ATTACHMENT 1
Operability Evaluation

1. **ISSUE IDENTIFICATION:**

1.1 Notification (Order)#: **20460078 (70109482 Op 0010)**

1.2 OpEval #: **10-005** Revision: **0**

General Information:

1.3 Affected Station(s): **Salem**

1.4 Unit(s): **2**

1.5 System: **Auxiliary Feedwater (AF)**

1.6 Component(s) Affected: **4" NPS Pipe 2AF1019 and 2AF1013**

1.7 Detailed description of what SSC is degraded or the nonconforming condition, by what means and when first discovered, and extent of condition for all similarly affected SSCs:

During S1R20 Unit 1 refueling outage, corrosion was found on the 4" Auxiliary Feedwater (AFW) buried piping that supplies the 12 and 14 steam generators. The corrosion exceeded the minimum wall criteria and the corrosion was seen on all excavated piping. This inspection was performed as part of planned buried pipe inspections during S1R20. This evaluation assesses the applicability of the findings to the Salem Unit 2 AFW piping

Unit 1 Buried AFW Piping:

Auxiliary Feedwater pipes connect to the #12 and #14 main feedwater lines in the outer penetration area. This location requires the #12 and #14 AFW pipes to travel approximately 170 feet underground along the edge of the containment building before entering the outer penetration area at elevation 94' 8" and 96' 2" for #12 and #14, respectively.

The Guided Wave inspections of the Salem Unit 1 #12 and #14 AFW buried piping during Salem's S1R20 refueling outage revealed degraded pipe wall conditions due to external corrosion in excess of the design minimum wall thickness due to heavy external uniform corrosion. The apparent cause of the corrosion was the absence or improper application of the specified pipe coatings. The specified coating was X-Tru-Coat, an adhered polyethylene protection system, with Bitumastic applied at the welded joints. Visual inspections of this piping after excavation showed no recognizable coating system. The only remnant of coating found was a portion of coal tar which was approximately 9 inches in length and 7 inches of the circumference. This piece of coating was in the shape of the 4 inch AFW piping and conformed to that same surface.

The piping is 4-inch NPS, Schedule 80, A106 Gr B seamless carbon steel. It is classified as Nuclear 3, Seismic Category I. Per the Pipe Specification S-C-MPOO-MGS-0001, SPS 54E, the system design Pressure-Temperature limit is 1950 psi at 140 F. The nominal wall thickness is 0.337 inches ± 12.5%.

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Using the Guided Wave inspection results to target specific pipe areas of the 12 and 14 AFW piping during S1R20, NDE Services initially performed confirmatory UT measurements on 378 grid areas. Approximately 76 percent of these UT measurements were non-conforming, having a minimum wall thickness less than the design minimum wall thickness of 0.278 inches. For the worst case UT measurements, the minimum wall thickness for the #12 AFW buried piping showed a 55 percent loss (0.152 inches). For the #14 AFW buried piping, the greatest loss was approximately 78 percent (0.077 inches). As of 4/19/2010 the following number of UT readings were taken:

#14 AFW Line (Upper Pipe): 8,904 readings total. 1,194 are below 0.278"

#12 AFW Line (Lower Pipe): 8,852 readings total. 192 readings are below 0.278"

Removal of sections of the Salem Unit 1 #12 and #14 AFW piping during S1R20 and subsequent visual examinations has validated that the corrosion identified above is external. These inspections also revealed that there is evidence of the X-Tru-Coat, an adhered polyethylene protection system only on the thru wall portions of the #12 and # 14 AFW piping where it passes into the fuel transfer tube area. It is obvious this coating system was not on the buried portions of these lines and validates that the corrosion is due to lack of coating. The ground fill of the AFW piping is not a harsh environment (harsh with regard to coating), and there does not appear to be a correlation between the missing/deterioration of coating and the buried pipe environment.

Summary of Structural Integrity Associates (SIA) Finite Element Analysis Report

The underground auxiliary feedwater piping at Salem, Unit 1 was designed to the t_{min} requirement given in the B31.1 Power Piping Code. B31.1 does not provide specific criteria for the evaluation of non-uniform wall thickness or local thinning. However, guidance for stress analysis may be taken from the ASME Code, Section III as described below.

The technical approach taken herein is based on the premise that while piping may have localized thinned regions that violate the design t_{min} requirements, the non-uniform wall thickness of the pipe cross-section may be shown to meet design stress allowables. This approach is possible for the pipe section exhibiting thinning when a remaining wall greater than t_{min} surrounds the thinned region. This approach is similar to the basis for qualifying pipe penetrations using branch reinforcement rules in the ASME Code.

Design requirements for Class 3 piping are provided in ND-3600 (similar to B31.1 rules) of the ASME Code, Section III [2]. More rigorous analyses are allowed under ND-3611.3:

> *"The specific design requirements of ND-3600 are based on a simplified engineering approach. A more rigorous analysis such as described in NB-3600 or NB-3200 may be used to calculate the stresses required to satisfy these requirements. These calculated stresses must be compared to the allowable stresses in this Subsection. In such cases, the designer shall include the appropriate justification for the approach taken in the Certified Design Report."*

Thus, NB-3200 design by analysis is employed. Based on the linear-elastic finite element analysis results which showed that the thinned section of pipe was bounding, it was required to perform additional analysis only for that section of pipe in order to show operability. The more rigorous analysis employed is described in Section NB3228.1, Limit Analysis. Specifically Section NB-3228.1 states that limits on Local Membrane Stress Intensity need not be satisfied at a specific location if it can be shown by limit analysis that the specified loadings do not exceed two-thirds of the lower bound collapse load. Also, NB-3228.1 states that the yield strength to be used in this calculation is 1.5 S_m. In this evaluation, the value of yield strength is equal to 1.5 S, where S is taken as the value of S_h, 15.0 ksi, from the original 1967 B31.1 Power Piping Code. Thus, a yield strength of 22.5 ksi is used.

The thinned section of pipe is modeled using the as-found wall thickness values for the region specified in S-TODI-2010-0005 which includes a minimum wall thickness of 0.077 inches. A pressure load of 1.5 times the PSEG specified operating pressure is applied (1943 psi = 1.5*[1310psia-14.7psi]) to the pipe.

The results of the finite element analysis show that the thinned pipe in this section remains structurally stable at 1.5 times the PSEG specified operating pressure and therefore passes the limit load analysis.

Unit 2 Buried AFW Piping:

At Salem Unit 2, the AFW discharge lines supplying the #22 and #24 SGs are also buried and run alongside the Unit 2 containment similar to the Unit 1 #12 and #14 AFW lines. The piping and coatings specified for Unit 2 AFW are identical to those in Salem Unit 1 AFW buried piping.

December 1994 Inspection

In December 1994, three areas of the buried Salem Unit 2 AFW piping were excavated due to a concern over water entering the Williamson penetration seals into Outer Penetration area. The concern was that this water could potentially be coming from a degraded buried #22 and/or #24 AFW line. Work order (941017262) created to excavate specific areas of the yard area containing these buried lines to rule out any degradation of the #22 or #24 AFW lines and prove that ground water was the source of the ingress.

Once excavation was complete in the three areas identified, coatings on these lines were inspected and photographs were taken. Per Report SCI-94-0877, the coal tar coating on the #22 and #24 Aux Feed lines were investigated. It was noted that some of the coating had adhered very well and in other areas it had flaked off. Details of the extent of coating degradation was not captured in the report.

In one of the excavated areas, the coal tar coating was removed from the #22 and #24 AFW piping to allow for UT examination. These UT examinations revealed the following:

Upper AFW Pipe (#24):

No unacceptable conditions of the piping were noted, with 50% of the readings at or above nominal thickness. No thickness readings below the manufacturer's tolerance of 87.5%. The lowest recorded value was 0.321" which was within the manufacturer's tolerance (Ref Work Order 941017262).

Lower AFW Pipe (#22):
No unacceptable conditions of the piping were noted, with 55% of the readings at or above nominal thickness, no thickness readings below the manufacturer's tolerance of 87.5%. The lowest recorded value was 0.306" which was within the manufacturer's tolerance (Ref Work Order 941017262).

Post-inspection:
Any exposed carbon steel was prepped and recoated, and included the areas of minor flaking and sections where coating was removed for UT. All work was performed IAW work order instructions and station procedures. Two coats of Bitumastic 50 were applied over exposed metal surfaces IAW work order instructions. (See Report SCI-94-0877).

Recent AFW Excavation Inspection
On 4/22/2010, a sample portion of the Unit 2 Aux Feed piping that was not part of the 1994 inspection was excavated in order to perform a visual inspection. Salem Buried Pipe Program Engineer performed a visual inspection of the No. 24 Aux Feed Train going to No. 24 Steam Generator. The subject pipe was unearthed in the Fuel Transfer Area just as it exits the building heading North towards the Outer Penetration. This 4" diameter pipe was completely exposed for an approximate 2 foot length at the wall penetration along with the first elbow which turns down into the sand. The Bitumasitic coating was fully intact on the pipe, and showed no signs of deterioration or any flaking. Visual inspection included a look at the appearance, and running a hand over the pipe surface looking for loose coating or lack of adhesion. There was no loose coating or lack of adhesion, the coating was in excellent condition. The elbow and an approximate 6 inch section of pipe on the inlet and outlet of the elbow all had a large glob of Bitumasitic tar on the top, with some of the coating flowing down the sides. The intrados of the elbow had a mixture of tar, sand, and what appeared to be surface rust, but no flaking or scaling. The elbow and the 6 inch inlet and outlet pipes were UT examined, and showed no evidence of any wall loss, with the lowest reading on the elbow and the inlet/outlet 6 inch pipes being 0.325" (96% of Nominal Wall 0.337"). Examination of the No. 22 Aux Feed Train in the Fuel Transfer Area was performed by the Aux Feedwater System Engineer. The results are the same as those performed on the No. 24 train for the visual examination (pipe coating fully intact with the elbow and its inlet / outlet pup pieces having some globbing of tar on it). The UT examination on the No. 22 Train elbow and inlet / outlet pup pieces also identified no evidence of any wall loss, with the lowest reading on this section being 0.333" (99% of Nominal Wall 0.337").

Pooling Water
Notification 20459941 identified that pooling water was found in the area between Unit 2 containment and fuel handling building. Sampling results by chemistry detected measurable traces of ammonia. The results of an evaluation stated that the source of the water was not from the Unit 2 Auxiliary Feedwater system. Note that data is retrievable from the Chemistry Dept by referring to the subject (AF buried piping, door to nowhere) and the date (4/22/2010).

AFW Temperature Difference
On 4/20/2010 temperatures were taken on AF piping at various points upstream of the AF23 check valves. The purpose of this evolution was to determine if any of the AF lines is experiencing back leakage (which could be an indication of thru-wall leak). The results of the

analysis shows that the temperatures measured is normal conduction of heat through the valve plug into fluid within the pipe. The pipe temperatures would be expected to stay elevated for longer lengths if there were a constant source of heated water moving through the pipe. Additionally, a review of operator log entries, SAP, and surveillance test results indicates that there has been no appreciable loss of inventory in the AFWST over the previous operating cycle. The absence of flow supports that the buried piping is leak tight.

Analysis

The piping is 4-inch NPS, Schedule 80, A106 Gr B seamless carbon steel. It is classified as Nuclear 3, Seismic Category I. Per the Pipe Specification S-C-MPOO-MGS-0001, SPS 54E, the design Pressure-Temperature limit is 1950 psi at 140 F. The nominal wall thickness is 0.337 inches.

To assess the available margin in the degraded Salem Unit 1 Piping, the maximum credible operating pressure was developed using all AFW system operating conditions (see SAP 70108698-0100). The resulting pressure is 1275 psi. The pipe wall t_{min} for this pressure is 0.185 inches. This operating pressure evaluation also applies to Salem Unit 2.

The Salem Unit #2 AFW piping was found to be above manufacturer's tolerance during 1994 inspection, and again during the 2010 inspection (most coating intact, some degraded/missing coating on #24AF elbow). Since the apparent cause of the Unit 1 AFW pipe corrosion was no coating or inappropriate coating, and the Unit 2 coating is as specified; the Unit 2 AFW piping is not subject to the same failure. However, to provide an understanding of margin an average corrosion rate of 6 mils/year is assumed. The proposal is to perform excavation and inspections during the upcoming Unit 2 refueling outage (S2R18) scheduled for April 2011. This is a span of 16.5 years from the last inspection in 1994. The projected wall loss assuming a corrosion rate of 6 mils/per year is 0.099 mils (16.5 x 0.006). The projected wall thickness would be 0.207, which meets the minimum thickness requirement of 0.185 inches to support maximum credible operating pressure of 1275 psi Note that this projection assumes a nominal corrosion rate, even though spot inspections performed in 1994 and again in April 2010 showed that coating was intact and in good condition. Corrosion rate for sound coated carbon steel piping is zero.

Coating Life Span

Need explicit statement of struct integrity — excellent good

Proper preparation of the carbon steel piping and application of the coating will ensure proper adherence to the piping. The recent inspections of the Unit 2 AFW piping performed on 4/22/2010 and in 1994 show good endurance of correctly specified and applied coating system.

In-service testing

The latest in-service testing for Unit 2 pumps and valves are provided below. Results of all testing was SAT.

Procedure	Component	Work Order	Date	Results
S2.OP-SO.AF-0005	21 & 22 Motor Driven Pumps	50114298	11/5/2009	SAT
S2.OP-SO.AF-0006	AF23 Stop Check Valves	50128109	01/24/2010	SAT
S2.OP-SO.AF-0007	23 Turbine Driven Pump	50113100	10/13/2009	SAT

(limited)

Conclusion
Considering the positive inspection findings for both coatings and UT readings of the Salem Unit 2 #22 and #24 AFW buried lines, coupled with fact it is apparent that the Salem Unit 1 #12 and 14 AFW lines were not coated or improperly coated, there is reasonable assurance that the buried #22 and #24 AFW lines are protected from corrosion at this time by the coating system applied and are structurally sound, and the coating is assumed to remain intact until next Unit 2 refueling outage. Per the table above, recent In-service testing results for the AFW components were all SAT.

Based on the above information, it is concluded that Unit 2 AFW buried piping can perform its intended function.

- Future Actions and/or Compensatory Actions

Implement planned inspection per the buried pipe program in the next refueling outage. This may include performing Guided Wave examinations of the #22 and # 24 AFW buried piping. The results from the Guided Wave inspections will be used to target areas of interest for follow-up direct visual and confirmatory UT inspections to determine pipe minimum as-found wall thicknesses. Any portion of the piping if found unacceptable will be replaced.

2. EVALUATION:

2.1 Describe the safety function(s) or safety support function(s) of the SSC. As a minimum the following should be addressed, as applicable, in describing the SSC safety or safety support function(s):

UFSAR Section 10.4.7.2: Auxiliary Feedwater

The AFW System serves as a backup system for supplying feedwater to secondary side of the steam generators at times when the Main Feedwater System is not available. The AFW System is relied upon to prevent core damage and system overpressurization in the event of accidents such as a loss of normal feedwater or a secondary system pipe rupture, and to provide a means for plant cooldown.

Each unit is equipped with one turbine-driven and two motor-driven auxiliary feed pumps. Each motor-driven pump discharges to two steam generators with a normally isolated (21 and 22AF923 valves) cross-connect line joining the motor-driven pump discharge headers. The turbine-driven pump feeds all four steam generators. Feedwater flow is controlled from the Control Room by remotely operated flow control valves in the supply lines to each steam generator. In order to prevent a runout condition of the motor driven pumps the steam generator flow control valves (AF21's) modulates to control the motor-driven auxiliary feedwater pump discharge pressure.

The minimum performance limits required for the auxiliary feedwater pumps to satisfy the design bases analyses, as verified during quarterly (minimum flow/recirculation)

and Full Flow Technical Specification Inservice Testing, are included below. Note that these values account for test instrumentation uncertainties.

S2.RA-ST.AF-0002 (*22AFP Min Flow Test)

Min Flow Test

21 motor-driven AFWP* ____________________ 160 gpm and 1369 psid

22 motor-driven AFWP ____________________ 160 gpm and 1389 psid

23 turbine-driven AFWP ____________ 400 gpm and 1506 psid at 3600 rpm

S2.RA-ST.AF-0005 (*22 AFP Full Flow Test)

Full Flow Test

21 motor-driven AFWP ____________________ 440 gpm and 1184 psid

22 motor-driven AFWP* ____________________ 450 gpm and 1114 psid

23 turbine-driven AFWP ____________ 880 gpm and 1269 psid at 3600 rpm

All auxiliary feed pumps normally take suction from the auxiliary feed storage tank. A safety grade, automatic low pressure trip is provided as backup protection for each pump in the event that tornado missile damage to the auxiliary feedwater storage tank results in loss of suction pressure. To protect against spurious activation, this trip will be made operable only during "tornado warnings" issued by the National Weather Service. The tank has sufficient capacity to allow residual heat removal for 8 hours. Backup water sources for the auxiliary feed pumps are the two demineralized water storage tanks (500,000 gallons capacity each), the two fire protection and domestic water storage tanks (350,000 gallons capacity each) and the station Service Water System, which must first have a spool piece installed. The quality of water from these sources is lower and is therefore intended for use only in the event of emergency situations.

- **Does the SSC receive/initiate an RPS or ESF actuation signal?**

YES. The Auxiliary Feedwater System (AFWS) is an Engineered Safeguards System (ESF). The motor driven auxiliary Feedwater pumps (MDAFPs) start automatically due to (1) trip of both main Feedwater pumps (LONF), (2) Safety Injection signal, and (3) a Low-Low signal from any one SG. The two MDAFPs are loaded onto the emergency diesel generators by the automatic load sequencer. The turbine driven auxiliary Feedwater pump (TDAFP) starts automatically on (1) a Low-Low level in two of the four SGs, (2) Loss of 125VDC control power, (3) Loss of Control Air, and (4) undervoltage on the reactor coolant pump group buses on 1 out of 2 logic. For anticipated transients without scram (ATWS) events, which are not design basis transients analyzed in Chapter 15 of the FSAR, Westinghouse plants such as Salem have an ATWS Mitigation System Actuation Circuitry (AMSAC) to initiate a turbine trip and

actuate auxiliary feedwater flow independent of the Reactor Protection System or the ESF Actuation System (ESFAS). When SG level drops below the AMSAC set point in 3 of 4 SGs, AMSAC initiates tripping the turbine, initiates AFWS, and isolates the SG blowdown and sample lines. AMSAC is non-safety related.

- **Is the SSC in the main flow path of an ECCS or support system?**

NO. The AFWS is not an Emergency Core Cooling System (ECCS) or an ECCS support system. The AFWS serves as a backup system supplying feedwater to the secondary side of the SGs when Main Feedwater system is unavailable. It is relied upon to prevent core damage and RCS overpressurization in certain design basis accidents such as Loss of Offsite Power (LOOP), LONF, Feedwater Line Break (FWLB), Main Steam Line Break (MSLB), Steam Generator Tube Rupture (SGTR), or Loss of Coolant Accident (LOCA) by providing a means for plant cooldown from normal operating conditions to initiation of low pressure residual heat removal systems. It functions during startup, shutdown, and hot standby (HSB).

AFWS factored in most initiating event but modeled?

- **Is the SSC used to:**
  - **Maintain reactor coolant pressure boundary integrity?**

YES. The Auxiliary Feedwater system supplies water to the SGs for reactor decay heat removal when the normal Feedwater sources are unavailable due to loss of offsite power (LOOP) or other malfunction. By maintaining water levels in the SGs and thus ensuring an adequate heat sink, the AFWS functions to remove decay heat, reactor coolant pump heat, and sensible heat during plant cooldown. In addition, the AFW system functions to prevent overpressurization of the RCS, thereby protecting the reactor coolant pressure boundary (RCPB) integrity.

  - **Shutdown the reactor?**

NO. The AFWS does not provide a reactivity control safety function for shutting down of the reactor; although it does help to cooldown the reactor. The AFWS does not affect the rod control system or the alternative boron chemical shim system that control reactivity in the core. By providing the SG secondary side heat sink medium capable of receiving heat transfer from the reactor coolant system, the AFWS has an indirect positive reactivity effect by cooling and thus increasing the density of the reactor coolant neutron moderator.

  - **Maintain the reactor in a safe shutdown condition?**

YES. The licensing basis for safe shutdown at Salem is hot standby (HSB). The AFWS must perform its safe shutdown function to maintain the plant in HSB. The AFWS can be manually controlled to maintain HSB conditions until cooldown can be established. The AFWS is provided with sufficient water from the Auxiliary Feedwater Storage Tank (AFST) to allow the SGs to provide decay heat removal for 8 hours. In addition, backup water sources are provided from the Demineralized Water Storage Tanks (DWSTs), the Fire Protection Water Storage Tanks (FPWSTs), and a normally disconnected connection to the Service Water system for use in an emergency in the event of a seismic event that incapacitates AFST, DWSTs, and FPWSTs. During normal cooldown, each of the MDAFPs has the capacity to remove heat from the SGs at a

sufficient rate to prevent RCS overpressurization and to maintain SG levels to prevent thermal cycling.

- **Prevent or mitigate the consequences of an accident that could result in offsite exposures comparable to 10 CFR 50.34(a)(1), 10 CFR 50.67(b)(2), or 10 CFR 100.11 guidelines, as applicable.**

YES. The AFWS performs a safety function in mitigating design basis accidents, including LOOP, LONF, FWLB, MSLB, SGTR, and small break LOCA (SBLOCA) by supplying adequate feedwater to the secondary side of the Steam Generators to prevent overheating the reactor coolant system and to provide a means for achieving plant cooldown to initiation of the residual heat removal system. Depending on the design basis accident, the AFWS either maintains or limits feedwater to the SGs. For the SBLOCA, LONF, and LOOP/LONF, the AFWS must maintain adequate feedwater. For the FWLB, the AFWS must preserve inventory while maintaining level. For the MSLB and SGTR events, the AFWS must limit feedwater flow as too much water delivery will result in overcooling the reactor coolant system or overpressurization of the containment.

- **Does the SSC provide required support (i.e., cooling, lubrication, etc.) to a TS required SSC?**

YES. During normal plant cooldown, the AFWS removes sufficient heat from the SGs to prevent overpressurization of the RCS and to maintain SG levels sufficient to prevent thermal cycling.

- **Is the SSC used to provide isolation between safety trains, or between safety and non-safety ties?**

NO. The AFWS does not perform an isolation function per se; however, whenever either the MDAFPs or the TDAFP automatically starts, a signal is sent to the isolation valves of the Steam Generator Blowdown and Sampling Systems to close. The isolation signal to the Sample System isolation valves can be bypassed using a keylocked switch located in the Control Room.

- **Is the SSC required to be operated manually to mitigate a design basis event?**

NO. The AFW pumps can be operated manually at their local control panel or from the main Control Room. Automatic initiation signals are designed to prevent system malfunction given a single failure. AFW flow is controlled from the Control Room using remotely-operated flow control valves (AF21's) in the supply lines to each SG. Safety-related flow indication to each SG is provided in the Control Room. The flow control valves have reduced capacity trim to limit the maximum flow under certain plant conditions.

- **Have all specified safety functions described in TS been included?**

YES. Salem T/Ss require that at least three independent AFW pumps, their associated manual activation switches in the Control Room, and their flow paths are operable in Modes 1 though 3. The two MDAFPs must be capable of being powered from separate

vital busses and the TDAFP must be capable of being powered from an operable steam supply system. Operability of the AFWS ensures that the Reactor Coolant System can be cooled down to less than 350 F from normal operating conditions in the event of a total loss of offsite power (LOOP).

- **Have all safety functions of the SSC required during normal operation and potential accident conditions been included?**

YES. The AFWS safety functions include LONF, FWLB, MSLB, LOOP, and LOCA during accident conditions and plant cooldown during normal plant conditions. The AFWS supplies water to the SGs for reactor decay heat removal if the normal Feedwater sources are unavailable due to loss of offsite power or other malfunctions.

- **Is the SSC used to assess conditions for Emergency Action Levels (EALs)?**

NO. The AFWS is not used to assess conditions for EALs.

2.2 Describe the following, as applicable: (a) the effect of the degraded or nonconforming condition on the SSC safety function(s); (b) any requirements or commitments established for the SSC and any challenges to these; (c) the circumstances of the degraded/nonconforming condition, including the possible failure mechanism(s); (d) whether the potential failure is time dependent and whether the condition will continue to degrade and/or will the potential consequences increase; and (e) the aggregate effect of the degraded or nonconforming condition in light of other open OpEvals:

Table: List of Existing OpEvals

NUMBER	NOTF/ORDER	ENTRY DATE	DESCRIPTION	OWNER	STATUS	EXPECTED CLOSURE
07-033	80094618	9/07/07	S1/2 ECCS room cooler thermostats (DCP 80094618 and 80095613)	Bhardwaj	80094618-issued, need orders planned 80095613- issued, need orders planned	08/11
08-040	70087831	8/08/08	230V Motor Operated Valve – degraded voltage	Ciarlante	S1/S2 On-Line DCP 80099509 to be planned, scheduled, installed	12/23/10
09-09	60084229	4/07/09	CAA14/CAA17/CAA20	Hassler	Perform Inspections	5/31/10
09-019	60085180	8/10/09	SRW watertight door	Hassler	Replace door seal WW 0022	5/21/10
09-021	70103767	11/5/09	Can Liner	Curran	Repair in S2R18	S2R18

09-023	70104221	11/9/09	PZR Heater busses E & G 3 overheating	R. Smith	Procure new panel door design/ Implement new design	6/1/10
10-001	70106347	1/28/10	21 SI pump oil leak	Hummel	Develop repair plan Repair Oil Leak	9/27/10
10-002	60089385	03/19/10	#4 SW Bay Ventilation Temp Controller	Hayman	Perform repairs	4/27/10
10-003	20455408	3/25/10	22SW34 Valve failed ASME code reverse flow check	Hassler	Perform repairs	5/30/10
10-004	20457356	4/07/10	#3 SW Bay Vent temp controller for 1SWV3	Hayman	Perform repairs	9/30/10

A) THE EFFECT OF THE DEGRADED OR NONCONFORMING CONDITION ON THE SSC SAFETY FUNCTION(S)

There is no nonconforming condition. This Op Eval assesses the potential extent of condition related in response to the Salem Unit 1 AFW pipe corrosion and demonstrates sufficient margin to depend on existing buried piping program to manage its performance.

B) ANY REQUIREMENTS OR COMMITMENTS ESTABLISHED FOR THE SSC AND ANY CHALLENGES TO THESE

The requirement associated with minimum wall thickness (Tmin) for buried AFW pipe is governed by the ANSI B31.1, 1967 Edition, Power Piping code.

C) THE CIRCUMSTANCES OF THE DEGRADED/NONCONFORMING CONDITION, INCLUDING THE POSSIBLE FAILURE MECHANISM(S)

The Unit 2 AFW piping is coated. The degradation found on the Unit 1 piping is not applicable to the Unit 2 piping. Based on the existing data, it is concluded that the Unit 2 AFW piping will be able to perform its intended design function if degraded. A complete loss of wall thickness would result in rupture in the pipe. Any rupture will result in loss of cooling of the steam generators.

D) WHETHER THE POTENTIAL FAILURE IS TIME DEPENDENT AND WHETHER THE CONDITION WILL CONTINUE TO DEGRADE AND/OR WILL THE POTENTIAL CONSEQUENCES INCREASE; AND

The potential failure of the pipe is time dependent based on corrosion. Planned buried piping inspections in S2R18 will assure that condition is assessed and necessary action implemented.

E) THE AGGREGATE EFFECT OF THE DEGRADED OR NONCONFORMING CONDITION IN LIGHT OF OTHER OPEN OPEVALS (SEE TABLE OF OPEN OPEVALS ABOVE)

The aggregate impact of the non-conformance being evaluated was assessed against outstanding OpEVals listed in the Table above. Each of the ODs was reviewed in depth for the description of condition and the basis of the operability determination to determine if the non-conformance described in this OpEval will make any SSC covered in the other outstanding ODs inoperable or degraded. In

conclusion, the OpEval discussed herein has no aggregate impact on any SSC safety function or other OD currently open.

		YES	NO
2.3	Is SSC operability supported? Explain basis (e.g., analysis, test, operating experience, engineering judgment, etc.):	[X]	[ ]

This evaluation assesses extent of condition of the degraded AFW pipe at Salem Unit 1. Since the Unit 1 pipe was not correctly coated and the Unit 2 AFW pipe was coated the condition is not applicable.

A significant margin to operability exists. Even with the high level of degradation on Salem Unit 1 piping, the pipe could meet its design function.

If 2.3 = NO, notify Operations Shift Management **immediately**.
If 2.3 = YES, clearly document the basis for the determination.

		YES	NO
2.4	Are compensatory measures and/or corrective actions required?	[X]	[ ]

If 2.4 = YES, complete section 3.0 (if NO, N/A section 3.0).

Reference Documents:

2.4.1. Technical Specifications Section(s):

T/S 3/4.7 Plant Systems, LCO 3.7.1.2, Auxiliary Feedwater System

2.4.2. UFSAR Section(s):
3.7.3.9
3.9.4: Inservice Testing Pumps and Valves
10.4.7.2, Auxiliary Feedwater System
15.2.8, Loss of Normal Feedwater
15.2.9, Loss of Offsite Power to Station Auxiliaries (LOP)
15.3.1, Loss of Reactor Coolant from Small Ruptured Pipes (SBLOCA)
15.4.1, Major Reactor Coolant System Pipe Ruptures (LBLOCA)
15.4.2, Major Secondary System Pipe Rupture (MSLB)
15.4.3, Major Rupture of Main Feedwater Line (FWLB)
15.4.4, Steam Generator Tube Rupture (SGTR)

2.4.3. Other:
Technical Evaluation 70108698, Rev. 0
Technical Evaluation 20459941 Potential Water Sources Inner Mechanical Penetration
ANSI B31.1, 1967 Ed., Power Piping
DWG 205336 Sheet 1 Rev. 49

DWG 218233 Sheet 1 Rev. 11
S-C-MPOO-MGS-0001, SPS54, Rev. 6, Piping Schedule, Auxiliary Feedwater
S-C-AF-MDC-0445, Rev. 3, Auxiliary Feedwater System Hydraulic Analysis
S-C-F400-MDC-0096, Rev. 4 Auxiliary Feedwater Storage Tank (AFWST) Capacity
S-C-A900-MDC-005, Rev. 0, Pipe Wall Thickness Calculations (Info Only)
S2.OP-ST.AF-0002 Rev 18
S2.RA-ST.AF-0001 Rev. 6 (21 Aux Feed Pump)
S2.RA-ST.AF-0002 Rev. 9 (22 Aux Feed Pump)
S2.RA-ST.AF-0005 Rev. 9
SC.DE-BD.AF-0001(Q), Rev. 0, Auxiliary Feedwater System (Info Only)
Structural Integrity Associates Calculation, "ASME Code, Section III, Design by Analysis Evaluation of a 4-inch Auxiliary Feedwater Piping" (draft provided under S-TODI-2010-0005
SCI-94-877 LTR dated 12/16/1994 - Excavated Auxiliary feedwater Piping Walkdown/Disposition of Coating Requirements
NOTF 20459689
Work Order 941017262
Duane Arnold Energy Center Relief Requests NDE-R004 and NDE-R007 (Info Only)

3. ACTION ITEM LIST:

If, through evaluating SSC operability, it is determined that the degraded or nonconforming SSC does **not** prevent accomplishment of the specified safety function(s) in the TS and the intention is to continue operating the plant in that condition, then record below, as appropriate, any required compensatory measures to support operability and/or corrective actions required to restore full qualification. For corrective actions, document when the actions should be completed (e.g., immediate, within next 13 week period, next outage, etc.) and the basis for timeliness of the action. Corrective action timeframes longer than the next refueling outage are to be explicitly justified as part of the OpEval or deficiency tracking documentation being used to perform the corrective action.

Compensatory Measure #1: **None**

Responsible Dept./Supv.:

Action Due:

Action Tracking #:

Compensatory Measure #2: **None**

Responsible Dept./Supv.:

Action Due:

Action Tracking #:

Corrective Action #1: **Implement planned buried piping inspections in S2R18.**

Responsible Dept./Supv.: **Engineering Programs / Colville**

Action Due: **S2R18 Refueling Outage (April 2011)**

Action Tracking #: **Work Order 60084161**

Corrective Action #2:

Responsible Dept./Supv.:

Action Due:

Basis for timeliness of action:

Action Tracking #:

4. **SIGNATURES:**

4.1	Preparer(s)	Mark Puher	Date	04/22/2010
		Robert Down	Date	04/22/2010
4.2	Reviewer	Kiran Mathur (10 CFR 50.59 screener qualified or active SRO license holder)	Date	04/22/2010
4.3	Sr. Manager Design Engr/Designee Concurrence		Date	
4.4	Operations Shift Management Approval		Date	

4.5 If the OpEval is to declare a Shutdown Safety System or component Operable but Degraded, then the following signatures are required: **(CAPR 70103591)**

Operations Director ______________________________ Date __________

Engineering Director ______________________________ Date __________

* Shutdown Safety Manager ______________________________ Date __________

* When in Modes 4, 5, 6, Defueled (SA) or Modes 3, 4, 5 (HC).

4.6 Ensure the completed form is forwarded to the OEPM for processing and Action Tracking entry as appropriate.

5. **<u>OPERABILITY EVALUATION CLOSURE:</u>**

5.1 Corrective actions are complete, as necessary, and the OpEval is ready for closure

______________________________ Date __________
(OEPM)

5.2 Operations Shift Management
Approval ______________________________ Date __________

5.3 Ensure the completed form is forwarded to the OEPM for processing, Action Tracking entry, and cancellation of any open compensatory measures, as appropriate.