DOCUMENT REVISION DISTRIBUTION SHEET - UNIT 1 OFF NORMAL & EMERGENCY OPER. PROCEDURE

DOCUMENT TITLE Loss of Feedwater or Steam Generator Level

DOCUMENT FILE NUMBER 0700040

DOCUMENT REVISION NUMBER 12

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FLORIDA POWER & LIGHT COMPANY
ST. LUCIE UNIT #1
EMERGENCY OPERATING PROCEDURE NO. 0700040
REVISION 12

1.0 Title:

Loss of Feedwater or Steam Generator Level

2.0 Approval:

Reviewed by the Facility Review Group September 12 1975
Approved by J. H. Barrow For Plant Manager Sept 12 1975

Revision 12 Reviewed by Facility Review Group SEPT 21 1982
Approved by [signature] Plant Manager Oct. 25 1982

3.0 Purpose and discussion:

3.1 This procedure provides instructions to be followed in the event of loss of feedwater flow and/or loss of steam generator level.

3.2 Loss of steam generator level results in a reduction in capability of the secondary system to remove the heat generated in the reactor core. Loss of steam generator level results from the inability to supply feedwater in an amount equal to the existing steam demand. Excessive steam demand, i.e., above feedwater system capability is considered in Emergency O.P. 0810040, Main Steam Line Break.

3.3 The loss of all feedwater to the steam generator and the subsequent heatup of the Reactor Coolant System will result in saturation conditions at high temperature and pressure in the Reactor Coolant System. This would cause a loss of reactor coolant mass through the PORV's and code safeties and void formations throughout the system. A maximum effort should be directed toward the initiation of feedwater flow to the steam generators. Without feedwater, the steam generators could boil dry within approximately 13 minutes.

3.4 The inability to supply feedwater in the required quantity could result from one or a combination of the following:

3.4.1 Pipe break in the condensate/feedwater system.

3.4.2 Flowpath blockage due to valve closure or strainer stoppage.

3.4.3 Loss of pumping capacity due to pump trip, loss of AC power, or pump cavitation.

3.4.4 Loss of C Auxiliary Feedwater pump remote operating capability.

3.5 The following protective functions are provided to prevent loss of heat sink..

1

3.0 Purpose (cont)

3.5 (cont)

3.5.1 Reactor trip:

3.5.1.1 Steam generator low-low level at 39%.

3.5.2 Turbine Runback:

3.5.2.1 Loss of both heater drain pumps if turbine power is $\geq$ 92%.

3.5.2.2 Loss of feedwater pump if turbine power is $\geq$ 60%.

3.5.3 Aux Feed Pump Auto-start at 34% steam generator level.

3.6 The action taken for loss of steam generator level is basically the same regardless of cause. That is, to trip the reactor, thereby removing the heat source, and restoring steam generator level with the auxiliary feedwater pumps. This approach is due to the self-sufficient nature of the auxiliary feed system. It, in no way, depends on the normal feedwater system. The auxiliary feed system has the capability to bring the unit to hot shutdown and remain there for a period in excess of 20 hours, regardless of any single failure in the normal feed system. Three auxiliary feed pumps are available. Two motor driven pumps, either of which can supply either steam generator and one steam driven pump which can supply either steam generator.

The auxiliary feedwater system ties into each steam generator feed line downstream of the steam generator feed inlet check valve. Capability exists to feed either steam generator by any auxiliary feed pump. A break in the feed line between the feed line check valve and the steam generator would result in the loss of that steam generator as a heat sink. Corrective action would be to isolate feed flow to that steam generator and continue maintaining level in the unaffected steam generator. Residual heat can be adequately dissipated in this manner.

The leak must be isolated in any incident involving a break even though the break does not immediately affect the auxiliary feedwater system. The isolation of a leak is necessary to conserve the water available in the condensate storage tank. The leak is isolated by stopping the steam generator feed pumps and condensate pumps. A leak downstream of a steam generator feed line check valve would also require stopping auxiliary feed flow to that steam generator.

1

3.0 Purpose (cont)

3.7 The Aux feed pumps will auto start approximately 3 minutes following either S/G level dropping below 34% (2/4 logic). Flow is automatically initiated to both steam generators and cannot be terminated for 30 seconds. Bypass switches are provided on RTGB 102 which will prevent pump starts and valve stroke and would be utilized if normal feedwater flow remains or becomes available and is desired.

4.0 Symptoms:

4.1 Low-low steam generator level.

4.2 Low feed pump suction or discharge pressure.

4.3 Steam generator feed pump trip.

4.4 Condensate pump trip.

4.5 Heater drain pump trip.

4.6 Increasing Tavg.

EMERGENCY OPERATING PROCEDURE NO. 0700040, REV. 12
LOSS OF FEEDWATER OR STEAM GENERATOR LEVEL

5.0 Instructions:

5.1 Immediate Automati Actions (some or all of the following may occur).

5.1.1 Reactor trip.

5.1.2 Turbine trip.

5.1.3 Transfer from Auxiliary transformer to startup transformer of auxiliary power.

5.1.4 Generator OCB's open.

5.1.5 Steam dump to condenser actuation.

R12

5.1.6 Steam generator relief activation.

5.1.7 With a turbine trip, the main feed reg valves will close and the 15% bypass valves will open to ≈ 5% flow position.

5.1.8 Aux Feed Pump auto start sequence at 34% indicated level.

5.2 Immediate Operator Action.

5.2.1 With reactor trip.

5.2.1.1 Carry out immediate operator actions for reactor trip per OP 0030130.

5.2.1.2 If one feed pump is lost, feed steam generators with remaining feedwater train.

5.2.1.3 If both feed pumps are lost, immediately initiate auxiliary feed to the steam generators. Stop both heater drain pumps and leave one condensate pump running to cool down the secondary systems. When establishing auxiliary feed flow to the steam generators, use steam generator levels as well as header flow rates to ensure each steam generator is receiving auxiliary feedwater.

5.2.1.4 If all feedwater flow is stopped or lost and steam generator level is less than 42% then:

1) Reinitiate auxiliary feedwater flow as soon as possible; however, do not exceed a flow rate of 150 gpm per steam generator.

EMERGENCY OPERATING PROCEDURE NO. 0700040, REV. 12
LOSS OF FEEDWATER OR STEAM GENERATOR LEVEL

5.0 Instructions: (Cont'd)

5.2 Immediate Operator Action (Cont'd)

2) Limit feedwater flow rate to 150 gpm per steam generator until condinuous feedwater flow to the SG has been maintained for five minutes.

5.2.1.5 If a major rupture occurs in the condensate-feedwater system immediately trip both condensate pumps, both heater drain pumps, and both feed pumps to minimize damage to secondary components. Immediately initiate auxiliary feed flow to the steam generators. (Isolate rupture as quickly as possible).

5.2.1.6 Refer to applicable Subsequent Actions.

5.2.2 Immediate Operator Action (Reactor does not trip).

5.2.2.1 If loss of a feed pump results in a turbine runback, check that:

5.2.2.1.1 The load reduction is consistent with the capacity of the operating feed pump.

5.2.2.1.2 Steam generator levels can be maintained using one feed pump.

5.2.2.1.3 Reactor power is matched with turbine power (Tavg = Tref).

5.2.2.2 Refer to applicable Subsequent Actions.

5.3 Subsequent Actions

5.3.1 Subsequent Actions (with reactor trip)

5.3.1.1 Implement the Emergency Plan as necessary in accordance with EPIP 3100021E, "Duties of the Emergency Coordinator".

5.3.1.2 Monitor auxiliary feedwater flow to each steam generator. If either steam generator cannot be maintained above 38% with auxiliary feedflow and its pressure is relatively low compared to the other steam generator, secure auxiliary feed flow to this steam generator.

5.3.1.3 If all main feedwater flow is lost, coordinate the dumping of steam and the addition of auxiliary

R11

EMERGENCY OPERATING PROCEDURE NO. 0700040, REV.12
LOSS OF FEEDWATER OR STEAM GENERATOR LEVEL

5.0 Instructions (Cont'd)

5.3 Subsequent Actions (Cont'd)

5.3.1 Subsequent Actions (with reactor trip) - Cont'd

5.3.1.3 (Cont'd)

feedwater to restore steam generator level to approximately 65% and Tavg to approximately 532°F.

NOTE: Use caution to avoid excessive cooldown on addition of auxiliary feedwater.

5.3.2 Subsequent Actions (without reactor trip)

5.3.2.1 After insuring the plant is in a stable condition, determine and correct the cause of the loss of feedwater.

6.0 References:

6.1 FSAR, Section 15.2.8, and Section 10.5.3.

6.2 Combustion Engineering Emergency Procedure, F-EP-9.

7.0 Records, Reports and Notifications:

7.1 Log Book entries.

DOCUMENT REVISION DISTRIBUTION SHEET - UNIT 1
OFF NORMAL & EMERGENCY OPER. PROCEDURE

DOCUMENT TITLE Total Loss of AC Power

DOCUMENT FILE NUMBER 1-0030143

DOCUMENT REVISION NUMBER 1

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FLORIDA POWER & LIGHT COMPANY
ST. LUCIE UNIT NO. 1
EMERGENCY OPERATING PROCEDURE NUMBER 1-0030143
REVISION 1

1.0 TITLE:

TOTAL LOSS OF AC POWER

2.0 APPROVAL:

Reviewed by Facility Review Group August 4 1982

Approved by C. M. Wethy Plant Manager August 4 19

Revision 1 Reviewed by FRG Oct 26 1982

Approved by J. H. Barrow Plant Manager Oct 26 1982

3.0 PURPOSE AND DISCUSSION:

3.1 See Appendix A.

4.0 SYMPTOMS:

4.1 Loss of power to 1A1, 1B1 6.9KV Bus.

4.2 Loss of power to 1A2, 1A3, 1B2, 1B3 and 1AB 4.16KV Bus.

5.0 INSTRUCTIONS:

5.1 Automatic Actions

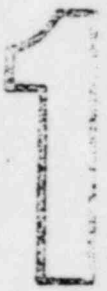
5.1.1 Reactor Trip.

5.1.2 Turbine Trip/Generator Lockout.

5.1.3 Auxiliary Feedwater Auto Actuation.

5.1.4 PORV's Operate.

ST. LUCIE UNIT NO. 1
EMERGENCY OPERATING PROCEDURE NUMBER 1-0030143, REVISION 1
TOTAL LOSS OF AC POWER



5.0 INSTRUCTIONS: (Cont.)

5.2 Immediate Operator Actions

5.2.1 Insure all CEA's on bottom, and reactor trip breakers open.

5.2.2 Insure Auxiliary Feedwater Pump 1C is restoring Steam Generator level. If S/G level has dropped to <42%, then take control of Aux Feed and reduce to less than 150 GPM. /R1

5.2.3 Close both of the main steam isolation valves HCV-08-1A and HCV-08-1B. /R1

5.2.4 Close both letdown isolation valves V-2515 and V-2516. /R1

ST. LUCIE UNIT NO. 1
EMERGENCY OPERATING PROCEDURE NUMBER 1-0030143, REVISION 1
TOTAL LOSS OF AC POWER

5.0 INSTRUCTIONS: (Cont.)

5.3 Subsequent Actions

5.3.1 Insure generator OCB's and field breaker open.

5.3.2 Open 30102 (S.U. Transformer to 1A1 6.9KV bus).
Open 30202 (S.U. Transformer to 1B1 6.9KV bus).
Open 20102 (S.U. Transformer to 1A2 4.16KV bus).
Open 20302 (S.U. Transformer to 1B2 4.16KV bus).

5.3.3 Insure D/G breakers open (1A-20211 and 1B-20701).

5.3.4 Insure 1AB 4.16KV bus feeders are open:

20208, 20505 (1A3 4.16KV to 1AB 4.16KV bus).
20409, 20504 (1B3 4.16KV to 1AB 4.16KV bus).

5.3.5 Open 40103 (1A2 4.16KV feed to 1A1 L.C.-Hi side).
Open 20110 (1A2 4.16KV feed to 1A1 L.C.-Lo side).
Open 40203 (1A3 4.16KV feed to 1A2 L.C.-Hi side).
Open 20210 (1A3 4.16KV feed to 1A2 L.C.-Lo side).

5.3.6 Open 40403 (1B2 4.16KV feed to 1B1 L.C.-Hi side).
Open 20310 (1B2 4.16KV feed to 1B1 L.C.-Lo side).
Open 40503 (1B3 4.16KV feed to 1B2 L.C.-Hi side).
Open 20402 (1B3 4.16KV feed to 1B2 L.C.-Lo side).

5.3.7 Insure 1AB 480V Load Center Feeders are open:

40204, 40702 (1A2 480V L.C. to 1AB).
40706, 40504 (1B2 480V L.C. to 1AB).

5.3.8 Insure the main steam isolation bypass valves both indicate closed or dispatch an operator to locally take control and close the valves. /R1

NOTE: The handwheels on these valves turn counterclockwise direction to close, opposite of most valve handwheels in the plant. /R1

5.3.9 Open 1A and 1B Atmospheric Dump Valves to reduce Steam Generator pressure below safety lift pressure.

1. If instrument air pressure has decayed, local operation is necessary. Additional instrument air control capacity might be gained by opening cross-connect from service air system. /R1

2. Maintain communication with local operator.

ST. LUCIE UNIT NO. 1
EMERGENCY OPERATING PROCEDURE NUMBER 1-0030143, REVISION 1
TOTAL LOSS OF AC POWER

5.0 INSTRUCTIONS: (Cont.)

5.3 (Cont.)

5.3.10 Close FCV 23-3, 4, 5 and 6 (1A and 1B S/G Blowdown Isolations).

5.3.11 Close FCV-23-7 and FCV-23-9 (1A and 1B S/G Blowdown Sample Isolations).

5.3.12 Close AOV-5200, 5201, 5202, 5203, 5204 and 5205 (RCS Sample Isolations).

5.3.13 Implement the Emergency Plan as necessary in accordance with EP 3100021E, "Duties of the Emergency Coordinator."

5.3.14 Minimize atmospheric steam dump use thereby insuring minimum RCS heat loss; however,

1. Maintain S/G pressure less than S/G safety setpoint.

2. With decreasing RCS pressure, maintain hot leg temperature (Th) at least 20°F below the saturation temperature corresponding to the RCS pressure.

5.3.15 Verify by the following indications that natural circulation flow has been established within approximately 15 minutes after RCP's were stopped.

1. Loop Delta T less than normal full power Delta T (<46°F).

2. Cold leg (Tc) constant or decreasing.

3. Hot leg (Th) stable (i.e., not steadily increasing).

5.3.16 If RCS pressure decreases to 1700 psia, verify receipt of block permissive annunciator R-6 and block SIAS.

5.3.17 Notify system dispatcher of plant conditions and request most urgent priority in restoring off-site power.

5.3.18 If 1C Auxiliary Feedwater Pump is stopped or flow is lost, and Steam Generator level is less than 42%, then:

1. Reinitiate auxiliary feed flow as soon as possible; however, do not exceed a flow rate of 150 GPM per affected Steam Generator.

2. Limit feed flow rate to 150 GPM per affected Steam Generator until continuous feed flow to the affected Steam Generator has been maintained for five minutes.

ST. LUCIE UNIT NO. 1
EMERGENCY OPERATING PROCEDURE NUMBER 1-0030143, REVISION 1
TOTAL LOSS OF AC POWER

5.0 INSTRUCTIONS: (Cont.)

5.3 (Cont.)

5.3.19 Use all available resources to restore one emergency diesel generator to operable status.

1. (Insert techniques later)

5.3.20 The following restoration sequence assumes "A" train power supply is restored first.

1. Strip all vital and non-vital load center breakers in preparation for a systematic power restoration.

2. Energize 1A3 4.16KV bus by either:

   a. Starting 1A D/G and closing D/G breaker. Adjust and maintain voltage and frequency at 4.16KV/60 HERTZ.

   or

   b. Close 20102 (S.U. Transformer to 1A2 4.16KV bus). Close 20109 (1A2 4.16KV to 1A3 4.16KV bus). Insert sync plug and close 20209 (1A2 4.16KV to 1A3 4.16KV bus).

3. Energize 1A2 480V Load Center as follows:

   a. Close 40203 (1A3 4.16KV feed to 1A2 L.C.-Hi side).

   b. Close 20210 (1A3 4.16KV feed to 1A2 L.C.-Lo side).

4. Energize 1AB 480V Load Center by closing 40204 and 40702 (1A2 480V L.C. feed to 1AB L.C.).

5. Energize 1A5, 1A6, 1A7 and 1A8 480V MCC's as follows:

   a. Close 40214 (1A2 480V L.C. feed to 1A5 MCC).

   b. Close 40218 (1A2 480V L.C. feed to 1A6 MCC).

   c. Close 40219 (1A2 480V L.C. feed to 1A7 MCC).

   d. Close 40215 (1A2 480V L.C. feed to 1A8 MCC).

   e. Open 41270 (1A5 MCC supply to 1A containment instrument air compressor). /R1

ST. LUCIE UNIT NO. 1
EMERGENCY OPERATING PROCEDURE NUMBER 1-0030143, REVISION 1
TOTAL LOSS OF AC POWER

5.0 INSTRUCTIONS: (Cont.)

5.3 (Cont.)

5.3.20 (Cont.)

6. Energize non-essential sections of 1A5, 1A6 and 1A8 MCC's as follows:

   a. Close 41230 (MCC 1A5 non-essential breaker).

   b. Close 41325 (MCC 1A6 non-essential breaker).

   c. Close 41513 (MCC 1A8 non-essential breaker).

7. Insure 1A battery charger is "ON LINE" supplying the 1A DC bus by observing 1A DC bus voltage on RTGB 101 to be greater than 120V DC.

8. Align and start emergency cooling water to the instrument air compressor. Start the 1A instrument air compressor and observe restoration of instrument air pressure.

9. Start the 1A charging pump to reestablish pressurizer level. When the CCW system has been restored per step 15, then 1A HPSI pump can also be started to augment refilling of the pressurizer. /R1

   a. Evaluate RCS temperature, pressure, and level instrumentation to determine if a bubble exists other than in the Pressurizer.

   b. If evaluation confirms, then continue charging to increase RCS pressure.

   c. When greater than 20°F subcooled, operate Charging and/or HPSI pumps to maintain Pressurizer level greater than 30% level.

10. Insure closed 20204 (Pressurizer heater transformer 1A 4.16KV feed).

11. When pressurizer level indicates greater than 30%, energize pressurizer heaters B-1, B-2, B-3, and P-1.

ST. LUCIE UNIT NO. 1
EMERGENCY OPERATING PROCEDURE NUMBER 1-0030143, REVISION 1
TOTAL LOSS OF AC POWER

5.0 INSTRUCTIONS: (Cont.)

5.3 (Cont.)

5.3.20 (Cont.)

12. Establish ICW sealwater using offsite power. If power was restored via 1A emergency D/G, proceed to step 13; otherwise: /R1

    a. Energize 1A1 480V Load Center by closing 20110 (1A2 4.16KV feed to 1A1 480V L.C.).

    b. Start 1A Domestic Water Pump to supply water for Intake Cooling Water Pump start. Go to step 14.

13. Establish ICW sealwater using power from the diesel generator. Energize 1A1 480V Load Center as follows: /R1

    a. Insure 1A1 480V loadcenter is fully stripped of loads. /R1

    b. Insert sync plug, close 20109, and hold control switch closed while closing 20209.

    c. Close 20209 and release 20109 hand switch.

    d. Close 20110 (1A2 4.16KV feed to 1A1 480V load center).

    e. While loading secondary plant equipment, insure diesel loading remains less than 3500 KW.

    f. Start 1A Domestic Water Pump to supply water for Intake Cooling Water Pump start.

14. Reestablish "A" train Intake Cooling Water System as follows:

    a. Establish seal water.

    b. Throttle 1A I.C.W. pump dishcarge valve.

    c. Start 1A I.C.W. pump; pressurize and vent "A" I.C.W. header.

    d. After venting, open 1A I.C.W. pump discharge valve.

ST. LUCIE UNIT NO. 1
EMERGENCY OPERATING PROCEDURE NUMBER 1-0030143, REVISION 1
TOTAL LOSS OF AC POWER

5.0 INSTRUCTIONS: (Cont.)

5.3 (Cont.)

5.3.20 (Cont.)

15. Reestablish "A" train Component Cooling Water System as follows:

    a. Isolate CCW to RCP's by closing HCV-14-1, 2, 6 and 7 (to prevent thermal shocking RCP seals)

    b. Throttle 1A CCW pump discharge valve.

    c. Insure surge tank at normal level.

    d. Start 1A CCW pump; pressurize and slowly open 1A CCW pump discharge valve.

16. Reestablish CVCS letdown to maintain Pressurizer level at normal operating level. /R1

17. Commence boration to Cold Shutdown boron concentration. /R1

18. Start one set of cavity and support cooling fans. /R1

19. Proceed to EOP 0120040, "Natural Circulation/Cooldown," step 5.3.9, and perform in conjunction with the balance of this procedure.

20. Restore balance of secondary plant in accordance with EOP 0030140, "Blackout Operation."

ST. LUCIE UNIT NO. 1
EMERGENCY OPERATING PROCEDURE NUMBER 1-0030143, REVISION 1
TOTAL LOSS OF AC POWER

APPENDIX A

DISCUSSION

The "Total Loss of AC Power" event consists of a loss of off-site power in conjunction with failure of the Emergency Diesel Generators to provide emergency power. This results in a loss of all AC electrical power except that provided by inverters powered from the vital DC busses. The termination of AC power causes a loss of forced reactor coolant flow, main feedwater flow, steam flow to the turbine and pressurizer pressure control. The reactor trips on either low reactor coolant flow, high reactor coolant system (RCS) pressure or low steam generator level depending on initial conditions.

The "Total Loss of AC Power" event also causes a loss of all reactor coolant system makeup capability which includes charging and safety injection flow. Inventory losses through leakage, reactor coolant pump controlled bleedoff, and primary relief valve releases are the major contributors to the degradation of pressure and level control during the event. The other contributor to coolant system shrinkage and pressure reduction is system heat loss, primarily through the pressurizer walls.

Core heat removal is accomplished through natural circulation. Reactor coolant system heat removal is accomplished using atmospheric dump valves and the steam driven auxiliary feedwater pump.

DOCUMENT REVISION DISTRIBUTION SHEET - UNIT 1 OFF NORMAL & EMERGENCY OPER. PROCEDURE

DOCUMENT TITLE Off-Normal Operation of the Liquid Waste Monitor.

DOCUMENT FILE NUMBER 1-1110032

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PROCESSED BY: B Hall DATE 10-27-82

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FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT NO. 1
OFF-NORMAL OPERATING PROCEDURE NO. 1-1110032
REVISION NO. 1

1.0 Title:

Off-Normal Operation of the Liquid Waste Process Monitor

2.0 Review and Approval:

Reviewed by Plant Nuclear Safety Committee _____ 19___
Approved by _____ Plant Manager _____ 19___

Revision No. 1 Reviewed by PNSC Sept 8 19 82
Approved by [signature] Plant Manager Sept. 23- 19 82

3.0 Purpose and Discussion:

3.1 Purpose

This procedure provides instruction in the off-normal operations of the Liquid Waste Process Monitor.

3.2 Discussion

The purpose of the Liquid Waste Monitor is to continuously monitor and record the radioactivity that is being discharged in the liquid waste being released to the circulating water canal. Prior to each discharge a representative sample of the liquid waste to be discharged is taken and analyzed. Based on this analysis, the monitor setpoints are determined and set.

4.0 Symptoms:

4.1 Visual and audible alarms on RMS cabinet "E"

4.2 Flashing Alert or High red alarm LED lights on the ratemeter.

4.3 A flashing Low Rate (Fail) red alarm LED light on the ratementer.

4.4 Increasing activity as noted on the recorder trace.

5.0 Instructions:

5.1 Immediate Automatic Action:

5.1.1 FCV-6627X, liquid waste flow control valve closes upon actuation of a High, Low Flow, or Monitor Fail alarms.

OFF-NORMAL OPERATING PROCEDURE NO. 1-1110032, REVISION 1
OFF-NORMAL OPERATION ON THE LIQUID WASTE PROCESS MONITOR
ST. LUCIE PLANT UNIT #1

5.0 Instructions: (cont)

5.2 Immediate Operator Action

5.2.1 Ensure FCV-6627X, liquid waste flow control valve is closed.

5.3 Subsequent Operator Action

5.3.1 Notify Chemistry Department on termination of release.

5.3.2 Upon Evaluation of problem, a new analysis of waste monitor tanks contents is necessary, complete requirements of OP# 0510022, Controlled Liquid Release to the Circulatory Water Discharge to terminate release.

5.3.3 Upon Chemistry Department revaluation, the release can be restarted, using the same release permit with new setpoints entered into the radwaste monitor and the release permit reviewed by chemistry department and the Nuclear Plant Supervisor.

/R1

1

OFF-NORMAL OPERATING PROCEDURE NO. 1-1110032, REVISION 1
OFF-NORMAL OPERATION OF THE LIQUID WASTE PROCESS MONITOR
ST. LUCIE PLANT UNIT #1

6.0 References:

6.1 FSAR Section 11.4.2.3

6.2 PSL Technical Specifications

6.3 PCM 102-80 through 106-80

7.0 Records Required:

7.1 Normal log entries

DOCUMENT REVISION DISTRIBUTION SHEET - UNIT II
OFF NORMAL & EMERGENCY OPER. PROCEDURE

DOCUMENT TITLE BLACKOUT OPERATION

DOCUMENT FILE NUMBER 2-0030140

DOCUMENT REVISION NUMBER 0

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FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2
EMERGENCY OPERATING PROCEDURE NO. 2-0030140
REVISION 0

1. TITLE BLACKOUT OPERATION
2. PREPARED BY M. Perry 10-18 19 82
3. SUBCOMMITTEE REVIEW BY J. Sydick, D. Sager for FPL 10-19 1982
4. REVIEWED BY FRG ON Oct 26 1982
5. APPROVED BY J. H Barrow F. Plant Manager 10-26 1982
6. REVISION REVIEWED BY FRG ON 19
7. APPROVED BY Plant Manager 19

2

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE UNIT 2
EMERGENCY OPERATING PROCEDURE NO. 2-0030140
REVISION 0

1.0 TITLE:

BLACKOUT OPERATION

2.0 APPROVAL:

Reviewed by Facility Review Group [illegible] 19[illegible]
Approved by J H Barrow Jr Plant Manager [illegible] 19[illegible]
Revision ____ Reviewed by FRG _____ 19___
Approved by _____ Plant Manager _____ 19___

3.0 PURPOSE OR DISCUSSION:

3.1 This procedure provides the action to be taken in the event of a complete loss of off-site electrical power concurrent with a Turbine trip.

3.2 Discussion - See Appendix A.

4.0 SYMPTOMS:

4.1 Alarms associated with the loss of operating plant components.

4.2 Loss of normal Control Room lighting and DC lighting energized.

4.3 Reactor and Turbine trip.

4.4 Emergency Diesel Generators start.

4.5 Reactor Coolant Pump trip and Main Feedwater Pump trip.

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EMERGENCY OPERATING PROCEDURE NO. 2-0030140, REVISION 0
BLACKOUT OPERATION

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5.0 INSTRUCTIONS:

5.1 Immediate Automatic Action:

5.1.1 Reactor and Turbine trip; Generator lockout.

5.1.2 Generator breakers open.

5.1.3 Incoming feeder breakers open to 4160V and 6900V buses.

5.1.4 Tie breakers between normal 4160V buses (2A2 and 2B2) and the emergency 4160V buses (2A3 and 2B3) open.

5.1.5 Ties between essential and non-essential sections of emergency 480V MCCs open.

5.1.6 Breakers open for the following non-safety related loads which are normally fed from emergency buses.

NOTE: These loads can be manually reconnected to the emergency buses as needed.

Pressurizer heater transformers A and B

CEDM MG Sets 2A and 2B

Fuel Handling 480V MCC 2A8, 2B8

Reactor cavity sump pump 2A

Containment building elevator

Electrical equipment room hoist

120/208 Power Panel 121 transformer

Lighting panel transformers 110, 112, 114, 117, 125, 126

Incoming feeder from 2A2 and 2B2 4160V buses

RCP oil lift pumps (B pumps only - A pumps running)

Pressurizer relief isol valves (1403 and 1405)

CVCS heat tracing transformer 2A and 2B

480V Lighting panel 2A, 2B and 2C

Waste management heat tracing transformers 2A and 2B

Air conditioner HVA-4, ACC-4

Power panel 120

Lighting panels 113, 116, 109, 115, 130

Refueling equipment

Refueling water to charging pumps (V-2504)

Boric Acid batching tank heaters

Fire siren

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BLACKOUT OPERATION

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5.0 INSTRUCTIONS: (Cont.)

5.1 Immediate Automatic Action: (Cont.)

5.1.7 All loads on emergency buses are tripped except the following:

Boric Acid Makeup Pumps

Charging Pumps

Emergency lighting

Class I power panels

RCP oil lift pumps (A pumps only - B pumps off)

Diesel fuel oil transfer pump

5.1.8 Diesel generators 2A and 2B start and energize 4160V emergency buses 2A3, 2B3, and 2AB and loads listed in step 5.1.7.

5.1.9 Subsequent loads are started at three second intervals. (See Table 1, Emergency Diesel Generator Loading Sequence.)

5.1.10 Auxiliary Feedwater auto start initiates when the first Steam Generator level decreases to 39%.

5.2 Immediate Operator Action:

5.2.1 Trip Turbine and reactor manually.

5.2.2 Check all CEAs are fully inserted and reactor trip breakers are open.

5.2.3 Check turbine valves are closed.

5.2.4 Check generator field and 240KV OCBs are open.

5.2.5 Place reheater control system in manual, close TCVs.

5.2.6 Check that Diesel Generators have started and are feeding only emergency buses.

5.2.7 Open Startup transformer breakers.

5.2.8 Reduce T_{ave} to reference setpoint by manual operation of the steam dump valves to atmosphere.

5.2.9 Isolate Steam Generator blowdown.

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EMERGENCY OPERATING PROCEDURE NO. 2-0030140, REVISION 0
BLACKOUT OPERATION

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5.0 INSTRUCTIONS: (Cont.)

5.2 Immediate Operator Action: (Cont.)

5.2.10 Verify the Steam driven AFW pump has started and has established flow to SGs. If AFW pumps have started due to the auto start feature, the motor driven pumps may be secured, if desired.

5.2.11 If any of the automatic actions listed in 5.2.2 through 5.2.10 do not occur automatically, then manually initiate that action.

5.3 Subsequent Action:

5.3.1 Implement the Emergency Plan as necessary in accordance with EPIP 3100021E, "Duties of the Emergency Coordinator."

5.3.2 Verify adequate natural circulation flow by ensuring that hot and cold leg temperatures, Pressurizer pressure and level stabilize within minutes. The core ΔT should be less than $\sim 49^{\circ}F$ (ΔT for full power).

1. If the above conditions are not established:

   A. Check RCS temperature and pressure to ensure that the RCS is subcooled.

   B. Ensure AFW flow to the Steam Generators has been initiated and the steam dumps to atmosphere are in operation.

   C. Refer to EOP 2-0120043, "Inadequate Core Cooling."

2. Return at least one RCP in each loop to operation as soon as off-site power is available.

5.3.3 Start equipment in Table 1 if required.

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EMERGENCY OPERATING PROCEDURE NO. 2-0030140, REVISION 0
BLACKOUT OPERATION

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5.0 INSTRUCTIONS: (Cont.)

5.3 Subsequent Action: (Cont.)

5.3.4 If one Diesel fails to start, attempt a manual start.

1. If manual start attempt is unsuccessful, an operator should be sent to the diesel local control station to inspect status of local alarm panel.

2. If no alarms are present on the local alarm panel, an inspection of the overspeed trip lever should be made to insure it has not tripped.

3. If the overspeed trip levers are latched, the normal/isolate switches on the local control panel should be placed in the ISOLATE position and a local start attempt should be made.

4. Refer to OP 2-2200020 and OP 2-2200050.

5.3.5 Locally open Condenser vacuum breakers (MV10-1A and MV10-1B). Locally close MSR main steam block valves (MV08-4, MV08-6, MV08-8, and MV08-10).

5.3.6 Check MSR warm-up valves (MV08-5, MV08-7, MV08-9, and MV08-11) to be closed or close manually.

5.3.7 Send an operator to align and start emergency cooling water to the Instrument Air Compressor, then reset Control Room handswitch and manually start the Instrument Air Compressor.

CAUTION: Do not overload the Diesel Generators when starting additional equipment (3685KW maximum continuous rating).

5.3.8 When Diesel Generator power is available, energize equipment as may be required for plant safety and to achieve an orderly shutdown within the Diesel Generator load limitations as follows:

1. Verify one set of cavity and support cooling fans operating. If not, start one set.

2. Lock out automatic starting equipment that is not in service.

3. Manually open all breakers on any non-vital bus or motor control center that is to be re-energized.

4. Reset lockout relays for each required bus to allow closing of feeder breakers.

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EMERGENCY OPERATING PROCEDURE NO. 2-0030140, REVISION 0
BLACKOUT OPERATION

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5.0 INSTRUCTIONS: (Cont.)

5.3 Subsequent Action: (Cont.)

5.3.9 Energize 4160V buses 2A2, 2B2, 480V load centers 2A1, 2B1 and 480 MCCs 2A1, 2B1, and 2C as follows:

	ACTION	LOCATION	
1.	Strip non-vital 4.16KV buses (All should be opened automatically)	2A2	2B2
2.	Insert sync plug, close 4.16KV non-vital breaker and hold control switch closed while closing 4.16KV vital breaker.	2A2-20109	2B2-20309
		2A3-20209	2B3-20411
3.	Strip non-vital load center	2A1	2B1
4.	Close 4.16KV feed breaker to non-vital load centers	2A2-20110	2B2-20310
5.	Strip 480V MCC	2A1 2C	2B1
6.	Close 480V Load Center feed breaker to MCC 2A1 and 2B1	2A1-40115	2B1-40411
7.	Close 480V Load Center feed breaker to MCC 2C	2A1-40119	2B1-40410

5.3.10 At MCC 2C, close breakers for turning gear, bearing oil pump, air side seal oil pump and hydrogen seal oil pump.

5.3.11 Place a Turbine Cooling Water Pump in operation.

5.3.12 Align Turbine Cooling Water to the Instrument Air Compressor back to normal alignment.

5.3.13 Place turbine drain valve switch in the OPEN position.

5.3.14 Start bearing oil pump before turbine bearing oil pressure reaches 12 psig decreasing. Pump starts automatically at 12 psig decreasing turbine bearing oil pressure. NOTE: If bearing oil pump fails to start, the emergency DC oil pump will start at 10 psig decreasing bearing oil pressure. Operator should start pump before 10 psig is reached. Stop the DC oil pump if it is running in addition to the bearing oil pump.

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EMERGENCY OPERATING PROCEDURE NO. 2-0030140, REVISION 0
BLACKOUT OPERATION

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5.0 INSTRUCTIONS: (Cont.)

5.3 Subsequent Action: (Cont.)

5.3.15 Remove the following components from service:

Steam jet air ejectors

Priming ejector

Auxiliary priming ejector

Auxiliary steam to RAB

Gland seal system

5.3.16 Start CEDM cooling fans 2A and 2B.

5.3.17 Start reactor support cooling fans 2A and 2B.

CAUTION: Consider equipment starting requirements. Alternate operation of equipment may be required to avoid overloading the Diesel Generators (3685KW maximum continuous rating).

5.3.18 Manually close breakers for pressurizer heater buses on 4160V buses 2A3 and 2B3.

5.3.19 Check that the bearing oil lift pump starts automatically when turbine speed decreases to approximately 600 rpm.

5.3.20 Start turbine lube oil vapor extractor and generator oil vapor extractor.

5.3.21 Check that the turning gear engages and starts automatically when turbine speed decreases to zero rpm, or manually engage it.

5.3.22 Reduce the flow of cooling water to maintain the temperature of the oil leaving the turbine lube oil and the air side and hydrogen side oil coolers between 95 - 100°F.

5.3.23 Isolate cooling water supply to the generator hydrogen coolers.

5.3.24 If additional Condensate Storage Tank water is required, have Unit 1 personnel place the Water Treatment Plant in service.

5.3.25 Place the spent fuel pool cooling pump in operation as necessary.

NOTE: With spent fuel elements from 3-1/3 cores present, the spent fuel pool can safely withstand five hours without cooling before reaching the boiling point.

ST. LUCIE UNIT 2
EMERGENCY OPERATING PROCEDURE NO. 2-0030140, REVISION 0
BLACKOUT OPERATION

5.0 INSTRUCTIONS: (Cont.)

5.3 Subsequent Action: (Cont.)

5.3.26 Periodically check fuel oil levels in the Diesel Generator day tanks to confirm proper operation of the fuel oil transfer system and to ensure uninterrupted Diesel Generator operation.

5.3.27 Sample and analyze the reactor coolant to determine if fuel element clad failure has occurred.

5.3.28 Determine expected duration of power outage. If unable to do so or if outage is to be prolonged, borate RCS to Cold Shutdown concentration.

5.3.29 If the outage will exceed four hours and the RWT is available, proceed to Cold Shutdown conditions utilizing natural circulation, atmospheric steam dump and feedwater addition. Refer to EOP 2-0120040, "Natural Circulation/Cooldown." Place shutdown cooling in service when appropriate temperatures and pressures are reached.

NOTE: Do not begin plant cooldown until Cold Shutdown boron concentration is verified.

5.3.30 If Pressurizer cooldown cannot be accomplished in a timely manner from the addition of cooler liquid (auxiliary spray) from the Charging Pump via the Pressurizer spray line, proceed with the alternate positive means of depressurization as follows:

1. Place the switches for the Power Operated Relief Valves (V-1474 and V-1475) in the OVERRIDE position.

2. Initiate a high Pressurizer pressure trip signal on two RPS channel trip units.

3. Place the switch for either Power Operated Relief Valve (V-1474 or V-1475) in the NORMAL RANGE position and vent the Pressurizer to the Quench Tank. Return the switch to OVERRIDE to close valve.

4. Control the rate of cooldown and depressurization by selective operation of the Power Operated Relief Valves in this mode until cooldown via the auxiliary spray valves can be initiated.

5.3.31 When normal AC power is available:

1. Restore bus sections to their normal supplies.

2. Place the Diesel Generator system in standby lineup as per OP 2-2200020.

3. Restore all plant systems to normal.

6.0 REFERENCES:

6.1 FSAR, Section 15

6.2 FSAR, Section 8

6.3 Off-Normal OP 2-0030130, "Shutdown Resulting From Reactor/Turbine Trip."

6.4 OP 2-0210020, "Charging and Letdown."

6.5 OP 2-0330020, "Turbine Cooling Water Operation."

6.6 Off-Normal OP 2-0250031, "Boron Concentration Control, Off-Normal."

6.7 Off-Normal OP 2-1010040, "Loss of Instrument Air."

6.8 OP 2-1540020, "Water Plant Startup and Shutdown."

6.9 OP 2-2200020, "Emergency Diesels - Standby Lineup."

6.10 OP 2-0700022, "Auxiliary Feedwater System Operation."

7.0 RECORDS/NOTIFICATIONS:

7.1 Normal log entries.

7.2 AP 0010134, "Component Cycles and Transients."

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ST. LUCIE UNIT 2
EMERGENCY OPERATING PROCEDURE 2-0030140, REVISION 0
BLACKOUT OPERATION

TABLE 1

DIESEL GENERATOR LOADING SEQUENCE

Item	Automatic Starting Equipment (4)	Per Diesel Generator Quantity	Nominal Load or Nameplate HP	Starting KVA	Timing Sequence	RUNNING LOAD (KW) Shutdown With Loss of Off-Site Power (LOOP)	LOCA (Recirculation) With Loss of Off-Site Power (LOOP)	Main Steam Line Break With Loss of Offsite Power (LOOP)
1	High Pressure Safety Inj. Pump	1	400	2422.0	0 Sec.	-	373	373
2	Motor Operated Valves	Lot	57	585	0 Sec.	40	8 (1)	80
3	Emergency Lighting	Lot	-	-	0 Sec.	70	70	70
4	Power Panels	Lot	-	-	0 Sec.	30	30	30
5	Diesel Oil Transfer Pumps	1	3	21.5	0 Sec.	3	3	3
6	RCP Oil Lift Pumps	4	10	66.85	0 Sec.	19	19	19
7	Uninterruptible Power Supply	1	-	-	0 Sec.	20	20	20
8	HVAC Dampers	Lot	-	-	0 Sec.	4	4	4
9	HVAC Valves	Lot	-	-	0 Sec.	3	3	3
10	Elec. Equip. Room Exhaust, 2-HVE-11	1	50	244.7	0 Sec.	47.5	47.5	47.5
11	Elec. Equip. Room Exhaust, 2-RV-3	1	5	34.22	0 Sec.	5	5	5
12	Battery Room Roof Ventilator, 2-RV-1	1	0.75	8.5	0 Sec.	.75	.75	.75
13	Low Pressure Safety Inj. Pump	1	400	2183.3	3 Sec.	-	-	361
14	Containment Fan Coolers	2	125/83	828.4	3 Sec.	160	160	160
15	Elec. Equip. Room Supply	1	100	584.12	3 Sec.	95	95	95
16	Component Cooling Water Pump	1	450	2491.2	6 Sec.	400	400	400
17	Shield Building Exhaust	1	60	340.6	6 Sec.	-	57	57
18	Shield Building Heaters	Lot	-	-	6 Sec.	-	31.5	31.5

ST. LUCIE UNIT 2

EMERGENCY OPERATING PROCEDURE 2-0030140, REVISION 0

BLACKOUT OPERATION

TABLE 1

DIESEL GENERATOR LOADING SEQUENCE

(Continued)

Item	Automatic Starting Equipment (4)	Per Diesel Generator Quantity	Nominal Load or Nameplate HP	Starting KVA	Timing Sequence	RUNNING LOAD (KW) Shutdown With Loss of Off-Site Power (LOOP)	LOCA (Recirculation) With Loss of Off-Site Power (LOOP)	Main Steam Line Break With Loss of Offsite Power (LOOP)
19	Intake Cooling Water Pump	1	600	3709.0	9 Sec.	527	527	527
20	Containment Spray Pump	1	500	2892.6	12 Sec.	-	450	450
21	Hydrazine Pump	1	3	21.5	12 Sec.	1	1	1
22	Auxiliary Feedwater Pump	1	350	1951.4	15 Sec.	297	297	297 (2)
23	Boric Acid Heat Trace	Lot	Lot	-	18 Sec.	5	5	5 (3)
24	Control Room Air Conditioning	2	60	-	18 Sec.	57	57	57
25	Control Room Emer. Filter Fan	1	10	62.0	18 Sec.	9.5	9.5	9.5
26	RAB Supply Fan	1	150	900.1	18 Sec.	142.5	142.5	142.5
27	EECS Area Exhaust Fan	1	60	358	18 Sec.	57	57	57
28	Reactor Cavity Supply Fan	1	20	124.15	18 Sec.	19	-	-
29	Reactor Supports Cooling	1	40	234.76	18 Sec.	38	-	-
30	Intake Building Cooling Fan	1	7.5	44.0	18 Sec.	7.13	7.13	7.13
31	Battery Charger	1	3	-	-	73.5	73.5	73.5
32	Charging Pumps	2	125	1656.8	Manual load	237.5	237.5	-
33	Boric Acid Makeup Pump (5)	2	25	148.2	Manual load	47.5	47.5	-
34	Low Pressure Safety Inj. Pump	1	400	2183.3	Manual load	309	-	-

ST. LUCIE UNIT 2
EMERGENCY OPERATING PROCEDURE 2-0030140, REVISION 0
BLACKOUT OPERATION

TABLE 1

DIESEL GENERATOR LOADING SEQUENCE
(Continued)

Item	Automatic Starting Equipment (4)	Per Diesel Generator Quantity	Nominal Load or Nameplate HP	Starting KVA	Timing Sequence	RUNNING LOAD (KW) Shutdown With Loss of Off-Site Power (LOOP)	LOCA (Recirculation) With Loss of Off-Site Power (LOOP)	Main Steam Line Break With Loss of Offsite Power (LOOP)
35	Instrument Air Compressor	1	60	340.6	Manual load	57	-	-
36	Fuel Pool Cooling Pump	1	40	234.76	Manual load	38	38	-
37	Hydrogen Recombiner	1	-	-	Manual load	-	75	-
38	Pressurizer Heaters	1	-	-	Manual load after 2 hours LOOP	150	-	-
				Total		3317.0 KW	3298.00 KW	3335.53 KW

Notes:

(1) Actuated on RAS
(2) Started if operating prior to LOOP
(3) Approximate KW required for temperature maintenance
(4) Items 32 to 37 inclusive are manual loads
(5) Both Boric Acid Makeup Pumps are loaded onto Diesel Generator A

ST. LUCIE UNIT 2
EMERGENCY OPERATING PROCEDURE NO. 2-0030140, REVISION 0
BLACKOUT OPERATION

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APPENDIX A

DISCUSSION

1. A loss of power to the 4160V buses results in a loss of power to all 480V Load Centers and Motor Control Centers and to all instrumentation not fed directly or indirectly from the station battery. A reactor trip will occur from a low reactor coolant flow rate signal due to the loss of power to the 6900V buses supplying the Reactor Coolant Pumps and will be accompanied by a Turbine trip and Generator lockout.

2. Steam dump to atmosphere must be used to remove reactor decay heat. Initially, Steam Generator safety valves may actuate to augment the steam flow and to help control Steam Generator pressure immediately after the trip.

3. On-site power will be supplied by the Emergency Diesel Generators.

4. A rapid reduction in Steam Generator water levels will occur due to the reduction of the Steam Generator void fraction on the secondary side and also because steam flow will continue after normal feedwater flow stops. Auxiliary feedwater flow will automatically initiate after the first Steam Generator level reaches 39% (2/4 logic).

5. Core decay heat removal is accomplished by natural circulation in the reactor coolant loops.

6. Core damage is not expected as a result of a loss of power condition as the Steam Generators are maintained as a heat sink and pressurizer pressure and inventory control are available.

7. If operating under blackout conditions and an Engineered Safety Features Actuation signal occurs, any non-emergency loads that are running will be automatically tripped and the required emergency loads will be automatically started.

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OFF NORMAL & EMERGENCY OPER. PROCEDURE

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DOCUMENT FILE NUMBER 2-0030141

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10	Watch Engineers II			G. Regal	
11				John Holwell-Backfit	
12				Training - Larry Baker	
13					
14					
15	Training			J. Spodick	
				T. Vogan - GO	
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				Attn: Chief, Nuclear Response Branch	
				C. Burns - CE	

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FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT NO. 2
EMERGENCY OPERATING PROCEDURE 2-0030141
REVISION NO. 0

2

1. TITLE: CONTROL ROOM INACCESSIBILITY

2. PREPARED BY: L. Rich, M. Perry 10-7 1982

3. SUBCOMMITTEE REVIEW BY: B. PEARCE, D. SAGER For FP&L 10-5 1982

4. REVIEWED BY FRG ON: Oct 22 19__

5. APPROVED BY J.H. Buckley Jr PLANT MANAGER Oct 26 19__

6. REVISION REVIEWED BY FRG ON: _____ 19__

7. APPROVED BY _____ PLANT MANAGER 19__

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE UNIT NO. 2
EMERGENCY OPERATING PROCEDURE 2-0030141
REVISION 0

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1.0 TITLE:

CONTROL ROOM INACCESSIBILITY

2.0 APPROVAL:

Reviewed by Facility Review Group _____ 19__
Approved by _____ Plant Manager _____ 19__

Rev. ___ Reviewed by FRG _____ 19__
Approved by _____ Plant Manager _____ 19__

3.0 PURPOSE & DISCUSSION:

3.1 This procedure provides instructions for placing the plant in a safe condition when operations cannot safely be conducted from the Control Room.

3.2 The reactor and turbine are manually tripped prior to leaving the Control Room, if possible, or locally from the Reactor Trip Switchgear and the Turbine front standard.

3.3 A heat sink is provided by automatic steam dump to the Condenser and/or to atmosphere.

3.4 Level is maintained in the Steam Generators by manual control of auxiliary feedwater valves with flow furnished by the Auxiliary Feedwater Pumps.

3.5 Pressurizer level and pressure are maintained by manual control of Pressurizer heaters, auxiliary spray valves, and letdown valves, and are monitored at the Remote Shutdown Panel.

3.6 Isolation switches located in the Reactor Auxiliary Building Electrical Equipment Room, Turbine Building Switchgear Room, Diesel Generator Rooms, and Reactor Auxiliary Building are manually selected to the ISOLATE position to prevent inadvertant operation of vital equipment due to possible electrical malfunction in the unattended Control Room.

3.7 A copy of this procedure will be posted at each manned operating station required for plant shutdown from outside the Control Room.

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EMERGENCY OPERATING PROCEDURE NUMBER 2-0030141, REVISION 0
CONTROL ROOM INACCESSIBILITY

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3.0 PURPOSE & DISCUSSION: (continued)

3.8 A listing of isolation switches will be posted on each of the following panels, MCCs, and distribution buses.

1. Load Centers 2A, 2B, 2AB
2. Isolation Switch Panels 2A, 2B, 2AB
3. MCC 2A5, 2A6, 2B5, 2B6
4. 4160V Buses 2A3, 2B3, 2AB
5. 4160V Buses 2A2, 2B2
6. 6900V Buses 2A1, 2B1
7. Diesel Generator 2A and 2B Control Panels

3.9 The Nuclear Plant Supervisor will utilize additional personnel as available to assist in required subsequent actions.

4.0 SYMPTOMS:

4.1 Conditions exist such that the Control Room becomes uninhabitable and must be evacuated.

5.0 INSTRUCTIONS:

5.1 Immediate Actions:

5.1.1 Manually trip the reactor and Turbine prior to leaving the Control Room, if possible.

5.1.2 Announce evacuation of the Control Room over the P.A. system.

5.1.3 Implement the Emergency Plan, as necessary, in accordance with EPIP 3100021E, "Duties of the Emergency Coordinator".

5.1.4 Obtain the Remote Shutdown Room Keybox Master Key from the Control Room Key Locker: Key Number (LATER).

5.1.5 Evacuate all personnel from the Control Room.

5.2 Subsequent Actions:

5.2.1 Man and take control of stations as follows:

1. Reactor Control Operator "A" - Remote Shutdown Panel.

A. Establish communications on the Sound Power Phone System.

B. Monitor available plant parameters on the Remote Shutdown Panel.

C. Start motor or steam-driven Auxiliary Feedwater Pumps and feed the Steam Generators as required.

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EMERGENCY OPERATING PROCEDURE NUMBER 2-0030141, REVISION 0
CONTROL ROOM INACCESSIBILITY

2

5.0 INSTRUCTIONS: (continued

5.2 (continued)

5.2.1 (continued)

D. Control Pressurizer pressure and level by manual control of Pressurizer heaters, auxiliary spray valves, and letdown valves.

NOTE: Only the "P" Letdown level and pressure valves are controllable from the Remote Shutdown Panel.

2. Nuclear Plant Supervisor - Electrical Equipment Room, Reactor Auxiliary Building - 43' Elev.

A. Open or check open Reactor Trip Breakers TCB-1 through 8.

B. Place isolation switches in the ISOLATE position on the following switchgear in the order listed: (See Appendix A).

480V Load Center 2A3
480V Load Center 2B3
480V Load Center 2A2
4160V SWGR 2A3
480V MCC 2A5
480V MCC 2A6
480V Load Center 2B2
4160V SWGR 2B3
480V MCC 2B6
480V MCC 2B5
480V MCC 2AB
Isolation Panel 2AB
Isolation Panel 2A
Isolation Panel 2B
Communications Isolation Panel

C. Assist Reactor Control Operator "A" in monitoring unit parameters from the Remote Shutdown Panel.

3. Reactor Control Operator "B" - Turbine Operating Level.

A. Locally trip or verify tripped Unit No. 2 Turbine.

B. Verify Turbine Stop Valves and Control Valves are shut; if not, initiate Turbine trip from Turbine front standard.

C. Proceed to Turbine Building Switchgear Room and establish communications on the Sound Powered Phone circuit.

ST. LUCIE UNIT NO. 2
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CONTROL ROOM INACCESSIBILITY

2

5.0 INSTRUCTIONS: (continued)

5.2 (continued)

5.2.1 (continued)

D. Place isolation switches in the ISOLATE position for bus feeder breakers as follows (see Appendix A):

4160V SWGR 2A2
4160V SWGR 2B2
6900V SWGR 2A1
6900V SWGR 2B1

E. Stop 2A and 2B Main Feedwater Pumps, 2A and 2B Heater Drain Pumps, and one Condensate Pump by opening their respective breakers.

CAUTION:Ensure that one Condensate Pump remains in service.

4. Nuclear Operator - Reactor Auxiliary Building.

A. Place isolate switches in ISOLATE/LOCAL position on the following switchgear (see Appendix A):

4160V SWGR 2AB
480V Load Center 2AB

B. Proceed to the Diesel Generator Building and place isolation switches on 2A and 2B Diesel Control Panels in ISOLATE position (see Appendix A).

C. Open or check open isolation valves for Letdown pressure and level control valves (V-2110P and V-2201P). Isolate V-2110Q and V-2201Q.

D. Proceed to the Charging Pump area and establish communications on the Sound Powered Phone circuit.

5.2.2 Maintain Pressurizer level at approximately 33% indicated level.

5.2.3 Maintain Pressurizer pressure at approximately 2100 psia.

5.2.4 Maintain Reactor Coolant System temperature at or below 532°F (2A cold leg temperature) by use of atmosphere steam dump and/or selective shutdown of Reactor Coolant Pumps.

NOTE: Stop Reactor Coolant Pumps as required by opening the Reactor Coolant Pump breakers in the Turbine Building Switchgear Room.

5.2.5 Maintain Steam Generator levels at the approximately 65% indicated level by operation of the Auxiliary Feedwater Pumps and discharge valves to the Steam Generators.

ST. LUCIE UNIT NO. 2
EMERGENCY OPERATING PROCEDURE NUMBER 2-0030141, REVISION 0
CONTROL ROOM INACCESSIBILITY

2

5.0 INSTRUCTIONS: (continued)

5.2 (continued)

5.2.6 Isolate Steam Generator blowdown by manually closing isolation valves at the Closed Blowdown Heat Exchangers.

5.2.7 When Turbine speed decreases to "0" RPM, verify that the Turning Gear Oil Pump and the turning gear are in operation.

5.2.8 Periodically check the habitability of the Control Room and when conditions permit, reoccupy the Control Room. Return isolation switches to NORMAL for switches and controls that are operational and maintain the Unit at Hot Standby until a complete evaluation has been made.

5.2.9 If Control Room accessibility is not possible, place the unit in a Cold Shutdown condition as follows:

1. Commence boration to Cold Shutdown conditions by manual valve lineup. Borate to 1900 ppm as shown below.

NOTE: This concentration will ensure >5% Shutdown Margin at 201°F at any time in core life, assuming the most reactive CEA stuck full out. Use both the local boron flow meters vs. time and BAM Tank level change to determine how many gallons of boron have been added. Do not interpolate values shown, always round critical boron concentration DOWN to next lower value on table.

NOTE: If plant curves are available, they may be used to determine shutdown boron concentration requirements instead of this Table.

Boron Conc. Prior to Control Room Inaccessibility	Number of Gallons of Boron needed to reach 1900 ppm	BAM Tank level change (1 BAM Tank)
50 PPM	7223 Gal	75%
100 PPM	7039 Gal	73%
200 PPM	6668 Gal	70%
300 PPM	6295 Gal	66%
400 PPM	5919 Gal	62%
500 PPM	5442 Gal	57%
600 PPM	5162 Gal	54%
700 PPM	4779 Gal	50%
800 PPM	4395 Gal	46%
900 PPM	4008 Gal	42%
1000 PPM	3618 Gal	38%
1100 PPM	3226 Gal	34%
1200 PPM	2832 Gal	30%
1300 PPM	2435 Gal	25%
1400 PPM	2036 Gal	21%
1500 PPM	1634 Gal	17%

2

5.0 INSTRUCTIONS: (continued)

5.2 (continued)

5.2.9 (continued)

2. Ensure Steam Generator level is being maintained at approximately 65% by the Auxiliary Feedwater Pumps.

3. Stop at least one Reactor Coolant Pump prior to reaching 500°F by tripping its breaker at the 2A1 or 2B1 switchgear. Additional RCPs may be stopped as desired to control cooldown rate. After pump coastdown, stop the lift pumps by opening the associated breakers in the electrical switchgear room. Re-close lift pump breakers after one minute elapses.

4. Place all Pressurizer heater switches at the Remote Shutdown Panel to OFF. Heaters may be energized to control RCS pressure as needed.

5. The highest RCS cold leg temperature (highest one with RCP running) shall be plotted every 30 minutes. The copy of the graph (Figure 1) shall be kept with this procedure. The RCS temperature and pressure shall be determined to be within the limits of Figure 3.4-2b at least once per 30 minutes during cooldown.

   NOTE: Cooldown of the RCS shall be limited to $\leq$ 75°F in any one hour period.

6. The Pressurizer water phase temperature shall be plotted every 30 minutes using the Saturated Temperature v_s Pressure curve of this procedure (Figure 2). If possible, maximize letdown and minimize charging when using auxiliary spray to minimize thermal stress on spray nozzle.

   NOTE: Cooldown of the Pressurizer shall be limited to $\leq$ 190°F in any one hour period.

7. When the quanity of boron calculated in Step 5.2.9.1 has been added, cooldown may proceed. Verify by chemistry sample (if possible) that desired boron concentration has been obtained. Commence taking data on cooldown curve. Have the "B" Reactor Control Operator break Condenser vacuum by manually opening vacuum breaker MOVs.

   CAUTION: MSIS will occur at about 475°F, and sealing steam will be lost. Condenser vacuum must be broken prior to 475°F to prevent seal damage.

ST. LUCIE UNIT NO. 2
EMERGENCY OPERATING PROCEDURE NUMBER 2-0030141, REVISION 0
CONTROL ROOM INACCESSIBILITY

2

5.0 INSTRUCTIONS: (continued)

5.2 (continued)

5.2.9 (continued)

8. While locally monitoring and controlling VCT level, slowly open the atmospheric steam dumps and establish the desired cooldown rate.

NOTE: A makeup blend ratio to the VCT of about 9:1 is sufficient to maintain 1900 PPM boron in the RCS.

NOTE: A temperature differential of approximately 100°F between the RCS and Pressurizer should be maintained during cooldown. Cooldown of the Pressurizer must be accomplished by use of auxiliary spary and heater control.

9. At 1750 psia, isolate and bypass the following transmitters:

1) Charging header flow: close valve marked "HIGH SIDE", open valve marked "BYPASS", and close valve marked "LOW SIDE".

2) Charging header pressure: close its isolation valve.

10. When the SIAS amber permissive lights come on (1700 psia), block SIAS by turning the key operated switch on the Remote Shutdown Panel for both A and B channels.

11. Commence venting all four SITs from remote valve stations in the Pipe and Electrical Penetration Rooms. (Valves 3733, 3734, 3735, 3736, 3737, 3738, 3739 and 3740).

12. Maintain at least two Reactor Coolant Pumps operating. If possible, two RCPS in the same loop should be left running.

13. Periodically adjust the steam dump controllers and auxiliary spray control to maintain the desired cooldown and de-pressurization rate. Verify that the Steam Generators are being maintained at approximately 65% level.

14. With RCS pressure < 1700 psia, but prior to commencing SDC operations, rack out 2A and 2B Containment Spray Pump breakers (2-20203 and 2-20407).

ST. LUCIE UNIT NO. 2
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CONTROL ROOM INACCESSIBILITY

5.0 INSTRUCTIONS: (cont.)

5.2 (continued)

5.2.9 (continued)

15. When RCS temperature is < 500°F and RCS pressure is < 1500 psia, preform the following:

    A. Close 2-V-07145 and 2-V-07130 (Containment spray pump disch valves)

    B. Close the following containment spray header manual isolation valves.

    2-V-07161 (A hdr FCV upstream isol)
    2-V-07164 (B hdr FCV upstream isol)
    2-V-07162 (A hdr FCV downstream isol)
    2-V-07165 (B hdr FCV downstream isol)

16. When RCS pressure is < 275 psia, rack in the breakers for and then close the SIT discharge valves by placing the local control switch in the CLOSE position.

    MV-3614: Bkr 2-41219
    MV-3624: Bkr 2-41311
    MV-3634: Bkr 2-42117
    MV-3644: Bkr 2-42048

17. Rack out the SIT discharge valve breakers.

    CAUTION: Prior to lowering RCS pressure below (LATER) psia, two RCPs in the same loop must be operating.

18. Lower RCS termperature to 300°F and RCS pressure to 260 psia.

19. Remove the trip and close fuses on one HPSI Pump. Ensure that the other HPSI Pump remains operable.

    CAUTION: With SDC in service, an increase in RCS pressure > 350 psia will result in rapid RCS inventory loss due to lifting of relief valves in Hot Leg suction lines (Total capacity 4,600 gpm).

NOTE: Minimum pressure for RCP operation is (LATER), so it is necessary to proceed quickly to Shutdown Cooling.

ST. LUCIE UNIT NO. 2
EMERGENCY OPERATING PROCEDURE NUMBER 2-0030141, REVISION 0
CONTROL ROOM INACCESSIBILITY

2

5.0 INSTRUCTIONS: (cont.)

5.2 (continued)

5.2.9 (continued)

20. Stop the operating RCPs prior to lowering pressure to (LATER) by tripping the breakers on 2A1 and 2B1 switchgear. After pump coastdown, stop the oil lift pumps by opening the breaker for each pump for 1 minute, then re-closing the breaker.

21. Reduce RCS pressure to < 350 psia, then open the following valves from their local controllers:

A. Hot Leg Suction Valves: V-3651, V-3652, V-3665, V-3480, V-3481, V-3664.

NOTE: V-3664 and V-3665 local controllers are in Pipe Penetration Room, all others are in the Cable Spreading Room.

NOTE: V-3545 (Hot Leg Suction Cross-Tie) is normally closed. It may be used to provide flow during off-normal conditions.

B. CCW from SDC Heat Exchangers: HCV-14-3A and HCV-14-3B by (LATER).

C. SDC Heat Exchanger Discharge Valves: MV-3456 and MV-3457.

D. LPSI Header Isolation Valves: MV-3615, MV-3625, MV-3635 and MV-3645.

22. Close the following valves:

A. RWT recirculation stop valves: V-3459, V-3463, and V-3597.
B. Miniflow header stop valves: V-3659, V-3660, V-3459 and V-3496.

23. Have the Nuclear Operator establish communications on the Sound Power Phone System in the 2A LPSI Pump Room.

ST. LUCIE UNIT NO. 2
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CONTROL ROOM INACCESSIBILITY

2

5.0 INSTRUCTIONS: (cont.)

5.2 (continued)

5.2.9 (continued)

24. Establish SDC as follows:

A. Insert keys for MV-3306 and MV-3657 (controllers located in A LPSI Room) and place switches to MODULATE position.

B. Using key switches at local controllers, open MV-3517 and MV-3456.

C. Give MV-3306 a 3 second open signal, then allow switch to return to NORMAL.

D. Start the 2A LPSI Pump, then open MV-3306 to obtain 3000 gpm flow as indicated on FI-3306 at the Remote Shutdown Panel.

E. While observing SDC outlet temperature and flow on the Remote Shutdown Panel, alternately open MV-3657 and close MV-3306 to achieve desired cooldown rate and maintain 3000 gpm.

25. At 200°F RCS temperature, remove the trip and close fuses on the remaining HPSI Pump. Open the breaker for one Charging Pump so that no more than two Charging Pumps are operable.

26. Stabilize RCS temperature at approximately 100°F and RCS pressure at approximately 250 psia. Control pressure by use of Pressurizer heaters and auxiliary spray. Do not take the Pressurizer solid until Control Room access has been re-established.

ST. LUCIE UNIT NO. 2
EMERGENCY OPERATING PROCEDURE NUMBER 2-0030141, REVISION 0
CONTROL ROOM INACCESSIBILITY

APPENDIX "A" (continued)

ISOLATION SWITCHES

480V Load Center 2A3 - Pressurizer Heater Bus, Auxiliary Building Electrical Equipment Room

1. Heater Bank P-1
2. Heater Bank B-1
3. Heater Bank B-2
4. Heater Bank B-3

ST. LUCIE UNIT NO. 2
EMERGENCY OPERATING PROCEDURE NUMBER 2-0030141, REVISION 0
CONTROL ROOM INACCESSIBILITY

2

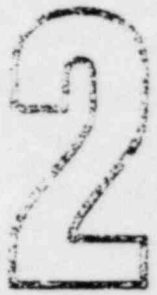
APPENDIX "A" (continued)

ISOLATION SWITCHES

480V Load Center 2B3 - Pressurizer Heater Bus, Auxiliary Building Electrical Equipment Room

1. Heater Bank P-2
2. Heater Bank B-4
3. Heater Bank B-5
4. Heater Bank B-6

ST. LUCIE UNIT NO. 2
EMERGENCY OPERATING PROCEDURE NUMBER 2-0030141, REVISION 0
CONTROL ROOM INACCESSIBILITY



APPENDIX "A" (continued)

ISOLATION SWITCHES

480V Load Center 2A2 - Auxiliary Building Electrical Equipment Room

1. SS Transformer 2A2
2. Bus Tie to 480V L.C. 2AB
3. Containment Fan Cooler 2-HVS-1A
4. Containment Fan Cooler 2-HVS-1B
5. 2A Charging Pump

ST. LUCIE UNIT NO. 2
EMERGENCY OPERATING PROCEDURE NUMBER 2-0030141, REVISION 0
CONTROL ROOM INACCESSIBILITY

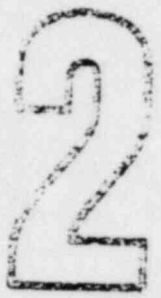
APPENDIX "A" (continued)

ISOLATION SWITCHES

4160V SWGR 2A3 - Auxiliary Building Electrical Equipment Room

1. 2A HPSI Pump
2. 2A LPSI Pump
3. 2A Containment Spray Pump
4. Pressurizer Heater Transformer 2A3
5. 2A Component Cooling Water Pump
6. 2A Intake Cooling Water Pump
7. CEDM Cooling Fan 2HVE-21A
8. Feed to 4160V Bus 2AB
9. Feed from 4160V Bus 2A2
10. Feed to 480V SS Transformer 2A2
11. Feed from 2A Emergency Diesel Generator
12. 2A Auxiliary Feedwater Pump

ST. LUCIE UNIT NO. 2
EMERGENCY OPERATING PROCEDURE NUMBER 2-0030141, REVISION 0
CONTROL ROOM INACCESSIBILITY



APPENDIX "A" (continued)

ISOLATION SWITCHES

480V MCC 2A5 - Auxiliary Building Electrical Equipment Room

1. Makeup Bypass to Charging Pumps (V-2514)
2. 2A AFW Pump Discharge to 2A Steam Generator (MV-09-9)
3. 2B Steam Generator to 2C AFW Pump Turbine (MV-08-12)
4. CCW to Containment Fan Cooler 2HV5-1A (MV-14-9)
5. CCW to Containment Fan Cooler 2HV5-1A (MV-14-10)
6. CCW to Containment Fan Cooler 2HV5-1B (MV-14-11)
7. CCW to Containment Fan Cooler 2HV5-1B (MV-14-12)

ST. LUCIE UNIT NO. 2
EMERGENCY OPERATING PROCEDURE NUMBER 2-0030141, REVISION 0
CONTROL ROOM INACCESSIBILITY

2

APPENDIX "A" (continued)

ISOLATION SWITCHES

480V MCC 2A6 - Auxiliary Building Electrical Equipment Room

1. 2A Boric Acid Makeup Pump
2. 2B Boric Acid Makeup Pump
3. 2HVA-3A - Control Room Outdoor Air Conditioner
4. 2HVE-6A - Shield Building Exhaust Fan
5. 2HVE-13A - Control Room Booster Fan
6. Containment Spray Isolation Valve (MV-07-161)
7. 2A LPSI Pump Suction Valve (V-3432)

ST. LUCIE UNIT NO. 2
EMERGENCY OPERATING PROCEDURE NUMBER 2-0030141, REVISION 0
CONTROL ROOM INACCESSIBILITY

APPENDIX "A" (continued)

ISOLATION SWITCHES

480V Load Center 2B2 - Auxiliary Building Electrical Equipment Room

1. SS Transformer 2B2
2. Bus Tie to 480V L.C. 2AB
3. Containment Fan Cooler 2HVS-1C
4. Containment Fan Cooler 2HVS-1D
5. 2B Charging Pump

ST. LUCIE UNIT NO. 2
EMERGENCY OPERATING PROCEDURE NUMBER 2-0030141, REVISION 0
CONTROL ROOM INACCESSIBILITY

APPENDIX "A" (continued)

ISOLATION SWITCHES

4160V SWGR 2B3 - Auxiliary Building Electrical Equipment Room

1. Feed from 2B Emergency Diesel Generator
2. Feed to 480V SS Transformer 2B2
3. Pressurizer Heater Transformer 2B3
4. CEDM Cooling Fan 2HVE-21B
5. 2B Component Cooling Water Pump
6. 2B HPSI Pump
7. 2B LPSI Pump
8. 2B Containment Spray Pump
9. Feed to 4160V Bus 2AB
10. Feed from 4160V Bus 2B2
11. 2B Intake Cooling Water Pump
12. 2B Auxiliary Feedwater Pump

ST. LUCIE UNIT NO. 2
EMERGENCY OPERATING PROCEDURE NUMBER 2-0030141, REVISION 0
CONTROL ROOM INACCESSIBILITY

APPENDIX "A" (continued)

ISOLATION SWITCHES

480V MCC 2B6 - Auxiliary Building Electrical Equipment Room

1. 2HVE-6B - Shield Building Exhaust Fan
2. 2HVA-3B - Control Room Air Conditioner
3. 2HVE-13B - Control Room Booster Fan
4. Containment Spray Isolation Valve (MV-07-164)
5. 2B LPSI Pump Suction Valve (V-3444)

ST. LUCIE UNIT NO. 2
EMERGENCY OPERATING PROCEDURE NUMBER 2-0030141, REVISION 0
CONTROL ROOM INACCESSIBILITY

APPENDIX "A" (continued)

ISOLATION SWITCHES

480V MCC 2B5 - Auxiliary Building Electrical Equipment Room

1. Boric Acid Gravity Feed Valve (V-2508)
2. Boric Acid Gravity Feed Valve (V-2509)
3. 2B AFW Pump Discharge to 2B Steam Generator (MV-09-10)
4. 2A Steam Generator to 2C AFW Pump Turbine (MV-08-13)
5. CCW to Containment Fan Cooler 2HV5-1C (MV-14-13)
6. CCW to Containment Fan Cooler 2HV5-1D (MV-14-14)
7. CCW to Containment Fan Cooler 2HV5-1D (MV-14-15)
8. CCW to Containment Fan Cooler 2HV5-1D (MV-14-16)

ST. LUCIE UNIT NO. 2
EMERGENCY OPERATING PROCEDURE NUMBER 2-0030141, REVISION 0
CONTROL ROOM INACCESSIBILITY

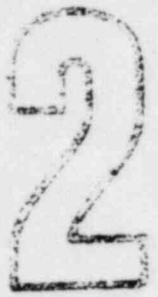
APPENDIX "A" (continued)

ISOLATION SWITCHES

480V MCC 2AB - Auxiliary Building Electrical Equipment Room

1. 2HVA-3C- Control Room Air Conditioner, Indoor Unit
2. CCW Discharge Valve - A Hdr. (MV-14-1)
3. CCW Discharge Valve - B Hdr. (MV-14-2)
4. CCW Discharge Valve - A Hdr. (MV-14-3)
5. CCW Discharge Valve - B Hdr. (MV-14-4)

ST. LUCIE UNIT NO. 2
EMERGENCY OPERATING PROCEDURE NUMBER 2-0030141, REVISION 0
CONTROL ROOM INACCESSIBILITY



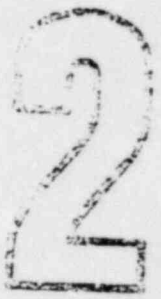
APPENDIX "A" (continued)

ISOLATION SWITCHES

Isolation Panel 2AB - Auxiliary Building Electrical Equipment Room

1. 2C Auxiliary Feed Pump Stop Valve (MV-08-3)

ST. LUCIE UNIT NO. 2
EMERGENCY OPERATING PROCEDURE NUMBER 2-0030141, REVISION 0
CONTROL ROOM INACCESSIBILITY



APPENDIX "A" (continued)

ISOLATION SWITCHES

Isolation Panel 2A - Auxiliary Building Electrical Equipment Room

1. SS-1-189 - Auxiliary Spray Valve (I-SE-02-3)
2. SS-1-157 - Letdown Containment Isolation Valve (V-2516)
3. SS-1-176 - Charging to Loop 2A2 (I-SE-02-02)
4. SS-194 - Charging Line Isolation Valve (V-2523)
5. 2A Steam Generator Atmospheric Steam Dump PIC-08-1A1 (2 switches)
6. 2B Steam Generator Atmospheric Steam Dump PIC-08-3A1
7. 2A Diesel Generator Watt/Volt Meter
8. 2C AFW Pump Discharge to 2B Steam Generator (MV-09-12)

ST. LUCIE UNIT NO. 2
EMERGENCY OPERATING PROCEDURE NUMBER 2-0030141, REVISION 0
CONTROL ROOM INACCESSIBILITY

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APPENDIX "A" (continued)

ISOLATION SWITCHES

Isolation Panel 2B - Auxiliary Building Electrical Equipment Room

1. SS-2-189 - Auxiliary Spray Valve (I-SE-02-04)
2. SS-2-157 - Letdown Stop Valve (V-2515)
3. SS-2-176 - Charging to Loop 2B1 (I-SE-02-01)
4. SS-1-194 - Letdown Containment Isolation Valve (V-2522)
5. 2B Steam Generator Atmospheric Steam Dump PIC-08-1B1 (2 switches)
6. 2B Steam Generator Atmospheric Steam Dump PIC-08-3B1
7. 2B Diesel Generator Watt/Volt meter
8. 2C AFW Pump Discharge to 2A Steam Generator (MV-09-11)

ST. LUCIE UNIT NO. 2
EMERGENCY OPERATING PROCEDURE NUMBER 2-0030141, REVISION 0
CONTROL ROOM INACCESSIBILITY

APPENDIX "A" (continued)

ISOLATION SWITCHES

Communications Isolation Panel - Auxiliary Building Communications Room

1. Fire Alarm/Site Evacuation - Control Console, Isolation Switch
2. Control Room PA Isolation Switch
3. Code Call Isolation Switch

APPENDIX "A" (continued)

ISOLATION SWITCHES

4160V SWGR 2A2 - Turbine Building Switchgear Room

1. Feed to 480V SS Transformer 2A1
2. Feed to 4160V Bus 2A3
3. Feed from 2A4 SWGR

APPENDIX "A" (continued)

ISOLATION SWITCHES

4160V SWGR 2B2 - Turbine Building Switchgear Room

1. Feed to SS Transformer 2B1
2. Feed to 4160V Bus 2B3
3. Feed from 2B4 4160V Bus

ST. LUCIE UNIT NO. 2
EMERGENCY OPERATING PROCEDURE NUMBER 2-0030141, REVISION 0
CONTROL ROOM INACCESSIBILITY

APPENDIX "A" (continued)

ISOLATION SWITCHES

6900V SWGR 2A1 - Turbine Building Switchgear Room

1. Feed from Startup Transformer 2A

ST. LUCIE UNIT NO. 2
EMERGENCY OPERATING PROCEDURE NUMBER 2-0030141, REVISION 0
CONTROL ROOM INACCESSIBILITY

APPENDIX "A" (continued)

ISOLATION SWITCHES

6900V SWGR 2B1 - Turbine Building Switchgear Room

1. Feed from Startup Transformer 2B

ST. LUCIE UNIT NO. 2
EMERGENCY OPERATING PROCEDURE NUMBER 2-0030141, REVISION 0
CONTROL ROOM INACCESSIBILITY

APPENDIX "A" (continued)

ISOLATION SWITCHES

4160V SWGR 2AB - Auxiliary Building Ground Floor

1. 2C Component Cooling Water Pump - "Local" switch position
2. 2C Intake Cooling Water Pump - "Local" switch position
3. Feed from 4160V Bus 2A3
4. Feed from 4160V Bus 2B3

ST. LUCIE UNIT NO. 2
EMERGENCY OPERATING PROCEDURE NUMBER 2-0030141, REVISION 0
CONTROL ROOM INACCESSIBILITY

APPENDIX "A" (continued)

ISOLATION SWITCHES

480V Load Center 2AB - Auxiliary Building Ground Floor

1. Bus Tie to 480V L.C. 2A2
2. 2C Charging Pump
3. Bus Tie to 480V L.C. 2B2

ST. LUCIE UNIT NO. 2
EMERGENCY OPERATING PROCEDURE NUMBER 2-0030141, REVISION 0
CONTROL ROOM INACCESSIBILITY

APPENDIX "A" (continued)

ISOLATION SWITCHES

2A Diesel Generator Control Panel

1. Voltage Control
2. Frequency Control
3. Start Circuit

ST. LUCIE UNIT NO. 2
EMERGENCY OPERATING PROCEDURE NUMBER 2-0030141, REVISION 0
CONTROL ROOM INACCESSIBILITY

APPENDIX "A" (continued)

ISOLATION SWITCHES

2B Diesel Generator Control Panel

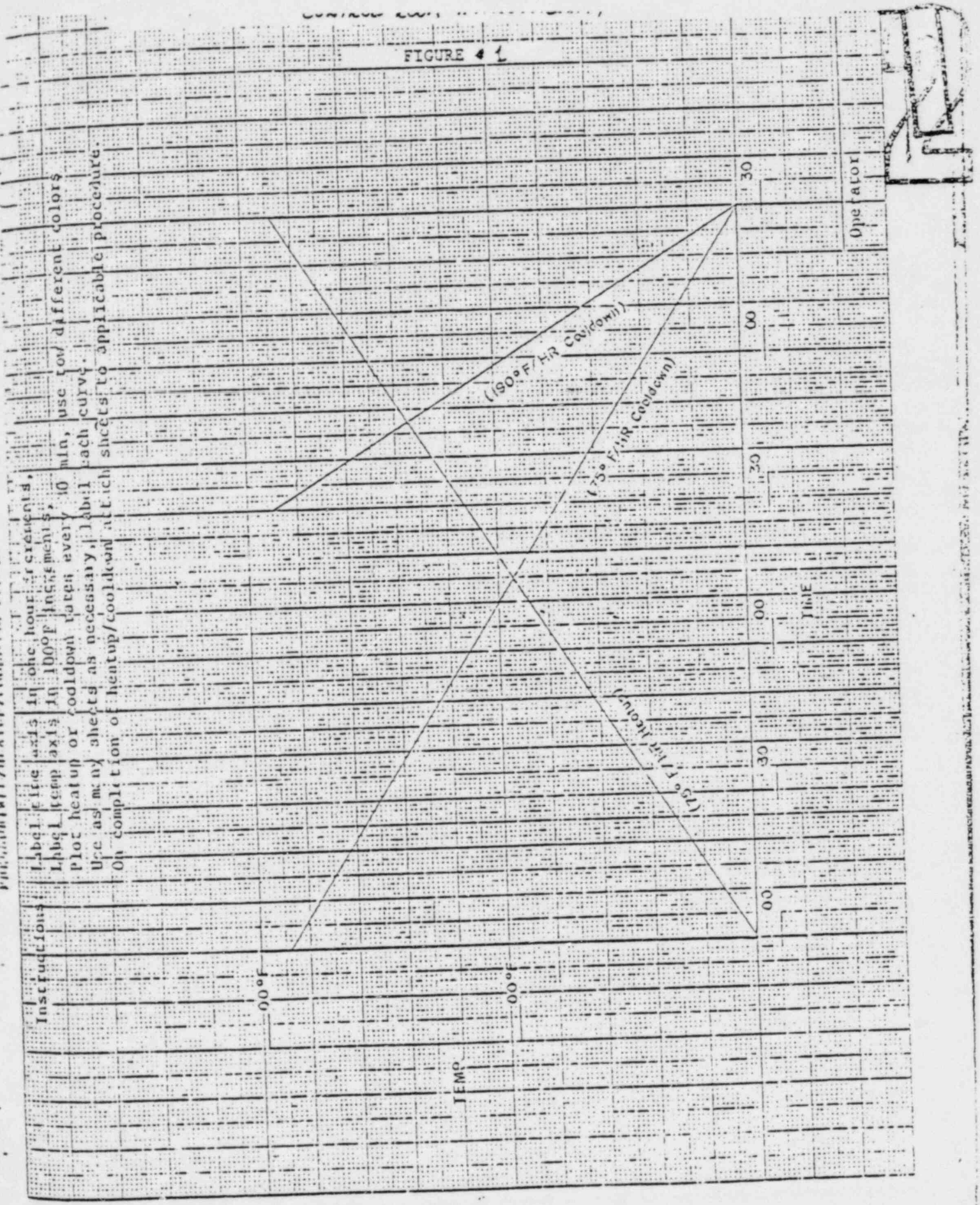
1. Voltage Control

2. Frequency Control

3. Start Circuit

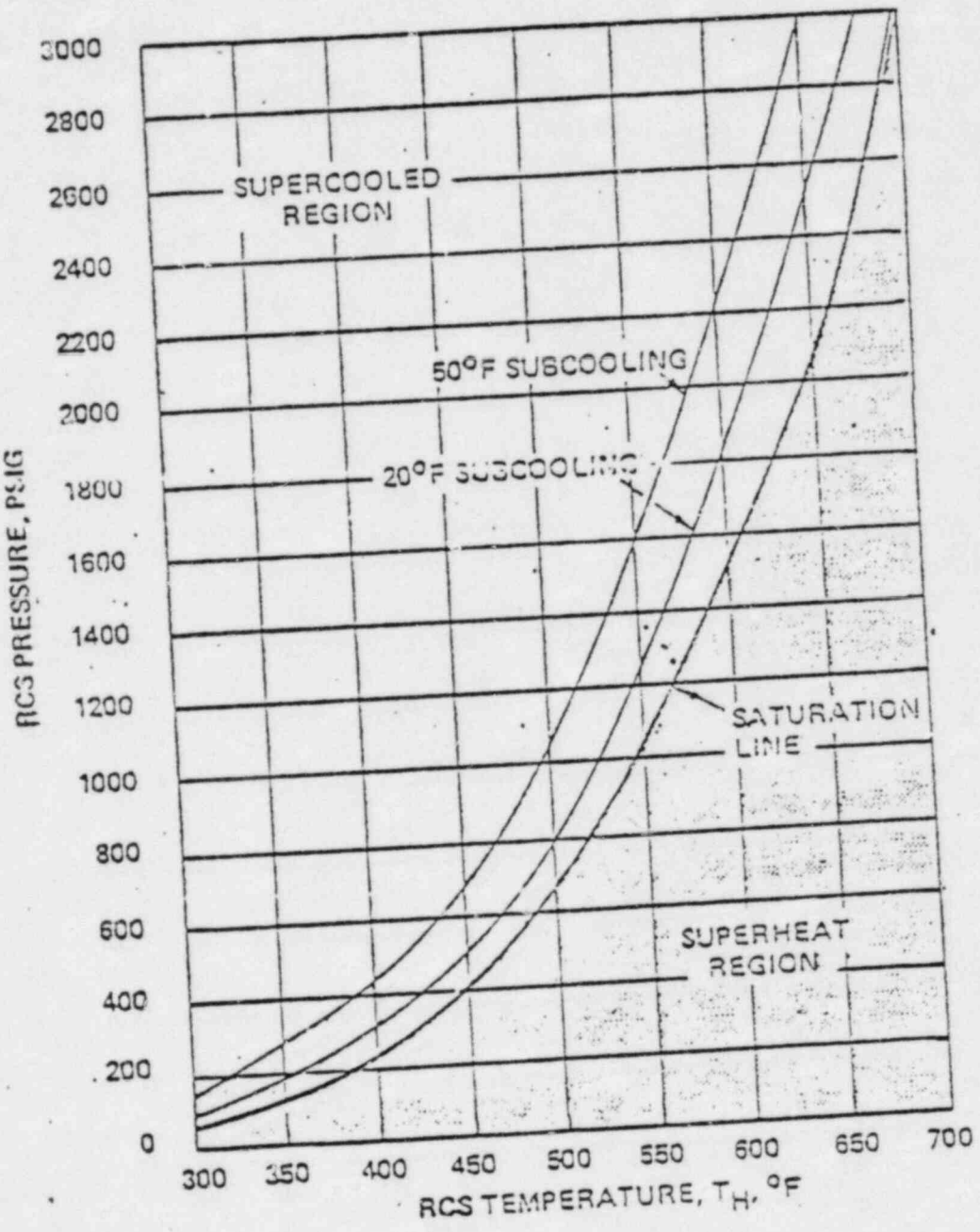
ST. LUCIE UNIT 2
EMERGENCY OPERATING PROCEDURE 2-0030141, REVISION 0
CONTROL ROOM INACCESSIBILITY

FIGURE 4.1



ST. LUCIE UNIT 2
EMERGENCY OPERATING PROCEDURE 2-0030141, REVISION 0
CONTROL ROOM INACCESSIBILITY

Figure 2
SATURATION



ST. LUCIE UNIT 2
EMERGENCY OPERATING PROCEDURE 2-0030141, REVISION 0
CONTROL ROOM INACCESSIBILITY

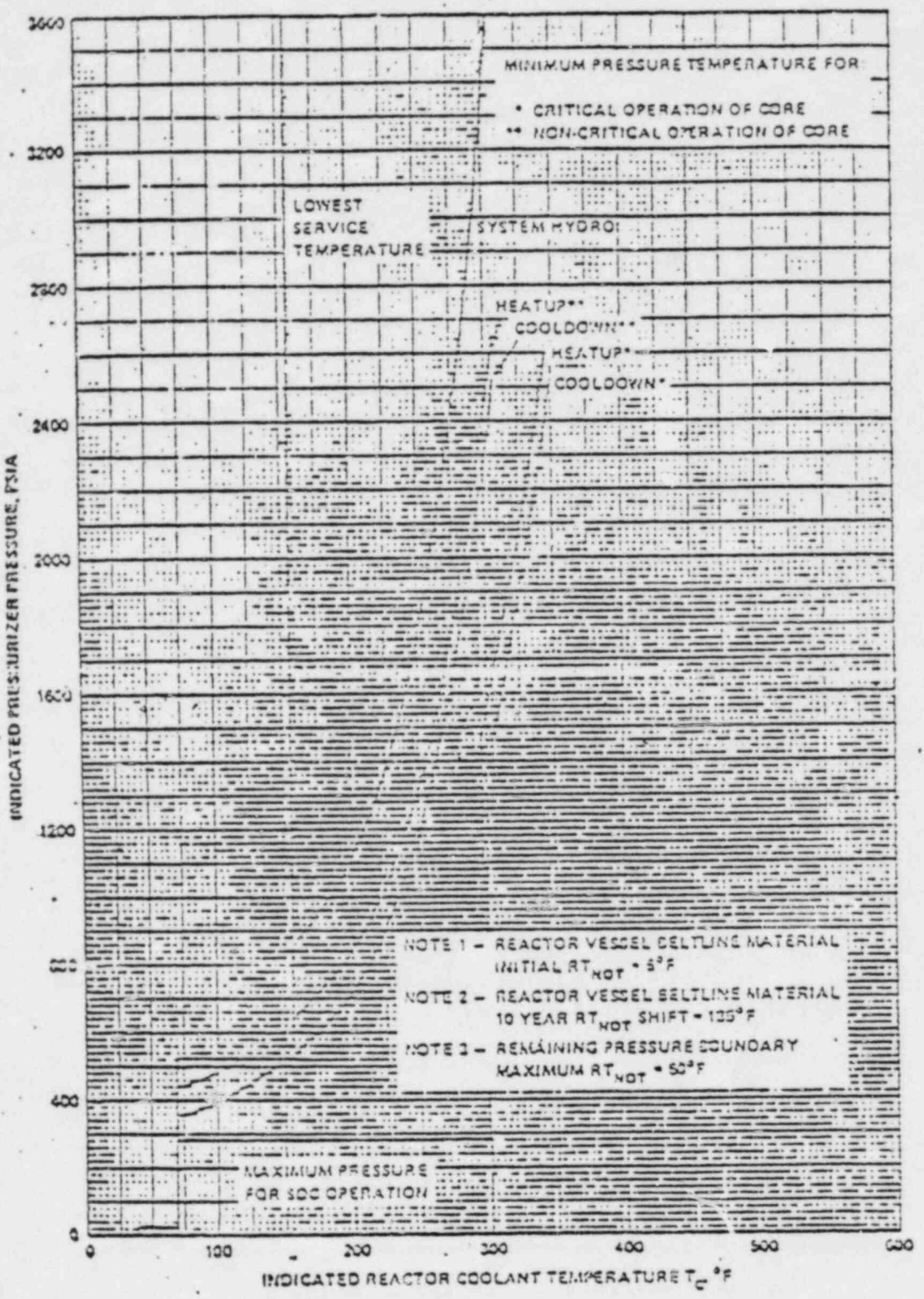


FIGURE 3.4-2b

Reactor Coolant System Pressure Temperature Limitations for up to 10 Years of Full Power Operation

DOCUMENT REVISION DISTRIBUTION SHEET - UNIT II
OFF NORMAL & EMERGENCY OPER. PROCEDURE

DOCUMENT TITLE Reactor Trip / Turbine Trip

DOCUMENT FILE NUMBER 2-0030130

DOCUMENT REVISION NUMBER 1

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FLORIDA POWER AND LIGHT COMPANY
ST. LUCIE PLANT UNIT 2
OFF-NORMAL OPERATING PROCEDURE
NUMBER 2-0030130
REVISION 1

REACTOR TRIP/TURBINE TRIP
OCTOBER 25, 1982

TOTAL NO. OF PAGES 12

FLORIDA POWER AND LIGHT COMPANY
ST. LUCIE PLANT UNIT 2
OFF-NORMAL PROCEDURE NUMBER 2-0030130
REVISION 1

2

1.0 SCOPE

This procedure provides guidelines for an operator following a reactor trip. The circumstances which contributed to the trip may require the use of another procedure concurrent with or following this procedure.

2.0 SYMPTOMS

2.1 Indications and annunciator alarms associated with any of the following trips:

SYMPTOM	INDICATION/ALARM
2.1.1 Hi power	2.1.1 Indication J1002A/004A, B, C, D, JR009/010 RPS - Ch. 1 TR1111/1121 Alarms L-9, L-17
2.1.2 Hi rate of change/power	2.1.2 Indication JK1-001A, B, C, D, RPS - Ch. 2
2.1.3 Lo RC Flow	2.1.3 Indications PDI-1101A, B, C, D, RPS - Ch. 6 Alarms L-10, L-18
2.1.4 Lo S/G level	2.1.4 Indications LIC-9013 A, B, C, D, LIC-9023 A, B, C, D, LR-9011/9021 RPS - Ch. 7 Alarms L-3, L-11

2

2.0 SYMPTOMS (Cont.)

2.1 (Cont.)

2.1.5 Lo S/G Pressure	2.1.5 Indications PI-08-1A, 1B, PR-08-1, 2, RPS - Ch. 8 PI-8013A, B, C, D, (RTGB 206) PI-8023A, B, C, D, (RTGB 206) Alarms L-19, L-27
2.1.6 Local Power Density	2.1.6 Indications JR-012, JO-012-1 JI-005A, B, C, D. JI-006A, B, C, D. RPS - Ch. 3 Alarms L-22, L-30
2.1.7 Thermal margin/low pressure	2.1.7 Indications PIA-1102A, B, C, D, RPS - Ch. 4 Alarms L-36, L-41
2.1.8 Hi Pressurizer Pressure	2.1.8 Indications PI-1102A, B, C, D, PR-1100 PIC-1100X/Y RPS - Ch. 5 Alarms L-20, L-28
2.1.9 Hi Containment Pressure	2.1.9 Indications PIS-07-2A, 2B, 2C, 2D. PI-07-4A/5A PR-07-4B/5B Alarms L-5, L-13

2.0 SYMPTOMS (Cont.)

2.1 (Cont.)

2.1.10 Turbine trip	2.1.10 Indications WM-881 DMW-881 W-REC-881 RPS - Ch. 10 DEH - SYSTEM Alarms L-21, D-8
2.1.11 Low CCW Flow to RCP's (<636 GPM ≥ 10 min.)	2.1.11 Indications FIA-1158, 1168, 1178, 1188 RPS - Ch. 11 FIS-14-1A, 1B Alarms L-6, L-14
2.1.12 Turbine Overspeed	2.1.12 Indications RPS - Ch. 10 DEH - SYSTEM MW-881 Alarms D-5, L-21
2.1.13 Condenser low vacuum	2.1.13 Indications RPS - Ch. 10 PI-10-7A, 7B Alarms D-3, L-21, D-13
2.1.14 Thrust bearing failure	2.1.14 Indications RPS - Ch. 10 TR-22-1 Alarms D-6, D-16

R1

2.0 SYMPTOMS (Cont.)

2.1 (Cont.)

2.1.15 Generator Lockout	2.1.15 Indications RPS - Ch. 10 AM 881 AM 872 VM 872 Alarms D-7
2.1.16 Exhaust Hood High Temp	2.1.16 Indications RPS - Ch. 10 TR-22-6 Alarms D-4, D-14
2.1.17 Turbine Bearing Oil Pressure	2.1.17 Indications RPS- Ch. 10 PI-22-25 Alarms D-2, D-12
2.1.18 Auto-Stop Oil Pressure	2.1.18 Indications RPS - Ch. 10 PI-22-25, 26 Alarms D-7, D-17
2.1.19 High S/G Level	2.1.19 Indications LIC-9013 A, B, C, D LIC-9023 A, B, C, D LR-9011/9021 RPS - Ch. 12 (FUTURE) Alarms L-?, L-?, (FUTURE) G-1, G-9
2.1.20 DEH DC Bus Failure	2.1.20 Alarms D-19

2.0 SYMPTOMS (Cont.)

2.1 (Cont.)

2.1.21 Manual Trip

2.1.21 Indications
All CEA's fully inserted
ADS, DEH- SYSTEM
W-REC-871
DMW-871
Core Mimic
Digital Position Readout

Alarms
L-1, D-10

NOTE: In every case where a reactor trip occurs, the following alarms should also energize, K-1, -2, -3, -4, -5, -9, -10, -12, -13, (RTB's) If they do not, this could be an indication of ATWS

2.2 Reactor Trip Breakers OPEN

2.2 Indications
RPS

Alarms
K-1, -2, -3, -4, -5, -9, -10, -12, -13

2.3 CEA's Insert

2.3 Indications
ADS, Core Mimic, Digital Position Readout, and Backup

2.4 Generator MW Output Reduces to Zero

2.4 Indications
DEH, W-REC-871
DMW-871, RPS - Ch. 10

Alarms
D-21, D-8

2.5 After trip, the following Parameters:

Reactor Power	- Decrease
Pressurizer Pressure	- Decrease
Pressurizer Level	- Decrease
RCS Temperature	- Decrease
Steam Generator Pressure	- Increase
Steam Generator Level	- Decrease

OFF-NORMAL OPERATING PROCEDURE NUMBER 2-0030130
REVISION 1

2

3.0 AUTOMATIC ACTIONS

3.1 The turbine generator will trip with
EITHER

A Turbine Trip Signal

OR

A Reactor Trip Signal

3.2 The reactor will trip with
EITHER

A Reactor Trip Signal

OR

A Turbine Trip Signal and
Power is > 15%

3.3 Plant electrical auxiliaries transfer from auxiliary to SU transformer.

3.4 S/G level $\leq$ 39% narrow range (2 out of 4 channels) automatic initiation of auxiliary feedwater sys.

3.5 Atmospheric Dumps and/or SBCS actuate following a trip.

3.6 Turbine trip on Hi S/G level will also CLOSE 100% feedwater bypass valves.

4.0 IMMEDIATE OPERATOR ACTIONS

4.1 Manually depress both Reactor Trip P.B.'s on RTGB 201 or 204 and ensure Reactor Trip Bkrs. are open.

> NOTE: If the conditions for a Reactor Trip are present, and the Reactor has not tripped, refer immediately to OP 2-0030132 (ATWAS)

4.2 Manually depress Turbine Trip P.B. on RTGB 201, ensure all G.V.'s and T.V.'s close.

4.3 Ensure all CEA's are fully inserted. If more than one CEA is not fully inserted, initiate Emergency Boration per Op #2-0250030.

4.4 Close reheater block valves (MV-08-4, 6, 8 and 10).

4.5 Ensure Gen. OCB's and Gen Field Bkr are open.

4.6 Ensure that auxiliary power has tranferred to the Startup Transformers.

OR

D/G 2A and/or D/G 2B are running with their output Bkrs closed carrying only the emergency buses.

> Note: In the event of a complete loss of offsite pwr, refer immediately to op #2-0030140, "Blackout Operation".

4.7 Ensure main feedwater flow to S/G's through 15% valves,

OR

Ensure aux feedwater initiated.

4.8 Ensure that Tave is being maintained at 532°F by SBCS or Atmos Dumps.

5.0 SUBSEQUENT ACTIONS

CHECK

5.1 Consult break diagnostic chart (Fig. 1) and determine if another emergency procedure is required. If so, immediately refer to that procedure; if not, proceed to Step 5.2 _____

5.2 Reverify (using check list) all immediate actions have occurred. _____

5.3 If trip was caused by High Pressurizer Pressure, verify the PORV's are CLOSED or isolate manually when pressure <2300 psia. _____

CAUTION

Do not overfeed the S/G's. This could cause T_{avg} to go below 532°F and thermal shock the S/G's.

5.4 Place the feedwater bypass valves in the "auto" position to maintain no load levels. _____

5.5 If the emergency diesels are running, START both motor driven auxiliary fw pumps and maintain S/G level _____

5.6 If both the S/G feed pumps and motor driven auxiliary FW pumps are inoperable, then START steam driven auxiliary fw pump. _____

CAUTION

Feed should be diverted from any S/G showing abnormally low steam pressure or high feed flow.

5.7 Ensure pressurizer level is being returned to setpoint by auto control of charging pumps and letdown control valves. If not, take manual control. _____

5.8 Ensure pressurizer pressure is being controlled automatically by the heaters and spray valves. If not, take manual control. _____

5.0 SUBSEQUENT ACTIONS (Cont.)

CHECK

5.9 If steam pressure cannot be maintained above 800 psig, CLOSE MSIV's or atmospheric dump valves, as appropriate, to avoid excessive cooldown and depressurization of the RCS. ____

5.10 Verify shutdown margin. If it is below Tech Specs, emergency borate ____

5.11 As the turbine slows down, ensure the bearing oil pumps START as follows or manually START, if required:

5.11.1 AC bearing oil pump and seal-oil backup pumps START together @ 11-12 psig ____

5.11.2 Emergency D.C. oil pump @ 10-11 psig ____

5.11.3 Bearing oil lift pump starts when turbine reaches 600 RPM ____

5.12 Ensure at 0 RPM the turning gear engages. ____

5.13 Place turbine drain selector to **OPEN** ____

CAUTION

Do not isolate steam to gland seals as long as condenser vacuum is maintained.

CHECK

5.14 Reduce bearing oil temperature to 90°F - 100°F. ____

5.15 In the event the condenser is not available, evaluate condensate storage tank inventory. ____

5.16 If it is unsafe to maintain the plant in hot standby condition; bring the unit to cold shutdown per OP #2-0030127 ____

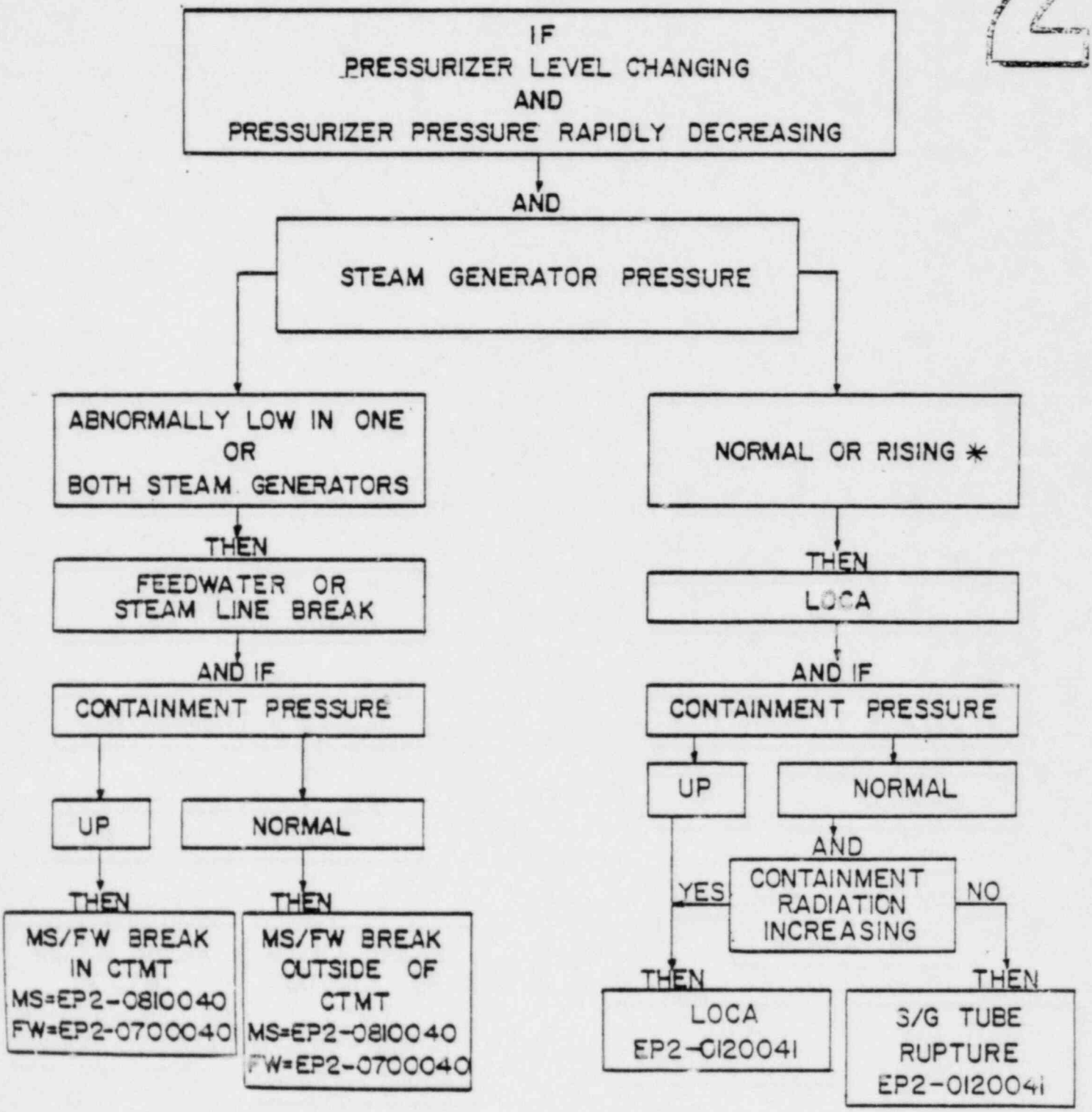
5.17 If immediate recovery and return to power is planned, commence CEA block circuit check, if required (see OP #2-0030122 Para. 8.6, Reactor Startup). ____

NOTE

If RCP's have tripped, they may be restarted if it has been confirmed that a LOCA has not occurred, pump services CAN be restored and RCS pressure-temperature conditions permit restart.

FIGURE 1
BREAK DIAGNOSTIC CHART

2



* MAY DECREASE SLIGHTLY AFTER REACTOR TRIP

OFF-NORMAL OPERATING PROCEDURE NUMBER 2-0030130
REVISION 1

6.0 PURPOSE/DISCUSSION

This procedure provides the entry to a sequence of events that will lead to the safe termination of any of the emergency events considered for our plant. The first few immediate actions verify that all has performed as it should. The operator verifies CEA's in, or if not, is referred to the ATWAS procedure. He then verifies off-site power and if it is not available, he is referred to the Blackout Procedure. He then scans a Diagnostic Chart and, if necessary, is directed to the appropriate emergency procedures. Each of these emergency procedures will provide specific instructions for the particular circumstances and verify adequate core cooling, or if not, refer to the operator to the inadequate core cooling procedure.

If no emergency conditions exist, the operator continues to the subsequent actions, which guide him to a safe shutdown and preparation for return to power, if conditions warrant.

7.0 REFERENCES

7.1 St. Lucie Unit #1 Off-Normal Procedures

7.2 St. Lucie Unit #2 FSAR, Sect. 7

7.3 CEN 128, C.E. NSSS trans.ents & accidents

8.0 RECORDS REQUIRED

8.1 Normal log entries and trip details

8.2 Startup/Shutdown log entry

8.3 Reactor trip log entry

8.4 Applicable log chart recorders

9.0 APPROVAL

Reviewed by the Facility Review Group October 12, 1982
Approved by C. M. Wethy Plant Manager October 14, 1982

Rev. 1 reviewed by Facility Review Group _____ 19__
Approved by _____ Plant Manager _____ 19__

"L A S T P A G E"

EP 2-0030130
REV. 1
TOTAL NO. OF PAGES 12

DOCUMENT REVISION DISTRIBUTION SHEET - UNIT II
OFF NORMAL & EMERGENCY OPER. PROCEDURE

DOCUMENT TITLE ANTICIPATED TRANSIENT WITHOUT STEAM FLOW

DOCUMENT FILE NUMBER 2-0030132

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EMERGENCY PROCEDURE
2-0030132 Rev 1
ATWS

2

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2
EMERGENCY PROCEDURE NUMBER 2-0030132
REVISION 1

ANTICIPATED TRANSIENT WITHOUT SCRAM
(ATWS)

OCTOBER 25, 1982

TOTAL NO. OF PAGES 5

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2
EMERGENCY PROCEDURE NUMBER 2-0030132
(ATWS) REVISION 1

1.0 SCOPE

This procedure provides instructions to be used in the event of an ATWS. The transients which produce most limiting ATWS consequences are covered by this procedure.

2.0 SYMPTOMS

The following are symptoms related to the three transients; Loss of Feedwater (LOF), Loss of Offsite Power (LOOP), and stuck open Relief Valve, which would cause a reactor trip. Any of these symptoms, not accompanied by insertion of all CEA's, as indicated by the ADS, Core Mimic, Digital Position Readout, Backup readout and core power indication are an indication of ATWS:

		TRIP SIGNAL GENERATED BY:			
	SYMPTOM	LOF	LOOP	STUCK OPEN PORV	INDICATION/ALARM
2.1	High Przr Pressure	Yes	Yes	No	2.1 Indications PI-1102A, PI-1102B, PI-1102C, PI-1102D PR-1100 PIC-1100X, PIC-1100Y RPS - Channel 5 2.1 Alarms L-20, L-28
2.2	TM/LP	No	No	Yes	2.2 Indications PIA-1102A, PIA-1102B, PIA-1102C, PIA-1102D RPS - Channel 4 2.2 Alarms L-36, L-41

EMERGENCY PROCEDURE NUMBER 2-0030132, REVISION 1
(ATWS)

2.0 SYMPTOMS: (Cont.)

	SYMPTOM	TRIP SIGNAL GENERATED BY: LOF	LOOP	STUCK OPEN PORV	INDICATION/ALARM
2.3	Low RCS Flow	Yes	Yes	No	2.3 Indications PDI-1101A, PDI-1101B, PDI-1101C, PDI-1101D RPS - Channel 6 2.3 Alarms L-10, L-18
2.4	Low S/G Level	Yes	No	No	2.4 Indications LIC-9013A, LIC-9013B, LIC-9013C, LIC-9013D LIC-9023A, LIC-9023B, LIC-9023C, LIC-9023D LR-9011, LR-9021 RPS - Channel 7 2.4 Alarms L-3, L-11

3.0 AUTOMATIC ACTIONS:

Some of the following Automatic Actions will occur during the various transients with the absence of a reactor trip:

NOTE: Any Automatic Actions that should occur and do not, must be manually initiated.

	AUTOMATIC ACTION	INITIATING EVENT	
3.1	Turbine Trip	3.1 If reactor trip SHOULD HAVE occurred	
3.2	AFW Auto Start	3.2 39% narrow range inst.'s (2 out of 4 channels)	R1
3.3	PORV Actuation	3.3 RCS pressure @ 2375 PSIA	R1
3.4	Main Steam Safety Valves Open	3.4 S/G pressure $\geq$ 985 PSIG	R1
3.5	SBCS Actuation	3.5 Turbine Trip or High S/G pressure	
3.6	Generator OCB's Open	3.6 Turbine Trip	

EMERGENCY PROCEDURE NUMBER 2-0030132, REVISION 1
(ATWS)

3.0 AUTOMATIC ACTIONS: (Cont.)

	AUTOMATIC ACTION		INITIATING EVENT
3.7	SIAS and CIAS	3.7	RCS pressure 1600 PSIA Containment pressure 5 PSIG
3.8	CSAS	3.8	Containment pressure 10 PSIG

4.0 IMMEDIATE OPERATOR ACTIONS

			LOCATION
4.1	Verify required Auto Actions have occurred or manually initiate.		
4.2	Trip Turbine	4.2	RTGB 201
4.3	Ensure AFW Flow	4.3	RTGB 202
4.4	Trip Reactor	4.4	RTGB 201 or 204
4.5	Emergency Borate	4.5	RTGB 205
AND IF CEA'S DON'T DROP			
4.6	Open RTB's locally	4.6	Cable spreading room
4.7	Stop both M-G sets at the M-G sets or by opening Breakers 2-40212 and 2-40511	4.7	RAB 19.5' Elev. (M-G sets) RAB 43' Elev. L.C. 2A2/2B2 (Breakers to M-G sets)
AND IF CEA'S DON'T DROP			
4.8	Re-energize CEA bus with either M-6 set.		
4.9	Manually Insert CEA's	4.9	RTGB 204
AND			
4.10	Emergency Borate by opening MV-2514 and starting BA pumps 2A and 2B	4.10	RTGB 205
4.11	Stop M-G sets either at M-G set or at breaker 2-40212 and 2-40511	4.11	Locally in RAB
4.12	Return to 2-0030130, Reactor Trip/ Turbine Trip, Immediate Operator Actions to determine type of transient and further action required.		

R1

5.0 SUBSEQUENT ACTIONS:

EMERGENCY PROCEDURE NUMBER 2-0030132, REVISION 1
(ATWS)

None

6.0 DISCUSSION:

This procedure starts and ends during a transient. For this reason, there is no subsequent action. The last immediate action is to refer to the Reactor Trip/Turbine Trip procedure and from there determine the course of action to take.

7.0 REFERENCES.

7.1 Memorandum from Frank Schroeder to Robert L. Tedesco, dated June 23, 1980

7.2 CE Emergency Procedure Guidelines, CEN-152

7.3 St. Lucie #1 Off-Normal Operating Procedures

8.0 RECORDS REQUIRED:

8.1 Normal Log Entries

9.0 APPROVAL:

Reviewed by the Facility Review Group October 12, 1982
Approved by J. H. Buchanan Plant Manager Oct 21 1982

Rev.____ reviewed by Facility Review Group_____ 19__
Approved by _____ Plant Manager_____ 19__

"L A S T P A G E"

EP 2-0030132
REV 1
TOTAL NO. OF PAGES 5

DOCUMENT REVISION DISTRIBUTION SHEET - UNIT II
OFF NORMAL & EMERGENCY OPER. PROCEDURE

DOCUMENT TITLE Total Loss of AC Power

DOCUMENT FILE NUMBER 2-0030143

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FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT NO. 2
GNCL- OPERATING PROCEDURE 2-0030143
REVISION NO. 0

1. TITLE: Total Loss of AC Power
2. PREPARED BY: C. Couture 10-20 19 82
3. SUBCOMMITTEE REVIEW BY: DH Jaeger For FP&L 10-26 19 82
4. REVIEWED BY FRG ON: OCT 26 19 82
5. APPROVED BY J H Buchanan PLANT MANAGER OCT 26 19 82
6. REVISION REVIEWED BY FRG ON: 19
7. APPROVED BY: PLANT MANAGER 19

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FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2
EMERGENCY PROCEDURE NUMBER 2-0030143
REVISION 0

TOTAL LOSS OF AC POWER
(TLOP)

OCTOBER 25, 1982

TOTAL NO. OF PAGES 9

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE UNIT NO. 2
EMERGENCY OPERATING PROCEDURE NUMBER 2-0030143
REVISION 0

2

1.0 SCOPE:

This procedure is to be used in the event of a total loss of both offsite AC power, and loss of both diesel generators.

2.0 SYMPTOMS:

2.1 Loss of power to 2A1, 2B1 6.9 KV Bus.

2.2 Loss of power to 2A2, 2A3, 2B2, 2B3 and 2AB 4.16 KV Bus.

3.0 AUTOMATIC ACTIONS:

	ACTION		INITIATING EVENT
3.1	Reactor Trip.	3.1	Low RCS Flow
3.2	Turbine Trip/Generator Lockout	3.2	Reactor Trip
3.3	Auxiliary Feedwater Auto Actuation.	3.3	Low S/G Level @ 39%
3.4	PORV's Operate.	3.4	Hi Pressurizer Press @ 2375 PSIA

ST. LUCIE UNIT NO. 2
EMERGENCY OPERATING PROCEDURE NUMBER 2-0030143, REVISION 0
TOTAL LOSS OF AC POWER

4.0 IMMEDIATE OPERATOR ACTIONS:

4.1 Insure all CEA's on bottom, and reactor trip breakers open.

4.2 Insure 2C Auxiliary Feedwater Pump is restoring Steam Generator level.

4.3 Close both of the main steam isolation valves, HCV-08-1A and HCV-08-1B.

4.4 Close letdown isolation valves V-2515, V-2516 and V-2522.

ST. LUCIE UNIT NO. 2
EMERGENCY OPERATING PROCEDURE NUMBER 2-0030143, REVISION 0
TOTAL LOSS OF AC POWER

5.0 SUBSEQUENT ACTIONS:

5.1 Insure generator OCB's and field breaker open.

5.2 Open 2-30102 (S.U. Transformer to 2A1 6.9 KV bus).
Open 2-30202 (S.U. Transformer to 2B1 6.9 KV bus).
Open 2-20102 (S.U. Transformer to 2A2 4.16 KV bus).
Open 2-20302 (S.U. Transformer to 2B2 4.16 KV bus).

5.3 Insure D/G breakers open (2A-2-20211 and 2B-2-20401).

5.4 Insure 2AB 4.16KV bus feeders are open:

2-20208, 2-20505 (2A3 4.16KV to 2AB 4.16 KV bus).
2-20409, 2-20504 (2B3 4.16KV to 2AB 4.16 KV bus).

5.5 Open 2-40103 (2A2 4.16KV feed to 2A1 L.C. - Hi side).
Open 2-20110 (2A2 4.16KV feed to 2A1 L.C. - Lo side).
Open 2-40203 (2A3 4.16KV feed to 2A2 L.C. - Hi side).
Open 2-20210 (2A3 4.16KV feed to 2A2 L.C. - Lo side).

5.6 Open 2-40403 (2B2 4.16KV feed to 2B1 L.C. - Hi side).
Open 2-20310 (2B2 4.16KV feed to 2B1 L.C. - Lo side).
Open 2-40503 (2B3 4.16KV feed to 2B2 L.C. - Hi side).
Open 2-20402 (2B3 4.16KV feed to 2B2 L.C. - Lo side).

5.7 Insure 2AB 480V Load Center Feeders are open:

2-40204, 2-40702 (2A2 480V L.C. to 2AB).
2-40706, 2-40504 (2B2 480V L.C. to 2AB).

5.8 Insure the main steam isolation bypass valves both indicate closed or dispatch an operator to locally take control and close the valves.

NOTE: The handwheels on these valves turn counterclockwise direction to close, opposite of most valve handwheels in the plant.

5.9 Open 2A and 2B Atmospheric Dump Valves to reduce Steam Generator pressure below safety lift pressure. AC power to controllers will be lost, so DC operation of the valves will become necessary as below:

1. Take desired ADV auto/man switch to MANUAL.

2. Modulate the dump valve open or closed with direct DC power with the open/close control switch.

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TOTAL LOSS OF AC POWER

5.0 SUBSEQUENT ACTIONS: (Cont.)

5.10 Close FCV-23-3, 5, 4 and 6 (2A and 2B S/G Blowdown Isolations).

5.11 Close FCV-23-7 and FCV-23-9 (2A and 2B S/G Blowdown Sample Isolations).

5.12 Close AOV-5200, 5201, 5203, 5204 and 5205 (RCS Sample Isolations).

5.13 Implement the Emergency Plan as necessary in accordance with EP 3100021E, "Duties of the Emergency Coordinator."

5.14 Minimize atmospheric steam dump use thereby insuring minimum RCS heat loss; however,

1. Main S/G pressure less than S/G safety setpoint.

2. With decreasing RCS pressure, maintain hot leg temperature (Th) at least 20°F below the saturation temperature corresponding to the RCS pressure.

5.15 Verify by the following indications that natural circulation flow has been established within approximately 15 minutes after RCP's were stopped.

1. Loop Delta T less than normal full power Delta T (< 46°F).

2. Cold leg (Tc) constant or decreasing.

3. Hot leg (Th) stable (i.e., not steadily increasing).

5.16 If RCS pressure decreases to 1700 psia, verify receipt of block permissive annunciator R-6 and block SIAS.

5.17 Notify system dispatcher of plant conditions and request most urgent priority in restoring off-site power.

5.18 If 2C Auxiliary Feedwater Pump is stopped or flow is lost, then:

1. Reinitiate auxiliary feed flow as soon as possible; however, do not exceed a flow rate of 150 GPM per affected Steam Generator.

2. Limit feed flow rate to 150 GPM per affected Steam Generator until continuous feed flow to the affected Steam Generator has been maintained for five minutes.

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5.0 SUBSEQUENT ACTIONS: (Cont.)

5.19 Use all available resources to restore one emergency diesel generator to operable status.

1. (Insert techniques later)

5.20 The following restoration sequence assumes "A" train power supply is restored first.

1. Strip all vital and non-vital load center breakers in preparation for a systematic power restoration.

2. Energize 2A3 4.16KV bus by either:

   a. Starting 2A D/G and closing D/G breaker. Adjust and maintain voltage and frequency at 4.16KV/60 HERTZ.

   or

   b. Close 2-20102 (S.U. Transformer to 2A2 4.16KV bus). Close 2-20109 (2A2 4.16KV to 2A3 4.16KV bus). Insert sync plug and close 20209 (2A2 4.16KV to 2A3 4.16KV bus).

3. Energize 2A2 and 2A5 480V load centers:

   a. Close 2-40203 (2A3 4.16KV feed to 2A2 L.C. - Hi side).

   b. Close 2-20210 (2A3 4.16KV feed to 2A2 L.C. - Lo side).

   c. Close _____ (2A5 4.16KV feed to 2A5 L.C. - Lo side).

4. Energize 2AB 480V Load Center by closing 2-40204 and 2-40702 (2A2 480V L.C. feed to 2AB L.C.)

5. Energize 2A5, 2A6, 2A7 and 2A8 480V MCC's as follows:

   a. Close 2-40214 (2A2 480V L.C. feed to 2A5 MCC).

   b. Close 2-40218 (2A2 480V L.C. feed to 2A6 MCC).

   c. Close 2-40219 (2A2 480V L.C. feed to 2A7 MCC).

   d. Close 2-40215 (2A2 480V L.C. feed to 2A8 MCC).

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TOTAL LOSS OF AC POWER

5.0 SUBSEQUENT ACTIONS: (Cont.)

5.20 (Cont.)

6. Energize non-essential sections of 2A5, 2A6 and 2A8 MCC's as follows:

   a. Close 2-41230 (MCC 2A5 non-essential breaker).

   b. Close 2-41325 (MCC 2A6 non-essential breaker).

   c. Close 2-41513 (MCC 2A8 non-essential breaker).

7. Insure 2A battery charger is "ON LINE" supplying the 2A DC bus by observing 2A DC bus voltage on RTGB-201 to be greater than 120V DC.

8. Align and start emergency cooling water to the instrument air compressor. Start the 2A instrument air compressor and observe restoration of instrument air pressure.

9. Start the 2A charging pump to reestablish pressurizer level. When the CCW system has been restored per step 15, then 2A HPSI pump can also be started to augment refilling of the pressurizer.

   a. Evaluate RCS temperature, pressure, and level instrumentation to determine if a bubble exists other than in the Pressurizer.

   b. If evaluation confirms, then continue charging to increase RCS pressure.

   c. When greater than 20°F subcooled, operate Charging and/or HPSI pumps to maintain Pressurizer level greater than 30% level.

10. Insure closed 2-20204 (Pressurizer heater transformer 2A 4.16V feed).

11. When pressurizer level indicates greater than 30%, energize pressurizer heaters B-1, B-2, B-3 and P-1.

12. Ensure ICW seal water from Unit 1 Domestic Water System is available.

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TOTAL LOSS OF AC POWER

5.0 SUBSEQUENT ACTIONS: (Cont.)

5.20 (Cont.)

13. Reestablish "A" train Intake Cooling Water System as follows:

    a. Establish seal water.

    b. Throttle 2A ICW pump discharge valve.

    c. Start 2A ICW pump; pressurize and vent "A" ICW header.

    d. After venting, open 2A ICW pump discharge valve.

14. Reestablish "A" train Component Cooling Water System as follows:

    a. Isolate CCW to RCP's by closing HCV-14-1, 2, 6 and 7 (to prevent thermal shocking RCP seals)

    b. Throttle 2A CCW pump discharge valve.

    c. Insure surge tank at normal level.

    d. Start 2A CCW pump; pressurize and slowly open 2A CCW pump discharge valve.

15. Reestablish CVCS letdown to maintain Pressurizer level at normal operating level.

16. Commence boration to Cold Shutdown boron concentration.

17. Start one set of cavity and support cooling fans.

18. Proceed to EOP 2-0120040, "Natural Circulation/Cooldown", step 5.3.9, and perform in conjunction with the balance of this procedure.

19. Restore balance of secondary plant in accordance with EOP 2-0030140, "Blackout Operation".

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TOTAL LOSS OF AC POWER

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6.0 DISCUSSION:

The "Total Loss of AC Power" event consists of a loss of off-site power in conjunction with failure of the Emergency Diesel Generators to provide emergency power. This results in a loss of all AC electrical power except that provided by inverters powered from the vital DC busses. The termination of AC power causes a loss of forced reactor coolant flow, main feedwater flow, steam flow to the turbine and pressurizer pressure control. The reactor trips on either low reactor coolant flow, high reactor coolant system (RCS) pressure or low steam generator level depending on initial conditions.

The "Total Loss of AC power" event also causes a loss of all reactor coolant system makeup capability which includes charging and safety injection flow. Inventory losses through leakage, reactor coolant pump controlled bleedoff, and primary relief valve releases are the major contributors to the degradation of pressure and level control during the event. The other contributor to coolant system shrinkage and pressure reduction is system heat loss, primarily through the pressurizer walls.

Core heat removal is accomplished through natural circulation. Reactor coolant system heat removal is accomplished using atmospheric dump valves and the steam driven auxiliary feedwater pump.

7.0 REFERENCES:

7.1 CE Emergency Procedure Guidelines, CEN-152

7.2 St. Lucie #1 Off-Normal Operating Procedures

8.0 RECORDS REQUIRED:

8.1 Normal Log Entries

9.0 APPROVAL:

Reviewed by the Facility Review Group Oct 26 19 82
Approved by J. H. Barrow Plant Manager Oct 26 19 82

Rev. ___ Reviewed by Facility Review Group _____ 19__
Approved by _____ Plant Manager _____ 19__

"L A S T P A G E"

EP 2-0030143
REV. 0
TOTAL NO. OF PAGES 9

DOCUMENT REVISION DISTRIBUTION SHEET - UNIT II
OFF NORMAL & EMERGENCY OPER. PROCEDURE

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DOCUMENT FILE NUMBER 2-0120040

DOCUMENT REVISION NUMBER 0

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FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT NO. 2
EMERGENCY OPERATING PROCEDURE 2-0120040
REVISION NO. 0

2

1. TITLE: NATURAL CIRCULATION/COOLDOWN

2. PREPARED BY: H. Johnson 10/22 1982

3. SUBCOMMITTEE REVIEW BY: D. A. Sager For FP&L 10/25 1982

4. REVIEWED BY FRG ON: [illegible] 19[illegible]

5. APPROVED BY: [signature] Plant Manager [illegible] 19[illegible]

6. REVISION ____ REVIEWED BY FRG ON: _____ 19__

7. APPROVED BY: _____ Plant Manager _____ 19__

2

1.0 TITLE:

NATURAL CIRCULATION/COOLDOWN

2.0 APPROVAL:

Reviewed by Facility Review Group _____ 19__
Approved by _____ Plant Manager _____ 19__

Revision __ Reviewed by FRG _____ 19__
Approved by _____ Plant Manager _____ 19__

3.0 PURPOSE AND DISCUSSION:

3.1 Purpose

1. This procedure provides instructions to the operator in the event of a total loss of Reactor Coolant Pump (RCP) flow to the reactor core.

2. This procedure also provides guidance to the operator in the event that the plant must be cooled down using natural circulation flow.

3.2 Precautions - See Appendix A.

3.3 Discussion - See Appendix B.

4.0 SYMPTOMS:

4.1 Loss of off-site power.

4.2 Loss of or low voltage on 6.9 KV busses as indicated by:

1. 6.9 KV switchgear 2A1, 2B1 differential current trip.

2. 6.9 KV switchgear 2A1, 2B1 UNDERVOLTAGE alarm.

4.3 RCP OVERLOAD alarm.

4.4 REACTOR COOLANT LOW FLOW channel pre-trip alarm.

4.5 REACTOR COOLANT LOW FLOW CHANNEL trip.

4.6 Loss of Component Cooling Water (CCW) flow to RCPs for greater than 10 minutes, requiring manual trip of all four pumps.

4.7 Valid SIAS-CIS caused by low RCS pressure, requiring all RCPs to be tripped after all control Element Assemblies have been inserted for 5 seconds.

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EMERGENCY OPERATING PROCEDURE NUMBER 2-0120040, REVISION 0
NATURAL CIRCULATION/COOLDOWN

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5.0 INSTRUCTIONS:

5.1 Automatic Action

1. Reactor coolant low flow reactor trip (Setpoint: 95% of full RCS flow).

5.2 Immediate Operator Action

5.2.1 Carry out immediate operator actions for reactor trip in accordance with Off-Normal OP# 2-0030130.

5.3 Subsequent Actions

5.3.1 Implement the Emergency Plan as necessary in accordance with EPIP 3100021E, "Duties of the Emergency Coordinator".

5.3.2 Establish and maintain hot let temperature (T_h) at least 20°F below the saturation temperature corresponding to RCS pressure (refer to Figure 1) by doing the following:

1. Operate pressurizer heaters or auxiliary spray to increase or maintain pressurizer pressure, and to provide subcooling margin.

2. Increase turbine bypass or atmospheric steam dump flow to reduce or maintain RCS temperature and prevent lifting secondary safeties.

5.3.3 Verify that the pressurizer level control system is functioning to maintain pressurizer level. If necessary, manually operate charging and letdown to restore and maintain normal pressurizer level. If operable charging pumps cannot restore RCS inventory and pressurizer level, observe RCS and containment parameters for indications of a LOCA.

5.3.4 Restore and maintain steam generator levels at approximately 65%. When feeding the steam generators use caution to avoid excessively cooling the RCS.

CAUTION: Do not exceed a cooldown rate of 75°F/hr.

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NATURAL CIRCULATION/COOLDOWN

5.0 INSTRUCTIONS: (Cont.)

5.3 (Cont.)

5.3.5 Verify the following indications that natural circulation flow has been established within approximately 15 minutes after RCPs were tripped:

1. Loop ΔT ($T_h - T_c$) less than normal full power ΔT ($<46^{\circ}F$).

NOTE: The effective core ΔT with only one steam generator in operation is determined at $Th-Tc_{core}$ where

$$Tc_{core} = \frac{2x\ (Tc\ operating\ loop) + Tc\ non\text{-}operating\ loop}{3}$$

2. Cold leg temperatures (Tc) constant or decreasing.

3. Hot leg temperatures (Th) stable (i.e., not steadily increasing).

4. No abnormal differences between Th RTD's and core thermocouples.

5.3.6 Confirm boron concentration in the RCS by sampling from as many different points as possible.

5.3.7 Maintain the plant in a stabilized condition based upon auxiliary plant system availability (e.g., condensate inventory).

5.3.8 If one or more RCP's are restored to an operable condition within 10 minutes, start an RCP in each loop if the following criteria are satisfied:

1. At least one steam generator is removing heat from the RCS.

2. Pressurizer level and pressure are responding normally to the Pressurizer Level and Control System.

3. The RCS is at least $20^{\circ}F$ subcooled (refer to Figure 1).

4. The yellow PERMISSIVE light on the associated pump control switch is lit.

5. No indication of voids in RCS are present.

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5.0 INSTRUCTIONS: (Cont.)

5.3 (Cont.)

5.3.9 If all four RCPs can be returned to operable status within 10 minutes, power operation may be resumed under the direction of the Nuclear Plant Supervisor. If RCS cooldown is required under these conditions, the cooldown should be accomplished using forced circulation.

5.3.10 If required to conduct a plant cooldown to shutdown cooling (SDC) conditions using natural circulation, proceed as follows:

1. Establish as stable plant conditions as circumstances permit.

2. Commence boration to maintain required SDM during cooldown.

3. Commence an RCS cooldown by utilizing one of the following methods:

   a. If the Condenser is available, use the Steam Dump Bypass System and Main or Auxiliary Feedwater.

   b. If the Condenser is not available, use the atmospheric dump valves and Main or Auxiliary Feedwater.

4. Continuously verify natural circulation flow throughout the cooldown process.

5. Observe all available indications to determine conditions within the RCS.

   a. Use the Subcooled Margin Monitor (SMM) Th, Tc, and RCS pressure to verify that the RCS is subcooled.

   b. Figure 1 or the nomograph on RTGB-203 should be used for comparison with the SMM; subcooled margin can also be determined by subtracing Th from pressurizer temperature (TE-1101).

   c. Incore thermocouples, recorded on the DDPS, can also be used for indication of Th.

6. Establish and maintain a RCS cooldown rate of 50°F/hr (See Figure 2). The highest RCS cold leg temperature shall be plotted every 30 minutes on a copy of Figure 4. The RCS temperature and pressure shall be determined to be within the limits of Technical Specification Figure 3.4-2B at least once per 30 minutes during cooldown.

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NATURAL CIRCULATION/COOLDOWN

5.0 INSTRUCTIONS; (Cont.)

5.3 (Cont.)

5.3.10 (Cont.)

7. The pressurizer water phase shall be recorded on Figure 5 and plotted every 30 minutes on Figure 4. This temperature shall also be compared with the lowest spray water temperature to ensure that differential temperature does not exceed 350°F.

8. Maintain RCS pressure above and to the right of curve values shown on Figure 3.

9. During the cooldown, maintain a minimum of 20°F subcooling by the following methods (listed in order of preference):

   a. Manual control of pressurizer heaters and auxiliary spray.

      NOTE: Use only one charging pump.

   b. Operating charging or HPSI pumps.

10. During the cooldown, maintain pressurizer level by the following methods (listed in order of preference):

    a. Control charging and letdown.

    b. Operating HPSI pumps.

11. Monitor the available condensate inventory and replenish the CST as required.

    CAUTION: CONDENSATE STORAGE TANK VOLUME SHALL BE MAINTAINED PER TECHNICAL SPECIFICATIONS 3.7.1.3.

12. During RCS cooldown and depressurization, perform the evolutions specified in Appendix C.

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5.0 INSTRUCTIONS: (Cont.)

5.3 (Cont.)

5.3.10 (Cont.)

13. During RCS depressurization monitor for void formation in the reactor vessel upper head region. Indications of possible void formation include:

    a. RCS temperature = Tsat for the corresponding RCS pressure.

    b. A pressurizer level increase significantly greater than expected while operating auxiliary spray.

    c. A pressurizer level decrease while operating charging.

    d. If the Pressurizer Level Control System is in automatic, an unanticapted letdown flow greater than charging flow.

14. If voiding in the RCS is indicated, perform the following:

    a. Isolate letdown by closing V-2515 and V-2516 (Letdown Containment Isolation).

    b. Stop the RCS depressurization.

    c. Stop the RCS cooldown.

    d. If possible, review and select one RCP in each loop for restarting.

    e. Repressurize the RCS to eliminate the void by operating pressurizer heaters or HPSI and charging pumps.

       NOTE: If the HPSI or charging pumps are utilized to charge the RCS solid, the pumps should be stopped after solid RCS conditions are indicated.

    f. If required to continue the cooldown with the known presence of a steam void in the reactor vessel head, proceed using the Fill and Drain Method (Appendix D).

    g. When conditions permit, re-initiate letdown and resume depressurization to SDC initiation pressure.

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5.0 INSTRUCTIONS: (Cont.)

5.3 (Cont.)

5.3.10 (Cont.)

15. If off-site power has been lost, and it becomes necessary to augment the cooldown rate refer to Appendix E.

16. When RCS temperature reaches 325°F, maintain the RCS at this temperature for an additional 20.4 hours (See Figure 2).

17. Upon completion of the required "soak" period, initiate SDC in accordance with Appendix F.

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NATURAL CIRCULATION/COOLDOWN

Figure 1
SATURATION

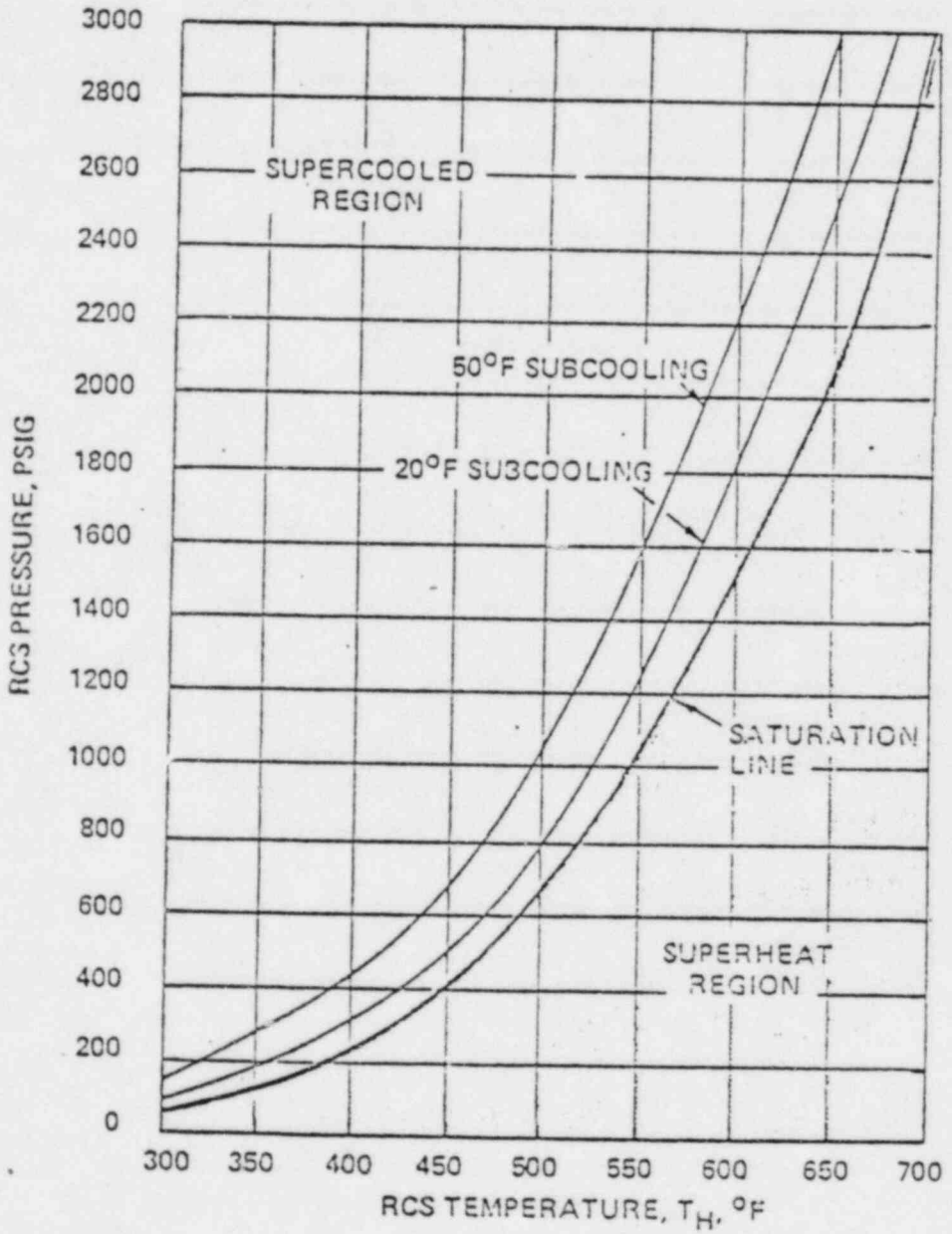

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FIGURE 2

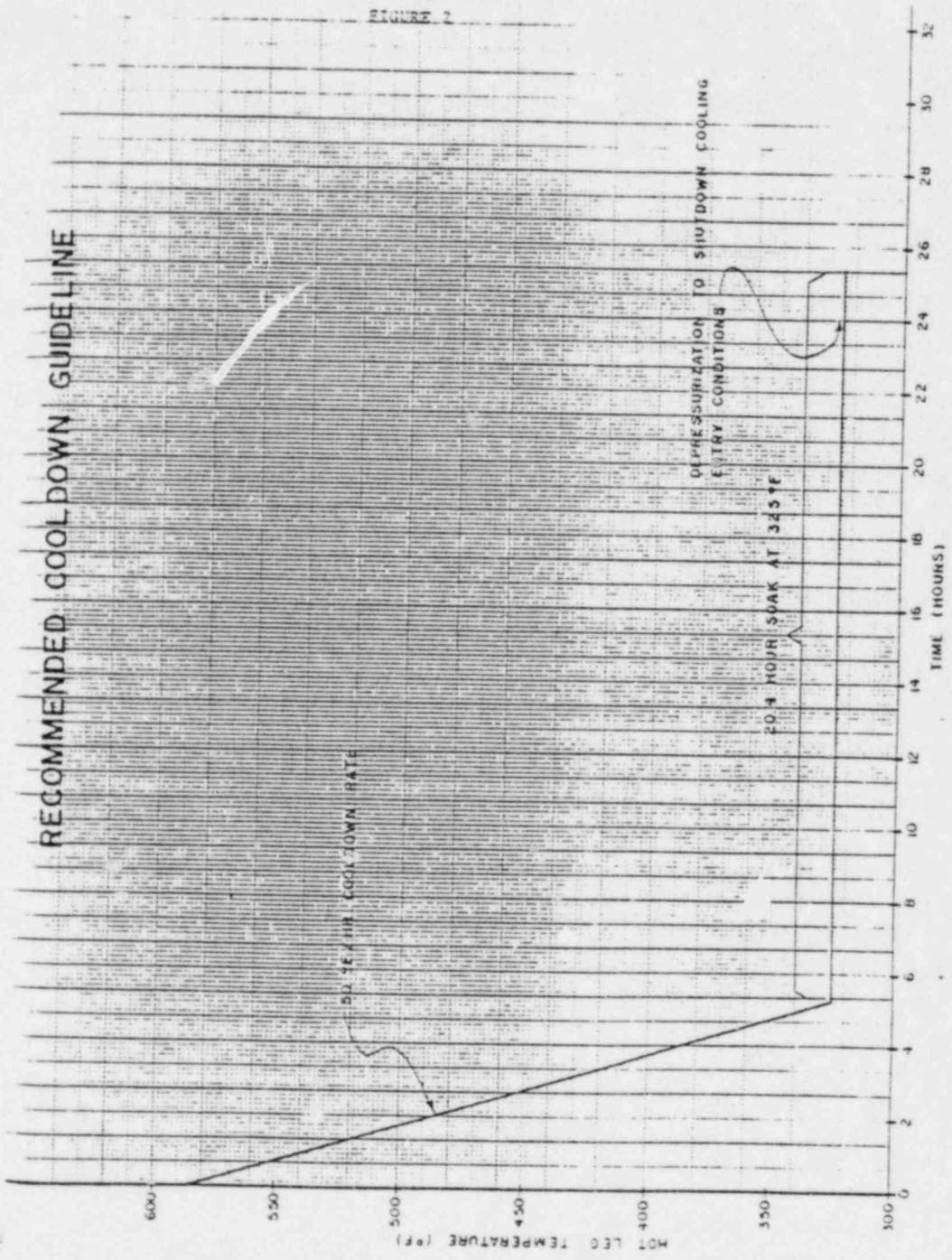

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FIGURE 1

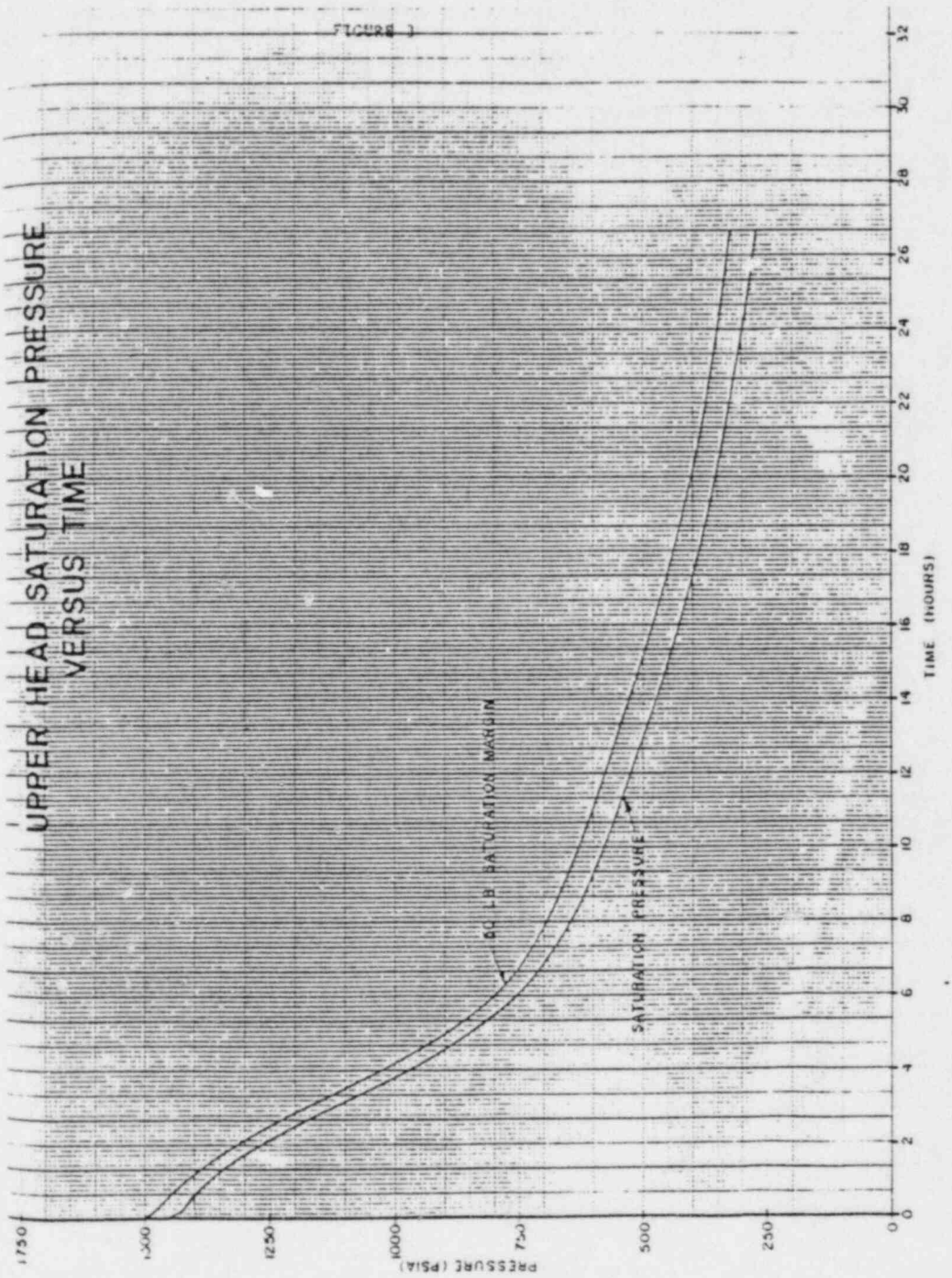

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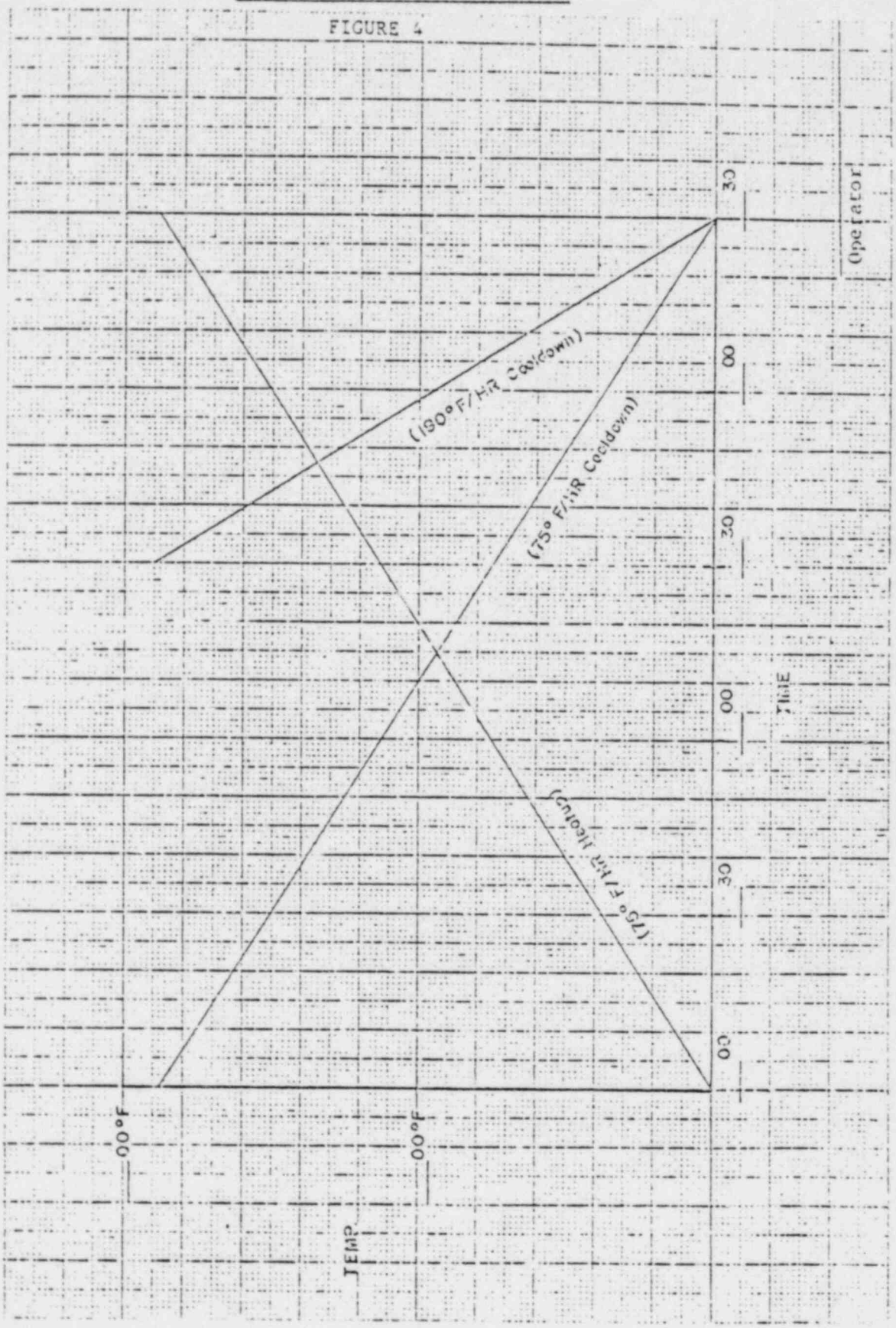
FIGURE 4



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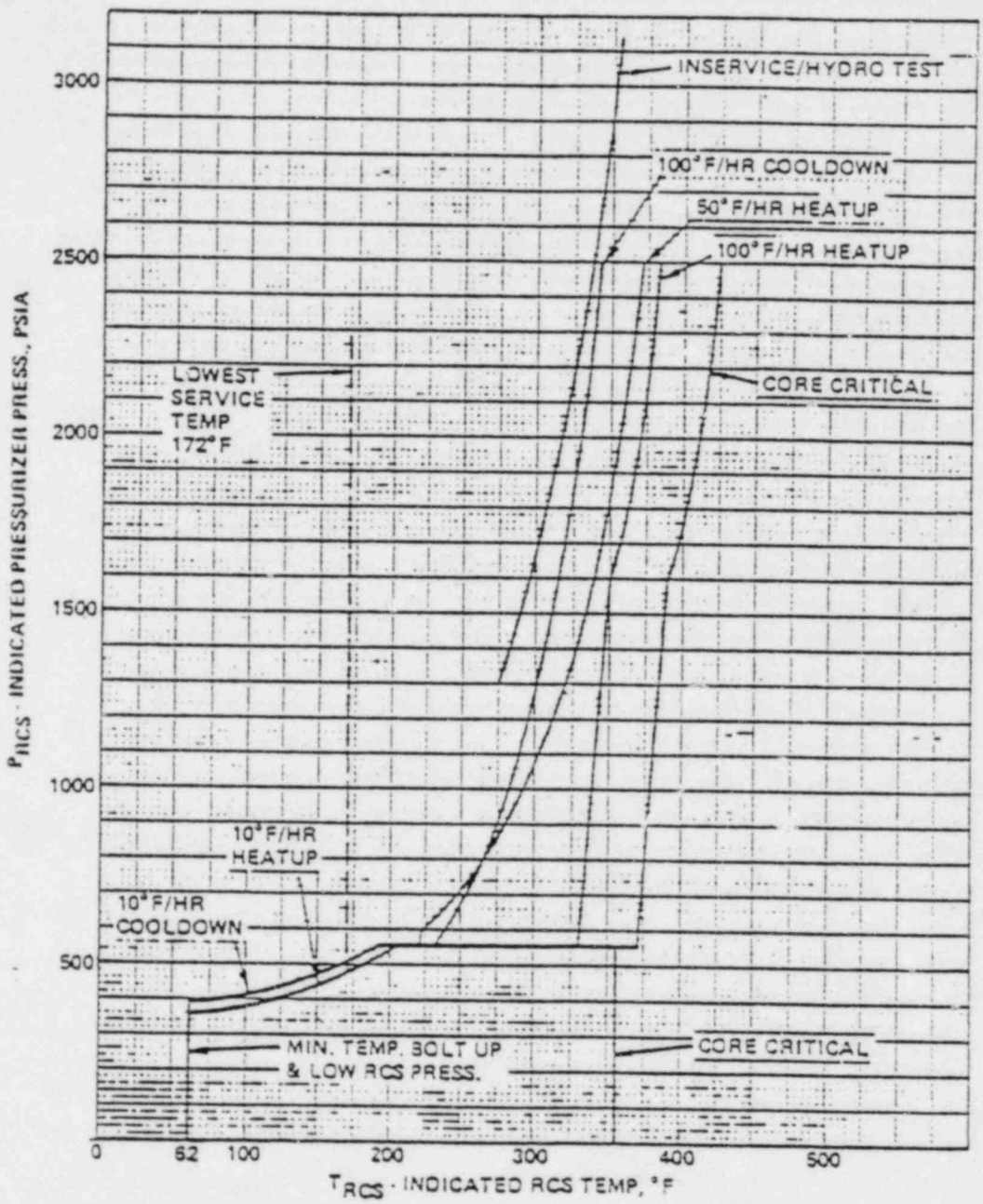

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FIGURE 5

DATE _____

TIME every 30 minutes	COLUMN 1 PRESSURIZER TEMP TI-1101	COLUMN 2 LOWEST SPRAY LINE TEMP TIA 1103/1104	COLUMN 3 PRESSURIZER PRESS PI 1107/1108	* DIFFERENCE COLUMN 1 MINUS COLUMN 2

*LIMITED TO $\leq$ 350° AND $\geq$ 50°

_____ _____
Operator Shift

RCS TEMP AND PRESSURE
SHALL BE WITHIN LIMITS
OF FIGURE 3.4-2b FOR EACH
30 MINUTE PERIOD.

_____ _____
Operator Shift

_____ _____
Operator Shift

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NATURAL CIRCULATION/COOLDOWN

APPENDIX A

PRECAUTIONS

1. Natural circulation flow cannot be verified until the RCP's have stopped coasting down after being tripped.

2. Due to increased loop transit times, verification of plant responses to a plant change cannot be accomplished until approximately 10 to 15 minutes following the action.

3. After a cold shutdown boron concentration is attained in the RCS, makeup water added to the RCS during the cooldown should be at least the same boron concentration as in the RCS to prevent any dilution of RCS boron concentration.

4. Once pressurizer cooldown has begun, pressurizer level indication decalibration will occur (indication on the normal pressurizer level indication will begin to deviate from the true pressurizer level). The temperature compensation correction curve posted on the RTGB should be used to determine true pressurizer water level. Cold calibrated pressurizer level indication is also available for lower pressurizer temperatures.

5. Minimize the use of pressurizer auxiliary spray whenever the temperature differential between the spray water and the pressurizer is greater than 200°F. Any auxiliary spray cycle which results in a spray line temperature change of 650°F to 120°F in < 1.5 seconds shall be recorded in accordance with AP 0010134.

6. If pressurizer spray is not available, boron concentration in the pressurizer may be lower than the RCS loop boron concentration. RCS boron concentration should be increased to avoid being diluted below minimum requirements by a possible pressurizer outsurge.

7. If either the HPSI or LPSI pumps are utilized to collapse any steam voids in the RCS by charging the system solid, the pump(s) should be stopped after solid conditions are indicated. This will minimize the potential for any inadvertant flowpath from the RCS back to the Refueling Water Tank.

8. If the RCS is solid, closely monitor any makeup or draining and any system heatup or cooldown to avoid any unfavorable rapid pressure excursions.

9. During all phases of the cooldown, monitor RCS temperature to avoid exceeding a cooldown rate > 100°F/hr.

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NATURAL CIRCULATION/COOLDOWN

APPENDIX A (Cont.)

PRECAUTIONS

10. If cooling down by natural circulation with an isolated steam generator, an inverted ΔT (i.e., Tc > Th) may be observed in the idle loop. This is due to a small amount of reverse heat transfer in the isolated steam generator and will have no effect on natural circulation flow in the intact steam generator.

11. All available indications should be used to aid in diagnosing the event since it may cause irregularities in a particular instrument reading. Critical parameters must be verified when one or more confirmatory indications are available.

12. When establishing auxiliary feedwater flow to the Steam Generators, use Steam Generator levels as well as header flowrates to ensure each Steam Generator is receiving auxiliary feedwater.

13. Condensate inventory should be monitored periodically to ensure that an adequate supply is available. Makeup to the Condensate Storage Tank should be started as soon as practical. If CST level decreases to minimum required by Technical Specifications, the plant should be immediately cooled down utilizing the Fill and Drain Method (Appendix D).

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APPENDIX B

DISCUSSION

Reactor Coolant Pump forced circulation and heat transfer to the Steam Generators is the preferred mode of operation for decay heat removal whenever plant temperatures and pressures are above the Shutdown Cooling System entry conditions. The natural circulation capability at the St. Lucie Plant provides an emergency means for core cooling using the steam generators, if the RCPs are unavailable.

Natural circulation is governed by decay heat, component elevations, primary to secondary heat transfer, loop flow resistance, and voiding. Component elevations at St. Lucie Plant are such that satisfactory natural circulation decay heat removal is obtained by density differences between the bottom of the core and the top of the steam generator tube sheet. An additional contribution to natural circulation flowrate is the density difference obtained as the coolant passes through the Steam Generator U-tubes, but this is not required for satisfactory natural circulation. Natural circulation is assured even if the U-tubes are partially uncovered on the Steam Generator secondary side. Because of the temperature distribution in the Steam Generator U-tubes, there is no degradation in primary to secondary heat transfer as long as the secondary level covers at least 1/3 of the tube height. By ensuring that the loop ΔT is less than the full power ΔT, the power-to-flow ratio is assured to be less than 1.0 during natural circulation.

Satisfactory natural circulation heat removal can be obtained with either one or two Steam Generators. Unequal auxiliary feedwater to the Steam Generators will not lead to unsatisfactory natural circulation as long as all the decay heat is being removed throught the Steam Generators.

Assurance that the RCS is being maintained in a subcooled condition can be obtained as follows. With the Subcooling Margin Monitor (SMM) operating normally, the nomograph on RTGB 204 is used in conjunction with the SMM to eliminate dependence on a single instrument. With the SMM inoperable, reference to the nomograph utilizing control room indication such as hot leg temperature, pressurizer pressure, and incore thermocouples will determine the margin to saturation. Subcooling margin can also be determined by subtracting hot leg temperature from pressurizer temperature (TE-1101).

During normal plant operation under conditions of forced circulation flow, there is only a small flow of coolant in the reactor vessel head area. During periods of natural circulation, there is little, if any, effective flow. If the RCS is cooled down using natural circulation, it is possible to generate a steam void in the reactor vessel head when saturation conditions develop. These conditions can be produced by the temperature sustained by the retained metal heat and decreased RCS pressure during cooldown.

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NATURAL CIRCULATION/COOLDOWN

APPENDIX B (Cont.)

DISCUSSION

Analyses have demonstrated that the upper reactor head region fluid can be cooled to Shutdown Cooling System (SDC) entry conditions without void formation using a hot leg temperature cooldown rate of 50°F/hr in approximately 14.2 hours. In order to provide additional conservatism, this procedure directs that a cooldown rate of about 50°F/hr to 325°F be utilized, followed by a soak of 325°F for 20.4 hours for a total cooldown time of approximately 25.7 hours from cooldown initiation. (See Figure 1). The condensate supply required for this cooldown is 270,500 gallons. Makeup water can be supplied from the Water Treatment Plant and the two 500,000 gallon City Water Storage Tanks, or Treated Water Storage Tank. Pumping capability from all sources can be supplied from the diesel generators.

An alternative to the above cooldown procedure is the fill and drain method (See Appendix D). This method may be employed should an extremely low probability event occur which could cause a loss of condensate makeup capacity or require a rapid RCS de-pressurization rate. It provides for cooling of the upper reactor vessel head region by using auxiliary spray to the pressurizer to lower RCS pressure and create a void in the upper head. Voiding in the upper head flushes hot upper head fluid into the cooler RCS where it mixes with RCS water. The water flushed out of the upper head will cause a surge of water from the RCS into the pressurizer. The process is halted by stopping the spray. The insurge compresses the pressurizer steam space, raising the pressure, thus stopping the insurge and halting flashing in the upper head. Charging to the RCS will then force fluid into the upper head due to the elevation difference between the reactor vessel upper head and the pressurizer. Mixing of colder loop water with the hot upper head cools the upper head and causes an outsurge from the pressurizer. The process is continued until the upper head is solid. The cycle is then repeated until RCS temperature and pressure have been reduced to SDC entry conditions.

The above procedure has been analyzed and performed sucessfully twice at St. Lucie and is considered a safe, alternative method of natural circulation cooldown.

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APPENDIX C

RCS COOLDOWN/DE-PRESSURIZATION CHECKOFF LIST

1. At RCS pressure of 1750 psig, isolate and bypass the following transmitters:

_____ 1.1 FT-2212 (Charging Header Flow Transmitter)

NOTE: Close the valve on the transmitter marked HIGH SIDE, open the valve marked BYPASS, and close the valve marked LOW SIDE.

_____ 1.2 PT-2212 (Charging header Pressure Transmitter)

NOTE: Close its isolation valve.

_____ 2. At RCS pressure of 1700 psia, the SIAS Channel BLOCK PERMISSIVE annunciator will come on. Block Channels A and B of SIAS by turning the key-interlocked switches to the BLOCK position.

NOTE: If the channels have been blocked, the two annunciators SIAS ACTUATION CHANNEL A BLOCKED and SIAS ACTUATION CHANNEL B BLOCKED will come on.

_____ 3. At Steam Generator pressure of 685 psig, the MSIS ACTUATION CHANNEL A BLOCK PERMISSIVE and MSIS ACTUATION CHANNEL B BLOCK PERMISSIVE annunciators will come on. Block the MSIS channels by turning the key-interlocked switches to the BLOCK position.

NOTE: If the channels have been blocked, the two annunciators MSIS ACTUATION CHANNEL A BLOCKED and MSIS ACTUATION CHANNEL BE BLOCKED will come on.

_____ 4. Prior to reaching RCS pressure of 1100 psia, unisolate and place in operation the standby pressurizer level control and letdown pressure control valves.

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APPENDIX C (Cont.)

RCS COOLDOWN/DE-PRESSURIZATION CHECKOFF LIST

5. When RCS temperature is < 500°F and RCS pressure is < 1500 psia, perform the following:

   5.1 Close the Containment Spray (CS) pump discharge valves:

   _____ V-07145
   _____ V-07130

   5.2 Close and tag the manual valves in the CS header:

   _____ V-07162 (A Hdr)
   _____ V-07165 (B Hdr)

   5.3 Close containment spray motor operated valves

   _____ MV-07-3 (A Hdr)
   _____ MV-07-4 (B Hdr)

6. When RCS cold leg temperature reaches 280°F, annunciator SELECT LTOP OPERATION will come on.

   _____ 6.1 Close MOV-1476 and MOV-1477 (PORV Isolation)

   _____ 6.2 Select LTOP on control switches for PORV-1402 and PORV-1404, and ensure that neither PORV opens.

   _____ 6.3 Open MOV-1476 and MOV-1477 (PORV Isolation).

7. When RCS temperature reaches 325°F and RCS pressure reaches 260 psia, perform the following:

   _____ 7.1 Remove the trip and close fuses on <u>one</u> HPSI pump, and tag with caution tags.

   NOTE: Ensure the remaining HPSI pump is operable.

   _____ 7.2 Remove the trip and close fuses on the 2A and 2B CS Pumps, and tag with caution tags.

8. When RCS temperature reaches 200°F, perform the following:

   _____ 8.1 Remove the trip and close fuses on the remaining HPSI pump and tag with caution tags.

   _____ 8.2 Tag out one charging pump such that no more than two charging pumps are available for dilution below 200°F.

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APPENDIX D

RCS FILL AND DRAIN METHOD OF COOLING

REACTOR VESSEL HEAD REGION

NOTE: This method of RCS cooldown should only be employed in the event that rapid de-pressurization of the RCS is required, or Condensate Storage Tank level decreases below minimum required by Tech Specs.

CAUTION: DURING THIS EVOLUTION, PRESSURIZER LEVEL IS NOT A VALID INDICATOR OF RCS INVENTORY DURING TRANSIENT CONDITIONS. CARE SHOULD BE EXERCISED TO OBSERVE OTHER PARAMETERS WHICH WOULD INDICATE ANY LOSS OF RCS INVENTORY.

1. Take manual control of the charging and letdown system.

2. Lower RCS pressure by using auxiliary sprays into the pressurizer.

3. As voiding occurs in the upper reactor vessel head, a surge of water from the RCS will cause pressurizer level to increase rapidly. Terminate auxiliary spray prior to pressurizer level increasing to 70% indicated level.

4. Cool the upper reactor vessel head region by charging with a charging pump to the RCS loop(s). Continue charging until either of the following conditions occur:

   4.1 Pressurizer level decreases to 30% indicated level

   OR

   4.2 The upper reactor head is charged solid.

   NOTE: A solid upper head condition will be evident by an increasing pressurizer level as charging to the loops is continued.

5. Repeat steps 1 thru 4 above until SDC entry conditions are established.

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APPENDIX E

AUGMENTED COOLDOWN WITH THE STEAM DUMP

BYPASS SYSTEM (SBCS)

If the desired RCS cooldown rate cannot be attained, the SBCS can be used either by itself or in conjunction with the atmospheric dump valves. Since condenser vacuum will not be available, the following actions should be taken to place the SBCS in service:

1. Call available maintenance personnel onsite to remove the target flange on a SBVS valve (preferable V-8803).

   NOTE: If no maintenance personnel are on site, call the Duty Call Supervisor.

2. Isolate all other SBCS valves from the condenser (except the selected valve).

3. Jumper low vacuum interlock in SBCS. (Performed by I & C.)

4. Reset the condenser vacuum interlock by depressing the reset button (on the outside of the RRS #2 cabinet) and observe that the condenser vacuum interlock yellow light goes out.

   NOTE: This will bypass the vacuum permissive and allow operation of V-8803 to atmosphere after removal of the target flange.

5. Place all SBCS controllers in Manual

6. When the taget flange for V-8803 has been removed and the vacuum interlock jumpered, manually adjust the controller for V-8803 to control RCS cooldown rate.

   CAUTION: DO NOT EXCEED A COOLDOWN RATE $\geq$ 75°/HR.

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APPENDIX F

INITIATION OF SHUTDOWN COOLING

NOTE: Perform bracketed steps for train "B"

_____ 1. Open HCV-3657 [3512] (SDC disch to LPSI hdr)
_____ 2. Open MV-3517 [3658] (LPSI pump supply to SDC HX)
_____ 3. Check to be open FCV-3306 [3301] (SDC HX bypass)
_____ 4. Open MV-3536 [3539] (SDC recirc warmup)
_____ 5. Open MV-3456 [3457] (SDC HX isol)
_____ 6. Check to be open V-3204 [3205] (LPSI pump mini-flow)
_____ 7. Check to be open V-3495 and 3659 [3496 and 3660] (Mini-flow hdr stop)
_____ 8. Start 2A [2B] LPSI pump
_____ 9. Check to be closed V-3661 (Check valve leakage drain)
_____ 10. Open HCV-3615 and 3625 [3635 and 3645] (LPSI isol)
_____ 11. Open HCV-3618 and 3628 [3638 and 3648] (Check valve leakage control)
_____ 12. Open V-3459, V-3463, and 2I-SE-03-2A and 2B (RWT recirc stop)
_____ 13. Check the boron concentration in the system after circulating for ten minutes. Continue circulation until the boron concentration is $\geq$ to the concentration in the RCS.
_____ 14. Close HCV-3618, HCV-3628, [HCV-3638, and HCV-3648] (Check valve leakage control)
_____ 15. Close V-3459, V-3463 and 2I-SE-03-2A and 2B (RWT recirc stop)
_____ 16. Close HCV-3615 and 3625 [3635 and 3645] (LPSI isol)
_____ 17. Close HCV-3657 [3512] (SDC disch to LPSI hdr)
_____ 18. Continue to run LPSI pump to heat the SDC system as much as pratical.
_____ 19. Verify flow on FI-3306 [3301].
_____ 20. Close V-3204 [3205]. Ensure pump minimum flow requirements are met.
_____ 21. Stop the LPSI pump.
_____ 22. Close V-3444 [3432] (LPSI pump suction from RWT)
_____ 23. Close MV-3536 [3539] (SDC recirc warmup)
_____ 24. Check RCS pressure < 275 psia, then open V-3480, 3481 and 3664 [V-3451, 3452 and 3665] (SDC return valves)
_____ 25. Open HCV-14-3A [3B] (CCW to SDC HX)
_____ 26. Start 2A [2B] LPSI pump.
_____ 27. Slowly inch open HCV-3625 [3635] to bring SDC system up to temperature.
_____ 28. Adjust FIC-3306 [3301] to maximum flow in AUTO mode
_____ 29. When temperature has stabilized, open fully HCV-3615 and 3625 [3635 and 3645] and adjust FIC-3306 [3301] to control at 3000 gpm in AUTO.
_____ 30. Adjust HCV-3657 [3512] to maintain desired cooldown rate.

DOCUMENT REVISION DISTRIBUTION SHEET - UNIT II
OFF NORMAL & EMERGENCY OPER. PROCEDURE

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DOCUMENT FILE NUMBER 2-0120041

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ST. LUCIE PLANT UNIT 2
EMERGENCY PROCEDURE NUMBER 2-0120041
REVISION 1

STEAM GENERATOR TUBE RUPTURE
(SGTR)
OCTOBER 25, 1982

TOTAL NO OF PAGES 15

EMERGENCY PROCEDURE NUMBER 2-0120041
REVISION 1

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1.0 SCOPE:

This procedure provides operator instruction for two conditions:

(A) S/G tube leak less than charging pump capacity (Reactor shutdown-SIAS not recieved) R1

(B) S/G tube leak greater than charging pump capacity (SIAS revieved). The procedure leaves the RCS in a cold shutdown condition and the affected Steam Generator isolated. R1

2.0 SYMPTOMS:

NOTE
These symptoms are alike for both a large and small leak.

2.1 Unique to this incident:	2.1 Radiation monitoring system
2.1.1 S/G Blowdown Monitor Alarm 2.1.2 Condenser Air Ejector Alarm	

NOTE
Any or all of the following may be evident due to a tube failure.

2.2 Decreasing PRZR level	2.2 Indications BU Charging pump start PRZR heaters de-energize Alarms H-17,H-18,H-25,H-26, H-29,H-30
2.3 Decreasing PRZR pressure	2.3 Indications BU heaters energize Alarms H-9,H-10,H-1,H-2,H-3, H-4
2.4 Initial increase in affected S/G level followed by return to programmed level	2.4 Dependent on size of tube leak LR-9011, 9012

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2.0 SYMPTOMS: (Cont.)

2.5	Feed flow less than steam flow on affected S/G	2.5 Dependent on size of tube leak FR-8011/9011 FR8021/9021
2.6	Decreasing letdown flow	2.6 Caused by decreasing PRZR level FIA-2202
2.7	Increasing charging flow	2.7 Will cause VCT level to decrease LIC-2226 FIA-2212
		Alarms M-3

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3.0 AUTOMATIC ACTIONS:

3.1	PRZR level controls close to minimum	3.1 On both large leak and on small leak.
3.2	S/G blowdown and sample valves close on high radiation	3.2 On both large leak and on small leak.
3.3	PRZR backup heaters energize	3.3 On small leak only.
3.4	Reactor trip from TM/LP (variable)	
3.5	SIAS when RCS pressure decreases to 1600 PSIA	
3.6	CIS from initiation of SIAS	
3.7	Turbine trip from reactor trip	
3.7.1	FW Reg valves close and 15% bypass valves open to 5% flow position	
3.8	PRZR heaters de-energize on low low level	
3.9	PORV's open at 2400 PSIA	

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4.0 IMMEDIATE OPERATOR ACTIONS:

4.1 Ensure all required automatic actions have occured, or initiate manually.

4.2 Start additional charging pumps as necessary.

4.3 Attempt to shutdown the turbine and reactor in a controlled manner prior to recieving any automatic reactor trip signals.

5.0 SUBSEQUENT ACTIONS:

Check

5.1 Reactor Shutdown - SIAS not recieved.

NOTE: If SIAS occurs during these actions, proceed immediately to Step 5.2, SIAS recieved. _____

5.1.1 Isolate letdown if necessary to maintain pressurizer level. _____

5.1.2 Attempt to determine the affected steam generator by comparing levels, steam and feed flow, and by radiation monitoring and sampling. _____

5.1.3 Ensure condensor air ejector vent is aligned to the plant vent. _____

5.1.4 Ensure atmospheric steam dump on affected steam generator is closed and in manual. _____

5.1.5 Ensure blowdown is aligned to monitor tanks. Isolate blowdown on affected steam generator except as needed to maintain level within the indicated range. _____

5.1.6 Stop one reactor coolant pump in each loop. _____

5.1.7 Commence borating to cold shutdown boron concentration, and start cooling down the on non-affected steam generator _____

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5.0 SUBSEQUENT ACTIONS: (Cont.)

5.1 (Cont.)

Check

5.1.8 As soon as plant conditions allow, depressurize RCS to 900 psia. _____

5.1.9 Isolate the affected steam generator as follows: _____

1. Shut MSIV

2. Close AFW manual isolation valves to the affected steam generator.

   2A: V-9152 and V-9120
   2B: V-9158 and V-9136

3. Close affected steam generator main feed header block valves.

4. Close steam supply to 2C AFW pump from affected S/G.

5.1.10 If plant conditions warrant, implement the Emergency Plan per EPIP 3100021E. _____

5.1.11 Continue the cooldown to Cold Shutdown conditions. _____

5.2 SIAS recieved

5.2.1 Following a SIAS caused by low RCS pressure and after it has been verified that CEA's have been fully inserted for 5 seconds, stop all operating RCPs. _____

5.2.2 If pressurizer is availible, use heaters to establish 20°F subcooled conditions. _____

CAUTION: A BUBBLE MAY EXIST IN THE VESSEL HEAD. IF PRESSURIZER LEVEL STARTS TO DROP RAPIDLY WHEN HEATERS ARE ON, DE-ENERGIZE HEATERS AND ATTEMPT TO RESTORE LEVEL WITH CHARGING PUMPS.

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5.0 SUBSEQUENT ACTIONS: (Cont.)

5.2 (Cont.)

		Check
5.2.3	If the Pressurizer is not available, cooldown by natural circulation to establish 20°F subcooling. If pressurizer becomes available, use heaters to maintain pressure. Do not raise pressure except as needed to maintain subcooling. The preferred method to remain subcooled is by RCS cooldown.	_____
5.2.4	Ensure equipment operation per Table I, Safety Injection Actuation and Table II, Containment Isolation.	_____
5.2.5	Upon verification that SIAS is the result of S/G tube rupture, and when plant conditions permit, start one reactor coolant pump in each loop.	_____
5.2.6	Determine affected steam generator by comparing level and by radiation monitors and by sampling.	_____
5.2.7	Ensure blowdown is aligned to monitor tanks, isolate blowdown on affected steam generator. Blowdown as needed to maintain level within indicated band.	_____
5.2.8	Continue plant cooldown at a rate determined by cooldown of affected steam generator.	_____

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5.0 SUBSEQUENT ACTIONS: (Cont.)

5.2 (Cont.)

Check

5.2.9 When RCS pressure is < 900 psia, isolate the affected steam generator as follows: _____

1. Shut MSIV

2. Close AFW manual isolation valves to the affected steam generator.

   2A: V-9152 and V-9120
   2B: V-9156 and V-9136

3. Close affected steam generator main feed header block valves.

4. Close steam supply to 2C AFW pump from affected steam generator.

NOTE: Steam generator must be above AFAS reset point before AFW pumps can be stopped

5.2.10 If HPSI is no longer needed to maintain pressurizer level, secure both HPSI pumps. _____

5.2.11 Continue cooldown to cold shutdown conditions. _____

R1

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TABLE I

SAFETY INJECTION ACTUATION SYSTEM (SIAS)

	CONDITION	CHECK
RTGB 206, Left to Right		
(2) CCW PPS 2A, 2B, or 2C	ON	
(2) CCW to Fuel Pool HX Isolation Valves MV-14-17, MV-14-18	Closed	
(4) CCW Hdr Non-essential Isolation Valves HCV-14-8A, HCV-14-8B, HCV-14-9, HCV-14-10	Closed	
(2) CCW Outlet from Shutdown HX 2A, HX-2B, Valves, HCV-14-3A, HCV-14-3B	Open	
(2) LPSI Pumps	On	
(2) HPSI Pumps	On	
(4) LPSI Disch to Loops HCV-3615, HCV-3625, HCV-3635, HCV- 3645	Open	
(8) HPSI Disch to Loops HCV-3617, HCV-3627, HCV-3637, HCV-3647 - A Header HCV-3616, HCV-3626, HCV-3636, HCV-3646 - B Header	Open	
(2) HPSI Pp Fill to SIT's V3572, V3571	Closed	
(2) SI Test to RWT I-SE-03-2A, I-SE-03-2B	Closed	
(4) SIT Isolation Valves V3614, V3624, V3634, V3644	Open	
(4) SIT Fill/Drain Valves I-SE-03-1A, I-SE-03-1B, I-SE-03-1C, I-SE-03-1D	Closed	
(4) SIT Check Leakoff Valves HIC-3628, HIC-3618, HIC-3638, HIC-3648	Closed	
(4) S/G Feed Pump Discharge ISOL Valves HCV-09-1A, HCV-09-2A, HCV-09-1B, HCV-09-2B	Closed	

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TABLE I (SIAS) (Cont.)

	CONDITION	CHECK
(4) CCW To/From RCP's HCV-14-1, HCV-2, HCV-7, HCV-6	Closed	
(2) Containment Sump Isolation LCV-07-11A, LCV-07-11B	Closed	
RTGB 205, Left to Right		
(1) BA Makeup Valve V2512	Closed	
(2) BA Gravity Feed V2509, V2508	Open	
(1) VCT Discharge V2501	Closed	
(2) Letdown Isolation V2516, V2515	Closed	
RTGB 203, Left to Right		
(2) ICW Pumps 2A, 2B, or 2C	On	
(3) ICW Isolation Valves MV-21-3, MV-21-4, MV-21-2	Closed	
RTGB 201		
(2) Diesel Generators 2A, 2B	On	
HVAC Panel, left to Right		
(4) RAB Main Supply and ECCS Exhaust Fans 2HVS-4A, 2HVE-9A, 2HVS-4B, 2HVE-9B	On	
(4) Containment Fan Cooler 2HVS-1A, 2HVS-1B, 2HVS-1C, 2HVS-1D	On (Slow Speed)	
(8) ECCS Isolation Dampers D5A D6A, D9A, D12A - A Train D5B, D6B, D9B, D12B - B Train	Closed	
(2) Rx Support & Cavity Cool Fans 2HVS-2A, 2HVS-2B, 2HVE-3A, 2HVE-3B	Off	

NOTE:
Any spare equipment that is running, and not needed for controlling this incident should be STOPPED

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TABLE II

Containment Isolation Actuation Signal (CIAS)

	CONDITION	CHECK
RTGB 206, Left to Right		
(2) SIT to RWT I-SE-03-2A, I-SE-03-2B	Closed	____
(5) SIT Sample Isolation Valve FCV-03-1A, FCV-03-1B, FCV-03-1C, FCV-03-1D, FCV-03-1E	Closed	____
(4) S/G Blowdown Isolation Valves and 2 S/G Sample Isolation Valves (Isolation FCV-23-3, FCV-23-5, FCV-23-4, FCV-23-6) (Sample FCV-23-7, FCV-23-9)	Closed	____
(2) Containment Sump Isolation Valves LCV-07-11A, LCV-07-11B	Closed	____
(6) RCS & PRZR Sample Isolation Valves V5200, V5201, V5202, V5203, V5204, V5205	Closed	____
(1) Primary Water Isolation HCV-15-1	Closed	____
(1) Instrument Air Isolation HCV-18-1	Closed	____
(1) N^2 Supply Isolation V6741	Closed	____
(2) Waste Gas Isolation V6750, V6718	Closed	____
(2) RCP Bleed-Off Isolation V2505, V2524	Closed	____
(2) RX Drain TK Isolation V6341, V6342	Closed	____

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TABLE II (CIAS) (Cont.)

	CONDITION	CHECK
RTGB 205		
(3) Letdown Isolation Valves V2516, V2522, V2515	Closed	
RTGB 201		
(2) Diesel Generator 2A, 2B	On	
HVAC Panel, Left to Right		
(2) Shield Bldg. Ventilation Fan 2HVE-16A Control Room Fan 2HVE-13-A	On	
(4) Control Room Isolation Valves FCV-25-24, FCV-25-17, FCV-25-18, FCV-25-16	Closed	
(2) Shield Bldg. Ventilation Fan 2-HVE-16B Control Room Filter Fan 2HVE-13B	On	
(4) Control Room Isolation Valves FCV-25-25, FCV-25-14, FCV-25-15, FCV-25-19	Closed	
(2) Containment Purge Exhaust Fans 2-HVE-8A, 2-HVE-8B	Off	
(6) Containment Purge Isolation Valves FCV-25-1, FCV-25-3, FCV-25-5, FCV-25-6, FCV-25-4, FCV-25-2	Closed	
(3) Continuous Containment H_2 Purge Isolation FCV-25-20, FCV-25-26, FCV-25-21	Closed	
(2) Shield Bldg. Vent Isolation Valves FCV-25-32, FCV-25-33	Open	
(2) Fuel Bldg. Emerg. Vent Isolation Valves FCV-25-30, FCV-25-31	Closed	
(6) Containment Sample Isolation Valves (on RTGB 206) FCV-26-2, FCV-26-4, FCV-26-6, FCV-26-1, FCV-26-3, FCV-26-5	Closed	

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6.0 PURPOSE/DISCUSSION:

6.1 The purpose of this procedure is to list the indications that will enable the operator to identify a Steam Generator Tube failure and to provide the action to be taken to control the accident and minimize radioactive release to the environment.

This procedure provides instructions for two cases, "Leak Within the Capacity of the Charging Pumps" (SIAS not recieved) and "Tube failure" (exceeds Charging Pump Capacity - SIAS recieved). R1

6.2 Discussion:

A Steam Generator Tube Failure causes leakage of reactor coolant into the steam system. If the leakage exceeds the capacity of the charging pumps, pressurizer pressure will decrease rapidly, causing a tnermal margin/low pressure trip. The subsequent cooldown following the reactor trip combined with the continued leakage of reactor coolant into the Steam Generator will cause a further reduction in pressurizer pressure and level, resulting in initiation of safety injection and containment isolation. The tube rupture will cause a reduction in reactor coolant system volume and due to reactor coolant leakage into the steam generator, the affected steam generator level will continue to increase after the feedwater block valves are closed by SIAS. The resulting decrease in RCS pressure and volume will result in the RCS briefly being at saturation conditions. The possibility the exists for void formation in the reactor coolant system.

Operator action should be directed toward prompt isolation of the affected Steam Generator, to minimize contamination of the steam system and prevent possible radioactive release to the environment. With the exception of a compound accident in which loss of power accompanies the Steam Generator Tube failure, steam is dumped to the condenser, rather than the atmosphere, to prevent gross release of contamination to the environment. Action must be taken to identify the affected Steam Generator as soon as possible and to isolate its feedwater flow to prevent water slugging the steam lines.

The Steam Generator Tube failure accident is most severe when it occurs at low power levels, due to the low inventory of water initially present in the pressurizer.

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6.0 PURPOSE/DISCUSSION: (Cont.)

6.2 (Cont.)

If a controlled reactor shutdown is commenced, reduce plant load at a maximum rate which will not of itself cause a plant trip; a power reduction of approximately 5%/minute is recommended.

Minimize the use of the atmospheric steam dump valves. Any necessary releases that are made must receive appropriate authorization.

Use motor driven emergency or normal feedwater pumps to reduce the release of potentially radioactive steam from turbine driven pump exhausts.

Maintain reactor coolant pressure slightly greater than the affected steam generator. R1

Do not exceed a maximum cooldown rate of approximately 75°F/HR

Condensate activity may be transferred to the Circulating Water System by way of condenser tube leakage. The condenser should be isolated if vacuum is lost and the condenser is not being used for reactor plant cooldown. R1

To facilitate cooldown a main steam isolation signal may be avoided by bypassing the signal setpoint on each safety channel.

If reactor coolant pressure control is maintained, a safety injection actuation signal may be avoided by bypassing the signal setpoint on each pressurizer pressure safety channel, thus facilitating cooldown and depressurization.

Maintain the affected steam generator level below the maximum indicatable level by draining by way of the blowdown or sampling systems to the radioactive waste system.

Although it is possible in the long term to note an increasing steam generator level, automatic feedwater modulation keeps the steam generator level approximately constant during the short term.

After the faulted steam generator has been isolated and the cooldown is proceeding via natural circulation an inverted ΔT (i.e., T_c high than T_h) may be observed in the idle loop. This is due to a small amount of reverse heat transfer in the isolated steam generator and will have no effect on natural circulation flow in the intact steam generator.

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7.0 REFERENCES:

7.1 Instruction Manual - Steam Generators, St. Lucie Unit No. 1 8770-5008.

7.2 EBASCO Prints 8770-G-079, 080.

7.3 Accident Analysis, FSAR, Section 15.4.4, Steam Generator Tube Failure.

7.4 CEN 117, Inadequate Cooling.

8.0 Records Required:

8.1 Normal Log Entries.

8.2 Applicable Transient Recorder Charts

9.0 Approval:

Reviewed by: Facility Review Group October 12, 1982
Approved by: C. M. Wethy Plant Manager October 14, 19

Revision 1 Reviewed by FRG 19
Approved by: Plant Manager 19

"L A S T P A G E"

DOCUMENT REVISION DISTRIBUTION SHEET - UNIT II
OFF NORMAL & EMERGENCY OPER. PROCEDURE

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DOCUMENT FILE NUMBER 2-0120042

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FLORIDA POWER & LIGHT COMPANY
ST. LUCIE UNIT 2
EMERGENCY PROCEDURE NUMBER 2-0120042
REVISION 1
OCTOBER 22, 1982

LOSS OF COOLANT ACCIDENT (LOCA)

TOTAL NO. OF PAGES 25

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1.0 SCOPE:

This procedure provides instructions which leaves the plant in a cold shutdown condition following a small or large break LOCA.

2.0 SYMPTOMS:

2.1 Decreasing pressurizer pressure	2.1 Indications PI-1102 A, PI-1102 B, PI-1102 C, PI-1102 D PR-1100 Alarms H-9, H-10, H-1, H-2, H-3, H-14
2.2 Decreasing pressurizer level	2.2 Indications Leakage greater than charging pump capacity. LI-1110X, LI-1110Y, LIC-1110X, LIC-1110Y, LR-1110X, LR-1110 Alarms H-17, H-18, H-25, H-26, H-29, H-30
2.3 Reactor Trip/Turbine Trip	2.3 Indications CEA's inserted (ADS) core Mimic RPS-Ch.1, RPS-Ch.4, RPS-Ch.7, RPS-Ch.9, RPS-Reactor Trip Breakers OPEN Alarms L-3, L-9, L-11, L-17, L-36, L-44, L-5, L-13, D-8 L-10, L-18

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2.0 SYMPTOMS: (Cont.)

2.4 SIAS/CIS Actuation	2.4 Indications Przr press < 1600 PSIA Equipment starts/isolates Tables 1 and Table II Alarms R-6, R-16, R-26, R-3, P-3, P-13, P-23.
2.5 CSAS Signal	2.5 Indications FI-07-1A, FI-07-1B, PIS-07-3A, PIS-07-3B Alarms S-7, S-17
2.6 Increasing Containment Pressure, Temperature and Humidity	2.6 Indications PIS-07-2A, PIS-07-2B, PIS-07-2C, PIS-07-2D PR-07-4B, PR-07-5B, TR-07-3B, TR-07-5B, TI-07-3A, TI-07-5A, PI-07-4A, PI-07-5A Alarms P-13,P-23
2.7 Increasing Reactor Cavity Sump Level	2.7 Indications LIS-07-6,FR-07-3 Alarms N-21,H-29
2.8 High containment radiation	2.8 Indications RIS-26-6-2D, RIS-26-5-2C, RIS-26-4-2B, RIS-26-3-2A Alarms P-5, P-15
2.9 Quench tank high level, temperature, pressure	2.9 Indications LIA-1116, TIA-1116, PIA-1116 Alarms H-16, H-24, H-32

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2.0 SYMPTOMS: (Cont.)

2.10	Decreasing VCT level	2.10 Indications LIC-2226 Alarms M-3, M-11
2.11	Unbalanced charging and letdown flow	2.11 Indications FIA-2202, HIC-1110, FIA-2212 Alarms M-5, M-13, M-15
2.12	Pressurizer safety valves open	2.12 Indications PIA-1116, LIA-1116, TIA-1116, TIA-1109, TIA-1108, TIA-1107 Alarms H-12, H-11, H-19, H-27, H-16, H-24, H-32
2.13	RCS subcooling margin decrease	2.13 Indications TR-1115, TI-1115, TI-1102, A, B, C, D, TR-1123, TI-1123, TR 1111X/1121X Alarms H-5, H-6, H-7, H-8
2.14	Reactor Coolant Pumps motor amps decreasing and/or erratic.	2.14 Indications AM-113, AM-105, AM-109, AM-101, PDI-1101A, PDI-1101B, PDI-1101C, PDI-1101D Alarms J-5, J-16, J-32, J-21

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3.0 AUTOMATIC ACTIONS:

	CAUSE
3.1 Reactor Trip	3.1 TM/LP or Low Pressurizer Pressure
3.2 Turbine Trip	3.2 Reactor trips turbine
3.3 SIAS	3.3 RCS press $\leq$ 1600 PSIA
3.4 CIAS	3.4 SIAS initiates
3.5 CSAS	3.5 High containment pressure
3.6 RAS	3.6 RWT level 3 feet, indicated

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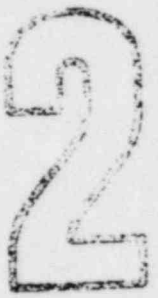

4.0 IMMEDIATE OPERATOR ACTION:

4.1 Carry out immediate operator actions for a reactor trip per Off-Normal OP #2-0030130.

4.2 If SIAS was caused by low RCS pressure:

4.2.1 Verify CEA's inserted > 5 sec.

4.2.2 Stop the operating RCP's.

4.3 Establish and maintain S.G level with the Auxiliary Feedwater System.

5.0 SUBSEQUENT ACTIONS:

		Check
5.1 Classify the event as conditions dictate, according to EP 3100021E, "Criteria for Evaluation of Emergency" and implement the Emergency Plan as necessary.		_____
5.2 Ensure all required Automatic Actions (3.0) have occured.		_____
5.3 Allow time for RCP coastdown and verify adequate core cooling by incore thermocouples.	5.3 Reason: Verify adequate flow across the core, caused by flow through the break.	_____
5.4 Check the ESFAS Bypass Status board.	5.4 Reason: To ensure availability of equipment for auto functions.	_____
5.5 Ensure SIAS, CIAS are functioning properly or manually initiate.	5.4 Refer to Table I and Table II.	_____

CAUTION:
Overfeeding the S/G's may cause excessive cooldown.
Do not exceed 75°F/HR cooldown rate.

5.6 If Containment pressure approaches 10 psig initate CSAS.	5.6 Ensure CSAS components function. Refer to Table III.	_____

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5.0 SUBSEQUENT ACTIONS: (Cont.)

CHECK

5.7 Refer to Reactor Trip/Turbine Trip, 2-0030130 and ensure that all subsequent actions (Section 5) have been or are being performed. ____

5.8 When containment pressure decreases to < 10 psig:

Reset CSAS
Stop 2A and 2B CS pps ____
Close FCV-07-1A, FCV-07-1B ____
Ensure Iodine Removal Pps 2A, 2B stopped ____
Ensure Iodine Removal System Isolation valves I-SE-07-3A and I-SE-07-3B closed ____

5.9 Within one (1) hour, stop RCS/BAMT boration via the charging pumps. ____

5.10 Conduct area radiation surveys as soon as possible to determine extent of damage. ____

5.11 Commence RCS cooldown per OP 2-0030127 as soon as possible and in any case within one (1) hour. Refer to Appendix "A" for Reactor Head Cooling precautions & instructions. ____

CAUTION

Ensure RCS is maintained in a subcooled condition. After any SIAS, operate the SIS until RCS hot and cold leg temperatures are at least 20°F below saturation temperature for the RCS pressure.

5.12 Ensure proper operation of the safety injection system by checking flow rates and SIT levels. ____

5.13 If steam dump to condenser is available, close the atmospheric steam dump and begin dumping steam to the condenser. ____

5.14 If offsite power is lost, steam dump to the atmosphere must be used for cooldown. ____

CAUTION

Do not exceed 75°F/hour cooldown rate.

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5.0 SUBSEQUENT ACTIONS: (Cont.)

		Check
5.15	Continue auxiliary feedwater flow to the steam generators during cooldown.	____
5.16	Immediately prior to RAS, ensure power is available to V3659, V3660, V3495, V3496. (HPSI and LPSI return to RWT.)	____
5.17	Ensure RAS occurs when the RWT level decreases to 3 ft. indicated - (4 ft. from bottom of the tank). Table IV, page 18, may be used as a check list.	____
5.18	If all HPSI pumps and charging pumps are operating and the HPSI pumps are delivering less than 75 GPM per pump, stop the charging pumps one at a time, then HPSI pumps one at a time until only one HPSI pump remains operating. Do not allow HPSI pumps to operate dead headed.	____
5.19	Check RAB radiation levels and sump levels after RAS to detect SIS leakage. Even if leaks are detected, at least one HPSI pump must remain in operation to provide flow to the core.	____
5.20	Establish radiation areas and warnings where necessary. Be cautious when initiating SDC because of possible high RCS activity.	____
5.21	Within ten (10) hours of the incident occurrence, initiate hot leg injection. This will be in conjunction with the existing cold leg injection.	____
5.22	If the pressure and inventory control with the SIS cannot be established after eight hours and RCS pressure is less than 300 PSIG, continue hot and cold leg injection.	____

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5.0 SUBSEQUENT ACTIONS: (Cont.)

5.23 If pressure and inventory control with the SIS are established after eight (8) hours and RCS pressure is greater than 300 PSIG, conduct one of the following activities (in order of decreasing preference). This condition indicates the system is refilled and subcooling has occurred. _____

5.23.1 1.) Verify subcooling by checking the saturation temperature for the existing pressure. _____

2.) Realign the SIS for cold leg injection. _____

3.) Continue to maintain subcooling and reduce RCS pressure to <275 PSIA for shutdown cooling by reducing the flow delivered by the high pressure injection and charging pumps. _____

4.) While reducing pressure and after shutdown cooling is initiated, maintain RCS pressure with the charging pumps and/or the HPSI pumps to maintain at least 20^{o} subcooling. _____

OR

5.23.2 Continue to remove decay heat using auxiliary feedwater and steam dumps if adequate condensate is available and (5.23.1) cannot be implemented. _____

OR

5.23.3 If 5.23.1 of 5.23.2 above cannot be implemented, open pressurizer power operated relief valves and align the safety injection system for cold leg injection.

To open the PORV's, pull two RPS pressurizer high pressure trip unit bistables. _____

5.24 Place both hydrogen recombiners in service (see Appendix "C"). _____

5.25 If containment hydrogen concentration cannot be maintained below 3.5% as indicated on the containment hydrogen sample system, then place the containment hydrogen purge system in operation (see Appendix "D"). _____

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6.0 PURPOSE AND DISCUSSION:

This procedure provides instructions to be followed in the event that leakage from the Reactor Coolant System exceeds the capacity of the operable charging pumps. When conditions in the Reactor Coolant System degrade to the point that a Limiting Safety System Setting is approached the Reactor Protective System will initiate a reactor trip, making the reactor subcritical. This will stop the production of power in the core. Cooling of the core, however, must continue to remove the considerable decay heat that remains. The Safety Injection System automatically provides a flow of subcooled water to the core for decay heat removal. Failure to keep the core covered will result in overheating of the fuel, failure of the cladding, and a release of gross amounts of fission products to the containment atmosphere.

The spectrum of breaks which would cause a LOCA is from approximately at .2 inch diameter break up to a double-ended hot leg rupture. For an example: Analysis show that the flow from an unrestricted .3 inch diameter break is approximately 180 GPM at 2250 PSIA. A major concern for these small breaks is that the flow through the break may not be sufficient for decay heat removal. In those circumstances it is imperative that a secondary heat sink be available.

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Operator actions should be directed toward ensuring proper operation of the Safety Injection and Containment Isolation Systems, ensuring all automatic functions have initiated properly, and taking action to protect plant personnel. Long term action is directed toward placing the plant in a cold shutdown condition. For small breaks where the ECCS will maintain RCS volume and pressure, operator action must be directed toward establishing and maintaining subcooled conditions in the RCS during the cooldown to prevent void formation. Figure 1 is a quick reference for operator actions.

Some instruments (valve position, temperature, pressure, level indications, etc.) specified for use in this procedure have not been designed for long term post LOCA conditions inside containment. Therefore, the operator should be especially alert that the potential exists for erroneous indication after >15 minutes have elapsed following a LOCA event.

If there is a high radioactivity level in the reactor coolant system, circulation of this fluid in SDC may result in high area radioactivity readings in the RAB.

It may be necessary to fill the przr solid to regain pressure control and to achieve 20°F subcooling. If this is the case, HPSI discharge valves will have to be carefully throttled during the cooldown to reduce system pressure.

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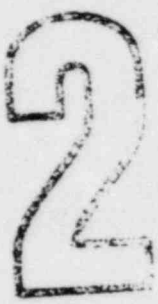

6.0 PURPOSE AND DISCUSSION: (Cont.)

Ensure HPSI flow to the core continues after RAS. Do not allow the HPSI pumps to operate "dead-headed". HPSI shutoff head (no flow) 1250 PSIG.

Do not exceed 75°F/hour cooldown rate.

If conditions permit, attempt to locate and isolate the source of the leak. Possible leak locations include but are not limited to the PORV's, the letdown line and the sample lines.

Przr level may not always be a true indicator of RCS fluid inventory. Przr. steam space ruptures, reference leg failures, and reference leg heating may cause indications which are contrary to true conditions.

Take appropriate action to keep core covered or reflood if it becomes partially uncovered. Maintain or re-establish a heat removal path. Regain RCS pressure and level control. Follow long term shut down procedures in order to assure that boron precipitation does not occur.

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FIGURE 1
LOSS OF COOLANT ACCIDENT STRATEGY CHART

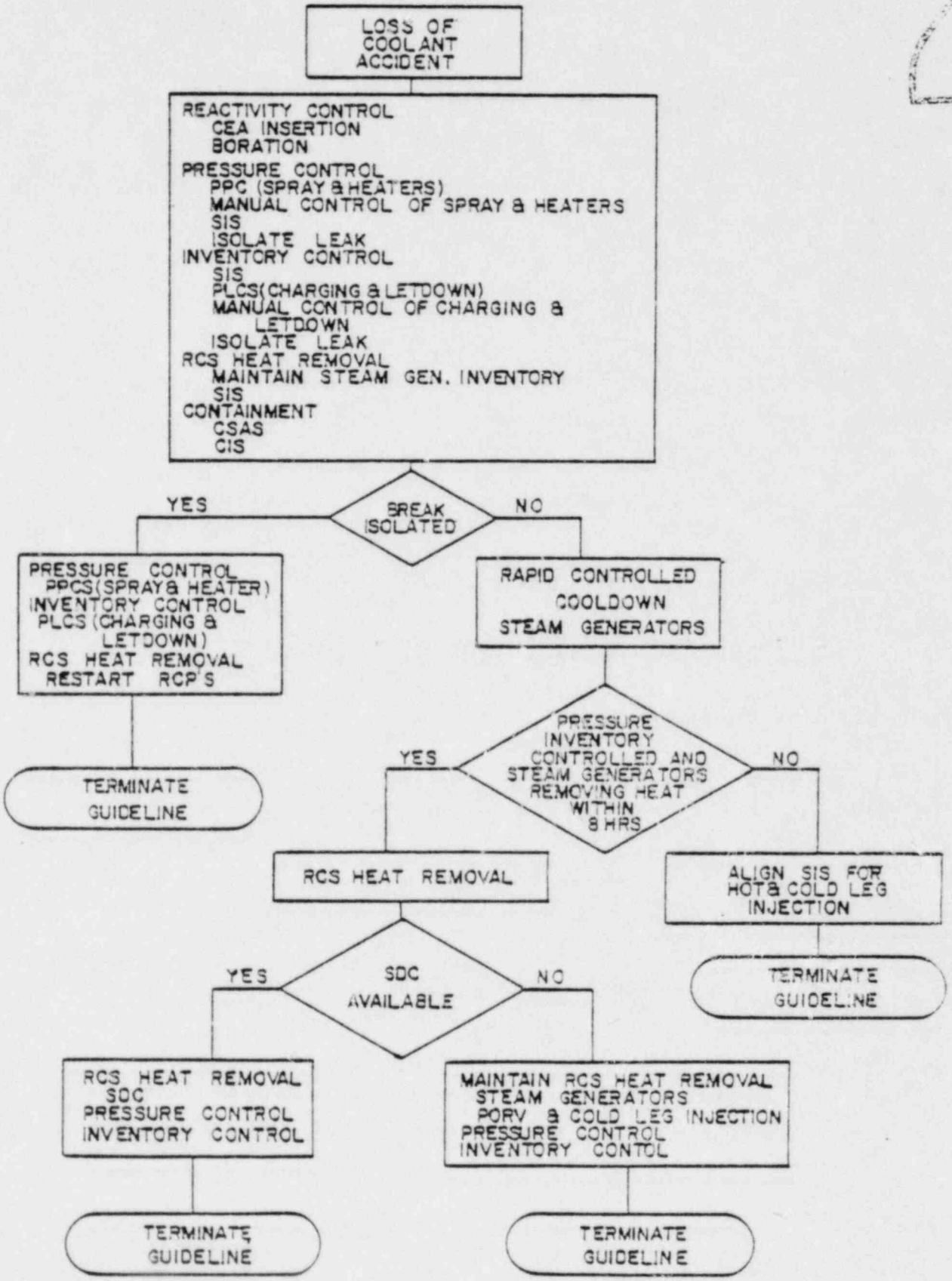

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TABLE I

SAFETY INJECTION ACTUATION SIGNAL (SIAS)

RTGB 206, Left to Right	CONDITION	CHECK
Two (2) CCW Pp (2A, 2B, or 2C)	On	
Two (2) CCW to Fuel Pool HX Isolation Valves (MV-14-17, MV-14-18)	Closed	
Four (4) CCW HDR Non-essential Isolation Valves (HCV-14-8A, HCV-14-8B, HCV-14-9, HCV-14-10)	Closed	
Two (2) CCW Outlet Valves from shutdown HX 2A, 2B (HCV-14-3A, HCV-14-3B)	Open	
Two (2) LPSI PPS	On	
Two (2) HPSI PPS	On	
Four (4) LPSI Disch Valves to Loops (HCV-3615, HCV-3625, HCV-3635, HCV-3645)	Open	
Eight (8) HPSI Disch Valves to Loops (HCV-3617, HCV-3627, HCV-3637, HCV-3647 - Header A) (HCV-3616, HCV-3626, HCV-3636, HCV-3646 - Header B)	Open	
Two (2) Hot Leg Injection Check Vlv. Leakage Valves. (V3572, V3571)	Closed	
Two (2) SI Test to RWT (I-SE-03-2A, I-SE-03-2B)	Closed	
Four (4) SI Tank Isolation Valves (V3614, V3624, V3634, V3644)	Open	
Four (4) SI Tank Fill/Drain Valves (I-SE-03-1A, I-SE-03-1B, I-SE-03-1C, I-SE-03-1D)	Closed	
Four (4) SI Check Leakage Test (HCV-3618, HCV-3628, HCV-3638, HCV-3648)	Closed	
Four (4) CCW To/From RCP's (HCV-14-1, HCV-14-2, HCV-14-7, HCV-14-6)	Closed	

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TABLE I (Cont.)
SAFETY INJECTION ACTUATION SIGNAL (SIAS)

	CONDITION	CHECK
RTGB 205		
Two (2) Boric Acid Make-up Pumps 2A and 2B	Start	_____
Two (2) Boric Acid Make-up Tank Recirc Vlv's 2A (V-2650), 2B (V-2651)	Closed	_____
One (1) Boric Acid Make-up Vlv (V-2512)	Closed	_____
Two (2) Boric Acid Gravity Feed Vlv's (V-2508, V-2509)	Open	_____
One (1) Volume Control Tank Discharge Vlv. (V-2501)	Closed	_____
Two (2) Letdown Isolation Vlv's (V-2516, V-2515)	Closed	_____
Three Charging Pumps (2A, 2B and 2C)	Start Signal	_____
One (1) Boric Acid Make-up Flow Vlv (FCV-2210Y)	Closed	_____
Two (2) Containment Sump Isolation Valves (LCV-07-11A, LCV-07-11B)	Closed	_____
Two (2) Intake Cooling Water, Lube Water to Circ. Water Pumps, Isolation Valves (MV-21-4A, MV-21-4B)	Closed	_____
RTGB 202		
Two (2) Intake Cooling Wtr Pumps	On	_____
Two (2) Intake Cooling Wtr Isolation Valves (MV-21-3, MV-21-2)	Closed	_____
RTGB 201		
Two (2) Diesel Generators	On	_____

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TABLE I (Cont.)
SAFETY INJECTION ACTUATION SIGNAL (SIAS)

	CONDITION	CHECK
HVAC PANEL LEFT TO RIGHT		
Four (4) RAB Main Supply and ECCS Exhaust Fans (2-HVS-4A, 2-HVE-9A, 2-HVS-4B, 2-HVE-9B)	On	
Four (4) Containment Fan Coolers (2-HVS-1A, 2-HVS-1B, 2-HVS-1C, 2-HVS-1D)	On slow Speed	
Eight (8) ECCS Isolation Dampers (D5A, D6A, D9A, D12A, D5B, D9B, D12B)	Closed	

NOTE
Any spare equipment that is running and not needed for controlling this incident should be STOPPED.

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TABLE II

CONTAINMENT ISOLATION ACTUATION SIGNAL (CIAS)

	CONDITION	CHECK
RTGB 206, Left to Right		
Two (2) SI Tank return to RWT (I-SE-03-2A, I-SE-03-2B)	Closed	
Five (5) SI Tank Sample Isolation Valves (FCV-03-1A, FCV-03,1B, FCV-03-1C, FCV-03-1D, FCV-03-1E)	Closed	
Four (4) S/G Blowdown and two (2) S/G Sample Isolation Valves (Isolation FCV-23-3, FCV-23-5, FCV-23-4, FCV-23-6) (Sample FCV-23-7, FCV-23-9)	Closed	
Two (2) Containment Sump Isolation Valves (LCV-07-11A, LCV-07-11B)	Closed	
Six (6) RCS and pressurizer Sample Isolation Valves (V5200, V5201, V5202, V5203, V5204, V5205)	Closed	
One (1) Primary Water Isolation (HCV-15-1)	Closed	
One (1) Instrument Air Isolation (HCV-18-1)	Closed	
One (1) N^2 Supply Isolation (V6741)	Closed	
Two (2) Waste Gas Isolation (V6750, V6718)	Closed	
Two (2) RCP Bleed-off Isolation (V2505, V2524)	Closed	
Two (2) RDT Isolation (V6341, V6342)	Closed	
RTGB 205		
Three (3) Letdown Isolation Valves (V2516, V2522, V2515)	Closed	
RTGB 201		
Two (2) Diesel Generators	On	
HVAC Panel, Left to Right		
Two (2) Shield Bldg. Ventilation and Control Room Filter Fans (2-HVS-13A, 2-HVE-6A)	On	
Four (4) Control Room Isolation Valves (FCV-25-24, FCV-25-17, FCV-25-18, FCV-25-16)	Closed	
Two (2) Shield Bldg. Ventilation and Control Room Filter Fans (2-HVS-13B, 2-HVE-6B)	On	
Four (4) Control Room Isolation Valves (FCV-25-25, FCV-25-14, FCV-25-15, FCV-25-19)	Closed	

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TABLE II (Cont.)

CONTAINMENT ISOLATION ACTUATION SIGNAL (CIAS)

	CONDITION	CHECK
Two (2) Containment Purge Exhaust Fans (2-HVE-8A, 2-HVE-8B)	Off	
Six (6) Containment Purge Isolation Valves (FCV-25-1, FCV-25-3, FCV-25-5, FCV-25-6, FCV-25-4, FCV-25-2)	Closed	
Three (3) Continuous Containment H_2 Purge Isolation (FCV-25-20, FCV-25-26, FCV-25-21)	Closed	
Two (2) Shield Bldg. Vent. Isolation Valves (FCV-25-32, FCV-25-33)	Open	
Two (2) Fuel Bldg. Emerg. Ventilation Isolation Valves (FCV-25-30, FCV-25-31)	Closed	
Six (6) Containment Sample Isolation Valves (FCV-26-2, FCV-26-4, FCV-26-6, FCV-26-1, FCV-26-3, FCV-26-5) (RTGB 206)	Closed	

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TABLE III

CONTAINMENT SPRAY ACTUATION SIGNAL (CSAS)

	CONDITION	R1 CHECK
Two (2) Containment Spray Pumps	On	
Two (2) Containment Spray HDR Isolation Valves (FCV-07-1A, FCV-07-1B)	Open	
Two (2) Iodine Removal System Pumps	On	
Two (2) Iodine Removal System Isolation Valves (I-SE-07-3A, I-SE-07-3B)	Open	

NOTE: Verify Flow on FI-07-1A and FI-07-1B.

EMERGENCY PROCEDURE NUMBER 2-0120042
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TABLE IV

RECIRCULATION ACTUATION SIGNAL (RAS)

	CONDITION	CHECK
Two (2) LPSI PPS	Off	
Two (2) SI Pump Recirc. to RWT Isolation Valves (V3659, V3660)	Closed	
Four (4) Minimum Flow Isolation Valves (V3495, V3496, V-3659, V-3660)	Closed	
Two (2) Containment Sump Outlet Valves (MV-07-2A, MV-07-2B)	Open	
Two (2) RWT Outlet Valves (MV-07-1A, MV-07-1B)	Closed	

R1

EMERGENCY PROCEDURE NUMBER 2-0120042
REVISION 1

2

APPENDIX "A"

REACTOR HEAD COOLING

Analyses have demonstrated that the upper reactor head region fluid can be cooled to Shutdown Cooling System (SDC) entry conditions without void formation using a hot leg temperature cooldown rate of 50°F/hr in approximately 14.2 hours. In order to provide additional conservatism, a cooldown rate of about 50°F/hr to 325°F should be utilized, followed by a soak of 325°F for 20.4 hours for a total cooldown time of approximately 25.7 hours from cooldown initiation. The condensate supply required for this cooldown is 270,500 gallons. Makeup water can be supplied from the Water Treatment Plant and the two 500,00 gallon City Water Storage Tanks, or Treated Water Storage Tank. Pumping capability from all sources can be supplied from the diesel generators.

If voiding in the RCS is indicated, perform the following:

a. Isolate letdown by closing V-2515 and V-2516 (Letdown Containment Isolation).

b. Stop the RCS depressurization.

c. Stop the RCS cooldown.

d. If possible, review and select one RCP in each loop for restarting.

e. Repressurize the RCS to eliminate the void by operating pressurizer heaters or HPSI and charging pumps.

NOTE: If the HPSI or charging pumps are utilized to charge the RCS solid, the pumps should be stopped after solid RCS conditions are indicated.

f. If required to continue the cooldown with the known presence of a steam void i the reactor vessel head, proceed using the Fill and Drain method (Appendix "B").

g. When conditions permit, re-initiate letdown and resume depressurization to SDC intiation pressure.

EMERGENCY PROCEDURE NUMBER 2-0120042
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APPENDIX "A"

REACTOR HEAD COOLING
(continued)

An alternative to the above cooldown procedure is the fill and drain method (See Appendix "B"). This method may be employed should an extremely low probability event occur which could cause a loss of condensate makeup capacity or require a rapid RCS de-pressurization rate. It provides for cooling of the upper reactor vessel head region by using auxiliary spray to the pressurizer to lower RCS pressure and create a void in the upper head. Voiding in the upper head flushes hot upper head fluid into the cooler RCS where it mixes with RCS water. The water flushed out of the upper head will cause a surge of water from the RCS into the pressurizer. The process is halted by stopping the spray. The insurge compresses the pressurizer steam space, raising the pressure, thus stopping the insurge and halting flashing the upper head. Charging to the RCS will then force fluid into the upper head due to the elevation difference between the reactor vessel upper head and the pressurizer. Mixing of colder loop water with the hot upper head cools the upper head and causes an outsurge from the pressurizer. The process is continued until the upper head in solid. The cycle is then repeated until RCS temperature and pressure have been reduced to SDC entry conditions.

R1

EMERGENCY PROCEDURE NUMBER 2-0120042
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APPENDIX "B"

RCS FILL AND DRAIN METHOD OF COOLING

REACTOR VESSEL HEAD REGION

NOTE: This method of RCS cooldown should only be employed in the event that rapid de-pressurization of the RCS is required, or Condensate Storage Tank level decreases below 150,000 gallons.

CAUTION: During this evolution, pressurizer level is not a valid indicator of RCS inventory during transient conditions. Care should be exercised to observe other parameters which would indicate any loss of RCS inventory.

1. Take manual control of the charging and letdown system.

2. Lower RCS pressure by using auxiliary sprays into the pressurizer.

3. As voiding occurs in the upper reactor vessel head, a surge of water from the RCS will cause pressurizer level to increase rapidly. Terminate auxiliary spray prior to pressurizer level increasing to 70% indicated level.

4. Cool the upper reactor vessel head region by charging with a charging pump to the RCS loop(s). Continue charging until either of the following conditions occur:

   4.1 Pressurizer level decreases to 30% indicated level

   or

   4.2 The upper reactor head is charged solid.

   NOTE: A solid upper head condition will be evident by an increasing pressurizer level as charging to the loops is continued.

5. Repeat steps 1 thru 4 above until SDC entry conditions are established.

EMERGENCY PROCEDURE NUMBER 2-0120042
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APPENDIX "C"

PLACING H_2 RECOMBINERS IN SERVICE

I. Place recombiners in service as follows:

1A	1B	
_____	_____	1. Ensure breakers #41262 in 480V MCC 2A3 (2A) and #42103 and in 480V MCC 2B6 (2B) are closed.
_____	_____	2. Set the power adjust potentiometer at zero (ooo).
_____	_____	3. Check that power is available to the power supply panel by observing the "power available" white light on the control panel is illuminated.
_____	_____	4. Set the Power Out Switch on the control panel to the "ON" position. The red light on the switch will illuminate.

CAUTION

There is a lag in the following meter reading, so turn the potentiometer knob slowly. Do not exceed 75 KW.

_____	_____	5. Gradually turn the Power Adjust potentiometer to 70 KW as indicated on the Power Out Wattmeter.
_____	_____	6. Periodically check the temperature of the three thermocouples using the temperature channel selector switch. And, when the temperature reaches 1250°F, adjust the power adjust potentiometer to maintain temperature between 1250°F and 1400°F. Do not exceed 1400°F.

EMERGENCY PROCEDURE NUMBER 2-0120042
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APPENDIX "D"

PLACING CONTAINMENT H_2 PURGE IN SERVICE

II. Place containment H_2 purge in service as follows:

1. Close FCV 25-35, normal discharge to plant vent.
2. Close FCV 25-9, filter train inlet.
3. Open FCV 25-20 and FCV 25-21, containment isolation valves
4. Open FCV 25-28, filter train bypass valve.
5. Ensure that 2-HVE-10A or 2-HVE-10B is running.
6. Open FCV 25-29 or FCV 25-34 as appropriate to direct the purge fan exhaust to the active SBVS filter train inlet.
7. Start 2-HVE-7A or 2-HVE-7B.
8. Open FCV-25-26 to provide makeup air to the containment.
9. Throttle FCV-25-28 to provide the proper purge flow rate based on the hydrogen concentration rate of increase.

R1

EMERGENCY PROCEDURE NUMBER 2-0120042
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7.0 REFERENCES:

St. Lucie Unit #1 Emergency Procedures Unit #2 FSAR SECT. 1.0, 6.0, 9.0.

Lund Consulting report to C. E. (Feb. 6, 1981)

Draft of NUREG - 0799

8.0 RECORDS REQUIRED:

Normal log entries

L E R

Transient indicators and recorder charts

9.0 APPROVAL:

Reviewed by Facility Review Group October 12, 1982

Approved by C. M. Wethy Plant Manager October 14 1982

Revision __ Reviewed by Facility Review Group _____ 19__

Approved by _____ Plant Manager _____ 19__

"L A S T P A G E"

DOCUMENT REVISION DISTRIBUTION SHEET - UNIT II
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DOCUMENT TITLE Inadequate Core Cooling (ICC)

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FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2
EMERGENCY PROCEDURE NUMBER 2-0120043
REVISION 1

INADEQUATE CORE COOLING (ICC)

OCTOBER 25, 1982

TOTAL NO. OF PAGES 5

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2
EMERGENCY PROCEDURE NUMBER 2-0120043
ICC
REVISION 1

1.0 SCOPE:

Provides actions to recognize and correct inadequate core cooling.

2.0 SYMPTOMS:

> **NOTE:** Any of the following symptoms may be indication of ICC.

2.1	Steam Generator levels at or near zero on wide range level indication.	RTGB 202
2.2	Loss of RCS subcooling or RCS superheated.	
2.3	Loss of natural circulation	T_H increasing steadily, Tc increasing steadily, Core exit thermocouple Temps increasing Loop $\Delta T > 46^{\circ}$

3.0 AUTOMATIC ACTIONS:

None

4.0 IMMEDIATE OPERATOR ACTIONS:

4.1	Ensure at least one steam generator wide range level is greater than 33%.	
4.2	Ensure atmos. steam dump or SBCS is operating	Steps 4.1 and 4.2 insure a secondary heat sink

EMERGENCY PROCEDURE NUMBER 2-0120043
(ICC) REVISION 1

2

4.0 IMMEDIATE OPERATOR ACTIONS: (Cont.)

4.3 Regain or maintain 20° subcooling in RCS

4.4 If natural circ. can not be regained and RCP's can not be restarted, depressurize RCS to initiate HPSI flow to core.

5.0 SUBSEQUENT ACTIONS:

5.1 Refer to the Emergency Procedure which covers the event which initiated the inadequate core cooling (Natural Circulation/Cooldown, Total Loss of AC Power, Loss of Feedwater or S/G Level ECT.)

R1

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(ICC) REVISION 1

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6.0 PURPOSE/DISCUSSION:

Inadequate core cooling (ICC) is a term that defines a reactor core condition that is degraded beyond that anticipated during normal plant operations. The ICC conditions could result from operator error or a combination of equipment failures. In order to induce ICC, established operating procedures must have been violated or equipment failures greater than considered credible in design criteria have occured.

This procedure is to be considered as a guide to avoid ICC and not a replacement for procedures which refer to specific accidents or conditions.

On CE plants the core is protected from DNB by either the TM/LP Trip or loss of flow trip. These systems trip the reactor automatically if the design DNBR is approached, assuring that a lower DNBR, which could lead to ICC, is not reached. A postulated flow blockage in the core support plate or fuel channel would result in a flow maldistribution in the core. that could result in a lower DNBR. Any evidence of core non-symmetry should be investigated.

The operator should be aware that Natural Circulation may be temporarily lost due to the isolation of a Steam Generator. As the temperature of that Steam Generator increases (due to metal temp) above the RCS temperature, a reverse flow will result, causing a temporary loss of Natural Circulation. As the RCS heats above the Steam Generator, Natural Circulation will begin again. This should not necessarily be the time to open the PORV's to establish core flow. However, core parameters should be closely monitored during this period.

Loss of feedwater to both S/G during power operation has the potential of producing conditions which could lead to ICC.

Compliance with LOCA guidelines assures that the appropriate corrective actions are accomplished. The LOCA discussed is synonymous with a small break LOCA.

Do not exceed 75°F/hr cooldown rate during steam dump operation.

If a SIAS occurs, operate the HPSI pumps until the RCS is at least 20° subcooled, and there is level indication in the przr. Restart HPSI pumps as necessary to maintain this condition.

If RAS occurs assure that flow rates are > minimum HPSI pump flow, (30 gpm). If necessary stop charging pps until one HPSI pp is operating. Restart pps as necessary to maintain 20° F subcooling.

Maximum safety injection flow and PORV operation is suggested only as an alternative due to multiple malfunctions. It is the least desirable means of inventory and pressure control.

EMERGENCY PROCEDURE NUMBER 2-0120043
(ICC) REVISION 1

7.0 REFERENCES:

7.1 St. Lucie Unit #1 Emergency Procedures
7.2 St. Lucie Unit #1 FSAR Chapter 6
7.3 CE guidelines CEN 152
7.4 Draft of NUREG 0799

8.0 RECORDS REQUIRED:

8.1 Normal log entries
8.2 Applicable recorder charts

9.0 APPROVAL:

Reviewed by the Facility Review Group October 12, 1982
Approved by C. M. Wethy, Plant Manager October 14, 1982

REV 1 Reviewed by the Facility Review Group [illegible] 19[illegible]
Approved by [illegible], Plant Manager [illegible] 19[illegible]

"L A S T P A G E"

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DOCUMENT TITLE Loss of Feedwater or S/G Level

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FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2
EMERGENCY PROCEDURE NUMBER 2-0700040
REVISION 1

LOSS OF FEEDWATER OR S/G LEVEL

OCTOBER 22, 1982

TOTAL NO. OF PAGES 7

EMERGENCY PROCEDURE NUMBER 2-0700040
REVISION 1

2

1.0 SCOPE:

Provide actions to control plant during a loss of main feed or steam generator level.

2.0 SYMPTOMS:

2.1	Low feed pump suction pressure	Feed pump suction sigma on RTGB 202 and applicable alarms
2.2	Feed pump trip	Feed pump amps and Red/Green indicator lights on RTGB 202 and applicable alarms.
2.3	Low-Low steam generator level	Steam generator level sigma's and recorders on RTGB 202 and applicable alarms.
2.4	Steam flow greater than feed flow and decreasing steam generator level.	Steam/feed flow recorders on RTGB 202.

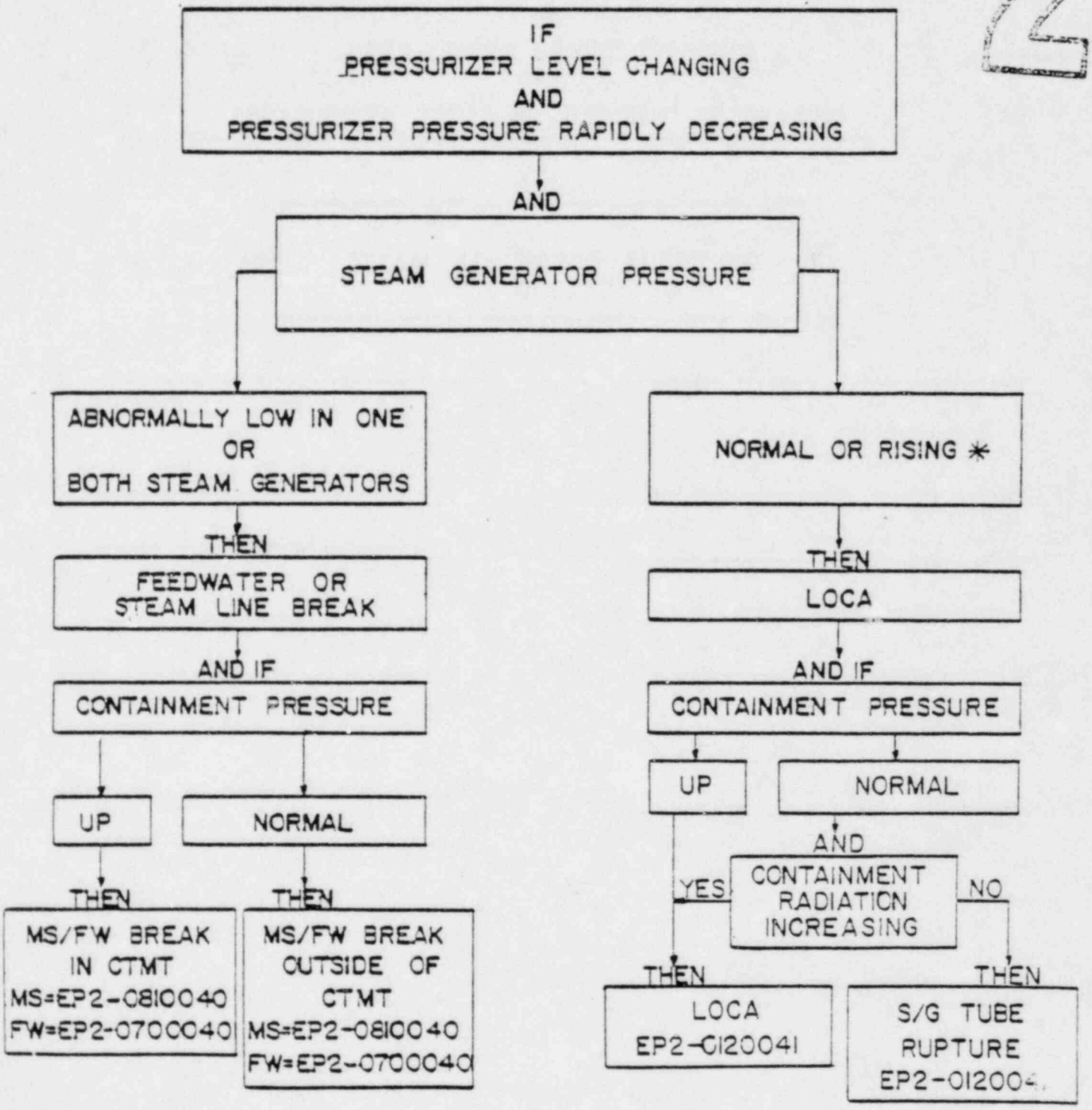
NOTE

Main feed rupture, main steam line break, LOCA and steam generator tube rupture have some similar indications, Figure 1 may provide assistance in accident analysis.

FIGURE 1

BREAK DIOGNOSTIC CHART

2



*MAY DECREASE SLIGHTLY AFTER REACTOR TRIP

EMERGENCY PROCEDURE NUMBER 2-0700040
REVISION 1

3.0 AUTOMATIC ACTIONS:

3.1	Reactor Trip	If steam generator levels go below 39%.
3.2	Turbine Trip	On reactor trip
3.3	Generator lock-out	On turbine trip
3.4	Runback	To 92% on loss of both heater drain pumps OR to 60% on loss of 1 feed pump.
3.5	Aux Feed Actuation Signal (AFAS)	Steam generator level goes below 39%

4.0 IMMEDIATE OPERATOR ACTIONS:

4.1 Immediate operator actions, if transient causes reactor trip

4.1.1	Perform immediate operator actions of OP #2-0030130, "Reactor Trip".	
4.1.2	If steam generators are below 39% level insure AFAS has aligned the aux feed system to feed the non-faulted steam generatoes	Faulted steam generator is indicated by a difference in steam pressure or feed pressure between A & B generators.
4.1.3	If SIAS is actuated insure CEA's inserted greater than 5 sec.'s and stop RCP's.	RCP's may be restarted if LOCA has not occured 20° subcooling is achieved and pzr level and pressure control is gained.

4.2 Immediate Operator Actions, if Transient has Not caused Reactor Trip

4.2.1	Insure steam generator levels can be maintained with available main feed or reduce steam demand until levels can be maintained.	Steam flow must equal feed flow, indicated on RTGB 202.
4.2.2	If runback occurs insure RX power is matched with turbine power.	TAV = TREF

EMERGENCY PROCEDURE NUMBER 2-0700040
REVISION 1

5.0 SUBSEQUENT ACTIONS:

	Check
5.1 If feed rupture has occured all available means should be used to isolate it, while maintaining at least 1 steam generator as a heat sink.	_____
5.2 If Reactor Coolant Pumps were tripped in step 4.1.3 action should be taken to establish conditions necessary for restarting them.	_____
5.3 One condensate pump should be left running, if possible, for secondary equipment cooldown and protection.	_____
5.4 If transient did not cause reactor trip, establish stable plant conditions and identify and correct cause of loss of feed.	_____

6.0 PURPOSE/DISCUSSION:

6.1 This procedure provides instructions to be followed in the event of loss of feedwater flow and/or loss of steam generator level. It is to be used when specific symptoms indicate this condition and the immediate actions of the Reactor Trip/Turbine Trip procedures have been completed.

6.2 Loss of steam generator level results in a reduction in capability of the secondary system to remove the heat generated in the reactor core. Loss of steam generator level results from the inability to supply feedwater in an amount equal to the existing steam demand. Excessive steam demand, i.e., above feedwater system capability is considered in Emergency OP 2-0810040, Main Steam Line Break.

6.3 The loss of all feedwater to the steam generator and the subsequent heatup of the Reactor Coolant System will result in saturation conditions at high temperature and pressure in the Reactor Coolant System. This would cause a loss of reactor coolant mass through the PORV's and code safeties and void formations throughout the system. A maximum effort should be directed toward the initiation of feedwater flow to the steam generators. Without feedwater, the steam generators could boil dry within approximately 13 minutes.

6.4 The inability to supply feedwater in the required quantity could result from one or a combination of the following:

6.4.1 Pipe break in the condensate/feedwater system.

6.4.2 Flow path blockage due to valve closure or strainer stoppage.

6.4.3 Loss of pumping capacity due to pump trip, loss of AC power, or pump cavitation.

EMERGENCY PROCEDURE NUMBER 2-0700040
REVISION 1

6.0 PURPOSE/DISCUSSION: (Cont.)

6.5 The following protective functions are provided to prevent loss of heat sink.

a) Reactor trip:

Steam generator low-low level at 39%.

b) Turbine Runback; due to:

1. Loss of both heater drain pumps if turbine power is $\geq$ 92%.

"OR"

2. Loss of feedwater pump if turbine power is $\geq$ 60%.

6.6 The action taken for loss of steam generator level is basically the same regardless of cause. That is, to trip the reactor, thereby removing the heat source, and restoring steam generator level with the auxiliary feedwater pumps. This approach is due to the self-sufficient nature of the auxiliary feed system. It, in no way, depends on the normal feedwater system. Three auxiliary feed pumps are available. Two motor driven pumps, either of which can supply either steam generator and one steam driven pump which can supply either steam generator.

The leak must be isolated in any incident involving a break even though the break does not immediately affect the auxiliary feedwater system. The isolation of a leak is necessary to conserve the water available in the condensate storage tank. The leak is isolated by stopping the steam generator feed pumps and condensate pumps.

EMERGENCY PROCEDURE NUMBER 2-0700040
REVISION 1

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7.0 REFERENCES

7.1 FSAR, Section 15.2.8 and Section 10.5.3

7.2 Combustion Engineering Emergency Procedure F-EP-9

7.3 C.E. LOF guidelines, CEN-128

7.4 FP&L EP 0700040 Rev. 8 (Unit 1)
(Loss of Feedwater or Steam Generator Level)

7.5 Draft of NUREG 0799

8.0 RECORDS REQUIRED

Log Book Entries

Applicable chart recorders

9.0 APPROVAL

Reviewed by the Facility Review Group October 12, 1982

Approved by C. M. Wethy Plant Manager October 14, 1982

Rev. 1 Reviewed by Facility Review Group OCT 26 1982

Approved by J. H. Barrow Plant Manager OCT 26 1982

"L A S T P A G E"

Emergency Procedure
2-0700040 Rev.1
TOTAL NO. PAGES 7

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DOCUMENT TITLE MAIN STEAM LINE BREAK

DOCUMENT FILE NUMBER 2-0810040

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ST. LUCIE PLANT UNIT 2
EMERGENCY PROCEDURE NUMBER 2-0810040
REVISION 0
October 25, 1982

MAIN STEAM LINE BREAK

REV._____FRG._____
Approval _____Plt.Mngr._____

TOTAL NO. OF PAGES 20

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2
EMERGENCY PROCEDURE NUMBER 2-0810040
REVISION 0

2

1.0 SCOPE:

Provide operator actions to be taken when an uncontrolled steam release occurs from a steam generator.

2.0 SYMPTOMS:

NOTE: Figure 2.1, page 5, may assist in evaluating this event.

2.1	Loud noise audible in the control room	2.1	Indications Steam break outside containment
2.2	Continuously decreasing T_{AVE}	2.2	Indications Excess steam demand from secondary system TR-1111, TR-1121, (RTGB 204) TR-1120E
		2.2	Alarms K-25
2.3	Abnormally low pressure in one or both steam generators.	2.3	Indications PI-8023A,B,C,D PI-8013A,B,C,D PR-8013D, 8023D
		2.3	Alarms P-17,P-19

ST. LUCIE PLANT UNIT 2
MAIN STEAM LINE BREAK
EMERGENCY PROCEDURE NUMBER 2-0810040
REVISION 0

2.0 SYMPTOMS: (Cont.)

2.4 Rapid decrease S/G level	2.4 Indications LR-9013D, 9023D LR-9011, 9021 LIC-9013-A,B,C,D LIC-9023-A,B,C,D LIA-9012, 9022 LR-9012/9022
	2.4 Alarms G-1, G-9
2.5 Reactor Trip Turbine Trip	2.5 Indications CEA's inserted (ADS) RPS-CH.4, CH.1, CH.7 or CH.9 RPS-RTB's Open Gen. Output -0-, W-REC-81, core mimic
	2.5 Alarms L-17, L-9, L-11, L-3, L-36, L-44, L-5, L-13, D-8
2.6 A. Increased steam flow feed flow B. Decreased generator output	2.6 Indications Until MSIS occurs FR-8011,9011 FR-8021, 9021 FI-08-1A,1B, FI-09-1A,1B, W-REC-81
	2.6 Alarms G-17
2.7 Decreasing Pressurizer level and pressure	2.7 Indications LI-1110X,Y,LIC-1110X,Y PI-1102A,B,C,D PR-1100, LR-1110, LR1110X
	2.7 Alarms H-9,H-10,H-17,H-18,H-25, H-26,H-1,H-2,H-3,H-4
2.8 Containment Radiation monitors are normal	2.8 Indications NO hi radiation alarms from containment. Differentiates between LOCA and MSLB.

ST. LUCIE PLANT UNIT 2
MAIN STEAM LINE BREAK
EMERGENCY PROCEDURE NUMBER 2-0810040
REVISION 0

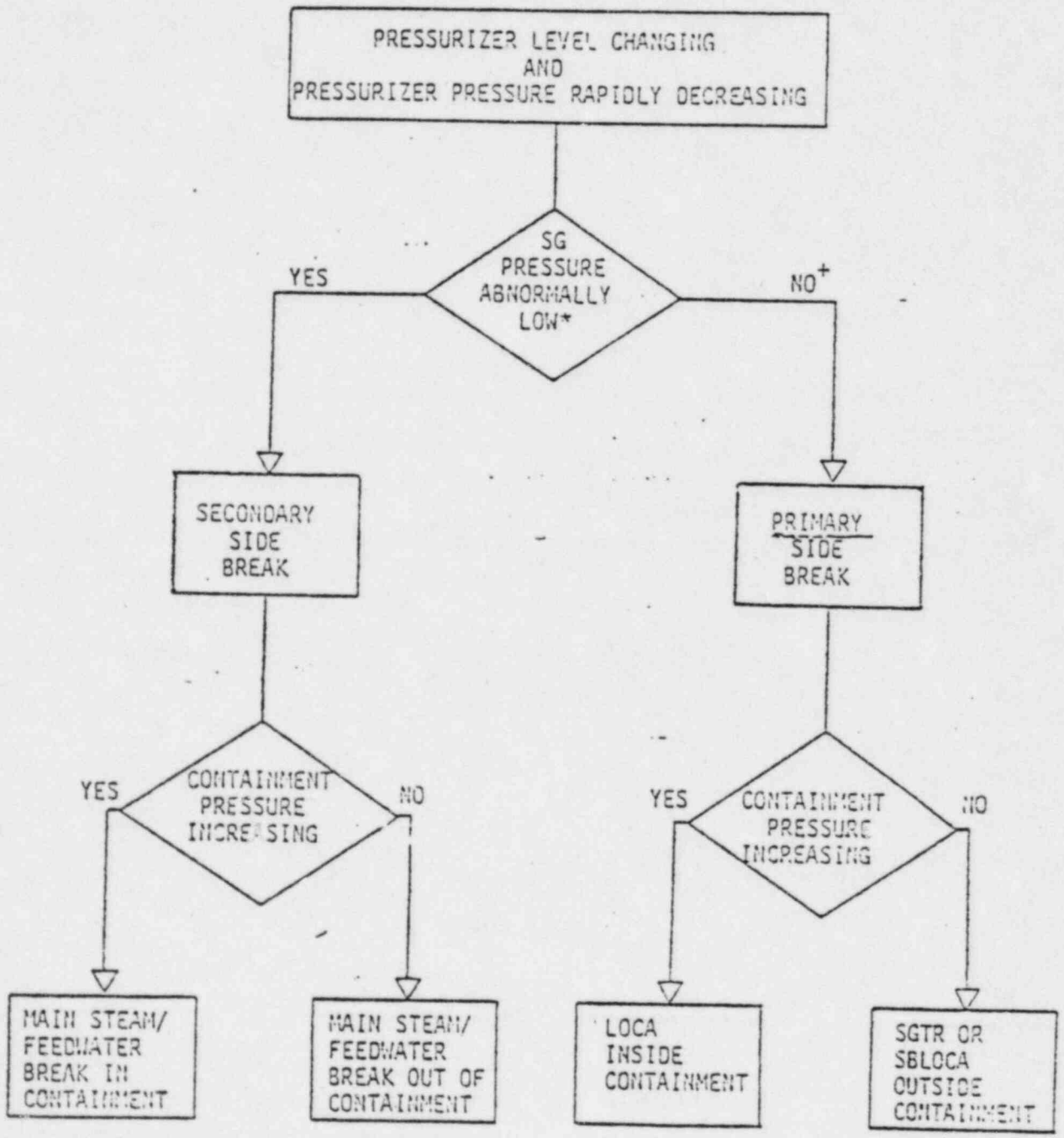
2.0 SYMPTOMS: (Cont.)

2.9 Hi Containment Pressure	2.9 Indications Break inside containment PIS-07-2A,2B,2C,2D 2.9 Alarms P-13,P-23
2.10 Containment Reactor Cavity Sump level increasing	2.10 Indications Break inside containment LIS-07-6,FR-07-3 2.10 Alarms N-21,H-29
2.11 MSIS Actuated	2.11 Indications Equipment isolates as per table I 2.11 Alarms P-7,P-9,P-17,P-19
2.12 SIAS, CIAS Actuated	2.12 Indications Equipment starts and isolates per table II and table III 2.12 Alarms R-6,R-16,R-26,Q-3,P-3, P-13,P-23
2.13 CSAS Actuated	2.13 Indications Equipment operates per table IV 2.13 Alarms S-7,S-27

ST. LUCIE PLANT UNIT 2
MAIN STEAM LINE BREAK
EMERGENCY PROCEDURE NUMBER 2-0810040
REVISION 0

FIGURE 2.1

BREAK IDENTIFICATION CHART



*IN ONE OR BOTH STEAM GENERATORS

+MAY DECREASE SLIGHTLY AFTER TRIP

ST. LUCIE PLANT UNIT 2
MAIN STEAM LINE BREAK
EMERGENCY PROCEDURE NUMBER 2-0810040
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3.0 IMMEDIATE AUTOMATIC ACTION:

	AUTOMATIC ACTION		INITIATING EVENT
3.1	Reactor Trip	3.1	S/G low press 600 psia decreasing
3.2	Turbine trip	3.2	Reactor trip bus low voltage
3.3	Generator lock-out	3.3	Turbine trip/Bkrs closed
3.4	Auxiliaries change to Start-up transformer	3.4	From gen. lock-out
3.5	MSIS	3.5	600 psia S/G press. decreasing or 5 psig cont. press increasing
3.6	SIAS	3.6	1600 PSIA RCS press. decreasing or 5 psig cont. press increasing
3.7	CIAS	3.7	5 PSIG cont. press. increasing or Hi cont. radiation $\geq$ 10 R/HR or from SIAS actuation.
3.8	CSAS	3.8	10 psig cont. press. concurrent with SIAS
3.9	AFAS (feeds only the non-faulted S/G)	3.9	S/G level < 39%

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4.0 IMMEDIATE OPERATOR ACTION:

	ACTION	NOTES
4.1	Carry out standard immediate operator actions on a reactor trip	4.1 If necessary, refer to RX Trip Procedure OP #2-0030130
4.2	Ensure SIAS actuates if if conditions require.	4.2 SIAS actuates on: 1600 psia low RCS press. 5 psig Hi cont. press.
	If SIAS actuates on low RCS pressure, after verification of all rods inserted > 5 sec. then stop all Reactor Coolant Pumps.	
4.3	Ensure MSIS actuates if conditions require	4.3 MSIS actuates on: 600 psia low S/G press. 5 psig hi cont. press.
4.4	Determine affected generator	4.4 Observe S/G pressures and levels
4.5	Ensure AFAS is establishing flow only to the non-effected generator.	

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5.0 SUBSEQUENT ACTIONS:

CHECK

5.1 Use all available indications to determine sub-cooled or saturated conditions in the RCS. If this occurs the operator must ensure that the RCP's are turned off, the SIS is providing makeup to the RCS, and that the operable steam generator is removing heat from the RCS. _____

> NOTE: Information can be obtained from the SPDS display, RCS hot leg temperature, RCS cold leg temperature, incore thermocouple temperature and RCS pressure to determine if the RCS is sub-cooled or saturated. An increase in temperature above the saturation temperature for the existing pressure is an indication of voiding in the RCS. (P-T Nomograph Available on RTGB-203)

5.2 Check the ESFAS BYPASS STATUS BOARD (ensure equipment availability for auto functions). Refer to Tables to ensure the proper operation of engineered safety features as time and conditions permit. _____

5.3 Implement the Emergency Plan as necessary in accordance with EPIP 3100021E, "Duties and Responsibilities of the Emergency Coordinator". _____

5.4 Isolate steam generator blowdown; close FCV-23-3, 5, 4, 6 and sample FCV-23-7,8. _____

5.5 When S/G level rises > 39%, take control of aux. feed to halt further feeding of relativly cold water until cooldown transient has terminated. _____

> NOTE: Erroneous indications may be observed > 15 minutes after a break inside containment.

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5.0 SUBSEQUENT ACTIONS: (Cont.)

CHECK

5.6 When the cooldown has stopped and RCS temperature is above 400°F, reintiate aux. feed flow to non-faulted steam generator not exceeding 150 GPM for a period of 5 minutes. Maintain RCS temp. stable with atmospheric dumps on non-effected generator. _____

5.7 Maintain hot leg temperature less than 520°F with auxiliary feed and steam dump to atmosphere. _____

NOTE: Do not admit auxiliary feed flow to the faulted steam generator regardless of location of break.

5.8 When pressurizer level on control channels indicates 30% energize all pressurizer heaters to aid in increasing RCS pressure. _____

5.9 When pressurizer level indicates 40% secure all charging pumps. _____

5.10 As hot leg temperature is maintained less than 520°F verify that pressurizer press. stabilizes at approximately 1250 PSIA (shut off head of HPSI) _____

NOTE: Ensuring hot leg temperature less than 520°F and pressurizer pressure greater than 1250 psia ensures a margin of 50°F subcooled.

5.11 Stop emergency diesel generators if offsite power is available and feeding the emergency buses. _____

5.12 When containment pressure is < 10 PSIG

a) Reset CSAS _____
b) Stop CS pumps _____
c) Close FCV-07-1A, 1B _____

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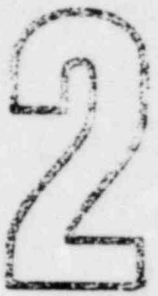

5.0 SUBSEQUENT ACTIONS: (Cont.)

CHECK

5.13 OPEN ICW to TCW Heat Exchangers MV-21-3, MV-21-2. _____

5.14 CLOSE CCW outlet from SDC Heat Exchangers, HCV-14-3A, 3B. _____

5.15 Restore CCW on the RCP's by performing the following steps:

5.15.1 Open the "N" header supply and return valves from A and B CCW header:

"OVERRIDE" HCV-8A, HCV-9 (A side) _____
"OVERRIDE" HCV-8B, HCV-10 (B side) _____

(Taking these valves to "OVERRIDE" position will open valves) SIAS signal present.

5.15.2 Restore CCW to containment "N" header by opening containment isolation valves:

"OPEN/RESET" HCV-14-2 _____
"OPEN/RESET" HCV-14-6 _____
"OPEN/RESET" HCV-14-1 _____
"OPEN/RESET" HCV-14-7 _____

(Taking valves to "OPEN/RESET" position will override SIAS signal)

5.15.3 Restore CCW to individual RCP's seal coolers by opening valves:

Open HCV-14-11-1A1 _____
Open HCV-14-11-1A2 _____
Open HCV-14-11-1B1 _____
Open HCV-14-11 1B2 _____

NOTE: It may be necessary to cycle these valves to restore flow.

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5.0 SUBSEQUENT ACTIONS: (Cont.)

CHECK

5.16 When at least 20 degrees subcooling has been re-established, and control of pressure and level have been regained, the HPSI pumps can be secured. _____

5.17 Once control of transient has been gained with normal pressure control, the safety injection signal may be reset by first key-blocking the ESFAS SIAS signal, then manually resetting the SIAS signal present by taking the channel control switches to the reset position. _____

5.18 Once SIAS signal has been reset, the CIAS ESFAS signal can be reset by taking the CIAS channel control switches to the reset position, allowing control of the letdown isolation valves. _____

5.19 When CIAS has been reset, open the letdown isolation valves, and re-establish charging and letdown per OP #2-0210030, "Charging and Letdown off-Normal Procedure". _____

5.20 Resume forced cooling as soon as conditions permit. _____

5.21 Notify Chem. Dept. to sample RCS for indications of fuel failure. _____

5.22 Continue controlled cooldown in accordance with OP #0030127. _____

NOTE: If containment spray system has actuated, portions of the containment spray system will contain Hydrazine.

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TABLE I

MAIN STEAM ISOLATION SIGNAL (MSIS)

	CONDITION	CHECK
One (1) Main Steam Line A ISOL. Valve HCV-08-1A	closed	
One (1) Main Steam ISOL. Valve A bypass MV-08-1A	closed	
Two (2) FW. DISCH. to S/G 2A HCV-09-1A, HCV-09-1B	closed	
Two (2) FW. DISCH. to S/G 2B HCV-09-2A, HCV-09-2B	closed	
One (1) Main Steam ISOL. Line B ISOL. Valve HCV-08-1B	closed	
One (1) Main Steam ISOL. Valve B bypass MV-08-1B	closed	

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TABLE II

SAFETY INJECTION ACTUATION SIGNAL (SIAS)

	CONDITION	CHECK
RTGB 206, Left to Right		
Two (2) CCW Pp (2A, 2B, or 2C)	On	
Two (2) CCW to Fuel Pool HX Isolation Valves (MV-14-17, MV-14-18)	Closed	
Four (4) CCW HDR Non-essential Isolation Valves (HCV-14-8A, HCV-14-8B, HCV-14-9, HCV-14-10)	Closed	
Two (2) CCW Outlet Valves from shutdown HX 2A, 2B (HCV-14-3A, HCV-14-3B)	Open	
Two (2) LPSI PPS	On	
Two (2) HPSI PPS	On	
Four (4) LPSI Disch Valves to Loops (HCV-3615, HCV-3625, HCV-3635, HCV-3645)	Open	
Eight (8) HPSI Disch Valves to Loops (HCV-3617, HCV-3627, HCV-3637, HCV-3647 - Header A) (HCV-3616, HCV-3626, HCV-3636, HCV-3646 - Header B)	Open	
Two (2) Hot Leg Injection Check Vlv. Leakage Valves. (V3572, V3571)	Closed	
Two (2) SI Test to RWT (I-SE-03-2A, I-SE-03-2B)	Closed	
Four (4) SI Tank Isolation Valves (V3614, V3624, V3634, V3644)	Open	
Four (4) SI Tank Fill/Drain Valves (I-SE-03-1A, I-SE-03-1B, I-SE-03-1C, I-SE-03-1D)	Closed	
Four (4) SI Check Leakage Test (HCV-3618, HCV-3628, HCV-3638, HCV-3648)	Closed	
Four (4) CCW To/From RCP's (HCV-14-1, HCV-14-2, HCV-14-7, HCV-14-6)	Closed	

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TABLE II (Cont.)

SAFETY INJECTION ACTUATION SIGNAL (SIAS)

	CONDITION	CHECK
RTGB 205		
Two (2) Boric Acid Make-up Pumps 2A and 2B	Start	
Two (2) Boric Acid Make-up Tank Recirc Vlv's 2A (V-2650), 2B (V-2651)	Closed	
One (1) Boric Acid Make-up Vlv (V-2512)	Closed	
Two (2) Boric Acid Gravity Feed Vlv's (V-2508, V-2509)	Open	
One (1) Volume Control Tank Discharge Vlv. (V-2501)	Closed	
Two (2) Letdown Isolation Vlv's (V-2516, V-2515)	Closed	
Three Charging Pumps (2A, 2B and 2C)	Start Signal	
One (1) Boric Acid Make-up Flow Vlv (FCV-2210Y)	Closed	
Two (2) Containment Sump Isolation Valves (LCV-07-11A, LCV-07-11B)	Closed	
Two (2) Intake Cooling Water, Lube Water to Circ. Water Pumps, Isolation Valves (MV-21-41, MV-21-4B)	Closed	
RTGB 202		
Two (2) Intake Cooling Wtr Pumps	On	
Two (2) Intake Cooling Wtr Isolation Valves (MV-21-3, MV-21-2)	Closed	
RTGB 201		
Two (2) Diesel Generators	On	

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TABLE II (Cont.)

SAFETY INJECTION ACTUATION SIGNAL (SIAS)

HVAC PANEL LEFT TO RIGHT

Four (4) RAB Main Supply and ECCS Exhaust Fans (2-HVS-4A, 2-HVE-9A, 2-HVS-4B, 2-HVE-9B)	On	_____
Four (4) Containment Fan Coolers (2-HVS-1A, 2-HVS-1B, 2-HVS-1C, 2-HVS-1D)	On slow Speed	_____
Eight (8) ECCS Isolation Dampers (D5A, D6A, D9A, D12A, D5B, D9B, D12B)	Closed	_____

NOTE
Any spare equipment that is running and not needed for controlling this incident should be STOPPED.

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TABLE III

CONTAINMENT ISOLATION ACTUATION SIGNAL (CIAS)

	CONDITION	CHECK
RTGB 206, Left to Right		
Two (2) SI Tank return to RWT (I-SE-03-2A, I-SE-03-2B)	Closed	
Five (5) SI Tank Sample Isolation Valves (FCV-03-1A, FCV-03,1B, FCV-03-1C, FCV-03-1D, FCV-03-1E)	Closed	
Four (4) S/G Blowdown and two (2) S/G Sample Isolation Valves (Isolation FCV-23-3, FCV-23-5, FCV-23-4, FCV-23-6) (Sample FCV-23-7, FCV-23-9)	Closed	
Two (2) Containment Sump Isolation Valves (LCV-07-11A, LCV-07-11B)	Closed	
Six (6) RCS and pressurizer Sample Isolation Valves (V5200, V5201, V5202, V5203, V5204, V5205)	Closed	
One (1) Primary Water Isolation (HCV-15-1)	Closed	
One (1) Instrument Air Isolation (HCV-18-1)	Closed	
One (1) N^2 Supply Isolation (V6741)	Closed	
Two (2) Waste Gas Isolation (V6750, V6718)	Closed	
Two (2) RCP Bleed-off Isolation (V2505, V2524)	Closed	
Two (2) RDT Isolation (V6341, V6342)	Closed	
RTGB 205		
Three (3) Letdown Isolation Valves (V2516, V2522, V2515)	Closed	
RTGB 201		
Two (2) Diesel Generators	On	
HVAC Panel, Left to Right		
Two (2) Shield Bldg. Ventilation and Control Room Filter Fans (2-HVS-13A, 2-HVE-6A)	On	
Four (4) Control Room Isolation Valves (FCV-25-24, FCV-25-17, FCV-25-18, FCV-25-16)	Closed	

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TABLE III (Cont.)

CONTAINMENT ISOLATION ACTUATION SIGNAL (CIAS)

	CONDITION	CHECK
Two (2) Shield Bldg. Ventilation and Control Room Filter Fans (2-HVS-13B, 2-HVE-6B)	On	
Four (4) Control Room Isolation Valves (FCV-25-25, FCV-25-14, FCV-25-15, FCV-25-19)	Closed	
Two (2) Containment Purge Exhaust Fans (2-HVE-8A, 2-HVE-8B)	Off	
Six (6) Containment Purge Isolation Valves (FCV-25-1, FCV-25-3, FCV-25-5, FCV-25-6, FCV-25-4, FCV-25-2)	Closed	
Three (3) Continuous Containment H_2 Purge Isolation (FCV-25-20, FCV-25-26, FCV-25-21)	Closed	
Two (2) Shield Bldg. Vent. Isolation Valves (FCV-25-32, FCV-25-33)	Open	
Two (2) Fuel Bldg. Emerg. Ventilation Isolation Valves (FCV-25-30, FCV-25-31)	Closed	
Six (6) Containment Sample Isolation Valves (FCV-26-2, FCV-26-4, FCV-26-6, FCV-26-1, FCV-26-3, FCV-26-5) (RTGB 206)	Closed	

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TABLE IV

CONTAINMENT SPRAY ACTUATION SIGNAL (CSAS)

	CONDITION	CHECK
Two (2) Containment Spray PPS. 2A, 2B	On	
Two (2) Containment Spray HDR. ISOL. Valves FCV-07-1A, 1B	Open	
Two (2) Iodine Removal System PP's 2A, 2B	On	
Two (2) Iodine Removal System ISOL. Valves I-SE-07-3A, 3B	Open	
NOTE: Verify Flow on F1-07-1A, 1B		

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6.0 PRECAUTIONS:

A rupture of a steam line is assumed to include any accident which results in an uncontrolled steam release from a steam generator. The release can occur due to a break in a pipe line or from the malfunction of an atmospheric dump valve, steam dump and bypass valve or safety valve. The steam release results in an initial increase in steam flow which decreases during the accident as the steam pressure falls. The energy removal from the Reactor Coolant System causes a reduction of coolant temperature and pressure. This transient results in the RCS being at saturation conditions with the potential for void formations in the system. Operator actions should be directed toward establishing subcooled conditions in the Reactor Coolant System.

Core protection after a break would be provided by MSIS at 600 PSIA steam generator pressure or 5 PSIG containment pressure (break inside containment) and SIAS at 1600 PSIA pressurizer pressure or 5 PSIG containment pressure (break inside containment).

All available indications should be used to aid in diagnosing the event since the accident may cause irregularities in a particular instrument reading. Critical parameters must be verified when one or more confirmatory indications are available. With the safety parameter display system (SPDS) operating normally, use the nomograph, in conjunction with the SPDS to eliminate dependence on a single instrument. With the SPDS inoperable refer to the nomograph utilizing control room indicators such as T_h, pressurizer pressure and incore thermocouples to determine the margin to saturation. Subcooling margin can also be determined by subtracting hot leg temperature from pressurizer temperature.

An increase in temperature above the saturation temperature for the existing pressure is an indication of voiding in the RCS. If this occurs the operator must ensure that the RCP's are turned off, the SIS is providing makeup to the RCS, and that the operable steam generator is removing heat from the RCS.

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7.0 REFERENCES:

FSAR Sect. 6, 7, 15

OP. Proc. 0810040 (Unit #1)

C. E. Guidelines (CEN-152)

Draft of Nureg - 0799

8.0 RECORDS REQUIRED:

Normal log entry

Recorders covering transient conditions

9.0 APPROVAL:

Reviewed by Facility Review Group _____
Approved by _____ Plant Manager _____

Revision __ Reveiwed by FRG _____
Approved by _____ Plant Manager _____

L A S T P A G E