following issuance of the renewed operating licenses
54) Re-apply for relief request	PPL will process a relief request for circumferential vessel shell weld volumetric examinations for the period of extended operation.	A.1.3.1.5	Prior to the period of extended operation.

APPENDIX B

AGING MANAGEMENT PROGRAMS

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B.0 Aging Management Programs

B.1 INTRODUCTION

B.1.1 Overview

License renewal aging management program (AMP) descriptions are provided in this appendix for each program credited for managing aging effects based upon the aging management review results provided in Sections 3.1 through 3.6 of this application.

Each AMP described in this appendix has 10 program elements in accordance with the guidance in Appendix A.1, Section A.1.2.3 of NUREG-1800, the Standard Review Plan for License Renewal (SRP-LR). For existing AMPs that are comparable to the programs described in Sections X and XI of NUREG-1801, the "Generic Aging Lessons Learned" (GALL) report, the 10 elements have been compared to the elements of the NUREG-1801 program. For plant-specific programs that do not correlate with NUREG-1801, and for all new programs, the 10 elements are addressed in the program description.

B.1.2 Method of Discussion

For those existing AMPs that are comparable to the programs described in Sections X and XI of NUREG-1801, the program discussion is presented in the following format:

- **Program Description** – An abstract of the overall program is provided.
- **NUREG-1801 Consistency** - A statement is made regarding consistency between the SSES program and the corresponding NUREG-1801 program.
- **Exceptions to NUREG-1801** - Exceptions to the NUREG-1801 program are outlined and justifications provided.
- **Required Enhancements** - Enhancements to ensure consistency with NUREG-1801 or additions to the NUREG-1801 program to manage aging for additional components with aging effects not assumed in the NUREG-1801 program are proposed. A proposed schedule for completion is discussed.
- **Operating Experience** – Discussion of operating experience information specific to the program is provided.
- **Conclusion** - A conclusion section provides a statement of reasonable assurance that the program is effective or will be effective once enhanced or developed.

For those programs that are plant-specific or new, the above format is followed with the additional discussion of each of the 10 elements in the program description.

Exceptions to NUREG-1801 programs are identified when certain considerations of the SSES program are different from the NUREG-1801 program considerations or certain NUREG-1801 program considerations are not applicable to SSES.

B.1.3 Quality Assurance Program and Administrative Controls

Three elements of an effective aging management program that are common to all existing, enhanced, and new aging management programs are corrective actions, confirmation process, and administrative controls. These elements are included in the Operational Quality Assurance Program (OQA) for SSES. The OQA Program satisfies the requirements of 10 CFR 50, Appendix B, and is described in Sections 13.4 and 17.2 of the SSES Final Safety Analysis Report.

The elements of corrective actions, confirmation process, and administrative controls in the SSES OQA Program will be applied to each existing, enhanced, and new aging management program and activity credited for license renewal, for both safety-related and nonsafety-related structures and components determined to require aging management during the period of extended operation. The corrective actions, confirmation process, and administrative controls in the SSES OQA program, for the credited aging management programs and the structures and components determined to require aging management, are consistent with the related discussions in the Appendix to NUREG-1801, Volume 2.

The elements of corrective actions, confirmation process, and administrative controls of the existing OQA Program for SSES Units 1 and 2 are described in the sections below, including a general comparison to the pertinent elements of the corresponding NUREG-1801 aging management programs (AMPs).

Corrective Actions:

For SSES, corrective actions are implemented through the administrative and processing requirements of the Action Request (AR), Condition Report (CR), and Management Process (MGNT) that satisfies 10 CFR 50, Appendix B, Criterion XVI. Conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, and defective material or equipment, are promptly identified and corrected. In the case of significant conditions adverse to quality, measures are implemented to ensure that the root cause of the deficiency is determined and that corrective actions are taken to prevent recurrence. In addition, the identification of the significant condition adverse to quality, the cause of the condition, and the corrective action(s) taken are documented and reported to appropriate levels of management.

Confirmation Process:

The focus of the confirmation process is on the follow-up actions that must be taken to verify effective implementation of corrective actions and preclude repetition of significant

conditions adverse to quality. The SSES Corrective Action Program includes the requirement that measures be taken to preclude repetition of significant conditions adverse to quality. These measures include actions to verify effective implementation of proposed corrective actions. The confirmation process is part of the corrective action program and, for significant conditions adverse to quality, includes:

- reviews to assure proposed actions are adequate,
- tracking and reporting of open corrective actions,
- root cause determinations, and
- reviews of corrective action effectiveness.

At SSES, effectiveness reviews are conducted as part of the corrective action process, to ensure that all corrective actions have been completed and to identify any repetition of the event. The AR process is also monitored for potentially adverse trends. The existence of an adverse trend due to recurring or repetitive adverse conditions will result in the initiation of a follow-up AR.

Administrative Controls:

Administrative controls that govern aging management activities are established within the document control procedures that implement: (1) industry standards related to administrative controls and quality assurance for the operational phase of nuclear power plants and (2) the requirements of 10 CFR 50, Appendix B, Criterion VI.

At SSES, plant policies, directives, procedures, and controls, are written and controlled to specify and manage various activities, particularly those related to compliance with 10 CFR 50, Appendix B. The phrase 'administrative control' refers to the adherence to the policies, directives, and procedures, and also refers to the formal review and approval process that the plant policies, directives, and procedures undergo as they are issued (and revised). The individual documents (i.e., the plant policies, directives, and procedures), in conjunction with the SSES OQA Program documents, provide the overall administrative framework to assure the applicable regulatory requirements are met.

B.1.4 Operating Experience

Industry operating experience was incorporated into the License Renewal process through a review of industry documents to identify aging effects and mechanisms that could challenge the intended function of systems and structures within the scope of License Renewal. Review of plant-specific operating experience was performed to identify aging effects experienced. The review of plant-specific operating experience involved electronic database searches of plant information. Consideration of operating

experience from industry and PPL sources is accomplished by means of assessment activities performed under the SSES OQA Program.

Operating experience regarding existing programs/activities, including past corrective actions resulting in program enhancements, was considered. This information provides objective evidence that the effects of aging have been, and will continue to be, adequately managed.

B.1.5 Aging Management Programs

Table B-1 provides a listing of the NUREG-1801 aging management programs and the corresponding aging management programs for SSES, if applicable. Table B-2 provides a summary of the aging management programs for SSES with respect to consistency with NUREG-1801 aging management programs. Table B-2 also provides information on whether programs are either existing or new, whether enhancements are required, and whether the programs are plant-specific. Each aging management program is addressed in Section B.2.

B.1.6 Aging Management Programs for Time-Limited Aging Analyses

Table B-1 and Table B-2 also include a listing of AMPs used to resolve time-limited aging analyses (TLAAs) in accordance with 10 CFR 54.21(c). TLAA-related AMPs, are addressed in Section B.3.

B.2 AGING MANAGEMENT PROGRAMS

The correlation between NUREG-1801 (GALL) programs and SSES AMPs is shown in the following table. The table is organized by the NUREG-1801 program number, first for Chapter XI, then for Chapter X, and finally for plant-specific programs.

Table B-1
Correlation of NUREG-1801 and SSES Aging Management Programs

Number	NUREG-1801 Program	Corresponding SSES Program
GALL Report Chapter XI		
XI.M1	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	Inservice Inspection (ISI) Program See Section B.2.1.
XI.M2	Water Chemistry	BWR Water Chemistry Program See Section B.2.2.
XI.M3	Reactor Head Closure Studs	Reactor Head Closure Studs Program See Section B.2.3.
XI.M4	BWR Vessel ID Attachment Welds	BWR Vessel ID Attachment Welds Program See Section B.2.4.
XI.M5	BWR Feedwater Nozzle	BWR Feedwater Nozzle Program See Section B.2.5.
XI.M6	BWR Control Rod Drive Return Line Nozzle	BWR CRD Return Line Nozzle Program See Section B.2.6.
XI.M7	BWR Stress Corrosion Cracking	BWR Stress Corrosion Cracking (SCC) Program See Section B.2.7.
XI.M8	BWR Penetrations	BWR Penetrations Program See Section B.2.8.
XI.M9	BWR Vessel Internals	BWR Vessel Internals Program See Section B.2.9.
XI.M10	Boric Acid Corrosion	Not applicable. SSES does not use boric acid in any systems. The Standby Liquid Control System uses a sodium pentaborate solution.

Table B-1
Correlation of NUREG-1801 and SSES Aging Management Programs
(continued)

Number	NUREG-1801 Program	Corresponding SSES Program
XI.M11A	Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors	Not applicable. SSES Units 1 and 2 are Boiling Water Reactor (BWR) designs.
XI.M12	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	Not credited for aging management.
XI.M13	Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)	Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program See Section B.2.10.
XI.M14	Loose Parts Monitoring	Not credited for aging management.
XI.M15	Neutron Noise Monitoring	Not credited for aging management.
XI.M16	PWR Vessel Internals	Not applicable. SSES Units 1 and 2 are Boiling Water Reactor (BWR) designs.
XI.M17	Flow-Accelerated Corrosion	Flow-Accelerated Corrosion (FAC) Program See Section B.2.11.
XI.M18	Bolting Integrity	Bolting Integrity Program See Section B.2.12.
XI.M19	Steam Generator Tube Integrity	Not applicable. SSES Units 1 and 2 are Boiling Water Reactor (BWR) designs.
XI.M20	Open-Cycle Cooling Water System	Piping Corrosion Program See Section B.2.13.
XI.M21	Closed-Cycle Cooling Water System	Closed Cooling Water Chemistry Program See Section B.2.14.
XI.M22	Boraflex Monitoring	Not applicable. Spent fuel racks at SSES use “Boral” as the neutron absorber (rather than Boraflex).

Table B-1
Correlation of NUREG-1801 and SSES Aging Management Programs
(continued)

Number	NUREG-1801 Program	Corresponding SSES Program
XI.M23	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	Crane Inspection Program See Section B.2.15.
XI.M24	Compressed Air Monitoring	Not credited for aging management.
XI.M25	BWR Reactor Water Cleanup System	Not credited for aging management. There are no 4-inch diameter or larger stainless steel components outside the 2nd containment isolation valve.
XI.M26	Fire Protection	Fire Protection Program See Section B.2.16.
XI.M27	Fire Water System	Fire Water System Program See Section B.2.17.
XI.M28	Buried Piping and Tanks Surveillance	Buried Piping Surveillance Program See Section B.2.18.
XI.M29	Aboveground Carbon Steel Tanks	Condensate and Refueling Water Storage Tanks Inspection See Section B.2.19.
XI.M30	Fuel Oil Chemistry	Fuel Oil Chemistry Program See Section B.2.20.
XI.M31	Reactor Vessel Surveillance	Reactor Vessel Surveillance Program See Section B.2.21.
XI.M32	One-Time Inspection	• Chemistry Program Effectiveness Inspection See Section B.2.22. • Cooling Units Inspection See Section B.2.23. • Heat Exchanger Inspection See Section B.2.24. • Lubricating Oil Inspection See Section B.2.25. • Main Steam Flow Restrictor Inspection See SectionB.2.26.

Table B-1
Correlation of NUREG-1801 and SSES Aging Management Programs
(continued)

Number	NUREG-1801 Program	Corresponding SSES Program
XI.M32 (cont.)	One-Time Inspection	• Monitoring and Collection System Inspection See Section B.2.27. • Supplemental Piping/Tank Inspection See Section B.2.28.
XI.M33	Selective Leaching of Materials	Selective Leaching Inspection See Section B.2.29.
XI.M34	Buried Piping and Tanks Inspection	Buried Piping and Tanks Inspection Program See Section B.2.30.
XI.M35	One-time Inspection of ASME Code Class 1 Small Bore-Piping	Small Bore Class 1 Piping Inspection See Section B.2.31.
XI.M36	External Surface Monitoring	System Walkdown Program See Section B.2.32.
XI.M37	Flux Thimble Tube Inspection	Not applicable. SSES Units 1 and 2 are Boiling Water Reactor (BWR) designs.
XI.M38	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	Not credited for aging management.
XI.M39	Lubricating Oil Analysis	Lubricating Oil Analysis Program See Section B.2.33.
XI.S1	ASME Section XI, Subsection IWE	Inservice Inspection (ISI) Program – IWE See Section B.2.34.
XI.S2	ASME Section XI, Subsection IWL	Inservice Inspection (ISI) Program – IWL See Section B.2.35.
XI.S3	ASME Section XI, Subsection IWF	Inservice Inspection (ISI) Program – IWF See Section B.2.36.
XI.S4	10 CFR Part 50, Appendix J	Containment Leakage Rate Test Program See Section B.2.37.
XI.S5	Masonry Wall Program	Masonry Wall Program See Section B.2.38.

Table B-1
Correlation of NUREG-1801 and SSES Aging Management Programs
(continued)

Number	NUREG-1801 Program	Corresponding SSES Program
XI.S6	Structures Monitoring Program	Structures Monitoring Program See Section B.2.39.
XI.S7	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	RG 1.127 Water-Control Structures Inspection See Section B.2.40.
XI.S8	Protective Coating Monitoring and Maintenance Program	Not credited for aging management.
XI.E1	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Non-EQ Electrical Cables and Connections Visual Inspection Program See Section B.2.41.
XI.E2	Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program See Section B.2.42.
XI.E3	Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Non-EQ Inaccessible Medium-Voltage Cables Program See Section B.2.43.
XI.E4	Metal-Enclosed Bus	Metal-Enclosed Bus Inspection Program See Section B.2.44.
XI.E5	Fuse Holders	Not credited for aging management.
XI.E6	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Non-EQ Electrical Cable Connections Program See Section B.2.45.
GALL Report Chapter X		
X.M1	Metal Fatigue of Reactor Coolant Pressure Boundary	Fatigue Monitoring Program See Section B.3.1.
X.S1	Concrete Containment Tendon Prestress	Not applicable. SSES containments do not contain pre-stressed tendons.

Table B-1
Correlation of NUREG-1801 and SSES Aging Management Programs
(continued)

Number	NUREG-1801 Program	Corresponding SSES Program
X.E1	Environmental Qualification (EQ) of Electrical Components	EQ Program See Section B.3.2.
SSES Plant-Specific Programs		
N/A	Plant-Specific Program	Area-Based NSAS Inspection See Section B.2.46.
N/A	Plant-Specific Program	Leak Chase Channel Monitoring Activities See Section B.2.47.
N/A	Plant-Specific Program	Preventive Maintenance Activities – RCIC/HPCI Turbine Casings See Section B.2.48.

Table B-2
Consistency of SSES Aging Management Programs with NUREG-1801

Program Name	New / Existing	Consistent with NUREG-1801	Exceptions to NUREG-1801	Plant-Specific	Enhancement Required
Area-Based NSAS Inspection	New	--	--	Yes	--
Bolting Integrity Program	Existing	--	Yes	--	Yes
Buried Piping and Tanks Inspection Program	New	--	Yes	--	--
Buried Piping Surveillance Program	New	--	Yes	--	--
BWR CRD Return Line Nozzle Program	Existing	--	Yes	--	--
BWR Feedwater Nozzle Program	Existing	Yes	--	--	--
BWR Penetrations Program	Existing	--	Yes	--	--
BWR Stress Corrosion Cracking (SCC) Program	Existing	Yes	--	--	--
BWR Vessel ID Attachment Welds Program	Existing	Yes	--	--	--
BWR Vessel Internals Program	Existing	Yes	--	--	Yes
BWR Water Chemistry Program	Existing	Yes	--	--	--
Chemistry Program Effectiveness Inspection	New	Yes	--	--	--

Table B-2
Consistency of SSES Aging Management Programs with NUREG-1801
(continued)

Program Name	New / Existing	Consistent with NUREG-1801	Exceptions to NUREG-1801	Plant-Specific	Enhancement Required
Closed Cooling Water Chemistry Program	Existing	--	Yes	--	--
Condensate and Refueling Water Storage Tanks Inspection	New	Yes	--	--	--
Containment Leakage Rate Test Program	Existing	Yes	--	--	--
Cooling Units Inspection	New	Yes	--	--	--
Crane Inspection Program	Existing	Yes	--	--	--
EQ Program	Existing	Yes	--	--	--
Fatigue Monitoring Program	Existing	Yes	--	--	Yes
Fire Protection Program	Existing	--	Yes	--	--
Fire Water System Program	Existing	Yes	--	--	Yes
Flow-Accelerated Corrosion (FAC) Program	Existing	Yes	--	--	--
Fuel Oil Chemistry Program	Existing	--	Yes	--	--
Heat Exchanger Inspection	New	Yes	--	--	--
Inservice Inspection (ISI) Program	Existing	--	Yes	--	--

Table B-2
Consistency of SSES Aging Management Programs with NUREG-1801
(continued)

Program Name	New / Existing	Consistent with NUREG-1801	Exceptions to NUREG-1801	Plant-Specific	Enhancement Required
Inservice Inspection (ISI) Program - IWE	Existing	Yes	--	--	--
Inservice Inspection (ISI) Program – IWF	Existing	Yes	--	--	--
Inservice Inspection (ISI) Program – IWL	Existing	Yes	--	--	--
Leak Chase Channel Monitoring Activities	Existing	--	--	Yes	--
Lubricating Oil Analysis Program	Existing	--	Yes	--	Yes
Lubricating Oil Inspection	New	Yes	--	--	--
Main Steam Flow Restrictor Inspection	New	Yes	--	--	--
Masonry Wall Program	Existing	Yes	--	--	Yes
Metal-Enclosed Bus Inspection Program	New	Yes	--	--	--
Monitoring and Collection System Inspection	New	Yes	--	--	--
Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program	New	Yes	--	--	--
Non-EQ Electrical Cables and Connections Visual Inspection Program	New	Yes	--	--	--

Table B-2
Consistency of SSES Aging Management Programs with NUREG-1801
(continued)

Program Name	New / Existing	Consistent with NUREG-1801	Exceptions to NUREG-1801	Plant-Specific	Enhancement Required
Non-EQ Electrical Cable Connections Program	New	Yes	--	--	--
Non-EQ Inaccessible Medium-Voltage Cables Program	New	Yes	--	--	--
Piping Corrosion Program	Existing	--	Yes	--	--
Preventive Maintenance Activities – RCIC / HPCI Turbine Casings	Existing	--	--	Yes	--
Reactor Head Closure Studs Program	Existing	Yes	--	--	--
Reactor Vessel Surveillance Program	Existing	--	Yes	--	--
RG 1.127 Water-Control Structures Inspection	Existing	Yes	--	--	Yes
Selective Leaching Inspection	New	Yes	--	--	--
Small Bore Class 1 Piping Inspection	New	Yes	--	--	--
Structures Monitoring Program	Existing	Yes	--	--	Yes
Supplemental Piping/Tank Inspection	New	Yes	--	--	--
System Walkdown Program	Existing	Yes	--	--	Yes

Table B-2
Consistency of SSES Aging Management Programs with NUREG-1801
(continued)

Program Name	New / Existing	Consistent with NUREG-1801	Exceptions to NUREG-1801	Plant-Specific	Enhancement Required
Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program	New	Yes	--	--	--

B.2.1 Inservice Inspection (ISI) Program

Program Description

The purpose of the Inservice Inspection (ISI) Program is to manage cracking and loss of material of multiple reactor coolant system pressure boundary components, including the reactor vessel, a limited number of internals components, and the reactor coolant system pressure boundary. The Inservice Inspection (ISI) Program was developed as required by 10 CFR 50.55a. The program is in accordance with the requirements detailed in the 1998 Edition through the 2000 Addenda, of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, Division 1, Subsections IWA, IWB, IWC, IWD, IWE, IWF, IWL, Mandatory Appendices, Inspection Program B of IWA-2432, and approved ASME Code Cases.

The inservice inspections conducted throughout the service life of SSES will comply, to the extent practical, with the requirements of the ASME Code Section XI Edition and Addenda incorporated by reference in 10 CFR 50.55a(b) 12 months prior to the start of the inspection interval, subject to prior approval via letter from the NRC. This is consistent with NRC statements of consideration (SOC) for 10 CFR 54 associated with the adoption of new editions and addenda of the ASME Code in 10 CFR 50.55a. Therefore, conducting the SSES Inservice Inspection (ISI) Program in accordance with the 1998 Edition through the 2000 Addenda of the ASME Code, Section XI, is consistent with the requirements of NUREG-1801, Section XI.M1, “ASME Section XI Inservice Inspection.”

The ASME Section XI Inservice Inspection (ISI) Program in accordance with Subsections IWB, IWC or IWD has been shown to be generally effective in managing aging effects in Class 1, 2 or 3 components and their integral attachments in light-water cooled power plants. However, in certain cases, the ASME Inservice Inspection (ISI) Program is to be augmented to manage effects of aging for license renewal and is so identified in the GALL report.

NUREG-1801 Consistency

The SSES Inservice Inspection (ISI) Program is an existing program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M1, “ASME Section XI Inservice Inspection,” with an exception.

Exceptions to NUREG-1801

Program Element Affected:

- **Detection of Aging Effects** –

  The SSES Inservice Inspection (ISI) Program uses "Risk Informed" methodology rather than Code tables to determine inspection samples of certain welds.

Required Enhancements

None.

Operating Experience

Recent SSES operating experience related to inservice inspection is documented in the Unit 1 and Unit 2 Inservice Inspection Outage Summary Reports. Specific examples of inservice inspection findings are documented in Condition Reports. SSES operating experience is consistent with industry experience, a large number of examinations are being performed, and an occasional indication is being found and resolved. No aging mechanisms not already addressed have been discovered. The extensive industry operating experience with ASME Inservice Inspection Programs to date provides assurance that the programs are effective in managing effects of aging so that components crediting these programs can perform their intended function consistent with the current licensing basis during the period of extended operation.

An internal audit of the SSES program for Inservice Inspection and Inservice Testing was conducted by the SSES Quality Assurance department from February 9 to April 16 of 2004. The purpose of the audit included verifying that the SSES program met the requirements of 10 CFR 50.55a. The audit resulted in no findings, and two weaknesses concerning oversight and control of welding during Unit 1's thirteenth refueling outage. Condition reports were written and processed to improve the weaknesses.

Conclusion

The Inservice Inspection (ISI) Program has been demonstrated to be capable of managing cracking and loss of material for components of the reactor coolant pressure boundary, including piping, valves, the reactor vessel, and selected vessel internals. The Inservice Inspection (ISI) Program provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.2 BWR Water Chemistry Program

Program Description

The purpose of the BWR Water Chemistry Program is to mitigate damage due to loss of material and cracking of plant components that are within the scope of license renewal and contain treated water. The program manages the relevant conditions that could lead to the onset and propagation of a loss of material or cracking through proper monitoring and control consistent with pertinent EPRI water chemistry guidelines. The SSES BWR Water Chemistry Program currently implements BWRVIP-29 (TR-103515) and is in the process of incorporating the recommendations of BWRVIP-130. The relevant conditions are specific parameters such as sulfates, halogens, dissolved oxygen, and conductivity that could lead to or are indicative of conditions for corrosion, erosion, or stress corrosion cracking (SCC) of susceptible materials. The BWR Water Chemistry Program is a mitigation program.

The BWR Water Chemistry Program is supplemented by a separate one-time inspection of representative areas of select treated water systems to provide further confirmation that loss of material and cracking are effectively mitigated or to detect and characterize whether, and to what extent, degradation is occurring. Refer to Section B.2.22 for discussion of the Chemistry Program Effectiveness Inspection.

NUREG-1801 Consistency

The BWR Water Chemistry Program is an existing SSES program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M2, “Water Chemistry”.

Exceptions to NUREG-1801

None.

Required Enhancements

None.

Operating Experience

The BWR Water Chemistry Program for SSES is an ongoing program that effectively incorporates the best practices of industry guidance, vendor recommendations, and industry experience in providing the definition of chemistry control requirements, monitoring of plant performance in implementing them, and continual review of their adequacy. The program incorporates EPRI and Institute of Nuclear Power Operations (INPO) guideline documents as well as “lessons learned” from site and other utility operating experience. The program has been and continues to be subject to periodic

internal and external assessment of the performance to identify strengths and potential adverse trends.

SSES operating experience did not reveal a loss of component intended function for components exposed to reactor coolant, feedwater, condensate, control rod drive hydraulic water, or accident mitigation water (i.e., suppression pool) that could be attributed to an inadequacy of the BWR Water Chemistry Program. The known chemistry-related problems suffered by other utilities are a consideration in the ongoing refinement of the BWR Water Chemistry Program. Abnormal chemistry conditions are promptly identified, evaluated (with increased sampling to better trend the data), and corrected.

Conclusion

The BWR Water Chemistry Program has been demonstrated to be capable of managing loss of material and cracking for susceptible components through monitoring and control of the relevant parameters in treated water. The BWR Water Chemistry Program provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.3 Reactor Head Closure Studs Program

Program Description

The purpose of the Reactor Head Closure Studs Program is to manage cracking for the reactor head closure studs. The Reactor Head Closure Studs Program includes (a) inservice inspection in conformance with the requirements of the ASME Code, Section XI, Subsection IWB (edition and addenda described in B.2.1), Table IWB 2500-1, and (b) preventive measures in accordance with Regulatory Guide 1.65 to mitigate cracking. The Reactor Head Closure Studs Program is implemented by the design of the plant and the Inservice Inspection (ISI) Program.

NUREG-1801 Consistency

The SSES Reactor Head Closure Studs Program is an existing program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M3, “Reactor Head Closure Studs.”

Exceptions to NUREG-1801

None.

Required Enhancements

None.

Operating Experience

Stress corrosion cracking has occurred in other BWR reactor head closure studs as described in General Electric RICSIL-55. However, review of SSES operating experience (condition reports, work orders, etc.) has not revealed any reactor head closure stud cracking or loss of material. The existing program is adequately managing the aging of the reactor head closure studs to maintain intended function, and will continue to do so for the period of extended operation.

Conclusion

The Reactor Head Closure Studs Program has been demonstrated to be capable of managing cracking for the reactor head closure studs, nuts washers, and bushings. The Reactor Head Closure Studs Program provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.4 BWR Vessel ID Attachment Welds Program

Program Description

The purpose of the BWR Vessel ID Attachment Welds Program is to manage cracking of the welds for internal attachments to the reactor pressure vessel.

The program includes (a) inspection and flaw evaluation in accordance with the guidelines of the NRC-approved Boiling Water Reactor Vessel and Internals Project (BWRVIP) report BWRVIP-48 and (b) monitoring and control of reactor coolant water chemistry in accordance with the guidelines of BWRVIP-29 to ensure the long-term integrity and safe operation of the vessel inside diameter (ID) attachment welds. The BWR Vessel ID Attachment Welds Program is based on the inspection and flaw evaluation guidelines of the BWRVIP, and is implemented by the Inservice Inspection (ISI) Program in accordance with the ASME Code, Section XI, Table IWB 2500-1. Refer to Section B.2.1 for details of the Inservice Inspection (ISI) Program.

NUREG-1801 Consistency

The SSES BWR Vessel ID Attachment Welds Program is an existing program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M4, “BWR Vessel ID Attachment Welds.”

Exceptions to NUREG-1801

None.

Required Enhancements

None.

Operating Experience

SSES site specific operating experience agrees with industry operating experience that the BWR Vessel ID Attachment Welds Program has been effective in managing aging effects. SSES operating experience to date has not detected any flaws in reactor vessel attachment welds. Therefore, continued implementation of the program provides reasonable assurance that effects of aging will be managed so that the reactor vessel ID attachment welds can perform their intended function consistent with the current licensing basis during the period of extended operation.

Conclusion

The BWR Vessel ID Attachment Welds Program has been demonstrated to be capable of managing cracking of the vessel internal attachment welds. The BWR Vessel ID Attachment Welds Program provides reasonable assurance that the aging effects will

be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.5 BWR Feedwater Nozzle Program

Program Description

The purpose of the BWR Feedwater Nozzle Program is to manage cracking of the feedwater nozzles. The BWR Feedwater Nozzle Program is in accordance with ASME Section XI and Boiling Water Reactor Vessel and Internals Project (BWRVIP) guidelines.

This program includes (a) enhanced inservice inspection in accordance with the requirements of the ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWB, Table IWB 2500-1 (edition and addenda described in B.2.1) and the recommendations of report GE-NE-523-A71-0594, and (b) system modifications (completed on the spargers prior to initial startup) to mitigate cracking. The program specifies periodic ultrasonic inspection of critical regions of the feedwater nozzles.

NUREG-1801 Consistency

The SSES BWR Feedwater Nozzle Program is an existing program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M5, “BWR Feedwater Nozzle.”

Exceptions to NUREG-1801

None.

Required Enhancements

None.

Operating Experience

The original design of the reactor vessel for SSES did not include cladding of the feedwater nozzles, but did include an adequate feedwater flow controller and routing of RWCU return flow to reduce thermal cycles during times of low feedwater flow. In addition, the original feedwater sparger thermal sleeves were replaced with an improved design. Pre-service examinations of the six Unit 1 feedwater nozzles and inner radii were conducted with no indications found. Subsequent inspections of the Unit 1 and Unit 2 feedwater nozzles have resulted in no recordable indications. Consistent with industry operating experience and corresponding NRC-approved recommendations, the inspection frequency was changed to once per interval during the twelfth Unit 1 refueling outage.

SSES operating experience, consistent with industry operating experience, shows that the BWR Feedwater Nozzle Program has been effective in managing aging effects in

that no feedwater nozzle cracking has been observed at SSES. Therefore, continued implementation of the program provides reasonable assurance that effects of aging will be managed so that the feedwater nozzles can perform their intended function consistent with the current licensing basis during the period of extended operation.

Conclusion

The BWR Feedwater Nozzle Program has been demonstrated to be capable of managing cracking of the feedwater nozzles. The BWR Feedwater Nozzle Program provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.6 BWR CRD Return Line Nozzle Program

Program Description

The purpose of the BWR CRD Return Line Program is to manage cracking of the control rod drive return line (CRDRL) nozzle, cap, and connecting weld. This program was developed in response to industry events involving the CRD return line nozzle.

SSES modified the CRD System by cutting the CRDRL and capping the nozzle prior to initial plant startup. The CRDRL was not rerouted. SSES has completed all of the requirements specified in NUREG-0619 for the CRD System modifications performed at SSES, including the final liquid penetrant testing (PT) inspection and system performance testing. The SSES BWR CRD Return Line Nozzle Program monitors the effects of cracking on the intended function of the CRDRL nozzle by performing inservice inspections in conformance with the ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWB, Table IWB 2500-1 (edition and addenda described in B.2.1). Any cracks that are detected will be dispositioned in accordance with the requirements of ASME Section XI.

NUREG-1801 Consistency

The SSES BWR CRD Return Line Nozzle Program is an existing program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M6, "BWR Control Rod Drive Return Line Nozzle," with an exception.

Exceptions to NUREG-1801

Program Element Affected:

- **Acceptance Criteria –**

  SSES intends to repair any CRDRL nozzle cracks, if found, by weld overlay rather than removing them by grinding as suggested in NUREG-1801. This is consistent with current industry practice and represents an update to NUREG-1801. SSES will obtain NRC approval prior to implementation of a weld overlay repair.

Required Enhancements

None.

Operating Experience

Prior to initial startup of the SSES units, the CRDRL nozzle was cut and capped with no alternate return line flow established to implement the recommendations of NUREG-

0619. CRD system functionality (without return line flow) has been demonstrated by initial startup testing, described in FSAR Section 14.2, and subsequent system operation. Pre-startup liquid penetrant and dye-penetrant testing of the capped CRDRL nozzle was performed with no recordable indications found. Subsequent inspections also did not find any recordable indications.

SSES operating experience is consistent with industry experience and confirms that the BWR CRD Return Line Nozzle Program has been effective in managing cracking of the CRDRL nozzle. Periodic inspections of the CRDRL nozzles on SSES Units 1 and 2, as recently as 2005, have found no cracking. Therefore, continued implementation of the program provides reasonable assurance that effects of aging will be managed so that the CRDRL nozzle can perform its intended function consistent with the current licensing basis during the period of extended operation.

Conclusion

The BWR CRD Return Line Nozzle Program has been demonstrated to be capable of managing cracking of the CRDRL nozzle. The BWR CRD Return Line Nozzle Program provides reasonable assurance that cracking will be managed such that the CRDRL nozzle will continue to perform its intended functions consistent with the current licensing basis for the period of extended operation.

B.2.7 BWR Stress Corrosion Cracking (SCC) Program

Program Description

The purpose of the BWR Stress Corrosion Cracking (SCC) Program is to manage stress corrosion cracking for stainless steel piping, valves, flow instruments, and pump casings. The program to manage stress corrosion cracking in pressure boundary piping made of stainless steel is delineated in NUREG-0313, Revision 2, and Nuclear Regulatory Commission (NRC) Generic Letter (GL) 88-01 and its Supplement 1. The program includes (a) preventive measures to mitigate intergranular stress corrosion cracking (IGSCC), and (b) inspection and flaw evaluation to monitor IGSCC and its effects. The NRC-approved Boiling Water Reactor Vessel and Internals Project (BWRVIP) report BWRVIP-75 allows for modifications of inspection scope in the GL 88-01 program.

NUREG-1801 Consistency

The SSES BWR Stress Corrosion Cracking (SCC) Program is an existing program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M7, “BWR Stress Corrosion Cracking.”

Exceptions to NUREG-1801

None.

Required Enhancements

None.

Operating Experience

Incidents of SCC in piping and components included in the BWR Stress Corrosion Cracking (SCC) Program have been limited at SSES due to low carbon weld conditions. Also, in 1988/1989, SSES performed induction heating stress improvement on various Unit 1 and 2 welds to reduce their susceptibility to SCC. In the seventeen years since the issuance of GL 88-01, industry operating experience and SSES plant specific operating experience show that this program has been effective in managing aging effects. Therefore, continued implementation of the program provides reasonable assurance that stress corrosion cracking of austenitic stainless steel will be managed so that components crediting the BWR Stress Corrosion Cracking (SCC) Program can perform their intended function consistent with the current licensing basis during the period of extended operation.

Conclusion

The BWR Stress Corrosion Cracking (SCC) Program has been demonstrated to be capable of managing cracking of stainless steel components. The BWR Stress Corrosion Cracking (SCC) Program provides reasonable assurance that cracking of stainless steel components will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.8 BWR Penetrations Program

Program Description

The purpose of the BWR Penetrations Program is to manage cracking of selected reactor vessel penetrations. The BWR Penetrations Program is implemented via the Inservice Inspection (ISI) Program (Refer to Section B.2.1) in compliance with ASME Section XI and the Boiling Water Reactor Vessel and Internals Project (BWRVIP) guidelines.

The program includes (a) inspection and flaw evaluation in conformance with the guidelines of NRC-approved BWRVIP reports BWRVIP-49 and BWRVIP-27, and (b) monitoring and control of reactor coolant water chemistry in accordance with the guidelines of BWRVIP-29 to ensure the long-term integrity and safe operation of reactor vessel internal components. The BWRVIP-49 report provides guidelines for instrument penetrations, and the BWRVIP-27 report addresses the standby liquid control (SLC) system nozzle or housing.

NUREG-1801 Consistency

The SSES BWR Penetrations Program is an existing program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M8, “BWR Penetrations Program,” with the following exception:

Exceptions to NUREG-1801

Program Element Affected:

- **Scope –**

  NUREG-1801 Section XI.M8 implies that the BWR Penetrations Program applies only to the standby liquid control (SLC) penetration (per BWRVIP-27) and instrument penetrations (per BWRVIP-49). However, NUREG-1801 Section IV.A1, also credits this program for managing the effects of aging for additional penetrations. The SSES BWR Penetrations Program is applied to additional penetrations, as follows, consistent with Section IV.A1 rather than XI.M8.

  In addition to the SLC and instrument penetrations, the BWR Penetrations Program is also credited for managing the effects of aging for the vessel flange leakoff penetration, vessel drain penetration, control rod drive penetrations, and incore flux monitor penetrations.

Required Enhancements

None.

Operating Experience

SSES operating experience has found no crack indications in the reactor vessel penetrations. As a participant in the BWRVIP, SSES is committed to incorporate lessons learned from operating experience of the entire BWR fleet. Both SSES and industry operating experience show that the BWR Penetrations Program has been effective in managing aging effects. Therefore, continued implementation of the program provides reasonable assurance that effects of aging will be managed so that the reactor vessel penetrations crediting this program can perform their intended function consistent with the current licensing basis during the period of extended operation.

Conclusion

The BWR Penetrations Program has been demonstrated to be capable of managing cracking of reactor vessel penetrations. The BWR Penetrations Program provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.9 BWR Vessel Internals Program

Program Description

The BWR Vessel Internals Program for SSES manages aging of the reactor vessel internals in accordance with the requirements of ASME Section XI and the Boiling Water Reactor Vessel and Internals Project (BWRVIP) documents. The purpose of the BWR Vessel Internals Program is to manage cracking, loss of material, and reduction of fracture toughness for various subcomponents of the reactor vessel internals.

The program includes (a) inspection and flaw evaluation in conformance with the guidelines of applicable and NRC-approved BWRVIP reports and (b) monitoring and control of reactor coolant water chemistry in accordance with the guidelines of BWRVIP-29 to ensure the long-term integrity and safe operation of reactor vessel internal components.

NUREG-1801 Consistency

The BWR Vessel Internals Program is an existing SSES program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M9, "BWR Vessel Internals."

Exceptions to NUREG-1801

None.

Required Enhancements

Prior to the period of extended operation the enhancements listed below will be implemented in the identified program element:

- **Scope of Program –**

  The program will include requirements to inspect five percent of the top guide locations within six years after entering the period of extended operation and an additional five percent of the top guide locations within twelve years after entering the period of extended operation. The top guide locations to be inspected are those subject to neutron fluence levels that exceed the IASCC threshold of 5.0E+20 n/cm^2. The inspections shall be performed using the enhanced visual inspection technique, EVT-1. The extent of the examination and its frequency will be based on a ten percent sample of the total population, which includes all grid beam and beam-to-beam crevice slots.

Operating Experience

SSES operating experience is consistent with industry experience; a large number of examinations are being performed, and an occasional indication is being found and resolved. No aging mechanisms not already addressed have been discovered. The extensive industry operating experience with the BWRVIP Program to date provides assurance that the program is effective in managing effects of aging so that components crediting these programs can perform their intended function consistent with the current licensing basis during the period of extended operation.

INPO conducted a BWRVIP vessel and internals review visit at SSES during September 13-16, 2004. The visit included a review of inspections, flaw analysis and repairs, mitigation activities and leakage detection and equipment monitoring. INPO results are documented in an SSES self assessment report. The assessment team concluded that the BWRVIP program was being effectively implemented.

The SSES BWR Vessel Internals Program includes provisions to adopt any BWRVIP guideline changes in the future. This assures that operating experience from the BWR fleet will continue to be incorporated into the SSES program.

Conclusion

The BWR Vessel Internals Program is effectively managing loss of material, cracking, and reduction of fracture toughness for the reactor internals subcomponents, and will continue to effectively manage them through the period of extended operation. The BWR Vessel Internals Program will provide reasonable assurance that these aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.10 Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program

Program Description

The purpose of the Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program is to augment the visual inspection of the reactor vessel internals done in accordance with the American Society of Mechanical Engineers (ASME) Code, Section XI, Subsection IWB, Category B-N-1 and B-N-2. The inspection is augmented to detect the effects of loss of fracture toughness due to thermal aging and neutron irradiation embrittlement of cast austenitic stainless steel (CASS) reactor vessel internal components. The aging management program (AMP) includes (a) identification of susceptible components determined to be limiting from the standpoint of thermal aging susceptibility (i.e., ferrite and molybdenum contents, casting process, and operating temperature) and/or neutron irradiation embrittlement (neutron fluence), and (b) for each potentially susceptible component, aging management is accomplished through either a supplemental examination of the affected component based on the neutron fluence to which the component has been exposed as part of the SSES 10-year Inservice Inspection (ISI) Program during the license renewal term or a component-specific evaluation to determine its susceptibility to loss of fracture toughness.

The Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program is a new aging management program that will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The SSES Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program is a new program that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M13, “Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS).”

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The SSES Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program will screen reactor vessel internals components to determine which components are susceptible to reduction of fracture toughness due to the

combination of thermal aging and neutron embrittlement on the basis of casting method, molybdenum content, and ferrite content.

- Preventive Actions
  The SSES program will be an evaluation and inspection program with no actions to prevent or mitigate aging effects. The program will be implemented by analyses and augmenting of the Inservice Inspection program. See further discussion under *Detection of Aging Effects*.

- Parameters Monitored or Inspected
  The SSES program will screen components as discussed under *Scope of Program*. Components identified as susceptible by the screening will be individually evaluated for susceptibility based on neutron fluence and component material properties following the guidelines in NUREG/CR-4513, Revision 1. Those components evaluated to require inspection will be inspected by augmentation of the Inservice Inspection (ISI) Program as discussed under *Detection of Aging Effects*.

- Detection of Aging Effects
  The SSES Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program will first screen components as discussed under *Scope of Program*, then evaluate those components screened as susceptible to Reduction of Fracture Toughness as discussed under *Parameters Monitored or Inspected*. Those components or portions of components evaluated to be limiting from the standpoint of thermal aging susceptibility, neutron fluence, and cracking susceptibility will be inspected by augmenting the Inservice Inspection (ISI) Program. Supplemental inspections will be added to the 10-year ISI Program Plan for the first 10 years of the period of extended operation. Examination techniques will comply with the requirements of NUREG-1801 Section XI.M13. As determined necessary, nondestructive examinations (including visual, ultrasonic, and surface techniques) will be performed by qualified personnel following procedures consistent with Section XI of ASME B&PV Code and 10CFR50, Appendix B.

- Monitoring and Trending
  The SSES Inservice Inspection (ISI) Program already inspects in accordance with ASME Section XI and IWB-2400. Any augmented inspections resulting from the screening and evaluation discussed under *Scope of Program* and *Parameters Monitored or Inspected* will be added to the Inservice Inspection (ISI) Program as discussed under *Detection of Aging Effects*.

- Acceptance Criteria
  Flaws found by the augmented inspections will be evaluated in accordance with the ASME Boiler and Pressure Vessel Code, Section IWB-3500. Flaw evaluation for CASS components with up to 25 percent ferrite content will be in accordance with ASME Sections IWB-3640 and IWB-3641. Flaw evaluation for CASS components

with greater than 25 percent ferrite content will be developed on a case-by-case basis using fracture toughness data.

- Corrective Actions
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program is a new program for which there is no SSES-specific operating experience. Industry operating experience will be considered in development of this program, as appropriate.

Required Enhancements

None.

Conclusion

The Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program will manage reduction of fracture toughness for Cast Austenitic Stainless Steel components of the reactor vessel internals. The Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program will provide reasonable assurance that the aging effects will be managed such that the reactor vessel internals will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.11 Flow-Accelerated Corrosion (FAC) Program

Program Description

The purpose of the Flow-Accelerated Corrosion (FAC) Program is to manage loss of material for carbon steel components located in systems that are susceptible to flow-accelerated corrosion, also called erosion/corrosion. The Flow-Accelerated Corrosion (FAC) Program is a condition monitoring program which ensures that the integrity of piping systems susceptible to flow-accelerated corrosion is maintained. The program was developed in response to NRC Bulletin 87-01 and NRC Generic Letter 89-08. The program follows the guidance and recommendations of EPRI NSAC-202L and combines the elements of predictive analysis, inspections (to baseline and monitor wall-thinning), industry experience, station information gathering and communication, and engineering judgment to monitor and predict flow-accelerated corrosion wear rates.

NUREG-1801 Consistency

The Flow-Accelerated Corrosion (FAC) Program is an existing SSES program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M17, “Flow-Accelerated Corrosion.”

Exceptions to NUREG-1801

None.

Required Enhancements

None.

Operating Experience

Hydrogen Water Chemistry (HWC), which is known to impact flow-accelerated corrosion, has been implemented at SSES. The Reactor Water Cleanup System (RWCU) was predicted to see the most effect from the implementation. Baseline inspections for the implementation of HWC were conducted during the Unit 1 ninth refueling outage. Subsequent inspections for both units have included HWC considerations.

The Flow-Accelerated Corrosion (FAC) Program is a mature, well functioning program at SSES that is effective in managing flow-accelerated corrosion in carbon steel piping and components containing high-energy fluids. The program has been the subject of internal assessments, with industry participation, and includes the evaluation of industry operating experience for impact to the program. An assessment in late 2002 resulted in changes to component gridding requirements and ultrasonic testing data evaluation

methodologies, with an evaluation performed for each examined component, to further upgrade and improve the program.

This upgraded Flow-Accelerated Corrosion (FAC) Program was implemented during the Unit 1 thirteenth refueling outage (2004) and Unit 2 twelfth refueling outage (2005). During, the Unit 1 thirteenth refueling outage, flow-accelerated corrosion inspections were conducted for 123 components. Eleven expanded scope inspections, as a result of three component inspections, were also performed. Five of the examinations resulted in the generation of a condition report for evaluation, two for apparent unanticipated increase in wear and three for components with a projected remaining life less than one cycle. Five planned piping replacements (upgrades) and one contingency piping replacement with flow-accelerated corrosion resistant material (e.g., ASTM A335 P22) were made during the Unit 1 thirteenth refueling outage, with no unplanned replacements necessary. In addition, future inspection locations for subsequent Unit 1 and Unit 2 outages were identified based on the Unit 1 thirteenth refueling outage results.

Flow-accelerated corrosion inspections were also conducted for 123 components during the Unit 2 twelfth refueling outage. Eleven expanded scope inspections, as a result of four component inspections, were also performed. Eight of the examinations resulted in the generation of a condition report. The condition reports were dispositioned as replacement/repair, with flow-accelerated corrosion resistant materials, or use-as-is based on the evaluation. Five planned piping replacements (upgrades) and one contingency piping replacement with flow-accelerated corrosion resistant material (e.g., ASTM A335 P11) were made during the Unit 1 thirteenth refueling outage. In addition, there were three unplanned piping replacements made with either flow-accelerated corrosion resistant or like materials. One of these unplanned replacements was of a offgas recombiner drain line, as a result of steam trap failure, and expanded scope inspections did not reveal degradation elsewhere. Another was of a one inch reactor feed pump turbine stop valve drain line, with like material, recommended for replacement during the outage based on results of inspection in a parallel train. The third was of a nozzle, with flow-accelerated corrosion resistant material, as a result of expanded scope inspections.

Refueling outage inservice inspection results, including those for flow-accelerated corrosion, prior to the program upgrade discussed above have been selectively summarized in reports to the NRC for information. For example, PPL Letters PLA-5220, dated July 2000, and PLA-5649, dated July 2003, address the results of the flow-accelerated corrosion inspections for the eleventh refueling outage for SSES Unit 1 and Unit 2 respectively. Section H (and Appendix E) of PLA-5649 indicates that, for Unit 2, inspection of 103 components resulted in the issuance of 40 condition reports, repair of 11 piping segments (with remaining life less than one cycle), and re-inspection of six piping segments planned for the subsequent refueling outages.

Conclusion

The Flow-Accelerated Corrosion (FAC) Program has been demonstrated to be capable of detecting and managing loss of material for components susceptible to flow-accelerated corrosion. The Flow-Accelerated Corrosion (FAC) Program provides reasonable assurance that the aging effect will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.12 Bolting Integrity Program

Program Description

The Bolting Integrity Program is a combination of existing SSES activities that, in conjunction with other credited programs, addresses the management of aging for the bolting of subject mechanical components within the scope of license renewal. The Bolting Integrity Program relies on manufacturer/vendor information and industry recommendations for the proper selection, assembly and maintenance of bolting for pressure-retaining enclosures. The Bolting Integrity Program includes, through other credited programs, the periodic inspection of bolting for indication of degradation such as leakage, loss of material, or cracking.

Prior to the period of extended operation, the Bolting Integrity Program will include a specific precaution against the use of sulfur (sulfide) containing compounds as a lubricant for bolted connections.

NUREG-1801 Consistency

The Bolting Integrity Program is an existing SSES program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M18, "Bolting Integrity", with the following exceptions:

Exceptions to NUREG-1801

Program Elements Affected:

- **Scope of Program –**

  The Bolting Integrity Program is not credited for the aging management of structural bolting (including component support bolting). Consistent with the corresponding NUREG-1801 items, aging management of structural bolting is accomplished under the Inservice Inspection (ISI) Program – IWF and Structures Monitoring Program.

- **Preventive Actions (and Scope of Program) –**

  The Bolting Integrity Program does not explicitly address the guidelines outlined in EPRI NP-5769, or as delineated in NUREG-1339. However, the Bolting Integrity Program does rely on the recommendations of the manufacturer/vendor and the industry, contained in EPRI documents NP-5067 and TR-104213, and will include a precaution against the use of any sulfur (sulfide) containing compound as a lubricant.

- **Parameters Monitored or Inspected –**

  The inspection of structural bolting (including component support bolting) for indication of potential problems is accomplished under the Inservice Inspection (ISI) Program – IWF and Structures Monitoring Program, consistent with the corresponding NUREG-1801 items.

  Loss of preload/loss of pre-stress is not an aging effect requiring management for SSES bolting since SSES systems operate below the 700ºF threshold where stress relaxation becomes a plausible age-related concern. Improper bolting application or maintenance issues that might result in loss of preload are current plant operational (design) concerns, as supported by site operating experience, and are not related to aging.

- **Detection of Aging Effects –**

  Structural bolting (including component support bolting) both inside and outside containment is inspected by visual inspection through the Inservice Inspection Program – IWF or Structures Monitoring Program, consistent with the corresponding NUREG-1801 items.

- **Monitoring and Trending –**

  Periodic inspection of bolting, other than of the Class 1, 2 and 3 bolting performed by the Inservice Inspection (ISI) Program, is performed through the System Walkdown Program, including follow-up inspections if leakage is detected. The frequency of follow-up inspections is established by engineering evaluation of the identified problem. SSES operating experience has not shown a need for a set frequency (e.g., daily) applicable to all cases involving bolting.

- **Acceptance Criteria –**

  The acceptance criteria for structural bolting (including component support bolting) both inside and outside containment are addressed in the Inservice Inspection (ISI) Program – IWF and/or Structures Monitoring Program, consistent with the corresponding NUREG-1801 items.

  The program does not specify acceptance criteria for bolting. However, the Inservice Service Inspection (ISI) Program and the System Walkdown Program, through which the periodic visual inspection of mechanical components within the scope of license renewal are performed, do include acceptance criteria for evidence of degradation of components, including the bolting.

Required Enhancements

Prior to the period of extended operation the enhancement listed below will be implemented in the identified program element:

- **Preventive Actions –**

  The program will include a specific precaution against the use of sulfur (sulfide) containing compounds, such as molybdenum disulfide (MoS_2), as a lubricant for threaded fasteners (bolting), to further preclude the potential for stress corrosion cracking.

Operating Experience

Review of operating experience shows that the Bolting Integrity Program has been effective in managing aging effects. No instances of cracking or age-related loss of preload have been identified for bolting/fasteners, though some corroded bolting or facing surfaces (e.g., from general corrosion or leakage) have been identified at SSES. A recent evaluation of bolting discrepancies during the 2004 ISI and engineering inspections identified improper design or improper assembly. This resulted in revision of the pertinent SSES procedures and training of personnel to further ensure proper assembly/installation and more properly focused walkdowns.

Conclusion

The SSES Bolting Integrity Program been demonstrated to be capable of managing loss of material and cracking for the bolting of pressure-retaining mechanical components. When enhanced to further preclude the potential for SCC, the Bolting Integrity Program will provide reasonable assurance that the aging effects will be managed such that bolting will continue to perform its intended functions consistent with the current licensing basis for the period of extended operation.

B.2.13 Piping Corrosion Program

Program Description

The purpose of the Piping Corrosion Program is to manage fouling due to particulates (e.g., corrosion products) and biological material (micro- and/or macro-organisms), and loss of material due to crevice, galvanic, general, pitting, and microbiologically influenced corrosion (MIC), and erosion for components located in systems within the scope of the program that are exposed to a raw water environment. The program also manages the applicable aging effects for the internal environments of heat exchanger components within the scope of the program (e.g., the lubricating oil environment for the RHR pump motor oil cooler).

The Piping Corrosion Program is a combination of condition monitoring program (consisting of inspections, surveillances, and testing to detect the presence of, and to assess the extent of, fouling and loss of material) and a mitigation program (consisting of chemical treatments and cleaning activities to minimize fouling and loss of material). The program fully meets the intent of NRC Generic Letter (GL) 89-13, "Service Water System Problems Affecting Safety-Related Equipment."

NUREG-1801 Consistency

The Piping Corrosion Program is an existing SSES program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M20, "Open-Cycle Cooling Water System," with the following exceptions:

Exceptions to NUREG-1801

Program Elements Affected:

- **Preventive Actions –**

  NUREG-1801 states that system components are lined or coated. SSES subject components are lined or coated only where necessary to protect the underlying metal surfaces.

- **Monitoring and Trending –**

  NUREG-1801 states that testing and inspections are performed annually and during refueling outages. Inspection frequencies for the Piping Corrosion Program are based on operating conditions and past history; flow rates, water quality, lay-up and heat exchanger design.

Required Enhancements

None.

Operating Experience

SSES has implemented most of the recommended actions of NRC GL 89-13 and has justified any exceptions to those recommendations, thereby fully meeting the intent of the Letter. As a result, SSES has programs in place with operating experience to demonstrate that the effects of aging on the service water systems, and on the safety-related heat exchangers that they serve, will be effectively managed during the period of extended operation.

Conclusion

The Piping Corrosion Program has been demonstrated to be capable of detecting and managing loss of material and reduction in heat transfer for susceptible components in raw water environments. The Piping Corrosion Program provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.14 Closed Cooling Water Chemistry Program

Program Description

The purpose of the Closed Cooling Water Chemistry Program is to mitigate damage due to loss of material and cracking of plant components that are within the scope of license renewal and that contain treated water in a closed cooling water system or component (e.g., a heat exchanger) served by a closed cooling water system. The program manages the relevant conditions that could lead to the onset and propagation of a loss of material or cracking through proper monitoring and control of corrosion inhibitor concentrations consistent with the pertinent EPRI water chemistry guideline. The Closed Cooling Water Chemistry Program is a mitigation program.

The Closed Cooling Water Chemistry Program also includes monitoring of corrosion in the emergency diesel generator jacket water subsystem and is supplemented by a separate one-time inspection of representative areas of select closed cooling water cooling systems, as well as heat exchanger components served by closed cooling water systems, to provide confirmation that loss of material and cracking are effectively mitigated or to further detect and characterize whether, and to what extent, degradation is occurring. Refer to Section B.2.22 for discussion of the Chemistry Program Effectiveness Inspection and Section B.2.24 for discussion of the Heat Exchanger Inspection.

NUREG-1801 Consistency

The Closed Cooling Water Chemistry Program is an existing SSES program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M21, “Closed-Cycle Cooling Water System”, with the following exceptions:

Exceptions to NUREG-1801

Program Elements Affected:

- **Parameters Monitored or Inspected (and Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria)**

  The Closed Cooling Water Chemistry Program does not include performance or functional testing since performance and functional testing verify that component active functions can be accomplished, but in most cases, provide little definitive information or value with respect to the condition of passive components. In lieu of performance monitoring/functional testing, the Closed Cooling Water Chemistry Program includes monitoring of corrosion in the emergency diesel generator jacket water subsystem and is supplemented by the one-time Chemistry Program Effectiveness Inspection, which includes closed cooling

water system locations, and the one-time Heat Exchanger Inspection, which includes heat exchangers served by closed cooling systems, to confirm adequate mitigation in low flow and stagnant areas.

Required Enhancements

None.

Operating Experience

The Closed Cooling Water Chemistry Program for SSES is an ongoing program that effectively incorporates EPRI closed cooling water guideline documents as well as "lessons learned" from site and other utility operating experience. The program has been, and continues to be, subject to periodic internal and external assessment of its' performance to identify strengths and potential adverse trends. A recent internal assessment, including industry input, found that the program does an adequate job of maintaining effective chemistry control, with a strength noted in the aggressiveness in returning out-of-limit parameters to within limits in a timely manner. The assessment found no chemistry control related equipment reliability issues over the scope of the review.

Review of SSES operating experience did not reveal a loss of component intended function of subject components exposed to closed cooling water that could be attributed to an inadequacy of the Closed Cooling Water Chemistry Program. However, some continuing problems with the effectiveness of the program with respect to diesel jacket water corrosion/microbiological control were identified and evaluated in 1999. Additionally, instances of degradation (e.g., corrosion of the corresponding components) were noted by inspections associated with a 20-year overhaul in the same time period. Corrective actions included flushing of the jacket water, retaining an industry expert, and consideration of different biocide/corrosion inhibitor treatments. The appropriate improvements to the Closed Cooling Water Chemistry Program, including installation of instantaneous corrosion probes to monitor actual corrosion rates, were successfully implemented, as supported by subsequent operating experience with the diesel jacket water subsystem.

Conclusion

The Closed Cooling Water Chemistry Program has been demonstrated to be capable of managing loss of material and cracking for susceptible components through monitoring and control of the corrosion inhibitor concentrations and relevant parameters in treated water. The Closed Cooling Water Chemistry Program provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.15 Crane Inspection Program

Program Description

The Crane Inspection Program is credited with managing loss of material for cranes (including bridge, trolley, rails, and girders), monorails, and hoists within the scope of license renewal. The Crane Inspection Program at SSES is based on guidance contained in ANSI B30.2 for overhead and gantry cranes, ANSI B30.11 for monorail systems and underhung cranes, and ANSI B30.16 for overhead hoists. The inspections monitor structural members for the absence or signs of corrosion other than minor surface corrosion. The inspections are performed periodically for installed cranes and hoists (e.g., annually for reactor building crane and refueling platform, bi-annually for diesel generator bridge cranes). The crane/hoist inspection tag expires one year from inspection. Infrequently used cranes and hoists may have an inspection frequency of two years or prior to use.

The Crane Inspection Program provides reasonable assurance that the effects of aging are adequately managed for SSES cranes (including bridge, trolley, rails, and girders), monorails, and hoists and that their intended function is performed consistent with the current licensing basis for the period of extended operation.

NUREG-1801 Consistency

The SSES Crane Inspection Program is an existing program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M23, “Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems.”

Exceptions to NUREG-1801

None.

Required Enhancements

None.

Operating Experience

A review of crane/hoist inspections previously conducted at SSES and of industry operating experience confirms the reasonableness and acceptability of the inspections and their frequency in that degradation of cranes (including bridge, trolley, rails, and girders), monorails, and hoists was detected prior to loss of function. Related crane/hoist inspections have found no age-related degradation problems.

Conclusion

The Crane Inspection Program has been demonstrated to be capable of detecting and managing loss of material for cranes (including bridge, trolley, rails, and girders), monorails, and hoists within the scope of license renewal. The continued implementation of the Crane Inspection Program provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.16 Fire Protection Program

Program Description

The Fire Protection Program is an existing program that is described in the Fire Protection Review Report (FPRR) and which is credited with aging management of components with fire barrier functions in the scope of license renewal. Periodic visual inspections and functional tests are performed, as appropriate, of fire dampers, fire barrier walls, ceilings and floors, fire rated penetration seals (fire stops), fire wraps, fireproofing, and fire doors to ensure that functionality and operability are maintained. The Fire Protection Program is a condition monitoring program, comprised of tests and inspections generally in accordance with the applicable National Fire Protection Association (NFPA) recommendations.

NUREG-1801 Consistency

The Fire Protection Program is an existing SSES program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M26, “Fire Protection”, with the following exceptions:

Exceptions to NUREG-1801

Program Elements Affected:

- **Scope, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, Acceptance Criteria –**

  With respect to the halon/carbon dioxide (CO_2) suppression systems and the fuel oil supply line for the diesel-driven fire pump, inspections and tests included in the Fire Protection Program (and addressed in the Technical Requirements Manual) are not credited with aging management but do provide for periodic observation of the related components. While halon/CO_2 and fuel supply line internal conditions are not directly inspected or evaluated during these tests and inspections, they do provide indirect confirmation of whether degradation has occurred, prior to a loss of function.

Required Enhancements

None.

Operating Experience

A review of fire barrier, fire rated penetration seal, fire wrap, fireproofing, and fire door inspections previously conducted at SSES confirms the reasonableness and acceptability of the inspections and their frequency in that degradation of the fire barrier was detected prior to loss of function. These inspections have not found any age-

related problems. Fire door inspections revealed isolated cases of broken parts related to door operation and rusted/cracked hinge plates.

Several condition reports have been written against fire door degradation that determined that the fire door degradations were related to human performance and inadequate fire door installation. Isolated cases of fire rated penetration seal cracking and fire door seal degradation have also been identified. Corrective actions included additional personnel training, repair, and/or replacement activities.

The NRC presently conducts triennial fire protection team inspections at the SSES site to assess whether an adequate fire protection program has been implemented and maintained at SSES. The most recent of these inspections was conducted in November-December of 2005 and is documented in Inspection Report 05-09 for Dockets 50-387 and 50-388. This inspection had only one finding of very low safety significance that was not related to the portions of the program credited for aging management. With respect to passive fire protection, the team walked down accessible portions of selected fire areas to observe the material condition for boundaries (including walls, fire doors, and fire dampers), and electrical raceway fire barriers. In addition, the team reviewed installation/repair and qualification records for a sample of penetration seals and similar records for fire protection wraps. There were no findings of significance relative to passive fire protection.

Conclusion

The Fire Protection Program has been demonstrated to be capable of detecting and managing loss of material, cracking, delamination, separation, and change in material properties for susceptible components. The Fire Protection Program provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.17 Fire Water System Program

Program Description

The Fire Water System Program (sub-program of the overall Fire Protection Program) is an existing program that is described in the Fire Protection Review Report (FPRR) and which is credited with aging management of the water suppression components in the scope of license renewal. Periodic inspection and testing of the water-based fire suppression systems provides reasonable assurance that the systems will remain capable of performing their intended function. Periodic inspection and testing activities include hydrant and hose station inspections, fire main flushing, flow tests, and sprinkler inspections. The Fire Water System Program is a condition monitoring program, comprised of tests and inspections generally in accordance with the applicable National Fire Protection Association (NFPA) recommendations.

Prior to the period of extended operation the Fire Water System Program will be enhanced to incorporate sprinkler head sampling/replacements, in accordance with NFPA 25, and ultrasonic testing of representative above ground portions of water suppression piping that are exposed to water but which do not normally experience flow.

NUREG-1801 Consistency

The Fire Water System Program is an existing SSES program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M27, “Fire Water System”.

Exceptions to NUREG-1801

None.

Required Enhancements

Prior to the period of extended operation the enhancements listed below will be implemented in the identified program elements:

- **Detection of Aging Effects, Monitoring and Trending, Acceptance Criteria -**

  Sprinkler heads that have been in place for 50 years will either be replaced or representative samples will be submitted to a recognized laboratory for field service testing in accordance with NFPA 25 recommendations. Subsequent replacement or field service testing of representative samples will occur at 10-year intervals thereafter or until there are no sprinkler heads installed that will reach 50 years of service life during the period of extended operation.

- **Parameters Monitored or Inspected, Detection of Aging Effects -**

  Ultrasonic testing of representative portions of above ground fire protection piping that are exposed to water but do not normally experience flow will be performed after the issuance of the renewed license but prior to the end of the current operating term and at reasonable intervals thereafter, based on engineering review of the results.

Operating Experience

Water-suppression portions (subsystems) of the Fire Protection System are inspected, tested, and maintained following the pertinent NFPA recommendations and at the intervals recommended by the corresponding NFPA standards, or that have been effective for SSES. The water-suppression systems have demonstrated reliable performance with no significant problems in the approximate 20 years since their installation.

The NRC presently conducts triennial fire protection team inspections at the SSES site to assess whether an adequate fire protection program has been implemented and maintained at SSES. The most recent of these inspections was conducted in November-December of 2005 and is documented in Inspection Report 2005-09 for Dockets 50-387 and 50-388. This inspection had only one finding of very low safety significance that was not related to the portions of the program credited for aging management. With respect to fire suppression, the inspection included review of the design, maintenance, testing and operation of fire detection and suppression systems in selected plant fire areas. The inspection team performed a walkdown of accessible portions of suppression systems in the selected areas as well as of major system support equipment in other areas to assess the material condition of the systems and components. The inspection provided verification that manual and automatic detection systems were installed, tested and maintained in accordance with the NFPA code of record, with a minor finding related only to implementation of the fire brigade drill, which is not related to or credited for aging management.

Additionally, a past triennial NRC inspection of the SSES Fire Protection Program (including the Fire Water System Program), conducted in October-November of 1997 and documented in Inspection Report Nos. 50-387/97-201 and 50-388/97-201, have identified some programmatic weaknesses and functional inspection outstanding items. However, none of these programmatic weaknesses or functional inspection outstanding items were related to the effectiveness of the program with respect to water-suppression systems. Weaknesses and inspection outstanding items were focused on issues such as fire brigade practices, design coverage of hose stations, and control of combustibles, which are not facets of the program that are credited with aging management. No NRC concerns or SSES management concerns (through periodic audits and self-assessments) were identified for the Fire Water System Program with

respect to inspection, testing and maintenance of water-suppression portions of the Fire Protection System.

A search of condition reports was performed for the Fire Protection System. When conditions were found that required correction they were repaired in accordance with the site corrective action program. Data forms for recording the results of the credited surveillance and test procedures were reviewed for recent monthly, semiannual, annual and refueling interval inspections, flushes and flow tests as applicable. Data forms for surveillances and tests that have a periodicity of every three years were also reviewed to cover the two most recent surveillances. Any deviations from the acceptance criteria were evaluated and corrected in accordance with the site corrective action program. This review identified minor issues that did not affect the effectiveness of the Fire Protection Program or the aging effects under evaluation.

Conclusion

The Fire Water System Program has been demonstrated to be capable of detecting and managing loss of material, as well as fouling, for susceptible components. The Fire Water System Program provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

Enhancement of the Fire Water System Program to address sprinkler head testing/replacement and ultrasonic testing of water-suppression lines that do not normally experience flow will provided further assurance that aging effects are managed and subject components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.18 Buried Piping Surveillance Program

Program Description

The purpose of the Buried Piping Surveillance Program is to manage the effects of corrosion on the external surfaces of piping with damaged coatings exposed to a buried environment. The Buried Piping Surveillance Program will be a combination of a prevention program (consisting of cathodic protection) and a condition monitoring program (consisting of periodic testing). Implementation of the Buried Piping Surveillance Program will ensure that the pressure boundary integrity of the subject components is maintained consistent with the current licensing basis during the period of extended operation.

The Buried Piping Surveillance Program is a new aging management program that will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The SSES Buried Piping Surveillance Program is a new program that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M28, "Buried Piping and Tanks Surveillance," with an exception.

Exceptions to NUREG-1801

Program Element Affected:

- **Scope –**

  The scope for the Buried Piping Surveillance Program is limited to the sections of buried Residual Heat Removal Service Water (RHRSW) and Emergency Service Water (ESW) common return header piping for which damaged coatings are known to exist. Therefore, coatings are not credited by this program for aging management. All other buried piping and tanks subject to aging management are managed by the Buried Piping and Tanks Inspection Program.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The scope of the Buried Piping Surveillance Program includes only the portions of the buried piping in the RHRSW/ESW common return header known to have damaged coatings. The program is credited for managing loss of material due to crevice, general, and pitting corrosion and microbiologically influenced corrosion (MIC) for buried steel piping components with damaged coatings.

The Buried Piping Surveillance Program is not credited for managing the affects of aging on any buried steel tanks.

- Preventive Actions
  Consistent with standard industry practices and in accordance with plant design specifications, buried components are provided with protective coatings during installation for protection from direct contact with soil. However, the protective coatings on sections of buried RHRSW/ESW common return header piping are known to be damaged.

  The Cathodic Protection System has been designed to mitigate corrosion for sections of piping with damaged coatings by the installation of reference electrodes in the proximity of the piping.

- Parameters Monitored or Inspected
  Measurement of coating conductance is addressed during the process of piping installation. The coatings of the buried RHRSW/ESW piping were damaged during construction activities in 2005. The pipe-to-soil potential will be surveyed as part of the surveillance program.

  Exterior surfaces of the sections of buried RHRSW/ESW common return header piping with damaged coatings will be visually inspected when piping is excavated for maintenance or other reasons. Evidence of corrosion will be documented for further evaluation.

- Detection of Aging Effects
  The Cathodic Protection System was modified in 2005 and was designed with consideration for the piping locations with damaged coatings by the installation of reference electrodes in the proximity of the piping to check cathodic protection potential on a regular basis.

  The condition of the sections of RHRSW/ESW common return header piping known to have damaged coatings will be monitored by periodic soil potential surveys. Recent operating experience and the condition of buried piping, as known based on results of internal inspections or other relevant information, will be used to evaluate the condition of the piping.

- Monitoring and Trending
  The Buried Piping Surveillance Program will require monitoring of the current requirement versus time to provide an indication of the condition of the sections of piping with damaged coatings and the coatings immediately adjoining the damaged areas.

- Acceptance Criteria
  The Buried Piping Surveillance Program will include acceptance criteria for the assessment of coatings surrounding the damaged areas and of the Cathodic Protection System for the segments of buried RHRSW/ESW common return header piping with damaged coatings. The assessment will be conducted on an annual basis and compared to predetermined values. Indications of potential degradation of coatings or of the Cathodic Protection System will be documented and evaluated in accordance with the SSES Corrective Action Program. Engineering evaluation will be required to determine if, and to what extent, corrective actions are necessary.

- Corrective Actions
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Buried Piping Surveillance Program is a new aging management program; therefore, there is no SSES operating experience associated with the program. However, plant design considerations address the potential for degradation of segments of buried piping with damaged coatings through the application of cathodic protection.

  No history of piping degradation due to external corrosion of coated or uncoated buried piping was identified for SSES through searches of operating experience or discussions with program owners. SSES operating experience demonstrates that the coating of buried steel piping is effective in managing the effects of aging. SSES does not have operating experience with buried steel piping with damaged coatings. The identified damage to the RHRSW/ESW return header coatings occurred in 2005. The Cathodic Protection System was upgraded in 2005 to improve its performance and specifically addressed the segments of buried piping with damaged coatings. Therefore, there is no associated operating experience history with the new Cathodic Protection System or with the piping segments with damaged coatings.

Required Enhancements

None.

Conclusion

The Buried Piping Surveillance Program will be capable of managing loss of material due to corrosion for susceptible piping components in buried environments. The Buried Piping Surveillance Program will provide reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.19 Condensate and Refueling Water Storage Tanks Inspection

Program Description

The purpose of the Condensate and Refueling Water Storage Tanks Inspection is to detect and characterize the conditions on the bottom surfaces of the Condensate Storage Tanks and the Refueling Water Storage Tank. The inspection provides direct evidence through volumetric and/or visual examination as to whether, and to what extent, a loss of material due to crevice, general or pitting corrosion has occurred or is likely to occur in inaccessible areas (i.e., tank base/bottom) that could result in a loss of intended function.

Implementation of the Condensate and Refueling Water Storage Tanks Inspection will provide added assurance that the pressure boundary integrity of the Condensate Storage Tanks (for Unit 1 and Unit 2) is maintained consistent with the current licensing basis during the period of extended operation, and that the structural integrity of the Refueling Water Storage Tank is maintained such that spatial interaction (i.e. flooding) will not impair or prevent a safety-related intended function during the period of extended operation.

NUREG-1801 Consistency

The Condensate and Refueling Water Storage Tanks Inspection is a new one-time inspection for SSES that, in conjunction with the System Walkdown Program, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M29, ”Aboveground Steel Tanks.”

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The scope of the Condensate and Refueling Water Storage Tanks Inspection includes the base (bottom surface and foundation pad interface) of the Condensate Storage Tanks (CSTs) and Refueling Water Storage Tank (RWST) that are included in the Condensate Transfer and Storage and the Refueling Water Transfer and Storage systems.

  An appropriate combination of volumetric (including thickness measurement) and visual examinations will be conducted on sample of tanks to detect evidence of a loss of material due to crevice, general or pitting corrosion or to confirm a lack

thereof. Results will be applied to the other tanks within the scope of the inspection based on engineering evaluation.

Periodic inspection of the external surfaces of the tanks (including protective coatings and foundation sealants), other than the tank bottoms, are included in the scope of the System Walkdown Program, described in Section B.2.32.

- Preventive Actions
  No actions are taken as part of the Condensate and Refueling Water Storage Tank Inspection or the System Walkdown Program to prevent aging effects or to mitigate aging degradation. However, the external surfaces of the tanks do have protective coatings and sealants at the tank/foundation pad interface that are consistent with industry practice.

- Parameters Monitored or Inspected
  The parameters inspected by the Condensate and Refueling Water Storage Tank Inspection will include wall thickness or other volumetric and/or visual evidence of degradation, as appropriate, as measures of loss of material for the tank bottom.

  As described in Section B.2.32, the related parameters inspected by the System Walkdown Program include visual evidence of a loss of material or other degradation.

- Detection of Aging Effects
  The Condensate and Refueling Water Storage Tank Inspection will use a combination of established volumetric (Radiographic Testing [RT] or Ultrasonic Testing [UT]) and/or visual examination techniques performed by qualified personnel to inspect the bottom surface of a Condensate Storage Tank or the Refueling Water Storage Tank to determine whether, and to what extent, a loss of material has occurred or is likely to occur during the period of extended operation. The results of the examination will be applied to all of the tanks within the scope of the inspection.

  The Condensate and Refueling Water Storage Tank Inspection will be conducted after the issuance of the renewed licenses and prior to the end of the current operating licenses for SSES Unit 1 and Unit 2, with sufficient time to implement programmatic oversight for the period of extended operation, if necessary. The activities will be conducted no earlier than 10 years prior to the end of the current operating licenses, so that conditions are more representative of the conditions expected during the period of extended operation.

  The results of this inspection will also supplement the existing inspection of accessible external surfaces conducted by the System Walkdown Program, described in Section B.2.32.

- Monitoring and Trending
  No actions are taken as part of the Condensate and Refueling Water Storage Tank Inspection to monitor and/or trend inspection results. This is a one-time inspection activity that will use the appropriate combination of volumetric and/or visual techniques to determine if, and to what extent, further actions (including monitoring and trending) may be required.

  The examination techniques for accessible external surfaces, including the condensate and refueling water storage tanks, are described in the System Walkdown Program, contained in Section B.2.32.

- Acceptance Criteria
  The acceptance criterion for the Condensate and Refueling Water Storage Tank Inspection is: No unacceptable loss of material (or wall thinning) that could result in a loss of component intended function during the period of extended operation, as determined by engineering evaluation.

  Acceptance criteria for degradation of external surfaces, including the condensate and refueling water storage tanks (including of any coating/sealant) are described in the System Walkdown Program, contained in Section B.2.32.

- Corrective Actions
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Condensate and Refueling Water Storage Tank Inspection is a new one-time inspection for which there is no operating experience indicating a need for an aging management program. However, inspection methods will be consistent with accepted industry practices.

  No instances of degradation of Condensate Storage Tanks or of the Refueling Water Storage Tank were identified in a review of plant condition reports (CRs). However, to provide added assurance that the component intended function will be maintained

during the period of extended operation, inspection of the bottom surface is conservatively warranted.

The operating experience associated with the existing System Walkdown Program, which includes the accessible portions of the Condensate Storage Tanks and of the Refueling Water Storage Tank, is addressed in Section B.2.32.

Required Enhancements

None.

Conclusion

Implementation of the Condensate and Refueling Water Storage Tank Inspection will verify that there are no aging effects requiring management for the subject components or will identify appropriate corrective actions, possibly including programmatic oversight, to be taken to ensure that the Condensate Storage Tank intended function will be maintained consistent with the current licensing basis during the period of extended operation, and that the Refueling Water Storage Tank intended function will be maintained such that spatial interaction does not result in prevention or impairment of a safety-related function during the period of extended operation.

B.2.20 Fuel Oil Chemistry Program

Program Description

The Fuel Oil Chemistry Program maintains fuel oil quality in order to mitigate damage due to loss of material and cracking of susceptible materials for plant components that are within the scope of license renewal and that contain fuel oil. The program manages the relevant conditions that could lead to the onset and propagation of a loss of material or cracking through proper monitoring and control of fuel oil contamination consistent with pertinent plant technical specifications/requirements and American Society for Testing of Materials (ASTM) standards for fuel oil. The relevant conditions are specific contaminants such as water or microbiological organisms in the fuel oil that could lead to corrosion or stress corrosion cracking (SCC) of susceptible materials. Exposure to these contaminants is minimized by verifying the quality of new fuel oil before it enters the storage tanks and by periodic sampling to ensure that the tanks are free of water and particulates. The Fuel Oil Chemistry Program is a mitigation program.

The Fuel Oil Chemistry Program is supplemented by a separate one-time inspection of representative areas of the diesel fuel oil system, such as low points and tank bottoms where contaminants could accumulate, to provide further confirmation that loss of material and cracking are effectively mitigated or to detect and characterize whether, and to what extent, degradation is occurring. Refer to Section B.2.22 for discussion of the Chemistry Program Effectiveness Inspection.

NUREG-1801 Consistency

The Fuel Oil Chemistry Program is an existing SSES program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M30, “Fuel Oil Chemistry,” with the following exceptions:

Exceptions to NUREG-1801

Program Elements Affected:

- **Scope of Program -**

  Although largely focused on fuel oil tanks, the Fuel Oil Chemistry Program is also applicable to other components exposed to fuel oil, including the fuel oil supply components for the diesel engine-driven fire pump.

- **Parameters Monitored or Inspected, Acceptance Criteria -**

  With respect to modified ASTM D2276 for particulate determinations, 0.8 micron membrane filters recommended for aviation fuels are used at SSES but the required volume is decreased in order to increase the range of analysis.

- **Monitoring and Trending -**

  An annual frequency for sampling of fuel oil for biological activity is used for SSES, along with monthly or quarterly sampling for other contaminants.

Required Enhancements

None.

Operating Experience

The Fuel Oil Chemistry Program for SSES is an ongoing program that effectively incorporates the best practices of industry guidance and experience in controlling contaminant levels in fuel oil to minimize degradation.

Review of SSES operating experience did not reveal a loss of component function or fouling of subject components that contain fuel oil which could be attributed to an inadequacy of the Fuel Oil Chemistry Program. Fuel oil delivered to the site is sampled and analyzed prior to addition to fuel oil storage tanks and periodically thereafter. Water (and sediment) is removed, particulates are filtered, and biological activity is controlled, as appropriate. In addition, separate inspection of the Diesel Fuel Oil System storage tanks, required by Technical Specifications, revealed acceptable conditions for tank internal surfaces.

Conclusion

The Fuel Oil Chemistry Program has been demonstrated to be capable of managing loss of material and cracking, as well as fouling in fuel oil, for susceptible components through monitoring and control of contaminants in the fuel oil. The Fuel Oil Chemistry Program provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.21 Reactor Vessel Surveillance Program

Program Description

The purpose of the Reactor Vessel Surveillance Program is to manage reduction of fracture toughness for the low alloy steel reactor vessel shell and welds in the beltline region. The Reactor Vessel Surveillance Program is a condition monitoring program developed in response to 10 CFR 50 Appendix H.

The SSES Reactor Vessel Surveillance Program is part of the Integrated Surveillance Program (ISP) described in BWRVIP-78, BWRVIP-86-A and BWRVIP-116, and approved by the NRC staff. BWRVIP-116 extends the ISP to cover the period of extended operation. SSES will follow the requirements of the BWRVIP ISP and will apply the ISP data to SSES Units 1 and 2. The NRC approved the use of the BWRVIP ISP in place of a unique plant program at SSES.

NUREG-1801 Consistency

The SSES Reactor Vessel Surveillance Program is an existing program that is consistent with the 10 elements of an effective aging management as described in NUREG-1801, Section XI.M31, "Reactor Vessel Surveillance," with an exception.

Exceptions to NUREG-1801

Program Element Affected:

- **Monitoring and Trending –**

  NUREG-1801 recommends that analyzed capsules be stored once the analysis is complete. The BWRVIP does not require storage of the already analyzed capsules. SSES will continue to irradiate standby capsules in accordance with BWRVIP-116. Should SSES need to remove the standby capsules from the vessel, the NRC and the BWRVIP will be notified.

Required Enhancements

None.

Operating Experience

Capsule evaluations have been performed on Units 1 and 2 prior to joining the BWRVIP ISP. The measured decreases in Upper Shelf Energy (USE) were consistently less than the Regulatory Guide (RG) 1.99 projections. The measured increases in RT_{NDT} for Unit 1 were slightly greater, within one standard deviation, than the RG 1.99 projections while the measured increases in RT_{NDT} for Unit 2 were less than the RG 1.99 projections.

Conclusion

The Reactor Vessel Surveillance Program has been demonstrated to be capable of managing reduction of fracture toughness for components of the reactor vessel beltline region. The Reactor Vessel Surveillance Program provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.22 Chemistry Program Effectiveness Inspection

Program Description

The purpose of the Chemistry Program Effectiveness Inspection is to detect and characterize the condition of materials in representative low flow and stagnant areas of plant systems influenced by the BWR Water Chemistry Program, the Closed Cooling Water Chemistry Program, and the Fuel Oil Chemistry Program (mitigation programs). The inspection provides direct evidence as to whether, and to what extent, a loss of material due to crevice, general, or pitting corrosion and to microbiologically influenced corrosion in fuel oil, as well as cracking due to stress corrosion cracking (SCC) of susceptible materials in susceptible locations has occurred. Implementation of the Chemistry Program Effectiveness Inspection will provide confirmation of program effectiveness and further assurance that the integrity of susceptible components is maintained consistent with the current licensing basis during the period of extended operation.

NUREG-1801 Consistency

The Chemistry Program Effectiveness Inspection is a new one-time inspection for SSES that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M32, “One-Time Inspection”.

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The scope of the Chemistry Program Effectiveness Inspection includes the internal surfaces of aluminum, copper alloy, carbon and low alloy steel, cast iron, and stainless steel components in the following license renewal systems that contain treated water, treated water that is closed cooling water, or fuel oil that is controlled by a SSES chemistry program:

  Treated Water (BWR water) – Condensate Transfer and Storage, Containment and Suppression, Control Rod Drive Hydraulics, Core Spray, Feedwater, Fuel Pool Cooling and Cleanup, High Pressure Coolant Injection, Main Steam, Makeup Demineralizer, Makeup Transfer and Storage, Reactor Core Isolation Cooling, Reactor Nonnuclear Instrumentation, Reactor Recirculation (nonsafety-related instrument tubing/valve bodies), Reactor Vessel & Auxiliaries (nonsafety-related RPV level/backfill instrument tubing/valve bodies), Reactor Water Cleanup,

Refueling Water Transfer and Storage, Residual Heat Removal, Sampling (reactor area and post-accident sampling), and Standby Liquid Control systems

Treated Water (closed cooling water) – Control Structure Chilled Water, Diesel Generator, Reactor Building Chilled Water, Reactor Building Closed Cooling Water, Sampling (reactor area and post-accident sampling), and Turbine Building Closed Cooling Water (heat exchanger channels) systems

Fuel Oil – Fire Protection (diesel engine-driven fire pump fuel supply) and Diesel Fuel Oil systems

A representative sample of components in low flow and stagnant areas (i.e., locations that are isolated from the flow stream and possibly prone to gradual accumulation/concentration of contaminants) will be examined for evidence of loss of material (due to crevice, galvanic, general, or pitting corrosion, and to microbiologically influenced corrosion in fuel oil), or to confirm a lack thereof, and the results applied to the rest of the systems based on engineering evaluation. In addition, the representative sample will include stainless steel components exposed to temperatures greater than 140ºF that will be examined for evidence of cracking due to SCC and the results similarly applied to the rest of the systems.

- Preventive Actions
  No actions are taken as part of the Chemistry Program Effectiveness Inspection to prevent aging effects or to mitigate aging degradation. Refer to the discussion of the individual sub-programs of the Chemistry Program (Sections B.2.2, B.2.14, and B.2.20) for related mitigative/preventive considerations.

- Parameters Monitored or Inspected
  The parameters to be inspected by the Chemistry Program Effectiveness Inspection include wall thickness and visual evidence of internal surface degradation as measures of loss of material, or of cracking for stainless steel exposed to temperatures above 140ºF. Inspections will be performed by qualified personnel using established nondestructive examination (NDE) techniques appropriate to the system/location being inspected.

- Detection of Aging Effects
  The Chemistry Program Effectiveness Inspection will use a combination of established volumetric and visual examination techniques (such as equivalent to VT-1 or VT-3) performed by qualified personnel on a sample population of subject components to identify evidence of a loss of material, or cracking of stainless steel exposed to temperatures above 140ºF, or to confirm a lack thereof. The results of the inspection will be applied to all of the components within the scope of the inspection activity.

A sample population will be determined by engineering evaluation and, where practical, focused on components considered to be most susceptible to aging, such as due to their time in service, the severity of conditions during normal plant operations, and any pertinent design margins.

The Chemistry Program Effectiveness Inspection will be conducted after the issuance of the renewed licenses and prior to the end of the current operating licenses for SSES Unit 1 and Unit 2, with sufficient time to implement programmatic oversight for the period of extended operation, if necessary. The inspections will be conducted no earlier than 10 years prior to the end of the current operating licenses, so that aging effects with long incubation periods have time to manifest.

- Monitoring and Trending
  No actions are taken as part of the Chemistry Program Effectiveness Inspection to monitor and/or trend inspection results. This is a one-time inspection activity used to determine if, and to what extent, further actions, including monitoring and trending, may be required.

  Sample size will be determined by engineering evaluation, as described for the Parameters Monitored or Inspected element above. Results of the inspection activities that require further evaluation/resolution (e.g., if degradation is detected), if any, will be evaluated using the SSES corrective action process.

- Acceptance Criteria
  The acceptance criterion for the Chemistry Program Effectiveness Inspection will be: No unacceptable loss of material, or cracking of stainless steel exposed to temperatures above 140ºF, that could result in a loss of component intended function during the period of extended operation, as determined by engineering evaluation.

- Corrective Actions
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Chemistry Program Effectiveness Inspection is a new one-time inspection activity for which there is no operating experience. However, inspection methods are to be consistent with accepted industry practices.

Required Enhancements

None.

Conclusion

Implementation of the Chemistry Program Effectiveness Inspection will verify that there are no aging effects requiring management for the subject components or will identify appropriate corrective actions, possibly including programmatic oversight, to be taken to ensure that the component intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

B.2.23 Cooling Units Inspection

Program Description

The purpose of the Cooling Units Inspection is to detect and characterize the condition of aluminum, carbon steel, copper alloy, and stainless steel cooling unit components that are exposed to a ventilation environment or to an uncontrolled raw water environment from cooling unit drain pans, and of certain heat exchanger components exposed to treated water or ventilation environments in the Control Structure Chilled Water System, the Primary Containment Atmosphere Circulation System, and the Control Structure and Reactor Building HVAC systems. The inspection provides direct evidence as to whether, and to what extent, a loss of material due to crevice, galvanic, general, or pitting corrosion, or reduction in heat transfer due to fouling of heat exchanger tubes and fins, has occurred or is likely to occur in these systems that could result in a loss of intended function. Implementation of the Cooling Units Inspection will ensure that the pressure boundary integrity and heat transfer capability of susceptible components are maintained consistent with the current licensing basis during the period of extended operation.

NUREG-1801 Consistency

The Cooling Units Inspection is a new one-time inspection for SSES that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M32, “One-Time Inspection.”

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The Cooling Units Inspection detects and characterizes conditions relative to the following to determine whether, and to what extent degradation is occurring:

  - Loss of material due to crevice and pitting corrosion on carbon and stainless steel surfaces exposed to condensation at or near drain pans associated with cooling units in the Primary Containment Atmosphere Circulation System and loss of material due to galvanic corrosion on carbon steel surfaces near points of contact with stainless steel in the same areas. Note that only the Unit 2 unit cooler housings are constructed of carbon steel; the Unit 1 unit cooler housings are constructed of galvanized steel, for which there are no aging effects that require management during the period of extended operation.

- Loss of material due to crevice and pitting corrosion and selective leaching on the internal and external surfaces of the copper alloy (red brass) cooler channels in the Control Structure HVAC System.

- Loss of material due to crevice, galvanic, general and pitting corrosion on the internal surfaces of carbon steel drain piping associated with cooling units in the Control Structure Chilled Water System that are exposed to an uncontrolled raw water environment.

- Reduction in heat transfer for copper alloy (copper and copper-nickel) heat exchanger tubes (or cooling coils) and aluminum and copper fins in the Control Structure and Reactor Building HVAC systems.

The Cooling Units Inspection focuses on a representative sample population of subject components at susceptible locations to be defined in the implementing documents. The inspections provide symptomatic evidence of cracking, loss of material, or reduction in heat transfer at other susceptible locations within the scope of the inspection due to the similarities in materials and environmental conditions.

- Preventive Actions
  No actions are taken as part of the Cooling Units Inspection to prevent aging effects or to mitigate aging degradation.

- Parameters Monitored or Inspected
  The parameters to be inspected by the Cooling Units Inspection include wall thickness and visual evidence as measures of loss of material, and visual evidence of fouling as a measure of reduction in heat transfer. Inspections will be performed by qualified personnel using established nondestructive examination (NDE) techniques appropriate to the system/location being inspected.

- Detection of Aging Effects
  The Cooling Units Inspection will use a combination of established volumetric (RT or UT) and/or visual (VT-1 or VT-3 or equivalent) examination techniques performed by qualified personnel on a sample population of subject components determined by engineering evaluation, to identify evidence of a loss of material or fouling, or to confirm a lack thereof. The results of the inspection will be applied to all of the components within the scope of the inspection.

  The Cooling Units Inspection will be conducted after the issuance of the renewed licenses and prior to the end of the current operating licenses for SSES Unit 1 and Unit 2, with sufficient time to implement programmatic oversight for the period of extended operation, if necessary. The activities will be conducted no earlier than 10 years prior to the end of the current operating licenses, so that aging effects with long incubation periods have time to manifest.

- Monitoring and Trending
  No actions are taken as part of the Cooling Units Inspection to monitor and/or trend inspection results. This is a one-time inspection activity used to determine if, and to what extent, further actions, including monitoring and trending, may be required.

- Acceptance Criteria
  The acceptance criteria for the Cooling Units Inspection are: No unacceptable loss of material (or wall thinning), or fouling of heat exchanger tubes and fins, that could result in a loss of component intended function during the period of extended operation, as determined by engineering evaluation.

- Corrective Actions
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Cooling Units Inspection is a new one-time inspection activity for which there is no operating experience indicating the need for an aging management program. However, inspection methods are consistent with accepted industry practices.

Required Enhancements

None.

Conclusion

Implementation of the Cooling Units Inspection will verify that there are no aging effects requiring management for the subject components or will identify appropriate corrective actions, possibly including programmatic oversight, to be taken to ensure that the component intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

B.2.24 Heat Exchanger Inspection

Program Description

The purpose of the Heat Exchanger Inspection is to detect and characterize cracking due to stress corrosion cracking (SCC) and reduction in heat transfer due to fouling of heat exchanger tubes that are exposed to treated water in the Control Structure Chilled Water (CSCW), High Pressure Coolant Injection (HPCI), and Reactor Core Isolation Cooling (RCIC) systems.

The Heat Exchanger Inspection will detect and characterize the condition of the copper alloy tubes in the CSCW chiller oil cooler and chiller evaporator and the HPCI and RCIC lube oil coolers, and the stainless steel tubes in the RCIC lube oil coolers, that are exposed to a treated water environment.

The inspection provides direct evidence as to whether, and to what extent, cracking due to SCC or reduction in heat transfer due to fouling has occurred or is likely to occur that could result in a loss of intended function. Implementation of the Heat Exchanger Inspection will ensure that the heat transfer capabilities of the subject heat exchangers, and the pressure boundary integrity of the subject tubes, are maintained consistent with the current licensing basis during the period of extended operation.

NUREG-1801 Consistency

The Heat Exchanger Inspection is a new one-time inspection for SSES that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M32, “One-Time Inspection.”

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Activities
  The Heat Exchanger Inspection detects and characterizes conditions to determine whether, and to what extent a loss of heat transfer due to fouling is occurring (or is likely to occur) for the following heat exchangers within the scope of license renewal:

  - CSCW chiller evaporator – internal tube surfaces

  - CSCW chiller oil cooler – internal tube surfaces

- RCIC lube oil coolers – internal tube surfaces
- HPCI lube oil coolers – internal tube surfaces

The Heat Exchanger Inspection is also credited for managing cracking due to SCC in the treated water (internal) environment of the copper alloy (admiralty brass) tubes in the RCIC and HPCI lube oil coolers.

- Preventive Actions
  No actions are taken as part of the Heat Exchanger Inspection to prevent aging effects or to mitigate aging degradation.

- Parameters Monitored or Inspected
  The parameters inspected by the Heat Exchanger Inspection include visual evidence of accumulation of debris and foulants on or within the subject heat exchanger tubes and volumetric evidence of cracking of copper alloy (admiralty brass) tubes. Inspections will be performed by qualified personnel using established nondestructive examination (NDE) techniques appropriate to the system/location being inspected.

- Detection of Aging Effects
  Rather than focusing on a representative sample population, the Heat Exchanger Inspection will be applied to all heat exchangers within the scope of the program. The Heat Exchanger Inspection will use a combination of established nondestructive examination (NDE) techniques, including visual, ultrasonic, and surface techniques, and will be performed by qualified personnel.

  To detect and characterize reduction in heat transfer, the Heat Exchanger Inspection will use visual (VT-3 or equivalent) or remote visual inspection techniques to verify the absence of, or to identify the extent of, fouling on the tube surfaces described under *Scope of Activities* above.

  To detect and characterize cracking, the Heat Exchanger Inspection will use volumetric (RT or UT) to verify the absence of, or to identify the extent of, SCC on the internal surfaces of the copper alloy (admiralty brass) tubes that are exposed to the treated water environment.

  The Heat Exchanger Inspection will be conducted after the issuance of the renewed licenses and prior to the end of the current operating licenses for SSES Unit 1 and Unit 2, with sufficient time to implement programmatic oversight for the period of extended operation, if necessary. The activities will be conducted no earlier than 10 years prior to the end of the current operating licenses, so that aging effects with long incubation periods have time to manifest.

- Monitoring and Trending
  No actions are taken as part of the Heat Exchanger Inspection to monitor and/or trend inspection results. This is a one-time inspection activity used to determine if, and to what extent, further actions, including monitoring and trending, may be required.

- Acceptance Criteria
  The acceptance criteria for the Heat Exchanger Inspection are: No unacceptable fouling or cracking that could result in a loss of component intended function during the period of extended operation, as determined by engineering evaluation.

- Corrective Actions
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Heat Exchanger Inspection is a new one-time inspection for which there is no operating experience indicating the need for an aging management program. However, inspection methods are consistent with accepted industry practices.

Required Enhancements

None.

Conclusion

Implementation of the Heat Exchanger Inspection will verify that there are no aging effects requiring management for the subject components, or will identify appropriate corrective actions, possibly including programmatic oversight, to be taken to ensure that the component intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

B.2.25 Lubricating Oil Inspection

Program Description

The purpose of the Lubricating Oil Inspection is to detect and characterize the condition of materials in systems and components for which the Lubricating Oil Analysis Program (a mitigation program) is credited with aging management. The inspection provides direct evidence as to whether, and to what extent, a loss of material due to crevice, galvanic, general or pitting corrosion or selective leaching or reduction in heat transfer due to fouling has occurred. Implementation of the Lubricating Oil Inspection will provide additional confirmation of program effectiveness and further assurance that the intended functions of susceptible components are maintained consistent with the current licensing basis during the period of extended operation.

NUREG-1801 Consistency

The Lubricating Oil Inspection is a new one-time inspection for SSES that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M32, “One-Time Inspection”.

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The scope of the Lubricating Oil Inspection includes the internal surfaces of aluminum, copper alloy, carbon steel, cast iron, and stainless steel components in the following license renewal systems that contain lubricating oil:

  – Diesel Generator, Control Structure Chilled Water, Residual Heat Removal, Reactor Core Isolation Cooling, and High Pressure Coolant Injection systems

  A representative sample of components with special emphasis on locations that may be susceptible to water pooling will be examined for evidence of loss of material (due to crevice, galvanic, general, or pitting corrosion, or selective leaching) or reduction in heat transfer due to fouling, or to confirm a lack thereof, and the results applied to all of the systems and components within the scope of the inspection, based on engineering evaluation.

- Preventive Actions
  No actions are taken as part of the Lubricating Oil Inspection to prevent aging effects or to mitigate aging degradation. Refer to Section B.2.33 for discussion of the Lubricating Oil Analysis Program and related mitigative/preventive considerations.

- Parameters Monitored or Inspected
  The parameters to be inspected by the Lubricating Oil Inspection include wall thickness and visual evidence of internal surface degradation as measures of loss of material or fouling. Inspections will be performed by qualified personnel using established nondestructive examination (NDE) techniques appropriate to the system/location being inspected.

- Detection of Aging Effects
  The Lubricating Oil Inspection will use a combination of established volumetric and visual examination techniques (such as equivalent to VT-1 or VT-3) performed by qualified personnel on a sample population of subject components to identify evidence of loss of material or fouling or to confirm a lack thereof. The results of the inspection will be applied to all of the systems and components within the scope of the inspection activity.

  A sample population will be determined by engineering evaluation that, where practical, focuses on components considered to be the most susceptible to aging, such as due to their time in service, the severity of conditions during normal plant operations, and any pertinent design margins.

  The Lubricating Oil Inspection will be conducted after the issuance of the renewed licenses and prior to the end of the current operating licenses for SSES Unit 1 and Unit 2, with sufficient time to implement programmatic oversight for the period of extended operation, if necessary. The inspections will be conducted no earlier than 10 years prior to the end of the current operating licenses, so that aging effects with long incubation periods have time to manifest.

- Monitoring and Trending
  No actions are taken as part of the Lubricating Oil Inspection to monitor and/or trend inspection results. This is a one-time inspection activity used to determine if, and to what extent, further actions, including monitoring and trending, may be required.

  Sample size will be determined by engineering evaluation, as described for the Parameters Monitored or Inspected element above. Results of the inspection activities that require further evaluation/resolution (e.g., if degradation is detected), if any, will be evaluated using the normal site corrective action process.

- Acceptance Criteria
  The acceptance criterion for the Lubricating Oil Inspection will be: No unacceptable loss of material (or wall thinning) or fouling that could result in a loss of component intended function during the period of extended operation, as determined by engineering evaluation.

- Corrective Actions
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Lubricating Oil Inspection is a new one-time inspection activity for which there is no operating experience. However, inspection methods are to be consistent with accepted industry practices.

Required Enhancements

None.

Conclusion

Implementation of the Lubricating Oil Inspection will verify that there are no aging effects requiring management for the subject components or will identify appropriate corrective actions, possibly including programmatic oversight, to be taken to ensure that the component intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

B.2.26 Main Steam Flow Restrictor Inspection

Program Description

The purpose of the Main Steam Flow Restrictor Inspection is to detect and characterize reduction of fracture toughness of the cast austenitic stainless steel (CASS) subcomponents of the main steam flow restrictors. The inspection will detect cracking that is symptomatic of reduction of fracture toughness. Reduction of fracture toughness does not cause cracking, but the reduced toughness allows existing cracks to propagate at higher rates.

This inspection provides direct evidence as to whether, and to what extent, cracking has occurred or is likely to occur in the main steam flow restrictors. Implementation of the Main Steam Flow Restrictor Inspection will ensure that the flow restriction function of the subject restrictors is maintained consistent with the current licensing basis during the period of extended operation.

The Main Steam Flow Restrictor Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

NUREG-1801 Consistency

The Main Steam Flow Restrictor Inspection is a new one-time inspection for SSES that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M32, “One-Time Inspection.”

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The Main Steam Flow Restrictor Inspection is credited for managing reduction of fracture toughness, as evidenced by cracking, for the main steam flow restrictors.

- Preventive Actions
  No actions are taken as part of the Main Steam Flow Restrictor Inspection to prevent aging effects or to mitigate aging degradation.

- Parameters Monitored or Inspected
  The parameters inspected by the Main Steam Flow Restrictor Inspection include visual evidence of cracking. Visual examination will be performed by qualified personnel using established nondestructive examination (NDE) techniques appropriate to the system/location being inspected.

- Detection of Aging Effects
  The Main Steam Flow Restrictor Inspection will be applied to all eight (four per unit) main steam flow restrictors at SSES. The Main Steam Flow Restrictor Inspection will use established visual nondestructive examination (NDE) techniques to detect reduction of fracture toughness as evidenced by cracking, and will be performed by qualified personnel. The inspection is consistent with the NUREG-1801 one-time inspection recommendations for detection of cracking. Due to the specific focus of this inspection, the other aging effects and inspection methods in the NUREG-1801 one-time inspection are not applicable to this inspection.

  The Main Steam Flow Restrictor Inspection activities will be conducted after the issuance of the renewed licenses and prior to the end of the current operating licenses for SSES Unit 1 and Unit 2, with sufficient time to implement programmatic oversight for the period of extended operation, if necessary. The activities will be conducted no earlier than 10 years prior to the end of the current operating licenses, so that aging effects with long incubation periods have time to manifest.

- Monitoring and Trending
  No actions are taken as part of the Main Steam Flow Restrictor Inspection to monitor and/or trend inspection results. This is a one-time inspection used to determine if, and to what extent, further actions, including monitoring and trending, may be required.

- Acceptance Criteria
  The acceptance criterion for the Main Steam Flow Restrictor Inspection is: no cracking that could result in a loss of component intended function(s) during the period of extended operation, as determined by engineering evaluation.

- Corrective Actions
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Main Steam Flow Restrictor Inspection is a new one-time inspection activity for which there is no operating experience indicating the need for an aging management program. However, inspection methods are consistent with accepted industry practices.

Required Enhancements

None.

Conclusion

Implementation of the Main Steam Flow Restrictor Inspection will verify that there are no aging effects requiring management for the subject components or will identify appropriate corrective actions, possibly including programmatic oversight, to be taken to ensure that the component intended function(s) will be maintained consistent with the current licensing basis during the period of extended operation.

B.2.27 Monitoring and Collection System Inspection

Program Description

The purpose of the Monitoring and Collection System Inspection is to detect and characterize the conditions on the internal surfaces of subject components that are exposed to equipment/area drainage water and other potential contaminants/fluids. The inspection provides direct evidence as to whether, and to what extent, a loss of material due to crevice, general or pitting corrosion, or to microbiologically influenced corrosion (MIC) has occurred or is likely to occur in the Liquid Waste Management System that could result in a loss of intended function.

Implementation of the Monitoring and Collection System Inspection will provide assurance that the pressure boundary of susceptible safety-related components are maintained consistent with the current licensing basis during the period of extended operation. Implementation will also provide assurance that the structural integrity of susceptible nonsafety-related components will be maintained such that spatial interactions (e.g., leakage) will not result in loss of safety-related component intended functions during the period of extended operation.

NUREG-1801 Consistency

The Monitoring and Collection System Inspection is a new one-time inspection for SSES that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M32, “One-Time Inspection”.

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The scope of the Monitoring and Collection System Inspection includes the internal surfaces of subject carbon steel (and low alloy steel) and cast iron piping and valve bodies in the Liquid Waste Management System that are exposed to potentially radioactive drainage water (untreated water) and other potential contaminants/fluids during normal plant operations.

  A representative sample of components in the system, to be defined in the implementing documents, and to include containment isolation piping and/or valve bodies, will be examined for evidence of loss of material (due to crevice, general, or

pitting corrosion or to MIC), or to confirm a lack thereof, and the results applied to the rest of the system based on engineering evaluation.

- Preventive Actions
  No actions are taken as part of the Monitoring and Collection System Inspection to prevent aging effects or to mitigate aging degradation.

- Parameters Monitored or Inspected
  The parameters to be inspected by the Monitoring and Collection System Inspection include wall thickness and visual evidence of internal surface degradation as measures of loss of material. Inspections will be performed by qualified personnel using established nondestructive examination (NDE) techniques appropriate to the location being inspected.

- Detection of Aging Effects
  The Monitoring and Collection System Inspection will use a combination of established volumetric and visual examination techniques performed by qualified personnel on a sample population of subject components to identify evidence of loss of material or to confirm a lack thereof. The results of the inspection will be applied to all of the components within the scope of the inspection.

  A sample population will be determined by engineering evaluation and, where practical, focused on components considered to be most susceptible to aging, such as due to their time in service, the severity of conditions during normal plant operations, and lowest design margins. The sample population will include at least one location for containment isolation components.

  The Monitoring and Collection System Inspection activities will be conducted after the issuance of the renewed licenses and prior to the end of the current operating licenses for SSES Unit 1 and Unit 2 with sufficient time to implement programmatic oversight for the period of extended operation, if necessary. The activities will be conducted no earlier than 10 years prior to the end of the current operating licenses, so that slowly progressing aging effects and aging effects with long incubation periods have time to manifest.

- Monitoring and Trending
  No actions are taken as part of the Monitoring and Collection System Inspection to monitor and/or trend inspection results. This is a one-time inspection activity used to determine if, and to what extent, further actions, including monitoring and trending, may be required. Results of inspections, if necessary, are routinely evaluated through the site corrective action process.

- Acceptance Criteria
  The acceptance criteria for the Monitoring and Collection System Inspection will be: No unacceptable loss of material (or wall thinning) that could result in a loss of component intended function during the period of extended operation, as determined by engineering evaluation.

- Corrective Actions
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Monitoring and Collection System Inspection is a new one-time inspection activity for which there is no operating experience indicating the need for an aging management program. However, inspection methods will be consistent with accepted industry practices.

Required Enhancements

None.

Conclusion

Implementation of the Monitoring and Collection System Inspection will verify that there are no aging effects requiring management for the subject components, or will identify appropriate corrective actions, possibly including programmatic oversight, to be taken to ensure that the component intended functions will be maintained consistent with the current licensing basis during the period of extended operation, and that spatial interactions (e.g., leakage) will not result in loss of safety-related component intended functions during the period of extended operation.

B.2.28 Supplemental Piping/Tank Inspection

Program Description

The purpose of the Supplemental Piping/Tank Inspection is to detect and characterize the condition of carbon and stainless steel components that are exposed to moist air environments, particularly the aggressive alternate wet/dry environment that exists at air-water interfaces. The inspection provides direct evidence as to whether, and to what extent, a loss of material due to crevice, galvanic, general, and pitting corrosion has occurred or is likely to occur that could result in a loss of intended function. Implementation of the Supplemental Piping/Tank Inspection will ensure that the pressure boundary integrity of susceptible piping, tanks, and valve bodies is maintained consistent with the current licensing basis during the period of extended operation.

NUREG-1801 Consistency

The Supplemental Piping/Tank Inspection is a new one-time inspection for SSES that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M32, “One-Time Inspection.”

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The Supplemental Piping/Tank Inspection is credited for managing loss of material due to crevice and pitting corrosion on carbon steel surfaces at air-water interfaces in the following systems:

  - Condensate Transfer and Storage, Containment and Suppression, Control Structure Chilled Water, High Pressure Coolant Injection (HPCI), Main Steam, Reactor Core Isolation Cooling (RCIC), Residual Heat Removal (RHR), and Residual Heat Removal Service Water systems

  - Standby Gas Treatment System (SGTS) – For SGTS, the inspection is also credited for managing loss of material due to microbiologically influenced corrosion (MIC) at the air-water interface with the mist eliminator loop seal, which is filled with raw water from the Service Water System, and galvanic corrosion at points of contact between the mist eliminator housing and the SGTS filter enclosure, where condensation and water pooling may occur.

Additionally, the Supplemental Piping/Tank Inspection detects and characterizes whether, and to what extent, a loss of material due to crevice and pitting corrosion is occurring (or is likely to occur) for stainless steel surfaces at air-water interfaces in the following systems:

- Condensate Transfer and Storage, Fuel Pool Cooling and Cleanup, and Standby Liquid Control systems

The Supplemental Piping/Tank Inspection also detects and characterizes relative to the following to determine whether, and to what extent, degradation is occurring (or is likely to occur):

- Loss of material due to crevice, galvanic, general, and pitting corrosion on internal carbon steel surfaces within the scram discharge volume (piping and valve bodies) of the Control Rod Drive Hydraulic System, and within the air space of the condensate storage tanks.

The Supplemental Piping/Tank Inspection focuses on a limited but representative sample population of subject components at susceptible locations to be defined in the implementing documents, to include external piping surfaces and internal tank and/or piping surfaces at air-water interfaces. Sample locations will include both treated water and raw water interfaces. The inspections provide symptomatic evidence of loss of material at the other susceptible, but possibly inaccessible, locations (such as the internal surfaces of piping) due to the similarities in materials and environmental conditions.

- Preventive Actions
  No actions are taken as part of the Supplemental Piping/Tank Inspection to prevent aging effects or to mitigate aging degradation.

- Parameters Monitored or Inspected
  The parameters inspected by the Supplemental Piping/Tank Inspection include wall thickness and visual evidence as measures of loss of material. Inspections will be performed by qualified personnel using established nondestructive examination (NDE) techniques appropriate to the system/location being inspected.

- Detection of Aging Effects
  The Supplemental Piping/Tank Inspection will use a combination of established volumetric (RT or UT) and visual (VT-1 or VT-3 or equivalent) examination techniques performed by qualified personnel on a sample population of subject components, to be determined by engineering evaluation, to identify evidence of a loss of material or to confirm a lack thereof. The results of the inspection will be applied to all of the components within the scope of the inspection.

For components exposed to an aggressive environment due to alternate wetting and drying at air-water interfaces, both internal and external, the sample population should include at least one each of the following locations:

- An external carbon steel piping surface at the air-water interface in the suppression pool (e.g., Main Steam safety relief valve discharge pipes, RCIC and HPCI pump turbine exhaust pipes, RHR heat exchanger thermal relief discharge pipes, containment downcomer pipes)

- An internal stainless steel tank surface at the air-water interface (e.g., Fuel Pool Cooling and Cleanup skimmer surge tanks, Standby Liquid Control storage tanks, Control Structure Chilled Water expansion tanks)

- Spray array piping in the Residual Heat Removal Service Water System

For components exposed to a moist air internal environment, the sample population should include the following locations:

- Scram discharge volume piping or valve bodies in the Control Rod Drive Hydraulic System

- Suppression chamber spray header piping in the RHR System

The Supplemental Piping/Tank Inspection activities will be conducted after the issuance of the renewed licenses and prior to the end of the current operating licenses for SSES Unit 1 and Unit 2, with sufficient time to implement programmatic oversight for the period of extended operation, if necessary. The activities will be conducted no earlier than 10 years prior to the end of the current operating licenses, so that aging effects with long incubation periods have time to manifest.

- Monitoring and Trending
  No actions are taken as part of the Supplemental Piping/Tank Inspection to monitor and/or trend inspection results. This is a one-time inspection activity used to determine if, and to what extent, further actions, including monitoring and trending, may be required.

- Acceptance Criteria
  The acceptance criteria for the Supplemental Piping/Tank Inspection are: No unacceptable loss of material (or wall thinning) that could result in a loss of component intended function during the period of extended operation, as determined by engineering evaluation.

- Corrective Actions
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Supplemental Piping/Tank Inspection is a new one-time inspection activity for which there is no operating experience indicating the need for an aging management program. However, inspection methods are consistent with accepted industry practices.

Required Enhancements

None.

Conclusion

Implementation of the Supplemental Piping/Tank Inspection will verify that there are no aging effects requiring management for the subject components or will identify appropriate corrective actions, possibly including programmatic oversight, to be taken to ensure that the component intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

B.2.29 Selective Leaching Inspection

Program Description

The purpose of the Selective Leaching Inspection is to detect and characterize the conditions on internal and external surfaces of subject components. The inspection provides direct evidence through a combination of visual examination and hardness testing of whether, and to what extent, a loss of material due to selective leaching has occurred or is likely to occur that could result in a loss of intended function.

Implementation of the Selective Leaching Inspection will provide added assurance that the pressure boundary integrity of susceptible components is maintained consistent with the current licensing basis during the period of extended operation. The inspection will also provide added assurance that the structural integrity of susceptible components is maintained such that spatial interaction will not impair or prevent a safety-related intended function during the period of extended operation.

NUREG-1801 Consistency

The Selective Leaching Inspection is a new one-time inspection for SSES that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M33, “Selective Leaching of Materials.”

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The Selective Leaching Inspection detects and characterizes conditions to determine whether, and to what extent, a loss of material due to selective leaching is occurring (or likely to occur) for susceptible components including piping and tubing, valve bodies, pump and turbocharger casings, heat exchanger, cooler, and chiller components, hydrants, sprinkler heads, strainers, level gauges, orifices, and heater sheaths. The components within the scope of the program are formed of cast iron or copper alloy (brass and bronze) materials. The components are subject to raw water, treated water, groundwater (buried), indoor air with condensation, outdoor air, and fuel oil environments. The components within the scope of this program are located in 25 plant systems within the scope of license renewal.

- Preventive Actions
  No actions are taken as part of the Selective Leaching Inspection to prevent aging effects or to mitigate aging degradation. Although the control of water chemistry may reduce selective leaching, no specific credit is taken for water chemistry as part of this program.

- Parameters Monitored or Inspected
  The Selective Leaching Inspection will perform a combination of visual examination and hardness testing, as appropriate, of selected components within the scope of the program as measures of loss of material due to selective leaching.

  The elements of the program include (a) determination of the sample size based on an assessment of materials of fabrication, environment, plausible aging effects, and operating experience; (b) identification of the inspection locations in the system or component based on the aging effect; (c) determination of the examination technique, including acceptance criteria that would be effective in managing the aging effect for which the component is examined; and (d) evaluation of the need for follow-up examinations to monitor the progression of aging if age-related degradation is found that could jeopardize an intended function before the end of the period of extended operation.

- Detection of Aging Effects
  The Selective Leaching Inspection will include provision for a combination of visual examination and hardness testing of a sample of components with susceptible materials in environments conducive to the occurrence of selective leaching. The program will include the criteria for visual inspection and for hardness testing. The results of the inspections will be evaluated to determine the condition of the material. Engineering evaluation in conjunction with the Corrective Action Program will determine whether components with degraded materials are capable of performing their intended functions.

  The Selective Leaching Inspection activities will be conducted after the issuance of the renewed operating licenses and prior to the end of the current operating licenses for SSES Units 1 and 2, with sufficient time to implement programmatic oversight period of extended operation, if necessary. The activities will be conducted no earlier than 10 years prior to the end of the current operating licenses, so that conditions are more representative of the conditions expected during the period of extended operation.

- Monitoring and Trending
  No actions are taken as part of the Selective Leaching Inspection to monitor and/or trend inspection results. This is a one-time inspection activity used to determine if, and to what extent, further actions, including monitoring and trending, may be

required. Results of inspections, if necessary, are routinely evaluated through the site corrective action process.

- Acceptance Criteria
  The Selective Leaching Inspection will include acceptance criteria for visual inspections and for hardness testing. Inspections that do not meet the acceptance criteria will be entered into the Corrective Action Program. The Corrective Action Program includes provision for further evaluation of degraded materials and any necessary corrective actions.

- Corrective Actions
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Selective Leaching Inspection is a new one-time inspection activity for which there is no operating experience indicating the need for an aging management program. However, plant design considerations address the potential for degradation of installed components through the application of materials suitable for the expected operating environments. Inspection methods will be consistent with accepted industry practices.

Required Enhancements

None.

Conclusion

Implementation of the Selective Leaching Inspection will verify that there are no aging effects requiring management for the subject components, or will identify appropriate corrective actions, possibly including programmatic oversight, to be taken to ensure that the component intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

B.2.30 Buried Piping and Tanks Inspection Program

Program Description

The purpose of the Buried Piping and Tanks Inspection Program is to manage the effects of corrosion on the external surfaces of piping and tanks exposed to a buried environment. The Buried Piping and Tanks Inspection Program will be a combination of a prevention program (consisting of protective coatings and wrappings where appropriate) and a condition monitoring program (consisting of visual inspections). Implementation of the Buried Piping and Tanks Inspection Program will ensure that the pressure boundary integrity of the subject components is maintained consistent with the current licensing basis during the period of extended operation.

The Buried Piping and Tanks Inspection Program is a new aging management program that will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The Buried Piping and Tanks Inspection Program is a new SSES program that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M34, "Buried Piping and Tanks Inspection," with the following exceptions:

Exceptions to NUREG-1801

Program Elements Affected:

- **Scope –**

  In addition to steel (as well as cast iron) piping components and steel tanks, the scope of the program includes stainless steel piping components.

- **Preventive Actions –**

  The buried fire protection piping components and the buried stainless steel piping components in the Condensate Transfer and Storage System are not provided with any special coatings or wrappings in accordance with plant design specifications and consistent with plant operating experience.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The scope of the Buried Piping and Tanks Inspection Program includes buried components that are within the scope of license renewal for SSES. The program is

credited for managing loss of material due to crevice, galvanic, general, and pitting corrosion and microbiologically influenced corrosion (MIC) for buried steel and cast iron piping components. In addition, the program is credited with managing loss of material for buried stainless steel piping components. The buried components within the scope of this program are in the Condensate Transfer and Storage System, Cooling Tower System, Diesel Fuel Oil System, Emergency Service Water System, Fire Protection System, Residual Heat Removal Service Water System, and Water Pretreatment System.

The Buried Piping and Tanks Inspection Program is also credited for managing loss of material due to general corrosion for buried steel tanks in the Diesel Fuel Oil System.

- Preventive Actions
  Consistent with standard industry practices and in accordance with plant design specifications, buried components are provided with protective coatings during installation for protection from direct contact with soil except for piping in the Fire Protection System and the Condensate Transfer and Storage System.

  Buried piping in the Fire Protection System is formed of cast iron and ductile iron materials and is not required to be coated per plant design specifications.

  Buried piping in the Condensate Transfer and Storage System is formed of stainless steel and is not required to be coated per plant design specifications.

  Otherwise, no actions are taken as part of the Buried Piping and Tanks Inspection Program to prevent aging effects or to mitigate degradation.

- Parameters Monitored or Inspected
  The integrity of coatings and wrappings for buried components will be visually inspected when piping is excavated for maintenance or other reasons. Evidence of damaged wrapping or of coating defects will be documented for further evaluation.

  Exterior surfaces of buried stainless steel piping in the Condensate Transfer and Storage System and buried piping in the Fire Protection System will be visually inspected when piping is excavated for maintenance or other reasons. Evidence of corrosion will be documented for further evaluation.

- Detection of Aging Effects
  Integrity of coatings and wrappings will be inspected when components are excavated for maintenance or other reasons. An inspection of buried piping will be performed within the 10-year period prior to entering the period of extended operation (i.e., between year 30 and year 40). If an opportunistic inspection has not occurred between year 30 and year 38, an excavation of a section of buried piping for the purpose of inspection will be performed before year 40. The inspection

location will be established based on evaluation of recent operating experience, the condition of buried piping as known based on results of internal inspections or other relevant information, and a risk-based evaluation.

Inspections of the uncoated Fire Protection System piping and uncoated stainless steel piping in the Condensate Transfer and Storage System will be performed when the piping is excavated for maintenance or other reasons. An inspection of the uncoated buried piping will be performed within the 10-year period prior to entering the period of extended operation (i.e., between year 30 and year 40). If an opportunistic inspection has not occurred between year 30 and year 38, an excavation of a section of the piping for the purpose of inspection will be performed before year 40. The inspection location will be established based on evaluation of recent operating experience, the condition of buried piping as known based on results of internal inspections or other relevant information, and a risk-based evaluation.

Opportunistic inspections for buried piping are preferable, as the excavation of piping solely for purpose of inspection creates the risk of damaging an otherwise intact and functioning protective coating or of damaging the piping itself.

- Monitoring and Trending
  The Buried Piping and Tanks Inspection Program will require that evidence of damaged wrappings or coating defects identified during inspection activities be documented. Degradation of external coatings of buried piping will be evaluated to determine other potentially susceptible locations. The susceptible locations will be monitored or inspected, as necessary, based on engineering evaluation.

  The Buried Piping and Tanks Inspection Program will require that evidence of corrosion of uncoated piping identified during inspection activities be documented. Corrosion of external surfaces of uncoated buried piping will be evaluated to determine other potentially susceptible locations. The susceptible locations will be monitored or inspected, as necessary, based on engineering evaluation.

- Acceptance Criteria
  The Buried Piping and Tanks Inspection Program will include acceptance criteria to be used during inspections of coatings and wrappings for buried piping components. Degradation of coatings or wrappings identified during inspection of buried piping will be documented and evaluated in accordance with the SSES Corrective Action Program. Engineering evaluation will be required to determine if, and to what extent, corrective actions are necessary.

  The Buried Piping and Tanks Inspection Program will include acceptance criteria to be used during inspections of uncoated buried piping. Evidence of corrosion identified during inspection of uncoated buried piping will be documented and evaluated in accordance with the SSES Corrective Action Program. Engineering

evaluation will be required to determine if, and to what extent, corrective actions are necessary.

- Corrective Actions
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  This is a new aging management program; therefore, there is no SSES operating experience associated with the program. However, plant design considerations addressed the potential for degradation of buried piping components through the application of protective coatings and wrappings.

  No history of piping degradation due to external corrosion of coated or uncoated buried piping was identified for SSES through searches of operating experience or discussions with program owners. SSES operating experience demonstrates that the coating of buried steel piping and tanks is effective in managing the effects of aging. SSES operating experience demonstrates that the uncoated buried stainless steel and fire protection piping has not degraded as a result of aging.

Required Enhancements

None.

Conclusion

The Buried Piping and Tanks Inspection Program will be capable of managing loss of material due to corrosion for susceptible piping components and tanks in buried environments. The Buried Piping and Tanks Inspection Program will provide reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.31 Small Bore Class 1 Piping Inspection

Program Description

The purpose of the Small Bore Class 1 Piping Inspection is to confirm the effectiveness of the BWR Water Chemistry Program in mitigating loss of material and cracking for small bore Class 1 piping. It will also verify, by inspections for cracking, that reduction of fracture toughness due to thermal embrittlement requires no additional aging management for small bore Class 1 piping.

This inspection is applicable to small bore ASME Code Class 1 piping and systems less than 4 inches nominal pipe size (NPS 4), which includes pipes, fittings, and branch connections. The inspection provides additional assurance that either aging of small bore ASME Code Class 1 piping is not occurring or that the aging is insignificant, such that an additional aging management program (AMP) is not warranted. This program is applicable only to plants that have not experienced cracking of ASME Code Class 1 small bore piping resulting from stress corrosion or thermal and mechanical loading. Should evidence of significant aging be revealed by a one-time inspection or previous operating experience, periodic inspection will be proposed, as managed by a plant specific AMP. SSES has found no cracking of small bore piping due to stress corrosion or thermal and mechanical loading.

The Small Bore Class 1 Piping Inspection is a new one-time inspection that will be implemented prior to the period of extended operation. The inspection activities will be conducted within the 10-year period prior to the period of extended operation.

NUREG-1801 Consistency

The Small Bore Class 1 Piping Inspection is a new SSES one-time inspection that will be consistent with the 10 elements of an effective aging management inspection as described in NUREG-1801, Section XI.M35, “One-time Inspection of ASME Code Class 1 Small-Bore Piping.”

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The SSES inspection will include measures to verify that unacceptable degradation is not occurring in Class 1 small bore piping, thereby validating the effectiveness of the BWR Water Chemistry Program to mitigate aging-related degradation and

confirming that no additional aging management programs are needed for the period of extended operation. See *Monitoring and Trending* for a discussion of sample selection.

- Preventive Actions
  The SSES inspection will be an inspection and evaluation activity with no actions to prevent aging effects.

- Parameters Monitored or Inspected
  The SSES inspection will include nondestructive examinations (including volumetric techniques) performed by qualified personnel following procedures consistent with Section XI of ASME Code and 10CFR50, Appendix B.

- Detection of Aging Effects
  SSES has not experienced cracking of small bore class 1 piping due to stress corrosion or thermal and mechanical loading; therefore, this inspection is appropriate. This inspection will perform volumetric examinations on selected weld locations. SSES has found cracking due to vibrational fatigue of small bore piping and continues to inspect by augmentation of the SSES Inservice Inspection Program.

- Monitoring and Trending
  The SSES inspection will include a representative sample of the system population, and, where practical, will focus on the bounding or lead components most susceptible to aging due to time in service, severity of operating conditions, and lowest design margin. Actual inspection locations will be based on physical accessibility, exposure levels, non-destructive examination (NDE) techniques, and locations identified in Nuclear Regulatory Commission (NRC) Information Notice (IN) 97-46. Nondestructive examinations (including volumetric techniques) will be performed by qualified personnel following procedures that are consistent with Section XI of ASME Code and 10 CFR 50, Appendix B. Inspections already being performed by augmentation of the SSES Inservice Inspection Program for vibrational fatigue of small bore piping, will be factored into the sample determination for the Small Bore Class 1 Piping Inspection.

  Unacceptable inspection findings will be evaluated by the SSES corrective action process. The SSES Small Bore Class 1 Piping Inspection will require an increased sample size in response to unacceptable inspection findings. Evaluation of indications may lead to the creation of a plant-specific AMP.

- Acceptance Criteria
  Indications detected during inspections will be evaluated in accordance with the ASME Code. The evaluation of indications will include determining the extent of condition and necessary expansion of samples.

- Corrective Actions
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Small Bore Class 1 Piping Inspection is a new inspection for which there is no SSES specific operating experience. The evaluations and examinations to be performed by this inspection will use existing techniques with demonstrated capability and a proven industry record to detect cracking in piping weld and base metal.

Required Enhancements

None.

Conclusion

The Small Bore Class 1 Piping Inspection will verify that loss of material, cracking due to stress corrosion or thermal and mechanical loading, and cracking due to reduction of fracture toughness are being effectively managed for the subject piping. The Small Bore Class 1 Piping Inspection will provide reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.32 System Walkdown Program

Program Description

The purpose of the System Walkdown Program is to manage the following aging effects for the external surfaces, and in some cases, the internal surfaces, of mechanical components within the scope of license renewal:

- Loss of material for metals (aluminized steel, carbon/low alloy steel, cast iron, copper alloys, galvanized steel, and stainless steel) that are exposed to indoor air, outdoor air, or ventilation environments, including both the HVAC-type internal environments and ambient air internal environments, such as that found in the upper portion of a vented tank.

- Cracking and/or change in material properties for elastomers (neoprene and rubber) and polymers (Teflon) that are exposed to indoor air or ventilation environments.

The System Walkdown Program is a condition monitoring program consisting of observation and surveillance activities to detect aging and age-related degradation.

NUREG-1801 Consistency

The System Walkdown Program is an existing SSES program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M36, “External Surfaces Monitoring.”

Exceptions to NUREG-1801

None.

Required Enhancements

Prior to the period of extended operation the enhancements listed below will be implemented in the identified program elements:

- **Scope –**

  The governing procedure for the System Walkdown Program must be revised to add the listing of systems crediting the program for license renewal.

- **Detection of Aging Effects –**

  All of the systems to be added to the procedure contain mechanical components whose external surfaces require aging management during the period of extended operation. It may be determined by engineering evaluation that these

components do not require monitoring every two weeks, and the basis for a different walkdown frequency may be documented on the appropriate procedure form.

- **Detection of Aging Effects –**

  The governing procedure for the System Walkdown Program must be enhanced to address the license renewal requirement for opportunistic inspections of normally inaccessible components (e.g., those that are insulated), and those that are accessible only during refueling outages.

Operating Experience

The elements that comprise the System Walkdown Program are consistent with industry practice and have proven effective in maintaining the material condition of SSES plant systems and components.

A review of plant-specific operating experience for the most recent five-year period, through a search of Action Requests and Condition Reports, revealed that component leakage, damage, and/or degradation are routinely identified by the System Walkdown Program, with subsequent corrective actions taken in a timely manner; and that no loss of pressure boundary integrity has occurred that was, or could have been, attributed to the applicable aging effects that are in the scope of the program.

Conclusion

The System Walkdown Program has been demonstrated to be capable of detecting and managing loss of material for metallic components, and cracking and change in material properties for elastomers. The continued implementation of the System Walkdown Program, with the required enhancements, provides reasonable assurance that the effects of aging will be managed such that components subject to aging management will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.33 Lubricating Oil Analysis Program

Program Description

The purpose of the Lubricating Oil Analysis Program is to mitigate damage due to loss of material and reduction of heat transfer due to fouling for plant components that are within the scope of license renewal and exposed to lubricating oil. The program manages the relevant conditions that could lead to the onset and propagation of loss of material, or reduction in heat transfer for heat exchanger tubes, through proper monitoring consistent with manufacturer's recommendations, the equipment's importance to safe plant operation, equipment accessibility, and American Society for Testing of Materials (ASTM) standards for lubricating oil. The relevant conditions are specific parameters including particulate and water concentrations, viscosity, neutralization number, and flash point that could lead to, or are indicative of, conditions for age-related degradation of susceptible materials. The Lubricating Oil Analysis Program is a mitigation program.

The Lubricating Oil Analysis Program is supplemented by a separate one-time inspection of representative areas of select lubricating oil systems to provide further confirmation that loss of material is effectively mitigated. Refer to Section B.2.25 for discussion of the Lubricating Oil Inspection.

NUREG-1801 Consistency

The Lubricating Oil Analysis Program is an existing SSES program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M39, "Lubricating Oil Analysis Program", with the following exceptions:

Exceptions to NUREG-1801

Program Element Affected:

- **Parameters Monitored or Inspected –**

  The Lubricating Oil Analysis Program does not perform a particle count on the Emergency Diesel Generator or Residual Heat Removal System pump motor oil samples. Direct read ferrography provides sufficient particle information to verify the lubricating oil is suitable for continued use.

  The Lubricating Oil Analysis Program does not determine the flash point for the HPCI, RCIC, or RHR motor oil samples. Direct read ferrography, viscosity, total acid number, water content and metals content provide sufficient information to verify the lubricating oil is suitable for continued use.

Required Enhancements

Prior to the period of extended operation the enhancements listed below will be implemented in the identified program element:

- **Scope** –

  The scope of the Lubricating Oil Analysis Program must be enhanced to sample the lubricating oil from the Control Structure Chiller when the oil is changed. A particle count and a check for water must be performed on the drained oil.

Operating Experience

The Lubricating Oil Analysis Program for SSES is an ongoing program that effectively incorporates the best practices of industry guidance, vendor recommendations, and industry experience in providing the definition of lubricating oil quality requirements, monitoring of plant performance in implementing them, and continual review of their adequacy. The program considers inputs from a variety of industry sources as well as "lessons learned" from SSES and other utility operating experience. The program has been, and continues to be, subject to periodic internal and external assessment of the performance to identify strengths and potential adverse trends.

Review of SSES operating experience did not reveal a loss of component intended function for components exposed to lubricating oil that could be attributed to an inadequacy of the Lubricating Oil Analysis Program. Abnormal lubricating oil conditions are promptly identified, evaluated, and corrected.

Conclusion

The Lubricating Oil Analysis Program has been demonstrated to be capable of managing loss of material in lubricating oil, for susceptible components, through monitoring of the relevant parameters. The Lubricating Oil Analysis Program provides reasonable assurance that the aging effects will be managed such that components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.34 Inservice Inspection (ISI) Program - IWE

Program Description

The SSES Inservice Inspection (ISI) Program – IWE establishes responsibilities and requirements for conducting IWE inspections as required by 10 CFR 50.55a. The Inservice Inspection (ISI) Program – IWE includes visual examination of all accessible surface areas of the steel liner for the reinforced concrete primary containment and its integral attachments, containment seals and gaskets, and containment pressure-retaining bolting in accordance with the requirements of the ASME Boiler and Pressure Vessel Code (B&PV), Section XI, Division 1 1998 Edition with 2000 Addenda for Subsection IWE.

The inservice examinations conducted throughout the service life of SSES will comply, to the extent practical, with the requirements of the ASME B&PV Code Section XI Edition and Addenda incorporated by reference in 10 CFR 50.55a(b) 12 months prior to the start of the inspection interval, subject to prior approval via letter from the NRC. This is consistent with NRC statements of consideration (SOC) for 10 CFR 54 associated with the adoption of new editions and addenda of the ASME Code in 10 CFR 50.55a.

The Inservice Inspection (ISI) Program – IWE is implemented largely to meet the rules and requirements of the ASME Section XI Code. However, due to the similar nature of other inspection requirements, the Inservice Inspection (ISI) Program – IWE is expanded to include not only ASME Section XI examination and testing, but a variety of augmented inservice inspections being implemented in conjunction with the Inservice Inspection (ISI) Program – IWE and conforming to requirements other than ASME Section XI.

NUREG-1801 Consistency

The SSES Inservice Inspection (ISI) Program – IWE is an existing program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.S1, “ASME Section XI, Subsection IWE.”

Exceptions to NUREG-1801

None.

Required Enhancements

None.

Operating Experience

General visual inspections of the SSES Unit 1 and Unit 2 containment liners and penetrations have found evidence of age related degradation including flaking, discoloration, light to heavy pitting and corrosion. Deficiencies were further evaluated and corrected in accordance with the Inservice Inspection (ISI) Program – IWE. There were no code-related successive inspections required to be performed per Subsection IWE during the report period. Accessible wetted surfaces of submerged areas of the Unit 1 suppression pool were examined using VT-3 certified divers to perform these examinations and found acceptable. Examination of accessible wetted surfaces of submerged areas of the Unit 2 suppression pool using VT-3 certified divers is scheduled for the thirteenth refueling outage during 2007.

Conclusion

The Inservice Inspection (ISI) Program – IWE has been demonstrated to be capable of detecting and managing loss of material for steel surfaces of the containment. The continued implementation of Inservice Inspection (ISI) Program – IWE provides reasonable assurance that the aging effects will be managed such that the applicable structures and components will continue to perform their intended function consistent with the current licensing basis for the period of extended operation.

B.2.35 Inservice Inspection (ISI) Program - IWL

Program Description

The SSES Inservice Inspection (ISI) Program – IWL establishes responsibilities and requirements for conducting IWL Inspections as required by 10 CFR 50.55a. The Inservice Inspection (ISI) Program – IWL includes visual examination of all accessible surface areas of the reinforced concrete primary containment in accordance with the requirements of the ASME Boiler and Pressure Vessel Code (B&PV), Section XI, Division 1 1998 Edition with 2000 Addenda for Subsection IWL.

The inservice examinations conducted throughout the service life of SSES will comply, to the extent practical, with the requirements of the ASME B&PV Code Section XI Edition and Addenda incorporated by reference in 10 CFR 50.55a(b) 12 months prior to the start of the inspection interval, subject to prior approval via letter from the NRC. This is consistent with NRC statements of consideration (SOC) for 10 CFR 54 associated with the adoption of new editions and addenda of the ASME Code in 10 CFR 50.55a.

No applicable aging effects have been identified for the primary containment concrete. However, the Inservice Inspection (ISI) Program – IWL will be used to confirm the absence of significant aging effects for the extended period of operation.

The Inservice Inspection (ISI) Program – IWL is implemented largely to meet the rules and requirements of the ASME Section XI Code. However, due to the similar nature of other inspection requirements, the Inservice Inspection (ISI) Program – IWL is expanded to include not only ASME Section XI examination and testing, but a variety of augmented inservice inspections being implemented in conjunction with the Inservice Inspection (ISI) Program – IWL and conforming to requirements other than ASME Section XI.

NUREG-1801 Consistency

The SSES Inservice Inspection (ISI) Program – IWL is an existing program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.S2, “ASME Section XI, Subsection IWL.”

Exceptions to NUREG-1801

None.

Required Enhancements

None.

Operating Experience

For SSES, some of the currently existing concrete surface flaw conditions have existed since the original construction of the containment structures. These conditions are the result of the normal construction practices permitted by the original specifications and design criteria. They include small shrinkage cracks, minor construction joint voids, surface irregularities and similar conditions described in ACI 201.1R-68 and were generally considered to be minor degradation without needing further evaluation.

Visual examinations of the containment exterior have found some areas with minor surface cracking of no significance and existing drilled holes. No reinforcement was observed at hole locations. Deficiencies were further evaluated and corrected in accordance with the Inservice Inspection (ISI) Program – IWL. Examinations were conducted of 100 percent of the locations specified in the program. There were no code-related successive inspections required to be performed per Subsection IWL during the report period. There were no condition reports generated against the containment structure inspection program.

Conclusion

The Inservice Inspection (ISI) Program - IWL has been demonstrated to effectively identify and disposition issues that could have led to degraded conditions of the concrete primary containment structures. The continued implementation of Inservice Inspection (ISI) Program - IWL provides reasonable assurance that aging effects will be managed such that the concrete primary containment structures will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.36 Inservice Inspection (ISI) Program - IWF

Program Description

The SSES Inservice Inspection (ISI) Program – IWF establishes responsibilities and requirements for conducting IWF Inspections for ASME Class 1, 2, and 3 component supports as required by 10 CFR 50.55a. The Inservice Inspection (ISI) Program – IWF visual examination for supports is based on sampling of the total support population. The sample size varies depending on the ASME Class. The largest sample size is specified for the most critical supports (ASME Class 1). The sample size decreases for the less critical supports (ASME Class 2 and 3). Discovery of support deficiencies during regularly scheduled inspections triggers an increase of the inspection scope, in order to ensure that the full extent of deficiencies is identified. The primary inspection method employed is visual examination. Degradation that potentially compromises support function or load capacity is identified for evaluation. Subsection IWF specifies acceptance criteria and corrective actions. Supports requiring corrective actions are re-examined during the next inspection period in accordance with the requirements of the ASME Boiler and Pressure Vessel Code (B&PV), Section XI, Division 1 1998 Edition with 2000 Addenda for Subsection IWF.

The inservice examinations conducted throughout the service life of SSES will comply, to the extent practical, with the requirements of the ASME B&PV Code Section XI Edition and Addenda incorporated by reference in 10 CFR 50.55a(b) 12 months prior to the start of the inspection interval, subject to prior approval via letter from the NRC. This is consistent with NRC statements of consideration (SOC) for 10 CFR 54 associated with the adoption of new editions and addenda of the ASME Code in 10 CFR 50.55a.

The Inservice Inspection (ISI) Program – IWF provides reasonable assurance that the effects of aging are adequately managed to assure that the Class 1, 2, and 3 component supports intended function is performed consistent with the current licensing basis for the period of extended operation.

NUREG-1801 Consistency

The SSES Inservice Inspection (ISI) Program – IWF is an existing program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.S3, “ASME Section XI, Subsection IWF.”

Exceptions to NUREG-1801

None.

Required Enhancements

None.

Operating Experience

Inservice Inspection (ISI) Program – IWF inspections of SSES Units 1 and 2 have found non aging-related degradation such as pipe support clearance not in accordance with drawings, misaligned clamps, bent rods on spring can supports and sway struts, and loose lock nuts. Deficiencies were further evaluated and corrected in accordance with the Inservice Inspection (ISI) Program – IWF. Examinations were conducted of 100 percent of the locations specified in the program. There were no code related successive inspections required to be performed per Subsection IWF during the report period.

Conclusion

The Inservice Inspection (ISI) Program – IWF has been demonstrated to be capable of detecting and managing loss of material for ASME Class 1, 2, and 3 component supports. The continued implementation of the Inservice Inspection (ISI) Program – IWF provides reasonable assurance that aging effects will be managed such that applicable structures and components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.37 Containment Leakage Rate Test Program

Program Description

The Containment Leakage Rate Test Program is credited with managing aging effects for the primary containment and systems penetrating the primary containment, which are the containment liner and primary containment penetrations including personnel airlock, equipment hatches, and control rod drive (CRD) hatch.

The Containment Leakage Rate Test Program provides assurance that leakage from the primary containment will not exceed maximum values for containment leakage. The regulatory basis for the Containment Leakage Rate Test Program includes 10 CFR 50 Appendix J Option B, and Regulatory Guide 1.163 (Performance-Based Containment Leak-Test Program).

The Containment Leakage Rate Test Program provides reasonable assurance that the effects of aging are adequately managed to ensure that leakage through primary containment and systems and components penetrating primary containment does not exceed allowable values specified in technical specifications and that their intended function is performed consistent with the current licensing basis for the period of extended operation.

NUREG-1801 Consistency

The SSES Containment Leakage Rate Test Program is an existing program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.S4, “10 CFR Part 50, Appendix J.”

Exceptions to NUREG-1801

None.

Required Enhancements

None.

Operating Experience

For SSES, the integrated leakage rates for Type A tests, the sum of Type B and Type C leakage rate tests, have been less than the maximum allowable leakage rates specified in the SSES Technical Specifications. No significant age-related degradation of the containment and its penetrations have been identified. However, during the performance of inspections under the SSES Inservice Inspection Program, some anomalies were observed associated with the Unit 2 personnel hatch inner and outer doors and barrel assembly. The anomalies included corrosion found on door gaskets

and gasket seating surfaces, and moisture on barrel assembly surfaces. Corrective actions were subsequently implemented that included replacement of door seals, removal of rust, and installing protective coating on metal surfaces.

Conclusion

The Containment Leakage Rate Test Program has been demonstrated to be capable of detecting and managing aging effects for containment liner and primary containment penetrations. The continued implementation of the Containment Leakage Rate Test Program provides reasonable assurance that the aging effects will be managed such that the containment will continue to perform its intended function consistent with the current licensing basis for the period of extended operation.

B.2.38 Masonry Wall Program

Program Description

This program is an existing condition monitoring program and consists of inspection activities to detect aging and age-related degradation for masonry walls identified as performing intended functions in accordance with 10 CFR 54.4. Masonry walls that perform a fire barrier intended function are also managed by the Fire Protection Program (Refer to Section B.2.16).

The Masonry Wall Program is implemented as part of the Structures Monitoring Program.

The aging effect identified within the scope of the Masonry Wall Program is cracking, which is detected by visual inspection of external surfaces prior to the loss of the structure's or component's intended function(s). Masonry walls are visually examined at a frequency selected to ensure there is no loss of intended function between inspections and that the evaluation basis established for each masonry wall within the scope of license renewal remains valid through the period of extended operation.

NUREG-1801 Consistency

The SSES Masonry Wall Program is an existing program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.S5, "Masonry Wall Program."

Exceptions to NUREG-1801

None.

Required Enhancements

Prior to the period of extended operation the enhancements listed below will be implemented in the identified program element:

- **Acceptance Criteria –**

  The Masonry Wall Program is implemented as part of the Structures Monitoring Program. The Structures Monitoring Program procedure will be enhanced to specify that for each masonry wall, the extent of observed masonry cracking and/or degradation of steel edge supports/bracing is evaluated to ensure that the current evaluation basis is still valid. Corrective action is required if the extent of masonry cracking and steel degradation is sufficient to invalidate the evaluation basis. An option is to develop a new evaluation basis that accounts for the degraded condition of the wall (i.e., acceptance by further evaluation).

Operating Experience

Information Notice (IN) 87-67 was issued due of problems found during inspections verifying plants' responses to IE Bulletin 80-11. SSES was not required to provide a response to IE Bulletin 80-11 since SSES Units 1 and 2 did not have their Operating License at that time. However, SSES has conducted an internal industry events review for IN 87-67. Deficiencies noted in IN 87-67 having the potential for affecting plant safety are as follows:

- Unanalyzed Conditions - Unreinforced masonry walls (at other plants) were discovered to contain cracks that were not accounted for in the structural analysis of the walls.

  All of SSES masonry walls (safety and non-safety related) are reinforced. Therefore, discovery of cracks would not necessarily indicate a deficiency since the design of a reinforced masonry wall includes cracking from the outer masonry surface to the rebar.

- Improper Assumptions - Assumptions made (at other plants) during the reevaluation analyses for individual walls were either in error or had not been verified (i.e., mortar properties, wall boundary conditions, and unverified reinforcement).

  SSES masonry wall construction is governed by plant specification regarding mortar, block material, rebar, etc. Boundary conditions are delineated on plant drawings. Quality control inspectors verify that the construction of all safety related masonry walls are in accordance with the documents.

- Improper Classification - Classification and reclassification of masonry walls as safety-related and non safety-related (at other plants) as a result of Bulletin 80-11 was found to be a problem.

  No reclassification of masonry walls was done at SSES as a result of IE Bulletin 80-11. All masonry walls in Seismic Category I buildings are considered as safety-related.

- Lack of Procedural Control - Activities (at other plants) were performed on safety-related components or equipment without proper controls (i.e., walkdown surveys, record keeping, modifications).

  During the original construction of SSES, procedural control was used to control all attachments to masonry walls. This included documenting all attachments to masonry walls on individual drawings. Currently, modification control requirements are in place to update masonry wall attachment drawings to assure that the particular wall is not overstressed based on design criteria.

Visual examinations conducted by the Masonry Wall Program as implemented by the Structures Monitoring Program have not found any age-related problems or degraded conditions for SSES masonry walls that could affect their intended function.

Conclusion

The Masonry Wall Program, as part of the Structures Monitoring Program with enhancements (Refer to Section B.2.39), has been demonstrated to be capable of detecting and managing aging effects for masonry walls within the scope of license renewal. The continued implementation of the Masonry Wall Program provides reasonable assurance that the effects of aging will be managed so that masonry walls will perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.39 Structures Monitoring Program

Program Description

The Structures Monitoring Program is designed to ensure that age-related degradation of plant structures and structural components within its scope is managed to ensure that each such structure or structural component retains the ability to perform its intended function. The program is comprised of many existing monitoring and assessment activities that collectively address potential and actual degradation conditions and their effects upon the reliability of the structures and components that are within the scope of the program.

This program implements provisions of the Maintenance Rule, 10 CFR 50.65, that relate to structures, masonry walls, and water-control structures. It conforms to the guidance contained in Regulatory Guide (RG) 1.160, ANSI/ASCE 11-90, and NUMARC 93-01. Concrete and masonry walls that perform a fire barrier intended function are also managed by the Fire Protection Program (Refer to Section B.2.16).

The Structures Monitoring Program also implements the Masonry Wall Program.

The Structures Monitoring Program will also implement the RG 1.127 Water-Control Structures Inspection.

Since protective coatings are not relied upon to manage effects of aging for structural components included in the Structures Monitoring Program, the program does not address protective coating monitoring and maintenance.

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

NUREG-1801 Consistency

The SSES Structures Monitoring Program is an existing program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.S6, "Structures Monitoring Program."

Exceptions to NUREG-1801

None.

Required Enhancements

Prior to the period of extended operation the enhancements listed below will be implemented in the identified program elements:

- **Scope –**

  The Structures Monitoring Program procedure will be enhanced to include additional structures requiring aging management for license renewal to the scope of the inspections.

  The Structures Monitoring Program procedure will be enhanced to clarify "structural component" for inspection includes each of the component types identified as requiring aging management.

- **Parameters Monitored or Inspected –**

  The Structures Monitoring Program and excavation procedure will be enhanced to specify that if a below grade structural wall or structural component becomes accessible through excavation; a follow-up action is initiated for the responsible engineer to inspect the exposed surfaces for age-related degradation.

  The Structures Monitoring Program procedure will be enhanced to specify that the responsible engineer shall review site groundwater and raw water pH, chlorides, and sulfates results prior to inspection to validate that the below-grade or raw water environment remain non-aggressive during the period of extended operation. Chemistry data shall be obtained from SSES Chemistry Group. Chemistry data shall be collected at least once per year. Data collection date shall be staggered from year to year (summer-winter-summer) to account for seasonal variations.

- **Parameters Monitored or Inspected, Acceptance Criteria –**

  The Structures Monitoring Program procedure will be enhanced to include degradation mechanisms for elastomer and earthen embankment inspection.

- **Scope, Parameters Monitored or Inspected –**

  The Structures Monitoring Program procedure will be enhanced to include RG 1.127 inspection elements for water-control structures.

- **Acceptance Criteria –**

  The Structures Monitoring Program procedure will be enhanced to specify that for each masonry wall, the extent of observed masonry cracking and/or degradation of steel edge supports/bracing is evaluated to ensure that the current evaluation basis is still valid. Corrective action is required if the extent of

masonry cracking and steel degradation is sufficient to invalidate the evaluation basis. An option is to develop a new evaluation basis that accounts for the degraded condition of the wall (i.e., acceptance by further evaluation).

Operating Experience

Most of the major safety related structures at SSES have been visually inspected in accordance with condition survey procedures as part of the Susquehanna Plant Lifetime Excellence Program (SPLEX) implemented in 1990. The results of the initial surveys and life assessments contribute to the development of the Structures Monitoring Program. Although actual experience with SSES Structures Monitoring Program inspections is limited, recent inspection results along with condition surveys conducted as part of SPLEX have shown that plant structures are maintained in good condition. No significant failures have occurred in any SSES structures to date. Normal deterioration due to aging has been identified and effectively managed under SSES maintenance program.

Visual examinations conducted by the Structures Monitoring Program have found general corrosion on steel components and concrete cracking, flaking, and scaling. Some of the currently existing concrete surface conditions have existed since the original construction. These conditions are the results of the normal construction practices permitted by the original specifications and design criteria. They include small shrinkage cracks, minor construction joint voids, surface irregularities and similar conditions described in ACI 201.1R-68 and were generally considered to be minor degradation without needing further evaluation. Other age-related degradations noted by the Structures Monitoring Program include degraded roof membranes in several structures, isolated cases of water intrusion in the ESSW pumphouse, degraded expansion joints, and penetration leakage in diesel generator building and reactor building. Water in leakage at penetrations located below grade exterior walls has been identified in the past and presently monitored and controlled. Deficiencies were further evaluated and corrected in accordance with the corrective action program.

The Structures Monitoring Program has demonstrated that it provides reasonable assurance that aging effects are being managed. Additionally, this has been demonstrated through inspection reports, program health reports, and the Corrective Action Program.

Conclusion

The Structures Monitoring Program with enhancements has been demonstrated to be capable of detecting and managing aging effects for structures within the scope of license renewal. The continued implementation of the Structures Monitoring Program with enhancements provides reasonable assurance that the effects of aging will be managed so that components subject to aging management review will continue to

perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.40 RG 1.127 Water-Control Structures Inspection

Program Description

The RG 1.127 Water-Control Structures Inspection is an existing condition monitoring program consisting of inspection and surveillance activities to detect aging and age-related degradation of the Spray Pond (including concrete liner, emergency spillway, and riser encasements), ESSW Pumphouse (including pump intake chambers, overflow weir and chamber, and structural components within the ESSW Pumphouse), and the earthen embankments along the Spray Pond.

The RG 1.127 Water-Control Structures Inspection is implemented as part of the Spray Pond Inspection and Structures Monitoring Program.

SSES is committed to RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants, April 1977. Aging management for the Spray Pond is included in the Spray Pond Inspection. Aging management of the Spray Pond, ESSW Pumphouse, and earthen embankments is included in the Structures Monitoring Program. Enhancements pertaining to water-control structures inspection elements from RG 1.127 Revision 1 will be incorporated into the Structures Monitoring Program consistent with NUREG-1801, Section XI.S7.

NUREG-1801 Consistency

The SSES RG 1.127 Water-Control Structures Inspection is an existing program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.S7, “Inspection of Water-Control Structures Associated with Nuclear Power Plants Program.”

Exceptions to NUREG-1801

None.

Required Enhancements

Prior to the period of extended operation the enhancements listed below will be implemented in the identified program elements:

- **Scope, Parameters Monitored or Inspected –**

  The RG 1.127 Water-Control Structures Inspection is implemented as part of the Structures Monitoring Program. The Structures Monitoring Program procedure will be enhanced to add the Spray Pond (including concrete liner, emergency spillway, riser encasements and earthen embankments) to its scope for inspection.

- **Parameters Monitored or Inspected –**

  The RG 1.127 Water-Control Structures Inspection is implemented as part of the Structures Monitoring Program. The Structures Monitoring Program procedure will be enhanced to include RG 1.127 Revision 1 Section C.2 inspection elements and degradation mechanisms for water-control structure inspection.

- **Acceptance Criteria –**

  The RG 1.127 Water-Control Structures Inspection is implemented as part of the Structures Monitoring Program. The Structures Monitoring Program procedure will be enhanced to include acceptance criteria as delineated in NUREG-1801 Section XI.S7 for water-control structures. Evaluation criteria provided in Chapter 5 of ACI 349.3R-96 provides acceptance criteria (including quantitative criteria) for determining the adequacy of observed aging effects and specifies criteria for further evaluation.

Operating Experience

Visual inspections conducted by the Spray Pond Inspection have found no age-related problems. Groundwater elevation monitoring results are within acceptance limits. A condition report (CR) in 1998 identified cracking along the apron of the Spray Pond. Upon CR investigation it was determined that the identified cracks existed from original construction and that the two large slabs (on the south side of the pond) which were displaced during construction were analyzed in FSAR Section 2.5.4.14 and found to be acceptable. The FSAR also includes analysis of the Spray Pond construction and the effect of additional hairline cracking. The result of the analysis concluded additional cracking can be tolerated.

Visual examinations conducted by the Structures Monitoring Program on water-control structures have found general corrosion on steel components, shrink cracks within roof membranes, and water intrusion on the east wall of the base mat in the ESSW pumphouse. Degradations found were determined to have no adverse affect on structural integrity and action requests have been issued for repair. Water in leakage at below grade exterior walls has been identified in the past and is presently monitored and controlled. Deficiencies were further evaluated and corrected in accordance with the corrective action program.

Conclusion

The RG 1.127 Water-Control Structures Inspection as part of the Spray Pond Inspection and the Structures Monitoring Program with enhancements (Refer to Section B.2.39), has been demonstrated to be capable of detecting and managing aging effects for water-control structures within the scope of license renewal. The continued implementation of the RG 1.127 Water-Control Structures Inspection provides reasonable assurance that the effects of aging will be managed so that the water-

control structures will perform their intended functions consistent with the current licensing basis for the period of extended operation

B.2.41 Non-EQ Electrical Cables and Connections Visual Inspection Program

Program Description

The purpose of this aging management program is to manage the aging of non-EQ electrical cables and connections within the scope of license renewal at SSES. The program provides for the periodic visual inspection of accessible, non-EQ electrical cables and connections, in order to determine if age-related degradation is occurring, particularly in plant areas with high temperatures and/or high radiation levels. The program will provide reasonable assurance that the applicable electrical components will perform their intended function(s) for the period of extended operation.

The Non-EQ Electrical Cables and Connections Visual Inspection Program is a new aging management program that will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The SSES Non-EQ Electrical Cables and Connections Visual Inspection Program is a new program that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.E1, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The Non-EQ Electrical Cables and Connections Visual Inspection Program is credited with detecting aging effects from adverse localized environments in non-EQ cables and connections at SSES. The program is applicable to non-EQ cables and connections found in the Reactor Buildings, Circulating Water Pumphouse and Water Treatment Building, Control Structure, Diesel Generator Buildings, Turbine Building, Engineered Safeguards Service Water Pumphouse, and various yard structures (manholes, duct banks, valve vaults, instrument pits, etc.).

  These structures are within the scope of license renewal and contain electrical cables and connections that are subject to the guidelines of NUREG-1801, Section XI.E1.

This program is directed by physical location in the plant. Because there is no simple way (during an inspection) to determine which components are in scope for license renewal and which are not, the program inspections will be prioritized based on location rather than component identification or function.

Particular attention will be given to components in known adverse localized environments, where the localized temperatures and/or radiation levels are at the high end of the design environmental values. The inspection program will define these areas through a review of plant engineering data (EQ records, environmental surveys, condition monitoring data, etc.).

- Preventive Actions
  The Non-EQ Electrical Cables and Connections Visual Inspection Program is an inspection program; no actions are taken to prevent or mitigate aging degradation. The program is based on visual observation (and detection) only.

- Parameters Monitored or Inspected
  The Non-EQ Electrical Cables and Connections Visual Inspection Program will provide for the visual inspection of accessible cables and connections located in adverse localized environments. The implementing document(s) for the program will provide the technical basis for the sample selection, with respect to both sample size and inspection locations.

  The Non-EQ Electrical Cables and Connections Visual Inspection Program focuses on a visual inspection of accessible cables and connections. The cables and connections will not be touched during the inspection (either lifted, separated, felt or handled in any way). The inspection merely records the visible condition of the cable jacket or the visible condition of the connection (splice, terminal block, fuse block, etc.).

  For inspection of connections it may be necessary to open an electrical box to view the passive components.

- Detection of Aging Effects
  As described under *Parameters Monitored or Inspected*, the Non-EQ Electrical Cables and Connections Visual Inspection Program provides for a visual inspection of a representative sample of accessible electrical cables and connections located in adverse localized environments. The visual inspections will be performed on a 10-year interval, with the first inspection taking place within the 10-year period prior to the end of the current operating licenses. The program will inspect the accessible cables and connections for the aging effects due to heat, radiation, and moisture, in the presence of oxygen. The visible effects are embrittlement, discoloration, cracking, and surface contamination.

- Monitoring and Trending
  The Non-EQ Electrical Cables and Connections Visual Inspection Program will not include trending actions. If anomalies are found during the visual inspection process, they will be addressed at that time through the corrective action process.

- Acceptance Criteria
  The inspections of accessible cables and connections will identify unacceptable visual indications of surface anomalies, such as embrittlement, cracking, discoloration, crazing, crumbling, melting, and any other distinct visual evidence of oxidation, material deterioration or other visible degradation.

  The implementing document(s) for the Non-EQ Electrical Cables and Connections Visual Inspection Program will provide specific guidance on the identification of surface degradation.

- Corrective Actions
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Non-EQ Electrical Cables and Connections Visual Inspection Program is a new program for which there is no SSES-specific operating experience. Industry operating experience will be considered in development of this program, as appropriate.

Required Enhancements

None.

Conclusion

The Non-EQ Electrical Cables and Connections Visual Inspection Program will manage aging effects due to heat, radiation, and moisture, in the presence of oxygen for non-EQ cables and connections. The Non-EQ Electrical Cables and Connections Visual

Inspection Program will provide reasonable assurance that the aging effects will be managed such that the non-EQ cables and connections subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.42 Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program

Program Description

The purpose of this aging management program is to manage the age-related degradation associated with non-EQ, low current instrumentation cables and connections within the license renewal scope at SSES. This program addresses a subset of the overall in-scope, non-EQ cable and connections population at SSES (which is primarily addressed by the program guidelines of NUREG-1801, Section XI.E1).

This program applies to in-scope, non-EQ electrical cables and connections used in neutron monitoring and radiation monitoring circuits with sensitive, low-current signals. The sensitive nature of these circuits is such that visual inspection alone may not detect degradation to the insulation resistance function of the conductor insulation. This program will provide the technical input necessary to manage the aging of the non-EQ low-current instrumentation cables and connections within the license renewal scope.

The Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program is a new aging management program that will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The SSES Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program is a new program that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.E2, “Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits.”

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program is credited with identifying aging effects for sensitive, high-voltage, low-current signal applications that are in-scope for license renewal at SSES. These sensitive circuits are potentially subject to reduction in insulation resistance (IR) when found in adverse localized environments.

The exact scope of the circuits in the program will be detailed in the implementing document(s). The program is designed to include the in-scope high-range radiation monitoring circuits and the in-scope nuclear instrumentation circuits at SSES. See also discussion under *Detection of Aging Effects* below.

- Preventive Actions
  The Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program is a testing program designed to identify cable (and connection) degradation; no actions are taken to prevent or mitigate aging degradation.

- Parameters Monitored or Inspected
  The parameter monitored (tested) by the Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program is insulation resistance (IR). The applicable circuits will be tested to determine if there is any reduction in IR such that potential aging degradation can be identified for the circuit.

- Detection of Aging Effects
  The Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program will perform testing of the cable systems of sensitive, high-voltage, low-current instrumentation circuits to identify reduction in insulation resistance (IR). The testing methodology will utilize a proven test to detect degradation of the insulation. The test methodology will be specified prior to the first test, which will occur during the 10-year period prior to the end of the current operating license. Subsequent testing will be conducted at least once every 10 years, with the frequency to be determined by engineering evaluation.

  The testing will include in-scope sensitive, high-voltage, low-current instrumentation circuits. The implementing document(s) will detail the specific scope of the testing at SSES.

- Monitoring and Trending
  The Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program will not include trending actions. If anomalies are found during the inspection process, they will be addressed at that time through the corrective action process.

- Acceptance Criteria
  The acceptance criteria for the Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program will be provided by the implementing document(s) for the program. The test results will be evaluated against the acceptance criteria. Results outside the acceptance criteria will be evaluated in conjunction with the corrective action process.

- Corrective Actions
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program is a new program for which there is no SSES-specific operating experience. Industry operating experience will be considered in development of this program, as appropriate.

Required Enhancements

None.

Conclusion

The Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program will manage reduction in insulation resistance for non-EQ cables and connections used in sensitive, high-voltage, low-current circuits. The Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program will provide reasonable assurance that the aging effects will be managed such that the non-EQ cables and connections used in sensitive, high-voltage, low-current circuits, that are subject to aging management review, will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.43 Non-EQ Inaccessible Medium-Voltage Cables Program

Program Description

The purpose of this aging management program is to manage the aging of non-EQ inaccessible medium-voltage electrical cables subject to wetting within the license renewal scope at SSES. The program provides for the periodic testing of non-EQ inaccessible medium-voltage electrical cables, in order to determine if age-related degradation is occurring, and includes provision for the inspection of associated manholes to identify any collection of water. The program will provide reasonable assurance that the applicable electrical components will perform their intended function(s) for the period of extended operation.

The Non-EQ Inaccessible Medium-Voltage Cables Program is a new aging management program that will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The SSES Non-EQ Inaccessible Medium-Voltage Cables Program is a new program that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.E3, "Inaccessible Medium-Voltage Cables Not Subject to the 10 CFR 50.49 Environmental Qualification Requirements."

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The Non-EQ Inaccessible Medium-Voltage Cables Program involves two parts: first, the actions to inspect the applicable plant manholes (and to drain them, if necessary) on a periodic basis; and second, the development of a testing program to confirm that the conductor insulation on the applicable cables is not degrading.

  This program applies to six cables associated with the offsite power supply for SSES. These are the only inaccessible medium-voltage cables at SSES that are within the scope of license renewal and are exposed to significant moisture simultaneously with significant voltage. Two of the cables connect the Start-Up Transformers to the 13.8 kV buses. These cables run in underground duct banks (including several manholes) between the transformers and the Turbine Building. The other four cables connect the 13.8 kV buses to the Engineered Safeguards

System (ESS) Transformers, with portions of these cables run in underground duct banks (with no associated manholes).

The details of the SSES program scope, such as specific cable and manhole numbers, will be defined by the implementing document(s).

- Preventive Actions
  The Non-EQ Inaccessible Medium-Voltage Cables Program will include periodic preventive actions to inspect for water collection in applicable electrical manholes and to remove water (as necessary).

- Parameters Monitored or Inspected
  The specific type of test to be utilized in the Non-EQ Inaccessible Medium-Voltage Cables Program will be determined prior to the initial test. The implementing document(s) will specify a proven test for detecting the deterioration of the insulation system due to wetting (and energization), and will reflect the actual test methodology prior to the initial performance of the cable testing. In addition, the provisions for inspecting and draining (if necessary) the applicable electrical manholes will be described in the implementing document(s).

- Detection of Aging Effects
  The Non-EQ Inaccessible Medium-Voltage Cables Program will provide for the testing of in-scope medium-voltage cables to detect degradation of the conductor insulation. The program will utilize a proven test for detecting deterioration of the cable insulation due to wetting (and energization). The program will also conduct inspections of the applicable electrical manholes, to detect water collection and to drain the manholes (if necessary).

  The cable testing will be performed once every 10 years, with the first test to occur during the 10-year period prior to the end of the current operating license. The manhole inspection frequency will be based on actual plant operating experience with water accumulation in the manholes, but will be performed at least once every two years. The first inspections will occur during the 10-year period prior to the end of the current operating license.

- Monitoring and Trending
  The Non-EQ Inaccessible Medium-Voltage Cables Program will not include trending actions. If anomalies are found during the testing, they will be addressed at that time. The results of the manhole inspections will be recorded such that increasing water levels or the need for more frequent performance of draining can be identified.

- Acceptance Criteria
  The acceptance criteria for each test in the Non-EQ Inaccessible Medium-Voltage Cables Program will be defined by the specific type of test to be performed; the type

of test will be determined prior to the initial utilization of the program. The implementing document(s) will contain specific information on the acceptance criteria for the test.

- Corrective Actions
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Non-EQ Inaccessible Medium-Voltage Cables Program is a new program for which there is no SSES-specific operating experience. Industry operating experience will be considered in development of this program, as appropriate.

Required Enhancements

None.

Conclusion

The Non-EQ Inaccessible Medium-Voltage Cables Program will manage degradation of conductor insulation for inaccessible, non-EQ medium-voltage cables. The Non-EQ Inaccessible Medium-Voltage Cables Program will provide reasonable assurance that the aging effects will be managed such that the inaccessible, non-EQ medium-voltage cables subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.44 Metal-Enclosed Bus Inspection Program

Program Description

The purpose of this aging management program is to manage the aging of the metal-enclosed bus (MEB) within the license renewal scope at SSES. The program provides for the periodic inspection of the applicable metal-enclosed bus, in order to determine if age-related degradation is occurring. The program will provide reasonable assurance that the applicable electrical components will perform their intended function(s) for the period of extended operation.

The Metal-Enclosed Bus Inspection Program is a new aging management program that will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The SSES Metal-Enclosed Bus Inspection Program is a new program that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.E4, “Metal-Enclosed Bus.”

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The Metal-Enclosed Bus Inspection Program is credited with detecting aging effects for in-scope metal-enclosed bus at SSES. The applicable components for the metal-enclosed bus will be listed in the program implementing document(s), with their locations specified, as appropriate. The in-scope bus is limited to non-segregated metal-enclosed bus in the 13.8 kV and 4 kV electrical systems associated with the off-site power supply at SSES.

- Preventive Actions
  The Metal-Enclosed Bus Inspection Program is an inspection program; no actions are taken to prevent or mitigate aging degradation.

- Parameters Monitored or Inspected
  The Metal-Enclosed Bus Inspection Program will inspect the bus insulation for anomalies, such as embrittlement, cracking, melting, swelling or discoloration, which may indicate overheating or aging degradation. The internal bus enclosure will be inspected for cracks, corrosion, foreign debris, moisture, excessive dust buildup, and

evidence of water intrusion. The internal bus supports (i.e., internal to the enclosure) will be inspected for structural integrity and any sign of cracks.

The Metal-Enclosed Bus Inspection Program will inspect a sample of the bus bolted connections via thermography for signs of loose connections. The in-scope bus will be checked from the exterior with the bus energized to provide gross detection of any circuit hot spots. The Metal-Enclosed Bus Inspection Program will also inspect the elastomers used to seal the joints between adjacent bus sections (for the enclosure).

- Detection of Aging Effects
  The Metal-Enclosed Bus Inspection Program will utilize thermography to check the bolted connections in the non-segregated metal-enclosed bus that is within the license renewal scope at SSES. The thermography inspection will be performed for representative portions of the in-scope non-segregated metal-enclosed bus; the infrared readings will be taken from a distance with the bus energized and the enclosure covers in-place for a gross detection of any hot spots due to increased contact resistance.

  The Metal-Enclosed Bus Inspection Program also includes visual inspection of the internal bus enclosure, the bus insulation, the internal bus supports, and the elastomers used to seal adjacent bus sections (for the enclosure). The bus enclosure will be inspected for cracks, corrosion, foreign debris, moisture, excessive dust buildup, and evidence of water intrusion. The bus insulation will be inspected for anomalies, such as signs of embrittlement, cracking, melting, swelling or discoloration, which may indicate overheating or aging degradation. The internal bus supports (internal to the enclosure) will be inspected for structural integrity and signs of cracking. The elastomers used to seal the bus enclosure will be inspected for embrittlement, cracking, loosening, flaking, peeling, and other indications of aging degradation.

  Both the thermography inspection and the visual inspections will be performed on a 10-year interval, with the first inspections to be completed within the 10-year period prior to the end of the current operating license.

  The external bus enclosure supports (the structural supports for the entire bus assembly) will be inspected under the Structures Monitoring Program.

- Monitoring and Trending
  The Metal-Enclosed Bus Inspection Program will not include trending actions. If anomalies are found during the inspection process, they will be addressed at that time through the appropriate plant procedures.

- Acceptance Criteria
  The acceptance criteria for the thermography portion of the Metal-Enclosed Bus Inspection Program will be based on acceptance criteria already used in the thermography process at SSES. The acceptance criteria for the visual inspection portion (of the bus enclosure) will be that the MEB conductor insulation is free from unacceptable visual indications of surface anomalies, such as embrittlement, cracking, melting, swelling, and discoloration, and that the MEB is also free from unacceptable indications of corrosion, cracking, foreign debris, excessive dust buildup or evidence of moisture intrusion. In addition, the elastomers used to seal adjacent bus enclosures (exterior) are to be free from indications of aging degradation, such as embrittlement, cracking, loosening, flaking, and peeling.

- Corrective Actions
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Metal-Enclosed Bus Inspection Program is a new program for which there is no SSES-specific operating experience. Industry operating experience will be considered in development of this program, as appropriate.

Required Enhancements

None.

Conclusion

The Metal-Enclosed Bus Inspection Program will manage aging degradation for metal-enclosed bus. The Metal-Enclosed Bus Inspection Program will provide reasonable assurance that the aging effects will be managed such that the metal-enclosed bus subject to aging management review will continue to perform its intended functions consistent with the current licensing basis for the period of extended operation.

B.2.45 Non-EQ Electrical Cable Connections Program

Program Description

The purpose of this aging management program is to manage the aging effects for the metallic parts of non-EQ electrical cable connections within the scope of license renewal. It will address cable connections that are used to connect cable conductors to other cables or electrical devices. The most common types of connections used in nuclear power plants are splices (butt splices or bolted splices), crimp-type ring lugs, connectors, and terminal blocks. Most connections involve insulating material and metallic parts. This aging management program will account for the aging stressors of thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation of the metallic parts.

The Non-EQ Electrical Cable Connections Program is a new aging management program that will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The SSES Non-EQ Electrical Cable Connections Program is a new program that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.E6, “Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements”.

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  The metallic parts of electrical cable connections, not subject to 10 CFR 50.49, and associated with cables that are within the scope of license renewal, are part of this program, regardless of their association with active or passive components.

- Preventive Actions
  No actions are taken as part of this program to prevent or mitigate aging degradation.

- Parameters Monitored or Inspected
  This program will focus on the metallic parts of electrical cable connections. The monitoring includes inspection for loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination,

corrosion, and oxidation. A representative sample of electrical cable connections is tested. The following factors are considered for sampling: application (high, medium, and low voltage), circuit loading, and physical location (high temperature, high humidity, vibration, etc.) with respect to connection stressors. The technical basis for the sample selection will be documented. If an unacceptable condition or situation is identified in the selected sample, a determination is made as to whether the same condition or situation is applicable to other connections not tested.

- Detection of Aging Effects
  A sample of the electrical cable connections (the metallic parts) not subject to 10 CFR 50.49 environmental qualification requirements and within the scope of license renewal will be tested at least once every 10 years. Testing will utilize thermography. Thermography is a proven test for detecting loose connections and will be used to test a representative sample of cable connections to provide an indication of the integrity of the connections. A 10-year testing interval is adequate to preclude failures of the electrical connections since experience has shown that aging degradation is a slow process. This will provide two data points during a 20-year period, which can be used to characterize the degradation rate. The first tests for license renewal will be completed before the period of extended operation.

- Monitoring and Trending
  Trending actions are not included as part of this program.

- Acceptance Criteria
  The acceptance criteria will be based on the acceptance criteria already used for the thermography process at SSES.

- Corrective Actions
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Non-EQ Electrical Cable Connections Program is a new program for which there is no SSES-specific operating experience. Industry operating experience will be considered in the development of this program, as appropriate.

Required Enhancements

None.

Conclusion

The Non-EQ Electrical Cable Connections Program will manage the aging of the metallic parts of non-EQ electrical cable connections. The Non-EQ Electrical Cable Connections Program will provide reasonable assurance that aging effects will be managed such that the non-EQ electrical cable connections subject to aging management review will continue to perform their intended function consistent with the current licensing basis for the period of extended operation.

B.2.46 Area-Based NSAS Inspection

Program Description

The purpose of the Area-Based NSAS Inspection is to detect and characterize the conditions on the internal surfaces of subject nonsafety-related components that are exposed to non-radioactive equipment/area drainage water or potable water environments (evaluated as raw water). The Area-Based NSAS Inspection also detects and characterizes specific conditions on the internal surface of copper alloys exposed to raw water (from the spray pond/cooling tower). The conditions in these environments are not expected to result in sufficient degradation to cause spatial interaction with safety-related components or are expected to result in effects that progress very slowly. However, to ensure that spatial interactions do not occur that impair or prevent a safety-related function, a focused characterization of conditions is warranted to provide confirmation of a lack of degradation or to serve as the basis for recurring actions during the period of extended operation, if required.

This inspection provides direct evidence as to whether, and to what extent, a loss of material or cracking has occurred or is likely to occur for susceptible materials that could result in spatial interaction with safety-related components and prevention of safety-related intended functions. Implementation of the Area-Based NSAS Inspection will provide assurance that the structural integrity of susceptible nonsafety-related components is maintained such that spatial interactions (e.g., leakage) will not result in the loss of a safety-related component intended function during the period of extended operation.

NUREG-1801 Consistency

The Area-Based NSAS Inspection is a new one-time inspection for SSES that is plant-specific. The elements are generally similar to the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M32, “One-Time Inspection.” The considerations and relevant conditions associated with the inspection are considered specific to SSES.

Aging Management Program Elements

The results of an evaluation of each element against the 10 elements described in Appendix A of NUREG-1800, are provided below.

- Scope of Activity
  The scope of the Area-Based NSAS Inspection includes confirming the environmental and/or internal surface conditions of subject nonsafety-related carbon steel (includes low alloy steel), cast iron, copper alloy and stainless steel components in systems that (frequently or continuously during normal plant operations) contain non-radioactive equipment/area drainage water or potable

water, as well as for copper alloy components in systems that contain raw water (from the spray pond/cooling towers.

A representative sample of nonsafety-related components exposed to non-radioactive equipment/area drainage water or potable water in worst case locations, such as stagnant or low flow areas, will be examined for evidence of loss of material, or to confirm a lack thereof, and the results applied to the rest of the subject nonsafety-related components exposed to that environment, based on engineering evaluation.

In addition, conditions in non-radioactive equipment/area drainage water, potable water, and raw water environments will be evaluated for the presence of ammonia or ammonium compounds and, if found, a representative sample of nonsafety-related copper alloy components will be examined for evidence of cracking due to stress corrosion cracking (SCC).

- Preventive Actions
  No actions are taken as part of the Area-Based NSAS Inspection to prevent aging effects or to mitigate aging degradation.

- Parameters Monitored or Inspected
  The parameters inspected by the Area-Based NSAS Inspection will include wall thickness and/or visual evidence of internal surface degradation as a measure of loss of material of components exposed to non-radioactive equipment/area drainage water or potable water. If needed, the parameters inspected by the Area-Based NSAS Inspection will also include visual or volumetric evidence of internal surface degradation as a measure of cracking of copper alloy components exposed to non-radioactive equipment/area drainage water, potable water, or raw water (containing ammonia or ammonium compounds).

  Inspections will be performed by qualified personnel using established nondestructive examination (NDE) techniques appropriate to the nonsafety-related system/location being inspected.

- Detection of Aging Effects
  The Area-Based NSAS Inspection will use a combination of established volumetric and visual examination techniques performed by qualified personnel on a sample population of subject nonsafety-related components exposed to non-radioactive equipment/area drainage water or potable water to identify evidence of a loss of material or to confirm a lack thereof. The results of the inspection will be applied to all of the components within the scope of the inspection activity.

  If needed, based on engineering evaluation, the Area-Based NSAS Inspection, will use a combination of established volumetric and visual examination techniques performed by qualified personnel on a sample population of select nonsafety-related

components exposed to non-radioactive equipment/area drainage water, potable water, or raw water to identify evidence of cracking of susceptible copper alloy materials, or to confirm a lack thereof.

A sample population will be determined by engineering evaluation, where practical, focused on components considered to be most susceptible to aging, such as due to their time in service, the severity of conditions during normal plant operations, and lowest design margins.

The Area-Based NSAS Inspection, including any follow-up inspections, will be conducted after the issuance of the renewed licenses and prior to the end of the current operating licenses for SSES Unit 1 and Unit 2 with sufficient time to implement programmatic oversight for the period of extended operation, if necessary. The inspections will be conducted no earlier than 10 years prior to the end of the current operating licenses, so that aging effects which progress slowly and aging effects with long incubation periods have time to manifest.

- Monitoring and Trending
  No actions are taken as part of the Area-Based NSAS Inspection to monitor and/or trend inspection results. This is a one-time inspection used to determine if, and to what extent, further actions such as monitoring and trending may be required. Results of inspections, including follow-up inspections, are routinely evaluated through the site corrective action process, if necessary.

- Acceptance Criteria
  The acceptance criteria for the Area-Based NSAS Inspection will be: no unacceptable loss of material, wall thinning, or cracking that could result in spatial interaction (e.g., leakage) with safety-related components during the period of extended operation, as determined by engineering evaluation.

- Corrective Actions
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Area-Based NSAS Inspection is a new one-time inspection for which there is no operating experience indicating the need for an aging management program. However, inspection methods will be consistent with accepted industry practices.

Required Enhancements

None.

Conclusion

Implementation of the Area-Based NSAS Inspection for nonsafety-related components exposed to non-radioactive equipment/area drainage water or potable water, as well as for copper alloy components exposed to raw water will provide reasonable assurance that the effects of aging will be managed such that spatial interaction will not result in an adverse impact (e.g., impairment or prevention) to the performance of a safety-related intended function consistent with the current licensing basis during the period of extended operation.

B.2.47 Leak Chase Channel Monitoring Activities

Program Description

The spent fuel pool and fuel shipping cask storage pool Leak Chase Channel Monitoring Activities is a condition monitoring program, consisting of observation and surveillance activities to detect leakage from the spent fuel pool and the fuel shipping cask storage pool liners due to aging and age-related degradation. The Leak Chase Channel Monitoring Activities provide reasonable assurance that potentially detrimental aging effects will be adequately managed such that evidence of leakage from the spent fuel pool and the fuel shipping cask storage pool is promptly identified and the pool liner's intended functions will be maintained consistent with the current licensing basis for the period of extended operation.

NUREG-1801 Consistency

The SSES Leak Chase Channel Monitoring Activities is an existing plant-specific program. There is no corresponding aging management program described in NUREG-1801.

Aging Management Program Elements

The results of an evaluation of each element against the 10 elements described in Appendix A of NUREG-1800, are provided below.

- Scope of Activity
  The Leak Chase Channel Monitoring Activities, which include periodic monitoring of the spent fuel pool and fuel shipping cask storage pool leak chase system, are credited for supplementing the BWR Water Chemistry Program for managing loss of material aging effects for the spent fuel pool and fuel shipping cask storage pool liners.

- Preventive Actions
  No actions are taken as part of the Leak Chase Channel Monitoring Activities to prevent aging effects or mitigate age-related degradation.

- Parameters Monitored or Inspected
  The spent fuel pool and fuel shipping cask storage pool liner leak detection drain valves are periodically opened and the leak rate estimated by the volumetric method. This ensures evidence of leakage from the spent fuel pool and fuel shipping cask storage pool liner is promptly identified and corrected if necessary.

  The Leak Chase Channel Monitoring Activities include activities to cycle open and close spent fuel pool and fuel shipping cask storage pool liner drain valves, and measure and report any water collected to shift supervision.

- Detection of Aging Effects
  Detection of aging effects is by cycling the spent fuel pool and fuel shipping cask storage pool liner leak detection drain valves and measuring the volume of any water collected. Estimating the time from start of opening valve until flow slows to a slow drip is also performed for known leakage.

- Monitoring and Trending
  The Leak Chase Channel Monitoring Activities are performed at least once quarterly. The routine task requires that any water collected in excess of one pint is reported to shift supervision. Shift supervision will then notify Nuclear System Engineering (NSE) by appropriate mechanism. Data are entered into the Shift Operations Management System (SOMS) log for trending purposes even if no leakage was identified.

- Acceptance Criteria
  The acceptance criterion for the Leak Chase Channel Monitoring Activities is less than one pint of measured leakage from each liner leak chase drain valve. The one pint criterion is based on SSES plant-specific historical accumulation of water at Unit 2 spent fuel pool drain points.

- Corrective Actions
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The Leak Chase Channel Monitoring Activities have indicated small leakage in the Unit 2 spent fuel pool. The Unit 1 spent fuel pool and the common fuel shipping cask storage pool liners have shown no leakage.

  A condition report in 1994 identified leakage of 2 to 3 gallons per day from the Unit 2 spent fuel pool liner drain valve “A.” During subsequent trending, the rate dropped off to approximately 0.01 gallons per day. The source of the leakage was never identified but was believed to be the same condition documented in a Non-

Conformance Report (NCR) in 1990, which determined that the liner has a small leak and leakage was well within the makeup capability of the system. The condition was found acceptable via a use-as-is disposition to the NCR. Based on the expected leakage from this small leak as well as minor drainage previously noted at liner drain valves "B" and "E," inspection frequency has been accelerated to monthly for the Unit 2 spent fuel pool. For the past five years, the Unit 2 spent fuel pool liner leakage measurements have all been within the acceptance criteria.

Required Enhancements

None.

Conclusion

The Leak Chase Channel Monitoring Activities include cycling the spent fuel pool and fuel shipping cask storage pool liner drain valves to detect potential leakage from the spent fuel pool and fuel shipping cask storage pool liners. The leak chase channel monitoring supplements the BWR Water Chemistry Program by detecting loss of material aging effect such that the spent fuel pool and fuel shipping cask storage pool liner's integrity and intended functions will be maintained consistent with the current licensing basis for the period of extended operation.

B.2.48 Preventive Maintenance Activities – RCIC/HPCI Turbine Casings

Program Description

The purpose of the Preventive Maintenance Activities – RCIC/HPCI Turbine Casings is to manage loss of material due to general corrosion on the internal surfaces of the RCIC and HPCI pump turbine casings, and on the internal surfaces of associated piping and piping components (rupture disks and valve bodies) that are constructed of carbon steel or cast iron.

The Preventive Maintenance Activities – RCIC/HPCI Turbine Casings is a condition monitoring program consisting of inspections and surveillance activities to detect aging and age-related degradation.

NUREG-1801 Consistency

The Preventive Maintenance Activities – RCIC/HPCI Turbine Casings is an existing SSES program that is plant-specific. There is no corresponding aging management program described in NUREG-1801.

Aging Management Program Elements

The results of an evaluation of each element against the 10 elements described in Appendix A of NUREG-1800, are provided below.

- Scope of Activity
  The Preventive Maintenance Activities – RCIC/HPCI Turbine Casings is credited for managing loss of material due to general corrosion on the internal carbon steel and cast iron surfaces in the RCIC and HPCI pump turbine casings (and gland cases) and the in-scope piping and piping components in steam lines downstream from the steam admission valves that are exposed during normal plant operation to an ambient air internal environment and are subject to aging management review. This ambient (untreated, moist) air internal environment is a result of steam having either condensed and drained to the barometric condensers or vented to the drywell.

- Preventive Actions
  No actions are taken as part of the Preventive Maintenance Activities – RCIC/HPCI Turbine Casings to prevent aging effects or to mitigate age-related degradation.

- Parameters Monitored or Inspected
  The Preventive Maintenance Activities – RCIC/HPCI Turbine Casings inspects the internal carbon steel surfaces of RCIC and HPCI pump turbine casings and the internal cast iron surfaces of the associated gland cases for signs of degradation (rust, discoloration, etc.) that might be indicative of wall-thinning or loss of material.

- Detection of Aging Effects
  In accordance with the information provided in the Monitoring and Trending element, the Preventive Maintenance Activities – RCIC/HPCI Turbine Casings will detect loss of material prior to any loss of component intended functions.

- Monitoring and Trending
  The Preventive Maintenance Activities – RCIC/HPCI Turbine Casings is a conditioning monitoring program that is performed by qualified individuals at established intervals to identify internal degradation of the turbine casings through visual inspection. If during the internal inspection of the turbine, significant or unusual or unexpected casing deterioration is noted, a condition report is written. The condition report may result in analysis or further inspection, and a disposition is generated. The disposition of this type of condition report may result in a change in the frequency of inspection.

- Acceptance Criteria
  The acceptance criteria for the Preventive Maintenance Activities – RCIC/HPCI Turbine Casings are no unacceptable visual indications of wall-thinning or loss of material. Unacceptable components are those that are determined by engineering evaluation to be degraded to such an extent that they may not be capable of performing their intended function (pressure boundary integrity) until the next scheduled inspection.

- Corrective Actions
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls
  This element is common to SSES programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience
  The elements that comprise the Preventive Maintenance Activities – RCIC/HPCI Turbine Casings are consistent with industry practice and have proven effective in maintaining the material condition of the RCIC and HPCI pump turbines, including the casings.

A review of the most recent work authorization documentation for the turbine internal inspections reveals that inspections are performed of accessible surfaces in accordance with the appropriate procedures, results are documented and retrievable, and that, if indicated, corrective actions are taken. A review of plant-specific operating experience for the most recent five-year period, through a search of Action Requests and Condition Reports, revealed that no loss of pressure boundary integrity has occurred that was, or could have been, attributed to the applicable aging effects that are in the scope of the program.

Required Enhancements

None.

Conclusion

The Preventive Maintenance Activities – RCIC/HPCI Turbine Casings has been demonstrated to be capable of detecting and managing loss of material. The continued implementation of the Preventive Maintenance Activities – RCIC/HPCI Turbine Casings provides reasonable assurance that the effects of aging will be managed such that components subject to aging management will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.3 TIME-LIMITED AGING ANALYSIS PROGRAMS

B.3.1 Fatigue Monitoring Program

Program Description

The purpose of the Fatigue Monitoring Program is to manage fatigue for all Class 1 components, including the reactor pressure vessel. The Fatigue Monitoring Program is a combination of time-limited aging analyses (cumulative usage factor calculations) and transient counting procedures.

In order not to exceed the design limit on fatigue usage, the aging management program monitors and tracks the number and severity of critical thermal and pressure transients for the selected reactor coolant system components.

As evaluated, this is an acceptable option for managing metal fatigue for the reactor coolant pressure boundary, considering environmental effects.

NUREG-1801 Consistency

The Fatigue Monitoring Program is an existing SSES program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section X.M1, “Metal Fatigue of Reactor Coolant Pressure Boundary.”

Exceptions to NUREG-1801

None.

Required Enhancements

Prior to the period of extended operation the enhancements listed below will be implemented in the identified program elements:

- **Scope –**

  Provisions will be made in the Fatigue Monitoring Program to validate that components which have satisfied ASME Section III, Paragraph N-415.1 requirements (i.e., RPV nozzles N6A, N6B, and N7) continue to satisfy these requirements prior to and during the period of extended operation, thereby allowing fatigue to be continued to be addressed under N-415.1.

- **Preventive Actions, Acceptance Criteria –**

  Provisions will be made in the Fatigue Monitoring Program to address environmental effects on fatigue at specified locations in accordance with NUREG/CR-6260.

- **Preventive Actions, Monitoring and Trending –**

  The Fatigue Monitoring Program will include requirements to review Class 1 valve fatigue analyses and other fatigue-related TLAA, such as flued head analyses and high energy line break evaluations, when sufficient fatigue accumulation has occurred, to determine if additional actions are required to address fatigue-related concerns.

  The Fatigue Monitoring Program will include requirements for continued monitoring and periodic updates to current and projected CUFs for limiting locations. The program will include an approach to address CUFs that will exceed the allowable before the end of the period of extended operation. The actions will include one or more of the following:

  1. Further refinement of the fatigue analyses to lower the CUFs to less than the allowable;
  2. Repair of the affected components;
  3. Replacement of the affected components;
  4. Management by an inspection program that has been reviewed and approved by the NRC.

  The Fatigue Monitoring Program will include requirements to monitor NUREG/CR-6260 limiting locations prior to entering the period of extended operation. SSES will implement one or more of the following if fatigue usage, including environmental effects, is projected to exceed the allowable value of 1.0:

  1. Further refinement of the fatigue analyses to lower the CUFs to less than the allowable;
  2. Repair of the affected components;
  3. Replacement of the affected components;
  4. Management by an inspection program that has been reviewed and approved by the NRC.

- **Acceptance Criteria –**

  The Fatigue Monitoring Program does not have specific acceptance criteria that require corrective action if any CUFs are projected to exceed their allowable values prior to the end of the licensed period. The Fatigue Monitoring Program will be enhanced prior to the period of extended operation such that corrective action is procedurally required should any CUF projections be unacceptable.

  The Fatigue Monitoring Program will include a requirement to immediately notify management if any component CUF is approaching its' design limit.

The Fatigue Monitoring Program projects allowable CUFs to the end of the licensed period. If any projections exceed allowables, the program will require action to be taken, such as a Condition Report being written to require resolution. Resolution will consider more frequent monitoring of the data until another solution (reanalysis, component replacement, etc.) is implemented.

Operating Experience

Industry experience has been factored into the SSES Fatigue Monitoring Program through consideration of NRC information notices and bulletins, regulatory guides, and NEI and EPRI documents. Industry experience has identified that the effects of the reactor coolant environment on fatigue, which were not considered in the original design of SSES, should be addressed for the period of extended operation. The initial evaluation of the environmental effects at SSES indicates that additional actions are required prior to the period of extended operation. SSES will continue to evaluate any future industry experience related to fatigue of Class 1 components.

Operating experience associated with the Fatigue Monitoring Program at SSES has demonstrated the capability to track plant transients and monitor the accumulation of fatigue usage. The Fatigue Monitoring Program will continue to track and trend fatigue usage to identify any fatigue-related conditions that require corrective actions.

The Fatigue Monitoring Program effectively monitors plant transients and fatigue usage. The continued implementation of this program provides reasonable assurance that the aging effects will be managed so that the applicable structures and components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

Conclusion

The Fatigue Monitoring Program has been demonstrated to be capable of managing fatigue for components of the reactor coolant system pressure boundary. The Fatigue Monitoring Program provides reasonable assurance that fatigue will be managed such that the reactor coolant pressure boundary components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.3.2 EQ Program

Program Description

The NRC has established nuclear station EQ requirements in 10 CFR 50, Appendix A, Criterion 4 and 10 CFR 50.49. 10 CFR 50.49 specifically requires that an EQ program be established to demonstrate that certain electrical components located in harsh plant environments (i.e., those areas of the plant that could be subject to the harsh environmental effects of a loss of coolant accident, high energy line breaks or post-LOCA environment) are qualified to perform their safety function in those harsh environments after the effects of inservice aging. 10 CFR 50.49 requires that the effects of significant aging mechanisms be addressed as part of environmental qualification.

The SSES EQ Program manages component thermal, radiation, and cyclic aging through the use of aging evaluations based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49, EQ components not qualified for the current license term are to be refurbished, replaced or have their qualification extended prior to reaching the aging limits established in the evaluation. Aging evaluations for EQ components that specify a qualification of at least 40 years are considered TLAA for license renewal.

NUREG-1801 Consistency

The SSES EQ Program is an existing program that is consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section X.E1, “Environmental Qualification (EQ) of Electrical Components.”

Exceptions to NUREG-1801

None.

Required Enhancements

None.

Operating Experience

A formal process for review of industry operating experience is used to identify and transfer lessons learned from industry experience into SSES processes and programs, including the EQ Program. Internal operating experience is identified and evaluated primarily through the SSES corrective action program. Evaluation of both industry and internal operating experience includes consideration of the need to modify qualification bases and conclusions, including qualified life. As stated previously, the EQ Program is in compliance with 10 CFR 50.49, thereby providing reasonable assurance that components will be able to perform their intended functions even at end of qualified life.

Conclusion

The SSES EQ Program is in compliance with the requirements of 10 CFR 50.49 and is successfully being used to manage the aging of equipment in the EQ Program during the current license term. The EQ Program will be used to manage aging during the period of extended operation and provides reasonable assurance that the effects of aging will be adequately managed and that EQ components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

APPENDIX C

RESPONSE TO BWRVIP APPLICANT ACTION ITEMS

BWRVIP Report Applicant Action Items

Of the BWRVIP reports credited for SSES license renewal, the following have NRC safety evaluation reports (SERs) for license renewal:

- BWRVIP-18-A BWR Core Spray Internals Inspection and Flaw Evaluation Guidelines
- BWRVIP-25 BWR Core Plate Inspection and Flaw Evaluation Guidelines
- BWRVIP-26-A BWR Top Guide Inspection and Flaw Evaluation Guidelines
- BWRVIP-27-A BWR Standby Liquid Control System/Core Plate DP Inspection and Flaw Evaluation Guidelines
- BWRVIP-38 BWR Shroud Support Inspection and Flaw Evaluation Guidelines
- BWRVIP-41 BWR Jet Pump Assembly Inspection and Flaw Evaluation Guidelines (Revision 1)
- BWRVIP-47-A BWR Lower Plenum Inspection and Flaw Evaluation Guidelines
- BWRVIP-48-A BWR Vessel ID Attachment Weld Inspection and Flaw Evaluation Guidelines
- BWRVIP-49-A BWR Instrument Penetration Inspection and Flaw Evaluation Guidelines
- BWRVIP-74-A BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines
- BWRVIP-116 BWR Vessel and Internals Project Integrated Surveillance Program (ISP) Implementation for License Renewal

License renewal applicant action items (AAIs) identified in the corresponding SERs for each of the above BWRVIP reports are addressed in the following tables. BWRVIP-116 does not appear in the table because the associated SER does not contain any applicant action items. BWRVIP-76 is not included because the SER has not yet been issued. BWRVIP reports without SERs for license renewal have no AAIs and are therefore not included in the table.

It is recognized that the first three AAIs for the license renewal SERs applicable to the above BWRVIP reports are identical. For completeness, each table contains an individual response for every AAI applicable to the respective BWRVIP report.

BWRVIP-18-A BWR Core Spray Internals Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(1) The license renewal applicant is to verify that its plant is bounded by the report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP-18 report to manage the effects of aging on the functionality of the core spray internals during the period of extended operation. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the AMP within the BWRVIP-18 report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor pressure vessel components or other information presented in the report, such as materials of construction, will have to be identified by the LR applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	The SSES BWRVIP program requires the inspection and evaluation guidelines of this BWRVIP report to be implemented at SSES. Site procedures require a technical justification to be documented for any deviation from the guidelines. SSES has not identified any deviation from the BWRVIP-18-A guidelines. Therefore, SSES is bounded by the BWRVIP-18-A report. SSES commits to programs described as necessary in the BWRVIP report to manage the effects of aging during the period of extended operation. Commitments are administratively controlled in accordance with the requirements of 10 CFR 50 Appendix B. To date, the only component or material difference identified for SSES is related to the core spray piping weld P8b. The weld configuration for SSES Units 1 and 2 consists of two individual welds, a collar-to-shroud weld and a collar-to-collar weld. The BWRVIP-18-A P8b standard weld configuration consists of only the single collar-to-shroud weld. The collar-to-collar weld at SSES is different from the standard configuration. The P8b weld configuration for SSES was evaluated against the BWRVIP-18-A inspection and evaluation guidelines. It was determined that the P8b welds require an enhanced VT-1 exam for compliance with the BWRVIP. PPL is performing the enhanced VT-1 exams on the P8b welds in accordance with BWRVIP-18-A. Thus, the SSES components are bounded by the BWRVIP.

BWRVIP-18-A BWR Core Spray Internals Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(2) 10 CFR 54.21(d) requires that an FSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAA for the period of extended operation. Those applicants for license renewal referencing the BWRVIP-18 report for the core spray internals shall ensure that the programs and activities specified as necessary in the BWRVIP-18 report are summarily described in the FSAR supplement.	The SSES FSAR supplement, Appendix A of the LRA, includes a summary description of the programs and activities as required by this Applicant Action Item.
(3) 10 CFR 54.22 requires that each application for license renewal include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the renewal application. In its Appendix C to the BWRVIP-18 report, the BWRVIP stated that there are no generic changes or additions to technical specification associated with the core spray internals as a result of its aging management review and that the applicant will provide the justification for plant-specific changes or additions. Those applicants for license renewal referencing the BWRVIP-18 report for the core spray internals shall ensure that the inspection strategy described in the BWRVIP-18 report does not conflict or result in any changes to their technical specifications. If technical specification changes do result, then the applicant should ensure that those changes are included in its application for license renewal.	No technical specification changes are required for the inspection strategy described in the BWRVIP-18-A report.
(4) Applicants referencing the BWRVIP-18 report for license renewal should identify and evaluate any potential TLAA issues which may impact the structural integrity of the subject RPV internal components. This is discussed in more detail in Section 2.4 of this SE.	No TLAA issues were identified for the reactor pressure vessel (RPV) internal core spray components. As there are no TLAAs, there is no discussion in the LRA.

BWRVIP-25 BWR Core Plate Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(1) The license renewal applicant is to verify that its plant is bounded by the BWRVIP-25 report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP-25 report to manage the effects of aging on the functionality of the core plate assembly during the period of extended operation. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the AMP within the BWRVIP-25 report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	The SSES BWRVIP program requires the inspection and evaluation guidelines of this BWRVIP report to be implemented at SSES. Site procedures require a technical justification to be documented for any deviation from the guidelines. SSES has not identified any deviation from the BWRVIP-25 guidelines. Therefore, SSES is bounded by the BWRVIP-25 report. SSES commits to programs described as necessary in the BWRVIP report to manage the effects of aging during the period of extended operation. Commitments are administratively controlled in accordance with the requirements of 10 CFR 50 Appendix B.
(2) 10 CFR 54.21(d) requires that an FSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAA for the period of extended operation. Those LR applicants referencing the BWRVIP-25 report for the core plate will ensure that the programs and activities specified as necessary in the BWRVIP-25 report are summarily described in the FSAR supplement.	The SSES FSAR supplement, Appendix A of the LRA, includes a summary description of the programs and activities as required by this Applicant Action Item.

BWRVIP-25 BWR Core Plate Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(3) 10 CFR 54.22 requires that each application for license renewal include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the renewal application. In its Appendix B to the BWRVIP-25 report, the BWRVIP stated that there are no generic changes or additions to technical specification associated with the core plate as a result of its AMR and that the applicant will provide the justification for plant-specific changes or additions. Those applicants for license renewal referencing the BWRVIP-25 report for the core plate will ensure that the inspection strategy described in the BWRVIP-25 report does not conflict or result in any changes to their technical specifications (TS). If TS changes do result, then the applicant should ensure that those changes are included in its application for license renewal.	No technical specification changes are required for the inspection strategy described in the BWRVIP-25 report.
(4) Due to susceptibility of the rim hold-down bolts to stress relaxation, applicants referencing the BWRVIP-25 report for license renewal should identify and evaluate the projected stress relaxation as a potential TLAA issue.	The TLAA for loss of preload has been projected for the period of extended operation per 10 CFR 54.21(c)(1)(ii). See Section 4.7.3 of the LRA.

BWRVIP-25 BWR Core Plate Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(5) Until such time as an expanded technical basis for not inspecting the hold-down bolts is approved by the staff, applicants referencing the BWRVIP-25 report for license renewal should continue to perform inspections of the rim hold-down bolts.	PPL has performed baseline enhanced VT-1 inspections from the top and VT-3 inspections from the bottom of 50% of the rim hold-down bolts on both units at SSES. These inspections were performed when the jet pumps were removed for installation of labyrinth seals in 2003 (Unit 2) and 2004 (Unit 1). The re-inspection strategy for SSES currently does not include any further bolt inspections. This strategy is justified by the results of the baseline inspections, which found no crack indications, and a plant-specific analysis, which determined that adequate bolt preload will be retained after 60 years of operation, even if the bolts contain cracks. PPL's actions and re-inspection strategy are in accordance with BWRVIP-25. PPL will continue to monitor the developments of new inspection technologies and revised inspection guidance from the BWRVIP such that SSES continues to remain in compliance with BWRVIP-25. Prior to entering the period of extended operation, PPL will either (a) request NRC approval of the justification for not inspecting the core plate hold-down bolts, (b) implement a revised inspection strategy, approved by the NRC, to ensure an adequate number of bolts are intact to prevent lateral displacement of the core plate, or (c) install core plate wedges to structurally replace lateral load resistance provided by the bolts.

BWRVIP-26-A BWR Top Guide Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(1) The license renewal applicant is to verify that its plant is bounded by the topical report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP-26 report to manage the effects of aging on the functionality of the top guide structure during the period of extended operation. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the AMP within the BWRVIP-26 report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	The SSES BWRVIP program requires the inspection and evaluation guidelines of this BWRVIP report to be implemented at SSES. Site procedures require a technical justification to be documented for any deviation from the guidelines. SSES has not identified any deviation from the BWRVIP-26-A guidelines. Therefore, SSES is bounded by the BWRVIP-26-A report. SSES commits to programs described as necessary in the BWRVIP report to manage the effects of aging during the period of extended operation. Commitments are administratively controlled in accordance with the requirements of 10 CFR 50 Appendix B.
(2) 10 CFR 54.21(d) requires that an FSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAA for the period of extended operation. Those LR applicants referencing the BWRVIP-26 report for the top guide system shall ensure that the programs and activities specified as necessary in the BWRVIP-26 report are summarily described in the FSAR supplement.	The SSES FSAR supplement, Appendix A of the LRA, includes a summary description of the programs and activities as required by this Applicant Action Item.

BWRVIP-26-A BWR Top Guide Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(3) 10 CFR 54.22 requires that each application for license renewal include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the renewal application. In its Appendix C to the BWRVIP-26 report, the BWRVIP stated that there are no generic changes or additions to technical specification associated with the top guide as a result of its AMR and that the applicant will provide the justification for plant-specific changes or additions. Those applicants for license renewal referencing the BWRVIP-26 report for the top guide shall ensure that the inspection strategy described in the BWRVIP-26 report does not conflict or result in any changes to their TS. If TS changes do result, then the applicant should ensure that those changes are included in its application for license renewal.	No technical specification changes are required for the inspection strategy described in the BWRVIP-26-A report.
(4) Due to IASCC of the subject safety-related components, applicants referencing the BWRVIP-26 report for license renewal should identify and evaluate the projected accumulated neutron fluence as a potential TLAA issue.	Accumulated neutron fluence for the top guide is not a TLAA for SSES. The top guide will exceed the threshold fluence levels for IASCC identified in BWRVIP-26-A. The aging effect is managed per the inspection recommendations in BWRVIP-26-A.

BWRVIP-27-A BWR Standby Liquid Control System/Core Plate DP Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(1) The license renewal applicant is to verify that its plant is bounded by the report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP report to manage the effects of aging on the functionality of the DP/SLC vessel penetration/nozzle and safe-end extensions during the period of extended operation. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the aging management programs within this BWRVIP report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	The SSES BWRVIP program requires the inspection and evaluation guidelines of this BWRVIP report to be implemented at SSES. Site procedures require a technical justification to be documented for any deviation from the guidelines. SSES has not identified any deviation from the BWRIVP-27-A guidelines. Therefore, SSES is bounded by the BWRVIP-27-A report. SSES commits to programs described as necessary in the BWRVIP report to manage the effects of aging during the period of extended operation. Commitments are administratively controlled in accordance with the requirements of 10 CFR 50 Appendix B.
(2) 10 CFR 54.21(d) requires that an FSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAA for the period of extended operation. Those applicants for license renewal referencing the BWRVIP-27 report for the DP/SLC vessel penetration/nozzle and safe end extensions shall ensure that the programs and activities specified as necessary in the BWRVIP-27 document are summarily described in the FSAR supplement.	The SSES FSAR supplement, Appendix A of the LRA, includes a summary description of the programs and activities as required by this Applicant Action Item.

BWRVIP-27-A BWR Standby Liquid Control System/Core Plate DP Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(3) 10 CFR 54.22 requires that each application for license renewal include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the renewal application. In its Appendix B to the BWRVIP-27 report, the BWRVIP stated that there are no generic changes or additions to technical specification associated with the DP/SLC vessel penetration/nozzle and safe end extensions as a result of its aging management review and that the applicant will provide the justification for plant-specific changes or additions. Those applicants for license renewal referencing BWRVIP-27 for the DP/SLC vessel penetration/nozzle and safe end extensions shall ensure that the inspection strategy described in the BWRVIP-27 report does not conflict or result in any changes to their technical specifications. If technical specification changes do result, then the applicant should ensure that those changes are included in its application for license renewal.	No technical specification changes are required for the inspection strategy described in the BWRVIP-27-A report.
(4) Due to the susceptibility of the subject components to fatigue, applicants referencing the BWRVIP-27 report for license renewal should identify and evaluate the projected fatigue cumulative usage factors as a potential TLAA issue.	The only TLAA identified for the standby liquid control differential pressure (SLC/DP) line is the nozzle cumulative usage factor. This is addressed in Section 4.3.1 (Table 4.3-2) of the LRA.

BWRVIP-38 BWR Shroud Support Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(1) The license renewal applicant is to verify that its plant is bounded by the topical report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP-38 report to manage the effects of aging on the functionality of the shroud support components during the period of extended operation, including actions planned to inspect welds that are presently inaccessible. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the aging management programs within the BWRVIP-38 report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	The SSES BWRVIP program requires the inspection and evaluation guidelines of this BWRVIP report to be implemented at SSES. Site procedures require a technical justification to be documented for any deviation from the guidelines. SSES has not identified any deviation from the BWRIVP-38 guidelines. Therefore, SSES is bounded by the BWRVIP-38 report. SSES commits to programs described as necessary in the BWRVIP report to manage the effects of aging during the period of extended operation. Commitments are administratively controlled in accordance with the requirements of 10 CFR 50 Appendix B.
(2) An FSAR supplement is required by 10 CFR 54.21 (d) for the facility and must contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAA for the period of extended operation. Those applicants for license renewal referencing the BWRVIP-38 report for the shroud support shall ensure that the programs and activities specified as necessary in the BWRVIP-38 report are summarily described in the FSAR supplement.	The SSES FSAR supplement, Appendix A of the LRA, includes a summary description of the programs and activities as required by this Applicant Action Item.

BWRVIP-38 BWR Shroud Support Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(3) Each application for license renewal is required by 10 CFR 54.22 to include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the renewal application. In its Appendix B to the BWRVIP-38 report, the BWRVIP stated that there are no generic changes or additions to technical specification associated with the shroud support as a result of its aging management review and that the applicant will provide the justification for plant-specific changes or additions. Those applicants for license renewal referencing the BWRVIP-38 report for the shroud support shall ensure that the inspection strategy described in the BWRVIP-38 report does not conflict or result in any changes to their technical specifications. If technical specification changes do result, then the applicant should ensure that those changes are included in its application for license renewal.	No technical specification changes are required for the inspection strategy described in the BWRVIP-38 report.

BWRVIP-41 BWR Jet Pump Assembly Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(1) The license renewal applicant is to verify that its plant is bounded by the BWRVIP-41 report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP-41 report to manage the effects of aging on the functionality of the jet pump components during the period of extended operation, including actions planned to mitigate the issue concerning the inspection of welds that are presently inaccessible and the thermal and/or neutron embrittlement TLAA. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the aging management programs within the BWRVIP-41 report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	The SSES BWRVIP program requires the inspection and evaluation guidelines of this BWRVIP report to be implemented at SSES. Site procedures require a technical justification to be documented for any deviation from the guidelines. SSES has not identified any deviation from the BWRVIP-41 guidelines. Therefore, SSES is bounded by the BWRVIP-41 report. SSES commits to programs described as necessary in the BWRVIP report to manage the effects of aging during the period of extended operation. Commitments are administratively controlled in accordance with the requirements of 10 CFR 50 Appendix B.
(2) 10 CFR 54.21(d) requires that an FSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAA for the period of extended operation. Those applicants for license renewal referencing the BWRVIP-41 report for the jet pump components shall ensure that the programs and activities specified as necessary in the BWRVIP-41 report are summarily described in the FSAR supplement.	The SSES FSAR supplement, Appendix A of the LRA, includes a summary description of the programs and activities as required by this Applicant Action Item.

BWRVIP-41 BWR Jet Pump Assembly Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(3) 10 CFR 54.22 requires that each application for license renewal include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the renewal application. In its Appendix A to the BWRVIP-41 report, the BWRVIP stated that there are no generic changes or additions to technical specification associated with the jet pump assembly as a result of its aging management review and that the applicant will provide the justification for plant-specific changes or additions. Those applicants for license renewal referencing the BWRVIP-41 report for the jet pump assembly shall ensure that the inspection strategy described in the BWRVIP-41 report does not conflict or result in any changes to their technical specifications. If technical specification changes do result, then the applicant should ensure that those changes are included in its application for license renewal.	No technical specification changes are required for the inspection strategy described in the BWRVIP-41 report.

BWRVIP-47-A BWR Lower Plenum Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(1) The LR applicant is to verify that its plant is bounded by the BWRVIP-47 report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP-47 report to manage the effects of aging on the functionality of the lower plenum during the period of extended operation. LR applicants will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the AMPs within the BWRVIP-47 report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	The SSES BWRVIP program requires the inspection and evaluation guidelines of this BWRVIP report to be implemented at SSES. Site procedures require a technical justification to be documented for any deviation from the guidelines. SSES has not identified any deviation from the BWRVIP-47-A guidelines. Therefore, SSES is bounded by the BWRVIP-47-A report. SSES commits to programs described as necessary in the BWRVIP report to manage the effects of aging during the period of extended operation. Commitments are administratively controlled in accordance with the requirements of 10 CFR 50 Appendix B.
(2) 10 CFR 54.21(d) requires that an FSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAA for the period of extended operation. Those applicants for license renewal referencing the BWRVIP-47 report for the lower plenum shall ensure that the programs and activities specified as necessary in the BWRVIP-47 report are summarily described in the FSAR supplement.	The SSES FSAR supplement, Appendix A of the LRA, includes a summary description of the programs and activities as required by this Applicant Action Item.

BWRVIP-47-A BWR Lower Plenum Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(3) 10 CFR 54.22 requires that each LR application include any TS changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the LR application. In its Appendix A to the BWRVIP-47 report, the BWRVIP stated that there are no generic changes or additions to technical specification associated with the lower plenum as a result of its AMR and that the applicant will provide the justification for plant-specific changes or additions. Those LR applicants referencing the BWRVIP-47 report for the lower plenum shall ensure that the inspection strategy described in the BWRVIP-47 report does not conflict or result in any changes to their TSs. If technical specification changes do result, then the applicant should ensure that those changes are included in its LR application.	No technical specification changes are required for the inspection strategy described in the BWRVIP-47-A report.
(4) Due to fatigue of the subject safety-related components, applicants referencing the BWRVIP-47 report for LR should identify and evaluate the projected CUF as a potential TLAA issue.	The only TLAA identified for the lower plenum is the cumulative usage factor (CUF) for the control rod drive (CRD) penetrations. This is addressed in Section 4.3.1 (Table 4.3-2) of the LRA.

BWRVIP-48-A BWR Vessel ID Attachment Weld Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(1) The license renewal applicant is to verify that its plant is bounded by the BWRVIP-48 report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP-48 report to manage the effects of aging on the functionality of the bracket attachments during the period of extended operation. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the aging management programs within the BWRVIP-48 report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	The SSES BWRVIP program requires the inspection and evaluation guidelines of this BWRVIP report to be implemented at SSES. Site procedures require a technical justification to be documented for any deviation from the guidelines. SSES has not identified any deviation from the BWRVIP-48-A guidelines. Therefore, SSES is bounded by the BWRVIP-48-A report. SSES commits to programs described as necessary in the BWRVIP report to manage the effects of aging during the period of extended operation. Commitments are administratively controlled in accordance with the requirements of 10 CFR 50 Appendix B.
(2) 10 CFR 54.21(d) requires that an FSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAA for the period of extended operation. Those applicants for license renewal referencing the BWRVIP-48 report for the bracket attachments shall ensure that the programs and activities specified as necessary in the BWRVIP-48 report are summarily described in the FSAR supplement.	The SSES FSAR supplement, Appendix A of the LRA, includes a summary description of the programs and activities as required by this Applicant Action Item.

BWRVIP-48-A BWR Vessel ID Attachment Weld Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(3) 10 CFR 54.22 requires that each application for license renewal include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the renewal application. In its Appendix A to the BWRVIP-48 report, the BWRVIP stated that there are no generic changes or additions to technical specification associated with the bracket attachments as a result of its aging management review and that the applicant will provide the justification for plant-specific changes or additions. Those applicants for license renewal referencing the BWRVIP-48 report for the bracket attachments shall ensure that the inspection strategy described in the BWRVIP-48 report does not conflict or result in any changes to their technical specifications. If technical specification changes do result, then the applicant should ensure that those changes are included in its LR application.	No technical specification changes are required for the inspection strategy described in the BWRVIP-48-A report.

BWRVIP-49-A BWR Instrument Penetration Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(1) The license renewal applicant is to verify that its plant is bounded by the topical report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP report to manage the effects of aging on the functionality of the reactor vessel instrument penetrations during the period of extended operation. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the aging management programs within this BWRVIP report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	The SSES BWRVIP program requires the inspection and evaluation guidelines of this BWRVIP report to be implemented at SSES. Site procedures require a technical justification to be documented for any deviation from the guidelines. SSES has not identified any deviation from the BWRVIP-49-A guidelines. Therefore, SSES is bounded by the BWRVIP-49-A report. SSES commits to programs described as necessary in the BWRVIP report to manage the effects of aging during the period of extended operation. Commitments are administratively controlled in accordance with the requirements of 10 CFR 50 Appendix B.
(2) 10 CFR 54.21(d) requires that an FSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAA for the period of extended operation. Those applicants for license renewal referencing the BWRVIP- 49 report for the instrument penetrations shall insure that the programs and activities specified as necessary in the BWRVIP-49 report are summarily described in the FSAR supplement.	The SSES FSAR supplement, Appendix A of the LRA, includes a summary description of the programs and activities as required by this Applicant Action Item.

BWRVIP-49-A BWR Instrument Penetration Inspection and Flaw Evaluation Guidelines	
Applicant Action Item Text	**Plant-Specific Response**
(3) 10 CFR 54.22 requires that each application for license renewal include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the renewal application. In its Appendix A to the BWRVIP-49 report, the BWRVIP stated that there are no generic changes or additions to technical specification associated with instrument penetrations as a result of its aging management review and that the applicant will provide the justification for plant-specific changes or additions. Those applicants for license renewal referencing BWRVIP-49 for the instrument penetrations shall ensure that the inspection strategy described in the BWRVIP-49 document does not conflict or result in any changes to their technical specifications. If technical specification changes do result, then the applicant should ensure that those changes are included in its application for license renewal.	No technical specification changes are required for the inspection strategy described in the BWRVIP-49-A report.

BWRVIP-74-A BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines for License Renewal	
Applicant Action Item Text	**Plant-Specific Response**
(1) The LR applicant is to verify that the BWRVIP-74 report is applicable to its plant. Further, the LR applicant is to commit to programs described as necessary in the BWRVIP-74 report to manage the effects of aging on the functionality of the RPV components during the period of extended operation. LR applicants will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the AMP within the BWRVIP-74 report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor pressure vessel components or other information presented in the report, such as materials of construction, will have to be identified by the LR applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	The SSES BWRVIP program requires the inspection and evaluation guidelines of this BWRVIP report to be implemented at SSES. Site procedures require a technical justification to be documented for any deviation from the guidelines. SSES has not identified any deviation from the BWRVIP-74-A guidelines. Therefore, SSES is bounded by the BWRVIP-74-A report. SSES commits to programs described as necessary in the BWRVIP report to manage the effects of aging during the period of extended operation. Commitments are administratively controlled in accordance with the requirements of 10 CFR 50 Appendix B.
(2) 10 CFR 54.21(d) requires that an FSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAA for the period of extended operation. Those LR applicants referencing the BWRVIP-74 report for the RPV components shall ensure that the programs and activities specified as necessary in the BWRVIP-74 report are summarily described in the FSAR supplement.	The SSES FSAR supplement, Appendix A of the LRA, includes a summary description of the programs and activities as required by this Applicant Action Item.

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(3) 10 CFR 54.22 requires that each LR application include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the LR application. In its Appendix A to the BWRVIP-74 report, the BWRVIP stated that the technical specification changes resulting from neutron embrittlement will be made at the appropriate time prior to the end of the current license. Those LR applicants referencing the BWRVIP-74 report for the RPV components shall ensure that the inspection strategy described in the BWRVIP-74 report does not conflict or result in any changes to their technical specifications. If technical specification changes do result, then the applicant should ensure that those changes are included in its LR application.	No technical specification changes are required for the inspection strategy described in the BWRVIP-74-A report.
(4) The staff is concerned that leakage around the reactor vessel seal rings could accumulate in the VFLD lines, cause an increase in the concentration of contaminants and cause cracking in the VFLD line. The BWRVIP-74 report does not identify this component as within the scope of the report. However, since the VFLD line is attached to the RPV and provides a pressure boundary function, LR applicants should identify any AMP for the VFLD line.	The SSES reactor vessel flange leak detection lines are in the scope of license renewal. See the scoping and screening results in the LRA for the Reactor Coolant System Pressure Boundary (piping and fittings, flange leak detection lines, Section 2.3.1.3 and Table 3.1.2-3). Refer to Section 3.1.2.2.4 of the LRA for further information, and also see item 3.1.1-19 in Table 3.1.1. Cracking of these lines is mitigated by the BWR Water Chemistry Program, the effectiveness of which is verified by the Small Bore Class 1 Piping Inspection. These aging management programs are described in Appendix B of the LRA.

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(5) LR applicants shall describe how each plant-specific aging management program addresses the following elements: (1) scope of program, (2) preventive actions, (3) parameters monitored or inspected, (4) detection of aging effects, (5) monitoring and trending, (6) acceptance criteria, (7) corrective actions, (8) confirmation process, (9) administrative controls, and (10) operating experience.	A description of the SSES AMPs credited for license renewal is provided in Appendix B of the LRA. These descriptions include a discussion of any program element that deviates from the NUREG-1801 program element.
(6) The staff believes that inspection by itself is not sufficient to manage cracking. Cracking can be managed by a program that includes inspection and water chemistry. BWRVIP-29 describes a water chemistry program that contains monitoring and control guidelines for BWR water that is acceptable to the staff. BWRVIP-29 is not discussed in the BWRVIP-74 report. Therefore, in addition to the previously discussed BWRVIP reports, LR applications shall contain water chemistry programs based on monitoring and control guidelines for reactor water chemistry that are contained in BWRVIP-29.	As described in Appendix B of the LRA, the SSES BWR Stress Corrosion Cracking Program includes water chemistry as a preventive measure. As discussed in Appendix B of the LRA, the SSES BWR Water Chemistry Program is consistent with NUREG-1801 section XI.M2. The SSES BWR Water Chemistry Program is based on the monitoring and control guidelines that are contained in EPRI TR-103515, BWR Water Chemistry Guidelines (BWRVIP-29).
(7) LR applicants shall identify their vessel surveillance program, which is either an ISP or plant-specific in-vessel surveillance program, applicable to the licensed term.	As described in Appendix B of the LRA, the SSES Reactor Vessel Surveillance Program is part of the Integrated Surveillance Program (ISP), described in BWRVIP-78, BWRVIP-86-A, and BWRVIP-116, and approved by the NRC staff.
(8) LR applicants shall verify that the number of cycles assumed in the original fatigue design is conservative to assure that the estimated fatigue usage for 60 years of plant operation is not underestimated. The use of alternative actions for cases where the estimated fatigue is projected to exceed 1.0 will require case-by-case staff review and approval. Further, a LR applicant must address environmental fatigue for the components listed in the BWRVIP-74 report for the LR period.	Metal fatigue (including discussion of cycles, projected cumulative usage factors, and environmental fatigue effects) is addressed in Section 4.3 of the LRA.

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(9) Appendix A to the BWRVIP-74 report indicates that a set of P-T curves should be developed for the heatup and cooldown operating conditions in the plant at a given EFPY in the LR period.	P-T limit curves for SSES are discussed in Section 4.2.4 of the LRA.
(10) To demonstrate that the beltline materials meet the Charpy USE criteria in Appendix B of the report, the applicant shall demonstrate that the percent reduction in Charpy USE for their beltline materials are less than those specified for the limiting BWR3-6 plates and the non-Linde 80 submerged arc welds and that the percent reduction in Charpy USE for their surveillance weld and plate are less than or equal to the values projected using the methodology in RG 1.99, revision 2.	The details of the Charpy USE evaluation for the reactor vessel beltline materials, plates, and welds are provided in Section 4.2.2 of the LRA.
(11) To obtain relief from the in-service inspection of the circumferential welds during the LR period, the BWRVIP report indicates that each licensee will have to demonstrate that (1) at the end of the renewal period, the circumferential welds will satisfy the limiting conditional failure frequency for circumferential welds in the Appendix E of the staff's July 28, 1998, FSER, and (2) that they have implemented operator training and established procedures that limit the frequency of cold overpressure events to the amount specified in the staff's FSER.	(1) The basis for relief during the license renewal period is included in Section 4.2.5 of the LRA. (2) The existing relief request approvals substantiate that SSES has implemented the necessary operator training and procedural controls.
(12) As indicated in the staff's March 7, 2000 letter to Carl Terry, a LR applicant shall monitor axial beltline weld embrittlement. One acceptable method is to determine the mean RTNDT of the limiting axial beltline weld at the end of the extended period of operation is less than the values specified in Table 1 of this FSER.	The evaluation for SSES showed that the axial weld failure probability for the limiting axial beltline weld is bounded by the NRC analysis. See Section 4.2.6 of the LRA.

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(13) The Charpy USE, P-T limit, circumferential weld and axial weld RPV integrity evaluations are all dependent on neutron fluence. The applicant may perform neutron fluence calculations using a staff approved methodology or may submit the methodology for staff review. If the applicant performs the neutron fluence calculation using a methodology previously approved by the staff, the applicant should identify the NRC letter that approved the methodology.	SSES used RAMA fluence methodology developed for the Electric Power Research Institute and the Boiling Water Reactor Vessel and Internals Project. This methodology was approved by the NRC for application in accordance with Regulatory Guide 1.190 (Reference: "Letter from William H. Bateman (U. S. NRC) to Bill Eaton (BWRVIP), "Safety Evaluation of Proprietary EPRI Reports BWRVIP-114, -115, -117, and -121 and TWE-PSE-001-R-001," dated May 13, 2005). See Section 4.2.1 of the LRA.
(14) Components that have indications that have been previously analytically evaluated in accordance with Subsection IWB-3600 of Section XI to the ASME Code until the end of the 40-year service period, shall be re-evaluated for the 60 year service period corresponding to the LR term.	No indications that have been previously evaluated in accordance with Subsection IWB-3600 of Section XI to the ASME Code until the end of the 40-year service period have been identified at SSES. Therefore, no indications require re-evaluation for the period of extended operation.

APPENDIX D

TECHNICAL SPECIFICATION CHANGES

10 CFR 54.22 requires that an application for license renewal include any technical specification changes or additions necessary to manage the effects of aging during the period of extended operation.

No changes to the SSES Unit 1 or Unit 2 Technical Specifications are required to support the License Renewal Application.