WATTS BAR NUCLEAR PLANT

EMERGENCY OPERATING INSTRUCTIONS

EOI-0

IMMEDIATE ACTIONS AND DIAGNOSTICS

UNIT 1 or 2

Rev. By	Rev. No.	Date	Revised Pages
	0	6/9/81	All

The last page of this instruction is number 11.

1C	Plant Master File
	Acting Plant Superintendent
	Assistant Superintendent
	Mecnanical Maintenance Supervisor
1U	Results Supervisor
1C&1U	Operations Supervisor
1C	Quality Assurance Supervisor
1C	Health Physicist
	Management Services Supervisor
	Chemical Laboratory
	Instrument Shop
1C	Shift Engineer's Office
2C	Unit Control Room
	Health Physics Laboratory
	PSU Supervisor
	Mechanical Engineer
	Reactor Engineer
	Chemical Engineer
	Instrument Maintenance Supervisor
1U	Asst. Director of Nuc Power (Oper)
	Electrical Maintenance Supervisor
	Plant Services Supervisor
	Outage Director
	Administrative Services Supervisor
	Document Control Supervisor
1C	Nuclear Safety Review Staff
1U	NRC
1C	Nuc Pr Training Center
1U	Plant Training Office
1U	Supv., Reactor Systems Group

Prepared By Richard Cook

Submitted By Gary J. Preston
Supervisor

PORC Review 6-9-81
Date

Approved By Robert L. Lewis
for Superintendent

Date Approved 6-9-81

EE.B.11 Power supplies are not finalized.

II.E.5. DCR has been submitted to change panel 6G so it will be all dark during phase B contmt isol.

Gary T. Overton 6/8/81
Signature Date

PURPOSE

This instruction presents the automatic actions, the immediate operator actions and the diagnostic sequence to be followed in the identification of the following:

A. Spurious Actuation of Safety Injection
B. Loss of Reactor Coolant
C. Loss of Secondary Coolant
D. Steam Generator Tube Rupture

The reactor automatic protection equipment is designed to safely shut down the reactor in the event of any of the above emergencies. The safety injection system is designed to provide emergency core cooling and boration to maintain the safe reactor shutdown condition. These plant safeguards systems operate with offsite electrical power or from onsite emergency diesel-electric power should offsite power not be available.

In the subsequent documents in this series (EOI-1, 2 and 3), instructions for recovery from the event are presented for each particular accident.

I. SYMPTOMS

NOTE: The process variables referred to in this instruction are typically monitored by more than one instrumentation channel. Use redundant channels to check for consistency while performing this instruction.

A. The following symptoms are typical of those which may arise in a plant undergoing a loss of reactor coolant, loss of secondary coolant, or S/G tube rupture (symptoms may appear in any order):

1. Low Pressurizer Pressure
2. Low Pressurizer Water Level
3. High Pressurizer Water Level
4. High Containment Pressure
5. High Containment Radiation
6. High Condenser Vacuum Pump Exhaust
7. High Steam Generator Blowdown Radiation
8. Steam Flow/Feedwater Flow Mismatch
9. Letdown Isolation/Pressurizer Heater Cutout
10. Low Low Reactor Coolant System Average Coolant Temperature
11. High Containment Recirculation Sump Water Level
12. Low Steamline Pressure (one or all Steamlines)
13. Low Steam Generator Water Level
14. Increasing Steam Generator Water Level
15. Rapidly Changing Reactor Coolant System Average Coolant Temperature
16. Increased Charging Flow
17. High Steam Flow (one or all Steamlines)
18. High Containment Humidity
19. High Containment Temperature
20. Low Feedwater Pump Discharge Pressure
21. Ice Condenser Doors Open

II. IMMEDIATE ACTIONS

A. Conditions warranting reactor trip or safety injection may be characterized by a number of anomalous situations or unusual instrument indications.

1. If the plant is in a condition for which a reactor trip is warranted and an automatic reactor trip has not yet occurred, manually trip the reactor. Continue monitoring plant conditions as shown in Figure 1.

2. If there is not a rapid drop in nuclear power and the control rods are not inserted, then this is an ATWS event. Attempt to trip the reactor by other means, (see EOI-13 as needed).

3. If the plant is in a condition for which safety injection is warranted and an automatic safety injection has not yet occurred, manually initiate safety injection.

B. Verify the following actions and system status:

1. Reactor trip and turbine trip have occurred.

   a. All rods inserted

   b. Turbine steam stop valves closed

2. Electrical busses are energized and intended loads are being powered.

   a. Generator breakers open (30 second delay if no electrical fault)

   b. Station service transferred

3. Feedwater Isolation has occurred

   a. MFW Isolation valves closed

   b. MFW reg. valves closed

   c. MFW reg. bypass valves closed

4. Verify isolations and system alignment by status monitor lights:

   a. Phase A CNTMT isolation

   b. CNTMT ventilation isolation

   c. Safety injection system valve alignment

II. IMMEDIATE ACTIONS (continued)

d. Test all status monitor lights on panel 6C through 6H and verify their indications as follows:

(1) Panel 6C - Dark
(2) Panel 6D - Dark
(3) Panel 6E - Light (except for outlined)
(4) Panel 6F - Light (except for outlined)
(5) Panel 6G - Dark (except for outlined)
(6) Panel 6H - Dark

5. Auxiliary feedwater status:

a. All AFW pumps running.
b. AFW level control valves in auto (monitor lights on M-3) and positioned as appropriate for present S/G levels (indicated on M-3).

6. ECCS pumps started and flow established:

a. Centrifugal charging pumps (HI HEAD SI)
b. Safety injection pumps (LO HEAD SI)
c. RHR pumps (LO HEAD SI)
d. Flow through BIT (FI-63-170 on M-6).
e. As RCS pressure falls verify:

(1) SI pumps deliver flow if < 1500 psig (FI-63-20 & 151)
(2) RHR pumps deliver flow if < 180 psig (FI-63-91A & 92A)

7. ERCW and CCS Pumps have started.

8. Diesel Generators have started.

9. EGTS and ABGT systems have started.

10. If automatic actions do not occur, initiate manually.

11. Energize power supply to U-1 controlled H_2 ignition system by closing breakers 10, 11, and 12 in Standby Lighting Cabinet LS-4, (near CCS Surge tank).

C. Verify the following:

1. SI flow from at least one train is being delivered to the RCS if system pressure is below CCP's shutoff head (≅ 2400 psig). If not, operate equipment manually or locally.

II. IMMEDIATE OPERATOR ACTIONS (continued)

2. AFW flow from at least one train being delivered to S/G's. If not, operate equipment manually or locally. AFW flow should be regulated only after S/G level is in the narrow range or > 76% wide range (ensure tubes covered).

3. Verify RCS heat removal via S/G's:

a. Automatic steam dump to the condenser

b. Tavg is decreasing towards 557°F.

c. With condenser not available verify decay heat removal via:

1. S/G PORVs (S/G pressure @ 1125 psig & Tavg ≅ 560°F)
OR
2. S/G safety valves (S/G pressure @ 1185 psig & Tavg ≅ 567°F.)

D. If running, stop Rx Bldg Aux. floor & equipment drain pumps (Pocket Sump Pnl M-9) and floor & equipment drain Rx Bldg sump pumps stopped (Pnl M-15).

E. If CNTMT hi-hi pressure (2.81 psid) is reached;

1. Verify all MSIV's closed.

2. Containment spray and Phase B isolation initiated

3. Test status monitor lights on panel 6C through 6H and verify their indication as follows:

Panel 6C - Dark
Panel 6D - Dark
Panel 6E - Light
Panel 6F - Light
Panel 6G - Dark (except outlined area)
Panel 6H - Dark

4. If MISV's donot close, manually close from control board.

5. If CS or phase B does not occur, manually initiate.

III. ACCIDENT DIAGNOSTICS (Refer to Figure 2)

_____A. Evaluate RCS pressure to determine if it is low or decreasing in uncontrolled manner. If low or decreasing, verify:

III. ACCIDENT DIAGNOSTICS (Continued)

_____1. All PZR spray line valves closed, and

_____2. Both PZR PORV's closed

_____3. If not, manually close the valves from the control board.

_____4. If RCS pressure is above the low pressure reactor trip setpoint (1970 psig) and is stable or increasing, go to step G of accident diagnostics.

_____B. If conditions 1 or 2 below exists, stop all RCP's and maintain seal injection flow: Stop ALL RCP's

_____1. Within 5 minutes after CNTMT Phase B isolation occurs. (loss of motor bearing cooling)

OR

_____2. After verifying CCP operation and if RCS pressure decreases below ~ 1500 psig.

_____3. Monitor conditions for stopping RCP's periodically during this instruction.

_____C. IF condenser vacuum pump exhaust radiation or S/G blowdown radiation monitor exhibit abnormally high readings, AND CNTMT pressure, radiation, and recirc sump level exhibit normal readings, THEN go to EOI-3, "Steam Generator Tube Rupture."

_____D. IF the steam pressure is abnormally lower in one S/G than in the others, THEN go to EOI-2 "Loss of Secondary Coolant."

_____E. IF CNTMT pressure, radiation OR recirc sump levels exhibit either abnormally high or increasing readings, THEN go to EOI-1, "Loss of Reactor Coolant".

NOTE: For very small breaks inside CNTMT, the CNTMT pressure increase will be small and possible not recognizable. For very small breaks the recirculation sump level will increase very slowly and early in the transient may not indicate a level increase.

_____F. IF CNTMT pressure, radiation AND recirc sump level continue to exhibit stable readings in the normal pre-event range, THEN go to EOI-2, "Loss of Secondary Coolant".

_____G. Assume the SI is non-spurious unless the following are exhibited:

NOTE: To determine normal readings for a parameter, i.e. radiation levels, check recorder for absence of increasing values.

III. ACCIDENT DIAGNOSTICS (Continued)

_____1. Normal readings for CNTMT temperature, pressure, radiation and recirc sump level AND

_____2. Normal readings for auxiliary building radiation and ventilation monitoring AND

_____3. Normal readings for S/G blowdown and condenser vacuum pump exhaust radiation.

_____H. IF all of the symptoms 1 through 3 above are not met, return to step B.

_____I. IF all of the symptoms 1 through 3 above are met and when the following 1 through 4 are exhibited:

_____1. RCS pressure > 2000 psig and increasing

AND

_____2. PZR level > 20%

AND

_____3. RCS subcooling > 40°F

AND

_____4. AFW flow > 880 GPM (TOTAL) is injected into the S/G's OR indicated level in at least one S/G is in the narrow range or > 76% wide range.

THEN

_____5. Reset SI and stop all ECCS pumps not needed for normal charging and RCP seal injection.

CAUTION: If SI is concurrent with a BO, then BO relay must be met prior to stopping BO equipment.

CAUTION Auto SI initiation will not occur since the reactor trip breakers have not been reclosed.

CAUTION: Subsequent to this step, should loss of offsite power occur, manual SI initiation will be required to load safeguards equipment onto the diesel powered shutdown boards.

CAUTION: If SI is concurrent with a BO, then BO relay must be reset prior to stopping BO equipment.

III. ACCIDENT DIAGNOSTICS (continued)

_____6. Place all ECCS pumps not needed for normal charging flow in standby mode and maintain operable safety injection flowpaths.

_____7. Establish normal charging flow and then isolate SI flow to the RCS cold legs via the BIT.

_____a. Close charging FCV-62-89 (HIC-62-89A)

_____b. Open charging pumps' VCT outlet FCV-62-132 and 133.

_____c. Close charging pumps' RWST FCV-62-135 and 136.

_____d. Open charging line isolation valves FCV-62-90 and 91.

_____e. Close BIT inlet FCV-63-39 and 40, and outlet FCV-63-25 and 26.

_____f. Open seal water Hx flow isolation FCV-62-61 and 63.

_____g. Gradually open charging FCV-62-89. Adjust seal water flow to ~ 8 GPM per RCP.

_____8. Monitor the following (a, b, or c) parameter, should any one decrease below listed values, manually reinstate SI.

_____ _____a. PZR pressure < 1765
yes no

OR

_____ _____b. PZR level < 10%
yes no

OR

_____ _____c. RCS subcooling < 40°F
yes no

_____ d. If manual SI is required, rediagnose conditions and proceed to the appropriate EOI.

_____ e. Add 15°F to the sub-cooling requirement prior to second termination of the high head pumps. This can be achieved by terminating SI at 200 psi higher.

_____9. Control AFW flow as necessary to recover "0" power conditions.

III. ACCIDENT DIAGNOSTICS (continued)

_____10. Reestablish normal charging and letdown (if not the leakage path):

_____a. Determine boron concentration and set blender accordingly.

_____b. Maintain PZR level in the normal operating range (≅ 25%)

_____c. Ensure charging flow established.

_____d. Maintain RCS pressure > 2000 psig

_____e. Open RCS loop 3 letdown isolation valves FCV-62-69 and 70.

_____f. Open letdown line isolation valve FCV-62-77.

_____g. Open FCV-62-81 ≅ 25% on hand and immediately open FCV-62-76 (5 gpm orifice), then open FCV-62-73 (45 GPM orifice).

_____h. Adjust FCV-62-81 for desired pressure, then place control on auto. (≅ 320 psig @ normal letdown temperature.)

NOTE: After charging and letdown have been established, additional letdown may be increased as PZR level permits.

_____11. Reestablish operation of the PZR heaters. When RCS pressure can be controlled by heaters alone, return makeup and letdown to level control only.

_____12. Monitor the following parameter, if all remain above listed values, go to AOI-19,"Recovery from a spurious Safety injection."

___ ___a. PZR pressure > 1870 psig
yes no

___ ___b. PZR level > 10% span
yes no

___ ___c. RCS subcooling >40°F
yes no

_____d. If any one of the parameters fall below the listed value, Manually Reinitiate SI and rediagnose plant conditions.

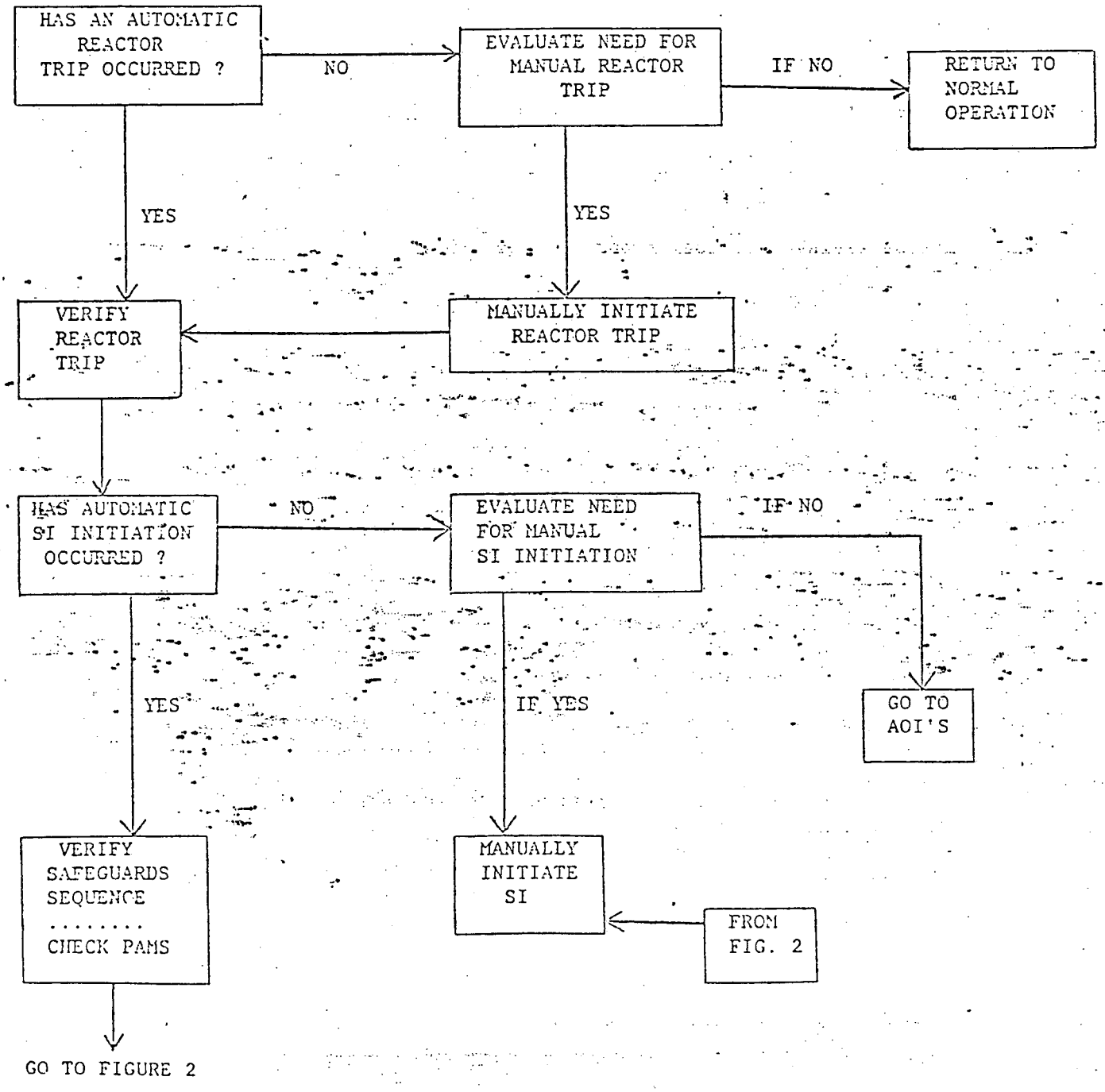
HAS AN AUTOMATIC REACTOR TRIP OCCURRED ?
NO
EVALUATE NEED FOR MANUAL REACTOR TRIP
IF NO
RETURN TO NORMAL OPERATION
YES
YES
VERIFY REACTOR TRIP
MANUALLY INITIATE REACTOR TRIP
HAS AUTOMATIC SI INITIATION OCCURRED ?
NO
EVALUATE NEED FOR MANUAL SI INITIATION
IF NO
YES
IF YES
GO TO AOI'S
VERIFY SAFEGUARDS SEQUENCE
.....
CHECK PAMS
MANUALLY INITIATE SI
FROM FIG. 2
GO TO FIGURE 2

FIGURE 1

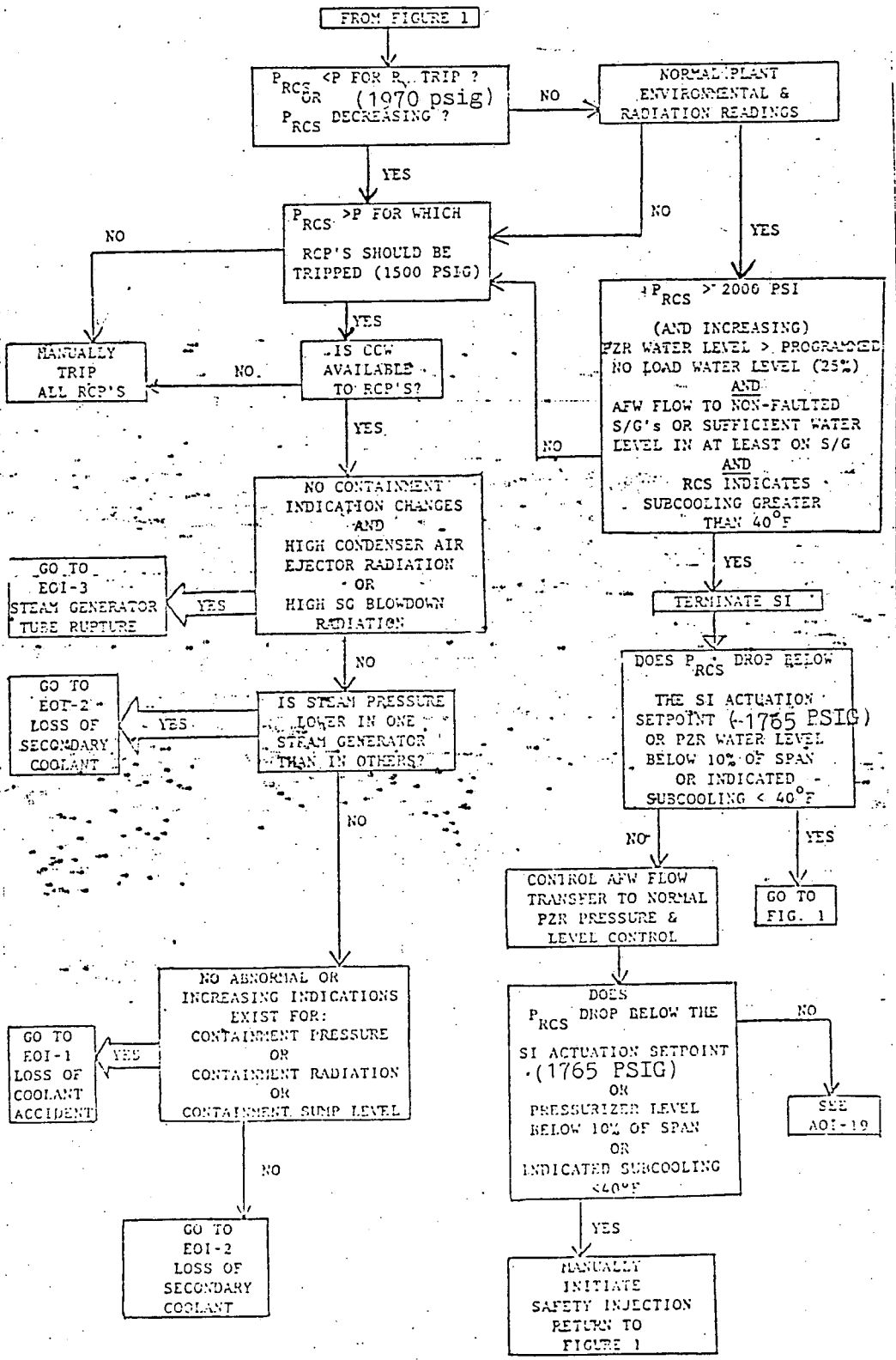
FROM FIGURE 1
P_{RCS} OR P_{RCS} DECREASING ? <P FOR R.. TRIP ? (1970 psig)
NO
NORMAL PLANT ENVIRONMENTAL & RADIATION READINGS
YES
P_{RCS} >P FOR WHICH RCP'S SHOULD BE TRIPPED (1500 PSIG)
NO
NO
YES
P_{RCS} > 2000 PSI (AND INCREASING) PZR WATER LEVEL > PROGRAMED NO LOAD WATER LEVEL (25%) AND AFW FLOW TO NON-FAULTED S/G's OR SUFFICIENT WATER LEVEL IN AT LEAST ON S/G AND RCS INDICATES SUBCOOLING GREATER THAN 40°F
MANUALLY TRIP ALL RCP'S
NO
IS CCW AVAILABLE TO RCP'S?
YES
NO
YES
NO CONTAINMENT INDICATION CHANGES AND HIGH CONDENSER AIR EJECTOR RADIATION OR HIGH SG BLOWDOWN RADIATION
GO TO EOI-3 STEAM GENERATOR TUBE RUPTURE
YES
NO
TERMINATE SI
GO TO EOI-2 LOSS OF SECONDARY COOLANT
YES
IS STEAM PRESSURE LOWER IN ONE STEAM GENERATOR THAN IN OTHERS?
DOES P_{RCS} DROP BELOW THE SI ACTUATION SETPOINT (1765 PSIG) OR PZR WATER LEVEL BELOW 10% OF SPAN OR INDICATED SUBCOOLING < 40°F
NO
YES
NO
CONTROL AFW FLOW TRANSFER TO NORMAL PZR PRESSURE & LEVEL CONTROL
GO TO FIG. 1
NO ABNORMAL OR INCREASING INDICATIONS EXIST FOR: CONTAINMENT PRESSURE OR CONTAINMENT RADIATION OR CONTAINMENT SUMP LEVEL
GO TO EOI-1 LOSS OF COOLANT ACCIDENT
YES
DOES P_{RCS} DROP BELOW THE SI ACTUATION SETPOINT (1765 PSIG) OR PRESSURIZER LEVEL BELOW 10% OF SPAN OR INDICATED SUBCOOLING <40°F
NO
SEE AOI-19
NO
YES
GO TO EOI-2 LOSS OF SECONDARY COOLANT
MANUALLY INITIATE SAFETY INJECTION RETURN TO FIGURE 1

FIGURE 2

WATTS BAR NUCLEAR PLANT

EMERGENCY OPERATING INSTRUCTIONS

EOI- 1

LOSS OF REACTOR COOLANT (LOCA)

Unit 1 or 2

PARTS OF THIS INSTRUCTION REQUIRE DOCUMENTATION

Rev. By	Rev. No.	Date	Revised Pages
CRC	3	6/10/81	All, Punchlist

The last page of this instruction is number 35.

1C	Plant Master File
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Prepared By Richard Cook

Submitted By Guy F. Morton
Supervisor

PORC Review 6-10-81
Date

Approved By Robert L. Lewis
Superintendent

Date Approved 6-10-81

PUNCHLIST

II. M.N. Identified possible cavitation problem to be determined during Preop.

Gary T. Allenton 6/9/81
Signature Date

PURPOSE:

The objectives of these instructions are to specify required operator actions and precautions necessary to:

1. Verify and establish short term core cooling to prevent or mimimize damage to the fuel cladding and release of excessive radioactivity.

2. Maintain long term shutdown and cooling of the reactor by recirculation of spilled reactor coolant, injected water, water from melted ice bed and containment spray system drainage.

This procedure is divided into two sections:

1. Loss of reator coolant (EOI-1A)

2. Loss of offsite power, with SIS reset, following a LOCA while in recirculation mode (EOI-1B).

I. IMMEDIATE OPERATOR ACTION

Refer to section on immediate actions of EOI-0, immediate actions and diagnostics, if not already performed.

II. SUBSEQUENT OPERATOR ACTIONS

NOTE: Use redundant instrument channels where available to monitor proper behavior of plant processes while performing this instruction. Use PAM instrumentation where provided.

_____A. Monitor the RWST closely. If RWST level decreases rapidly such that the RWST low level alarm appears imminent (≅29%) 120,000 gal. go directly to step "U" and then complete steps "B through "T" as soon as possible.

_____B. As RWST level decreases under the action of the ECCS pumps, check the following:

____ ____ 1. Recirculation sump level instrumentation indicates an
Yes no increase. (LI-63-180, 181, 182, and 183).

____ 2. With no increase in recirculation sump level, re-evaluate the symptoms in EOI-0.

_____C. Regulate AFW to S/G's to restore and/or maintain level as follows:

CAUTION: DO NOT rely on level indications on depressurized S/G's

_____ 1. S/G level greater than 40% and less than 71% on narrow range (high level is required to compensate for reference leg heatup).

_____ 2. Use the following backup variables to verify level in one or more S/G's:

_____ a. Auxiliary feedwater flow
_____ b. Steamline pressure
_____ c. Wide range T hot and T cold

_____D. If S/G level increases in an unexplained manner in one S/G, go to EOI-3, "S/G Tube Rupture".

_____E. Monitor the condensate storage tank level.

_____ 1. Verify auto. switchover to ERCW occurs upon reaching low level ≅6" on LI-2-230A and 233A).

_____ 2. If auto switchover does not occur at ≅6", manually switchover.

II. SUBSEQUENT OPERATOR ACTIONS (Cont'd)

____F. Monitor RCS pressure and PZR PORV status:

____ ____ 1. Verify PORV's are closed or close when RCS pressure
Yes no drops below 2335 psig.

____ ____ 2. Verify PZR PORV block valve open and power available
Yes no (indicating lights).

____ ____ 3. If any PRZ PORV does not reclose, attempt to isolate
Yes no using the appropriate block valve.

____ ____ 4. If RCS pressure decreases <1500 psig, close CCP's
Yes no miniflow FCV-62-98 and 99.

____G. Ensure CNTMT isolation is maintained:

1. Do not reset until manual action is required or necessary process.

____ 2. Start sampling CNTMT liquid and gaseous effluents if required to reset CNTMT isolation.

____ 3. Ensure controlled hydrogen ignition system in service per EOI-0, Section II.B.11.

____H. Monitor SI termination criteria continuously:

Safety Injection can be terminated IF:

____ ____ (1) RCS pressure >2000 psig and increasing
Yes no

AND

____ ____ (2) PZR level >50%
Yes no

AND

____ ____ (3) RCS subcooling >40°F
Yes no

AND

____ ____ (4) AFW isolated to faulted S/G's and ≥ 880 GPM (total)
Yes no is injected into non-faulted S/G(s)

OR

____ ____ S/G level >40% in at least one non-faulted S/G.
Yes no

THEN

II. SUBSEQUENT OPERATOR ACTIONS (Cont'd)

_____ (5) Reset SI (HS-63-134A & 134B), stop all ECCS pumps not needed for normal charging and RCP seal injection.

CAUTION: Auto SI is not available until reactor trip breakers reclose.

CAUTION: Subsequent to this step, should loss of offsite power occur, manual initiation is required to load safeguards equipment onto the diesel powered shutdown boards.

_____ (6) Place all ECCS pumps not needed for normal charging flow in standby and maintain operable safety injection flowpaths.

(7) Establish normal charging flow and then isolate safety injection flow to the RCS Cold legs via BIT.

_____ (8) Monitor the RCS at all times for indication of INADEQUATE CORE COOLING:

INADEQUATE CORE COOLING EXISTS WHEN:

COMPUTER AVAILABLE:

_____ _____ a. Five or more incore thermocouples exhibit readings ≥ 1200°F.
Yes no

OR

COMPUTER NOT AVAILABLE:

_____ _____ b. The hot leg wide range RTD's are pegged high
Yes no

OR

_____ _____ c. Five or more incore thermocouples are off-scale above 700°F.
Yes no

AND

_____ _____ d. Less than one complete train of ECCS delivering flow to the RCS
Yes no

AND

_____ _____ e. Greater than two S/G's inoperable as indicated by <76% wide range level and decreasing.
Yes no

_____ 9. If conditions indicate inadequate core cooling exists, see Appendix D for instructions to restore core cooling.

II. SUBSEQUENT OPERATION ACTIONS (cont'd)

_____ 10. Use computer subcooling program and Appendix A of this procedure to determine margin of subcooling being maintained.

_____ (11) Monitor the RCS for manual SI reinitiation criteria:

MANUALLY REINITIATE SI IF:

_____ _____ a. RCS pressure drops below 1765 psig.
Yes no

OR

_____ _____ b. PZR water level drops below 20%
Yes no

OR

_____ _____ c. RCS subcooling drops below 40°F.
Yes no

_____ _____ d. If manual SI reinitiation is required, GO to section
Yes no III of EOI-0 to reevaluate the event, unless this reevaluation has already been performed.

_____ _____ e. Add 15°F to the sub-cooling requirements prior to the
Yes no termination of the ECCS pumps. This can be achieved by terminating SI at 200 psi higher.

_____ (12) Reestablish normal charging and letdown (if not the leakage path):

_____ a. Determine boron concentration and set blender accordingly.

_____ b. Maintain PZR level in the normal operating range (≅25%)

_____ c. Ensure charging flow established.

_____ d. Maintain RCS pressure >2000 psig.

_____ e. Open RCS loop 3 letdown valves FCV-62-69 and 70.

_____ f. Open the letdown line isolation valve FCV-62-77.

_____ g. Open FCV-62-81 ≅ 25% on hand and immediately open FCV-62-76 (5 GPM orifice) then open FCV-62-73 (45 GPM orifice).

_____ h. Adjust FCV-62-81 for desired pressure then place control on auto. (≅320 psig at normal letdown temperature).

II. SUBSEQUENT OPERATION ACTIONS (Cont'd)

_____ (13) Reestablish operation of the PZR heaters (see Appendix B for availability of PZR heaters).

_____ a. Return makeup and letdown to PZR water level control only when the RCS pressure can be controlled by PZR heaters alone.

_____ (14) Verify S/G levels being maintained at ~40% narrow range span.

_____ (15) Monitor the AFW normal water supply (condensate storage tanks):

_____ a. Verify auto switover to ERCW occurs upon reaching a low level (≅6" on LI-2 - 230A & 233A).

_____ b. If auto switchover does not occur at ≅6", manually switchover.

_____ (16) Monitor the RCS temperature subcooled >50°F:

_____ a. Monitor the temperature indication of incore T/C's.

OR

_____ b. All wide range RCS temperature T_H

_____ c. Verify the RCS temperature is >50°F subcooled.

Yes no

_____ d. With 50°F indicated subcooling not present, attempt to establish by:

_____ 1. Steam dump to the condenser

OR

_____ 2. To the atmosphere (S/G PORV's)

_____ 3. Reduce S/G pressure to maintain a RCS cooldown rate of ≤ 50°F/HR, consistent with plant makeup capability, until 50°F subcooling is established.

_____ e. If 50° F indicated subcooling cannot be established or maintained:

_____ a. Manually reinitiate safety injection.

_____ b. Go to section III of EOI-0 to re-evaluate the event, unless this re-evaluation has already been performed.

II. SUBSEQUENT OPERATION ACTIONS (Cont'd.)

_____(17) Perform a controlled cooldown to cold shutdown conditions using normal cooldown procedures if requred to affect repairs.

_____(18) Maintain subcooled conditions (≥ 50°F indicated subcooling)

_____(19) If subcooled conditions cannot be maintained, proceed to Step I.

_____I. If the conditions for SI termination in step H are not met:

_____1. Maintain necessary ECCS pumps operating.

_____2. If equipment is not operating, attempt to operate the equipment from the control room or locally.

_____3. Effect repairs if necessary.

_____4. If RCS pressure stabilizes above the safety injection pumps' shut-off head (≅1500 psig), manually reset SI so that safeguards equipment can be controlled manually.

_____a. Stop the RHR pumps and place in the standby mode.

_____b. If RCS pressure decreases uncontrollably below the safety injection pumps' shutoff head (≅1500 psig), restart the RHR pumps.

_____J. If RHR pumps are left in service, place CCS water on the RHR heat exchangers.

_____K. Notify the chem. lab to initiate the conditional portion of SI-4.11.2. and inform health physics of conditions.

_____L. Shutdown D/G's as soon as possible after plant conditions stabilize.

_____ 1. Remove D/G's from service per SOI-82, section for shutdown after emergency start.

_____ 2. Place D/G's in standby mode per SOI-82

_____ 3. Use EOI-1B in conjunction with this procedure to re-establish operation of safety equipment should a loss of offsite power occur during injection mode.

_____M. Transfer NR-45 to one SR and one IR channel.

_____N. Verify control room vent isolation (SOI-31.1B)

II. SUBSEQUENT OPERATOR ACTIONS (Cont'd)

_____O. Close U-2 CNTMT equipment hatch temporary doors and check equipment transfer hatch cover in place (El 757 to lower elevation).

_____P. Request performance of SI-4.3.1.1.1.-22c to verify position of P-4 contacts (failure may prevent resetting SI signal) if SI will not reset.

_____Q. Refer to IP-1 and implement the REP relative to primary coolant leakage and ECCS actuation.

_____R. Leave both trains of EGTS in service till recovery portion of procedure is carried out.

_____S. Verify A-A and B-B CNTMT air return fans in service (10 min TD after phase B) and suction dampers ZS-30-72 and ZS-30-73 open.

_____T. Stop reciprocating charging pump if in service.

_____U. If conditions 1 or 2 below exist, stop all RCP's and maintain seal injection:

_____1. Within 5 minutes after CNTMT phase B isolation occurs, (loss of motor bearing cooling).

OR

_____2. After verifying centrifugal charging pump operation and if RCS pressure decreases below ~ 1500 psig.

_____3. Monitor the conditions for stopping RCP's periodically during this instruction.

_____4. If RCP's are tripped use Appendix C for natural circulation guidelines.

_____V. If steps B through T were skipped getting to this point in the procedure, verify here when steps B through T are complete.

_____W. Verify UHI accumulator isolation valves close on low level after accumulator liquid is dumped.

_____X. Verify cold leg accumulators dump their contents if RCS pressure decreases below ≅ 400 psig.

II. SUBSEQUENT OPERATOR ACTIONS (Continued)

____Y. Monitor RCS pressure:

____ ___ 1. If the break is characterized by RCS pressure quickly
Yes no decreasing below S/G pressure, go to step BB.

NOTE: If the RCS goes into a saturated condition, see Appendix C for two phase natural circulation guidelines.

____ ___ 2. If the break is characterized by a slowly decreasing
Yes no or stabilized pressure above the lowest S/G safety valve setpoint, (1185 psig), the following additional manual actions should be taken to aid cooldown and depressurization of the RCS.

MAIN CONDENSER IN SERVICE

_____ a. Check pressure equalized across the MSIV's or equalize by use of MSIV bypass and open at least one MSIV.

_____ b. Transfer steam dump control to the pressure mode.

_____ c. Dump steam to the condenser to lower the RCS temperature and consequently the RCS pressure.

MAIN CONDENSER NOT IN SERVICE

_____ a. Dump steam with the S/G PORV's to lower the RCS temperature and consequently, RCS pressure.

____3. Reduce S/G pressure to 985 psig (200 psi below lowest S/G safety)

____4. Maintain RCS coldown rate $\leq$ 50°F/HR., consistent with plant make-up capability.

____Z. If RWST low level alarm ($\cong$29%) is not imminent, perform a preliminary evaluation of the plant status:

____1. Periodically check auxiliary building area radiation monitor for detection of leakage.

____2. If significant leakage is detected attempt to isolate the leakage and implement the required radiation protection.

____3. Maintain injection flow to the RCS at all times.

II. SUBSEQUENT OPERATOR ACTIONS (Cont'd)

_____4. While the plant is in cold leg injection mode:

_____a. Make provisions for an evaluation of plant equipment.

_____b. Use Appendix G for equipment evaluation.

_____c. Follow radiation control methods while performing evaluations.

_____d. Re-energize breaker for FCV-63-1.

_____AA. Monitor CNTMT pressure:

_____1. If CNTMT pressure is near normal -0.1 to +0.3 psig):

_____a. Reset containment spray (HS-72-42 & 43 on M-6)

_____b. Stop CS pumps A-A & B-B and leave in standby.

_____c. Maintain operable CS flow paths.

_____BB. Prior to going to recirc mode; establish CCS water to the RHR heat exchangers:

NOTE: During a loss of power train situation it may be necessary to throttle back on the unaffected units component cooling water. Do not let unaffected unit's CCS temperature go above 120°F.

_____1. Open the following CCS valves: (Panel M-27B)

_____a. Open FCV-70-156, RHR HX.A outlet (60 sec. to full open)

_____b. Open FCV-70-153, RHR HX.B outlet (60 sec. to full open)

_____2. Monitor the ECCS pump operation:

_____a. Verify all ECCS pumps (Hi & Lo head) are operating.

_____b. Verify the SI pumps are delivering flow to the RCS cold legs.

_____c. If the SI pumps are not delivering flow to the RCS due to RCS pressure being higher than the SI pump discharge pressure, Stop the SI pumps.

_____CC. If a loss of offsite power occurs after switching to the recirculation mode, see EOI=1B to establish pre-loss of offsite power conditions and then return to this procedure to continue cooldown.

II. SUBSEQUENT OPERATOR ACTIONS (Cont'd)

____DD. Use the following guidelines during changeover to recirc mode:

a. Perform all actions expeditiously, in a precise, orderly sequence.

b. Do not interrupt changeover operation until all actions are completed.

c. If a valve fails to respond or to complete its demanded operation, postpone any corrective action until the subsequent steps are performed except as noted.

d. Loss of one complete train of power will allow the other train to be swapped. Parallel valves required to be closed will require one valve be closed locally.

e. Use Appendix F for contingency actions.

____EE. Automatic switch-over from injection to recirc mode is initiated when the RWST level reaches ≅29%, (120,000 gal.) coincident with a CNTMT sump level of ≅10%.

NOTE: Times provided at the end of subsequent steps are normal times for the valves to travel full stroke.

CAUTION: If a CNTMT sump valve cannot be opened, stop corresponding RHR pump.

____1. Verify RHR CNTMT sump valves FCV-63-72 (A-A) and FCV-63-73 (B-B) start to open while RHR pumps continue to run. (40 sec.)

____2. Verify RWST-RHR pump suction valves FCV-74-3 and FCV-74-21, start to close. (2 min)

____FF. Verify Auto switchover has begun, then perform the follow manual sections:

CAUTION Before RWST reaches 0% level, immediately stop any pumps taking suction from the RWST. Complete the switchover steps listed below, then restart reqired pumps.

NOTE Each valve handswitch requiring operation per this procedure is identified by a number representing each sequential step.

____1. Close the SI pump's miniflow valves.

____a. FCV-63-4 (10 sec)
____b. FCV-63-175 (10 sec)
____c. FCV-63-3, common miniflow isol (10 sec)

II. SUBSEQUENT OPERATOR ACTIONS (Cont'd)

_____2. Close the crosstie valves downstream of the RHR Hx's. (RHR Hx Bypass).

_____a. FCV-74-33 (40 sec)
_____b. FCV-74-35 (40 sec)

_____3. Open the parallel valves in the CCP's and SIP's common suction line

NOTE: Ensure CCP's miniflow FCV-62-98 and 99 are closed.

_____a. FCV-63-6 (10 sec)
_____b. FCV-63-7 (10 sec)

_____4. Open the valve from each RHR pump discharge to the CCP's suction and SI pump's suction. (FCV-63-3, 4, & 175 must be fully closed.)

_____a. FCV-63-8 (10 sec)
_____b. FCV-63-11 (10 sec)

_____5. All ECCS pumps are now aligned with suction flow from CNTMT sump. Verify proper operation and alignment of all ECCS compoents Complete the following manual actions to provide redundant isolatic of the RWST from the recirc fluid.

_____6. Reset the SI signal and close the two parallel valves in the line from the RWST to the charging pump suction.

_____a. FCV-62-135 (10 sec)
_____b. FCV-62-136 (10 sec)

_____7. Restore power to and close the valve in the common line from the RWST to both RHR pumps. (Powered from RX MOV Bd. A1-A).

FCV-63-1 (2 min.)

_____8. Close SI pump suction from RWST

FCV-63-5 (2 min.)

_____GG. Monitor area radiation monitors for detection of leakage from ECCS:

_____1. If significant ECCS leakage is found, attempt to isolate it.

_____2. Maintain recirc flow to the RCS at all times.

_____HH. With the ECCS in the cold leg recirc mode:

_____1. Make provision for plant equipment evaluation if not previously done.

_____2. Request sample of recirc sump and adjust sump PH if required.

II. SUBSEQUENT OPERATOR ACTIONS (Cont'd)

____II. After going into the recirc mode, the CS pumps will continue using water from the RWST. Upon reaching the RWST Low-Low level alarm point of ≅8%, (50,000 gal) realign the containment spray system:

____1. Stop both CS pumps and "pull to lock". (prevent restart while realigning.)

____2. Close the following valves:

____a. Close FCV-72-22 CS pump A-A suction from RWST (1 minute)

____b. Close FCV-72-21 CS pump B-B suction from RWST (1 minute)

____3. Open the following ERCW valves (Panel M-27A):

____a. Open FCV-67-125 (HS-67-125A) CS HX "A" ERCW inlet. (1 min)

____b. Open FCV-67-126 (HS-67-126A) CS HX. "A" ERCW outlet. (1 min)

____c. Open FCV-67-123 (HS-67-123A) CS HX. "B" ERCW inlet. (1 min)

____d. Open FCV-67-124 (HS-67-124A) CS HX. "B" ERCW outlet. (1 min)

____4. Open the CS pump-CNTMT sump suction valves:

____a. Open FCV-72-44, CS pump A-A suction (1 min)

____b. Open FCV-72-45, CS pump B-B suction (1 min)

CAUTION: If a CS pump suction valve from sump is not open, do not restart the corresponding pump.

____c. Observe CS pump suction valves above, full open.

____5. Start CS pump A-A

____6. Start CS Pump B-B

____7. Verify ≥ 4500 gpm flow on CSP A-A (FI-72-34)

____8. Verify ≥ 4500 gpm flow on CSP B-B (FI-72-13)

____9. After completing the preceding steps, verify the ECCS system aligned for cold leg recirc per Appendix E.

CAUTION: DO NOT remove either of the EGTS trains from service until recovery from the accident is planned. Flow switch problem may prevent restart of equipment.

II. SUBSEQUENT OPERATOR ACTIONS (Cont'd)

____JJ. After ≅ 15 minutes (sooner if possible) stop the emergency diesel generators if offsite power has not been interrupted, and prepare for restart.

____KK. Thirty minutes or longer after the accident occurs, place one of the operating ABGT systems in standby (SOI-30.6)

____LL. Approximately two hours after a design basis accident, the ice condenser will be depleted and CNTMT pressure will increase. If CNTMT pressure increases to 12.3 psid, PLACE ONE TRAIN OF RHR in CNTMT spray mode:

Train "A" RHR CNTMT spray initiation.

____1. Close the RHR cold leg injection valve FCV-63-93.

____2. Open the RHR spray header isolation valve FCV-72-40.

OR

Train "B" RHR-CNTMT spray initiation.

____1. Close the RHR cold leg injection valve FCV-63-94.

____2. Open the RHR spray header isolation valve FCV-72-41.

____MM Approximately 15 hours after transferring to cold leg recirc realign one train of EGCS for hot leg recirc to assure against an excessive buildup of boric acid concentration in core.

CAUTION: Due to possible cavitation in the vicinity of FCV-74-35 and piping tee downstream of this valve under high flow and low head conditions:

a) Use Train A RHR for hot leg recirc.

b) Use Train B RHR for hot leg recirc only in extreme emergency.

c) While Train A RHR is in hot leg recirc, leave Train B RHR in cold leg recirc.

____1. Train A RHR Changeover to H. L. Recirc (Preferred)

____a. Close FCV-63-93, RHR pump A-A cold leg isolation valve.

____b. Verify FCV-74-35 closed.

____c. Then open FCV-74-33, RHR pump A-A crosstie valve (RHR Hx bypass)

II. SUBSEQUENT OPERATOR ACTIONS (Cont'd)

_____d. Open FCV-63-172, RHR pump H. L. isolation valve

_____e. Verify H. L. flow on FI-63-173.

_____2. Train B RHR Changeover to H. L. Recirc (Used Only if Train A Cannot be Used)

_____a. Close FCV-63-94, RHR pump B-B C. L. isolation valve

_____b. Verify FCV-74-33 closed.

_____c. Then open FCV-74-35, RHR pump B-B crosstie valve (RHR Hx bypass)

_____d. If not open, open FCV-63-172, RHR pump H. L. isolation valve

_____e. Verify H. L. flow on FI-63-173.

_____3. Realign the SI pumps to the hot let injection headers to the RCS

_____a. SI Pump A-A

_____(1) Stop A-A SI pump.

_____(2) Close FCV-63-152, SI pump A-A crosstie isolation

_____(3) Verify FCV-63-152 closed, then open FCV-63-156, SI pump A-A hot leg isolation

_____(4) Start SI pump A-A and verify flow to the hot leg header. (FI-63-151)

_____b. SI Pump B-B

_____(1) Stop B-B SI pump

_____(2) Close FCV-63-153, SI pump B-B crosstie isolation

_____(3) Verify FCV-63-153 closed, then open FCV-63-157, SI pump B-B hot leg isolation.

_____(4) Start SI pump B-B and verify flow to the RCS through the hot leg header. (FI-63-20)

_____c. Close SI pumps' C. L. isolation valve FCV-63-22 (HS-63-22A)

_____d. Verify ECCS pump alignment per Appendix H.

II. SUBSEQUENT OPERATOR ACTIONS (Cont'd)

_____NN. Monitor CNTMT H_2 concentration:

_____1. Determine H_2 gas monitors are in service and switches are in analize position.

_____2. Monitor the H_2 gas monitor indication on M-9

_____3. Have CNTMT air sampled by chem lab. once per shift (sample frequency may be changed based on rate of change of H_2 concentration and radiation dose received drawing the sample).

_____4. Keep CNTMT air return fan in service for duration of H_2 buildup problem.

_____5. Place H_2 recombiners in service as follows:

_____a. If containment H_2 concentration reaches ½% by volume.

_____(1) If D/G's are carrying the electrical load, verify they will not exceed 4400 KW continuously or 5200 KW for a two hour period, (H_2) recombiners are rated at 75 KW each).

_____(2) If maximum load on D/G's will be reached, notify the SRO and make evaluation on which equipment may be removed from service to allow loading of recombiners.

_____(3) Then place one H_2 recombiner in service per SOI-83.1.

_____b. If CNTMT H_2 concentration reaches 1% by volume:

_____(1) If D/G's are carrying the electrical load, verify they will not exceed 4400 KW continuously or 5200 KW for a two hour period, (H_2 recombiners are rated at 75 KW each).

_____(2) If maximum load on D/G's will be reached, notify the SRO and make evaluation on which equipment may be safely removed from D/G load so as to allow loading of H_2 recombiners.

_____(3) Then place one H_2 recombiner in service per SOI-83.1.

II. SUBSEQUENT OPERATOR ACTIONS (Cont'd)

_____c. Place one H_2 recombiner in service no later than 24 hours after the accident to ensure a mixture of less than 4% by volume in CNTMT:

_____(1) If D/G's are carrying the electrical load, verify they will not exceed 4400 KW continuously or 5200 KW for a two hour period, (H_2 recombiners are rated at 75KW each).

_____(2) If maximum load on D/G's will be reached, notify the SRO and make evaluation on which equipment may be safely removed from D/G load so as to allow loading of H_2 recombiners.

_____(3) Then place one H_2 recombiner in service per SOI-83.1.

_____00. Guidelines for removing H_2 and other non-condensables from the primary system when trapped and cannot escape to containment:

_____1. Keep RCS pressure as high as possible to prevent bubble from enlarging and also to entrain more non-condensables in the RCS water.

_____2. With RCP's operating (RCP #1 or #2):

_____a. Verify PZR heaters operable
_____b. Use PZR spray valves periodically to strip non-condensables from water to PZR vapor space.
_____c. Then open a PZR PORV momentarily to vent non-condensables to the PRT where it can be vented to the waste gas system or to containment if the PRT rupture disc is blown.
_____d. Verify the PRZ PORV closed after each use.

_____3. With RCP's not operating:

Use auxiliary spray and follow guidelines for RCP's operating, (step 00.2 above).

_____4. With CVCS letdown operable:

_____a. Monitor CVCS closely for leakage
_____b. Set up proper radiation protection measures
_____c. Letdown through CVCS at desired rate.
_____d. As non-condensables are stripped in the VCT vapor space vent them to the waste gas system.

II. SUBSEQUENT OPERATOR ACTIONS (Cont'd)

_____5. Burp non-condensables from vessel head area with RCP's running:

_____a. Obtain SRO approval.
_____b. Slowly decrease RCS pressure (≅10 psig/min), maintain 50°F subcooling if possible.
_____c. Monitor excore nuclear instruments for indication of increased neutron leakage.
_____d. Monitor incore T/C's for increased temperature readings.
_____e. If during controlled depressurization, flow blockage occurs as indicated by increasing temperature of the RCS, repressurize and establish flow.
_____f. If RCP cavitation occurs as indicated by following, trip the RCP's
1. Hi vibration
2. Flow surges
3. RCP amperage surges
4. Use of saturation curve

_____g. When the bubble is moved from the upper head through the # 2 hot leg into the PZR surge line, the incore thermocouples should decrease, and PZR level should decrease.

_____h. Once the bubble is in the PZR, vent the PZR to the PRT.

III. RECOVERY

The reactor will remain in recirc mode for an indefinite period of time.

Instructions for recovery shall be prepared when the condition of the CNTMT and the accident evaluation is determined.

IV. REFERENCES

FSAR 15.3.1 (through Amendment 41)
6.3 (through Amendment 41)

LOSS OF OFFSITE POWER WITH SIS RESET FOLLOWING A LOCA IN RECIRCULATION MODE

I. SYMPTOMS

A. Loss of normal control room lights and emergency lights on.

B. Loss of all loads connected to the 6.9-KV and 480-V unit board and 6.9 KV and 480-V shutdown boards.

C. "6900-V unit board A (B, C, and D) failure or undervoltage." (68 percent of normal voltage after 5 seconds)

D. "480-V unit board A (and B) undervoltage or transfer." (68 percent of normal voltage after 5 seconds)

E. "6900-V SD Board A-A (and B-B) failure or undervoltage." (44 percent of normal voltage after 1.5 seconds)

F. "480-V SD Board A1-A (and A2-A, B1-B and B2-B) failure or undervoltage." (68 percent of normal voltage after 2 seconds)

G. "6900-V start bus failure or undervoltage" on control building recording annunciator. (79 percent of normal voltage after 2 seconds)

II. AUTOMATIC ACTION

A. Diesel generators 1A-A, 1B-B, 2A-A, and 2B-B start and close on their respective 6900-V shutdown board for boards that lost voltage.

B. Blackout sequence initiated for boards that lost voltage.

III. IMMEDIATE OPERATOR ACTION

A. If a loss of offsite power happens after the LOCA when the ECCS is in the recirculation mode and the SIS has been reset, proceed as follows (only for the unit which has the LOCA):

1. Do not reinstate the SI signal, as this would cause manually repositioned valves or other equipment to return to the injection mode.

2. Verify the D/G's energize the 6900V shutdown boards and the "Blackout Sequencer" starts sequencing loads for boards that lost voltage.

3. Lockout the CCP's prior to (preferred) or just after they start to prevent cavitation untill RHR pumps are restarted.

4. Secure all PZR heaters to prevent D/G overload.

III. IMMEDIATE OPERATOR ACTIONS (Cont'd)

5. Start control air compressors A and B, locally.

6. Start the following as soon as possible without overloading the D/G's: Watch D/G loads closely, if necessary secure loads listed in "subsequent actions" step A.

CAUTION: D/G rating: 4400 kW continuous or 5200 kW for 2 hours

a. RHR pumps
b. Centrifugal chargin pumps
c. SI pumps
d. CS pumps (CNTMT pressure $\geq$ 2.81 psid)
e. Air return fans if not running, and Ø B has initiated.

7. Announce "loss of offsite power unit _____," on PA system.

IV. SUBSEQUENT OPERATOR ACTIONS

_____A. Stop the following equipment on LOCA effected unit: (to avoid overload D/G.)

_____1. Lower compartment fans (won't start if ØB not reset.).

_____2. CRDM cooler fans (won't start if ØB not reset.).

_____3. Boric acid transfer pumps.

_____B. Place the following D/G loads back in service:

NOTE: Keep D/G load < 4400 kW continuous or 5200 kW for 2 hours. If maximum load limits become a problem, notify the SRO and decide which components may be removed from service safely.

_____1. Control building cleanup fan
_____2. Control building pressurizing fan
_____3. H_2 recombiner per SOI-83.1 if in service prior to loss of power.

_____c. The following D/G loads are sequenced on automatically following a blackout signal. Verify equipment operating or start as necessary to reestablish preloss of offsite power conditions:

NOTE: Watch total D/G loading closely.

_____1. ERCW Pumps (447 KW each)

_____2. CCS Pumps (261 KW each) and CCS booster pumps

IV. SUBSEQUENT OPERATOR ACTIONS (Cont'd)

_____3. CS Pumps (447 KW each)

_____4. Air Return Fans (37 KW each)

_____5. AFW Pumps (372 KW each)

_____6. PZR heaters (≅ 450KW/BANK)

_____D. Start (or verify) the following D/G loads as needed:

NOTE: Watch total D/G loading closely.

_____1. Control building MCR condensing unit

_____2. Control building EBR condensing unit

_____3. Auxiliary control air compressor

_____4. RHR Pump room cooler (verify)

_____5. SI Pump room cooler (verify)

_____6. CCP Pump room cooler (verify)

_____7. CS Pump room cooler (verify, if pump is running)

_____8. 125-V DC Vital Battery Chargers

_____9. Station Air Compressors

_____10. Emergency lighting cabinet

_____11. H_2 Recombiners

_____12. CCS and AFW Pump's area cooler

_____13. SD board room A/C chiller

_____14. SD board room el. 757 AHU

_____15. Electric board room AHU

_____16. Radiation monitor and sampling

_____17. D/G Starting Air Compressors

_____18. Vent Radiation Monitor

IV. SUBSEQUENT OPERATOR ACTIONS (Cont'd)

_____19. Control room A/C AHU

_____20. Spent Fuel Pit Cooling Pumps

_____21. Pipe chase cooler

_____22. Penetration rooms el. 692, 713, and 737 coolers.

_____23. Shutdown transformer room exhaust fans

_____24. Control building cleanup fans

_____25. El 772 board room pressure supply fans

_____26. El 772 board room AHU's

_____27. El 772 board room condenser units

_____28. El 772 board room A/C compressors

_____29. Control building battery room's el 692 exhaust fans

_____30. EGTS fans and heaters

_____31. ABGT System fans and heaters

_____32. EGTS room cooler

_____33. Shutdown board room A/C pressure fan

_____34. Control building pressure fans

_____35. Shutdown board room A/C CW pump

_____36. ERCW strainer

_____37. Boric acid transfer pump

_____38. Boric acid tank heater

_____39. Motor operated valves (480V Rx MOV Boards energized)

_____40. Charging pump auxiliary oil pump

_____41. 24 volt microwave battery charger

_____42. Diesel battery board exhaust fan

IV. SUBSEQUENT OPERATOR ACTIONS (Cont'd)

_____43. Diesel building exhaust fans

_____44. Diesel building fuel oil transfer pump

_____45. Diesel building lighting cabinet

_____46. D/G 125-VDC battery charger

_____47. Diesel engine day tank fuel transfer pump

_____48. D/G Room exhaust fan

_____49. ERCW pump station fan and heater

_____50. ERCW traveling screen and wash pump

_____51. Spent fuel pit pump area cooler

_____52. Diesel building electric heat

_____53. Fuel Handling Area Exhaust Fan (After ≅4 hours)

V. RECOVERY

Once the required loads are restarted to establish preloss of offsite power conditions, continue RCS cooldown in accordance with EOI-1A.

VI. REFERENCES

FSAR 6.3 (through Amendment 41)

SATURATION STEAM TABLE
(Temperatures rounded to nearest °F)

PSIG	Sat. Temp °F	50°F Subcooled	PSIG	Sat. Temp °F	50°F Subcooled
300	421	371	1350	584	534
350	435	385	1400	589	539
400	448	398	1450	593	543
450	459	409	1500	598	548
500	470	420	1550	602	552
550	480	430	1600	606	556
600	489	439	1650	610	560
650	497	447	1700	614	564
700	505	455	1750	618	568
750	513	463	1800	622	572
800	520	470	1850	626	576
850	527	477	1900	630	580
900	534	484	1950	633	583
950	540	490	2000	637	587
1000	547	497	2050	640	590
1050	552	502	2100	644	594
1100	558	508	2150	647	597
1150	563	513	2200	651	601
1200	569	519	2235	653	603
1250	574	524	2250	655	605
1300	579	529			

Temperatures read from hot leg W. R. RTD's or incore T/C's.

PZR HEATER AVAILABILITY

PR Htr's available as follows:

A-A, B-B & C.	1.	Manual/auto operation allowed 90 sec. after voltage is restored following blackout if SI is reset.
D.	1.	Manual/auto operation allowed following BO by resetting BO signal.
	2.	Manual/auto operation allowed following SI by resetting SI signal.

NATURAL CIRCULATION GUIDELINES

A. Guidelines to determine if natural circulation is taking place in the RCS under subcooled conditions.

_____1. Stabel ΔT of <55°F with a gradual decrease.

_____2. Determine core ΔT as follows:

_____a. Wide range RTD's (hot and cold legs) OR

_____b. Wide range RTD (cold legs) and incore T/C's.

_____3. Incore T/C's indicating below saturation temperature for the existing RCS pressure.

_____4. RCS heat being removed by secondary system:

_____a. S/G's steaming and water being added to S/G's.

_____b. Steam pressure near saturation for RCS temperature.

B. Guidelines to enhance natural circulation under subcooled conditions.

_____1. Keep S/G levels in narrow range (tubes covered), between 40% and 71% for post accident instrument error.

_____2. Keep RCS pressure above saturation pressure for the existing hot leg (W.R.) temperature or incore T/C temperature

_____3. Use steam dumps or S/G PORV's to cool RCS at desired rate.

If steam dump is necessary:

_____a. Reduce S/G pressure to 985 psig (200 psi below lowest S/G safety)

AND

_____b. Maintain RCS cooldown rate ≤ 50°F/HR., consistent with plant makeup capability.

NATURAL CIRCULATION

C. Actions to establish, maintain and monitor two-phase natural circulation:

NOTE: Maintain ECCS flow and monitor the incore T/C's closely.

_____1. Verify ECCS flow being delivered to the core (FI-63-170, 151, 20, 91A, and 92A). If not, operate equipment manually or locally.

_____2. Verify AFW flow being delivered to the S/G's. If not, operate equipment manually or locally.

_____3. Regulate AFW flow to the S/G's to maintain an indicated narrow range level between 40% and 71%.

_____4. Monitor the incore T/C temperatures to verify adequate core cooling.

_____5. If incore T/C's trend up, evaluate inadequate core cooling criteria and attempt to increase steam dump from the S/G(s).

INSTRUCTIONS TO RESTORE CORE COOLING DURING A SMALL LOCA
INADEQUATE CORE COOLING PROCEDURE (ICC)

A. PURPOSE

To specify precautions and actions to restore core cooling during a small LOCA.

B. INDICATION OF ICC

INADEQUATE CORE COOLING EXISTS WHEN:

COMPUTER AVAILABLE:

____ ____a. Five or more incore T/C's exhibit readings ≥ 1200°F.
YES NO

OR

COMPUTER NOT Available:

____ ____b. Hot leg RTD's pegged high
YES NO

OR

____ ____c. Five or more incore T/C's are off-scale above 700°F.
YES NO

AND

____ ____d. Less than one ECCS train delivering flow to RCS.
YES NO

AND

____ ____e. Less than two S/G's receiving AFW flow <400 gpm each
YES NO

C. ACTIONS

CAUTION: The RWST level should be (≅29% level) monitored for switchover to cold leg recirc. If required, go to step II.BB for instructions.

_____1. Throughout this instruction continue efforts to provide the following conditions. Operate equipment manually or locally, if required.

_____a. ECCS flow to the RCS.

_____b. Charging flow to the RCS.

_____c. Feedwater flow to the S/G's.

_____2. Depressurize and cool the RCS by:

CAUTION: Depressurization via the S/G's should be attempted only if there is an effective level and AFW or main feedwater is available.

_____a. steam dump to the condenser, or

_____b. If the condenser is not available, dump steam with the S/G PORVs.

_____3. Monitor incore T/C's to determine effectiveness of actions.

_____a. Verify secondary heat sink operable

_____(1) S/G water level on narrow range ≥ 41%.

_____(2) AFW system operable.

_____(3) Main Condenser steam dumps operable.

_____(4) S/G PORV(s) operable or

_____b. With adequate core cooling established and secondary heat sink operable terminate the use of this Appendix and return to EOI-1A step H.

_____4. Open the PZR PORV's only if:

_____a. ECCS is available to deliver to the RCS.

_____b. RCS depressurization cannot be accomplished by S/G steam relief.

_____c. Feedwater is not available to maintain the S/G water level.

INSTRUCTIONS TO RESTORE CORE COOLING
DURING A SMALL LOCA (Cont'd)

_____5. Monitor incore exit T/C's to determine effectiveness of actions.

_____6. Reestablish secondary heat sink by:

_____a. Establishing AFW flow

_____b. S/G level on narrow range $\geq$ 41%.

_____c. Main Condenser operable or

_____d. S/G PORV(s) operable.

_____7. With adequate core cooling established and secondary heat sink operable:

_____a. Close the PZR PORV(s).

_____b. Verify PZR PORV(s) closed (light positions and acoustic monitoring)

_____c. Then terminate use of this Appendix and return to EOI-1A step H.

_____8. If no means for RCS depressurization is available, or the depressurization did not result in decreasing incore T/C temperatures, then start an RCP.

_____a. Verify ECCS flow, and AFW flow

_____b. Maintain RCP operation

_____c. Leave RCP(s) in operation until joint SRO and administrative decision is made to stop RCP(s).

Date_____

COLD LEG RECIRCULATION VERIFICATION

NOTE: Requires verification by initials.

A.___ A-A RHR pump is delivering.

1.___ From recirculation sump directly to two RCS cold legs.

a.____ FCV-63-72 open
b.____ FCV-74-3 closed
c.____ FCV-63-93 closed
d.____ FI-63-91 _____ GPM (To C.L.)

2.____ FCV-62-98 and 99 closed

3.____ To two centrifugal charging pumps; FCV-63-8 Open

4.____ To the suction of SI pumps.

a.____ FCV-63-8 open
b.____ FCV-63-6 open
c.____ FCV-63-7 open

B.____ B-B RHR pump is delivering:

1.____ From the recirculation sump directly to two RCS cold legs.

a.____ FCV-63-73 open
b.____ FCV-74-21 closed
c.____ FCV-63-94 open
d.____ FI-63-92 _____ GPM (To C.L.)

2.____ To the suction of SI pumps; FCV-63-11 open

3.____ To two CCPs (via SI Pumps suction)

a.____ FCV-63-11 open
b.____ FCV-63-6 open
c.____ FCV-63-7 open

C.____ The SI Pumps and CCPs are:

1.____ Taking suction from the RHR pumps

a.____ FCV-63-11 open
b.____ FCV-63-8 open
c.____ FCV-63-6 open
d.____ FCV-63-7 open

COLD LEG RECIRCULATION
VERIFICATION (Cont'd)

2.____ Are delivering to four RCS cold legs.

a._____ FCV-63-39 open
b._____ FCV-63-40 open
c._____ FCV-63-25 open
d._____ FCV-63-26 open
e._____ FI-63-170 _____ GPM (To C.L. thru BIT)
f._____ FCV-63-22 open
g._____ FI-63-20 _____ GPM (from SI Pump B-B)
h._____ FI-63-151 _____ GPM (from SI Pump A-A)

D.____ The suction from the RWST to all ECCS Pumps are isolated:

a.____ FCV-62-135 closed
b.____ FCV-62-136 closed
c.____ FCV-63-5 closed
d.____ FCV-63-1 Closed

E.____ If containment spray is required, verify flow being delivered.

1.____ FI-72-34 _____ GPM
2.____ FI-72-13 _____ GPM

CONTINGENCY ACTIONS

_____1. IF a Containment Recirc Sump Valve Fails to Open, stop the corresponding RHR pump and verify that:

_____A. One RHR pump is delivering flow to two RCS cold legs and to the suction of two SI pumps and two CCP's.

AND

_____B. The two SI pumps and two CCP's are delivering to four RCS cold legs.

2. Loss of One Train of Electrical Power

A. If the single active failure is the failure of one of the D/G's to start in conjunction with a LOCA and a loss of offsite power, electrical power would not be available to one of the shutdown busses. As a consequence, all ESF equipment assigned to that corresponding electrical power train would not be available for operation until power could be restored. The instruction for switchover to cold leg recirculation, assuming a train failure, is essentially the same as the instruction which assumed no single failures. Follow the no single failures instruction starting with step T, with the understanding that those valves, without power, do not have to be repositioned.

It should be noted that if a train failed subsequent to the initiation of the SI signal additional steps may be required. For example, if no failure is assumed, the parallel suction valves in the line from the RWST to the charging pump suction header would open on a SI signal. Should a subsequent failure of one of the electrical trains occur, one of the parallel suction valves could not be closed from the main control room. Therefore, positive isolation of the RWST to charging pump suction path would have to be accomplished locally, (FCV-62-135 OR 136 auxiliary building El. 692 through double doors next to turbine drive AFW pump room).

EQUIPMENT AVAILABILITY EVALUATION FOLLOWING A LOCA AND SAMPLING FOLLOWING A LOCA

NOTE: Use appropriate SOI's to assist in equipment evaluation.

1. _____ Verify centrifugal charging pump availability.
2. _____ Verify safety injection pump availability.
3. _____ Verify RHR pump availability.
4. _____ Verify ECCS recirculation system availability.
5. _____ Verify containment vent isolation equipment availability.
6. _____ Verify containment Phase "A" isolation equipment availability.
7. _____ Verify containment Phase "B" isolation equipment availability.
8. _____ Verify D/G availability
   a. _____ Fuel supply adequate
   b. _____ Starting air system operable
9. _____ Verify auxiliary feedwater system availability.
10. _____ Verify shutdown board system availability.
11. _____ Verify RCP availability.
12. _____ Verify Containment upper and lower cooler availability.
13. _____ Verify CRDM cooler availability.
14. _____ Verify containment spray equipment availability.
15. _____ Request sampling of containment atmosphere.
16. _____ Request sampling of RCS for:
    a. Boron concentration
    b. Fuel damage
    c. pH

Date_____

HOT LEG RECIRCULATION VERIFICATION

NOTE: Requires verification by initials.

A._____ One RHR pump in H. L. recirculation, Train _____

Train A

1._____ FCV-63-93 closed
2._____ FCV-74-35 closed
3._____ FCV-74-33 open
4._____ FCV-63-172 open
5._____ FI-63-173 _____GPM (To. H.L.)
6._____ FCV-74-16 open

Train B

1._____ FCV-63-94 closed
2._____ FCV-74-33 closed
3._____ FCV-74-35 open
4._____ FCV-63-172 open
5._____ FI-63-173 _____ GPM (To H.L.)
6._____ FCV-74-28 open

B._____ The other RHR pump in C. L. recirculation, Train_____

Train A

1._____ FCV-63-72 open
2._____ FCV-74-3 closed
3._____ FCV-63-93 open
4._____ FI-63-91 _____ GPM (To C.L.)
5._____ FCV-74-16 open

Train B

1._____ FCV-63-73 open
2._____ FCV-74-21 closed
3._____ FCV-63-94 open
4._____ FCV-63-92 _____GPM (To C.L.)
5._____ FCV-74-28 open

C._____ Two SI pumps in H. L. recirculation

1._____ FCV-63-152 closed
2._____ FCV-63-156 open
3._____ FI-63-151 _____ GPM (To H.L.)
4._____ FCV-63-153 closed
5._____ FCV-63-157 open
6._____ FI-63-20 _____ GPM (To H.L.)

WATTS BAR NUCLEAR PLANT

EMERGENCY OPERATING INSTRUCTIONS

EOI-2

LOSS OF SECONDARY COOLANT

PARTS OF THIS INSTRUCTION REQUIRE DOCUMENTATION

Rev. By	Rev. No.	Date	Revised Pages
CRC	1	6/10/81	All

The last page of this instruction is number 20.

1C	Plant Master File
	Acting Plant Superintendent
	Assistant Superintendent
	Mechanical Maintenance Supervisor
1U	Results Supervisor
1C&1U	Operations Supervisor
1C	Quality Assurance Supervisor
1C	Health Physicist
	Management Services Supervisor
	Chemical Laboratory
	Instrument Shop
1C	Shift Engineer's Office
2C	Unit Control Room
	Health Physics Laboratory
	PSU Supervisor
	Mechanical Engineer
	Reactor Engineer
	Chemical Engineer
	Instrument Maintenance Supervisor
1U	Asst. Director of Nuc Power (Oper)
	Electrical Maintenance Supervisor
	Plant Services Supervisor
	Outage Director
	Administrative Services Supervisor
	Document Control Supervisor
1C	Nuclear Safety Review Staff
1U	NRC
1C	Nuc Pr Training Center
1U	Plant Training Office
1U	Supv., Reactor Systems Group

Prepared By Richard Cook

Submitted By [signature] Supervisor

PORC Review 6-10-81 Date

Approved By [signature] Superintendent

Date Approved 6-10-81

PURPOSE

The objectives of these instructions are to:

1. Establish stabilized RCS and S/G conditions prior to plant cooldown.

2. Minimize the energy release by isolating the break where possible.

3. Prevent PZR safety valves from lifting by dumping steam from all S/G's to the condenser when possible, or to the atmosphere from the unaffected S/G's.

4. Isolate AFW to the faulted S/G, maximize AFW flow to the intack S/G's to minimize the energy release.

5. Borate the RCS to establish and maintain shutdown margin.

I. IMMEDIATE OPERATOR ACTIONS

Refer to Immediate Operator Actions of EOI-0, Immediate Actions and Diagnostics, if not already performed.

II. MANUAL ACTIONS:

____ A. Verify steamline isolation. If not actuated, manually initiate steamline isolation.

III. SUBSEQUENT OPERATOR ACTIONS

NOTE: Use redundant instrument channels, where available, to monitor behavior of plant processes while performing this instruction. Use PAM instrumentation where provided.

____ A. Monitor the RCS pressure:

____ 1. If RCS pressure stabilizes above the SI pump shut-off head (≅1500 psig):

CAUTION: Following SI reset automatic SI reinitiation will not occur since the reactor trip breakers have not been reclosed.

CAUTION: Subsequent to this step, should loss of offsite power occur, manual SI initiation will be required to load safeguards equipment onto the diesel powered shutdown boards.

____ a. Manually reset SI.

____ b. Ensure CNTMT isolation is maintained.

____ c. Stop the RHR pumps.

____ d. Place the RHR pumps in standby.

____ e. Request performance of SI-4.3.1.1.1.-22.c to verify P-4 contact position if unable to reset the SI signal (failure of P-4 contacts will prevent reset of SI signal).

____ 3. If the PZR PORV(s) open at any time during this transient:

____ a. Verify the PORV(s) reclose when pressure drops below ≅2335 psig.

____ b. If any PZR PORV does not reclose:

____ 1) Isolate it using the appropriate block valve.

____ 2) If the PORV is open and cannot be isolated, go to EOI-1.

III. SUBSEQUENT OPERATOR ACTIONS (Cont'd)

_____B. If conditions 1 or 2 below exist, stop all RCP's and maintain seal injection. Stop all RCP's after high head safety injection pump operation has been verified and when the wide range RCS pressure decreases <1500 psig.

_____1. Within 5 minutes after Phase B isolation (loss of motor bearing cooling)

or

_____2. After the high head ECCS pump operation has been verified and if RCS pressure decreases below ~1500 psig.

_____3. Monitor conditions for stopping the RCP's periodically during this instruction.

_____4. See Appendix "A" for natural circulation guidelines.

_____C. Determine which S/G(s) is affect and:

_____1. Observe each S/G pressure.

_____2. A low S/G pressure compared to the other S/G denotes a faulted loop.

_____3. Terminate AFW to that depressurized or depressurizing S/G.

_____4. If all S/G's are depressurized or depressurizing, the AFW must not be terminated to any S/G until faulted loop is identified.

_____D. If no S/G has low pressure compared to the others and all MSIV's are closed:

_____ ___ 1. Determine if a break has occurred in the steamline or
Yes no

_____ ___ 2. In the main feedline or
Yes no

_____ _____ 3. In any system that connects with the secondary system.
Yes no

_____E. If no indication of a secondary break is found, go to Section III of EOI-0 and re-evaluate the accident with emphasis on LOSS OF REACTOR COOLANT.

_____F. If a secondary leak is found, continue to follow these instructions.

III. SUBSEQUENT OPERATOR ACTIONS (cont'd)

_____G. Monitor S/G's PORV operation: (Breaks in the area of S/G PORV's may cause their failure in the open position).

1. If a S/G PORV fails open, isolate if possible.

2. If unable to isolate, close AFW sypply to affected S/G.

_____H. If level in the non-faulted S/G's is in the narrow range span, regulate AFW flow to those S/G's to maintain level.

_____1. If break is inside CNTMT, maintain S/G level between 40% and 71% on narrow range for possible instrument error.

_____2. If S/G water level increases in an unexplained manner in one S/G, go to EOI-3, "S/G TUBE RUPTURE".

_____I. Monitor AFW pump water supply (condensate storage Tank):

_____1. Verify switchover to ERCW of level drops ≅6" (LI-2-230A & 233A).

_____2. If auto, switchover does not occur, manually switch over.

_____J. Monitor the RWST level:

_____1. If CS was actuated, and IF CNTMT pressure is reduced to near normal pressure (-0.1 to +0.3 psid):

_____a. Reset CS signal (HS-72-42 & 43 on M-6).

_____b. Stop CS pumps and place in standby mode, with operable flow paths.

_____2. Leave the ECCS pumps aligned to the RWST.

_____3. If the RWST low level alarm (≅29%) is reached:

_____a. Reset SI (HS-63-134A & 134B on M-6).

_____b. If RCS pressure is above the shutoff head of the SI pumps (≅1500 psig):

_____1) Stop the SI pumps

_____2) Place in a standby mode prior to transfer to cold leg recirc.

III. SUBSEQUENT OPERATOR ACTIONS (cont.)

_____c. Realign all ECCS pumps to cold leg recirc mode using procedure in Appendix C.

_____d. If the CS pumps are operating:

_____1) Reset containment spray signal (HS-72-42 & 43 on M-6).

_____2) Realign CS pumps to the recirc mode using procedure in Appendix B.

_____K. Monitor PZR pressure & level for CCP protection:

_____ _____ 1. If PZR pressure is ≥ 2235 psig, AND
Yes no

_____ _____ 2. PZR level is ≥ 70% and increasing AND
Yes no

_____ _____ 3. SI termination criteria is not met
Yes no

4. Reset the SI signal (HS-63-134A and 134B on M-6) AND

5. Open CCP mini-flow valves only, (HS-62-98 & 99).

CAUTION: Should RCS temperature decrease below NDTT for the RX vessel, do not allow pressure to increase above required pressure - temperature limits in TI-4, Part I, Figure A-9.

_____L. Monitor the following SI termination throughout this procedure.

NOTE: If all S/G's are depressurized or depressurizing, the ECCS flow must not be terminated until the faulted S/G is identified.

TERMINATE SI IF:

_____1. CRITERIA IF COOLED DOWN ≤ 350°F

_____ _____ a. One wide range RCS temperature T_H confirmed by incore T/C's
Yes no

AND

_____ _____ b. RCS pressure >700 psig and stable or increasing.
Yes no

AND

_____ _____ c. PZR level > 20% and rising.
Yes no

AND

III. SUBSEQUENT OPERATOR ACTIONS (cont.)

____ ____ d. RCS subcooling > 40°F
Yes no

AND

____ ____ e. AFW isolated to all depressurized S/G's and at least 880 GPM is injected into non-faulted S/G's
Yes no

OR

____ ____ Narrow range level > 40% in at least one non-faulted S/G.
Yes no

____ f. If all wide range RCS temperature indicators go above 350° F when attempting to satisfy the conditions of L1:

____ (1) Initiate SI manually

____ (2) Continue operation until conditions of L.2 or L.3 are met.

OR

____ 2. CRITERIA FOR BREAK OUTSIDE CONTAINMENT

____ ____ a. All wide range RCS temperature T_H are >350°F.
Yes No

AND

____ ____ b. Cntmt pressure, radiation AND recirc sump levels do not exhibit abnormally high or increasing readings
Yes No

AND

____ ____ c. RCS pressure >2000 psig and stable or increasing,
Yes No

AND

____ ____ d. PZR level > 20%.
Yes no

AND

____ ____ e. The RCS indicated subcooling > 40°F.
Yes no

AND

____ ____ f. AFW isolated to all depressurized S/G's and at least 880 GPM is injected into the non-faulted S/G(s)
Yes no

OR

____ ____ Indicated wide range S/G water level in at least one non-faulted S/G is ≥ 76% (above the top of the S/G U-tubes)
Yes no

III. SUBSEQUENT OPERATOR ACTIONS (cont'd)

_____g. If CNTMT pressure, radiation, or recirc sump level exhibit either abnormally high or increasing readings when attempting to satisfy the conditins of L.2 above:

____ (1) Initiate SI manually

____ (2) Continue operation until the following conditions are met.

OR

_____3. CRITERIA FOR BREAK INSIDE CONTAINMENT

____ ____ a. All wide range RCS temperature T_H > 350°F.
Yes No

AND

____ ____ b. CNTMT pressure, radiation, or recirc sump level exhibit
Yes No abnormally high or increasing readings.

AND

____ ____ c. RCS pressure > 2000 psig and stable or increasing.
Yes No

AND

____ ____ d. PZR level > 50%.
Yes no

AND

____ ____ e. RCS indicated subcooling > 40°F.
Yes no

AND

____ ____ f. AFW isolated to all depressurized S/G's and at least
Yes no 880 GPM is injected into the non-faulted S/G(s)

OR

____ ____ Indicated narrow range S/G level in at least one non-faulted
Yes no S/G > 40%.

THEN

_____4. Reset SI and stop ECCS pumps not needed for normal charging and RCP seal injection.

III. SUBSEQUENT OPERATOR ACTIONS (Cont'd)

_____5. Monitor the RCS for Manual SI Reinitation Criteria:

MANUALLY REINITIATE IF: (HS-63-133A or 133B on M-4 & M-6)

____ ____ a. Wide range RCS pressure decreases by 200 psi.
Yes No

OR

____ ____ b. PZR level decreases by 10% from the point of SI termination.
Yes no

OR

____ ____ c. RCS subcooling drops below 40°F.
Yes No

_____d. Go to EOI-0 to rediagnose the event if SI is re-initiated.

____ 6. Place all non-operating ECCS pumps in stand-by and maintain operable flowpaths.

____ 7. Establish normal charging and then isolate flow to the RCS cold legs via the BIT. While re-establishing:

_____a. Monitor RCS for loss of inventory.

_____b. Monitor radiation monitors for increasing levels.

_____c. Should leakage occur when re-establishing charging and letdown:

_____1) Isolate charging and letdown

_____2) Place excess letdown in service and charge through the RCP seals or BIT as needed.

_____d. Reset Phase "A" containment isolation (HS-30-63D & 63E on M-6)

_____e. Re-establish normal makeup to maintain system pressure: (See SOI-62 for re-establishing makeup)

_____(1) At values reached when SI was terminated ($T_H \leq$ 350°F).

OR

_____(2) To a nominal value of 2000 psig ($T_H \geq$ 350°F)

III. SUBSEQUENT OPERATOR ACTIONS (Cont'd)

_____(3) Determine boron concentration of RCS and set boric acid flow controller.

_____8. Verify sufficient PZR level and re-establish operation of the PZR heaters:

_____a. Compare PZR surge line, water & vapor space temperatures (TI-68-318, 319 & 324).

_____ _____ b. Maintain PZR level between 50% & 70% for instrument error
Yes N/A if break is inside containment.

_____c. Restore normal PZR level control when RCS pressure can be controlled by PZR heaters and CNTMT temperatures are low enough to assure proper operation of control system.

_____ _____ 9. After the level in the non-faulted S/G's has been restored
Yes N/A to the narrow range span, regulate AFW flow to maintain an indicated narrow range level of ≥ 41% if break is inside containment.

_____M. Monitor the RCS temperature for a subcooling margin ≥ 50°F by verifying RCS temperature is at least 50°F less than saturation for RCS pressure.

_____1. Monitor the average temperature indication incore T/C's.

OR

_____2. All wide range RCS temperature T_H.

_____ _____3. With < 50°F subcooling, initiate secondary system cooling:
<50° N/A

_____a. Establish a flow path to the condenser in at least one intact steamline in, IF:

_____(1) Main condenser is available

AND

_____(2) An uncontrolled steam release will not occur upon opening the MSIV(s).

_____b. Transfer the steam dump system to "pressure" mode.

_____c. Set PIC-1-33 control setpoint to the pressure in the intact S/G(s) at the time SI is terminated.

_____d. Close steam seal supply valve 1-560.

III. SUBSEQUENT OPERATOR ACTIONS (Cont'd)

____ e. Open the intack S/G(s) MSIV bypass warming valves.

____ f. With MSIV differential pressure less than 90 psi, open MSIV(s) on intact S/G(s).

____ g. With conditions stabalized, establish main turbine seals and vacuum per GOI-2.

OR

____ 4. If the main condenser can not be used as the heat sink (i.e. leak downstream of MSIV's):

____ a. Dump steam to atmosphere from the intack S/G's PORV's:

____ b. Set S/G PORV's setpoint to the pressure in the intack S/G's at the time SI is terminated.

____ 5. If ≥ 50°F subcooling cannot be established or maintained:

____ a. Then Manually Reinitiate SI.

____ b. GO to Section III of EOI-0 to re-evaluate the event, unless this re-evaluation has already been performed.

____ N. Refer to IP-1 and implement the REP relative to steam line break and ECCS actuation.

____ O. Shutdown D/G's as soon as possible after plant conditions stabilize.

____ 1. Remove D/G's from service per SOI-82 ("shutdown after emergency start."

____ 2. Place D/G's in standby mode per SOI-82.

____ P. Verify control room vent isolation (See SOI-31.1B).

____ Q. Verify U-2 CNTMT equipment hatch temporary door closed (El 757).

____ R. Verify Fuel handling floor equipment transfer hatch cover in place (El. 757 to lower elevations).

____ S. Place additional CRDM cooling fans and lower CNTMT cooling fans in service if break is inside CNTMT and Phase B isolation has not yet occurred.

____ T. Transfer NR-45 to 1SR and 1 IR detector.

III. SUBSEQUENT OPERATOR ACTIONS (Cont'd)

_____U. When the RCS temperature and pressure are stable, borate the RCS to cold shutdown conditions.

____ ___ V. With offsite power available:
Yes no

_____1. Establish systems necessary for a controlled cooldown to Mode 5.

_____2. If CNTMT pressure is reduced to near-normal, reset Phase B CNTMT isolation (HS-30-64D and 64E, Pnl M-6) to allow CCS to be returned to RCP oil coolers.

_____3. If no RCP's are running restart at least one RCP preferable in loop 2 or if not available, loop 1 (PZR spray) for cooldown purposes in accordance with procedures.

_____4. Maintain RCS subcooling conditions consistent with normal cooldown curve.

_____5. If subcooling cannot be maintained, restart ECCS pumps.

_____W. After establishing operations of auxiliary systems:

_____1. Initiate a controlled cooldown and depressurization to Mode 5 using normal cooldown procedures.

_____2. Reinitiate SI if an uncontrolled RCS depressurization or uncontrolled drop in PZR level occurs during cooldown.

NOTE: These criteria apply in lieu of those given in Step L.

_____3. Do not trip the RCP's when pressure is decreased below 1500 psig as previously required in Step C.

_____4. Monitor S/G's AND IF there is significant radioactivity in one or more S/G's secondary side:

_____a. Immediately isolate the S/G(s)

_____b. If S/G's with significant radioactivity cannot be isolated THEN

III. SUBSEQUENT OPERATOR ACTIONS (Cont'd)

____c. Begin cooldown and depressurization of the RCS to limit the release of radioactivity to the environs.

____X. Request the Chem. Lab. to initiate SI-4.11.2.B & W.

____Y. Recovery procedures for a particular event will be developed and implemented to effect plant return to service.

APPENDIX A

NATURAL CIRCULATION

OPERATIONAL GUIDELINES

_____A. Guidelines to determine if RCS natural circulating is taking place.

_____1. Stable ΔT with values <55°F and gradually decreasing.

_____2. Determine core ΔT as follows:

_____a. Wide range RTD's (hot -vs- cold legs)

OR

_____b. Wide range RTD's (cold legs) -vs- incore T/C's.

_____3. Incore T/C's indicating < saturation temperature for existing pressure.

_____4. RCS heat being removed by secondary system:

_____a. S/G's steaming and water being added to S/G's.

_____b. Steam header pressure near saturation for the RCS temperature.

_____B. To enhance natural circulation.

_____1. Keep S/G levels in narrow range (tubes covered), between 40% and 71% for post accident instrument error.

NOTE: When cooling down during natural circulation and it becomes desirable to depressurize the RCS, use the 5 incore T/C's reflecting vessel upper head temperature. Then base the RCS pressure reduction on an average of these to prevent reaching saturation in the upper head area.

_____2. Keep RCS above saturation pressure for the existing hot leg (WR) or incore T/C temperature.

_____3. Use steam dump or S/G PORV's to steam off and cool RCS.

Date _____

APPENDIX B

CONTAINMENT SPRAY SWITCHOVER TO RECIRCULATION MODE

A.____ With low RWST level alarm (< 29%) and CS pumps running, reset CNTMT spray with HS-72-42 and 72-43 THEN:

1.____ Stop both CS pumps and "pull to lock".

2.____ Close CS pumps' RWST suction valves:

a.____ Close FCV-72-22 CS pump A-A (1 minute)

b.____ Close FCV-72-21 CS pump B-B (1 minute)

3. Open ERCW valves (Panel M-27A):

a.____ Open FCV-67-125, CS HX A outlet (1 min)

b.____ Open FCV-67-126, CS HX A outlet (1 min)

c.____ Open FCV-67-123, CS HX B inlet (1 min)

d.____ Open FCV-67-124, CS HX B outlet (1 min)

4.____ Open CS pumps' CNTMT sump header suction valves:

a.____ Open FCV-72-44, CS pump A-A (1 min)

b.____ Open FCV-72-45, CS pump B-B (1 min)

CAUTION: If a CS pump suction valve from sump section header will not open, do not restart the corresponding pump.

5.____ Observe CS pumps' suction from CNTMT sump open. (Step 4)

6.____ Start CS pump A-A

7.____ Start CS pump B-B

8.____ Verify ≥ 4500 gpm flow on CS pump A-A (FI-72-34)

9.____ Verify ≥ 4500 gpm flow on CS pump B-B (FI-72-13)

Date _____

APPENDIX C

COLD LEG RECIRCULATION SWITCHOVER INSTRUCTIONS

I. OPERATIONAL STEPS

A.____ While auto switchover to recirc mode is in progress, establish CCS water flow to RHR heat exchangers:

NOTE: During a loss of power train situation it may be necessary to throttle back on the unaffected unit's CCS water.

1.____ Open the following CCS valves: (Panel M-27B).

a.____ Open FCV-70-156, RHR Hx. A outlet (60 sec. to full open).

b.____ Open FCV-70-153, RHR Hx. B outlet (60 sec. to full open).

2.____ Monitor the ECCS pump operation.

a.____ Verify all ECCS pumps operating.

b.____ Verify the SI pumps are delivering to the RCS cold legs.

c.____ If the SI pumps are not delivering flow to the RCS due to the RCS pressure being higher than the SI pump discharge pressure, Stop the SI pumps.

B.____ Guidelines for the changeover operation to recirc mode:

NOTE: With break inside containment concentration of boron will be lower than normal-may need to borate.

1. Perform actions expeditiously, in a precise, orderly sequence.

2. Do not interrupt changeover operation until all actions are complete.

3. If a valve fails to respond or to complete its demanded operation, postpone corrective action until subsequent steps are performed except as noted.

4. Loss of one complete train of powr will allow the other train to be swapped, parallel valves required to be closed will require one valve be closed locally.

5. See Step III for contingency actions.

Date _____

APPENDIX C

I. OPERATIONAL STEPS (Cont'd)

C. Automatic switch-over from injection to recirc mode is initiated when the RWST is at low level, ≅29%, (120,000 gal.) coincident with a CNTMT sump level of ≅10%.

NOTE: Times provided in subsequent steps are times for valves to travel full stroke.

CAUTION: If sump valve cannot be opened, stop corresponding RHR pump.

1.____ - Verify FCV-63-72 (A-A) and -73 (B-B), RHR pumps' suction from containment sump, start to open while RHR pumps continue to run. (40 sec.)

2.____ Verify FCV-74-3 and -21, RHR pumps suction from RWST start to close. (2 min.)

D. Begin manual switch-over operations upon verification that automatic switchover has begun.

CAUTION: Immediately stop any pumps taking suction from the RWST on indication of the RWST being empty. Complete the switchover steps listed below, then restart required pumps.

NOTE: Each handswitch requiring manual positioning is identified by a colored number representing each step in numerical sequence.

1.____ Close the SI pumps' miniflow valves.

a.____ FCV-63-4, pump A-A (10 sec.)
b.____ FCV-73-175, pump B-B (10 sec.)
c.____ FCV-73-3, common (10 sec.)

2.____ Close the two RHR Hx bypass valves.

a.____ FCV-74-33, pump A-A (40 sec.)
b.____ FCV-74-35, pump B-B (40 sec.)

3.____ Open the CCP - SI pump common suction parallel valves.

a.____ FCV-63-6 (10 sec.)
b.____ FCV-63-7 (10 sec.)

4.____ Open the valve from each RHR pump discharge to the CCP's and SI pump suction.

a.____ FCV-63-8, RHR Pump A-A to CCP's and SI pumps (10 sec.)
b.____ FCV-63-11, RHR pump B-B to SI pumps (10 sec.)

Date _____

I. OPERATIONAL STEPS (Cont'd)

NOTE: To open FCV-63-8 & 11; FCV-63-3, 4, & 175 must be closed.

5.____ All ECCS pumps are now aligned with suction from CNTMT sump. Verify proper operation and alignment of all ECCS components. Complete the following to provide redundant isolation of the RWST from the recirc water.

6.____ Reset the SI and close the parallel valves from the RWST to the CCP's.

a.____ FCV-62-135 (10 sec.)
b.____ FCV-62-136 (10 sec.)

7.____ Restore power and close the valve in the common line from the RWST to both RHR pumps FCV-63-1 (2 min.) (RX MOV Bd.A1-A).

8.____ Close SI pumps' suction from RWST, FCV-63-5 (2 min)

9.____ Periodically check area radiation monitors for detection of leakage from ECCS:

a. If significant leakage has been identified in the ECCS, attempt to isolate.

b. Maintain recirc flow to the RCS at all times.

10. While the plant is in cold leg recirc mode, make provisions for an evaluation of plant equipment.

II. VERIFICATION

A. After completing the preceding steps, verify the ECCS is aligned for cold leg recirc:

1.____ A-A RHR Pump is delivering:

a.____ From CNTMT SUMP to two RCS cold legs.

1)_____ FCV-63-72 open
2)_____ FCV-74-3 closed
3)_____ FCV-63-93 open
4)_____ FI-63-91 _____ GPM (To C.L.)
5)_____ FCV-74-16 open

b. To the suction of SI Pumps

1)___ FCV-63-8 open
2)___ FCV-63-6 open
3)___ FCV-63-7 open

Date _____

II. VERIFICATION (Cont'd)

c. To centrifugal charging pumps

1)_____ FCV-63-8 open

2.____ B-B RHR Pump is delivering:

a. From CNTMT sump to two RCS cold legs.

1)____ FCV-63-73 open
2)_____ FCV-74-21 closed
3)_____ FCV-63-94 open
4)_____ FI-63-92 _____ GPM (To C.L.)
5)_____ FCV-74-28 open

b. To the CCP's

1)_____ FCV-63-11 open
2)_____ FCV-63-6 open
3) _____ FCV-63-7 open

c.____ To the SI Pumps, FCV-63-11 open

3. Two SI pumps and two CCP's are delivering the four RCS cold legs:

a)____ FCV-63-39 open
b)____ FCV-63-40 open
c)____ FCV-63-25 open
d)____ FCV-63-26 open
e)____ FI-63-170 _____ GPM (CCP's thru BIT)
f)_____ FCV-63-22 open
g)_____ FI-63-20 _____ GPM (SI pump B-B)
h)_____ FI-63-151 _____ GPM (SI pump A-A)

4.____ Suction paths from RWST to all ECCS pumps are isolated.

a._____ FCV-62-135 closed
b._____ FCV-62-136 closed
c._____ FCV-63-5 closed
d._____ FCV-63-1 closed

5.____ If containment spray is required, verify flow:

a.____ FI-72-34 _____ GPM
b._____ FI-72-13 _____ GPM

B. If any failures have occurred, proceed to contingency actions.

Date _____

III. CONTINGENCY ACTIONS (Cont'd)

b._____ The SI Pumps are delivering to four RCS cold legs:

1)_____ FCV-63-22 open
2)_____ FI-63-20 _____ GPM
3)_____ FI-63-151 _____ GPM

c._____ The CCP's are delivering to four RCS cold legs:

1)_____ FCV-63-39 open
2)_____ FCV-63-40 open
3)_____ FCV-63-25 open
4)_____ FCV-63-26 open
5)_____ FI-63-170 _____ GPM

B. LOSS OF ONE TRAIN OF ELECTRICAL POWER

If the single active failure is the failure of one of the D/G's to start in conjunction with a LOCA and a loss of offsite power, electrical power would not be available to one of the SD boards. Consequently, all ESF equipment assigned to that power train would not be available for operation until power is restored. The instruction for switchover to cold leg recirculation, assuming a train failure, is essentially the same as the instruction, which assumed no single failures. The operator could follow the instruction which assumed no single failure, with the understanding that those valves, without power, do not have to be repositioned.

It should be noted that if a train failed subsequent to the initiation of the SI signal, additional steps may be required. For example, if no failure is assumed, the parallel suction valves from the RWST to the CCP's would open on a SI signal. Should a subsequent fialure of one of the electrical trains occur, one of the valves could not be closed from the main control board. Therefore, isolation of the RWST to CCP's suction path would have to be accomplished locally. (FCV-62-135 or 136 auxiliary building el. 692 through double doors next to turbine driven AFW Pumps room).

WATTS BAR NUCLEAR PLANT

EMERGENCY OPERATING INSTRUCTIONS

EOI-3

STEAM GENERATOR TUBE RUPTURE

Unit 1 or 2

Rev. By	Rev. No.	Date	Revised Pages
CRC	1		All

The last page of this instruction is number 12.

1C	Plant Master File
	Acting Plant Superintendent
	Assistant Superintendent
	Mecnanical Maintenance Supervisor
1U	Results Supervisor
1C&1U	Operations Supervisor
1C	Quality Assurance Supervisor
1C	Health Physicist
	Management Services Supervisor
	Chemical Laboratory
	Instrument Shop
1C	Shift Engineer's Office
2C	Unit Control Room
	Health Physics Laboratory
	PSU Supervisor
	Mechanical Engineer
	Reactor Engineer
	Chemical Engineer
	Instrument Maintenance Supervisor
1U	Asst. Director of Nuc Power (Oper)
	Electrical Maintenance Supervisor
	Plant Services Supervisor
	Outage Director
	Administrative Services Supervisor
	Document Control Supervisor
1C	Nuclear Safety Review Staff
1U	NRC
1C	Nuc Pr Training Center
1U	Plant Training Office
1U	Supv., Reactor Systems Group

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PORC Review 6-10-81
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Date Approved 6-10-81

STEAM GENERATOR TUBE RUPTURE

PURPOSE:

The objectives of this instruction are:

1. To minimize release of radioactive material by identifying and isolating the faulted S/G and by reducing RCS pressure below the lowest S/G safety valve setting.

2. To establish capability to supply feedwater to all intact S/G's and isolate feedwater to the faulted S/G.

3. To remove the necessary residual heat from the reactor through the intact S/G's via the steam dump or S/G PORV's.

4. To maintain the RCS subcooled during the recovery.

5. To prevent overflooding the faulted S/G.

STEAM GENERATOR TUBE RUPTURE

I. IMMEDIATE ACTIONS

Refer to immediate actions of EOI-0, "Immediate Actions and Diagnostics," if not already performed.

II. SUBSEQUENT OPERATOR ACTIONS

NOTE: Use redundant instrument channels, where available, to monitor proper behavior of plant processes while performing this instruction. Use PAM instrumentation where provided.

_____A. Identify the faulted S/G by one or more of the following methods:

_____1. Unexpected rise in one S/G level with feedwater flow reduced or stopped.

_____2. High radiation from any one S/G blowdown line radiation sample monitor.

_____3. High radiation from any one S/G blowdown line, as determined by analysis or portable radiation detector.

_____ _____ B. When the faulted S/G has been identified:
Yes no

CAUTION: Do not initiate RCS cooldown (Step L) until the faulted S/G is isolated.

_____1. Stop all feedwater flow to the faulted S/G.

_____2. Close the MSIV and bypass associated with the faulted S/G.

_____3. Verify closure of PORV associated with the faulted S/G, and place applicable handswitch to "close".

_____ _____ 4. Close the associated MOV in the steam supply to the AFW pump
Yes no from the faulted S/G (if applicable).

_____a. S/G #1 FCV-1-15

or

_____b. S/G #4 FCV-1-16

NOTE: With faulted S/G isolated at RCS temperature of 557°F, the faulted S/G pressure will be ≅ 1090 psig.

II. SUBSEQUENT OPERATOR ACTIONS (Cont'd)

_____C. Make arrangements to sample CNTMT atmosphere and S/G's to identify presence of abnormal radioactivity.

_____D. RCS pressure and PORV status:

_____1. Verify all PZR PORV's closed.

_____2. Verify the open status and power availability (indicating lights) to PZR PORV block valves.

_____3. If RCS pressure decreases <1500 psig, close CCPs' mini flow FCV-62-98 and 99.

_____E. If condition in 1 or 2 below exist stop all RCP's and maintain seal injection flow:

_____1. After the high head ECCS pump operation has been verified and if the RCS pressure decreases below 1500 psig.

OR

_____2. After 5 minutes if a Phase B CNTMT isolation occurs (loss of motor bearing cooling).

_____3. Monitor conditions for stopping RCP's through Step L (RCS cooldown).

_____4. If RCP's are tripped use Appendix A for natural circulation guidelines.

_____ _____ F. If offsite power and main condenser are available:
Yes no

_____1. Verify intact S/Gs' MSIV's open or open bypass valves to equalize pressure across MSIV(s)', then open to provide a flowpath to the steam dump system.

NOTE: Ensure CNTMT isolation is maintained, (not reset) until manual action is required for necessary process streams.

_____G. Verify (indicating lights) or establish power sources necessary to operate:

_____1. At least one PZR PORV (SOI-68).
_____2. At least one S/G PORV (SOI-1).
_____3. The charging and letdown flowpaths (SOI-62).

_____H. Stabilize the RCS at approximately no-load temperature:

_____1. By steam dump to the main condenser

OR

SUBSEQUENT OPERATOR ACTIONS (Cont'd)

_____2. If offsite power or the condenser is not available, utilize the S/G PORV's (use non-faulted if known)

_____I. Regulate AFW flow to the S/G's to restore and maintain level in the narrow range span, or >76% in the wide range span (assure U-tubes covered).

_____J. If RCS pressure stabilizes ≥ 1500 psig (SIP shutoff head):

_____1. Manually reset SI (HS-63-134A and 134B) so that safeguards equipment can be controlled manually.

_____2. Stop the RHR pumps and place in the standby mode.

_____3. Request performance of SI-4.3.1.1.1-22.c to verify position of P-4 contacts (failure of P-4 may prevent resetting SI) if the SI signal will not reset.

CAUTION: Auto SI initiation will not occur since the reactor trip breakers have not been reclosed.

CAUTION: If RCS pressure decreases uncontrollably, restart RHR pumps manually to deliver fluid to the RCS.

CAUTION: Subsequent to this step, should loss of offsite power occur, manual SI initiation is required to load required safeguards equipment onto the diesel powered shutdown boards.

_____K. Shutdown the D/G's as soon as possible after plant conditions stabilize.

_____1. Remove D/G's from service per SOI-82 "shutdown after emergency start."

_____2. Place D/G's in standby mode.

_____L. Prior to reducing RCS temperature (Step M) or if RCS pressure is less than 1900 psi, verify isolated or isolate UHI system. If offsite power is not available, close valves locally as hydraulic pump is fed from auxiliary building common MCC-B (C) and would not be energized.

_____1. Close FCV-87-21 and GAG

_____2. Close FCV-87-22 and GAG

_____3. Close FCV-87-23 and GAG

_____4. Close FCV-87-24 and GAG

II. SUBSEQUENT OPERATOR ACTIONS (Cont'd)

_____M. After faulted S/G has been isolated, begin a rapid RCS cooldown, within AFW system capabilities. Terminate the cooldown at ≅507°F on the RCS.

_____1. If offsite power and condenser are available, dump steam to the condenser from the intact S/G's by manual control of the steam header pressure controller, PIC-1-33,

OR

_____2. If offsite power or the main condenser is not available, dump steam from the intact S/G's through the PORV's.

_____N. Radiological plan initiation

_____1. Refer to IP-1 and implement the REP relative to the S/G tube leak.

_____2. Notify the chem lab to initiate the appropriate portions of SI-4.11.2.B & W.

_____3. Sound the plant radiological emergency siren to expedite assembly of personnel and to reduce onsite doses to personnel.

_____4. Survely meteorological information and notify Healty Physics Department to dispatch the shift HP representative to survey the downwind sector at the plant boundary and request HP section perform survey of secondary side of plant.

_____O. Transfer NR-45 to 1 SR and 1 IR detector.

_____P. After the RCS temperature has been reduced to ≅507, if necessary begin a depressurization of the RCS to a value equal to the faulted S/G pressure while maintaining ≥ 50°F subcooling.

NOTE: With RCS temperature at 507°F, 50°F subcooling will be maintained down to ≅ 1090 psig on the RCS.

NOTE: During subsequent controlled RCS depessurization, the pressure criteria for tripping the RCP's established in step E DOES NOT APPLY.

_____1. If the RCP's are in service, use PZR spray to reduce the pressure. (PIC-68-340B, or 340D)

OR

II. SUBSEQUENT OPERATOR ACTIONS (Cont'd)

____2. If offsite power is not available, or the RCP's are not in service, open one PZR PORV to decrease pressure, (PCV-68-340A or 334A).

NOTE: Prior to initiation of controlled RCS depressurization, there may be no indicated PZR level. As depressurization proceeds, an increase in indicated PZR level is expected as liquid replaces steam in the PZR and due to the decreased leakage via the S/G tube(s).

CAUTION: Monitor CNTMT indications to verify that a loss of reactor coolant other than the S/G tube rupture is not in progress. If recirc sump level or a CNTMT sample (if available at this time) are not in the normal pre-event range, further accident recovery must be directed according to EOI-1, "Loss of Reactor Coolant," step Y (Small LOCA).

____Q. As the RCS pressure decreases, due to PZR spray, or opening of the PORV, monitor the PZR level and stop depressurization if:

____1. Indicated PZR level rises above ≅50%.

OR

____2. When RCS pressure decreases to a value equal to the faulted S/G pressure.

____R. Isolate CL accumulators by energizing and closing the following valves when RCS pressure <1000 psig.

____1. FCV-63-118, Accum #1

____2. FCV-63-98, Accum # 2

____3. FCV-63-80, Accum #3

____4. FCV-63-67, Accum #4

____S. After the depressurization operation has been verified to have been terminated (using the PZR PORV stem-mounted position indicators or accoustic valve position monitoring system or spray valve demand signal), continue to monitor PZR pressure and level.

___1. If PZR level continues to rise or remains nearly constant concurrent with a RCS pressure decrease, suspect leakage from he pressurizer steam space. Monitor PRT pressure PI-68-301 temperature TI-68-309, and level LI-68-300 to identify continuously increasing conditions. Close the PORV block valves if a leak to the PRT is identified. Monitor PRT conditions to verify tank integrity.

II. SUBSEQUENT OPERATOR ACTIONS (Cont'd)

CAUTION: If PRT integrity is lost, abnormal CNTMT conditions could exist and may not be true indications of a continued loss of reactor coolant. If conditions of step SI persist after closing the PZR PORV block valves, further recovery must be directed according to EOI-1, Loss of Reator Coolant, step Y. The conditions of step S2 must be satisfied before proceeding to step T.

_____2. If PZR level subsequently continues to increase concurrent with a RCS pressure increase and with verified PRT integrity; ECCS flow is greater than the leak, then

_____3. SI Termination

_____a. When RCS pressure has increased by at least 200 psi (after shutting the spray valve or verified closure of the PZR PORV.

AND

_____b. PZR level has returned >20%

AND

_____c. ≥ 40°F subcooling exists in the RCS

THEN

_____d. Stop all operating ECCS pumps not needed for normal charging and RCP seal water.

_____4. Following SI termination, PZR pressure should decrease to a value equal to the faulted S/G.

_____T. Return all ECCS pumps not needed to standby and maintain operable SI flow paths.

_____U. Verify MCR ventilation isolation (See SOI-31.1B).

_____V. Verify U-2 CNTMT equipment hatch temporary doors closed (757 El.).

_____W. Verify fuel handling floor equipment transfer hatch cover closed 757 El. to lower elevations).

_____X. Re-establish charging and letdown to maintain PZR level in the operating range (≅25%).

II. SUBSEQUENT OPERATOR ACTIONS (Cont'd)

CAUTION: If, during subsequent recovery actions, PZR level cannot be maintained above 20% or 40°F subcooling is not maintained, manually initate SI flow to reestablish. If these conditions cannot be maintained by this method, return to step S and proceed with the instruction from that point.

_____1. Close charging FCV-62-89.

_____2. Open the charging pump - VCT valves FCV-62-132 and 133.

_____3. Close the charging pump - RWST valves FCV-62-135 and 136.

_____4. Open the CCP's miniflow valves FCV-62-98 and 99 (if closed previously).

_____5. Open the charging line isolation FCV-62-90 and 91.

_____6. Open seal water Hx inlet valves FCV-62-61 and 63.

_____7. Gradually open charging FCV-62-89. Adjust seal water flow to ~ 8 gpm per RCP.

_____8. Open RCS loop 3 letdown valves FCV-62-69 and 70.

_____9. Open letdown line isolation valve FCV-62-77.

_____10. Open FCV-62-76 (5gpm orifice) then open FCV-62-73 (45 gpm orifice)

_____11. Open PCV-62-81 to ~ 25%, then adjust to maintain ≅ 350 psig letdown pressure.

_____12. Close BIT inlet valves FCV-63-39 and 40 and outlet FCV-63-25 and 26.

NOTE: Flush injection lines and reestablished BIT concentration per AOI-19.

____ ____ Y. Reestablish PZR pressure control.
Yes no

_____1. Reestablish the PZR heater operation.

____ ____ 2. If offsite power is available, establish the required
Yes no conditions for operation of a RCP and start one RCP in loop 2, or if not available, in loop 1. If all RCP's are running, trip all but one RCP so as to maintain one pump operating in the loop connected to the PZR (loop 2).

_____Z. Follow faulted S/G pressure decay by:

II. SUBSEQUENT OPERATOR ACTIONS (Cont'd)

_____1. If offsite power is available, begin a controlled RCS cooldown at a rate of ≤ 50°F/hr. by steam dump to condenser from the non-faulted S/G's. Control the S/G levels in the narrow range span or in the wide range > 76% (assure U-tubes are covered).

OR

_____2. If offsite power is not available, dump steam from non-faulted S/Gs' PORV's to provide a controlled cooldown of the RCS at a rate ≤ 50°F/hr.

____ ____ AA. If system requires cooldown faster than faulted S/G pressure decay:
yes no

_____1. Consult with plant staff before using this method unless faster cooldown and depressurization is required. Prior to this time, samples of the RCS, CNTMT atmosphere and S/G's may have been obtained. The results of these samples, or corresponding estimates should be used to calculate the potential radioactive releases due to these steps. Do not proceed with these steps if the calculations concludes the 10-CFR-20 limits will be exceeded.

_____2. Simultaneous with the cooldown using the non-faulted S/G's, slowly decrease the faulted S/G pressure by opening the MSIV or bypass valve to the condenser (if available).

OR

_____3. If offsite power or the main condenser is not available, use of the faulted S/G PORV is required.

_____BB. As pressure is reduced in the faulted S/G, control RCS pressure at a value approximately equal to the faulted S/G pressure to minimize leakage flow. RCS pressure control should be accomplished by use of the PZR heaters and action of one of the following:

NOTE: Maintain RCS temperature and pressure within the cooldown limits of TI-4, Part I, Figure A-9.

_____1. Normal PZR spray (if a RCP is in service)

OR

_____2. Use of PZR auxiliary spray if letdown-charging system is in service. (preheated spray) (FCV-62-84A).

OR

_____3. Brief intermittant opening of one PZR PORV.

II. SUBSEQUENT OPERATOR ACTIONS (Cont'd)

CAUTION: If RCS pressure control is accomplished by use of the PZR PORV, continuously monitor the PRT pressure (PI-68-301), temperature (TI-68-309), and level (LI-68-300) and take appropriate actions to verify and maintain PRT integrity. Verify PZR PORV closure using the PORV stem-mounted position indicators, ACCOUSTIC VALVE POSITION MONITORING SYSTEM and PRT conditions. If a reactor coolant leak to the PRT is identified, close the PORV block valves.

____CC. Periodically sample and analyze the RCS boron concentration during the cooldown. Borate as necessary to maintain the required shutdown margin at all times. (Possible dilution from faulted S/G back leakage.)

____DD. Continue to cooldown and depressurize the RCS and faulted S/G until the RCS leg temperatures are <400°F in the non-faulted loops and the RCS pressure has reached ~400 psig (maintain PZR steam bubble).

____EE. Place the RHR system in operation per SOI-74.

NOTE: Throughout cooldown procedure, maintain PZR steam bubble. Solid water pressure control may be difficult and ineffective.

____FF. Continue normal RHR cooldown except that after the RCP operation has been terminated, continue to simultaneously control the faulted S/G pressure and RCS pressure to minimize the leakage flow.

____GG. When the RCS hot leg temperatures are < 200°F, PZR pressure may be reduced by auxiliary spray until RCS pressure and the faulted S/G pressures equilibrate.

____HH. Continue RHR system opeation to remove core residual heat.

____II. Maintain charging and letdown in service to control PZR level and provide a boration path.

III. RECOVERY

Following a S/G tube rupture, the exact procedure will be planned by PORC for repairing the affected tube(s) and decontamination of the secondary system. The procedure for repairing the affected S/G will include necessary docontamination and exposure precautions for personnel. Decontamination of the secondary system will be carried out after the extent and type of radiation present is analyzed, with protection to personnel being the most important consideration.

IV. REFERENCES

FSAR 15.4.3

SATURATION STEAM TABLE
(Temperatures rounded to nearest °F)

PSIG	Sat. Temp °F	50°F Subcooled	PSIG	Sat. Temp °F	50°F Subcooled
300	421	371	1350	584	534
350	435	385	1400	589	539
400	448	398	1450	593	543
450	459	409	1500	598	548
500	470	420	1550	602	552
550	480	430	1600	606	556
600	489	439	1650	610	560
650	497	447	1700	614	564
700	505	455	1750	618	568
750	513	463	1800	622	572
800	520	470	1850	626	576
850	527	477	1900	630	580
900	534	484	1950	633	583
950	540	490	2000	637	587
1000	547	497	2050	640	590
1050	552	502	2100	644	594
1100	558	508	2150	647	597
1150	563	513	2200	651	601
1200	569	519	2235	653	603
1250	574	524	2250	655	605
1300	579	529			

Temperatures read from hot leg W. R. RTD's or incore T/C's.

NATURAL CIRCULATION GUIDELINES

A. Guidelines to determine if RCS natural circulation is taking place.

1. Core ΔT (hot-cold) as read on wide range RTD's TR-68-1, 18, 431 60, or an indicated ΔT between W. R. cold leg and incore T/C's should be stable or dropping. A relatively stable ΔT with values less than 55°F with a gradual decrease, indicates natural circulation.

   AND

2. Incore T/C's indicating below saturation temperature for the existing RCS pressure:

   AND

3. Heat is being removed from the RCS by the S/G's steaming and water being added to S/G's and secondary system pressure near saturation pressure associated with RCS temperature.

B. To enhance natural circulation:

1. Keep S/G levels in narrow range (tubes covered).

   NOTE: When cooling down during natural circulation and it becomes desirable to depressurize the RCS, use the 5 incore T/C's for the vessel head area to determine the upper head temperature. Then base the RCS pressure reduction on an average of these 5 T/C's to prevent reaching saturation in the upper head area.

2. Keep RCS pressure above saturation pressure for the existing W.R. hot leg temperature or incore T/C temperature if possible.

3. Use condenser steam dump or S/G PORV's to cool RCS at desired rate.

WATTS BAR NUCLEAR PLANT

EMERGENCY OPERATING INSTRUCTION

EOI-13

ANTICIPATED TRANSIENTS WITHOUT SCRAM

Rev. By	Rev. No.	Date	Revised Pages
CRC	1	6/9/81	All

The last page of this instruction is number 6.

1C	Plant Master File
	Acting Plant Superintendent
	Assistant Superintendent
	Mechanical Maintenance Supervisor
1C	Results Supervisor
1C&1U	Operations Supervisor
1C	Quality Assurance Supervisor
1C	Health Physicist
	Management Services Supervisor
	Chemical Laboratory
	Instrument Shop
1C	Shift Engineer's Office
2C	Unit Control Room
	Health Physics Laboratory
	PSU Supervisor
	Mechanical Engineer
	Reactor Engineer
	Chemical Engineer
	Instrument Maintenance Supervisor
1U	Asst. Director of Nuc Power (Oper)
	Electrical Maintenance Supervisor
	Plant Services Supervisor
	Outage Director
	Administrative Services Supervisor
	Document Control Supervisor
1C	Nuclear Safety Review Staff
1U	NRC
1C	Nuc Pr Training Center
1U	Plant Training Office
1U	Supv., Reactor Systems Group

Prepared By A. E. Shultz

Submitted By [signature] Supervisor

PORC Review 6-9-81 Date

Approved By [signature] for Superintendent

Date Approved 6-9-81

PURPOSE

To provide the corrective actions in the event a reactor trip is not obtained following an automatic signal.

Also to provide the corrective action in the event any of the immediate actions following a reactor trip are not achieved automatically.

This procedure is to be used to correct a specific problem(s) and return to procedure from which referenced to this procedure.

I. SYMPTOMS

A. The failure to obtain a reactor trip following an automatic signal.

1. Rods not inserted as indicated by RPI's or the rod bottom lights.

2. No rapid drop in nuclear power as indicated by NIS readout, e.g., <10% of of initial power in 5 seconds.

3. RX trip breakers remain closed.

II. IMMEDIATE OPERATOR ACTIONS

NOTE: Actions in this procedure are to be performed by one or more operators simultaneously and in the desired order for the specific event.

A. Turbine Trip - Reactor Trip:

1. Verify reactor trip, if not then immediately:

a. Attempt to manually trip the reactor trip breakers by placing the reactor trip switches in the trip position, AND

b. Immediately dispatch someone to the 480V unit boards A and B to trip the breakers powering the control rod drive MG sets, AND

c. Dispatch someone to the rod drive MG set room to trip the reactor trip breakers.

d. If a reactor trip has not yet occurred, attempt to insert control rods manually and:

1. Start centrifugal charging pump.
CAUTION: "B" ECCS equipment will not normally have component cooling water aligned.

2. Open charging pump suction valves from RWST and close suction valves from VCT.

II. IMMEDIATE OPERATOR ACTIONS (Cont.)

3. Open BIT inlet and outlet valves and close BIT recirc valves.

4. Isolate normal charging path and charging pump recirculation valves.

5. Decrease turbine load as boron and/or control rods decrease reactor power.

2. Verify turbine trip (stop valves closed), if not then immediately:

a. Attempt to manually trip the turbine by placing the turbine trip switch in the trip position, AND

b. Immediately dispatch someone to the main trubine front standard to manually trip the turbine AND,

c. Immediately dispatch someone to EHC pump control station to stop and lockout both EHC pumps.

d. If a turbine trip has not yet occurred, immediately close MSIV's.

CAUTION: DO NOT open the main generator circuit breaker nor field breaker until the steam source is known to be closed and MW generation is known to be zero or negative.

B. Determine Reactor Coolant System Status:

1. Verify AFW pumps running and flow established to S/G's if not then immediately:

a. AFW pumps

1. Attempt to manually start A and/or B AFW pumps and/or steam driven AFW pump from MCR, or

2. Attempt to manually start A and/or B AFW pump from 6.9-kV S.D. boards and/or attempt to manually start steam driven AFW pump locally.

b. AFW LCV:

MTR Driven AFWP LCV's

NOTE: These valves fail open on loss of air or power.

1. If not open, isolate control air and bleed down pressure or remove control power, or

II. IMMEDIATE OPERATOR ACTIONS (Cont'd.)

2. If open, control feedwater flow with motor driven pump PCV, or use manual valve to control flow to regulate S/G level at ≅ 25%

Turbine Driven AFWP LCV's

NOTE: These valves fail closed on loss of control air or power.

3. If not open, use handwheel to open and control flow to regulate S/G level at ≅ 25%.

4. If open, use handwheel to control flow to regulate S/G level at ≅25%.

c. MTR Driven AFWP PCV:

1. See SOI 3.2.V.D. for manual operating instructions.

2. PZR Pressure and Level Within Expected Range, (≅ 1900 psig -2235 psig and ≅ 24-60%) if not then immediately:

a. PZR Pressure

High
1. Check sprays on, heaters off and PORV's open if needed.
2. Check heat sink (S/G's) operable (at least one S/G in narrow range or in wide range sufficient to cover S/G tubes).

Low
1. Check sprays off, heaters on, PORV's closed and safety valves closed.
2. Check PZR level normal.
3. Verify and/or actuate SI if below 1765 PSIG.

b. PZR Level

High
1. Check charging system flow rate, letdown system in service and make adjustment to charging and letdown as needed.
2. Check PORV's and safety valves closed if pressure is normal.

Low
1. Adjust charging flow to return level to normal.
2. Secure letdown if desired.
3. Place on additional charging pump if desired.

II. IMMEDIATE OPERATOR ACTIONS (Cont'd)

3. Tavg Controlling to 557°F, if not then immediately

a. High Temp

1. Verify steam dump valves opening and/or S/G PORV's opening, if not open, then
2. Attempt to open steam dump valves by going to pressure mode control and manually opening.
3. If steam dump valves are still not open, verify 553°F steam dump interlock reset.
4. If steam dump valves are still not open, use S/G PORV's to control Tavg at 557°F.
5. Verify PZR pressure sufficient to provide subcooling requirement.
6. Verify PZR level on scale.
7. Determine if a need to safety inject exists.
8. Verify S/G levels sufficient to provide heat sink.

b.
1. Verify steam dump valves and S/G PORV's closed, if not closed then
2. Attempt to close steam dump valves by going to pressure mode control and manually closing or,
3. Place steam dump interlock selector switch (BOTH) in OFF position.
4. If steam dump valve(s) are still open, close MSIV's.
5. Attempt to close S/G PORV's by going to manual with controls and closing or by using PORV's handswitch and placing in close position.
6. If S/G PORV(s) are still open, remove control power, or
7. If S/G PORV(s) are still open, send operator to manually close or isolate.
8. If RCS pressure is reduced to SI actuation setpoint, verify auto SI actuation and if not received, manually actuate.

4. Containment Pressure and Temperature Normal, (-0.1 psid + 0.3 psid) (85° - 110°F upper containment, 100-120° F lower containment) if not then immediately:

a. Containment Pressure

1. High Press

(aa) Verify containment humidity and radiation, if either are high see AOI-6 for excess leakage or
(bb) Verify containment temp. normal, place additional coolers in service if needed

II. IMMEDIATE OPERATOR ACTIONS (Cont'd.)

2. Low Press

Verify containment temperature normal, remove from service connected coolers.

b. Containment Temperature

1. High Temp

Verify sufficient number of uppr and lowr containment coolers in service.

2. Low Temp

Remove from service upper and lower containment coolers not needed.

5. Gen Breakers Open, 6.9-kV Unit Station Service Transferred, if not then immediately:

a. Gen Bkr's Open

1. Verify all steam sources are closed to main turbogenerator, then attempt to open gen bkr's from main control room and/or elect. control board.
2. If gen. bkr's are still not open, attempt to open them from switchyard local control.

b. 6.9 kV Unit Station Service Transferred, if not then immediately

Verify start bus energized and then energize 6.9-kV unit boards per SOI-57.3.

6. Steam Gen F. Regulator, Regulator Bypass and Main Isolation Valves Shut, if not then immediately:

a. F.W. Regulator(s) or Bypass(es)
1. Attempt to close F. W. reg valve(s) or bypass (ES) from main control room by manual control.
2. If still open, attempt to close associated F. W. Main isolation valve if not necessary.
3. If unable to isolate in this manner, reduce main feed pump speed (disch. pressure) to provide where pumps will not deliver water to S/Gs.

II. IMMEDIATE OPERATOR ACTIONS (Cont.)

b. Main Isolation

1. Attempt to close main isolation valve from MCR.
2. If still open, attempt to close associated F.W. reg. and reg. bypass if not closed.
3. If unable to isolate in this manner, reduce main feed pump speed (disch. pressure) to point where pumps will not deliver water to S/G's.
4. If desirable to continue S/G's with main F. W. attempt to close main isolation valve from 480V Rx MOV board or local by handwheel.

III. SUBSEQUENT OPERATOR ACTION

A. In the event of a change in the rated thermal power >15% in one hour, notify the Chem Lab to initiate the conditional portions of SI-4.11.2.B & E due to the thermal power change.