

*Superseded per Revision to Emergency
Plant Operating Procedures dtd 10/28/82
50-~~335~~335/389*

Emergency Procedure
2-0700040 Rev 0
LOF

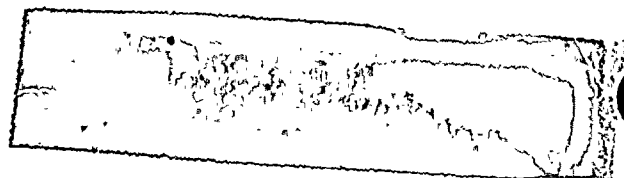
FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2
EMERGENCY PROCEDURE NUMBER 2-0700040
REVISION 0
OCTOBER 12, 1981

LOSS OF FEEDWATER OR S/G LEVEL

REV _____ FRG _____
Approval _____ Plt Mgr _____

TOTAL NO. OF PAGES 14

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PDR ADOCK 05000389
PDR



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2
EMERGENCY PROCEDURE NUMBER 2-0700040
REVISION 0

1.0 SCOPE

This procedure is provided to assist the control room operators in evaluating and controlling a loss of feedwater or S/G level condition.

NOTE: Any or all of the following symptoms may be present.

2.0 SYMPTOMS

2.1 Low-low S/G level

2.1 Indications

LIC-9013-A, B, C, D, (RTGB202)
LIC-9023-A, B, C, D, (RTGB202)
LR-9011, 9021 (RTGB202)
LIA-9012, 9022 (RTGB202)
LR-9012, 9022 (RTGB202)
LR-9013D, 9023D (RTGB206)
RPS-CH7

2.1 Alarms

G-1, G-9, L-11

2.2 Low feed pump suction
or discharge pressure

2.2 Indications

PI-12-19
PIS-09-5
Abnormal Readings On:
AM615/620
AM605/606
AM625/626

2.2 Alarms

G-18, G-19, G-17

2.3 Incorrect feedwater regulator
position
(open with high level
closed with low level)

2.3 Indications

F1-09-1A, 1B
FIC-9011, 9021
FR-09-1A, 1B
FCV-9011, 9021

2.3 Alarms

G-26, G-27



EMERGENCY PROCEDURE NUMBER 2-0700040REVISION 02.0 SYMPTOMS: (Cont.)

- | | | | |
|-----|--|-----|---|
| 2.4 | Low condensate pump discharge pressure | 2.4 | <u>Indications</u>
P1-12-19 |
| | | | <u>Alarms</u>
G-18,G-19 |
| 2.5 | S/G Feed pump trip | 2.5 | <u>Indications</u>
Green Lite
AM-615
AM-620 |
| | | 2.5 | <u>Alarms</u>
G-1,G-2,G-3 |
| 2.6 | Condensate pump trip | 2.6 | <u>Indications</u>
Green Lite
AM-605
AM-606 |
| | | 2.6 | <u>Alarms</u> |
| 2.7 | Heater drain pump trip | 2.7 | <u>Indications</u>
Green Lite
AM-625
AM-626 |
| | | 2.7 | <u>Alarms</u>
F-35,F-36 |
| 2.8 | Increasing T ave* | 2.8 | <u>Indications</u>
TR-1120E,TR-1111,TR-1121
* Initial increase, then decrease |
| | | 2.8 | <u>Alarms</u>
K-17 |

2.0 SYMPTOMS: (Cont.)

2.9 Increasing RCS Pressure
(initially)

2.9 Indications
PI-1102A, B, C, D
FR-1100
PIC-110X, Y
RPS-CH5

2.9 Alarms
L-20, L-28

NOTE: If a feedwater break occurs inside containment, be especially alert for erroneous indications.

2.10 Increasing containment pressure

2.10 Indications
Break inside containment
PIS-07-2A, 2B, 2C, 2D (RTGB206)
PI-07-4A, 5A (RTGB206)
FR-07-4B, 5B (RTGB206)

2.10 Alarms
L-5, L-13, Q-3, P-3, P-13, P-23

2.11 Increasing containment temperature

2.11 TI-07-3A, 5A (RTGB206)
TR-07-3B, 5B (RTGB206)

2.11 Alarms

2.12 Increasing reactor cavity sump level

2.12 Indications
LIS-07-6 (RTGB205)
FR-07-3 (RTGB205)

2.12 Alarms
N-29, N-21, N-46

2.13 Feed flow/steam flow mismatch

2.13 Indications
FR-8011, 9011
FR-8021, 9021
FR-09-1A, 1B

2.13 Alarms

EMERGENCY PROCEDURE NUMBER 2-0700040REVISION 02.0 SYMPTOMS: (Cont.)

2.14 Reactor Trip

2.14 Indications

CEA's Inserted (ADS)
RPS-CH.7 tripped
RPS-RTCB's Open

2.14 Alarms

L-3,L-11,K-1,K-2,K-3
K-4,K-5,K-9,K-10

2.15 Turbine Trip

2.15 Indications

WM881-0 Magawatts Meter for
generator output @ zero W-
REC-871

2.15 Alarms

D-8,C-3

2.16 After Trip, following
key parameters:

2.16.1 Reactor Power-Decrease

2.16.2 Przr Pressure-Initial
increase, then decrease, then
stabilize2.16.3 Temperature-initial
increase, then decrease2.16.4 Pressurizer level slight
increase, then decrease2.16.5 S/G Pressure - slight
increase, then decrease

2.16.6 S/G Level-decrease

NOTE: Break Diagnostic Chart Fig. 1
may assist in evaluating the
situation.

EMERGENCY PROCEDURE NUMBER 2-0700040
REVISION 0



3.0 AUTOMATIC ACTIONS

- | | | | |
|-----|--|-------|---|
| 3.1 | Reactor Trip
(Low S/G level) | 3.1.1 | Reactor trip breakers open |
| | | 3.1.2 | CEA's insert |
| | | 3.1.3 | Reactor Power decreasing |
| | | 3.1.4 | AFW Start @ 34% Level |
| 3.2 | Turbine Trip
(Reactor trip turbine) | 3.2.1 | Turbine valves close |
| | | 3.2.2 | Generator breakers open |
| | | 3.2.3 | Auxiliary power transfers to
Startup transformers |
| | | 3.2.4 | Main Fdwtr Valves close,
bypasses open to 5% flow
position |
| 3.3 | Turbine Runback
(loss of one feedwater
pump) | 3.3.1 | Load reduction \geq 40 of
rated power |
| | | 3.3.2 | Operation of steam bypass
control system and/or
atmospheric dumps |

4.0 IMMEDIATE OPERATOR ACTIONS

- 4.1 Ensure immediate operator actions for a reactor trip have been accomplished.
- 4.1.1 Any automatic functions that were required have operated properly.

IF

- | | | | |
|-----|--------------------------------|-----|---|
| 4.2 | A feedwater break is indicated | 4.2 | Continuously decreasing S/G level and pressure with increased fdwtr flow. |
|-----|--------------------------------|-----|---|

THEN

- | | | | |
|-----|---|-----|---|
| | Isolate the break with controls available in the control room | | Isolate the break manually with local controls. |
| 4.3 | Continue feeding the non-faulted S/G with the available source. | 4.3 | Either main fdwtr or aux fdwtr |
| 4.4 | If possible maintain one condensate pump running | 4.4 | To provide secondary system system cooling. |
| 4.5 | Verify proper operation of przr. pressure and level control systems | 4.5 | Maintain primary system control. |



EMERGENCY PROCEDURE NUMBER 2-0700040
REVISION 0

4.0 IMMEDIATE OPERATION ACTIONS: (Cont.)

IMPORTANT

If a non-isolable break has occurred, immediately refer to Main Steam Line Break procedure, EP 1-0810040.

IMPORTANT

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- 4.6 If the following symptoms are indicated, refer to ICC procedure 2-0120043
- a. S/G level at or near zero
 - b. S/G pressure rises to dump valve setpoint, unless a break occurs in which case pressure would be continually decreasing
 - c. Coincident pressure in the S/G and the and the primary system
 - d. T_h & T_c subcooled initially and decrease, then increase sharply
 - e. After reaching approx constant temperature, the primary coolant temperature increases well above secondary saturation temp
-

NOTE: Loss of feedwater to both steam generators during power operation has the potential of producing conditions which could lead to inadequate core cooling.

NOTES:

Following an 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 RCP's

Following any SIAS, operate the SIS until RCS hot and cold leg temperatures are at least 50°F below saturation temperature for RCS pressure and a pressurizer level is indicated, unless the cause of the SIAS has been verified to be an inadvertent actuation. If 50°F subcooling cannot be maintained after the system has stopped, the HPSI system must be restarted.

Reactor Coolant Pumps 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.



EMERGENCY PROCEDURE NUMBER 2-0700040
REVISION 0

5.0 SUBSEQUENT ACTIONSCHECK

- 5.1 Refer to Reactor Trip/Turbine Trip, 2-0030130 and ensure that all subsequent actions (Section 5) have been or are being performed. _____
- 5.2 If partial loss of feedwater results in a turbine runback:
- 5.2.1 Verify the load reduction is $\geq 40\%$ of rated pwr. _____
- 5.2.2 Attempt to restore main feedwater using manual control. _____
- 5.2.3 Maintain S/G levels with the remaining feedwater source. _____
- 5.2.4 Match turbine power with reactor power ($T_{avg} = T_{ref}$), within the capacity of the remaining feedwater source. _____
- 5.3 If both feed pumps are lost:
- 5.3.1 Initiate aux feed _____
- 5.3.2 Stop (2) Heater Drain Pumps _____
- 5.3.3 Stop (1) Condensate Pump _____
- 5.3.4 Stop (1) RCP in each loop _____
- 5.4 Close S/G blowdown isolation valves
- 5.4.1 Close FCV-23-3, 5, 4, 6 _____
- 5.4.2 Close FCV-23-7, '9 _____

CAUTION:

Overfeeding the S/G's can cause excessive cooldown
($> 75^{\circ}\text{F/hr}$)



EMERGENCY PROCEDURE NUMBER 2-0700040
REVISION 0

5.0 SUBSEQUENT ACTIONS: (Cont.)

CHECK

5.5 If the motor driven aux fdwtr pp capability is lost, perform the following:

5.5.1 Open MV-08-13 (2A) OR
MV-08-14 (2B)
Steam Supply Valve to aux fdwtr pp. _____

5.5.2 Control turbine speed with MV-08-3
for the desired rate. _____

5.5.3 Control feed flow to S/G's with
MV-09-11 (2A S/G)
MV-09-12 (2B S/G) _____

5.6 For manual operation of AFW.

5.6.1 Establish communications between the control
room and AFW station. _____

5.6.2 If local manual control is needed, OPEN breakers
2-50308 and 2-60320 @ 2AB-125VDC bus. _____

5.6.3 Throttle MV-08-3 to raise 2C aux fd pp
discharge pressure to approx 1200 psig. _____

5.7 If S/G level is < 38% do not exceed 785 GPM.
(Maximum flow rate of 2 elect AFW Pumps)
(Maximum flow rate of Steam AFW Pumps) _____

5.8 Check auxiliary feedwater flow utilizing all
available indications.
(flow indicators, flow recorders, S/G levels) _____

CAUTION:

Do not feed a dry S/G unless both S/G become dry. Then
admit fdwtr to only one S/G.

5.9 Observe CST level frequently (1/30 min) _____

5.10 If condenser vacuum is lost or MSIV's close, take
manual control of the atmospheric dumps for S/G
pressure control. _____

5.0 SUBSEQUENT ACTIONS: (Cont.)

CHECK

5.11 Ensure that the pressurizer pressure control system is automatically restoring RCS pressure. _____

5.12 Ensure that the CVCS is restoring pressurizer level, (MAX charging, MIN letdown). _____

NOTE: Any system that is placed in manual, requires more operator attention

5.13 Coordinate operations with Unit #1 to assure sufficient condensate via,

5.13.1 Water treatment plant and/or _____

5.13.2 City Wtr Str Tk and/or _____

5.13.3 Unit #1 CST _____

5.14 Follow appropriate procedures for cooldown or return to power. Do not exceed 75°F/hr cooldown rate. _____

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 O.P. 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 Flowpath 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.
 - 6.4.4 Loss of 2C Auxiliary Feedwater pump remote operating capability.
- 6.5 The following protective functions are provided to prevent loss of heat sink.
 - a) Reactor trip:
 - Steam generator low-low level at 39%.



EMERGENCY PROCEDURE NUMBER 2-0700040
REVISION 0

6.0 PURPOSE/DISCUSSION: (Cont.)

6.5 (Cont.)

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%.

c) AFW Pump Auto-start at 34% steam generator level.

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. 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.



EMERGENCY PROCEDURE NUMBER 2-0700040
REVISION 0

6.0 PURPOSE/DISCUSSION: (Cont.)

6.7 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.

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

"L A S T P A G E"

Emergency Procedure
2-0700040 Rev.0
TOTAL NO. PAGES 14