

EMERGENCY INSTRUCTION
I-4.7
STEAM GENERATOR TUBE FAILURE

1.0 PURPOSE

- 1.1 THIS INSTRUCTION COVERS THE SYMPTOMS, AUTOMATIC ACTIONS AND MANUAL ACTIONS FOR A STEAM GENERATOR TUBE LEAK AND A STEAM GENERATOR TUBE RUPTURE. EITHER OF THESE CONDITIONS RESULT IN LEAKAGE OF REACTOR COOLANT INTO THE SECONDARY SYSTEM.
- 1.2 OPERATOR ACTION IS REQUIRED, IN ACCORDANCE WITH THE ACCIDENT ANALYSIS IN THE FSAR, IN ORDER TO IDENTIFY AND ISOLATE THE FAULTED STEAM GENERATOR ON A TUBE RUPTURE. REACTOR COOLANT SYSTEM PRESSURE MUST BE REDUCED TO LESS THAN 1000 PSI WITHIN 30 MINUTES IN ORDER TO PREVENT LIFTING OF THE STEAM GENERATOR SAFETIES AND POWER OPERATED RELIEF VALVE ON THE AFFECTED STEAM GENERATOR. THIS WILL MINIMIZE THE RADIOACTIVE RELEASE TO THE ATMOSPHERE AND ENSURE COMPLIANCE WITH THE LIMITS SPECIFIED IN 10CFR.
- 1.3 THIS INSTRUCTION IS DIVIDED INTO TWO PARTS:

PART I - STEAM GENERATOR TUBE LEAK, WHICH DEALS WITH LEAKS SMALL ENOUGH WHERE SAFETY INJECTION IS NOT ACTUATED.

PART II - STEAM GENERATOR TUBE RUPTURE, WHICH DEALS WITH LEAKS OF A MAGNITUDE WHERE SAFETY INJECTION IS INITIATED.

PART I

1 STEAM GENERATOR TUBE LEAK

2.0 INITIAL CONDITIONS

- 2.1 ANY OF THE FOLLOWING HIGH RADIATION ALARMS.

11(21) STEAM GENERATOR BLOWDOWN 1(2)R19A
12(22) STEAM GENERATOR BLOWDOWN 1(2)R19B
13(23) STEAM GENERATOR BLOWDOWN 1(2)R19C
14(24) STEAM GENERATOR BLOWDOWN 1(2)R19D
CONDENSER AIR EJECTOR 1(2)R15
SG BLOWDOWN FILTER DISCHARGE 1(2)R35
CONDENSATE POLISHING FILTER 1(2)R40

- 2.2 CHARGING PUMP SPEED AND CHARGING FLOW INCREASE TO MAINTAIN PRESSURIZER LEVEL NORMAL.

3.0 IMMEDIATE ACTIONS

3.1 AUTOMATIC

3.1.1 CHARGING FLOW INCREAS NG

3.1.2 AUTOMATIC MAKEUP TO VOT

- 3.1.3 WARNING ALARM ON RMS CHANNEL R19 ISOLATES 12(22) S/G BD TANK VALVES 11, 12, 13 AND 14 (21, 22, 23 AND 24)GB10 AND 1(2)GB50.
- 3.1.4 HIGH ALARM ON THE STEAM GENERATOR BLOWDOWN RADIATION MONITORS (R19) WILL ISOLATE THE FOLLOWING:
- A) UNIT 1 - ALARM ON ANY CHANNEL, 1R19A-D, WILL TRIP CLOSED 11, 12, 13 AND 14GB4 STEAM GENERATOR BLOWDOWN ISOLATION VALVES.
 - B) UNIT 2 - 2R19A WILL TRIP CLOSED 21GB4, STEAM GENERATOR BLOWDOWN ISOLATION VALVE.
2R19B WILL TRIP CLOSED 22GB4, STEAM GENERATOR BLOWDOWN ISOLATION VALVE.
2R19C WILL TRIP CLOSED 23GB4, STEAM GENERATOR BLOWDOWN ISOLATION VALVE.
2R19D WILL TRIP CLOSED 24GB4, STEAM GENERATOR BLOWDOWN ISOLATION VALVE.
- 3.1.5 HIGH ALARM ON THE BLOWDOWN FILTER RADIATION MONITOR, 1(2)R35, SHIFTS 3-WAY VALVES 1(2)GB74 AND 1(2)GB112 TO DISCHARGE TO THE WASTE MONITOR HOLDUP TANKS.

3.2 MANUAL

- 3.2.1 VERIFY AUTOMATIC ACTIONS, INITIATE ANY THAT DID NOT OCCUR.
- 3.2.2 ON A HIGH RADIATION ALARM ON THE CONDENSATE POLISHING FILTER, 1(2)R40, BYPASS THE CONDENSATE POLISHING SYSTEM.
OPEN 11-13(21-23)CN108, CONDENSATE POLISHING BYPASS VALVES
CLOSE 1(2)CN109, CONDENSATE POLISHING INLET VALVE
- 3.2.3 ON A HIGH RADIATION ALARM ON 1R19A-D:
OPEN 1WD900, BLOWDOWN SAMPLE DISCHARGE TO WASTE HEADER
CLOSE 1WD901, BLOWDOWN SAMPLE DISCHARGE TO NON-RADIOACTIVE WASTE.
- 3.2.4 NOTIFY PERFORMANCE DEPARTMENT OF POSSIBLE STEAM GENERATOR TUBE LEAK.

4.0 SUBSEQUENT ACTIONS

COMMENTS

- 4.1 -VERIFY ALL IMMEDIATE ACTIONS ARE COMPLETED.
ACCOMPLISH ANY WHICH ARE NOT.
- 4.2 DETERMINE PRIMARY TO SECONDARY LEAK RATE.
- 4.3 DETERMINE WHICH STEAM GENERATOR IS LEAKING
BY SAMPLE ANALYSIS AND OBSERVING READINGS
ON STEAM GENERATOR SAMPLE RADIATION MONITORS.
DETERMINE SECONDARY ACTIVITY.
- 4.2 TECH SPEC 3.4.6.2.
- 4.3 STEAM GENERATOR SAMPLE LINES
AND RADIATION MONITORS ARE NOT
ISOLATED BY THE HIGH RADIATION
SIGNAL.
TECH SPEC 3.7.1.4.

4.4 MONITOR CHARGING PUMP FLOW FOR ANY INCREASE AND THE STEAM GENERATOR SAMPLE RADIATION MONITORS FOR INCREASED READINGS WHICH INDICATE HIGHER LEAKAGE.

4.5 SHUTDOWN THE PLANT WHEN TECHNICAL SPECIFICATION LEAKAGE LIMITS OR SECONDARY ACTIVITY LIMITS ARE REACHED IAW OI 1-3.4, "POWER OPERATION", 1-3.5, "MINIMUM LOAD TO HOT STANDBY", AND 1-3.6, "HOT STANDBY TO COLD SHUTDOWN".

4.5 THE FAULTY STEAM GENERATOR SHOULD NOT BE STEAMED DURING SUBSEQUENT COOLDOWN. COOLDOWN SHOULD BE ACCOMPLISHED BY USING THE ATMOSPHERIC STEAM RELIEF VALVES (MS-10) FOR THE UNAFFECTED STEAM GENERATORS.

II. STEAM GENERATOR TUBE RUPTURE2.0 INITIAL CONDITIONS

- 2.1 SAFETY INJECTION HAS BEEN INITIATED AND IT HAS BEEN DETERMINED BY USE OF SECTION 5.0, "IDENTIFICATION OF FOLLOWUP ACTIONS" OF EI 1-4.0, "SAFETY INJECTION INITIATION", THAT A STEAM GENERATOR TUBE RUPTURE HAS OCCURRED.

3.0 IMMEDIATE ACTIONS3.1 AUTOMATIC

- 3.1.1 WARNING ALARM ON RMS CHANNEL R19 ISOLATES 12(22) S/G BD TANK VALVES 11, 12, 13 AND 14(21, 22, 23 AND 24)GB10 AND 1(2)GB50.
- 3.1.2 HIGH ALARM ON THE STEAM GENERATOR BLOWDOWN RADIATION MONITORS (R19) WILL ISOLATE THE FOLLOWING:
- A) UNIT 1 - ALARM ON ANY CHANNEL, 1R19A-D, WILL TRIP CLOSED 11, 12, 13 AND 14GB4, STEAM GENERATOR BLOWDOWN ISOLATION VALVES.
- B) UNIT 2 - 2R19A WILL TRIP CLOSED 21GB4, STEAM GENERATOR BLOWDOWN ISOLATION VALVE
2R19B WILL TRIP CLOSED 22GB4, STEAM GENERATOR BLOWDOWN ISOLATION VALVE
2R19C WILL TRIP CLOSED 23GB4, STEAM GENERATOR BLOWDOWN ISOLATION VALVE
2R19D WILL TRIP CLOSED 24GB4, STEAM GENERATOR BLOWDOWN ISOLATION VALVE
- 3.1.3 HIGH ALARM ON THE BLOWDOWN FILTER RADIATION MONITOR 1(2)R35, SHIFTS 3-WAY VALVES 1(2)BG74 AND 1(2)BF112 TO DISCHARGE TO THE WASTE MONITOR HOLDUP TANKS.

3.2 MANUAL

- 3.2.1 VERIFY THAT ALL IMMEDIATE AND SUBSEQUENT ACTIONS DESCRIBED IN EI 1-4.0, "SAFETY INJECTION INITIATION", HAVE BEEN PERFORMED. COMPLETE ANY ACTIONS WHICH HAVE NOT BEEN PREVIOUSLY COMPLETED.
- 3.2.2 IF A WARNING ALARM HAS BEEN REACHED ON ANY OF THE R-19 CHANNELS, VERIFY THE FOLLOWING ARE CLOSED:
- 11-14(21-24)GB10, No. 12(22) BLOWDOWN TANK INLET VALVES
1(2)GB50, No. 12(22) BLOWDOWN TANK INLET CONTROL VALVE
- 3.2.3 IF A HIGH ALARM HAS BEEN REACHED ON AN R-19 CHANNEL, VERIFY THE FOLLOWING ARE CLOSED:
- UNIT 1 - 11-14GB4, STEAM GENERATOR BLOWDOWN ISOLATION VALVES
UNIT 2 - 2R19A - TRIPS 21GB4, STEAM GENERATOR BLOWDOWN ISOLATION VALVES
2R19B - TRIPS 22GB4, STEAM GENERATOR BLOWDOWN ISOLATION VALVES
2R19C - TRIPS 23GB4, STEAM GENERATOR BLOWDOWN ISOLATION VALVES
2R19D - TRIPS 24GB4, STEAM GENERATOR BLOWDOWN ISOLATION VALVES

3.2.4 ON A HIGH RADIATION ALARM ON THE CONDENSATE POLISHING FILTER, 1(2)R40, BYPASS THE CONDENSATE POLISHING SYSTEM.

OPEN OPEN 11-13(21-23)CN108, CONDENSATE POLISHING BYPASS VALVES
CLOSE 1(2)CN109, CONDENSATE POLISHING INLET VALVE

3.2.5 ON A HIGH RADIATION ALARM ON 1R19A-D:

OPEN 1WD900, BLOWDOWN SAMPLE DISCHARGE TO WASTE HEADER
CLOSE 1WD901, BLOWDOWN SAMPLE DISCHARGE TO NON-RADIOACTIVE WASTE.

4.0 SUBSEQUENT ACTIONS

4.1 VERIFY ALL IMMEDIATE ACTIONS ARE COMPLETED.
ACCOMPLISH ANY WHICH ARE NOT.

4.2 IF NOT ALREADY IDENTIFIED, IDENTIFY THE
FAULTED STEAM GENERATOR BY:

4.2.1 EXAMINE THE STEAM FLOW FEED FLOW
RECORDERS ON THE CONSOLE FOR
UNEXPLAINED OR SUDDEN MISMATCHES
ON ONE STEAM GENERATOR.

4.2.2 ISOLATE AUXILIARY FEED WATER FLOW TO
ALL STEAM GENERATORS AND OBSERVE THE
LEVELS AS INDICATED ON THE NARROW RANGE
LEVEL INDICATORS. THE STEAM GENERATOR
THAT HAS AN INCREASING LEVEL IS THE
FAULTY UNIT.

4.2.3 COMPARE RADIATION READINGS ON THE
STEAM GENERATOR BLOWDOWN SAMPLE
RADIATION MONITORS. THE ONE WITH
THE HIGHER READING IS THE FAULTY
UNIT.

4.3 RE-ESTABLISH AUXILIARY FEEDWATER FLOW TO
THE UNAFFECTED STEAM GENERATORS AND CON-
TROL THE LEVEL AT ~33% IN THE NARROW RANGE.

4.4 CLOSE THE STEAM GENERATOR STOP VALVE, MS167,
BYPASS VALVE, MS-18, AND DRAIN VALVE, MS7,
ON THE AFFECTED STEAM GENERATOR.
IF ANY OF THESE VALVES ON THE FAULTED
STEAM GENERATOR WILL NOT CLOSE, CLOSE THE
VALVES ON ALL UNAFFECTED STEAM GENERATORS.

4.2.1 A DECREASE IN FEED FLOW ON ONE
STEAM GENERATOR PRIOR TO THE
SAFETY INJECTION WILL IDENTIFY
THE FAULTED STEAM GENERATOR.

4.2.2 CLOSE THE AF11 & 21's. THE
AUX. FEED PUMPS WILL AUTO-
MATICALLY RESTART IF LEVEL
IS <18%.

4.2.3 SAMPLE LINES AND RADIATION
MONITORS HAVE BEEN ISOLATED
BY PHASE "A" ISOLATION AND
MAY NOT SHOW ANY INCREASE
IN RADIATION LEVELS.

4.3 DO NOT FEED THE FAULTED STEAM
GENERATOR.

4.4 THE MAIN STEAM ISOLATION PUSH-
BUTTON(S) ON THE SAFEGUARDS
BEZEL(S) MAY BE USED.
ISOLATION OF NON-FAULTED STEAM
GENERATORS WILL RESULT IN
ISOLATION OF THE FAULTED STEAM
GENERATOR.

4.5 IF THE RCP'S ARE IN SERVICE, COMPLETE STEPS 4.6 AND 4.7. IF THE RCP'S ARE NOT IN SERVICE, COMPLETE STEPS 4.8 AND 4.9.

4.6 REDUCE RCS TEMPERATURE TO $<500^{\circ}\text{F}$ AS QUICKLY AS POSSIBLE.

4.6.1 IF THE CONDENSER IS AVAILABLE:

1. SHIFT THE STEAM DUMP TO PRESS CONT AND REDUCE THE SETPOINT TO ~ 660 PSIG.
2. WHEN TAVG DECREASES TO BELOW THE LOW-LOW TAVG INTERLOCK RE-ESTABLISH STEAM DUMP BY DEPRESSING THE BYPASS TAVG PUSHBUTTONS ON THE STEAM DUMP INTERLOCK TRAIN "A" OR "B" BEZELS.

4.6.2 IF THE CONDENSER IS NOT AVAILABLE, OR THE NON-FAULTED STEAM GENERATORS ARE ISOLATED, REDUCE THE SETPOINT TO ~ 660 PSIG ON THE ATMOSPHERIC STEAM RELIEF VALVES, MS-10 FOR THE UNAFFECTED STEAM GENERATORS.

4.7 REDUCE RCS PRESSURE TO APPROXIMATELY THE PRESSURE OF THE FAULTED STEAM GENERATOR BY FULLY OPENING ONE PRESSURIZER SPRAY VALVE (PS1 OR 3).

4.7.1 TERMINATE THE PRESSURE REDUCTION BY CLOSING THE SPRAY VALVE WHEN RCS PRESSURE IS EQUAL TO THE FAULTED STEAM GENERATOR.

4.8 IF THE RCP'S ARE NOT IN SERVICE, PROCEED AS FOLLOWS TO REDUCE RCS TEMPERATURE TO $\leq 500^{\circ}\text{F}$ AS QUICKLY AS POSSIBLE.

1. APPROXIMATELY SATURATION PRESSURE FOR 500°F .

2. STEAM DUMP SHOULD MAINTAIN RCS TEMP. $\sim 500^{\circ}\text{F}$. IF THE CONTROLLER HAS SATURATED AND THE DEMAND REMAINS HIGH, GO TO MANUAL AND REDUCE THE DEMAND AND THEN GO BACK TO AUTO.

4.6.2 DO NOT STEAM THE AFFECTED STEAM GENERATOR. IF THE CONTROLLERS HAVE SATURATED AND THE DEMAND REMAINS HIGH AS PRESSURE APPROACHES 660 PSIG GO TO MANUAL AND REDUCE THE DEMAND AND THEN GO BACK TO AUTO.

4.7 MAINTAIN AT LEAST 50°F SUB-COOLING. THE RCP MUST BE RUNNING IN ORDER TO GET SPRAY FLOW. THE CRITERIA FOR TRIPPING ALL RCP'S AT 1500 PSIG DOES NOT APPLY.

4.8 THE REDUCTION IN RCS TEMP. AND PRESS. MUST BE DONE QUICKLY TO MINIMIZE THE RELEASE TO THE ATMOSPHERE FROM THE AFFECTED S/G.

- 4.8.1 FULLY OPEN THE ATMOSPHERIC STEAM RELIEF VALVES, MS-10, ON THE UN-AFFECTED STEAM GENERATORS.
- 4.8.2 REDUCE RCS TEMPERATURE TO $\leq 500^{\circ}\text{F}$ AS INDICATED BY THE INCORE THERMOCOUPLES OR T_H IN THE UNAFFECTED LOOPS. REFER TO THE PRESSURE-TEMPERATURE CURVE TO DETERMINE THE REQUIRED STEAM GENERATOR PRESSURE.
- 4.8.2 TAVG IS NOT VALID WITH NO RCP'S IN SERVICE.
- S/G PRESS IS DETERMINED BY T_c .
- REQUIRED S/G PRESS IS DETERMINED BY AMOUNT OF DECAY HEAT AS INDICATED BY ΔT .
- EXAMPLE:
 ΔT IS 50°F
 TO GET 500°F T_H , T_c MUST BE 450°F .
 STEAM PRESS SHOULD BE ~ 410 PSIG.
- 4.9 REDUCE RCS PRESSURE TO APPROXIMATELY THE PRESSURE OF THE FAULTED STEAM GENERATOR BY OPENING ONE PRESSURIZER POWER OPERATED RELIEF VALVE, (PR1 OR 2).
- 4.9 MAINTAIN AT LEAST 50°F SUB-COOLING.
 POWER OPERATED RELIEF VALVE BLOCK VALVE (PR6 OR 7) MUST BE OPEN.
- 4.9.1 TERMINATE THE PRESSURE REDUCTION BY THE POWER OPERATED RELIEF WHEN RCS PRESSURE IS EQUAL TO THE FAULTED STEAM GENERATOR.
- 4.9.1 PRT RUPTURE DISCS MAY RUPTURE GIVING CONTAINMENT INDICATIONS SIMILAR TO A LOCA.
- 4.10 IF THE FAULTED STEAM GENERATOR IS IDENTIFIED AS EITHER 11 OR 13(21 OR 23) AND NO. 11 & 12 (21 & 22) AUXILIARY FEEDWATER PUMPS ARE SUPPLYING WATER TO THE NON-FAULTED STEAM GENERATORS, STOP NO. 13(23) AUX. FEED PUMP.
- 4.10 NO. 13(23) AUX. FEED PUMP TURBINE EXHAUSTS TO ATMOSPHERE.
- 4.11 STOP THE RESIDUAL HEAT REMOVAL PUMP AS FOLLOWS:
- 4.11 THE RHR PUMPS SHOULD NOT BE ALLOWED TO RUN ON RECIRC FOR MORE THAN ~ 30 MINUTES SINCE THERE IS NO COMPONENT COOLING TO THE RHR HEAT EXCHANGERS.
- 4.11.1 RESET SAFETY INJECTION BY DEPRESSING BOTH TRAIN "A" & "B" S: RESET PUSH-BUTTONS ON THE SAFEGUARDS ACTUATION BEZELS ON THE CONTROL CONSOLE.
- 4.11.1 AUTOMATIC ACTUATION OF SAFETY INJECTION WILL NO LONGER BE AVAILABLE. ANY SUBSEQUENT ACTUATION MUST BE ACCOMPLISHED MANUALLY BY INSERTING THE SAFEGUARDS KEY INTO EITHER

TRAIN "A" OR "B" OPERATE ON
THE SAFEGUARDS ACTUATION
BEZEL AND TURN THE KEY.

IF AT ANY TIME AFTER SAFETY
INJECTION IS RESET, A BLACKOUT
SIGNAL IS RECEIVED, THE VITAL
BUSES WOULD BE STRIPPED AND
THE BLACKOUT LOADS WOULD BE SE-
QUENCED ON BY THE SEC. THE
SAFETY INJECTION PUMPS WILL NOT
BE RESTARTED. THEY MUST BE
MANUALLY STARTED AFTER THE
LOADING SEQUENCE IS COMPLETE
AS INDICATED BY THE LOADING
COMPLETE LIGHTS ON THE 1A, 1B
AND 1C(2A, 2B AND 2C) DIESEL
GENERATOR BEZELS.

THIS IS TO BE ACCOMPLISHED IN
SUCH A MANNER AS TO PREVENT
OVERLOADING THE DIESELS. THE
LOADS SHOULD BE APPLIED AT
~10 SEC. INTERVALS.

DO NOT RESTART THE PUMPS BY
MANUALLY INITIATING SAFETY
INJECTION AS THIS WILL ALSO
START THE RHR PUMPS.

4.11.2 RESET THE SAFEGUARDS LOADING SEQUENCE BY
DEPRESSING EMERGENCY LOADING RESET PUSH-
BUTTONS ON THE CONTROL CONSOLE FOR 1A,
1B AND 1C(2A, 2B AND 2C) DIESEL GENERATORS.

4.11.3 STOP BOTH RHR PUMPS.

4.12 WHEN ONE SET OF THE FOLLOWING CONDITIONS EXIST:

4.12.1 PRESSURIZER LEVEL >50% AND INCREASING
AND >50°F SUBCOOLING.

OR

4.12.2 REACTOR COOLANT PRESSURE INCREASES BY
200 PSIG AFTER THE CONTROLLED DEPRES-
SURIZATION (STEP 4.7 OR 4.9)

INJECTION FLOW IS GREATER
THAN LEAK FLOW.

AND

PRESSURIZER LEVEL IS INCREASING ON 2/3 CHANNELS.

AND

REACTOR COOLANT SYSTEM TEMPERATURE IS MORE THAN 50°F SUBCOOLED AS INDICATED BY EITHER THE WIDE RANGE T_H INDICATORS ON THE NON-FAULTED LOOPS OR THE INCORE THERMOCOUPLES.

IF TEMPERATURE REMAINS BELOW THE TSAT -50°F CURVE ON THE PRESSURE-TEMPERATURE CURVE, 50°F SUBCOOLING IS ASSURED.

THEN

- 4.12.1 STOP No. 11 & 12(21 & 22) SAFETY INJECTION PUMPS.
- 4.12.2 IF No. 13(23) CHARGING PUMP IS RUNNING, STOP No. 11 & 12(21 & 22) CHARGING PUMPS. IF No. 13(23) CHARGING PUMP IS NOT RUNNING, STOP EITHER No. 11 OR 12 (21 OR 22) CHARGING PUMP.
- 4.13 ESTABLISH NORMAL CHARGING AND LETDOWN IAW 01 11-3.3.1, "ESTABLISHING CHARGING, LETDOWN AND SEAL INJECTION FLOW"
- 4.13.1 CONTROL PRESSURIZER LEVEL AT -22%.
- 4.13.2 OPERATE THE PRESSURIZER HEATERS AS REQUIRED TO MAINTAIN REACTOR COOLANT PRESSURE DURING THE SUBSEQUENT COOLDOWN.
- 4.14 IF PRESSURIZER LEVEL CANNOT BE MAINTAINED >17%, OR, RCS SUBCOOLING CANNOT BE MAINTAINED >50°F, THEN, RESTART No. 11 AND/OR 12 (21 AND/OR 22) SAFETY INJECTION PUMP(S).
- 4.14 CONTINUE TO MONITOR FOR THESE CONDITIONS THROUGHOUT THE SUBSEQUENT COOLDOWN.
- 4.15 IF No. 11 AND 12(21 AND 22) SAFETY INJECTION PUMPS ARE RUNNING AND EITHER PRESSURIZER LEVEL OR SUBCOOLING CANNOT BE MAINTAINED, MANUALLY REINITIATE SAFETY INJECTION BY INSERTING THE SAFEGUARDS KEY INTO EITHER TRAIN "A" OR "B" SAFETY INJECTION OPERATE BEZEL AND TURN THE KEY. RETURN TO STEP 4.7 OF THIS INSTRUCTION AND PROCEED FROM THERE.
- 4.15 CONTINUE TO MONITOR THE THESE CONDITIONS THROUGHOUT THE SUBSEQUENT COOLDOWN.
- 4.16 WHEN CONDITIONS PERMIT, RETURN THE 4kV VITAL BUSES TO NORMAL BY:

4.16.1 STOP THE EMERGENCY DIESEL GENERATORS IAW
OI IV-16.3.1, "EMERGENCY POWER - DIESEL
OPERATION".

4.16.2 START OR STOP VITAL BUS LOAD AS
NECESSARY.

4.17 REFER TO EI I-4.2, "RECOVERY FROM SAFETY
INJECTION" FOR GUIDANCE IN RETURNING
SYSTEMS TO NORMAL OPERATION IN PREPARATION
FOR COOLDOWN.

4.18 IF NO REACTOR COOLANT PUMPS ARE IN OPERATION,
START ONE PUMP IN AN UNAFFECTED LOOP.

4.19 COMMENCE A COOLDOWN AND DEPRESSURIZATION
OF THE REACTOR COOLANT SYSTEM AS DESCRIBED
BELOW. OBSERVE THE FOLLOWING PRECAUTIONS.

4.19.1 DO NOT ATTEMPT TO COOLDOWN WITHOUT
AT LEAST ONE RCP IN OPERATION.
IF AN RCP CANNOT BE STARTED, MAIN-
TAIN PRESSURIZER LEVEL AND THE
FAULTED STEAM GENERATOR LEVEL BY
CONTROLLING CHARGING FLOW AND
PRESSURIZER PRESSURE.

4.19.2 MAINTAIN LEVEL IN THE FAULTED STEAM
GENERATOR IN THE NARROW RANGE.

4.19.3 IT IS PREFERRED TO DEPRESSURIZE THE
FAULTED STEAM GENERATOR BY ALLOWING
IT TO RAIN BACK TO THE RCS. IF
FOR SOME REASON THIS IS NOT POSSIBLE,
THE FAULTED STEAM GENERATOR WILL
HAVE TO BE DEPRESSURIZED BY BLEEDING
OF STEAM BY ONE OF THE FOLLOWING:

4.17 DUE TO ABNORMAL PLANT CONDI-
TIONS, SOME STEPS MAY NOT BE
APPROPRIATE AND SOME EQUIPMENT
UNAVAILABLE.

4.18 RUNNING NO. 13(23)RCP GIVES
THE BEST PRESSURE CONTROL.

NO. 11(21)RCP WOULD BE THE
SECOND CHOICE.

4.19.1 THE FAULTED STEAM GENERATOR
IS AN INTEGRAL PART OF THE
RCS. THE LEVEL WILL BE
CONTROLLED BY THE PRESSURE
IN THE RCS.

4.19.2 A SUPERHEATED STEAM BUBBLE
MAY EXIST IN THE FAULTED
STEAM GENERATOR. IF THIS
IS ALLOWED TO COME IN CON-
TACT WITH THE SUBCOOLED
TUBES A RAPID DEPRESSURIZATION
OF THAT STEAM GENERATOR
WILL RESULT IN A LARGE
OUTFLOW OF WATER FROM THE
RCS AND A RESULTANT DROP
IN PRESSURIZER LEVEL.

4.19.3 ALL POTENTIAL RELEASES
FROM THE STEAM GENERATOR
TO THE ATMOSPHERE MUST BE
CALCULATED BEFORE THE
RELEASE. THE RELEASES
MUST BE LESS THAN THAT
ALLOWED BY 10CFR20.

1. OPEN THE MAIN STEAM STOP BYPASS VALVE, MS18, AND BLEED STEAM TO THE CONDENSER, OP,
2. BRIEFLY OPEN THE STEAM GENERATOR POWER OPERATED RELIEF VALVE, MS-10, APPROXIMATELY 10%.

ALL RELEASES MUST BE PREVIOUSLY APPROVED BY THE SENIOR SHIFT SUPERVISOR.

4.20 REFER TO 01 I-3.6, "HOT STANDBY TO COLD SHUTDOWN" FOR DIRECTION AS TO THE OPERATION OF SUPPORT SYSTEMS DURING THE COOLDOWN.

4.21 SAMPLE THE RCS FOR BORON.

4.21.1 BORATE THE RCS AS NECESSARY TO INSURE SHUTDOWN MARGIN WILL BE MAINTAINED WHEN COLD SHUTDOWN IS ACHIEVED.

4.21.1 REFER TO REACTOR ENGINEERING MANUAL, FIGURE 20A.

4.21.2 PERIODICALLY SAMPLE THE RCS DURING COOLDOWN TO INSURE SHUTDOWN MARGIN IS MAINTAINED.

4.21.2 THE RCS BORON CONCENTRATION MAY DECREASE AS THE FAULTED STEAM GENERATOR DRAINS BACK TO THE RCS.

4.22 DUMP STEAM FROM THE UNAFFECTED STEAM GENERATORS AND ESTABLISH A COOLDOWN RATE OF $<50^{\circ}\text{F}/\text{HR}$.

4.22 USE EITHER STEAM DUMP TO THE CONDENSER OR THE MS-10'S

4.22.1 MAINTAIN THE LEVEL IN THE UNAFFECTED STEAM GENERATORS $\sim 33\%$.

4.22.2 MAINTAIN PRESSURIZER PRESSURE IAW THE PRESSURE TEMPERATURE CURVE.

4.22.3 WHEN RCS PRESSURE DECREASES TO <1000 PSIG, ISOLATE THE SAFETY INJECTION ACCUMULATORS BY CLOSING THE ACCUMULATOR ISOLATION VALVES, 11-14(21-14)SJ54.

4.22.3 RELEASE THE TAGS AND ENERGIZE THE VALVES. ONCE VALVES ARE CLOSED, OPEN THE BREAKER AND TAG FOR THE SHIFT SUPERVISOR.

4.22.4 WHEN RCS TEMPERATURE IN THE UN-AFFECTED LOOPS IS DECREASED TO <350°F AND RCS PRESSURE IS <400 PSIG, PLACE THE RHR SYSTEM IN OPERATION IAW OI 11-6.3.2, "INITIATING RESIDUAL HEAT REMOVAL".

4.22.5 CONTINUE THE COOLDOWN TO COLD SHUTDOWN CONDITIONS.

PREPARED BY J. BAILEY

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REVIEWED BY G. CONNOR

SORC MEETING NO. 74-80

DATE 9/19/80