PSEG Nuclear LLC
P.O. Box 236, Hancocks Bridge, New Jersey 08038-0236

PSEG
Nuclear LLC

10 CFR 50.55a

OCT 21 2010

LR-N10-0380

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Salem Nuclear Generating Station, Unit 1
Facility Operating License No. DPR-70
NRC Docket No. 50-272

Subject: Request for Authorization to Continue using a Risk-Informed Inservice Inspection Alternative to the ASME Boiler and Pressure Vessel Code Section XI Requirements for Class 1 and 2 Piping

Reference: USNRC Letter dated October 1, 2003, "Salem Nuclear Generating Station, Unit Nos. 1 and 2- Risk-Informed Inservice Inspection Program" (TAC Nos. MB7537 and MB7538)

In accordance with 10 CFR 50.55a(a)(3), "Codes and standards," PSEG Nuclear LLC (PSEG), hereby requests NRC approval of proposed Relief Requests S1-I4R-105 for Salem Generating Station, Unit 1. The proposed relief will allow Salem to continue to utilize the NRC approved Salem Unit 1 Alternate Risk Informed Inservice Inspection (RI-ISI) program as an alternative to the 2004 Edition, ASME Section XI inspection requirements for specific Class 1 and Class 2 piping welds, in accordance with 10 CFR 50.55a(a)(3)(i) by alternatively providing an acceptable level of quality and safety.

The RI-ISI program was developed in accordance with Electric Power Research Institute (EPRI) Topical Report (TR) 112657 Revision B-A, "Revised Risk Informed Inservice Inspection Evaluation Procedure," December 1999, and was previously approved for use at Salem (Reference 8.1).

Attachment 1 contains the Salem Unit 1 Relief Request S1-I4R-105, which provides justification that the use of the RI-ISI program provides an acceptable level of quality and safety. Attachment 2 contains the inspection location selection comparison of ASME Section XI Code and EPRI TR-112657 by Risk Category. Attachment 3 is a summary of the Regulatory Guide 1.200, Revision 1, "Approach for determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," evaluation performed on Revision 4.3 of the PRA model and the impact of the identified gaps on technical adequacy of the Salem PRA model to support the Salem RI-ISI request.

Relief is requested for the Fourth Ten-Year In-service Inspection Interval of the Salem Unit 1 In-service Inspection Program, currently scheduled to begin on May 20, 2011 and end May 20, 2021. PSEG requests approval of this relief request by October 22, 2011.

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There are no regulatory commitments contained in this letter.

If you have any questions or require additional information, please contact Mrs. Erin West of my staff at 856-339-5411.

Sincerely,

Jeffrie J. Keenan
Manager - Licensing
PSEG Nuclear LLC

Attachments:
1. Relief Request S1-I4R-105
2. Inspection Location Selection Comparison ASME Section XI Code and EPRI TR-112657 by Risk Category
3. Salem PRA Summary

cc: W. Dean, Regional Administrator - NRC Region I
R. Ennis, Project Manager - USNRC
NRC Senior Resident Inspector - Salem
P. Mulligan, Manager IV, NJBNE
H. Berrick - Salem Commitment Tracking Coordinator
L. Marabella - Corporate Commitment Tracking Coordinator

Salem Nuclear Generating Station, Unit 1
Facility Operating License No. DPR-70
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10 CFR 50.55a Request Number S1-I4R-105

Proposed Alternative In Accordance with 10 CFR 50.55a(a)(3)(i)
Alternative Provides Acceptable Level of Quality and Safety

1. **ASME Code Component(s) Affected**

System: Various ASME Code Class 1 and 2 Systems

Code Class: ASME Code Class 1 and 2

Component Description: ASME Code Class 1 and 2 Piping Welds

Components Affected:

Weld Numbers	Description	Weld Category	Code Item Number
Various	ASME Code Class 1 Piping Welds	B-F	B5.40, B5.70
Various	ASME Code Class 1 Piping Welds	B-J	B9.11, B9.21, B9.31, B9.32, B9.40
Various	ASME Code Class 2 Piping Welds	C-F-1	C5.11, C5.21, C5.30, C5.41
Various	ASME Code Class 2 Piping Welds	C-F-2	C5.51, C5.61, C5.81

2. **Applicable Code Edition and Addenda**

The applicable ASME Code, Section XI, for the Salem Unit 1 Fourth Interval In-Service Inspection Program is the 2004 Edition.

3. **Applicable Code Requirement**

The following Code requirements are paraphrased from the 2004 Edition of ASME Section XI:

ASME Section XI 2004 Edition IWB-2412, Inspection Program B, requires examinations in each examination category be completed during each inspection interval. ASME Section XI 2004 Edition IWB-2500 Examination and Pressure Test Requirements (a) Components shall be examined and tested as specified in Table IWB-2500-1. The method of examination for the components and parts of the pressure retaining boundaries shall comply with those tabulated in Table IWB-2500-1 except where alternate examination methods are used that meet the requirements of IWA-2240. Applicable category welds in table IWB-2500-1 are B-F (Pressure Retaining Dissimilar Metal Welds in Vessel Nozzles) and B-J (Pressure Retaining Welds in Piping). 100% of Category B-F welds and 25% of Category B-J welds for the ASME Code, Class 1, non-exempt piping shall be selected for volumetric and/or surface examination based on existing stress analyses and cumulative usage factors.

ASME Section XI 2004 Edition IWC-2412, Inspection Program B, requires examinations in each examination category be completed during each inspection interval in accordance with Table IWC-2412-1. Applicable category welds in table IWC-2500-1 are C-F-1 (Pressure Retaining Welds in Austenitic Stainless Steel or High Alloy Piping) and C-F-2 (Pressure Retaining Welds in Carbon or Low Alloy Steel Piping).

For Category C-F-1 welds in Class 2 piping, the welds selected for examination shall include 7.5%, but not less than 28 welds, of all dissimilar metal, austenitic stainless steel or high alloy welds not exempted by IWC-1220. (Some welds not exempted by IWC-1220 are not required to be nondestructively examined per Examination Category C-F-1. These welds, however, shall be included in the total weld count to which the 7.5% sampling rate is applied.) The examinations shall be distributed as follows:

(a) the examinations shall be distributed among the Class 2 systems prorated, to the degree practicable, on the number of nonexempt dissimilar metal, austenitic stainless steel, or high alloy welds in each system (i.e., if a system contains 30% of the nonexempt welds, then 30% of the nondestructive examinations required by Examination Category C-F-1 should be performed on that system);

(b) within a system, the examinations shall be distributed among terminal ends, dissimilar metal welds, and structural discontinuities prorated, to the degree practicable, on the number of nonexempt terminal ends, dissimilar metal welds, and structural discontinuities in that system; and

(c) within each system, examinations shall be distributed between line sizes prorated to the degree practicable.

For Category C-F-2 welds in Class 2 piping the welds selected for examination shall include 7.5%, but not less than 28 welds, of all carbon and low alloy steel welds not exempted by IWC-1220. (Some welds not exempted by IWC-1220 are not required to be nondestructively examined per Examination Category C-F-2. These welds, however, shall be included in the total weld count to which the 7.5% sampling rate is applied). The examinations shall be distributed as follows:

(a) the examinations shall be distributed among the Class 2 systems prorated, to the degree practicable, on the number of nonexempt carbon and low alloy steel welds in each system (i.e., if a system contains 30% of the nonexempt welds, then 30% of the nondestructive examinations required by Examination Category C-F-2 should be performed on that system);

(b) within a system, the examinations shall be distributed among terminal ends and structural discontinuities prorated, to the degree practicable, on the number of nonexempt terminal ends and structural discontinuities in that system; and

(c) within each system, examinations shall be distributed between line sizes prorated to the degree practicable.

4. Reason for Request

In accordance with the provisions of 10 CFR 50.55a, "Codes and Standards," paragraph 10 CFR 50.55a(a)(3), PSEG Nuclear requests relief from the requirement of ASME Code Section XI, Sub-article IWB-2500 and IWC-2500, Tables IWB-2500-1 and IWC-2500-1, Examination Categories B-F, B-J, C-F-1 and C-F-2, "Pressure Retaining Welds in Piping" welds.

ASME Section XI Examination Categories B-F, B-J, C-F-1, and C-F-2 currently contain the requirements for examination of piping components by means of nondestructive examination (NDE). The previously approved Risk-Informed In-service Inspection (RI-ISI) program (Reference 8.1) will be substituted for Class 1 and Class 2 piping (Examination Categories B-F, B-J, C-F-1, C-F-2) in accordance with 10 CFR 50.55a(a)(3)(i) by alternatively providing an acceptable level of quality and safety. Other non-related portions of the ASME Section XI Code will be unaffected.

5. Proposed Alternative and Basis for Use

Pursuant to 10 CFR 50.55a(a)(3), NRC approval of the Salem Unit 1 Alternate RI-ISI program as an alternative to the current 2004 Edition, ASME Section XI inspection requirements for Class 1, Examination Category B-F and B-J, and Class 2, Examination Category C-F-1 and C-F-2 piping welds is requested.

The Salem Unit 1 RI-ISI Program has been developed in accordance with the EPRI methodology contained in EPRI TR-112657, "Risk-Informed In-service Inspection Evaluation Procedure" (Reference 8.2). It was approved for use at Salem during the first inspection period of the Third Ten-year Inspection Interval and is still applicable for the Fourth In-service Inspection Interval. The Salem Unit 1 specific RI-ISI program is summarized in Table 1 (Attachment 2). The RI-ISI program has been updated consistent with the intent of NEI-04-05 (Reference 8.3) and continues to meet EPRI TR-112657 and Regulatory Guide 1.174 risk acceptance criteria.

PSEG will continue to implement the Risk-Informed Inservice Inspection Program in accordance with ASME Code Case N-578-1, "Risk-Informed Requirements for Class 1, 2, and 3 Piping, Method B, Section XI, Division 1." The ultrasonic examination volume to be used based on degradation mechanism and component configuration will be the examination figures specified in Section 4 of EPRI TR-112657. The ultrasonic examination procedures, equipment, and personnel used to detect and size flaws in piping welds will be qualified by performance demonstration in accordance with ASME Section XI Appendix VIII, "Performance Demonstration for Ultrasonic Examination Systems." The volumetric scanning will be in both the axial and circumferential directions to detect flaws in these orientations.

As part of the RI-ISI living program update, the delta risk assessment was re-evaluated and was determined to continue to meet the delta risk acceptance criteria of EPRI TR-112657. This update is based on the most recent Salem PRA, which has been peer reviewed to Regulatory Guide 1.200, Rev 1 and updated accordingly. The PRA has been determined to be adequate for this application as described in Appendix A.

Pursuant to 10CFR50.55a(a)(3)(i), relief is requested on the basis that the proposed alternative to continue using a Risk-Informed Inservice Inspection Program would provide an acceptable level of quality and safety.

6. Duration of Proposed Alternative

Relief is requested for the Fourth Ten-Year Inspection Interval of the Salem Unit 1 In-service Inspection Program, currently scheduled to begin on May 20, 2011 and end May 20, 2021.

7. Precedent

The NRC previously approved the Salem Unit 1 Alternate Risk-Informed In-service Inspection Program in Reference 8.1.

Salem considers both the plant and industry operating experience and updates the RI-ISI program during the re-evaluation process following each inspection period per our commitment in section 4 of our original relief request (Reference 8.5)

8. Reference

8.1 USNRC Letter dated October 1, 2003, "Salem Nuclear Generating Station, Unit Nos. 1 and 2- Risk-Informed Inservice Inspection Program" (TAC Nos. MB7537 and MB7538) (ML032390034)

8.2 EPRI TR-112657, Electric Power Research Institute Report for Alternative Requirements of Risk-Informed In-service Inspection Evaluation Procedure, EPRI, Polo Alto, CA: 1999, Rev B-A.

8.3 NEI-04-05, "Living Program Guidance to Maintain Risk-Informed In-service Inspection Programs for Nuclear Plant Piping Systems", dated April 2004.

8.4 Request for Additional Information Related to Byron Station, Units 1 and 2, Request for relief 13R-02, TAC Nos. MD3855 and MD3856, dated August 8, 2007. (ML072140023)

8.5 PSEG Letter dated January 21, 2003, "Request for Authorization to use a Risk-Informed Inservice Inspection Alternative to the ASME Boiler And Pressure Vessel Code Section XI Requirements for Class 1 and 2 Piping Salem Generating Station Unit Nos. 1 and 2" Docket Nos. 50-272 and 50-311. (ML030300116)

8.6 PSEG Letter dated July 1, 2003, "Response to NRC Request for Additional Information Regarding Risk-Informed Inservice Inspection Submittal Salem Generating Station Unit Nos. 1 and 2" Docket Nos. 50-272 and 50-311. (ML031950120)

Salem Nuclear Generating Station, Unit 1
Facility Operating License Nos. DPR-70
NRC Docket Nos. 50-272

Table 1: Inspection Location Selection Comparison ASME Section XI Code and EPRI TR-112657 by Risk Category

System*	Risk Group		Consequence Category	Failure Potential		Section XI Category	1st Approved RI-ISI Interval			Proposed RI-ISI Interval		
	Category	Rank		Degradation Mechanism	Rank		Weld Count	RI-ISI	Other	Weld Count	RI-ISI	Other
AF	5	Medium	Medium	TT	Medium	C-F-2	31	4		27 (a)	3	
CS	2	High	High	ECSCC	Medium	C-F-1	5	2		3 (b)	1	
CS	4	Medium	High	None	Low	C-F-1	101	11		101	11	
CS	5	Medium	Medium	IGSCC, ECSCC	Medium	C-F-1	2	1		2	1	
CS	6	Low	Medium	None	Low	C-F-1	52	0		50 (c)	0	
CS	7	Low	Low	None	Low	C-F-1	18	0		18	0	
CVC	2	High	High	TASCS, TT	Medium	B-J	5	1		5	1	
CVC	2	High	High	TT	Medium	B-J	2	1		2	1	
CVC	4	Medium	High	None	Low	B-J, C-F-1	102	11		102	11	
CVC	5	Medium	Medium	TT	Medium	B-J	27	3		27	3	
CVC	5	Medium	Medium	ECSCC	Medium	C-F-1	12	1		8 (d)	1	
CVC	6	Low	Medium	None	Low	B-J, C-F-1	336	0		299 (e)	0	
CVC	7	Low	Low	None	Low	B-J	0	0		34 (f)	0	
MS	6	Low	Medium	None	Low	C-F-2	235	0		235	0	
RC	2	High	High	TASCS, TT, PWSCC	Medium	B-F	1	1		0 (g)	0	
RC	2	High	High	TASCS, TT	Medium	B-J	14	2		18 (h)	5	
RC	2	High	High	TT, PWSCC	Medium	B-F	1	1		0 (g)	0	
RC	2	High	High	TT	Medium	B-J	3	1		11 (i)	3	
RC	2	High	High	PWSCC	Medium	B-F	12	5		0 (g)	0	
RC	4	Medium	High	None	Low	B-F, B-J	208	25		216 (j)	29	
RC	6	Low	Medium	None	Low	B-J	9	0		0 (k)	0	
RC	6	Low	Low	IGSCC	Medium	C-F-1	6	0		6	0	
RC	6	Low	Low	ECSCC	Medium	C-F-1	1	0		1	0	
RC	7	Low	Low	None	Low	B-J, C-F-1	85	0		95 (l)	0	
RHR	2	High	High	TASCS	Medium	B-J, C-F-1	7	2		7	2	
RHR	4	Medium	High	None	Low	B-J, C-F-1	109	11		109	11	
RHR	5	Medium	Medium	ECSCC	Medium	C-F-1	3	1		3	1	
RHR	6	Low	Medium	None	Low	B-J, C-F-1	69	0		69	0	
RHR	7	Low	Low	None	Low	C-F-1	20	0		20	0	
SGF	5	Medium	Medium	TASCS, TT	Medium	C-F-2	13	2		13	2	
SGF	6	Low	Medium	None	Low	C-F-2	85	0		85	0	
SJ	2	High	High	TASCS, TT	Medium	B-J	12	3		12	3	
SJ	2	High	High	TASCS	Medium	C-F-1	6	0		6	2	
SJ	2	High	High	TT	Medium	B-J	19	5		13 (m)	4	
SJ	2	High	High	ECSCC	Medium	B-J, C-F-1	13	5		13	4	

System*	Risk Group		Consequence Category	Failure Potential		Section XI Category	1st Approved RI-ISI Interval			Proposed RI-ISI Interval		
	Category	Rank		Degradation Mechanism	Rank		Weld Count	RI-ISI	Other	Weld Count	RI-ISI	Other
SJ	4	Medium	High	None	Low	B-J, C-F-1	404	44		392 (n)	40	
SJ	5	Medium	Medium	TT, IGSCC	Medium	B-J	16	1		2 (o)	1	
SJ	5	Medium	Medium	IGSCC	Medium	B-J	31	4		31	4	
SJ	6	Low	Medium	None	Low	B-J, C-F-1	847	0		792 (p)	0	
SJ	6	Low	Low	TT, IGSCC	Medium	B-J	0	0		14 (q)	0	
SJ	7	Low	Low	None	Low	B-J	122	0		184 (r)	0	
SW	4	Medium	High	None	Low	C-F-1	65	7		65	7	
						TOTALS	3109	155		3090	151	

Notes to Table 1:

(a) welds determined to be Class 3 and were removed from RI-ISI scope
(b) components determined not to be Class 1 and 2 weld scope and removed from RI-ISI scope
(c) components determined not to be Class 1 and 2 weld scope and removed from RI-ISI scope
(d) components determined not to be Class 1 and 2 weld scope and removed from RI-ISI scope
(e) welds moved from RC6 to RC7 as a result of consequence change and components determined not to be in Class 1 and 2 weld scope and removed from RI-ISI scope
(f) welds moved from RC6 to RC7 as a result of consequence change
(g) PWSCC welds removed from RI-ISI scope since managed by MRP-139
(h) weld moved to TT only, another moved to RC4, added 4 from fill & vent modification
(i) weld added from TT/TASCS, others moved from SI system to RC system
(j) added new welds and welds moved from SI system to RC system
(k) welds moved from RC6 to RC7 as result of consequence change
(l) welds moved from RC6 to RC7 as a result of consequence change, other welds moved from RC6 to RC7 (were incorrectly assigned) and another weld deleted as not in scope
(m) welds moved from SI to RC system
(n) welds moved from RC4 to RC6 as result of consequence change and other welds moved from SI system to RC system
(o) RC5 welds moved to RC6 as a result of consequence change
(p) welds moved from RC6 to RC7, others moved from RC7 to RC6, and some moved from RC4 to RC6 due to consequence changes
(q) RC5 welds moved to RC6 as result of consequence change
(r) welds moved from RC6 to RC7, others moved from RC7 to RC6 due to consequence change

*Systems defined:

AF – Auxiliary Feedwater System
CS – Containment Spray System
CVC – Chemical and Volume Control System
MS – Main Steam System
RC – Reactor Coolant System
RHR – Residual Heat Removal System
SGF – Steam Generator Feedwater system
SJ – Safety Injection System
SW – Service Water System

Salem Nuclear Generating Station, Unit 1
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Salem PRA Summary

The Salem PRA has been updated several times to maintain current with the plant design and operation and to support peer review. Revision 3 to the model was released as a draft in November 2001 in preparation for the Westinghouse Owners Group (WOG) peer review. Documentation for Revision 3 was finalized in June 2002. This is the version of the model that was used for the original RI-ISI submittal. More recently, the PWR Owners Group conducted a peer review of Regulatory Guide 1.200, Rev 1, "Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," in November of 2008. A final report of that peer review was issued in March of 2010. PSEG Nuclear has made changes to the model post peer review and maintains the attached Table A1 of "Identified Gaps to Capability Category II of the ASME Standard" which discusses significance of the gap and is assessed for each application. The latest PRA model used for this evaluation is Revision 4.3, which is adequate to support this application based on a review of the gaps and their significance.

The original RI-ISI evaluation concluded external events are not likely to impact the consequence ranking. This position is further supported by Section 2 of EPRI Report 1021467, "Nondestructive Evaluation: Probabilistic Risk Assessment Technical Adequacy Guidance for Risk-Informed In-Service Inspection Programs" which concludes that quantification of these events will not change the conclusions derived from the RI-ISI process. As a result, there is no need to further consider these events.

**Table A1:
Identified Gaps to Capability Category II
of the ASME PRA Standard**

Finding	Finding Description	Applicable Supporting Requirements	Resolution
IE-A1-01	A loss of an AC bus may not result in a reactor trip, but may result in a forced shutdown due to technical specifications. If the lost bus happens to be the operating bus for equipment, systems will be challenged. Loss of an AC bus is generally modeled in most PRAs. This F&O is characterized as a finding based on the lack of sufficient documentation to allow verification of SR. Include events for loss of 4Kv bus if they require a forced shutdown consistent with most industry PRAs.	IE-A1	Minimal impact, referenced event is bounded by the modeled reactor trip initiator. Initiator impact is a qualitative consideration.
IE-A3-01	Historical events appear to lead to somewhat more complex situations than the assigned grouping would indicate. The plant-specific history indicates that on 12/31/01 an event occurred resulting in SI. The categorization of initiating events does not account for this or the case of ESFAS actuation. This F&O is characterized as a finding based on the lack of sufficient documentation to allow verification of SR. Consider re-categorizing this event as an ESF actuation (QR9).	IE-A3	Response: Table 3-2 indicates this was binned as a trip with loss of feedwater, consistent with the classification scheme employed for Salem (Spurious SI = Tp). Negligible impact on technical adequacy of the PRA model.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
IE-A3a-01	Although sited as an input source, there appears to be no documentation supporting a comparison of initiating events with regard to plants of similar design. The documentation indicates that "past probabilistic risk assessments" were used for source and experience. However, there is not documentation of such a comparison. It also does not identify that any examination was made for Salem-like designs. A comparison to similar designs can potentially identify those design-specific events than may have unique consequences which may not be defined in more generic sources. It also provides an industry basis for selection. This F&O is characterized as a finding based on the lack of sufficient documentation to allow verification of SR. Utilize available industry summary documentation to define generally appropriate initiating event list for specific design.	IE-A3a	Comparisons were made to industry data and to other plants. This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.
IE-A4-01	The requirement is to address each system, including support systems to assess potential for initiating events. The analysis only addresses support systems and does not address the impact of other operating systems with regard to events resulting in a plant upset and subsequent trip signal. For charging this has the potential to impact both the initiator and response models such that consequential failures could be possible. This F&O is characterizing as a finding based on the lack of sufficient documentation to allow verification of SR. Add evaluations for frontline operating systems that in particular are part of the PRA response model.	IE-A4	Loss of charging not included based on screening criterion, must cause automatic or manual trip AND frontline systems are significantly affected. No significant impact on frontline systems expected. This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
IE-A5-01	SA PRA Initiating Events Notebook, SA-PRA-001, Revision 0, Section 2.1.2 describes the review of Salem Generating Station Experience and Trip Review. No mention is made of consideration of events that occurred at conditions other than at-power operation. Also, events resulting in controlled shutdown were excluded on the basis that they present only mild challenges rather than being determined to be not applicable to at-power operation. Failure to consider non-power events and controlled shutdown events could result in exclusion of valid initiating events. Provide an explicit discussion of the review of non-power events. Improve the justification for exclusion of controlled shutdown events to address applicability to at-power operation or to provide a quantitative justification for exclusion.	IE-A5	Other than at-power events were evaluated. This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.
IE-A6-01	SA PRA Initiating Events Notebook, SA-PRA-001, Revision 0, Section 2.1.2 does not indicate that plant operations, maintenance, engineering, and safety analysis personnel were interviewed or included in the review process for the initiating events notebook to determine if potential initiating events have been overlooked. Documentation was not available to show that the Category II/III requirement was satisfied. The initiating event analysis should document a reasonably complete identification of initiating events. Document the required interviews.	IE-A6	This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
IE-A7-01	SA PRA Initiating Events Notebook, SA-PRA-001, Revision 0, Section 2.1.2 does not indicate that a review of plant-specific or industry operating experience was performed for the purpose of identifying initiating event precursors. Failure to consider precursor events and controlled shutdown events could result in exclusion of valid initiating events. The model owner stated that precursors were considered during the review of plant operating experience. However, because this is not documented, the SR cannot be considered met. This should be explicitly stated in the Initiating Events Notebook.	IE-A7	Plant and industry operating experience was reviewed. This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.
IE-B3-01	Initiating events are not grouped with less severe events without assuming the worst potential effects. For example, the potential for a spurious SI actuation is grouped in the general transient category with events such as reactor trip and considered to be no worse than the reactor trip. However, unmitigated spurious SI events can challenge a PORV resulting in a consequential LOCA. Spurious SI events should not be grouped with general reactor trips. Also, the loss of AC power bus (F) is said to result in a degraded loss of condensate/feedwater performance. However, it is placed in the PCS available category. This presents a problem when developing the conditional failure PCS in response to the event. This F&O is characterized as a finding based on the lack of sufficient documentation to allow verification of SR. Separate out events on basis of unique impacts to the response sequence.	IE-B3, AS-A5	Initiating events should be grouped reasonably, as PRA should be realistic and not conservative. Spurious SI will generally be recovered and the event will be a transient. If SI is not reset prior to PORV operation, what results is a transient with improved reliability of feed-and-bleed cooling (already initiated). SI can still be reset and PORV closed. If difficulty is experienced in closing PORV, block valve can be closed. Regarding the loss of AC bus, this does not result in even a trip so it would be quite conservative to bin such events as trips with loss of PCS. Minimal impact on the ability to assess significance of proposed application.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
IE-C1b-01	The loss of SW initiating event fault tree S1R4.Caf (gate IE-TSW) was reviewed and the logic appears to capture the appropriate combinations of equipment failures that contribute to the initiator. However, the documentation of the development of the initiator fault trees appears to be lacking. Section 3.3 of the Salem SA-PRA-001, Revision 0 notebook does not provide much detail of how the initiators modeled 'as-fault' trees are developed. It refers to the system model notebook. For the loss of SW initiator, the SW model notebook SA-PRA-005.13, Revision 0 was reviewed and there was no discussion of the development of the loss of SW initiator fault tree. For the loss of CC initiator fault tree, Section 4.2 of notebook SA-PRA-005.12, Revision 0 provides a good description of how that initiator fault tree is developed. This F&O is characterized as a finding based on the lack of sufficient documentation to allow verification of SR IE-C1b. Document how the loss of SW initiating event fault tree is developed. Likewise for other system initiators, as needed. Include a discussion of the recoveries credited in the initiator. This should also be done for the other initiators that are fault trees.	IE-C1b, IE-C6	This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.
IE-C3-01	The initiators that are fault trees, such as loss of SW and loss of CC, the initiator frequency is not based on reactor year. For example, under gate IE-TSW, basic event SWS-PIP-RP-TBHDR has a mission time of 8760 hours. This F&O is characterized as a finding because it does not meet the SR. Use reactor year when quantifying the initiator frequencies.	IE-C3	This is a minor conservative modeling issue and would not affect the ability to assess the impact of an application.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
AS-A7-01	Accident Sequences and Event Tree Development Notebook, SA-PRA-002, Revision 0 delineates the possible accident sequences for each modeled initiating event. However, some sequences are not explicitly modeled in the single-top fault tree (e.g., TT sequences S04 and S05 are combined into a single fault tree gate). No documentation was found to describe the basis of these combinations. Subsuming non-minimal sequences in the single-top fault tree model could result in loss of risk insights or masking of importance in non-standard configurations. Provide a description of the process used to combine non-minimal sequences with their bounding equivalent sequence in both the Accident Sequences and Event Tree Notebook or in the Quantification Notebook. Discuss how it is ensured that risk insights are not impacted by the subsuming of sequences. Provide a more complete basis for not modeling sequences judged to have "very low frequencies" such that a reviewer can evaluate the basis for the exclusion.	AS-A7	Sequences TTS04 and TTS05 differ only in whether containment is isolated, which is of concern only in level 2, not for CDF. Level 2 analysis does address containment status. Not excluded based on very low frequency. This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.
AS-A7-02	The VS ISLOCA sequence with no piping failure is assumed to be terminated with operator isolation of the suction path using the pump suction isolation MOVs. However, isolation cannot be accomplished until primary pressure is reduced. The potential for flooding of adjacent areas by water lost through the RHR pump seals and/or RHR heat exchangers prior to isolation does not appear to have been evaluated. Flooding of adjacent areas could impact additional equipment affecting the ability to achieve a safe, stable condition. Evaluate the potential volume of water which can be released prior to isolation of the VS sequence with no piping failure to determine if additional mitigation equipment could be affected.	AS-A7	Inventory loss from the postulated ISLOCA would not be expected to flood more than the lower levels of the auxiliary building. RH-4 valves which could be used for isolation are located a floor above the postulated break. Flooding analysis addresses plant response and demonstrates that the plant can be safely shut down without the potentially affected components, This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
AS-A8-01	Accident Sequences and Event Tree Development Notebook, SA-PRA-002, Revision 0 and the associated CAFTA event trees define the end state of each sequence as success or core damage. However, the SBO sequences S08, S11, S14, and S17 are assumed to be successful based on offsite power recovery. Operator action to restore mitigating systems after power recovery is not addressed. In addition, given the fact that power recovery is only credible out to 4 hours, 20 hours of mitigating system operation and the potential failures of that equipment over a significant portion of the 24 hour mission time is not being addressed. This failure to address recovery of mitigating systems following power recovery does not ensure a safe, stable end state has been reached for some SBO sequences. There is also concern that the application of offsite power recovery is included twice in the modeling of the SBO event. Recovery is credited in the application of a diesel mission time of 6 hours and again through the application of offsite power recovery top event RBU. Recovery of offsite power does not guarantee restoration of mitigating systems needed to establish a safe stable condition in the plant. In some plant models, operator action to restore required mitigating systems following power recovery has been shown to be significant. In addition, mitigating system operation over a significant portion of the 24 mission time is not being addressed. Extend the event tree models to address restoration and operation of required safety functions following offsite power recovery. Potential events to include are decay heat removal and primary inventory makeup.	AS-A8, AS-B6	Mission times vice recovery of offsite power are addressed in current PRA model. Documentation issue.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
AS-A10-01	Systems and operator actions required to meet each key safety function are discussed in general terms in the Accident Sequences and Event Tree Development Notebook, SA-PRA-002, Revision 0 Sections 3 through 9. Operator actions and diverse systems to satisfy top events are included in the fault tree but are grouped under common top events in the accident sequence model (e.g., core decay heat removal includes AFS, operator action to depressurize, and condensate under a common top event). However, the modeling of offsite power recovery in the SBO event tree does not explicitly model the differences in recovery times or plant response associated with different RCP seal leakage rates. Instead, a single lumped recovery event is modeled. The lumping of RCP seal leakage rate with offsite power recovery under the RBU top event does not provide sufficient detail to determine differences in requirements for mitigation systems and operator responses. For example, RCP seal leakage of 21 gpm per pump may proceed like a general transient and only require secondary side cooling whereas larger seal leakage rates may also require primary makeup for success. Provide explicit event tree branches for each RCP seal leakage rate the event timing and mitigation requirements for different leakage rates can be shown to be the same. This will ensure that significant differences in mitigation requirements and event timing are captured.		Varying seal leak rates are now explicitly addressed.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
AS-C2-01	Documentation does not clearly address the procedural guidance, operator actions and interfaces of the plant event trees with plant damage states. The current documentation does not include sufficient detail to allow correlation of operator actions required to mitigate the accident sequences to the HRA or the interface between the accident sequences and plant damage states carried forward to the Level 2 analysis. Expand the event trees to include important operator actions as separate top events or provide a table which describes operator actions included under each existing top event. Provide a description of the procedural guidance used in mitigation of each accident sequence or group of accident sequences. Document the interfaces between the event tree end points and plant damage states in the Accident Sequence notebook or through a specific reference to the appropriate section of the Level 2 notebook.		Operator actions and related procedural guidance are discussed in detail in HRA notebook. Plant event trees, success / failure paths are discussed in accident sequence and success criteria notebooks. Level 2 notebook describes interfaces. This information has been provided in the accident sequence, success criteria and L2 notebooks.
SC-A1-01	The ASME standard defines core damage as "uncovery and heatup of the reactor core to the point at which prolonged oxidation and severe fuel damage involving a large section of the core is anticipated." In the Salem PRA Success Criteria Notebook, SA-PRA-003, a "big picture" definition as described in the ASME PRA standard appears to missing. In the Salem PRA, core damage is defined as maintaining core temperature below 1200 degrees F which deals with heatup but not uncovery. The big picture definition of core damage is incomplete in that it defines core heatup but not uncovery. Include core uncovery in the definition of core damage.		Documentation clarified regarding core damage.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
SC-A2-01	In the Salem PRA core cooling was defined as successful if core exit temperatures do not exceed 1200 degrees F. This represents the temperature below which no core damage is expected to occur and the core exit thermocouple temperature at which the operators transfer to severe accident guidelines. The 1200 degrees F core temperature success criteria were interpreted to be the core hottest node temperature (TCRHOT) in MAAP. However, in the T/H notebook a peak cladding temperature of 1800 degrees F was referenced. The MAAP code used 1800 degrees as TCRHOT. Also, there is no mention of core collapsed liquid level. The temperature defined for core damage in the success criteria notebook was not the temperature used for TCRHOT in the MAAP code. Reconcile the definition of core damage between the T/H calculations and the success criteria notebook.		Documentation clarified regarding core damage
SC-B4-01	MAAP Thermal-Hydraulic Calculations Notebook (SA-PRA-007, Revision 1) Sections 1.2 and 1.3 provide a discussion of the codes available and the advantages associated with using MAAP, respectively. However, MAAP is used in establishing large LOCA success criteria, although the code is not suitable for analysis of this plant upset. A discussion of code limitations needs to be documented. Use of a non-applicable code could result in incorrect success criteria. Base the success criteria for large LOCA on an appropriate T/H code. Provide a general discussion of known T/H code limitations.		Documentation updated.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
SC-B5-01	A check of the reasonableness and acceptability of the success criteria results is not documented. Comparing success criteria results with those of similar plants or performed using other plant-specific codes provides greater assurance that the results are correct. Document a check of the reasonableness and acceptability of the success criteria results. Supporting requirement SC-B5 provides example methods. Note that the PWROG PSA database identifies success criteria for its constituent plants and may be a helpful resource.	SC-B5	This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.
SC-C3-02	Sources of uncertainty are addressed in a draft evaluation using guidance from draft EPRI report, "Treatment of Parameter and Model Uncertainty for Probabilistic Risk Assessments." An appropriate characterization of uncertainty is required to support risk-informed decision making. Apply the EPRI guidance, once finalized, to identify the sources of uncertainty in the analysis.	SC-C3, AS-C3, HR-D6, HR-G9, HR-I3, DA-E3, QU-E1, QU-E3, QU-E4, QU-F4, LE-F2, LE-G4	This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.
SY-A4-01	System walkdown documentation not included in the system notebook documentation. A review of system notebooks and available documentation does not include system walkdown information. A draft document containing photos and documentation of insights from a system walkdown was provided to the peer review but is not finalized. Finalize the provided notebook.	SY-A4	This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.
SY-A6-01	Missing boundary definitions for system models. The system notebooks do not clearly define the boundaries. The training documentation is not adjusted to be specific to the PRA model. Additionally some systems, such as ac power, do not include discussion of modeled events. The diesel generator and the fuel oil transfer system are not addressed explicitly. Develop PRA specific illustrations and expand documentation to clearly describe the system boundaries to ensure that no components are double counted or missed.	SY-A6, SY-C2	This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
SY-A8-01	Review of notebooks and data notebook did not provide a source for inclusion or exclusion of failure modes based on data boundaries. No documentation of component boundaries. Expand the data discussion to provide component definitions.	SY-A8	This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.
SY-A10-01	Some systems do not include expected failure modes and although this may be correct, there is no documentation as to how the data boundaries encompass the expected failures. One example is the diesel generator model does not include the diesel generator day tank and instrumentation. The response to inquiries was that these components are part of the diesel skid package. This is usually separate modeling to capture miscalibrations. Define what is included within the diesel generator "box" or expand the model.	SY-A10	This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.
SY-A12-01	Review of system models identified some missing component failure modes. Required components are not always addressed in the model. For example, the diesel generator day tank and fuel oil check valves are not included. Additionally, restart of some components (such as dampers having to re-open for CAV) are absent in the model. Define boundaries to show incorporation of failure modes by other events or expand model.	SY-A12	Components are included in the PRA model either explicitly or as part of a super-component. This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.
SY-A13-01	The modeling excludes some required component failures without justification. Some failure modes listed for inclusion in the SR are not found or are excluded from the model. This includes the transfer closed/plugging failure modes for valves and the absence of some check valves and/or tanks. Justify the exclusion of any failure mode or model the failure mode.	SY-A13	This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
SY-A16-01	The SWS fault tree includes recovery via alignment of the header crosstie. HFE SWS-XHE-FO-OVER2 is used for this recovery action in all cases, even LOSP. However, the timing used in the HRA for this action is based on room heatup following a loss of CAV, not on the more restrictive timing required for recovery of cooling to a diesel following LOSP. Application of the HFE for recovery of SW via the header crosstie in the incorrect context may result in underestimating the importance of the HFE and associated equipment required for the recovery. Create a variation of the SWS-XHE-FO-OVER2 HFE accounting for differences in timing during LOSP conditions where cooling to a diesel generator is required.	SY-A16	Action can be taken from the control room and will be taken within 10 minutes or less based on responses to control room alarms, which should be adequate. Minimal impact to application.
SY-A19-01	System notebooks do not include discussions on potential adverse operating conditions that could impact operation. No documentation of any potential for loss of desired system function, e.g., excessive heat loads, excessive electrical loads, excessive humidity, etc. Add brief discussion.	SY-A19, SY-A20	This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.
SY-A21-01	The current type code does not provide consistent nomenclature for same failure data. The SR indicates that the nomenclature should use the same identifier for the same failure mode. The type code changes by system although the data is from the same source. For data sources from the same reference the same type code should be used. Using type codes by system may obscure the state of knowledge information.	SY-A21, QU-A2b	Same data are used for different types of failures when data are lacking and a surrogate data set is required (e.g. diesel air compressors). Minimal impact to application. .

Finding	Finding Description	Applicable Supporting Requirements	Resolution
SY-B3-01	The review of the system model and documentation identified cases the selection of CCF combinations are not complete and those selected are not the most limiting. Example of incorrect usage is found for the dc chargers. Combinations of 3, 4 and 5 of six chargers are not included in current model. Additionally, CCF for two of two on same bus is modeled but cross train is not addressed (A & B, A & C, B & C) which are more significant. Review and revise as appropriate the selection of CCF combinations and model all possible combinations of CCF.		Additional battery charger CCF terms are now included.
SY-B5-01	Documentation indicated that the heated water circulating system was required. Documentation for several system notebooks (AFW, CVCS and RWST) indicated that the heated water circulating system was required to prevent freezing, but was not modeled. Model the heated water circulating system or justify the reason for not modeling.	SY-B5	This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.
SY-B6-01	No documentation provided related to analysis of support system requirements. There appears to be no analysis of support system requirements concurrent with their definition in the system notebooks. Perform the required engineering analysis.		Support system requirements are analyzed, modeled, documented.
SY-B11-01	Some AFW signals (SI, LOSP) are not defined and no justification for exclusion is provided The SR states that actuation signals must be considered or justification provided. The AFW start signals are not completely modeled and justifications for exclusion are not provided. Provide justification for exclusion of the AFW signals or model these signals.	SY-B11	This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
SY-B12-01	Some run times for components do not reflect the actual required mission time. Several components reflect 8 hour run times (DG and control room fans as examples) when the required mission time is continued operation 24 hours. The design generator and turbine driven pump run time of 6 hours is not sufficient to address the total run time of 24 hours. Justify mission times or revise the mission times to the required value.		Mission times changed in current model
HR-B2-01	DO NOT screen activities that could simultaneously have an impact on multiple trains of a redundant system or diverse systems (HR-A3).		Section 4.3.3.1 of the HRA Notebook which allows screening of actions that could simultaneously have an impact on multiple trains of a redundant system or diverse systems is in violation of this. This requirement is not met. Change the documentation to reflect that the activities are being screened because they are either not in the PRA model or do not impact any success criteria. No screening performed. Documentation clarified.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
HR-C3-01	There is no documentation showing that miscalibration as a mode of failure of initiation of standby systems was considered. An example of this is that there is no HFE for miscalibration of bus undervoltage bus, RPS relays, etc. There is no documentation showing that miscalibration as a mode of failure of initiation of standby systems was considered. An example of this is that there is no HFE for miscalibration of bus undervoltage bus, RPS relays, etc. Consider analyzing the miscalibration of standby systems.	HR-C3, SY-B16	Can be considered to be modeled by common-cause failure events. No impact expected to application.
HR-F2-01	Complete the definition of the HFEs by specifying: (a) Accident sequence specific timing of cues, and time window for successful completion (b) Accident sequence specific procedural guidance (e.g., AOPs, and EOPs) (c) The availability of cues and other indications for detection and evaluation errors. (d) The complexity of the response. (Task analysis is not required.) The accident sequence specific timing of time window for successful completion for CCS-XHE-FO-ISOLT is not based on a calculation that addresses leakage. The calculation S-CC-MDC-2111 is for loss of Service Water and does not address leakage of the Component Cooling Water System. The time window should account for leakage that would drain the CCW system and make it inoperable. This is the limiting time since the CCW system will continue to cool with the leak until the surge tank is drained. This is only one example of a timing window error. Review all HRA analysis to verify that the time window in the analysis is based on an applicable calculation. This review needs to be documented		This information is available. The cited calculations were reviewed and found to provide appropriate basis for the related operator actions. No impact to application.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
DA-A1a-01	No discussion of component boundary definition is provided in either the data or systems analysis. Boundaries for unavailability events are not established. Boundary definitions help assure that failures are attributed to the correct component and that calculated failure rates and unavailability values are appropriate. Some component boundaries are discussed in the notes to Appendix A, "Generic (Industry) Failure Data" of the Data Notebook. Note 32 states to "Assume that CCW/RHR HX failure rates apply to TDAFW Pump Bearing and governor jacket coolers", however unless the Salem TDAFW pump has unique features that require this to be modeled separately, cooling to the TDAFW pump is usually included in the component boundary to the pump. Define the component boundary for each component consistent with the failure data source. Establish boundaries for unavailability events consistent with definitions in the systems analysis.	DA-A1a, DA-C1	This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.
DA-A2-01	Mean values for failure rates appear in the model; however no uncertainty distributions could be found in the basic event database. Failure rates used in the model are not exact and uncertainty distributions are needed to help bound the analysis. Include data distributions in the database in the model.		Data distribution information is documented.
DA-C1-01	Generic unavailability data is used for some SSCs without demonstrating that the data is consistent with the test and maintenance philosophies for the subject plant. Generic unavailability data may not be applicable to Salem if its T&M approach is different. Review and state that any generic unavailability data used is applicable to the Salem model.	DA-C1	This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
DA-C2-01	Plant-specific data is only collected for MSPI components. The PRA procedure requires plant specific data to be collected for components with a RAW >2 or an F-V greater than 0.005. MSPI components are only a subset of the risk-significant components. Expand collection of plant-specific data to all modeled components or justify why the generic data is applicable.	DA-C2	Plant-specific data is collected and maintained by the station for components and systems such as those tracked for MSPI. The PRA was updated with this plant specific data. This is believed to be appropriate. Documentation issue.
DA-C4-01	Documentation describing the process of evaluating maintenance records for failures could not be identified. All failures must be reviewed for applicability to the PRA model. Failure rates are dependent on an accurate failure count. Document the process of evaluating maintenance records for failures, ensuring failures are reviewed for applicability to the PRA model in accordance with SR-DA-C4.		Plant data were developed from existing plant programs (e.g. MSPI, maintenance rule, etc.) which is also an acceptable approach.
DA-C5-01	Documentation describing the process for counting component failures could not be identified. Failure rates are dependent on an accurate failure count. Counting repeated failures occurring within a short interval could skew the importance of SSC. Document the process for counting component failures, consistent with SR DA-C5. The draft data procedure provided did not discuss counting of repeated failures in a short interval.		This information is available in the process descriptions for relevant plant programs.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
DA-C6-01	Documentation describing the process of evaluating the number of plant specific demands for standby components could not be identified. Standby components were identified in Table 1 of the Data Analysis Notebook and plant specific demands for some of these components were listed in Appendix B, however the basis for these numbers of demands was not provided. The draft data procedure states that plant specific data should be estimated by actual counts of hours or demands from logs or counters, use of surveillance procedures to estimate the frequency of demands and run times, or estimates based upon input from the System Engineer. Failure rates are dependent on an accurate demand count or component importance could be skewed. Standby components were identified in Table 1 of the Data Analysis Notebook and plant specific demands for some of these components were listed in Appendix B, however the basis for the number of demands was not provided. The draft data procedure states that plant specific data should be estimated by actual counts of hours or demands from logs or counters, use of surveillance procedures to estimate the frequency of demands and run times, or estimates based upon input from the System Engineer. Issue the data collection guidance document and document/justify the basis for the demands used.	DA-C6	This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
DA-C7-01	Documentation describing the process of collecting the number of surveillance tests and planned maintenance activities on plant components could not be identified. In Appendix C for example CCS MOVs in test and Maintenance were described. The source of the data was listed as Salem 3.2 PRA, however no specific breakdown of the surveillance tests included was provided. The draft data procedure identifies surveillance tests as a source of data. Maintenance and testing unavailability are dependent on an accurate review of test and maintenance procedures. Document the source of maintenance and testing activities.		Plant data were developed from existing plant programs (e.g. MSPI, maintenance rule, etc.) which is an acceptable approach.
DA-C9-01	Documentation describing the process of estimating the operational time of standby components from testing was identified in draft procedure. Standby components were identified in Table 1 of the Data Analysis Notebook and operational times for some of these components were listed in the Data Analysis Notebook, however the source of the data was not provided. Failure rates are dependent on an accurate run times. Document the source of data for the actual run times of standby components.		Plant data were developed from existing plant programs (e.g. MSPI, maintenance rule, etc.) which is an acceptable approach.
DA-C10-01	Compare the initiator frequencies used in the Salem model with other generic data sources. This F&O is characterized as a suggestion because the IE notebook does include a comparison with NUREG/CR-5750. It is recommended for completeness to check how the Salem set of initiators compares with other data sources.	DA-C10	This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
DA-C11-01	Maintenance and testing unavailability were identified in the model; however no specific surveillance tests were discussed in the Data Analysis Notebook. MSPI/Maintenance Rule sources were identified. Document the specific surveillances or plant maintenance contributing to the unavailability of plant components. Document the process for counting these durations in a data procedure.		Plant data were developed from existing plant programs (e.g. MSPI, maintenance rule, etc.) which is an acceptable approach.
DA-C11A-01	Documentation describing the process of using maintenance and testing durations to determine plant specific durations was identified in a draft document. Component availability depends on an accurate count of maintenance unavailability. Document the process for counting maintenance unavailability in a data procedure.		Plant data were developed from existing plant programs (e.g. MSPI, maintenance rule, etc.) which is an acceptable approach.
DA-C12-01	There was no specific documentation or guidance document provided that discusses how maintenance was treated for shared systems. Component availability depends on an accurate count of maintenance unavailability including shared systems. While a table of critical hours was provided and the Maintenance Unavailability Table provided in Appendix C appears to address these hours there was no specific documentation or guidance document provided that discusses how maintenance was treated for shared systems.		Plant data were developed from existing plant programs (e.g. MSPI, maintenance rule, etc.) which is an acceptable approach.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
DA-C13-01	Coincident unavailability for service water pumps was modeled as shown in Appendix C of the Data Analysis Notebook, however, no overall guidance document could be found to ensure all systems were reviewed for coincident unavailability. Component availability depends on an accurate count of maintenance unavailability. Document the review of coincident unavailability in plant systems.		With the exception of service water and a handful of other systems, concurrent unavailability of multiple components would require a prompt shutdown. This condition is remote and is not modeled.
DA-D3-01	Several items listed in Table A-1 do not contain any reference information for either error factor or basic input parameters from which an error factor can be derived. Provide information related to the bounds of the failure rates.		Bounds have been provided.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
DA-D4-01	No documentation exists related to the comparison between the generic value and the plant-specific update value to ensure accurate and meaningful implementation of Bayes approach. The documentation only indicates that data came from NUREG/CR-6928 and that MSPI data was used to perform the update. It then references Appendix B which is only Table B-1. The table provides limited information related to the update and does not provide any comparisons of results or discussions with regard to applicability of results. The documentation only indicates that data came from NUREG/CR-6928 and that MSPI data was used to perform the update. It then references Appendix B which is only Table B-1. The table provides limited information related to the update and does not provide any comparisons of results or discussions with regard to applicability of results. Perform comparisons of results with regard to initial ranges of possible generic values and confirmation that the updated results are within the expected range. Also confirmation that plant data, due to relatively small generic alpha factors is not biasing the updated value.	DA-D4	This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.
DA-D6-01	No documentation is present that provides any comparisons between data sources. Perform the evaluation.	DA-D6	This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.
DA-E2-01	A draft document was provided that documented how to establish component boundaries, how to establish failure probabilities, sources of generic data, etc. This procedure needs to be formalized. The draft document discussing how to perform data analyses needs to be finalized to ensure quality. Provide procedure on how to perform data analysis.	DA-E2, DA-C6 DA-C7 DA-C8 DA-C9	This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
IF-A4-01	Appendix A of the SA-PRA-012, Revision 0 contains a summary of the walkdown performed for the internal flooding analysis. However, it does not contain the details of the walkdown notes such as spatial information, plant design features, mitigating equipment such as drains, sumps, doors, wall penetrations, etc. This F&O is characterized as a finding because there was insufficient documentation available to verify the SR. Include walkdown sheets in with the documentation that includes the observations of the walkdowns.		This information was available; location of information is at most a documentation issue.
IF-B1a-01	This SR requires consideration flood sources for multi-unit sites. The internal flooding notebook does not contain documentation that Unit 2 flood sources could or could not impact Unit 1 and vice versa. This F&O is characterized as a finding because there was insufficient documentation available to verify the SR. Assess whether Unit 2 flood sources can impact Unit 1 and vice versa.		This was done. AB-084B scenario is an example.
IF-C1-01	Propagation paths are not documented for each flood area. The requirement specifies that the propagation paths should be identified. Document propagation paths for each flood area.		See Appendix E of the Internal Flooding report. Very low risk areas were not addressed using the same level of detail as for higher risk areas.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
IF-C2-01	Plant design features that have the ability to terminate or contain the flood propagation are not documented for all defined flood areas. The information contained in Appendix A does not provide documentation information for each flood area. Document the required information for each flood area.		Plant design feature information is provided for those areas which could not be shown to be unimportant. Information was not gathered if no important floods were identified in the area.
IF-C2b-01	The documentation does not provide spatial information for components. This is required information for flood areas. Document the required information for each flood area.		See Appendix E of the Internal Flooding report. Very low risk areas were not addressed using the same level of detail as for higher risk areas.
IF-C2C-01	The propagation paths and spatial information is not provided for SSCs contained in flood areas. The evaluation limits the propagation paths to only those found to be of highest frequency. Spatial information is not provided for components listed in Appendix D with respect to potential flood sources. Document the required information for each flood area.		See Appendix E of the Internal Flooding report. Very low risk areas were not addressed using the same level of detail as for higher risk areas.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
IF-C3a-01	Appendix D of the PRA Internal Flood Evaluation states that "For spray scenarios, however, walkdown observations revealed that Air-Operated Valves (AOVs) and Motor-Operated Valves (MOVs) were of a robust design that would exclude them from being susceptible to water damage. Hence, these components were not automatically failed (PRA event equal to TRUE) for quantification of the CCDP." This is not an adequate basis for determining the susceptibility of these components to flood-induced failure mechanisms per this SR. Improperly screening SSCs from flood-induced failure could lead to underestimating the risk associated with a flood sequence. Per the SR, take credit for the operability of SSCs identified in IF-C2c with respect to internal flooding impacts only if supported by an appropriate combination of: (a) test or operational data (b) engineering analysis (c) expert judgment.		This was our informed judgment based on empirical observation. Experience shows that water spray does not generally prevent AOVs and MOVs from operating. Therefore the assumption is believed to be appropriate for best-estimate PRA work. No impact expected to application.
IF-C3b-01	Propagation was not performed for initial screening. The propagation paths for systems during the initial quantification were not defined or utilized to perform the flood area screening. This can result in screening sequences that could be important. Identify propagation paths for each flood area.		This was done for any flood which could contribute to CDF. This information was not developed for all areas. If, for instance, no source within or external to an area could impact equipment in that area or in other areas which the area would drain to, then it was not necessary to develop detailed propagation information.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
IF-C4-01	Flood scenarios were screened without development of flood rate, source, and operator actions. Detailed assessments were only provided for selected high-frequency floods. Improperly screening flood scenarios could lead to underestimating the risks associated with internal floods. Provide a more thorough development of all flood scenarios		Detailed assessments were provided for those floods which could not be shown by screening to be negligible risk contributors. Guidance does not indicate that detailed information must be gathered for locations once they are shown not to contribute to flood risk.
IF-C4a-01	Documentation of multi-unit scenarios could not be identified. For completeness, the potential for multi-unit scenarios needs to be addressed. Address the potential for multi-unit internal flood scenarios.		This was considered; see for example flood AB084B
QU-A2b-01	Parametric uncertainty is not performed on the quantification results. In addition, it is not clear that the same type code is used for multiple events based upon the same underlying data. For Category II, the "state-of-knowledge" correlation must be accounted for in determining the mean. Since the uncertainty characterization for basic events is not carried into the CAFTA database and no Monte Carlo techniques are used to generate the mean CDF, this SR is only met at Category I. Incorporate the uncertainty bounds into the CAFTA database to allow generation of a CDF mean accounting for the "state-of-knowledge" correlation. This may also require revision of the type code applications to ensure all basic events relying on the same underlying data are correctly correlated.		Uncertainty information has now been provided.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
QU-A4-01	Recovery events NRAC-12H, NRAC-OSP, and NREDG-4H are included in the S1R4REC.CAF file, but their application is not discussed in the Accident Sequences and Event Tree notebook or in the AC Power System Notebook. The model owner stated that the recovery events in question should not have been used in the latest revision. However, it appears that their inclusion did not significantly affect the results. Review the recovery file to ensure only those events intended to be applied are included. Provision of a listing of all recovery events and their intended application in the Quantification Notebook could facilitate this review for future model revisions.		Recovery file was reviewed.
QU-B3-01	Either applies a truncation limit satisfying the criteria of "final change is less than 5%" for both CDF and LERF or use a lower truncation limit to the LERF quantification to satisfy the criteria.		Truncation evaluation has been updated.
QU-B5-01	Salem Quantification Notebook SA PRA-2008-01 Attachment E documents the convergence analysis performed to set an appropriate truncation value. The truncation level for both CDF and LERF was set at 1.0E-11. The percentage change between 1.0E-10 and 1.0E-11 was 2.2% for CDF, but 6.1% for LERF. Therefore, this SR was not satisfied for LERF. The supporting requirement applies the same criteria for convergence to both CDF and LERF. The criteria were satisfied for CDF, but not LERF. Document the overall philosophy and method for breaking circular logic in the Quantification notebook and provide sufficient documentation in the system notebooks to provide assurance that unnecessary conservatisms or non-conservatisms are not introduced.	QU-B5	Convergence validation was updated. The circular logic issue is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
QU-B9-01	Split fractions and undeveloped events are included in the model. Examples include main feedwater availability for ATWS (MFI-UNAVAILABLE) and some Unit 2 systems credited for recovery of Unit 1 CAV failure (G2SW22). The derivation of the values for these events is not documented. The derivation of split fractions and undeveloped events is not documented sufficiently to allow identification of shared events and results interpretation based on individual events subsumed into the split fraction. Document the derivation of any split fractions and undeveloped events used in the model sufficiently to allow results interpretation and to provide assurance that the impact of any shared components is appropriately considered.	QU-B9	This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.
QU-D1b-01	There is no discussion in the quantification notebook that indicates a review of the results was performed for the purpose of assessing modeling and operational consistency. Also, since the sequences were not quantified, it is difficult to perform this verification. This F&O is characterized as a finding because there was insufficient documentation available to verify the SR. Review the results for modeling consistency (e.g., event sequence models consistency with systems models and success criteria) and operational consistency (e.g., plant configuration, procedures, and plant-specific and industry experience) and include in the quantification notebook.	QU-D1b	This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
QU-D3-01	This is a Capability Category I because there is no documentation to indicate that the Salem results were compared to the results of a similar plant. No documentation was provided showing this requirement was met. Provide a comparison of initiating event contributions and significant basic event importances between Salem and similar plants based on information available in the PWROG PRA Comparison Database.	QU-D3	This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.
QU-D4-01	There is no documentation indicating that a sampling of non-significant accident cutsets or sequences were reviewed to determine they are reasonable and have physical meaning. Quantification Notebook Section 2 only requires a review of the top 100 cutsets. Review of a sampling of non-significant cutsets can also reveal logic problems or recovery rules which are not being applied correctly. Include a requirement for review of a sampling of non-significant sequences in Section 2 of the Quantification Notebook and in procedures governing the model update process.	QU-D4	This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
QU-F2-01	This requirement was only partially met as described below: (a) This requirement is met by the system and HRA notebooks. (b) There is a cutset review process description (c) There is no description of how the success systems are accounted for. Since a one top tree is used the software already accounts for this. A statement stating would be satisfactory. The truncation values and how they were determined were documented. The method for applying recovery and how post initiator HFE's are applied was not described. (d) This requirement was met. (e) This requirement was met (f) This requirement was not met since the cutsets per accident sequence were not discussed. (g) This requirement was not met since equipment or human actions that are the key factors in causing the accidents sequences to be are not discussed. (h) This requirement was not met since sensitivities were not documented. (i) This requirement was not met since the uncertainty notebook was not finalized. (j) This requirement is not met since there is no discussion of importance. (k) This requirement is not met because there is not list of mutually exclusive events and there justification. (l) This requirement is not met because there is no discussion of asymmetries in quantitative modeling to provide application users the necessary understanding regarding why such asymmetries are present in the model. (m) This requirement is met since CAFTA and Forte are being used. Both of these pieces of software are industry standards and therefore no further testing is required. Several documentation items called for in this supporting requirement were not available for review. Specific items not included in the documentation were: the process used to account for system successes, accident sequence results, discussion of factors causing accidents to be non-dominant, sensitivity assessments, uncertainty distribution, importance measure results, basis for elimination of mutually exclusive events, asymmetries in the model, and a quantitative definition of significant basic event, significant cutset, and significant accident sequence . Expand the documentation to address the items documented in the F&O.	QU-F2, QU-F3, QU-F6	This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
LE-C8a-01	Equipment survivability and human actions under adverse environments must be considered to reach Category II. No documentation provided or credit taken for equipment or operators in adverse environment. Provide discussion on environmental conditions and the effects on operator actions.	LE-C8a, LE-C8b, LE-C9a, LE-C9b	No credit is taken for equipment or actions under adverse environments. This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.
LE-D1b-01	Requirements are to address penetrations, hatches and seals. No documentation presented in the containment isolation documentation that the required analysis was performed. Perform analyses for penetrations, hatches and seals.		This was evaluated as only a documentation issue.
LE-D6-01	Consider both failures of isolation and safety systems. The CI model (SA-PRA-005.07) does not provide sufficient information and does not address potential failures due to air locks or other locations. Perform detail analyses for failures due to air locks and other locations.		This was evaluated as only a documentation issue.
LE-F1b-01	Other than verifying that the sum of the three end states (INTACT, LATE and LERF) is approximately equal to the core damage frequency, no checks on the reasonableness of the LERF contributors is documented. A review for reasonableness is required to meet the intent of this SR. Review contributors for reasonableness (e.g., to assure excessive conservatisms have not skewed the results, level of plant specificity is appropriate for significant contributors, etc.).	LE-F1b	This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.

Finding	Finding Description	Applicable Supporting Requirements	Resolution
LE-F3-01	LERF uncertainties are not characterized consistent with the requirements in Tables 4.5.8-2(d) and 4.5.8-2(e). LERF uncertainties must be appropriately characterized to meet the intent of this SR. Characterize the LERF uncertainties consistent with the requirements in PRA Standard Tables 4.5.8-2(d) and 4.5.8-2(e).	LE-F3	This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model. The NEI 04-10 methodology explicitly addresses uncertainty.
LE-G5-01	Limitations in the LERF analysis that would impact applications are not documented. Limitations in the LERF analysis that would impact applications must be discussed to meet this SR. Document the limitations in the LERF analysis that would impact applications.	LE-G5	This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.
LE-G6-01	A definition for significant accident progression sequence is not documented. A definition for significant accident progression sequence must be included to meet this SR. Include in the documentation a definition for significant accident progression sequence.	LE-G6	This is judged to be a documentation consideration only and does not affect the technical adequacy of the PRA model.
MU-C1-01	There is no reference to a review of the cumulative impact of pending changes. Multiple changes to PRA inputs can necessitate the need for a PRA model update/upgrade. Revise the FPIE model procedure to require a review of the cumulative impact of impending changes		Documentation issue.