

**PSEG NUCLEAR L.L.C.  
SALEM/OPERATIONS**

**1-EOP-LOSC-1 - Rev. 22**

**LOSS OF SECONDARY COOLANT**

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- ◆ Biennial Review Performed: Yes        No ✓  
◆ Change Package(s) and Affected Document Number(s) incorporated into this revision:  
DCP No. 80057520 Rev. No. 00 AD No. P009 Rev. No. 0
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**REVISION SUMMARY**

The following changes are included in this revision:

- Revised EOP Step 8.3 to indicate "1R46 A THRU D" versus "1R46 A THRU E".  
This change was incorporated as the existing 1R46 Main Steam Line Monitoring System was replaced with an Adjacent-to-Line Ion-Chamber for each individual steam pipe IAW  
DCP 80057520, Upgrade of Salem Unit 1 R46 Main Steam Line Radiation Monitors  
[80057520-0410]

**IMPLEMENTATION REQUIREMENTS**

Effective Date: 12-14-06

DCP 80057520, Upgrade of Salem Unit 1 R46 Main Steam Line Radiation Monitors

**APPROVED:**



Operations Director - Salem

10-21-06

Date

**EMERGENCY OPERATING PROCEDURE  
1-EOP-LOSC-1  
LOSS OF SECONDARY COOLANT**

**1.0    Entry Conditions**

See Flowchart

**2.0    Operator Actions**

**2.1    Immediate Actions**

None

**2.2    Subsequent Actions**

See Flowchart

**3.0    Attachment List**

**3.1    Continuous Action Summary**

**3.2    Tables**

None

**3.3    Figures**

None

**3.4    Graphs**

None

**3.5    Checkoff Sheets**

None

**3.6    Attachments**

1 - Major Action Categories

LOSS OF SECONDARY COOLANT  
1-EOP-LOSC-1

CONTINUOUS ACTION SUMMARY

CONDITION

ACTION

RCS PRESSURE LESS THAN 1500 PSIG  
AND  
BIT FLOW ESTABLISHED

CLOSE CHG PUMP MINIFLOW

RCS PRESSURE GREATER THAN 2000 PSIG

OPEN CHG PUMP MINIFLOW

"AFWST LEVEL LO-LO" ALARM (10.3%)

SHIFT AFW PUMP SUCTION

## **MAJOR ACTION CATEGORIES**

- **CHECK MAIN STEAMLINE ISOLATION**
- **CHECK FOR AT LEAST ONE NONFAULTED SG**
- **IDENTIFY AND ISOLATE FAULTED SG(s)**
- **CHECK FOR SG TUBE RUPTURE**

# **SALEM GENERATING STATION**

## **1-EOP-LOSC-1 LOSS OF SECONDARY COOLANT BASIS DOCUMENT**

**EOP Step No:** ENTRY CONDITIONS

**ERG Step No:** ENTRY CONDITIONS

**EOP Step:**

EOP-SGTR-1 STEP 8.3  
EOP-SGTR-3 STEP 12.3  
EOP-SGTR-4 STEP 6.3  
EOP-LOCA-1 STEP 2.2  
EOP-TRIP-1 STEP 26, 26.1  
EOP-FRHS-5 STEP 6, 6.1

**Purpose:**

To provide the plant conditions for entry into this procedure.

**ERG Basis:**

N/A

**EOP Basis:**

This EOP is entered from:

- EOP-LOCA-1, EOP-SGTR-1, EOP-SGTR-3, and EOP-SGTR-4 when:  
Any SG pressure decreasing in an uncontrolled manner or any SG completely depressurized.  
AND  
Faulted SG isolation not verified.
- EOP-TRIP-1 and EOP-FRHS-5 when:  
Any SG pressure decreasing in an uncontrolled manner.  
OR  
Any SG completely depressurized.

This EOP provides actions to identify and isolate a faulted SG.

**EOP Step No:** ENTRY CONDITIONS (CONTINUED)

**Supplemental Information:**

None

**Setpoints and Numerical Values:**

None

**ERG Deviations:**

No deviation from the ERG.

**EOP Step No:** CAS

**ERG Step No:** N/A

**EOP Step:**

N/A

**Purpose:**

To remind the operator to monitor certain parameters or conditions and respond as directed if any of these parameters or conditions are exceeded.

**ERG Basis:**

N/A

**EOP Basis:**

The flowcharts use a Continuous Action Summary (CAS) table. The CAS contains the important items that should be monitored continuously during the performance of the EOP. The CAS is located in the upper left corner on each flowchart sheet and is the same for all flowchart sheets in a given procedure.

**Supplemental Information:**

None

**Setpoints and Numerical Values:**

<u>Value</u>	<u>Number</u>	<u>Description</u>
1500 psig	B.10	RCS pressure for closing charging pump miniflow valves when charging pumps are injecting through the BIT.
2000 psig	B.11	RCS pressure for opening charging pump miniflow valves.
10.3%	U.01	AFST low-low level switchover setpoint.

**ERG Deviations:**

DEV.1 Added a Continuous Action Summary (CAS) to the EOP.

JUST. The CAS contains the important items that should be continuously monitored during the performance of the EOP. The CAS was added to enhance the EOP and to provide the operator with the parameters that need to be continuously monitored. [SD-55]



**EOP Step No:** Step 1

**ERG Step No:** Caution 1-1

**EOP Step:**

**CAUTION AT LEAST ONE SG MUST BE MAINTAINED AVAILABLE FOR RCS COOLDOWN  
[MAIN STEAM ISOLATION]**

**Purpose:**

To alert the operator that at least one SG must be available as a heat sink for decay heat removal and RCS cooldown.

**ERG Basis:**

During the attempt to determine the faulted loop(s), the operator must maintain at least one loop available for cooldown capability. Otherwise, RCS pressure and temperature will increase if all SGs are isolated.

**EOP Basis:**

Same as ERG basis.

**Supplemental Information:**

ERG Knowledge Item: System transient characteristics and symptoms for different size breaks.

**Setpoints and Numerical Values:**

None

**ERG Deviations:**

No deviation from the ERG.

**EOP Step No:** Step 2

**ERG Step No:** Caution 1-2

**STEP:**

**CAUTION ANY FAULTED SG SHOULD REMAIN ISOLATED  
UNLESS NEEDED FOR RCS COOLDOWN  
[MAIN STEAM ISOLATION]**

**Purpose:**

To alert the operator that an isolated SG should not be used for cooldown unless it is the only one available.

**ERG Basis:**

During isolation of a faulted SG or secondary break, normal cooldown paths are likely to be isolated. Cooldown procedures may direct the operator to open one of the isolated cooldown paths resulting in a reinitiation of the event. However, in cases where an isolated SG is the only SG available, this SG can be unisolated and used for RCS cooldown.

**Plant Specific Basis:**

Same as ERG basis.

**Supplemental Information:**

None

**Setpoints and Numerical Values:**

None

**ERG Deviations:**

No deviation from the ERG.

**EOP Step No:** Step 3

**ERG Step No:** Step 1

**EOP Step:**

INITIATE LOOP 11 THRU 14 MAIN STEAM ISOLATION  
[MAIN STEAM ISOLATION]

**Purpose:**

To ensure that the steamline isolation and bypass valves have closed.

**ERG Basis:**

Since the procedure is entered after symptoms of a faulted SG have been identified, the main steamline isolation signal should have been previously actuated and the MSIVs and bypass valves should have previously received a "CLOSE" signal. On the ERG reference plant, the MSIVs and bypass valves in all main steamlines receive the same isolation signal and, therefore, all SG main steamlines should be isolated. Consequently, all MSIVs and bypass valves are checked to be closed in this step in an attempt to isolate the break and to isolate the SGs from each other. If any valves have not received a "CLOSE" signal or if the valves failed to close, the operator is instructed to manually close the valves.

**EOP Basis:**

Same as ERG basis, with the following additional information:

While the plant has individual manual steamline isolation capability, the automatic steamline isolation signal closes all four MSIVs. Therefore, this EOP step is written assuming that an automatic main steamline isolation has occurred and, therefore, all four SG MSIVs should be closed.

**Supplemental Information:**

None

**Setpoints and Numerical Values:**

None

**ERG Deviations:**

DEV.1 Added a plant specific list of valves for main steam isolation.

JUST. This guidance aids operators in performing these actions in a consistent manner. [SD-12]

**EOP Step No:** Step 4

**ERG Step No:** Steps 2 and 3

**EOP Step:**

IS ANY SG PRESSURE DROPPING IN AN UNCONTROLLED MANNER  
[FAULTED SG IDENTIFICATION]

**Purpose:**

To ensure there is at least one nonfaulted SG.

To identify any faulted SG.

**ERG Basis:**

(ERG Step 2) Any cooldown operations that are performed as subsequent recovery actions will require at least one nonfaulted SG. If all SG pressures are decreasing in an uncontrolled manner, this indicates a failure affecting all SGs. Recovery actions, in this case, should be performed using EOP-LOSC-2, MULTIPLE STEAM GENERATOR DEPRESSURIZATION, since feedwater flow will be necessary to a faulted SG and normal level control should not be used.

(ERG Step 3) An uncontrolled SG pressure decrease (following MSIV closure and FW isolation) or a completely depressurized SG indicates an unisolable failure of the secondary pressure boundary. The operator is directed to search for the initiating break in main steamlines, feedlines, or other secondary piping such as blowdown lines, sample lines, etc. The operator should also check for stuck open atmospheric steam dump valves and/or safety valves.

**EOP Basis:**

Same as ERG basis, with the following information:

The search for the initiating break might be necessary if the break was automatically or manually isolated before reaching this step. Even though isolated, knowing its location will prevent inadvertently unisolating it later in the accident recovery.

**Supplemental Information:**

ERG Knowledge Item: "Uncontrolled" means not under the control of the operator and incapable of being controlled by the operator using available equipment.

**EOP Step No:** Step 4 (CONTINUED)

**Setpoints and Numerical Values:**

None

**ERG Deviations:**

No deviation from the ERG.

**EOP Step No:** Step 5

**ERG Step No:** Step 4 and Caution 4-1

**EOP Step:**

FOR ANY FAULTED SG, CLOSE THE FOLLOWING VALVES:

- BF19 (FEEDWATER CONTROL)
  - BF40 (BYPASS)
  - BF13 (FW INLET STOP)
  
  - AF21 (SG INLET)
  - AF11 (SG INLET)
  
  - MS10 (RELIEF)
  - MS7 (DRAIN)
  - MS18 (WARMUP)
  - MS167 (STOP)
  
  - GB4 (SG OUTLET)
- [FAULTED SG ISOLATION]

**Purpose:**

To isolate all feedwater to and steam flow from the faulted SG(s).

To warn the operator that the steamline to the turbine-driven AFW pump must not be isolated if it is the only source of feed flow to the steam generators.

**ERG Basis:**

(ERG step 4) Isolation of the feedwater to the faulted SG maximizes the cooldown capability of the nonfaulted loops following a feedline break and minimizes the RCS cooldown and mass and energy release following a steamline break. Isolation of steam paths from the faulted SG also minimizes the RCS cooldown and mass and energy release to containment. In addition, isolation of these steam paths could isolate the break.

(ERG Caution 4-1) If the turbine-driven AFW pump is the only operable source of feed flow to the steam generators (i.e., no other MD AFW pumps or other operable pumps are capable of providing feed flow to the SGs), then isolation of its steam supply line may degrade system conditions and result in a transition to FRHS-1. Therefore, this isolation must not be performed.

**EOP Step No:** Step 5 (CONTINUED)

**EOP Basis:**

Same as ERG basis, with the following additional information:

After the 13 AFW Pump is tripped, the pump should be stopped (by depressing the "13 STOP" bezel) to close 1MS132. This prevents the turbine from restarting when 1MS52 is reset locally.

**Supplemental Information:**

ERG Knowledge Item: Recovery actions affected by isolation of the faulted SG or secondary break.

**Setpoints and Numerical Values:**

None

**ERG Deviations:**

- DEV.1 Did not provide a contingent action for dispatching an operator for performing local closure of valves that cannot be closed.
- JUST. It is common operating practice to circle valves which cannot be positioned from the control room. Operators would then be dispatched to locally close the circled valves. This meets the intent of the EOP step.
- DEV.2 Added step to trip 13 AFW Pump if not needed and if 11 or 13 SG is faulted.
- JUST. This step isolates all steam flow paths from the faulted SG including the steam supply to the 13 AFW Pump. With the 13 AFW Pump steam supply isolated, the pump should be stopped to prevent pump damage.
- DEV.3 Deleted ERG Caution 4-1 regarding not stopping 13 AFW pump if is the only available source of feed.
- JUST. Since the EOP Writer's Guide does not allow hidden actions in cautions and notes, the ERG Caution was converted into a series of action steps.

**EOP Step No:** N/A

**ERG Step No:** Step 5

**EOP Step:**

N/A

**Purpose:**

To determine if an alternate water supply is necessary for the AFW pumps.

**ERG Basis:**

When AFST level decreases below 10.3%, inadequate suction pressure may result in AFW pump trip. An alternate suction source should be provided. During secondary break events, depletion of the AFST is of greater concern than during other types of breaks.

**EOP Basis:**

N/A

**Supplemental Information:**

None

**Setpoints and Numerical Values:**

None

**Setpoints and Numerical Values:**

None

**ERG Deviations:**

DEV.1 Deleted ERG caution on alternate feedwater supply.

JUST. Since the EOP Writer's Guide does not allow hidden actions in cautions and notes, the ERG caution was converted into a CAS action. [SD-20]



**EOP Step No:** Steps 6, 7 and 8

**ERG Step No:** Steps 6 and 7

**EOP Step:**

(Step 6) RESET PHASE A ISOLATION  
RESET "SG B/D SAMPLE ISOLATION BYPASS"

(Step 7) DUMP STEAM AS NECESSARY TO STABILIZE RCS TEMPERATURE

(Step 8) IS ANY SG NR OR WR LEVEL RISING IN AN UNCONTROLLED MANNER  
[STEAM GENERATOR TUBE RUPTURE EVALUATION]

**Purpose:**

To determine if a SGTR exists coincident with a secondary pressure boundary failure.

To direct the operator to the appropriate procedure for further recovery actions.

**ERG Basis:**

(ERG Step 6) Abnormal radiation in a SG indicates primary to secondary leakage. Therefore, periodic activity samples in all SGs should be taken and unisolated secondary radiation monitors should be checked to determine if secondary radiation is in the normal range. Optimal recovery in dealing with a SGTR is provided in EOP-SGTR-1, STEAM GENERATOR TUBE RUPTURE.

(ERG Step 7) EOP-LOCA-1, LOSS OF REACTOR COOLANT, contains the appropriate subsequent recovery actions if a ruptured SG has not been identified.

**EOP Basis:**

Same as ERG basis, with the following additional information:

The SG B/D sample isolation valves (SS94) automatically close on either a Phase A Isolation signal OR on any automatic AFW pump start signal. The 13 AFW Pump automatic start signals that close the SS94 valves are loss of 125VDC control power, low-low SG water level, 4KV group bus UV, and AMSAC actuation. The 11 and 12 AFW Pump automatic start signals that close the SS94 valves are low-low water level, SGFP trip, AMSAC, and SEC load sequencing. Refer to Logic Diagrams 231446 thru 231448 for the details on these pump start and SS94 isolation signals.

Normally, the SS94 valves can NOT be re-opened to sample SGs until the Phase A Isolation signal is reset AND the automatic AFW pump start signals are removed.

**EOP Step No:** Steps 6, 7 and 8 (CONTINUED)

**EOP Basis:** (CONTINUED)

To allow prompt SG sample capability without having to wait for SG water levels to rise above the low-low setpoint, a SG B/D SAMPLE ISOLATION BYPASS keyswitch was installed on control console CC2 by DCP IEC-3544. This switch has positions of OFF and ON. In the OFF position, the SS94 valves respond normally to Phase A Isolation and AFW pump automatic start signals. In the ON position, the auto close signal to the SS94 valves due to an AFW pump automatic start signal is bypassed, allowing the operator to open the valves using their normal open pushbuttons. A SG B/D SAMPLE ISOLATION BYPASS status light illuminates above the keyswitch to indicate that this bypass is in effect. Note that the Phase A Isolation signal is NOT bypassed by this keyswitch. Thus, Phase A Isolation must still be reset to allow opening these valves using the normal open pushbutton.

**Supplemental Information:**

ERG Knowledge Item: If time is required to obtain samples or analyze them, the operator should continue with the next step and transfer to EOP-LOCA-1, LOSS OF REACTOR COOLANT. When results are available, a transition from EOP Step 4 of EOP-LOCA-1 or from the EOP-LOCA-1 CAS to EOP-SGTR-1, STEAM GENERATOR TUBE RUPTURE, can be accomplished, if necessary.

ERG Knowledge Item: (DW-93-024) Since it may be difficult to sample a depressurized SG for activity, the operator should suspect a rupture if the SG does not dry out following isolation of feed to it. A faulted, ruptured SG will stay at some low pressure and continue to cool that loop and the RCS. In addition, the operator should suspect a rupture if following SG dryout, RCS inventory or pressure cannot be maintained and there is no indication of an RCS leak to containment. If the operator suspects that a faulted SG is not drying out and cannot confirm that it is ruptured by sampling because a sample cannot be drawn, he may either request a check for radiation in the area of the break (if it is outside the containment) to confirm that a rupture exists or he may conclude that the faulted generator is ruptured if it is not practical to check for radiation based on response of the faulted SG or the response of the RCS.

**Setpoints and Numerical Values:**

None

**EOP Step No:** Steps 6, 7 and 8 (CONTINUED)

**ERG Deviations:**

DEV.1 Added step to check SG level rising in an uncontrolled manner as an indication of a SGTR.

JUST. The check of SG level was added to make this step consistent with other steps throughout the EOPs on the proper symptoms of a SGTR.

DEV.2 Add a step to dump steam as necessary to stabilize RCS temperatures.

JUST. Added per validation comment VA-047. This would normally be done in EOP-TRIP-3 upon SI termination, but Westinghouse states that it is acceptable to include this step here as an earlier invocation.

**APPENDIX A**

**EOP/ERG CORRELATION**

