STEAM GENERATOR TUBE LEAK	41AO-1ZZ08	Revision 04.01

OBJECTIVE

This procedure gives guidance on how to mitigate a S/G Tube leak that is less than 80 gpm. The objective is to cooldown to Mode 5 if the leak is between .5 gpm and 80 gpm, or to provide adequate guidance to the operators if the leak is less than .5 gpm and to minimize any radioactive release to the environment. Instructions are also provided for draining the Condenser Hotwell to the Low TDS Sump.

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APPENDICES

1.0 Entry Conditions

____ 1.1 Check that any of the following entry conditions for a steam generator tube leak exists:

____ Condenser vacuum off-gas radiation monitor, RU-141 is increasing above a previously stable background level.

____ Activity is detected above expected levels in a secondary side sample.

____ A main steam line radiation monitor, RU-139 or RU-140, is increasing above a previously stable background level.

____ A blowdown radiation monitor, RU-4 or RU-5, is increasing above a previously stable background level.

____ There are indications of an increase in primary to secondary leakrate.

____ 1.2 IF any of the entry conditions for a steam generator tube leak exists,
THEN continue in this procedure.

____ IF NOT, THEN GO TO the applicable operating procedure for existing plant conditions.

2.0 Event Control

____ 2.1 IF all available charging pumps are operating,
AND pressurizer level continues to decrease,
THEN isolate letdown.

____ Close CHN-UV-515 on B03 to isolate letdown.

____ 2.2 IF, at any time during this procedure, any of the following conditions exist:

____ PZR level falls below 33% with all available charging pumps running, and letdown isolated.

____ Leak rate is above 80 gpm.

THEN perform the following:

____ 1. Trip the reactor.

____ 2. GO TO **Emergency Operations,** 41EP-1EO01, beginning at the entry to the Safety Function Flowcharts.

____ 2.3 Direct Chemistry to perform actions in accordance with **Abnormal Occurence Checklist,** 74DP-9ZZ05, for a steam generator tube leak.

____ 2.4 Ensure that the event is being classified in accordance with the Emergency Plan.

____ Direct an SRO or EC qualified person to CONCURRENTLY PERFORM **Emergency Classification**, EPIP-02, beginning with Step 4.0.

NOTE

The CRS may elect to perform one or both of the following leak rate determination methods. Moderate to Large Leak Rate Calculation, **Appendix A** takes approximately 20 minutes to complete but is not extremely precise. **RCS Water Inventory Balance,** 41ST-1RC02 is more precise, but takes over two hours to complete.

____ 2.5 Measure the leak rate using one or both of the following methods:

____ CONCURRENTLY PERFORM Moderate to Large Leak Rate Calculation, **Appendix A** to this procedure.

____ CONCURRENTLY PERFORM **RCS Water Inventory Balance,** 41ST-1RC02.

____ 2.6 Select the THRU FILTER MODE position with the Air Removal Post Filter Mode Select Switch, ARN-HS-19, on panel B07.

____ 2.7 Ensure that the SBCS valves that release to the condenser are in auto:

____ Ensure VALVE 1 MODE SELECT, SGN-HS-1001 is in auto.

____ Ensure VALVE 2 MODE SELECT, SGN-HS-1002 is in auto.

____ Ensure VALVE 3 MODE SELECT, SGN-HS-1003 is in auto.

____ Ensure VALVE 4 MODE SELECT, SGN-HS-1004 is in auto.

____ Ensure VALVE 5 MODE SELECT, SGN-HS-1005 is in auto.

____ Ensure VALVE 6 MODE SELECT, SGN-HS-1006 is in auto.

____ 2.8 Ensure that the SBCS valves that release to the atmosphere are closed:

____ Select OFF on VALVE 7 MODE SELECT, SGN-HS-1007.

____ Select OFF on VALVE 8 MODE SELECT, SGN-HS-1008.

____ 2.9 Ensure that the ADVs are closed:

____ Select CLOSE on SG 1 LINE 1 ISOL VLV, HV-184, SGA-HY-184A.

____ Select CLOSE on SG 1 LINE 1 ISOL VLV, HV-184, SGC-HY-184B.

____ Select CLOSE on SG 1 LINE 2 ISOL VLV, HV-178, SGB-HY-178A.

____ Select CLOSE on SG 1 LINE 2 ISOL VLV, HV-178, SGD-HY-178B.

____ Select CLOSE on SG 2 LINE 1 ISOL VLV, HV-185, SGB-HY-185A.

____ Select CLOSE on SG 2 LINE 1 ISOL VLV, HV-185, SGD-HY-185B.

____ Select CLOSE on SG 2 LINE 2 ISOL VLV, HV-179, SGA-HY-179A.

____ Select CLOSE on SG 2 LINE 2 ISOL VLV, HV-179, SGC-HY-179B.

____ 2.10 Align the demineralized water system to the condensate service header.

____ 1. Throttle open the Demineralized Water Feed to Condensate Service Header Valve, CDN-HV-275, to obtain a pressure of $\leq$ 100 psig on CDN-PI-201.

____ 2. Direct an auxiliary operator to close the Condensate Service Header Pressure Controller Outlet Isolation Valve, CDN-V099, located at the 110 ft level of the turbine building between the condensate pumps and the C condenser.

____ 2.11 IF two condensate demineralizers are not in service, THEN perform the following to place two in service:

____ 1. Ensure two service vessels are ready to be placed in service. Ensure the two service vessels to be placed in service have the service vessel inlet valves, A1, open.

____ 2. Ensure CONDENSATE POLISHING DEMIN INLT VLV, CDN-HS-191, is open on B05.

____ 3. Ensure the outlet valves for the two service vessels to be placed in service are open. Ensure the two service vessels to be placed in service have the service vessel outlet valves, E1, open.

____ 4. Ensure CDN-V195, CONDENSATE POLISHING DEMINERALIZER BYPASS VALVE, is open. Ensure CDN-PDIC-195, "DEMIN DIFF PRESS CONT" is in manual and has a 0 output signal. CDN-PDIC-195 is located in the unit control room on B05.

____ 5. Ensure CNDS POLISHING DEMIN OUTLT VLV, CDN-HV-199, is open on B05.

____ 6. Adjust flow through the condensate demineralizers. Throttle close CDN-V195 by slowly adjusting CDN-PDIC-195 until it indicates approx. 50 psid.

____ 7. Ensure CDN-PDIC-195, CONDENSATE POLISHING DEMINERALIZER BYPASS VALVE, is in AUTO.

____ 2.12 IF greater than two condensate demineralizers are in service, THEN contact chemistry to determine if any condensate demineralizers should be removed from service.

____ Remove condensate demineralizers from service per **Operating The Condensate Demineralizer System,** 41OP-1SC03, as directed by chemistry.

____ 2.13 Ensure the blowdown demineralizers are in service. Place a blowdown demineralizer in service per **Regeneration of the Blowdown Demineralizer,** 40OP-9SC05

____ 2.14 Isolate the condensate system from the CST and the condensate cross-tie header. Direct an auxiliary operator to perform Condensate Isolation Checklist, **Appendix B** to this procedure.

____ 2.15 IF auxiliary steam is available from another unit or an auxiliary boiler, THEN ensure the auxiliary steam cross-tie header is isolated from main steam:

____ 1. Ensure CROSS-TIE HEADER ISOLATION VALVE, ASN-V015 is open.

____ 2. Close REDUCER INLET VALVE, SGN-V093.

____ 3. Close REDUCER INLET VALVE, SGN-V094.

____ 4. Close REDUCER INLET VALVE, SGN-V095.

____ 2.16 IF auxiliary steam is NOT available from another unit or an auxiliary boiler, THEN ensure main steam is supplying auxiliary steam.

____ 1. Ensure CROSS-TIE HEADER ISOLATION VALVE, ASN-V015 is closed.

____ 2. Close CROSS-TIE HEADER BYPASS VALVE, ASN-V014 is closed.

____ 2.17 Direct RP to perform surveys of the condensate demineralizers, blowdown demineralizers, and other areas that may be affected.

____ 2.18 Identify the steam generator that has the tube leak.

____ Evaluate the following parameters in the table below and identify the leaking steam generator. Some or all of these parameters may be present:

Parameter	Steam Generator 1	Steam Generator 2
Highest sample activity	_____	_____
Main steam line activity in ALERT or HIGH alarm or increasing trend	_____ RU-139	_____ RU-140
Steam Generator blowdown activity in ALERT or HIGH alarm or increasing trend	_____ RU-4	_____ RU-5

____ 2.19 WHEN Chemistry reports testing results, THEN record the following data:

____ Steam Generator tube leak rate _____ gpm.

____ Steam Generator Dose Equivalent Iodine _____ µci/gram.

CAUTION

The time limits given in the following step help ensure that the pounds mass of RCS transferred to the secondary system, does not exceed the amount analyzed in the UFSAR (75,275 lbm).

____ 2.20 IF the tube leak is between 0.035 gpm (50 gpd) and 80 gpm, THEN perform a plant shutdown:

____ Perform a plant shutdown at a rate which will ensure the affected steam generator is isolated within the following time limits:

Primary to Secondary Leak Rate	Isolation time limit (From Leak Detection to Steam Generator Isolation)
0.035 gpm to 10.0 gpm	15 hours
10.0 gpm to 20.0 gpm	7.5 hours
20.0 gpm to 30.0 gpm	5 hours
30.0 gpm to 40.0 gpm	3.5 hours
40.0 gpm to 50.0 gpm	3 hours
50.0 gpm to 60.0 gpm	2.5 hours
60.0 gpm to 70.0 gpm	2 hours 10 min
70.0 gpm to 80.0 gpm	1 hour 50 min

____ GO TO Step 2.25 in this procedure.

____ 2.21 IF the secondary activity is greater than 0.10 µci/gram dose equivalent I-131, THEN perform a plant shutdown in accordance with Tech Spec 3.7.1.4.

____ GO TO Step 2.25 in this procedure.

____ 2.22 IF the primary to secondary leak rate is less than 10 gallons per day, THEN perform necessary notifications and exit this procedure.

____ 1. Notify operations management of the tube leak.

____ 2. Direct chemistry to continue steam generator samples in accordance with **Abnormal Occurence Checklist,** 74DP-9ZZ05.

____ 3. Continue to monitor available indications to verify the leak rate is stable.

____ 4. Exit this procedure.

____ 2.23 IF the primary to secondary leak rate is between 10 gallons per day and 50 gallons per day (0.035 gpm), THEN request Unit Chemistry management to perform the following:

____ Review continued operation of the plant.

____ Direct chemistry to continue steam generator samples in accordance with **Abnormal Occurence Checklist,** 74DP-9ZZ05.

____ 2.24 IF plant shutdown is not required, THEN exit this procedure.

CAUTION

During the performance of the CRS Diagnostic Logic Tree in **Emergency Operations, 41EP-1EO01**, the operator may be directed to **Steam Generator Tube Rupture, 41EP-1RO03**. If **Steam Generator Tube Rupture, 41EP-1RO03**, is performed, no further action is required in this procedure.

____ 2.25 Perform a plant shutdown to Mode 3. Shutdown the unit per one of the following combinations of procedures:

____ **Power Operations,** 41OP-1ZZ05, **Plant Shutdown Mode 1 to Mode 2,** 41OP-1ZZ07, and **Reactor Shutdown,** 41OP-1ZZ08.

____ **Rapid Shutdown,** 41AO-1ZZ56, and **Emergency Operations,** 41EP-1EO01.

____ 2.26 Check that all Section 2.0 steps have been addressed.

3.0 Steam Generator Isolation

_____ 3.1 IF any of the following conditions occur while performing this procedure,

____ Loss of RCS forced circulation.

____ Loss of condenser vacuum.

____ Pressurizer level below 33%, and not recovering.

THEN exit this procedure and perform **Emergency Operations,** 41EP-1EO01.

_____ 3.2 WHEN the plant is stabilized in Mode 3.0,
THEN initiate performance of **RCS and Pressurizer Heatup and Cooldown Rates,** 40ST-9RC01.

_____ 3.3 IF all of the following conditions exist:

____ Pressurizer pressure approaches the low pressure pretrip setpoint.

____ The pretrip alarm, LO PZR PRESS CH PRE-TRIP, actuates.

____ SIAS is NOT actuated.

THEN perform both of the following:

_____ 1. Ensure that the pressure reduction is due to deliberate actions.

_____ 2. Direct the secondary operator to maintain the automatic Pressurizer Pressure - Low setpoint below actual pressurizer pressure.

____ 3.4 Direct the primary operator to lower pressurizer pressure to reduce the steam generator tube leakage.

____ 1. CONCURRENTLY PERFORM Pressurizer Main Spray Cycle Log in **RCS and Pressurizer Heatup and Cooldown Rates,** 40ST-9RC01.

____ 2. De-energize available class backup heaters.

____ 3. Ensure <u>all</u> of the following:

____ Acceptable RCP NPSH. See RCP NPSH Curve, on the control board.

____ Acceptable RCS subcooling. See Normal Containment RCS P/T Limits, on the control board.

____ RVLMS level at least 41% in the RVUH.

____ 4. Lower and maintain pressurizer pressure to within 100 psid of the minimum subcooling limit. See Normal Containment RCS P/T Limits [Harsh Containment RCS P/T Limits], on the control board.

____ 3.5 <u>IF</u> <u>all</u> of the following conditions exist:

____ Steam generator pressure approaches the low pressure pretrip setpoint.

____ The pretrip alarm, LO SG PRESS CH PRE-TRIP, actuates.

____ MSIS is <u>NOT</u> actuated.

<u>THEN</u> perform <u>both</u> of the following:

____ 1. Ensure that the pressure reduction is due to deliberate actions.

____ 2. Direct the secondary operator to maintain the automatic Steam Generator - Low setpoint below steam generator pressure.

<u>CAUTION</u>

Maintaining T_h below 555°F will prevent steam generator safety valve actuation and radioactive release.

____ 3.6 Reduce and stabilize RCS T_h at less than 555°F using the SBCS to the condenser.

____ 3.7 WHEN RCS T_h is below 555°F,
THEN isolate the steam generator with the tube leak.

____ 1. Raise steam generator water levels to between 72 and 80% WR.

____ 2. Refer to the table below and perform the attachment for the leaking steam generator:

Steam Generator 1	Steam Generator 2
SG 1 Isolation Checklist, **Appendix C** to this procedure.	SG 2 Isolation Checklist, **Appendix D** to this procedure.

____ 3.8 Ensure that the most affected steam generator is isolated

____ Evaluate all of the following parameters to confirm that the most affected steam generator is isolated. Some or all of these parameters may be present:

Steam Generator 1	Steam Generator 2
____ Decreases in readings for the condenser off-gas radiation monitor:	____ Decreases in readings for the condenser off-gas radiation monitor:
____ RU-141	____ RU-141
____ Check for increasing steam generator level with no feedwater flow.	____ Check for increasing steam generator level with no feedwater flow.
____ Steam generator blowdown activity in ALERT or HIGH alarm on RU-4 or increasing trend.	____ Steam generator blowdown activity in ALERT or HIGH alarm on RU-5 or increasing trend.

____ 3.9 IF the wrong steam generator was isolated, THEN perform all of the following:

____ 1. Place the isolated steam generator back in service. Establish auxiliary feed and steam flow from the isolated steam generator.

____ 2. Isolate the most affected steam generator. Refer to the table below and perform the attachment for the leaking steam generator:

Steam Generator 1	Steam Generator 2
SG 1 Isolation Checklist, **Appendix C** to this procedure.	SG 2 Isolation Checklist, **Appendix D** to this procedure.

____ 3.10 CONCURRENTLY PERFORM **Hot Standby to Cold Shutdown Mode 3 to Mode 5**, 41OP-1ZZ10, beginning with Section 4.0.

NOTE

Steaming the isolated steam generator will reduce the pressure and affect the tube leak rate. The isolated steam generator should not be steamed unless the PZR pressure is less than or equal to the isolated steam generator pressure. Draining the steam generator with the blowdown system will reduce level without excessively reducing the steam generator pressure.

NOTE

When the PZR pressure is equalized with the pressure in the isolated steam generator, the tube leakage will be stopped. Using blowdown to drain large amounts of water should not be necessary.

____ 3.11 Maintain the isolated steam generator level between 50% and 80% NR by performing the following:

____ Feed the isolated steam generator to maintain the level above 50% NR, using auxiliary feedwater.

____ Drain the isolated steam generator to maintain the level below 80% NR, using the steam generator blowdown system at the ABNORMAL rate by performing the attachment indicated in the table below:

Steam Generator 1	Steam Generator 2
SG 1 Level Reduction Checklist, **Appendix E** to this procedure.	SG 2 Level Reduction Checklist, **Appendix F** to this procedure.

____ 3.12 Cool and depressurize the isolated steam generator as the RCS cooldown proceeds.

____ Feed the steam generator to maintain level greater than 50% NR, using auxiliary feedwater.

____ Drain the steam generator to maintain level less than 80% NR, using the steam generator blowdown system.

____ 3.13 Direct an AO and Chemistry to initiate performance of **Chemical Waste Neutralization Tank Surveillance Test,** 74ST-9ZZ02.

____ 3.14 IF the hotwell high level alarm actuates,
THEN direct an operator to drain the hotwell.

____ Direct an operator to use Draining the Hotwell to the Low TDS Sump, **Appendix G** to this procedure, to drain the hotwell.

____ 3.15 Check that all Section 3.0 steps have been addressed.

4.0 Procedure Exit

____ 4.1 Ensure equipment log entries have been made in the control room log.

____ 4.2 Ensure that the event classification has been logged in the unit log.

____ 4.3 Ensure that any Tech Spec LCOs that were entered have been complied with and that the LCO status is entered in the unit log:

____ RCS leakage limits per **Tech Spec 3.4.5.2**.

____ Secondary coolant system activity per **Tech Spec 3.7.1.4**.

____ Evaluate for any other LCOs that may have been entered.

____ 4.4 WHEN shutdown cooling has been established,
THEN exit this procedure.

END OF PROCEDURE

Appendix A - Moderate to Large Leak Rate Calculation

This appendix provides the actions necessary to perform a leakrate calculation for a moderate to large steam generator tube leak.

1.0 Leakrate Calculation

NOTE

Any transients may cause false indications of RCS leakage.

____ 1.1 Establish and maintain all of the following conditions:

____ RCS T_c is constant within 1°F.

____ PZR pressure is stabilized at 2235 to 2265 psia.

____ CVCS letdown is aligned to the VCT.

____ PZR level is stabilized.

____ All RCS sampling is stopped.

____ 1.2 Ensure makeup to the RCS is disabled by performing the following substeps:

____ 1. Place CHN-FIC-210X in manual with zero output.

____ 2. Place CHN-FIC-210Y in manual with zero output.

____ 3. Place CHN-HS-527 in the CLOSED position and verify that CHN-UV-527, MAKE-UP TO CHRG PMPS (VCT BYPASS) VLV indicates closed.

____ 4. Place CHN-HS-210, MAKEUP MODE SELECT SWITCH, in MANUAL.

____ 1.3 IF the leak rate causes the VCT level to approach 15%,
THEN record the final data, allow makeup to the VCT, and calculate the leak rate over the time period measured.

____ 1.4 Record the time the leak rate calculation is started in Table 1 and the initial leak rate data in Table 2.

____ 1.5 WHEN 15 minutes has elapsed,
OR VCT level can no longer be maintained above 15%,
THEN record final time and final leak rate data in Tables 1 and 2, using the same instruments as before.

Table 1.-Elapsed Time

Initial Time	_____
Final Time	_____
Elapsed Time	_____

Table 2.-Leak Rate Data

	PZR Level %	VCT Level %	T_{ave} F
Instrument #	_____	_____	_____
Initial Value	_____	_____	_____
Final Value	_____	_____	_____
Δ Value	_____	_____	_____

____ 1.6 Calculate the elapsed time in Table 1 and subtract the final values from the initial values in Table 2 to attain a Δ value.

____ 1.7 Perform the following calculations based on the elapsed time value from Table 1 and the Δ values from Table 2, on the previous page.

A. $\frac{\Delta PZR\ Level\ \_\_\_\_\_\%\ x\ 66.49\ gal/\%}{Elapsed\ Time\ \_\_\_\_\_\ (min)}$ = _____ gpm (A)

B. $\frac{\Delta VCT\ Level\ \_\_\_\_\_\%\ x\ 40.34\ gal/\%}{Elapsed\ Time\ \_\_\_\_\_\ (min)}$ = _____ gpm (B)

C. $\frac{\Delta T_{avg}\ \_\_\_\_\_\ ^{\circ}F\ x\ 117\ gal/^{\circ}F}{Elapsed\ Time\ \_\_\_\_\_\ (min)}$ = _____ gpm (C)

D. Calculate the RCS Leak Rate as follows:

[(A)_____gpm + (B)_____gpm] - (C)_____gpm = _____ gpm

____ 1.8 Place the MAKE-UP MODE SELECTOR, CHN-HS-210, in the AUTO position.

END OF APPENDIX

Appendix B - Condensate Isolation Checklist

This appendix provides the direction for isolating the condensate system in the affected unit to prevent the contamination of the other units or the auxiliary boiler.

1.0 Condensate Isolation

_____ 1.1 Close the Auto Drawoff Manual Isolation Valve, CDN-V062, for CDN-LV-75. CDN-V062 is located on the 110 ft level of the turbine building north corridor, west of the fire station.

_____ 1.2 Close the Auto Drawoff Bypass Manual Isolation Valve, CDN-V862, for CDN-LV-75.

_____ 1.3 Close the Unit Condensate Cross-tie Inlet Isolation Valve, CDN-V250. CDN-V250 is located at turbine bldg. 100 ft level northwest wall.

_____ 1.4 Close the Unit Condensate Cross-tie Inlet Bypass Isolation Valve, CDN-V252. CDN-V252 is located at turbine bldg 100 ft level northwest wall.

_____ 1.5 Close the Unit Condensate Make-up Cross-tie Isolation Valve, ASN-V164. ASN-V164 is located at turbine bldg 100 ft level northwest wall.

_____ 1.6 Ensure ASN-V088, Aux Steam Condensate To Main Condenser Isolation is open. ASN-V088 is located at turbine bldg 130 ft level northeast of heater drain tank A.

_____ 1.7 Ensure that the Condensate Receiver Tank to Cross-tie Header Valve, ASN-V024, is closed. ASN-V024 is located at turbine bldg 130 ft level on the east end of heater drain tank A.

_____ 1.8 IF the auxiliary boiler is using this unit for makeup, THEN direct the boiler operator to align another source of makeup water to the auxiliary boiler.

END OF APPENDIX

Appendix C - Steam Generator 1 Isolation Checklist

This appendix provides the direction for isolating steam generator 1 to reduce the amount of contamination that is released, in the event that steam generator 1 has the tube leak.

1.0 Steam Generator 1 Isolation

____ 1.1 IF Essential Steam Driven Auxiliary Feedwater Pump, AFA-P01, is in service, THEN ensure that the steam supply is from steam generator 2.

____ 1. Open SG 2 STM SPLY TO PMP, SGA-HS-138A.

____ 2. Close SG 1 STM SPLY TO PMP, SGA-HS-134A.

____ 1.2 Ensure that the ADVs for steam generator 1 are closed.

____ 1. Ensure that both of the ADVs are closed:

____ SG 1 LINE 1 VALVE CONTROL, SGA-HIC-184A.

____ SG 1 LINE 2 VALVE CONTROL, SGB-HIC-178A.

____ 2. Ensure that all of the following ADV permissives are closed:

____ SG 1 LINE 1 ISOL VLV, SGA-HS-184A.

____ SG 1 LINE 1 ISOL VLV, SGC-HS-184B.

____ SG 1 LINE 2 ISOL VLV, SGB-HS-178A.

____ SG 1 LINE 2 ISOL VLV, SGD-HS-178B.

____ 1.3 Ensure that the MSIVs and the MSIV bypass are closed.

____ 1. Press one of the following:

____ LINE 1/2 MSIV FAST CLOSE, SGA-HS-251.

____ LINE 1/2 MSIV FAST CLOSE, SGB-HS-253.

____ 2. Ensure that the MSIV bypass valve is closed as indicated by the green light on above MSIV BYPASS ISOL VLV, SGA-HS-169A.

____ 1.4 Ensure that the downcomer and auxiliary feedwater valves for steam generator 1 are closed. Close all of the following valves:

____ AUX FW TO SG 1 DOWNSTREAM VLV, AFB-HS-34A.

____ DOWNCOMER ISOL VLV, SGA-HS-172

____ DOWNCOMER ISOL VLV, SGB-HS-130.

____ AFW TO SG 1 DOWNSTREAM VLV, AFC-HS-36A.

____ 1.5 Ensure that the economizer feedwater isolation valves and chemical injection valve for steam generator 1 are closed.

____ 1. Fast close both of the following valves:

____ ECONO FWIV FAST CLOSE, SGA-HS-174C.

____ ECONO FWIV FAST CLOSE, SGB-HS-132C.

____ 2. Close SG 1 CHEMICAL INJ, SGB-HS-200.

____ 1.6 Ensure that the upstream trap isolation valves for steam generator 1 are closed. Close both of the following valves:

____ STM TRAP SGN-M23 ISOL VLV, SGA-HS-1133.

____ STM TRAP SGN-M01/M02 ISOL VLVS, SGB-HS-1135.

____ 1.7 Ensure that steam generator 1 blowdown is stopped. Ensure that SG 1 BLOWDOWN PATH SELECTOR VLVS, SCN-HS-1 is selected to OFF.

NOTE

Hot leg blowdown sample valves are left open for sampling.

____ 1.8 Ensure that the sample valves for steam generator 1 are closed. Close all of the following valves:

____ SG 1 DOWNCOMER BLODN UPSTR VLV, SGA-HS-220.

____ SG 1 DOWNCOMER BLODN DNSTR VLV, SGB-HS-221.

____ SG 1 COLD LEG BLODN UPSTR VLV, SGA-HS-211.

____ SG 1 COLD LEG BLODN DNSTR VLV, SGB-HS-228.

____ 1.9 GO TO Step 3.8 in this procedure.

END OF APPENDIX

Appendix D - Steam Generator 2 Isolation Checklist

This appendix provides the direction for isolating steam generator 2 to reduce the amount of contamination that is released, in the event that steam generator 2 has the tube leak.

1.0 Steam Generator 2 Isolation

_____ 1.1 IF Essential Steam Driven Auxiliary Feedwater Pump, AFA-P01, is in service, THEN ensure that the steam supply is from steam generator 1.

_____ 1. Open SG 1 STM SPLY TO PMP, SGA-HS-134A.

_____ 2. Close SG 2 STM SPLY TO PMP, SGA-HS-138A.

_____ 1.2 Ensure that the ADVs for steam generator 2 are closed.

_____ 1. Ensure that both of the ADVs are closed:

_____ SG 2 LINE 1 VALVE CONTROL, SGB-HIC-185A.

_____ SG 2 LINE 2 VALVE CONTROL, SGA-HIC-179A.

_____ 2. Ensure that all of the following valve permissives are closed:

_____ SG 2 LINE 1 ISOL VLV, SGB-HS-185A.

_____ SG 2 LINE 1 ISOL VLV, SGD-HS-185B.

_____ SG 2 LINE 2 ISOL VLV, SGA-HS-179A.

_____ SG 2 LINE 2 ISOL VLV, SGC-HS-179B.

_____ 1.3 Ensure that the MSIVs and the MSIV bypass valve are closed.

_____ 1. Press one of the following:

_____ LINE 1/2 MSIV FAST CLOSE, SGA-HS-250.

_____ LINE 1/2 MSIV FAST CLOSE, SGB-HS-252.

_____ 2. Ensure that the MSIV bypass valve is closed as indicated by the green light on above MSIV BYPASS ISOL VLV, SGB-HS-183B.

_____ 1.4 Ensure that the downcomer and auxiliary feedwater valves for steam generator 2 are closed. Close all of the following valves:

_____ AFW TO SG 2 DOWNSTREAM VLV, AFA-HS-37A.

_____ DOWNCOMER ISOL VLV, SGA-HS-175.

_____ DOWNCOMER ISOL VLV, SGB-HS-135.

_____ AUX FW TO SG 2 DOWNSTREAM VLV, AFB-HS-35A.

____ 1.5 Ensure that the economizer feedwater Isolation valves and chemical injection valve for steam generator 2 are closed.

____ 1. Fast close both of the following valves:

____ ECONO FWIV FAST CLOSE, SGA-HS-177C.

____ ECONO FWIV FAST CLOSE, SGB-HS-137C.

____ 2. Close SG 2 CHEMICAL INJ, SGB-HS-201.

____ 1.6 Ensure that the upstream trap isolation valves for steam generator 2 are closed. Close both of the following valves:

____ STM TRAP SGN-M24 ISOL VLV, SGA-HS-1134.

____ STM TRAP SGN-M03/M04 ISOL VLVS, SGB-HS-1136.

____ 1.7 Ensure that steam generator 2 blowdown is stopped. Ensure that SG 2 BLOWDOWN PATH SELECTOR VLVS, SCN-HS-2 is selected to OFF.

NOTE

Hot leg blowdown sample valves are left open for sampling.

____ 1.8 Ensure that sample valves for steam generator 2 are closed. Close all of the following valves:

____ SG 2 DOWNCOMER BLODN UPSTR VLV, SGB-HS-226.

____ SG 2 DOWNCOMER BLODN DNSTR ISOL VLV, SGA-HS-227.

____ SG 2 COLD LEG BLODN UPSTR VLV, SGB-HS-222.

____ SG 2 COLD LEG BLODN DNSTR VLV, SGA-HS-223.

____ 1.9 GO TO Step 3.8 in this procedure.

END OF APPENDIX

Appendix E - Steam Generator 1 Level Reduction Checklist

This appendix provides the direction for reducing the steam generator 1 level to prevent the over pressurization of the steam generator, causing further complications, and control the spread of contamination.

1.0 Steam Generator 1 Level Reduction

> **CAUTION**
>
> Draining the leaking steam generator to the condenser via the blowdown system will result in a direct transfer of RCS inventory to the hotwells. This will cause increased radiation levels in the vicinity of blowdown piping and the condenser hotwells.

____ 1.1 Inform Radiation Protection that steam generator draining to the condenser will occur.

____ 1.2 IF the blowdown demineralizer is NOT available,
OR high rate blowdown is required to maintain the steam generator level at less than 80% NR,
THEN GO TO step 1.18 in this attachment.

____ 1.3 IF all of the following conditions exist:

____ Long path recirculation has been established.

____ Adequate condensate flow to maintain temperature of blowdown out of the blowdown heat exchanger less than 133°F.

____ Blowdown demineralizer is available.

THEN continue in this procedure.

IF NOT, THEN GO TO step 1.18 in this attachment.

____ 1.4 Throttle SCN-VA59 and SCN-VA60, Bldwn HX Cond Clg Wtr Flow Control Valves to ED Pump Discharge, to maintain Blowdown Demineralizer Inlet Temperature, as read on SCN-TI-10, ≤ 133°F, and ensure less than 600 gpm condensate flow on each of the following:

____ SCN-FI-006A, located at the 100 ft level of the turbine building, under heater drain tank A.

____ SCN-FI-006B, located at the 100 ft level of the turbine building, north of heater drain tank B.

____ 1.5 Select OFF with the steam generator 1 Path Selector VALVES switch, SCN-HS-1.

____ 1.6 Select THRU DEMIN MODE LV-3B at DEMINERALIZER MODE SELECTOR VLVS, SCN-HS-3.

____ 1.7 Direct an auxiliary operator to ensure that both of the following valves are open, to send water to the blowdown flash tank:

____ SG 1 ABNORMAL BLOWDOWN TO FLASH TANK SCN-HV-1B OUTLET, SCN-V054.

____ SG 1 ABNORMAL BLOWDOWN TO FLASH TANK SCN-HV-1B INLET, SCN-V003.

____ 1.8 Select ABNORMAL on the SG 1 Rate Selector VALVES switch, SCN-HS-18.

____ 1.9 Ensure that one of the following valves is open:

____ SG 1 COLD LEG ISOL VLV, SGN-HS-41.

____ SG 1 HOT LEG ISOL VLV, SGN-HS-43.

____ 1.10 Open SG 1 COMMON UPSTR ISOL VLV, SGA-HS-500P.

____ 1.11 Open SG 1 COMMON DNSTR ISOL VLV, SGB-HS-500Q.

____ 1.12 Inform personnel in the turbine building that blowdown flow will be initiated, and to stand clear of blowdown piping.

____ 1.13 Select BLDWN TANK with the SG 1 PATH SELECTOR VALVES switch, SCN-HS-1.

____ 1.14 WHEN the steam generator 1 level is at 50% NR,
THEN select OFF with the SG 1 PATH SELECTOR VALVES switch, SCN-HS-1.

____ 1.15 Inform the CRS that steam generator 1 has been drained to 50% NR.

____ 1.16 PERFORM Steps 1.13 through 1.15 as necessary to maintain the steam generator level below 80% NR.

____ 1.17 WHEN draining the steam generator is finished,
THEN close both of the following valves:

____ SG 1 COMMON UPSTR ISOL VLV, SGA-HS-500P.

____ SG 1 COMMON DNSTR ISOL VLV, SGB-HS-500Q.

AND Exit this appendix.

____ 1.18 IF the blowdown demineralizer is NOT available,
OR high rate blowdown is required to maintain the steam generator level at less than 80% NR,
THEN lower the steam generator level with steam generator blowdown to the condenser.

____ 1.19 Select OFF with the SG 1 PATH SELECTOR VALVES switch, SCN-HS-1.

____ 1.20 Direct an auxiliary operator to ensure that all of the following valves are open, to send water to the condenser:

___ SG 1 HIGH RATE BLOWDOWN TO CONDENSER SCN-HV-18C OUTLET, SCN-V088.

___ SG 1 HIGH RATE BLOWDOWN TO CONDENSER SCN-HV-18C INLET, SCN-V099.

___ SG 1 ABNORMAL BLOWDOWN TO CONDENSER SCN-HV-18B OUTLET, SCN-V071.

___ SG 1 ABNORMAL BLOWDOWN TO CONDENSER SCN-HV-18B INLET, SCN-V072.

____ 1.21 Select the desired rate on the SG 1 Rate Selector VALVES switch, SCN-HS-18:

___ HIGH RATE.

___ ABNORMAL.

____ 1.22 Ensure that one of the following valves is open:

___ SG 1 COLD LEG ISOL VLV, SGN-HS-41.

___ SG 1 HOT LEG ISOL VLV, SGN-HS-43.

____ 1.23 Open SG 1 COMMON UPSTR ISOL VLV, SGA-HS-500P.

____ 1.24 Open SG 1 COMMON DNSTR ISOL VLV, SGB-HS-500Q.

___ 1.25 Inform personnel in the turbine building that blowdown flow will be initiated, and to stand clear of blowdown piping.

____ 1.26 Select COND with the SG 1 PATH SELECTOR VALVES switch, SCN-HS-1.

____ 1.27 WHEN the steam generator 1 level is at 50% NR,
THEN select OFF with the SG 1 PATH SELECTOR VALVES switch, SCN-HS-1.

____ 1.28 Inform the CRS that steam generator 1 has been drained to 50% NR.

____ 1.29 PERFORM Steps 1.26 through 1.28 as necessary to maintain the steam generator level below 80% NR.

____ 1.30 WHEN draining the steam generator is finished,
THEN close both of the following valves:

___ SG 1 COMMON UPSTR ISOL VLV, SGA-HS-500P.

___ SG 1 COMMON DNSTR ISOL VLV, SGB-HS-500Q.

END OF APPENDIX

Appendix F - Steam Generator 2 Level Reduction Checklist

This appendix provides the direction for reducing the steam generator 2 level to prevent the over pressurization of the steam generator, causing further complications, and control the spread of contamination.

1.0 Steam Generator 2 Level Reduction

CAUTION

Draining the leaking steam generator to the condenser via the blowdown system will result in a direct transfer of RCS inventory to the hotwells. This will cause increased radiation levels in the vicinity of blowdown piping and the condenser hotwells.

____ 1.1 Inform Radiation Protection that steam generator draining to the condenser will occur.

____ 1.2 IF the blowdown demineralizer is NOT available,
OR high rate blowdown is required to maintain the steam generator level at less than 80% NR,
THEN GO TO step 1.18 in this attachment.

____ 1.3 IF all of the following conditions exist:

____ Long path recirculation has been established.

____ Adequate condensate flow to maintain outlet temperature from the blowdown heat exchanger ... 133°F.

____ Blowdown demineralizer is available.

THEN continue in this procedure.

IF NOT, THEN GO TO step 1.18 in this attachment.

____ 1.4 Throttle SCN-VA59 and SCN-VA60, Bldwn HX Cond Clg Wtr Flow Control Valves to ED Pump Discharge, to maintain Blowdown Demineralizer Inlet Temperature, as read on SCN-TI-10, ≤ 133°F, and ensure less than 600 gpm condensate flow on each of the following:

____ SCN-FI-006A, located at the 100 ft level of the turbine building, under heater drain tank A.

____ SCN-FI-006B, located at the 100 ft level of the turbine building, north of heater drain tank B.

____ 1.5 Select OFF with the SG 2 PATH SELECTOR VALVES switch, SCN-HS-2.

____ 1.6 Select THRU DEMIN MODE LV-3B at DEMINERALIZER MODE SELECTOR VLVS, SCN-HS-3.

____ 1.7 Direct an auxiliary operator to ensure that both of the following valves are open, to send water to the blowdown flash tank:

____ SG 2 ABNORMAL BLOWDOWN TO FLASHTANK SCN-HV-2B OUTLET, SCN-V055.

____ SG 2 ABNORMAL BLOWDOWN TO FLASHTANK SCN-HV-2B INLET, SCN-V006.

____ 1.8 Select ABNORMAL on the SG 2 RATE SELECTOR VALVES switch, SCN-HS-19.

____ 1.9 Ensure that one of the following valves is open:

____ SG 2 HOT LEG ISOL VLV, SGN-HS-42.

____ SG 2 COLD LEG ISOL VLV, SGN-HS-44.

____ 1.10 Open SG 2 COMMON UPSTR ISOL VLV, SGB-HS-500R.

____ 1.11 Open SG 2 COMMON DNSTR ISOL VLV, SGA-HS-500S.

____ 1.12 Inform personnel in the turbine building that blowdown flow will be initiated, and to stand clear of blowdown piping.

____ 1.13 Select BLDWN TANK with the SG 2 PATH SELECTOR VALVES switch, SCN-HS-2.

____ 1.14 WHEN the steam generator 2 level is at 50% NR,
THEN select OFF with the SG 2 PATH SELECTOR VALVES switch, SCN-HS-2.

____ 1.15 Inform the CRS that steam generator 2 has been drained to 50% NR.

____ 1.16 PERFORM Steps 1.13 through 1.15 as necessary to maintain the steam generator level below 80% NR.

____ 1.17 WHEN draining the steam generator is finished,
THEN close both of the following valves:

____ SG 2 COMMON UPSTR ISOL VLV, SGB-HS-500R.

____ SG 2 COMMON DNSTR ISOL VLV, SGA-HS-500S.

AND Exit this appendix.

____ 1.18 IF the blowdown demineralizer is NOT available,
OR high rate blowdown is required to maintain the steam generator level at less than 80% NR,
THEN lower the steam generator 2 level with steam generator blowdown to the condenser.

____ 1.19 Select OFF with the SG 2 PATH SELECTOR VALVES switch, SCN-HS-2.

_____ 1.20 Direct an auxiliary operator to ensure that all of the following valves are open, to send water to the condenser:

____ SG 2 HIGH RATE BLOWDOWN TO CONDENSER SCN-HV-19C OUTLET, SCN-V103.

____ SG 2 HIGH RATE BLOWDOWN TO CONDENSER SCN-HV-19C INLET, SCN-V104.

____ SG 2 ABNORMAL BLOWDOWN TO CONDENSER SCN-HV-19B OUTLET, SCN-V073.

____ SG 2 ABNORMAL BLOWDOWN TO CONDENSER SCN-HV-19B INLET, SCN-V074.

_____ 1.21 Select the desired rate on the SG 2 Rate Selector VALVES switch, SCN-HS-19:

____ HIGH RATE.

____ ABNORMAL.

_____ 1.22 Ensure that one of the following valves is open:

____ SG 2 COLD LEG ISOL VLV, SGN-HS-44.

____ SG 2 HOT LEG ISOL VLV, SGN-HS-42.

_____ 1.23 Open SG 2 COMMON DNSTR ISOL VLV, SGA-HS-500S.

_____ 1.24 Open SG 2 COMMON UPSTR ISOL VLV, SGB-HS-500R.

_____ 1.25 Inform personnel in the turbine building that blowdown flow will be initiated, and to stand clear of blowdown piping.

_____ 1.26 Select COND with the SG 2 PATH SELECTOR VALVES switch, SCN-HS-2.

_____ 1.27 WHEN the steam generator 2 level is at 50% NR,
THEN select OFF with the SG 2 PATH SELECTOR VALVES switch, SCN-HS-2.

_____ 1.28 Inform the CRS that steam generator 2 has been drained to 50% NR.

_____ 1.29 PERFORM Steps 1.26 through 1.28 as necessary to maintain the steam generator level below 80% NR.

_____ 1.30 WHEN draining the steam generator is finished,
THEN close both of the following valves:

____ SG 2 COMMON UPSTR ISOL VLV, SGB-HS-500R.

____ SG 2 COMMON DNSTR ISOL VLV, SGA-HS-500S.

END OF APPENDIX

Appendix G - Draining the Hotwell to the Low TDS Sump

This appendix provides the direction for draining the contaminated water in the hotwell to the low TDS sump to control the spread of the contamination.

1.0 Draining the Hotwell to the Low TDS Sump

_____ 1.1 Ensure that the LRS HUTs have space to receive water.

_____ 1.2 IF the LRS HUTs have space to receive water,
THEN drain the hotwell to the LRS HUT in service.

_____ 1. Ensure that the Low TDS Sump is aligned to receive water.

_____ 2. Close Low TDS to Circulating Water Valve, CMN-V076.

_____ 3. Open Low TDS to LRS Holdup Valve, CMN-V091.

_____ 4. Throttle open the following resin trap drain valve(s) for the mixed bed(s) in service. Do not exceed the capacity of the Low TDS sump pump.

_____ Vessel A Resin Trap Drain Valve, SCN-V801.

_____ Vessel B Resin Trap Drain Valve, SCN-V811.

_____ Vessel C Resin Trap Drain Valve, SCN-V821.

_____ Vessel D Resin Trap Drain Valve, SCN-V831.

_____ Vessel E Resin Trap Drain Valve, SCN-V841.

_____ Vessel F Resin Trap Drain Valve, SCN-V851.

_____ 5. WHEN hotwell level is less than 40 inches,
THEN close Low TDS to LRS Holdup Valve, CMN-V091.

_____ 1.3 IF the LRS HUTs did NOT have space to receive water, THEN drain the hotwell to the neutralizing tank.

_____ 1. Close Low TDS to Circulating Water Valve, CMN-V076.

_____ 2. Open Low TDS to Neutralizing Tank Valve, CMN-V077.

_____ 3. Ensure that Chemical Waste Outlet to Retention Basin Valve, CMN-V055, is closed.

_____ 4. Throttle open the following resin trap drain valve(s) for the mixed bed(s) in service. Do not exceed the capacity of the Low TDS sump pump.

_____ Vessel A Resin Trap Drain Valve, SCN-V801.

_____ Vessel B Resin Trap Drain Valve, SCN-V811.

_____ Vessel C Resin Trap Drain Valve, SCN-V821.

_____ Vessel D Resin Trap Drain Valve, SCN-V831.

_____ Vessel E Resin Trap Drain Valve, SCN-V841.

_____ Vessel F Resin Trap Drain Valve, SCN-V851.

_____ 5. WHEN hotwell level is less than 40 inches, THEN close Low TDS to Neutralizing Tank Valve, CMN-V077.

END OF APPENDIX

Appendix H - References

1.0 Implementing

1.1 **RCS and Pressurizer Heatup and Cooldown Rates,** 40ST-9RC01

1.2 **Rapid Shutdown,** 41AO-1ZZ56

1.3 **Emergency Operations,** 41EP-1EO01

1.4 **Steam Generator Tube Rupture.** 41EP-1RO03

1.5 **Power Operations,** 41OP-1ZZ05

1.6 **Plant Shutdown Mode 1 to Mode 2,** 41OP-1ZZ07

1.7 **Reactor Shutdown,** 41OP-1ZZ08

1.8 **Hot Standby to Cold Shutdown Mode 3 to Mode 5,** 41OP-1ZZ10

1.9 **Operating The Condensate Demineralizer System,** 41OP-1SC03

1.10 **RCS Water Inventory Balance,** 41ST-1RC02

1.11 **Determination of Primary to Secondary Leak Rate,** 74CH-9ZZ66

1.12 **Secondary System Activity Surveillance Test,** 74ST-9SG01

1.13 **Chemical Waste Neutralization Tank Surveillance Test,** 74ST-9ZZ02

1.14 **Secondary System Waste Discharge,** 74ST-9ZZ07

1.15 **Turbine Building Waste Discharge,** 74ST-9ZZ08

1.16 **Radiological Surveys,** 75RP-9RP07

1.17 **Emergency Classification,** EPIP-02

1.18 **Abnormal Occurence Checklist,** 74DP-9ZZ05

2.0 Developmental

2.1 Technical Specifications

2.2 **Steam Generator Tube Rupture**, 41EP-1RO03

2.3 C.E. Emergency Procedure Guidelines, Rev. 2.

2.4 P & ID's

01-M-SGP-001

01-M-SGP-002

01-M-AFP-001

2.5 RCTS #038218

2.6 EER 87-RC-254

2.7 EER 93-SF-003

2.8 EER 93-RC-018

2.9 Letter from Bill Barley to John Dennis, 215-010640WHB/TSG

2.10 Letter from J. A. Scott and P. W. Hughes to John Dennis, 214-00873-JAS

END OF APPENDIX

ENCLOSURE 2