

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE UNIT #1
EMERGENCY OPERATING PROCEDURE NO. 0700040
REVISION 11

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1.0 Title:

Loss of Feedwater or Steam Generator Level

2.0 Approval:

Reviewed by the Facility Review Group September 12 1975
Approved by G.H. Bannar For Plant Manager Sept 12 1975
Revision 11 Reviewed by FRG April 6 1982
Approved by D. M. W. [Signature] Plant Manager April 28 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.

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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.

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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.

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5.0 Instructions:

5.1 Immediate Automatic 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.

5.1.6 Atmospheric dump actuation.

5.1.7 Steam generator relief activation.

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

5.1.9 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 0020130.

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.

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5.0 Instructions: (Cont'd)

5.2 Immediate Operator Action (Cont'd)

- 2) Limit feedwater flow rate to 150 gpm per steam generator until continuous 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 ($T_{avg} = T_{ref}$).

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

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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^oF.

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.