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RM DOCUMENTATION NO. SA-SURV-2010-001 REV: 1 PAGE NO. 1/4

STATION: Salem Nuclear Generating Station

UNIT(S) AFFECTED: 2

TITLE: Risk Assessment of Missed Surveillance – Auxiliary Feedwater discharge line underground piping pressure testing

SUMMARY (Include UREs incorporated): On 04/21/2010 it was discovered that required ASME Section XI surveillance tests (pressure testing) had not been performed for buried Auxiliary Feedwater piping as required by ER-AA-330-001 and OU-AA-335-015. This condition is documented in Notification 20459689.

A risk assessment of the condition was performed in accordance with procedure ER-AA-600-1045, "Risk Assessments of Missed or Deficient Surveillances." A surveillance deferral time of up to the end of the current operating cycle was evaluated and found to be acceptable.

Revision 1 of this calculation was prepared to incorporate a refined assessment approach, thereby increasing the deferral time.

[ ] Review required after periodic Update

[X] Internal RM Documentation **[ ] External RM Documentation**

Electronic Calculation Data Files:
(Q:\System Engineering\Salem\PRA\Applications\Missed Surveillance\SA-SURV-001)

Salem PRA, Revision 4.3; Equipment Out of Service (EOOS), version 3.3a from EPRI Risk and Reliability Workstation.

Method of Review: [x] Detailed [ ] Alternate [ ] Review of External Document

This RM documentation supersedes: ___**Rev 0**_____**in its entirety.**

	Print	Sign	Date
Prepared by:	Brad Dolan	/	04/23/2010
Reviewed by:	Victoria Warren	[per telecom]	04/23/2010
Approved by:	N/A		

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On 04/21/2010 at 11:32 a.m. it was discovered that buried segments of the AFW discharge lines supplying #22 and #24 Steam generators had not been subjected to surveillance testing as required. Testing will be performed every period in the 10 year interval.

When a required surveillance test is discovered not to have been performed as required, Salem's technical specifications permit the test to be performed within 24 hours or the test may be performed at a later time if an assessment of the associated risk is performed within 24 hours and the risk is acceptable for the deferral period. This evaluation is provided to support that requirement.

This evaluation was prepared in accordance with Risk Management procedure ER-AA-600-1045, R1, "Risk Assessments of Missed or Deficient Surveillances."

That procedure indicates that if results are acceptable, a risk assessment may be performed which assumes that affected components and systems are unavailable for the period of time from discovery until the surveillance test is performed. Alternately a refined approach which increases the assumed likelihood of failure of the untested components may be employed. That approach was employed here.

The function of the AFW discharge lines is to direct auxiliary feedwater to the secondary side of the steam generators. Piping integrity also acts to prevent loss of necessary inventory of auxiliary feedwater supply. There are approximately 170 feet of piping in the subject piping section leading to the 22AF23 valve and approximately 170 feet of piping in the subject section leading to the 24AF23 valve.

There are two potential failure modes postulated which could occur in the buried AFW discharge piping to the #22 and #24 steam generators. The piping could collapse or otherwise obstruct, preventing flow from being delivered to the affected steam generators. It is also possible that the piping could leak or rupture, resulting in a diversion of inventory from the stored supplies maintained for the AFW system.

This condition was modeled using the Salem internal events model of record (v. 4.3).

The potential for loss of inventory was conservatively bounded in this way.

A pipe failure frequency from NUREG/CR-6928 (ref. 1) of 2.2E-7/ft-yr was believed to be appropriate and was adopted.

The next scheduled refueling outage for Unit 2 is scheduled to begin on April 5, 2011. The absence of a failure in the subject piping was last demonstrated during operation of the AFW system on January 21, 2010. Therefore the likelihood of failure of the AFW discharge piping during the subsequent 1.25 years remaining to the next refueling outage may be calculated: 2.2E-7/ft-y *

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340 ft of subject AFW piping * 1.25 y= 9.4E-5. The average likelihood of failure of the subject AFW system piping during that interval is 9.4E-5 /2 or 4.7E-5.

A postulated failure of AFW system piping involving substantial leakage was assumed to result in inability of the AFW system to perform its mission for any initiating events. In reality, for most events such as uncomplicated reactor trips, there would be ample indication of the problem and operators could isolate a failed line and provide for additional makeup to the AFW system from any of a number of unlimited sources including service water or fire water. The potential for failure of the entire AFW system was modeled by increasing the "common-cause failure of all AFW pumps" term AFS-MDP-FS-DF04, from 4.25E-4 to (4.25E-4 + 4.7E-5) = 4.72E-4/y).

Similarly the potential for obstruction of the AFW supply lines, thereby preventing supply to the #22 or #24 steam generators was evaluated.

The potential impact to the paths to the #22 and #24 SGs were evaluated by increasing the failure likelihood for events AFS-CKV-CC-2AF23 ("SCV 22AF23 FAILS TO OPEN") and AFS-CKV-CC-4AF23. These events represent the potential that check valves in the subject lines could close, thereby preventing flow in the lines. The base failure probability for these events is 1.3E-5/y. The absence of a failure in these components was last demonstrated during operation of the AFW system on January 21, 2010. The likelihood of a failure in the subject lines was calculated above (4.7E-5/y). This failure likelihood was apportioned equally to the two lines (4.7E-5 / 2 = 2.3E-5 and that value was added to the base value for each of the lines (1.3E-5 + 2.3E-5 = 3.6E-5/y).

The model was then quantified and a negligible increase in risk resulted (CDF increased from 2.25E-5/y to 2.28E-5/y).

A sensitivity case was then evaluated involving a doubling of the likelihood of a failure in the subject piping, from 2.3E-5/year per line to 4.6E-5/year per line, or a combined failure frequency per year of 9.2E-5/y total. In this instance, the values of AFS-CKV-CC-2AF23 and AFS-CKV-CC-4AF23 representing individual line obstructions were increased from 1.3E-5/y to (1.3E-5 + 4.6E-5) = 5.9E-5/y and the likelihood of CCF of the entire AFW system (to address potential inventory loss due to rupture) was increased from 4.25E-4 to(4.25E-4 + 9.2E-5)=5.17E-4. CDF increased from 2.25E-5/y base to 2.30E-5/y. This indicates that an ICCDP of less than 1E-6 would be expected during the remaining 50 weeks to the next refueling outage, even given this bounding sensitivity case. This measure of conservatism can be considered to address the potential for external event contributions which were not directly evaluated.

A similar set of modifications were made to the average test and maintenance CAFTA model of record and LERF was quantified, to confirm that ICCDP was the limiting parameter. Even in the sensitivity case, LERF increased from a baseline value of 1.18E-6 to 1.22E-6, thus confirming that the CDF calculation is limiting.

Conclusion

Deferral of the missed surveillance for a period of up to the end of the current operating cycle is acceptable and results in a negligible increase in risk. Per the guidance of ER-AA-600-1045, online risk assessments may be performed as usual without modification.

References:

1.) NUREG/CR-6928, Industry-Average Performance for Components and Initiating Events at U.S. Commercial Nuclear Power Plants (NUREG/CR-6928), 2007.