EMERGENCY PLANT SHUTDOWN

1.0 SYMPTOMS

1.1 Alarms.

1.1.1 RPS Trip Path Activated.

1.1.2 Reactor Trip Undervoltage Relay Tripped.

1.1.3 Reactor Trip Circuit Breaker.

1.1.4 PPS Channel Trouble.

1.1.5 Reactor trip/pretrip.

1.1.6 Turbine-Generator trip/pretrip.

1.2 Indications.

1.2.1 Reactor trip breakers open.

1.2.2 CEA rod bottom lights on.

1.2.3 Turbine control and stop valves closed.

1.2.4 Moisture Separator Reheater line steam inlet valves closed.

1.2.5 Unit CBs open.

1.2.5.1 CB-4062 and CB-6062 for Unit 2.

1.2.5.2 CB-4152 and CB-6152 for Unit 3.

1.3 Key Parameters.

1.3.1 Reactor power - decrease.

1.3.2 Pressurizer pressure - decrease.

1.3.3 RCS temperature - decrease.

1.3.4 Pressurizer level - expected to decrease (until nature of emergency is known the pressurizer level should not be relied upon as an indication of RCS inventory).

1.3.5 Steam generator pressure - increase.

1.3.6 Steam generator level - decrease.

2.0 AUTOMATIC ACTIONS

2.1 Turbine trip (initiated by reactor tripped signal).

2.2 Unit CBs open.

2.3 Unit auxiliaries transfer to the reserve auxiliary transformers.

2.4 Steam Bypass Control System (SBCS) operates to establish and maintain steam generator pressure at 1000 psia.

2.5 Feedwater Control System reactor tripped override closes the main feedwater valves FCV-1111 & FCV-1121, positions the main feedwater bypass valves HV-1105 and HV-1106 for 5% flow (∿ 25% open) and decreases the main feedwater pump speed to minimum.

2.6 Pressurizer Level Control System restores pressurizer level to the programmed no load setpoint (27.7% level).

2.7 Pressurizer Pressure Control System restores pressurizer pressure to ∿ 2250 psia.

3.0 IMMEDIATE OPERATOR ACTION

3.1 Verify all reactor trip breakers indicate open and reactor power is decreasing.

3.1.1 If the reactor is not tripped, push all four manual reactor trip pushbuttons.

3.2 Verify the turbine tripped and all HP Stop and HP Governor valves are closed.

3.2.1 If the turbine is not tripped, push the manual trip pushbutton.

3.3 Verify the unit output breakers open on low forward power as indicated by receipt of the "Generator Protection Trip" alarm and verify turbine speed is decreasing after the output breakers open.

3.3.1 If the unit output breakers fail to open within one (1) minute after the turbine trips, manually open the unit output breakers.

3.0 IMMEDIATE OPERATOR ACTION (Continued)

3.4 Verify unit auxiliaries have transferred to the reserve auxiliary transformers.

3.4.1 If the unit auxiliaries have not transferred, manually transfer them to the reserve auxiliary transformer.

3.5 Verify the SBCS is controlling steam generator pressure at 1000 psia.

3.5.1 If condenser vacuum is lost or if the MSIVs are closed, use the atmospheric dump valves to control steam generator pressure at ∿ 1000 psia.

3.6 Verify main feedwater flow is not less than 5% on FR-1011 and FR-1021.

3.6.1 If main feedwater flow is less than 5%, actuate EFAS #1 and EFAS #2.

3.7 Use the Public Address System to notify on-site personnel concerning the nature of the emergency.

4.0 SUBSEQUENT OPERATOR ACTION INITIALS *

CAUTION: Do not place systems in "manual" unless misoperation in "automatic" is apparent. Systems placed in "manual" must be checked frequently to ensure proper operation.

4.1 Verify all immediate operator actions have been initiated as follows:

4.1.1 If more than one CEA has not fully inserted, commence emergency boration per Emergency Operating Instruction S023-3-5.10, "Emergency Boration of the Reactor Coolant System" performing applicable steps concurrently with the steps in this instruction. _____

* The initial column is an optional operator aid and is intended to be used as follows:

Initial each completed action. Do not write N.A. Leave blank, items that are not applicable. Proceed through the instruction performing all applicable steps frequently re-checking those steps passed over to ensure action is taken when applicable.

4.0 SUBSEQUENT OPERATOR ACTION (Continued) INITIALS

4.1.2 If reactor power prompt drop does not reduce reactor power to less than 6% in less than 10 seconds or 10 or more CEAs have not fully inserted, carry out Emergency Operating Instruction S023-3-5.3, "Reactor Protection System Failure" and terminate use of this instruction. _____

4.1.3 If any HP Stop and its associated in line HP Governor valve remains open, close the MSIVs. _____

4.1.4 If unable to trip the turbine from the control room dispatch an operator to open the DC supply breaker to the Unitized Actuator dump valve solenoids. _____

4.1.5 Within one minute after the turbine trips, verify open or open the Unit Auxiliary Transformer low side breakers, then verify open or open the Unit output breakers. _____

4.1.6 Verify energized or energize the following 6.9KV and 4KV Busses. _____

4.1.6.1 A01 and A02. _____

4.1.6.1.1 If A01 and A02 cannot be energized, use Operating Instruction S023-3-2.31, "Natural Circulation Guidelines", to confirm that natural circulation has been established performing applicable steps concurrently with the steps in this instruction. _____

4.1.6.2 A03 and A07. _____

4.1.6.2.1 If A03 and A07 cannot be energized, use the atmospheric steam dumps and the auxiliary feedwater system to control steam generator pressure and level. _____

4.1.6.3 A08 and A09. _____

4.1.6.4 A04 and A06. _____

4.1.6.4.1 If A04 and A06 cannot be energized, carry out Emergency Operating Instruction S023-3-5-4, "Complete Loss of Offsite Electrical Power Concurrent with a Turbine Trip", performing applicable steps concurrently with the steps in this instruction. _____

4.0 SUBSEQUENT OPERATOR ACTION (Continued) INITIALS

4.1.6.5 If offsite power is available to the opposite unit and if A01, A02, A03, A07, A08 or A09 busses cannot be energized, carry out Emergency Operating Instruction S023-3-5.4.1, "Loss of Offsite Electrical Power to a Unit Concurrent with a Turbine Trip", performing applicable steps concurrently with the steps in this instruction. _____

4.1.6.6 If all offsite AC power is lost, carry out Emergency Operating Instruction S023-3-5.4, "Complete Loss of Offsite Electrical Power Concurrent with a Turbine Trip", performing applicable steps concurrently with the steps in this instruction. _____

4.1.7 If EFAS #1 is actuated, check flow on FI-4725. If flow is less than 700 gpm, verify started or start auxiliary feedwater pumps P-141 and P-140, open auxiliary feedwater control valves HV-4706 and HV-4713 and isolation valves HV-4715 and HV-4731. _____

4.1.8 If EFAS #2 is actuated, check flow on FI-4720. If flow is less than 700 gpm, verify started or start auxiliary feedwater pumps P-504 and P-140, open auxiliary feedwater control valves HV-4705 and HV-4712, and isolation valves HV-4714 and HV-4730. _____

4.1.9 If unable to establish at least 350 gpm feedwater flow to each steam generator, perform the following:

4.1.9.1 If steam generator pressure has rapidly decreased to the MSIS setpoint, go to Emergency Operating Instruction S023-3-5.9, "Steam Line Rupture", performing applicable steps concurrently with the steps in this instruction. _____

4.1.9.2 If steam generator pressure is gradually decreasing or increasing, go to Emergency Operating Instruction S023-3-5.30, "Loss of Feedwater", performing applicable steps concurrently with the steps in this instruction. _____

4.1.9.3 If unable to establish feedwater flow to at least one steam generator, establish emergency feedwater flow by performing the following:

4.1.9.3.1 Verify aligned or align auxiliary feedwater pump's manual valving. _____

4.1.9.3.2 Vent auxiliary feedwater piping and pump casings. _____

4.0 SUBSEQUENT OPERATOR ACTION (Continued) INITIALS *

4.2 Determine if the RCS pressure boundary is intact by verification of the following:

4.2.1 On PR-0100A/B, check that pressurizer pressure is between 2225 psia and 2275 psia. _____

4.2.1.1 If pressurizer pressure is not between 2225 psia and 2275 psia, attempt to establish and maintain the required pressurizer pressure per Emergency Operating Instruction S023-3-5.17, "Pressurizer Pressure Control System Malfunction". _____

4.2.2 On LR-0110A/B, check that pressurizer level is trending to 27.7% level (programmed setpoint for no load Tavg). _____

4.2.2.1 If pressurizer level is not trending toward 27.7% level, attempt to establish and maintain the required level per Emergency Operating Instruction S023-3-5.24, "Loss of Pressurizer Level Control". _____

4.2.3 Check that the pressurizer safety valves indicate closed. _____

4.2.4 On LI-0226A check that the Volume Control Tank level is between 37% and 51%. _____

4.2.4.1 If VCT level is not between 37% and 51%, verify the makeup system is functioning properly per Operating Instruction S023-3-2.2, "Makeup Operations". _____

4.2.5 On TI-9903-1 and TI-9911-2 check that the containment temperature is between 80°F - 120°F. _____

4.2.5.1 If containment temperature is not between 80°F - 120°F, verify the containment normal heat removal system is functioning properly per Operating Instruction S023-1-4, "Containment Normal Heat Removal". _____

4.2.6 On PI-0351-1, PI-0351-2, PI-0351-3 and PI-0351-4 check that the containment pressure is between + 1.5 psig and - 0.3 psig. _____

4.0 SUBSEQUENT OPERATOR ACTION (Continued) INITIALS

4.2.7 On LI-5853-1 and LI-5853-2 check that the containment normal sump level is not increasing. _____

4.2.8 At Radiation Control Panel L-103 check that the containment activity is within limits.

Indicator	Limits	
RI-7804A1 & RI-7807A2	Iodine-less than 4.6×10^2 CPM	_____
RI-7804B1 & RI-7807B2	Particulate-less than 5.7×10^2 CPM	_____
RI-7804C1 & RI-7807C2	Gaseous-less than 8.0×10^5 CPM	_____

4.3 If any parameter in Step 4.2 above fails to respond as indicated or does not return to its specified range after completion of prescribed action, go to attached Figures 1 and 2 to identify the event in progress. _____

4.3.1 If use of another Emergency Instruction is indicated, in conjunction with "Emergency Plant Shutdown", perform all applicable steps concurrently with the steps in this instruction. _____

4.4 Use Operating Instruction SO23-3-2.30, "Determination of Adequate Core Cooling" to confirm that conditions are not trending toward an inadequate core cooling event performing applicable steps concurrently with the steps in this instruction. _____

4.5 If main feedwater is available, verify proper operation of the Reactor Tripped/Feedwater Control System Override by completing the following:

4.5.1 Verify that the main feedwater valves (FCV-1111 and FCV-1121) indicate closed or closing on HIC-1111 and HIC-1121. If either main feedwater valve does not indicate closed or closing, complete the following: _____

4.5.1.1 On HIC-1111 (for SG #1) and/or HIC-1121 (for SG #2) use the manual control knob to match the manual output indicator with the auto output indicator. _____

4.5.1.2 Transfer the auto/manual transfer switch to manual. _____

4.0 SUBSEQUENT OPERATOR ACTION (Continued) INITIALS

4.5.1.3 Using the manual control knob decrease the valve position to zero. _____

4.5.1.4 If FCV-1111 remains open, close HV-4051 and if FCV-1121 remains open, close HV-4047. _____

4.5.2 Verify that the main feedwater bypass valves (HV-1105 and HV-1106) indicate closing to or at the 5% flow position (~ 25% open position) on HIC-1105 and HIC-1106. If either main feedwater bypass valve does not indicate closing to or at the (25%) open position, complete the following: _____

4.5.2.1 On HIC-1105 (for SG #1) and/or HIC-1106 (for SG #2) use the manual control knob to match the manual output indicator with the auto output indicator. _____

4.5.2.2 Transfer the auto/manual transfer switch to manual. _____

CAUTION: Avoid overfeeding the steam genrators to prevent an undesirable cooldown (Tavg below 540°F and decreasing) of the RCS.

4.5.2.3 Using the manual control knob position the affected valve(s) to establish a gradual (less than 2% per minute) level recovery to ~ 65% steam generator narrow range level indication. _____

4.5.3 Verify that main feedwater pump's speed is decreasing to or at ~ 3200 rpm as indicated on SR-4500 and SR-4501. If either main feedwater pump does not indicate speed is decreasing to or at ~ 3200 rpm, complete the following: _____

4.5.3.1 On HIC-1108 (FW Pump Speed Setpoint K006) and/or HIC-1107 (FW Pump Speed Setpoint K005) use the manual control knob to match the manual output indicator with the auto output indicator. _____

4.5.3.2 Transfer the auto/manual transfer switch to manual. _____

4.0 SUBSEQUENT OPERATOR ACTION (Continued) INITIALS

4.5.3.3 Using the manual control knob set the affected main feedwater pump(s) speed to ∿ 3200 rpm as indicated on SR-4500 (K-006) and/or SR-4051 (K-005). _____

4.6 If there is an undesirable cooldown of the RCS (Tavg below 540°F and decreasing), complete the following:

4.6.1 If main feedwater is available, take manual control of HIC-1105 and HIC-1106 and reduce the rate of steam generator level recovery as follows: _____

4.6.1.1 On HIC-1105 and HIC-1106 use the manual control knob to match the manual output indicator with the auto output indicator. _____

4.6.1.2 Transfer the auto/manual transfer switch to manual. _____

CAUTION: Do not reduce feedwater flow below the requirement to maintain a constant or increasing level.

4.6.1.3 Using the manual control knob position the valves to establish a gradual (less than 2% per minute) level recovery to ∿ 65% steam generator narrow range level indication. _____

4.7 If there is an excessive cooldown of the RCS (Tavg below 530°F and decreasing) caused by excessive auxiliary feedwater addition, reduce the number of operating auxiliary feedwater pumps as follows (listed in order of preference):

4.7.1 If P-140 is supplying both steam generators, then override and stop P-141 and P-504. _____

4.7.1.1 If steam generator level cannot be maintained, restart P-141 and/or P-504 to re-establish adequate flow. _____

4.7.2 If both P-141 and P-504 are supplying their respective steam generators, then override and stop P-140. _____

4.7.2.1 If steam generator level cannot be maintained, restart P-140. _____

4.0 SUBSEQUENT OPERATOR ACTION (Continued) INITIALS

4.8 After steam generator narrow range levels reach 30%, reset EFAS-1 and EFAS-2, at the Train A and Train B ESFAS Auxiliary Relay Cabinets. _____

NOTE: Reseting EFAS-1 and EFAS-2 disables the override-stop signals, re-aligning EFAS for automatic actuation of the auxiliary feedwater pumps and valves. (Failure to do so could result in a loss of heat sink.)

4.8.1 When EFAS-1 is reset, verify open or open HV-4731. Provided HV-4731 is open, verify closed or close HV-4715. _____

4.8.1.1 If HV-4731 cannot be opened, open HV-4715. _____

4.8.2 When EFAS-2 is reset, verify open or open HV-4714. Provided HV-4714 is open, verify closed or close HV-4730. _____

4.8.2.1 If HV-4714 cannot be opened, open HV-4730. _____

NOTE: HV-4730 and HV-4715 should remain closed except when an EFAS is present or during surveillance testing. This avoids a steam line break scenario concurrent with the loss of 125 VDC busses D1 or D2 which would result in feeding a ruptured steam generator.

4.8.3 If the steam generator blowdown is necessary for chemistry control, or to facilitate steam generator level reduction, establish steam generator blowdown per Operating Instruction S023-9-4, "Steam Generator Blowdown Processing System". _____

NOTE: EFAS isolates blowdown.

4.9 Establish auxiliary feedwater flow to each steam generator and secure the main feedwater flow as follows:

4.9.1 Verify started or start auxiliary feedwater pump P-141. _____

4.9.1.1 Jog open or close as necessary HV-4713 by intermittently depressing HS-4713-1 to establish a gradual (less than 2% per minute) S/G #1 level recovery to ~ 65% narrow range level. _____

4.0 SUBSEQUENT OPERATOR ACTION (Continued) INITIALS

4.9.1.2 If P-141 cannot be started or if HV-4713 cannot be positioned as desired, verify started or start P-140. _____

4.9.1.2.1 Jog open or closed as necessary HV-4706 by intermittently depressing HS-4706-2 to establish a gradual S/G #1 level recovery to ∿ 65% narrow range level. _____

4.9.1.3 Close main feedwater bypass valve HV-1105 using HIC-1105. _____

4.9.2 Verify started or start auxiliary feedwater pump P-504. _____

4.9.2.1 Jog open or closed as necessary HV-4712 by intermittently depressing HS-4712-1 to establish a gradual (less than 2% per minute) S/G #2 level recovery to ∿ 65% narrow range level. _____

4.9.2.2 If P-504 cannot be started or if HV-4712 can not be positioned as desired, verify started or start P-140. _____

4.9.2.2.1 Jog open or closed as necessary HV-4705 by intermittently depressing HS-4705-2 to establish a gradual S/G #2 level recovery to ∿ 65% narrow range level. _____

4.9.2.3 Close main feedwater bypass valve HV-1106 using HIC-1106. _____

4.9.3 Stop main feedwater pumps per Operating Instruction S023-2-1, "Main Feedwater Pump and Turbine Operation". _____

4.10 Place NI audible count rate in operation to monitor the change in shutdown margin. _____

4.11 Verify a shutdown margin greater than 5.15% ΔK/K on the Plant Monitoring System or by Operating Instruction S023-3-3.29, "Determination of Shutdown Margin". _____

4.0 SUBSEQUENT OPERATOR ACTION (Continued) INITIALS

4.11.1 If shutdown margin is less than 5.15% $\Delta K/K$, immediately start emergency boration per Emergency Operating Instruction S023-3-5.10, "Emergency Boration of the RCS" performing applicable steps concurrently with the steps in this instruction. _____

4.12 Carry out turbine shutdown per Operating Instruction S023-10-2, "Turbine Shutdown" performing applicable steps concurrently with the steps in this instruction. _____

4.13 Upon a unit trip, the Watch Engineer shall notify the "duty" Station Administrator and Shift Technical Advisor and discuss the situation. If unable to contact any Station Administrator in the normal reporting chain within fifteen (15) minutes following the event, notify the NRC via the red phone. _____

4.13.1 Notify the Systems Operating Supervisor concerning the nature of the emergency. _____

4.14 If extended shutdown is anticipated, continue operations per Operating Instruction S023-5-1.5, "Plant Shutdown from Hot Standby to Cold" and terminate the use of this instruction. _____

4.15 If plant startup is anticipated, continue operations per Operating Instruction S023-5-1.3, "Plant Startup from Hot Standby to Minimum Load" and terminate the use of this instruction. _____

5.0 ATTACHMENTS

5.1 Figure 1, Small Break Accident Identification.

5.2 Figure 2, Large Break Accident Identification.

H. E. MORGAN
Superintendent
Units 2 and 3

APPROVED:

J. M. CURRAN
Plant Manager

VBF/sa

FIGURE 1

ACCIDENT IDENTIFICATION SMALL BREAK

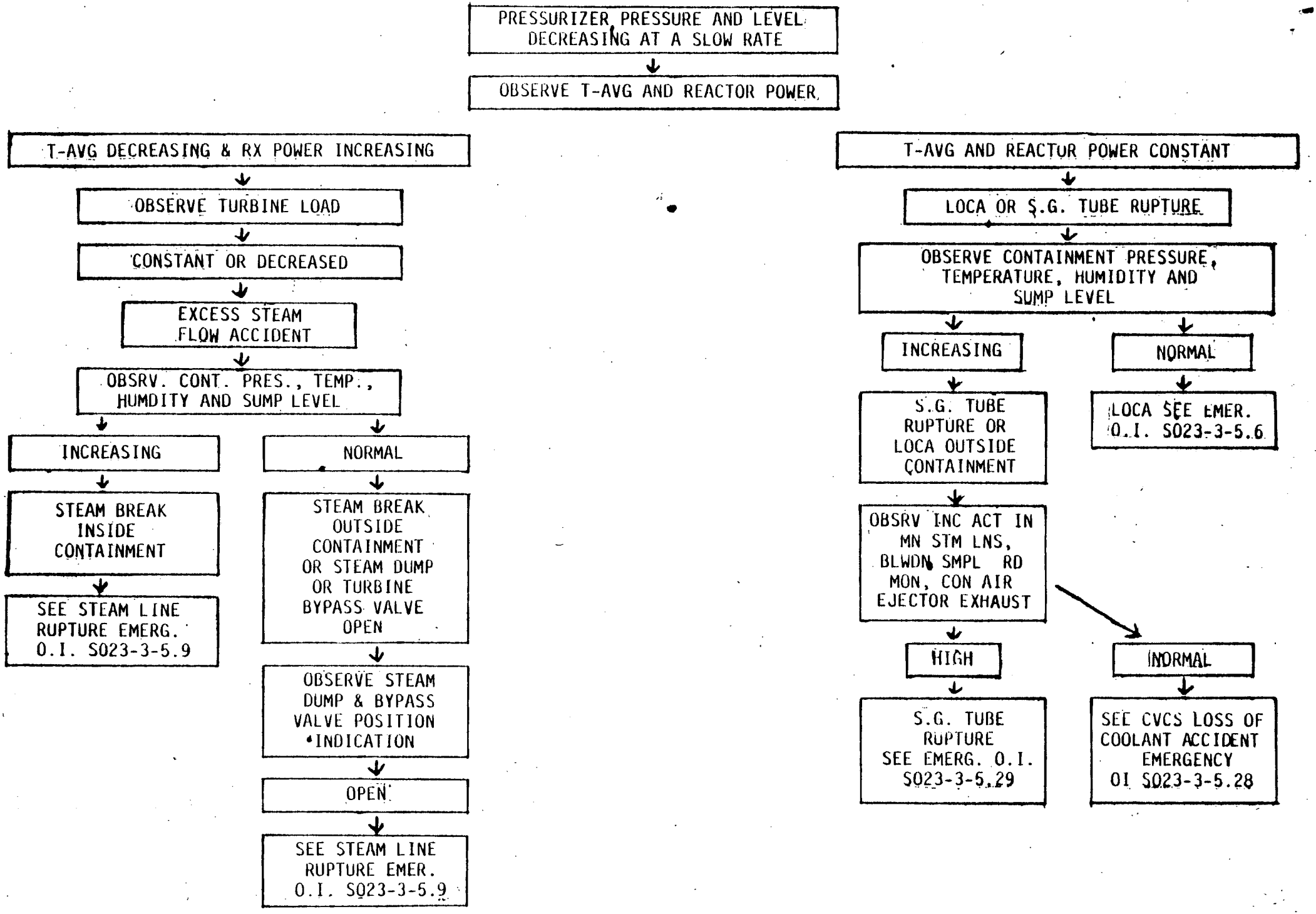

FIGURE 2

ACCIDENT IDENTIFICATION LARGE BREAK