THREE MILE ISLAND NUCLEAR STATION

UNIT #1 OPERATING PROCEDURE 1106-3

FEEDWATER SYSTEM

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PORC CHAIRMAN
UNIT 1

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THREE MILE ISLAND NUCLEAR STATION
UNIT #1 OPERATING PROCEDURE #1106-3
FEEDWATER SYSTEM

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3.1.1 Drawings

1. Feed Water System GAI-302-081
2. Main Steam GAI-302-011
3. Auxilliary Steam GAI-302-051
4. Condensate System GAI-302-101
5. Secondary Plant P.&I.D. B.&W. No. 27556-F
6. Feedpump Shaft Seals and Leakoff GAI-302-281
7. Feedpump Turbine Drains GAI-302-121
8. Turbine Gland Steam & Drains GAI-302-141
9. High Pressure Extraction Steam GAI-302-041

3.1.2 Manufacturers Instruction Manuals

1. Byron Jackson Pumps B/M RC1
2. General Electric - Steam Turbine Boiler Feed Pump Drive
3. Foster Wheeler Corporation - High Pressure Heaters B/M RC2&3
4. Associated Control Equipment - Foxboro and Bailey Manuals

3.1.3 System Descriptions

1. Feed Water System Vol. 1, Section C, Chapter 6
2. Condensate System Vol. 1, Section C, Chapter 9
3. Auxilliary Boiler System Vol. 1, Section C, Chapter 51
4. Main Feed Pump Turbine & Auxiliaries Vol. 1, Section C, Chapter 7
5. Emergency Feed Pump Turbines & Auxilliaries Vol. 1, Section C, Chapter 8

3.2 Limitation and Precautions

3.2.1 Equipment

1. If main feed pumps have been by-passed during feed and condensate system cleanup operation, preheat pumps prior to start-up by circulating warm condensate thru pumps.
2. The aux. oil pump should be started, if not running, and the oil temperature in the oil reservoir increased to at least 90°F prior to starting unit.
3. The maximum oil temperature rise through any bearing should not exceed 50°F and the oil discharge temperature should not be allowed to exceed 180°F.
4. Prior to starting the feed pumps insure condensate from the booster pumps discharge is lined up to the feed pumps stuffing box seal and is being controlled at 25 psid, inlet to outlet.
5. Temperature change limits on H.P. heaters is as follows:
   a. Normal rate 100°F per hour.
   b. If necessary 200°F per hour.
   c. Max. transient 600°F per hour.

   Temperature change limits on H.P. Heaters T1-37 and T1-38.
6. When an extended plant shutdown is planned, the feed pump turbines will remain on turning gear until the unit has cooled down to ambient temperature and no abnormal conditions exist, i.e., eccentricity normal. For short duration shutdowns, i.e., 1 to 2 weeks, the turbines will remain on turning gear (T.G.) for complete shutdown.

3.2.2 Administrative

1. Prior to starting main feed pumps insure FW-V10A & B, and FW-V11A & B are locked open providing a flow path to the main condenser for the feed pumps, on low flow condition.
2. During operation, insure that not more than one (1) key for operating the thrust bearing wear trip test switches, is left at the local control panels, to prevent an accidental trip of the feed pumps.
3. The stop valve trip should never be reset until the unit is ready to be started.
4. Do not reset emergency trip device until turbine speed has dropped 20% or more below trip speed, 4800 RPM.
5. If the feed pump turbine is started locally using the air motor hand wheel, when air loading is established and turbine is under air control, the hand wheel MUST BE RETURNED TO LOW SPEED STOP (LSS) and the lock pin at the air motor MUST BE re-installed.
6. Prior to tripping the last feed pump turbine off when shutting plant down, place the AUTO-START-DEFEAT SW on console "CC" for the EMERGENCY FEED PUMP TURBINE (E.F.P.T.) in the DEFEAT position.
7. First during start-up place the switch in NORMAL when the feed pump is placed in service.
8. By periodic sampling insure that condensate meets chemistry specs. per OP 1106-2.
9. Do not allow turbine rotor to stop with gland steam applied.

3.3 Operating Procedures

3.3.1 Normal System Startup (Feedwater System)

3.3.1.1 Prerequisites (Indicate satisfactory completion of steps below by initialing each step and sign name at end of applicable section).

1. The Normal and Emergency Electrical Systems lined up per OP 1107-1 and 1107-2 respectively.
2. On the following 480V control centers ensure that the designated equipment manual breakers are closed.
   a. 1C-E.S.V. - FW-V5A & B Units 10B and 11B
   b. 1A-T.P. - Aux. Oil Pump LO-P8A Unit 6E
      FW-V8 Unit 10C
   c. 1C-T.P. - Turning gear mtr. FW-Y1A Unit 1A
      Aux. oil pump LO-P8B Unit 1B
      FW-V1A, FW-V1B Units 10A and 10B
      FW-V2A, FW-V2B Units 10C and 10D
      FW-V3A, FW-V3B Units 11A and 11B
      FW-V4 & FW-V6 Units 11C and 11D
   d. 1D-T.P. - Turining gear mtr. FW-Y1B Unit 1A
      FW-V15 Unit 8D
3. On the 125 VDC distribution system close the following switches:

1C	3	M.S.C. FPT-A
1J	3	M.S.C. FPT-B

4. On the 250 VDC distribution system close the following switches:

Dist. Pnl.	Sw. #	Equipment
1C	17	LO-P9A
1D	17	LO-P9B

5. Control power (125 VDC) is available at the switchgear for breaker control.

6. The Instrument and Control Air System lined up for normal operation per OP 1104-25, and air pressure available to feed system components as applicable.

7. The secondary services closed cycle cooling system lined up for normal operation per OP 1104-12, and cooling water flow established to the feed pump oil coolers.

8. The feed pump turbine oil conditioner lined up for normal operation per OP 1104-34 and clean oil flow established to the feed pump turbine oil reservoirs.

9. The feed and condensate systems have been filled and vented per OP 1106-2.

   NOTE: During this procedure the feed pump, turbines, oil and turning gear system will be used. Refer to applicable steps in this procedure for placing turbines on T.G.

10. Prior to startup of the feed pumps, the condensate and Aux. Boilers System will be lined up as needed per OP 1106-2 and 1106-4.

11. Ensure that the feed pump shaft seal system is operating properly by local indicators DPI-265 and 266. Should indicate 25 psid across feed pump shaft seals.

12. Verify that feed system valves are lined up per section 3.5.1 of this procedure, Enclosure I.

3.3.1.2 Procedure (Indicate satisfactory completion of steps below by initialing each step and sign name at end of applicable section). The start-up of the feed system will be coordinated with the condensate system start-up and primary plant heat-up. Under normal start-up conditions two (2) condensate and condensate booster pumps will be in operation and flow established through both strings of L.P. and H.P. heaters by-passing the feed pumps. The start-up feed control valves FW-V16A & B are in auto maintaining steam generator levels at 30". Insure OTSG pressure is approximately 500 psig prior to starting the first feed pump. Up to the point of starting the feed pumps they should be on the turning gear, and the lube oil system temperature being increased to a min. of 60°F in the oil reservoirs. This procedure will cover the start-up of the feed pump lube oil and T.G. system, which should be placed in operation at the beginning of plant start-up, and then detail the feed pump turbine start-up by placing the feed system in normal full power operation. FW-P1A will be started first.

1. Check that feed pump turbine oil conditioner is operating properly and turbine oil reservoirs are at normal level, as indicated on local and at control board.

2. Verify L.P. & H.P. stop valves closed for each turbine when in the tripped position.

3. Start aux. oil pumps LO-P8A & B by placing C/Sls on console "C.L." from PULL-TO-LOCK to NORMAL-AFTER-STOP. Pump will start due to pressure interlock and stop when oil pressure increased to 53 psig from shaft driven pump. In this condition LO-P8A and/or LO-P-8B will automatically start on low lub. oil pressure when turbine is tripped.

4. After oil pressures reach normal condition, hyd. press. 200 psig on PG-1, bearings 12 psig on PG-2, place the emergency oil pumps LO-P9A/B/C/S, in NORMAL-AFTER-STOP position on console C.L.

   NOTE: All indicators are local on turbine control panel unless otherwise stated in Procedure.

5. To place each turbine on the turning gear on panel P.L.F., start appropriate turning gear motor. If turbine is at zero speed as detected by zero speed switches, it will automatically go on the turning gear. Turning gear engaged and disengaged lights are located next to turning gear motor control switches on panel P.L.F. If turning gear C/S3 are left in NORMAL-AFTER-STOP position, the turbines will automatically go on turning gear at zero speed. For the start-up of the main feed pump, the following plant conditions should be met:

   a. Condensate system lined up as needed in accordance with OP 1106-2.

b. Aux. Boilers in operation supplying steam as needed.

c. Gland seals established on feed pump turbines per OP 1106-10.

d. Aux. condenser vacuum established per OP 1106-15.

e. F.P. Turbine Oil Conditioner in service per OP 1104-34.

6. Warm up and drain aux. steam line to AS-V5A (B) Aux. Steam to FPT-1A (B) per OP 1106-4.

7. Position turbine drain valve C/S to position 3 on panel PLF, which opens TDV-9A (B), 10A (B), 11A (B), 12A (B), and 13A (B).

8. Locally open AS-V5A (B) admitting aux. steam to L.P. stop valve.

9. At local control panel for FPT-1A (B) press PB-11 - Vacuum reset pushbutton, verify vacuum trip alarm resets in control room.

10. On console C.L. open FW-P1A (B) suction valve CO-V9A (B).

NOTE: If CO-V-9A/B does not open, FW-V-11A/B will have to be closed to equalize pressure.

11. Verify oil temperature at oil cooler is 120° to 130°F as ind. on DT-1 when starting from cold conditions. If not, close manual valves SC-V-20A or SC-V-20B, lube oil cooler cooling water discharge valves until oil temperature increases to greater than 120°F.

12. On console C.L. using the MSC (motor speed changer) C/S, hold in slow lower position until red indicating light comes on above switch. MSC is now at LSS (low speed stop) position. Verify ICS control station in manual at zero speed.

13. On console 'C.L.' press reset P.B. for FPT-1A(B) and note green reset light on the red trip light off.
14. Verify red open lights on for L.P. & H.P. stop valves admitting steam to the L.P. control valves. Open discharge valve FW-V1A/B.
15. With an operator observing the turbine locally, open the control valves, using the MSC on console 'C.L.', to the point where sufficient steam is admitted to turn the rotor slowly.
16. The turning gear will automatically disengage, verify on PLF panel by insuring engage light off and disengage light on.
17. Place FPT-A(B) turning gear motor C/S in NORMAL-AFTER-STOP.
18. On console C.L. trip FPT-A(B) by pressing trip P.B. and note that turbine rotor coasts down.
19. Note that L.P. & H.P. stop valves indicated closed, and FPT-A(B) trip alarm light on.
20. Note that if rotor coasts down to zero rpm, the feed pump automatically goes on the turning gear.
21. Restart FPT-A(B); refer to steps 12 through 16.
22. Using MSC on console C.L. FPT fpt-A(B) slowly bring up to 1500 RPM.
23. Check turbine out carefully for any rubs, squeaks, or other unusual noises.
24. Position switch for turbine drain valves to off on PLF panel to close drain valves.

25. Maintain 1500 RPM until oil temperature to bearing is a minimum of 100°F as ind. on DT-1.

26. Slowly increase turbine speed using MSC until turbine goes on governer, about 3000 RPM. This will be noted by no speed change when MSC control switch is positioned to increase speed.

27. Monitor vibration indication on panel PCL when increasing turbine speed. Limit vibration to less than 2 mils.

28. Position MSC control switch to fast raise until at HSS (high speed stop) as noted by green indicating light above MSC switch.

29. The feed pump is now under air loading control from the ICS 36A(B) MCS in hand control.

    NOTE: Upon loss of I.A. or ICS 36 A/B MSC hand control position MSC control switch to lower until a slight decrease in RPM's is noted, at this point take the applicable full range main speed control switch to the ON position. With the MSC control switch you can now run the main F.W. pump to any RPM per valve ΔP/flow desired.

    CAUTION: In this mode of operation an overspeed trip can occur since there is no high speed stop, which was defeated by the full range speed control switch, (Stay below 5,500 RPM's).

30. Close FW-V6, feed pump by-pass valve, control on console C.L.

31. As plant heat-up is continued to a temperature of 532°F, FW-P1A(B) will be controlled from ICS-36A(B) MCS in hand to maintain steam generator level.

32. Place FPT-1A(B) in auto from ICS-36A(B) MSC on console C.L. when plant conditions permit. (Placing in auto can vary from time to time so it is strictly based on plant conditions.)

33. Continue plant heatup to primary temperature of 525°F using aux. steam for feed pump operation.

34. When plant conditions permit (i.e., additional main steam loading will not decrease RCS below 525°F) shift main feed pump to main steam supply thru MS-V5A(B) by slowly closing Aux. steam supply valve AS-V5A(B).

35. When primary plant temperature reaches 532°F place the main feed water valves FW-V17A & B control stations ICS-35 & B in auto from console C.C. Check feed pump seal leak off ΔP to be approximately 50 psid; if necessary, throttle open COV 277A(B).

    NOTE: When transferring a control station from hand to auto, depress auto pushbutton and hold until auto light is on.

36. Closely monitor turbine speed during transfer, if turbine control becomes erratic reopen AS-V5A(B).

    NOTE: Turbine speed will increase when H.P. control valves open then return to normal speed at time of transfer.

37. Insure the emergency feed pump auto-start switch in the normal position (per OP 1102-2 Plant Start-Up). Verify that MS-V-13A & B, MS-V-6, and EF-V-30A & B are not mechanically overridden to prevent auto opening.

38. As plant load increases, the feed water control system will lift off level control. Verify by oscillation in feed flow and pressure.

39. When plant conditions require, warm-up the 2nd Feed PUmp FWP 1A(B) and place on manual control at minimum speed on ICS-36A(B) control station per steps 7-29.

    NOTE: Steam supply will be from moisture separator #6 instead of aux. steam.

40. Place FW-P1A(B) in auto from ICS-36A(B) control station as follows, when plant conditions permit:

    a. Place Pos-M.V. Sw. to M.V. position. The meter will indicate auto-manual error in this position.

    b. Slowly increase speed on FW-P1A(B) using toggle Sw. on control station , to equal discharge pressure of FW-P1B(A) as indicated on PI-62 & 63 on console C.L.

    c. Check meter on ICS-36B(A), black pointer should be on red diamond. If not adjust bias control on ICS-36B to bring pointer over red diamond.

    d. Shift station to auto and as conditions permit slowly remove bias.

41. The feed water system is now lined up and operating in a normal full power line-up. See appropriate operating procedures for H.P. heater vents, drains, and extraction steam operation.

3.3.2 Normal System Operation

3.3.2.1 Prerequisites for Normal System Operation

(1) The feed system has been started per Section 3.3.1.

(2) The condensate system is operating normally per OP-1106-2.

(3) The feed system is being controlled automatically from ICS-13 Steam-gen. reactor master M.C.S.

(4) Feedwater chemistry is in specs. set forth in Plant Chemistry Manual.

3.3.2.2 Normal System Operating Procedure

Normal operation utilizes both main feed pumps FW-P1A & B, using 6th stage steam from the outlets of moisture separators 4 and 6 to drive the turbines for each pump. Each turbine speed is adjustable for pump flow up to 16,100 gpm, about 7,050,000 lb/hr. The feedwater flow is controlled through the use of control valves while the Δp across these valves is maintained constant thru the variable speed feed pumps. The pressure drop across the valves is monitored and compared to an adjustable setpoint. The error signal thru proportional, plus integral action, controls the feed pump turbine speed. The feed pumps discharge to the H.P. heater strings A & B. Each heater string consists of two (2) H.P. heaters, the 2nd and 4th stage. The feed water temperature is increased to about 460° F. prior to entering the steam generators. The feed pumps are protected during low flow condition by recirculation lines to the main condenser. Water chemistry control and treatment is provided on the condensate system. There are sampling provisions on the header just prior to the feed water flow control valves and on the cleanup recycle line to the main condenser.

(1) Check operating equipment t least once per shift to ensure that equipment is operating satisfactorily.

(2) Adjust oil cooler cooling water flow to maintain turbine bearing oil discharge temperature of 140°F to 160°F as ind. on DT-2 & 3.

Throttle the following oil cooler outlet valves to obtain these temps.

FW-P1A-SCV-20A & B FW-P1B-SCV-20C & D

(3) By comparison of readings, periodically check to ensure that the oil temperature rise through any bearing does not exceed 50°F, as by difference between DT-1 and DT-2, 3 & 4 and the oil discharge temperature should not be allowed to exceed 180°F as ind. on DT-2, 3, & 4.

(4) Periodically check the thrust bearing metal temperatures as indicated by thermocouples in the bearing, to detect any increase in temperature above normal. The normal will be determined by operating experience.

(5) Check the hydraulic oil pressure and bearing oil pressure as ind. on PG 1 & 2 once per shift. Pressure gages are mounted on the turbine console and instrument panel.

(6) Check oil level ind. on control console to ensure tank is being maintained at normal level.

(7) On turbine instrument panel check reading on PG 3 & 4 to determine oil pressure drop across filter. Filter should be cleaned when ΔP equals 12 psid.

(8) Note readings on Feed Pump vibration recorder on console C.L. for any abnormal trends. Normal vibration should be less than 2 mils (turbine). Normal vibration should be less than 2 mils (pump).

(9) Check main feed valves pressure drop on console C.L. periodically, should indicate 35 psid, as ind. on PI-DPI-11A/B.

(10) For an abnormal and/or emergency condition refer to OP 1202-26 Loss of Steam Generator Feed.

(11) To check operation and efficiency of the H.P. heater strings monitor plant computer points T.I.-45 through T.I.-50, inlet and outlet temperatures of heaters.

(12) Daily drain oil tank to remove any water or sludge that has collected in tank. The oil tanks is sloped to the center and toward the front to collect water and sludge.

NOTE: Do not drain excessive oil from tank.

(13) When performing trip checks follow posted instruction located by test switches.

3.3.3 Normal System Shutdown

3.3.3.1 Prerequisites for Shutdown

1. The system is operating as per Section 3.3.2 Normal Operation.

3.3.3.2 Shutdown Procedure (Indicate satisfactory completion of steps below by initialing each step and sign name at end of applicable section). Shutdown of the feedwater system is performed in conjunction with the condensate system, realizing that due to interlocks a main feedwater pump is shutdown before a condensate

booster pump. The first feedwater pump will be removed from service when the total feed flow is within the capacity of one pump. A main feedwater pump will be utilized to remove excess or decay heat from the primary system after shutdown by feeding the steam generators and dumping steam to the main condenser. This process is continued for primary system cooldown by dragging the steam pressure as low as possible and then switching to the decay heat removal system. When secondary system pressure is reduced sufficiently to remove the main feed pump from service, adequate feedwater pressure will be provided by the condensate and booster pumps at the stage of cooldown.

1. As plant load is reduced to 15% by the ICS, check operation of recirc. valves FW-V7A & B, indication on console C.L.
2. Place ICS-36B(A)-MSC, FPT-B(A) speed control, in hand and reduce to minimum speed. (Feed pumps are placed in hand as plant conditions permit.)
3. Using the MSC for FPT-B(A) position control switch to fast lower and reduce FPT-B(A) speed to LSS.

   NOTE: MSC will be at HSS during operation so it will not take control of turbine immediately.
4. On console C.L. press FPT-B(A) trip pushbutton and note trip lite is right above PB and closed on HP & LP stop valves below PB.
5. Check FPT-B(A) speed recorder on console C.L. for a decrease in turbine speed. Verify that aux. oil pump LO-P2B starts on decreasing oil press.

6. On C.L. console close FW-V1B(A), FW-P1B(A) discharge valve after unit has reached 0 speed.

7. After FPT-B(A) has reached 0 speed, the unit will automatically go on turning gear, verify same by indication on PLF panel.

8. On console C.L. start emergency DC lube oil pump LOP-9B(A) and place LOP-2B(A) c/s in PULL-TO-LOCK.

   NOTE: Aux. oil pump is a high pressure and the DC pump is a low pressure pump, and all that is needed for bearing lubrication.

9. As feedwater demand drops and start-up feed valves reach the 50% close position, verify on console CC that feed block valves FW-V5A & B automatically close.

10. When the main turbine is secured, the operating feed pump will transfer over to operation on HP steam. Verify by control valve position indication on panel PLF.

11. Continue operation of FW-P1A(B) on main steam for plant cooldown.

12. When main steam pressure drops to 500 psig, place E.F.P. auto start sw. to defeat and open FW-V6 feed pump by-pass valve, and secure FW-P1A(B) using same procedure as used for FW-P1B(A). (Steps 2 thru 8.)

13. Close FW-V1A(B), FW-P1A(B) discharge valve from console C.L.

14. Steam generator level will be maintained by condensate and condensate booster pumps through the start-up feed valves for the remainder of the cooldown.

15. From console C.L. close MS-V5A & B HP steam supply valves to FPT-A&B.

16. The turning gear and DC oil pump LOP-9A & B will be left in operation for a period of several hours, or at least until sufficient heat in the turbine casing and rotor has been dissipated, to avoid damage to the bearings.

17. When the shutdown is for a short period of time, the turning gear and LOP-9A & B will be kept in operation in order to prevent temporary distortion of the rotor due to uneven heat dissipation.

18. Stop running aux. vacuum pumps and if needed open manual vacuum breakers VA-V4A & B to break aux. condenser vacuum. Secure sealing steam when vacuum reaches 0" Hg.

19. After breaking aux. condenser 1A & B vacuum open TD-V9A & B thru 13A & B from panel PLF to drain condensate from HP & LP, stop valves and lines, and first stage.

20. When oil temperature out of oil cooler drops below 120°F, read at turbine instrument board on DT-1 secure cooling water flow by closing SC-V13A, B, C, and D.

    NOTE: Feed pump turbines can be taken off turning gear for extended shutdown by placing turning gear motor C/S on PLF to PTL and securing DC oil pump LOP-9A/B.

21. The feed pumps are now secured and feed flow is by-passing pumps through FW-V6.

22. When feedwater is no longer required the condensate and booster pumps will be secured.

23. The feed and condensate system shutdown is now complete. Individual heater string inlet and outlet valves need not be closed unless required for maintenance.

3.3.4 Startup Using Main Steam

3.3.4.1 Prerequisites (Indicate satisfactory completion of steps below by initialing each step and sign name at end of applicable section).

1. Complete prerequisites of section 3.3 step 3.3.1.1

3.3.4.2 Procedure

The start-up of the feed system will be coordinated with the condensate system start-up and primary heat-up. Under normal start-up conditions two (2) condensate and condensate booster pumps will be in operation and flow establish through both strings of L.P. and H.P. heaters, by-passing the feed pumps thru FW-V-6. The start-up feed control valves FW-V16A & B are in auto maintaining steam generator levels at 30". The primary temp. is approximately 475^{o}F as indicated on wide range Tc RC-5A/B T1-1 prior to using main steam through MS-V5A/B for feed pump warm up and operation. Up to the point of starting the feed pumps they should be on the turning gear, and the lube oil system temperature being increased to a min. of 60^{o}F in the oil reservoirs. This procedure will cover the start-up of the feed pump lube oil and TG system, which should be placed in operation at the beginning of plant start-up, and then detail

the feed pump turbine start-up by placing the feed system in normal full power operation. FW-P1A(B) will be started first.

(1) Check feed pump turbine oil conditioner operating properly and turbine oil reservoirs at normal level, as indicated on local and at control board.

(2) Verify L.P. & H.P. stop valves closed for each turbine when in tripped position.

(3) Start aux. oil pumps LO-P8A & B by placing C/Sls on console 'C.L.' from PULL-TO-LOCK to NORMAL-AFTER-STOP. Pump will start due to pressure interlock and stop when oil pressure increases to 53 psig from shaft driven pump. In this condition LO-P-8A and/or LO-P8B will automatically start on low lub. oil pressure when turbine is tripped.

(4) After oil pressures reach normal condition, hyd, press. 200 psig on PG-1, bearings 12 psig on PG-2, place the emergency oil pumps LO-P9A/B C/S, in NORMAL-AFTER-STOP position on console C.L.

NOTE: All indicators are local on turbine control panel unless otherwise stated in procedure.

(5) To place each turbine on the turning gear on panel PLF, start appropriate turning gear motor. If turbine is at zero speed as detected by zero speed switches, it will automatically go on the turning gear. Turning gear engaged and disengaged lights are located next to turning gear motor control switches on panel PLF. If turning gear

S/S3 are left in NORMAL-AFTER-STOP position, the turbines will automatically go on turning gear at zero speed. For the startup of the main feed pump, the following plant conditions should be met:

a. Condensate system is lined up as needed in accordance with OP 1106-2.

b. Primary temp. at approximately 475^{o} as ind. on wide rance Tc RC-5A/B T1-1.

c. Seal established on FPT-A/B and aux. condenser vacuum established.

d. Feed pump oil conditioning in service per OP 1104-34.

(6) Position turbine drain valve C/S to position 3 on panel PLF, which opens TDV-9A(B), 10A(B), 11A(B), 12A(B), and 13A(B).

(7) From console C.L. open MS-V5A(B) admitting H.P. steam-up to H.P. stop valve.

(8) At local control panel for FPT-1A(B), press PB-11 -vacuum reset pushbutton, and in the control room note vacuum trip alarm resets.

(9) From control room console C.L., open FW-P1A(B) suction valve CO-V9A(B), and check that discharge valve FW-V1A(B) indicates open.

(10) Check oil temperature from oil cooler at local control panel; it should be greater than 90^{o}F as ind. on DT-1 when starting from cold condition. If not, shut manual valves SC-V20A or 20B, lube oil cooler, cooling water discharge valves until lube oil temperature increases.

(11) On console C.L. using the MSC (motor speed changer) control switch, hold in slow lower position until red indicating light comes on above switch. MSC is now at LSS (low speed stop) position. Verify ICS control stations in manual at zero speed.

(12) On console 'C.L.' press reset P.B. for FPT-1A(B) and note green reset light on and red trip light off.

(13) Check that red open lights come on for L.P. & H.P. stop valves admitting steam to the H.P. control valves. Open FW-V-1A(B) FP-T-1A(B) discharge valve.

(14) With an operator observing the turbine locally, open the control valves, using the MSC on console 'C.L.', to the point where sufficient steam is admitted to turn the rotor slowly.

(15) The turning gear will automatically disengage, verify on PLF panel by engage light off and disengage light on.

(16) Place FPT-A(B) turning gear motor C/S in NORMAL-AFTER-STOP position.

(17) On console C.L. trip FPT-A by pressing trip P.B. and note that turbine rotor coasts down.

(18) Note that L.P. & H.P. stop valves indicated closed, and FPT-A(B) trip alarm light on.

(19) Note that if rotor coasts down to zero rpm, the feed pump automatically goes on turning gear.

(20) Restart FPT-A; refer to steps 7 through 15. Place C/S to turning gear in NORMAL-AFTER-STOP position.

(21) Using MSC on console C.L. for FPT-A(B), slowly bring up to 1500 RPM.

(22) Check turbine out carefully for any rubs, squeaks, or other unusual noises.

(23) Position switch for turbine drain valves to off on PLF panel to close drain valves.

(24) Maintain 1500 RPM until oil temperature to bearing is a minimum of 100°F as ind. on DT-1.

(25) Slowly increase turbine speed using MSC until turbine goes on governer, about 3000 RPM. This will be noted by no speed change when MSC control switch is positioned to increase speed.

(26) Monitor vibration indication on panel PCL when increasing turbine speed. Normal vibration should be less than 2 mils (Pump). Normal vibration should be less than 2 mils (Turbine).

(27) Position MSC control switch to fast raise at HSS (high speed stop) as noted by green indicating light above switch.

(28) The feed pump is now under air loading control from the ICS 36A(B) MCS in hand control. Place the EFP auto-start switch in the normal position.

NOTE: Upon loss of I.A. or ICS 36A/B MSC hand control, position MSC control switch to lower until a slight decrease in RPM's is noted, at this point take the applicable full range main speed

control switch to the ON position. With the MSC control switch you can now run the main F.W. pump to any RPM per valve ΔP/flow desired.

CAUTION: In this mode of operation an overspeed trip can occur since there is no high speed stop, which was defeated by the full range speed control switch. (Stay below 5,500 RPM's.)

(29) Close FW-V6, feed pump by-pass valve, control on console C.L.

(30) As plant heat-up is continued to a temperature of 532°F, FW-P1A(B) will be controlled from ICS-36A(B) MCS in hand to maintain steam generator level.

(31) When primary plant temperature reaches 532°F place the main feed water valves FW-V17A & B control stations ICS-35A & B in auto from console C.C., when direction by the plant heatup and startup procedures.

NOTE: When transferring a control station from hand to auto, depress auto pushbutton and hold until auto light is on.

(32) Place FPT-A(B) in auto from ICS-36A(B) MCS on console C.L.

(33) After the main turbine is on line (+ ≃ 5-10% Rx power) and low pressure steam becomes available from moisture separator #4 through EX-V10A(B) to the L.P. stop valve for FPT-A(B) cycle open then close TD-V11A(B). The L.P. stop valve drains by positioning C/S on PLF to position 2 then to off.

(34) Note control valve indication on panel PLF as FPT-A(B) automatically transfers to L.P. steam supply. H.P. steam control valve will close and L.P. steam control valve will control steam flow to turbine.

(35) As plant load increases, the feedwater control system will lift off level control. The OTSG level increase clearing OTSG low level limit alarm.

(36) Refer to Section 3.3.1.2 steps 39 through 41 to place feed system in full power lineup with both pumps operating.

(37) As soon as plant conditions permit, warm-up FW-P1B(A) and place on manual control at minimum speed of ICS-36B(A) MCS. Same procedure as used for FW-P1A(B).

3.3.5 Operation at 660 MWe with one feedwater pump operating.

1. When it is desired to operate the plant up to 660 MWe using only one feed pump, on approval from the Shift Supervisor, increase the feed pump limit by the following procedure.

   a. Plug DVM in 1-5-6 power supply #2 in ICS cabinets.

   b. Voltage should be + 1.7 vdc.

   c. Adjust screw pot for 3.200 vdc.

      (This corresponds to 660 MWe load demand).

   The plant may now be increased to 660 MWe load or maintained at that level.

2. After two feed pumps are in operation, on approval from the Shift Supervisor, decrease the feed pump ICS limit by the following procedure.

   a. Plug DVM in 1-5-6 power supply #2 in ICS cabinets.

   b. Voltage should be 3.200 vdc.

   c. Adjust screw pot for + 1.7 vdc.

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3.4 By-passing One H.P. Heater String

3.4.1 Prerequisites

1. The feed system is operating normally per Section 3.3.2 of this procedure.

3.4.2 Procedure

Either H.P. heater string may be bypassed for maintenance and plant operation at rated power continued. This procedure is for routine heater removal for maintenance and not intended to be used as an emergency procedure. Care must be used when isolating a heater string to insure that all drains, vents, and extraction steam lines have been isolated from the heaters being taken out of service. Extraction steam supply to heaters will be secured first. After the H.P. heater string being isolated has cooled down, feed water flow can be stopped by closing the H.P. heater inlet valve FW-V-2A(B) and simultaneously opening teh H.P. heater by-pass valve FW-V4. Monitor feed water header pressure P.I.-32 on computer while opening FW-V4 and maintain pressure at approximately the same value prior to isolating heater string. During this operation monitor primary systems parameters as changes in temperature and power can be expected due to cooler feedwater entering the steam generators. When heaters are returned to service, feed water flow will be extablished first and extraction steam last. This procedure covers the feed water section of the system, tube side of the H.P. heaters. For detailed operation of vents, drains, and extraction steam, refer to appropriate operating procedure.

1. Reduce Reactor Power to 75% to minimize transient shock to FW Heaters.
2. On the H.P. heater string being removed from service, slowly close manual extraction steam supply valve EX-V12A or 12B to the 2ND stage heater.
3. After 2ND stage heater cools to the temperature of the feed water leaving the 4TH stage heater, close EX-V1A or EX-V1B extraction steam supply to 4TH stage heater being isolated.
4. Close operating vent line valves to main condenser on H.P. heaters that were removed from service.
5. Close manual drain valves HD-V13A or 13B and check closed HD-V14A or 14B to isolate H.P. heater drain line from 6TH stage heater.

   NOTE: If extraction steam leakage causes heater relief valve to lift, open HD-V10A(B) by setting LC2A(B) setpoint to zero.
6. After isolated H.P. heaters have cooled to about the discharge temp. of feed pumps and system has stabilized, note pressure reading on PI-32 on computer.
7. To secure feed water flow thru heaters, manually close FW-V3A or 3B H.P. heater string A and B outlet valves, and simultaneously from the Control Room, jog open FW-V4 H.P. heater by-pass valve to maintain pressure on PI-32 within ± 15 psig of reading prior to isolation of heaters.
8. On isolated H.P. heater string, close inlet valve FW-V2A or 2B.

9. When system stabilized, FW-V4 can be adjusted to obtain optimum operation.

10. Increase Rx Power to 100% MW thermal. Adjust FW-V4 as required to maintain pressure on P1-32.

11. The heater string is now isolated and maintenance can be performed after system has been properly tagged out.

12. When returning isolated heater string to service at 100% full power (or any other power level), establish feed water flow first. Open the equalizing valve on FW-V3A or 3B or isolated string. If heaters have been drained, vent tube side. Crack FW-V3A or 3B off its seat and allow heaters to reach an equilibrium pressure. (Monitor at PX-54 or 55 if available).

13. Open the equalizing valve on FW-V2A or 2B. Maintain pressure on P1-32 within $\pm$ 15 PSIG by closing FW-V4 as needed. Insure heaters are properly vented. Crack FW-V2A or 2B off its seat. Allow pressure to become stable (Monitor on PX 54 or 55 if available). Open FW-V3A or 3B from the control room. Open FW-V2A or 2B from control room and maintain pressure on P1-32 within $\pm$ 15 PSIG by closing FW-V4 as needed.

14. Line up isolated heaters string vent and drains for normal operation.

15. Open equalizing valve on EX-V1A or 1B to 4th stage heater. Crack EX-V1A or 1B off its seat and allow the heater temperature to stabilize. Monitor reactor thermal power in the control room and adjust as needed. Open EX-V1A or 1B from the control room.

16. After the 4th stage heater has reached operating temperature and the outlet feed water temperature of the 2nd stage heater equals the discharge temperature of the 4th stage heater, apply steam to the 2nd stage heater as follows. Open the equalizing valve on EX-V12A or 12B. Monitor reactor thermal power in the control room and adjust as needed. Crack EX-V12A or 12B off its seat. Allow temperatures to stabilize. Slowly open EX-V12A or 12B.
17. Close any equalizing valves which were opened to place the heater string in service.
18. The system is now in a normal operating configuration. Adjust reactor power to 2535 MWT, or as required depending on desired power level.

3.4.3 High and Low Speed Stop and Overspeed Testing of the Feedwater Pump Turbines.

3.4.3.1 Prerequisites

1. FPT uncoupled from pump.
2. Vacuum on FPT condenser and main condenser.
3. FPT operable under all normal conditions.
4. FPT controller (ICS) in "HAND" and set for minimum speed signal.

3.4.3.2 Equipment

1. Strobe tach.
2. Fram Tach.
3. Frequency counter or other device to verify speed.
4. Hand tools.

3.4.3.3 Procedure

1. Verify the following:
   a. Oil temperatures normal.
   b. Oil pressures normal.
   c. Vacuum trip reset.
   d. Low pressure steam available up to the L.P. stop valves.
2. Reset the turbine locally by pulling on the reset handle.
3. Roll the Unit to approximately 2000 RPM using the handwheel on the motor speed changer.
4. Continue increasing speed, in approximately 50 RPM increments, until no further speed increase results. This speed corresponds to the low speed stop setting of the air motor. Record this value on the data sheet.
5. Continue turning the handwheel until it reaches its physical stop (MSC - high speed stop).
6. Using the feed pump speed controller at the Control Room Operator's panel, increase turbine speed to approximately 5400 RPM.
7. Perform an "Overspeed Trip Test" from the panel on the turbine. Record results on the data sheet.

   NOTE: If this test is not successfully completed, no attempt is to be made to overspeed the unit.
8. Verify action of the Backup Overspeed Device as follows:
   a. Energize the "Lockout Valve" as performed in step (7).

NOTE: The lockout handle must be held in the "locked out" position throughout the entire backup overspeed check. If this test is not successful, it is permissable to overspeed the turbine, but the Backup Overspeed Device must be adjusted.

b. Continue increasing speed slowly while observing the "lockout" and "normal" lamps on the turbine panel. When the "lockout" light goes out and the "normal" light comes on, the action of the Backup Overspeed Device is verified. Record this speed on the data sheet.

9. Continue increasing speed until the high speed stop of the air motor is reached. Record this speed on the data sheet.

10. Back-off the motor speed changer handwheel until the turbine speed decreases slightly.

11. At the Control Room Operator's panel, energize SV-7 by placing the FPT "Full Range Man Speed Control" switch in the "On" position.

NOTE: In order to reach the trip speed with an air motor/ MSC system it is necessary to use the SV-7 Hydraulic Jack because the fixed high speed stop of the air motor is not moveable. By energizing SV-7, speed control is transferred entirely to the MSC.

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12. Continue increasing speed using the MSC handwheel until the high speed stop is reached. Record this speed on the data sheet.

    NOTE: For the overspeed test, speed should be increased slowly so that the instruments may be observed to accurately record the speed at which the turbine trips.

13. Using a large screwdriver, depress the spring-loaded pin in the fulcrum nut and slowly turn the MSC handwheel until the pin passes the high speed stop.

14. Continue increasing the turbine speed until the trip speed is obtained.

    NOTE: Trip speed should occur between 5990 RPM and 6110 RPM.

    CAUTION: Do not attempt to increase turbine speed beyond the upper limit of the trip speed range. If no trip occurs within the given range, the turbine must be secured and the G.E. Co. notified.

15. Record the trip speed on the data sheet.

16. Verify all valves tripped closed.

17. Return the MSC handwheel to the low speed stop. It will be necessary to depress the spring loaded pin in the fulcrum nut.

18. Secure the turbine in a normal manner.

    NOTE: If the turbine fails to trip, adjust the emergency governor and reperform steps 14 thru 18.

OVERSPEED TEST DATA SHEET

1. Turbine Tested _____
2. Turbine Condition (Secured, operating on High pressure/Aux. boiler/Extraction). _____
3. Low Pressure Inlet Steam _____
4. High Pressure Inlet Steam _____ _____
5. Air Motor Low Speed Stop _____
6. Overspeed Governor Exerciser/Oil trip did lockout, reset trip lights and overspeed bolt functioned properly. _____
7. Backup Overspeed Test
   Record speed at which lockout and normal lights change states. _____
8. Air Motor High Speed Stop _____
9. M.S.C. High Speed Stop _____
10. Overspeed Trip Speed _____

DESIGN DATA

		L.P. Steam	H.P. Steam
1.	High Speed Stop (Air Motor and MSC)	5830rpm	5630rpm
2.	Air Motor Low Speed Stop	3680rpm	3270rpm
3.	Backup Trip Speed	5775rpm	
4.	Overspeed Trip Speed	5990 to 6110rpm	

Enclosure I

3.5.1 Startup Valve Lineup Checklist - Feed System

Valve	Name or Function	Position	Initial
	Turbine Bldg. 305' elev. near Condensate Booster Pumps		
FW-V-89	Penetration 210 isolation test valve	closed	_____
FW-V-90	Penetration 211 isolation test valve	closed	_____
	Under & south of 1A Aux. Condenser		
FW-V21A	FWP 1A Disch. Hdr. Drain	closed	_____
22A	FWP 1A Disch. Hdr. Drain	closed	_____
23A	FWP 1A Disch. Hdr. Drain	closed	_____
24A	FWP 1A Disch. Hdr. Drain	closed	_____
1033	PX 609A Pri. Isol.	closed	_____
1035	PX 609A Sec. Isol.	closed	_____
1009	PI 62 Pri. Root	open	_____
1010	PI 62 Sec. Root	open	_____
1041	PT 62 & DPS 542 Prim. Hi Side Drain	closed	_____
	Under & north of 1A Aux. Condenser at TC-V-9A		
TD-V14A	H.P. S.V. above Seat Drain Trap Inlet	open	_____
15A	H.P. S.V. above Seat Drain Trap Outlet	open	_____
21A	H.P. S.V. above Seat Drain Trap Drain	closed	_____
	North side of 1A Aux. Condenser		
TD-V23A	H.P. S.V. Below Seat Drain Isolation Valve	open	_____
24A	Spare Collection Header Drain Isolation Valve	closed	____
	Connection #16 Collection Header Main Condenser		
16A	H.P. S.V. Below Seat Drain Trap Inlet	open	_____
17A	H.P. S.V. Below Seat Drain Trap Outlet	open	_____
22A	H.P. S.V. Below Seat Drain Trap Drain	closed	_____
25	H.P. S.V. Header Connection Isolation Valve	open	_____

Enclosure I (cont'd)

	Under & North of 1A Aux. Condenser at TD-V12A		
18A	L.P.S.V. Below Seat Drain Trap Inlet	open	_____
19A	L.P.S.V. Below Seat Drain Trap Outlet	open	_____
20A	L.P.S.V. Below Seat Drain Trap Drain	closed	_____
	Under & South of 1B Aux. Condenser		
FW-V21B	FWP 1B Disch. Hdr. Drain	closed	_____
22B	FWP 1B Disch. Hdr. Drain	closed	_____
23B	FWP 1B Disch. Hdr. Drain	closed	_____
24B	FWP 1B Disch. Hdr. Drain	closed	_____
1034	PX 609B Pri. Isol.	closed	_____
1036	PX 609B Sec. Isol.	closed	_____
1011	PI 63 Primary Root	open	_____
1012	PI 63 Sec. Root	open	_____
1042	PT 63 & DPS 543 Prim. Hi Side Drain	closed	_____
	Under & North of 1B Aux. Condenser at TD-V-9B		
TD-V14B	H.P. S.V. above Seat Drain Trap Inlet	open	_____
15B	H.P. S.V. above Seat Drain Trap Outlet	open	_____
21B	H.P. S.V. above Seat Drain Trap Drain	closed	_____
	North Side of 1B Aux. Condenser		
TD-V23B	H.P. S.V. Below Seat Drain Location Valve	open	_____
24B	Spare Collection Header Drain Location Valve	closed	_____
	Connection #16 Collection Header Main Condenser		
16B	H.P.S.V. Below Seat Drain Trap Inlet	open	_____
17B	H.P.S.V. Below Seat Drain Trap Outlet	open	_____
22B	H.P.S.V. Below Seat Drain Trap Drain	closed	_____

ENCLOSURE I (cont'd)

Under & North of 1B Aux. Condenser at TD-V12B

18B	L.P.S.V. Below Seat Drain Trap Inlet	open	_____
19B	L.P.S.V. Below Seat Drain Trap Outlet	open	_____
20B	L.P.S.V. Below Seat Drain Trap Drain	closed	_____

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Enclosure I (cont'd)

Valve	Name or Function	Position	Initial
	Under 1A Aux. Cond. at S.E. Corner		
FW-V10A	FWP1A Recirc. Line Inlet Isolation	Locked Open	_____
65A	Chem. Clean Drain Upstream of FW-V10A	Closed	_____
66A	Chem. Clean Drain Upstream of FW-V10A	Closed	_____
67A	Chem. Clean Tell Tale Downstream of FW-V10A	Closed	_____
68A	Chem. Clean Tell Tale Downstream of FW-V10A	Closed	_____
	Under 1B Aux. Cond. at S.E. Corner		
FW-V10B	FWP1B Recirc. Line Inlet Isol.	Locked Open	_____
65B	Chem. Clean Drain Upstream of FW-V10B	Closed	_____
66B	Chem. Clean Tell Tale Upstream of FW-V-10B	Closed	_____
67B	Chem. Clean Tell Tale Downstream of FW-V-10B	Closed	_____
68B	Chem. Clean Tell Tale Downstream of FW-V10B	Closed	_____
	1st Floor 10' up S. of Col. F-3		
1031	PX-608A Isol.	Closed	_____
	1st Floor 10' up E. of Col. G-4		
1032	PX-608B Isol.	Closed	_____
	1st Floor 10' up S. of Col. F-3		
1077	PI-77 Primary Root	Closed	_____
1078	PI-77 Secondary Root	Closed	_____
	1st Floor 8' up E. of Col. G-4		
1079	PI-78 Primary Root	Closed	_____
1080	PI-78 Secondary Root	Closed	_____
	1st Floor 15 ft. up a N. End of Cond.		
63	Drain on Recycle Line between FW-V-8 & Cond.	Closed	_____
64	Drain on Recycle Line between FW-V-8 & Cond.	Closed	_____

ENCLOSURE I (CONT'D)

Valve	Name or Function	Position	Initial
	1st Floor N.E. Of Cond. At Concrete Col.		
FW-V14	6" Flush Line to Cond. Pit from Recycle Line	Close	_____
	2nd Floor Of Inter. Bldg.		
	Turbine Bldg. 322 Elev. Near Gland Stm. Condenser		
FW-V-86A	Stm. Gen. A Hot Drains Reg. Valve	Close	_____
86B	Stm. Gen. B Hot Drains Reg. Valve	Close	_____
91A	Stm. Gen. A Hot Drains Vent	Close	_____
91B	Stm. Gen. B Hot Drains Vent	Close	_____
49B	Drain for S.G. "B" Feed Control Block Valve	Open	_____
50B	Drain for S.G. "B" Feed Control Block Valve	Close	_____
	2nd Floor Of Inter. Bldg. - Top Of Pipe Downstream Of Check Valve		
85B	Feed Reg. and Startup Valve Bypass	Close	_____
92B	Startup Valve Isolation Valve	Close	_____
51	Feed Hdr. Vent to S.G. "B"	Close	_____
52	Feed Hdr. Vent to S.G. "B"	Close	_____
	Inter. Bldg. 2nd Floor 10' Above Block Valve		
FW-V-16A	Verify Lined-up For Automatic Operation (i.e., pin pulled, hand wheel backed off, and control box lever in Auto.)		
FW-V-17A	Verify Lined-up For Automatic Operation (i.e., pin pulled, hand wheel backed off, and control box lever in Auto.)		
1070	SP 11B DP-T18 DP-T2 Hi Side Prim. Root	Open	_____
1071	SP 11B DP-T18 DP-T2 Hi Side Sec. Root	Open	_____

ENCLOSURE I (CONT'D)

Valve	Name or Function	Position	Initial
Inter. Bldg. 2nd Floor At Startup Vlv. On E. Wall			
1072	SP 11B DP-T18 DP-T2 Lo Side Prim. Root	Open	_____
1073	SP 11B DP-T18 DP-T2 Lo Side Sec. Root	Open	_____
Inter. Bldg. 2nd Floor 15' Up Above S.U. Valve			
1062	FE 7BSP SP7B DPT Hi Side Prim. Root	Open	_____
1063	FE 7BSP SP7B DPT Hi Side Sec. Root	Open	_____
1064	FE 7BSP SP7B DPT Lo Side Prim. Root	Open	_____
1065	FE 7BSP SP7B DPT Lo Side Sec. Root	Open	_____
Inter. Bldg. 2nd Floor Last Cubicle Back To The E. Approx. 25' Up On A FW Line			
1054	SP-8B-FE Hi Side Prim. Root	Open	_____
1055	SP-8B-FE Hi Side Sec. Root	Open	_____
1056	SP-8B-FE Lo Side Prim. Root	Open	_____
1057	SP-8B-FE Lo Side Sec. Root	Open	_____

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Enclosure I (cont'd)

Valve	Name or Function	Position	Initial
	Pressure Transmitter Rack 2nd Fl. or Inter. Bldg.		
FW-V1175	SP-8B DPT1 Lo Side Isolation	Open	_____
1176	SP-8B DPT1 Equalizing Valve	Close	_____
1177	SP-8B DPT1 Hi Side Isolation	Open	_____
1178	SP-8B DPT2 Lo Side Isolation	Open	_____
1179	SP-8B DPT2 Equalizing Valve	Close	_____
1180	SP-8B DPT2 Hi Side Isolation	Open	_____
1181	SP-11B DPT1 Lo Side Isol.	Open	_____
1182	SP-11B DPT1 Equalizing Valve	Close	_____
1183	SP-11B DPT1 Hi Side Isol.	Open	_____
1184	SP-11B DPT2 Lo Side Isol.	Open	_____
1185	SP-11B DPT2 Equalizing Valve	Close	_____
1186	SP-11B DPT2 Hi Side Isol.	Open	_____
1187	SP-7B DPT Lo Side Isolation	Open	_____
1188	SP-7B DPT Equalizing Valve	Close	_____
1189	SP-7B DPT Hi Side Isol.	Open	_____
1194	SP-8B DPT1 & 2 Hi Side Drain	Close	_____
1195	SP-8B DPT1 & 2 Lo Side Drain	Close	_____
1196	SP-11B DPT1 & 2 Lo Side Drain	Close	_____
1197	SP-11B DPT1 & 2 Hi Side Drain	Close	_____
1198	SP-7B DPT Hi Side Drain	Close	_____
1199	SP-7B DPT Lo Side Drain	Close	_____
	2nd Fl. W. Side of Condenser		
FW-V11A	FW-P-1A Recirc. to Condenser	Locked Open	_____
11B	FW-P-1B Recirc. to Condenser	Locked Open	_____

ENCLOSURE I (CONT'D)

Valve	Name or Function	Position	Initial
2nd Floor W. Of LP Moisture Collection Tank Under Lo Load Control Valve			
FW-V49A	Drain for S.G. "A" Feed Control Valve	Open	_____
50A	Drain for S.G. "A" Feed Control Valve	Close	_____
2nd Floor Turbine Bldg. Downstream Of F.W. Cont. Valves Near Floor Level			
85A	Feed Reg. and Startup Valve Bypass	Closed	_____
92A	Startup Valve Isolation Valve	Closed	_____
53A	Feed Hdr. Drain to S.G. "A"	Close	_____
54A	Feed Hdr. Drain to S.G. "A"	Close	_____
2nd Floor At Column G5 20' Up			
41	Vent on Line to S.G. "A" Control Valves	Open	_____
42	Vent on Line to S.G. "A" Control Valves	Close	_____
2nd Floor W. Of Column G-5 15' Up			
FW-V-16B	Verified Lined-up For Automatic Operation (i.e., pin pulled, handwheel backed off, control box lever in Auto.)		
FW-V-17B	Verified Lined-up For Automatic Operation (i.e., pin pulled, handwheel backed off, control box lever in Auto.0		
1066	SP-11A DPT1 & DPT2 Hi Side Prim. Root	Open	_____
1067	SP-11A DPT1 & DPT2 Hi Side Sec. Root	Open	_____
2nd Floor W. Of LP Moist. Coll. Tank Downstream Of 16A Before Check Valve			
1069	SP-11A DPT1 & DPT2 Lo Side Sec. Root	Open	_____

1135 198

ENCLOSURE I (CONT'D)

Valve	Name or Function	Position	Initial
2nd Floor Upstream Of 16A About 25' In Air			
1050	SP7A-FE Hi Side Prim. Root	Open	_____
1051	SP7A-FE Hi Side Sec. Root	Open	_____
1052	SP7A-FE Lo Side Prim. Root	Open	_____
1053	SP7A-FE Lo Side Sec. Root	Open	_____
FWV 1047	Instrument Test Valve	Shut	_____
1048	Instrument Test Valve	Shut	_____
1049	Instrument Test Valve	Shut	_____
1076	Instrument Test Valve	Shut	_____

1135 199

Enclosure I (cont'd)

Valve	Name or Function	Position	Initial
	S.W. of 1B Feed Pump 25' up on W.Side of Feedwater Line		
FW-V1043	SP8A-FE Hi Side Prim. Root	Open	_____
1044	SP8A-FE Lo Side Prim. Root	Open	_____
1045	SP8A-FE Lo Side Sec. Root	Open	_____
1046	SP8A-FE Hi Side Sec. Root	Open	_____
	2nd Fl. Pres. Trans. Rack S.W. of 1B FPT		
	All the following valves located on the front or east side of rack:		Rev 1
FW-V1127	PT-62 Isolation	Open	_____
1128	PT-63 Isolation	Open	_____
1129	FW FT-7 Lo Side Isol.	Open	_____
1130	FW FT-7 Equalizing Valve	Close	_____
1131	FW FT-7 Hi Side Isol.	Open	_____
1132	FW FC-7 Lo Side Isol.	Open	_____
1133	FW FC-7 Equalizing Valve	Close	_____
1134	FW FC-7 Hi Side Isol.	Open	_____
1135	FW FT-7 Lo Side Isol.	Open	_____
1136	FW FT-8 Equalizing	Close	_____
1137	FW FT-8 Hi Side Isol.	Open	_____
1138	FW FC-8 Lo Side Isol.	Open	_____
1139	FW FC-8 Equalizing Valve	Close	_____
1140	FW FC-8 Hi Side Isol.	Open	_____
1141	PT-64 Isol.	Open	_____
1142	SP7A DPT Lo Side Isol.	Open	_____

Enclosure I (cont'd)

Valve	Name or Function	Position	Initial
	2nd Fl. Pres. Trans. Rack S.W. of 1B FPT (cont'd)		
FW-V1143	SP7A DPT Equalizing Valve	Close	_____
1144	SP7A DPT Hi Side Isol.	Open	_____
1145	SP8A DPT 1 Lo Side Isol.	Open	_____
1146	SP8A DPT 1 Equalizing Valve	Close	_____
1147	SP8A DPT 1 Hi Side Isol.	Open	_____
1148	SP8A DPT 2 Lo Side Isol.	Open	_____
1149	SP8A DPT 2 Equalizing Valve	Close	_____
1150	SP8A DPT 2 Equalizing Valve	Open	_____
1151	SP11A DPT 1 Hi Side Isol.	Open	_____
1152	SP11A DPT 1 Equalizing Valve	Close	_____
1153	SP11A DPT 1 Lo Side Isol.	Open	_____
1154	SP11A DPT 2 Hi Side Isol.	Open	_____
1155	SP11A DPT 2 Equalizing Valve	Close	_____
1156	SP11A DPT 2 Lo Side Isol.	Open	_____
	2nd Fl. P.T. Rack S.W. of 1B FPT		
	These valves on rear or west side of rack:		
1157	SP11A DPT 1 & 2 Lo Side Drain	Close	_____
1158	SP11A DPT 1 & 2 Hi Side Drain	Close	_____
1159	SP8A DPT 1 & 2 Lo Side Drain	Close	_____
1160	SP8A DPT 1 & 2 Hi Side Drain	Close	_____
1161	SP7A DPT Hi Side Drain	Close	_____
1162	SP7A DPT Lo Side Drain	Close	_____
1163	PT-64 Drain	Close	_____

Enclosure I (cont'd)

Valve	Name or Function	Position	Initial
	2nd Fl. P.T. Rack S.W. of 1B FPT - (cont'd)		
FW-V1167	FT-8, FC-8 Hi Side Drain	Close	_____
1168	FT-8, FC-8 Lo Side Drain	Close	_____
1169	FT-7, FC-7 Hi Side Drain	Close	_____
1170	FT-7, FC-7 Lo Side Drain	Close	_____
1171	PI-63 & PT-63 Drain	Close	_____
1172	PI-62 & PT-62 Drain	Close	_____
1173	PI-78 Drain	Close	_____
1174	PI-77 Drain	Close	_____
1123	PI-77 Isol.	Open	_____
1124	PI-62B Isol.	Open	_____
1125	PI-78 Isol.	Open	_____
1126	PI-63B Isol.	Open	_____
	East Side of F.W. Header		
47	Sample Point CE-6 Isol. Feed Hdr.	Open	_____
48	Sample Point CE-6 Isol. Feed Hdr.	Open	_____
	2nd Fl. 15' up, above Feedwater Header		
59	Sample Point CE-7 Isol. Recycle Line	Close	_____
60	Sample Point CE-7 Isol. Recycle Line	Close	_____
	2nd Fl. W. of 1A FPT on F.W. Hdr.		
13	Cleanup Recycle Line Isol.	Close	_____
	2nd Fl. North End of Feedwater Header		
43	30" Feed Hdr. Drain	Close	_____
44	30" Feed Hdr. Drain	Close	_____

Enclosure I (cont'd)

Valve	Name or Function	Position	Initial
	2nd Fl. W. of 1A FPT on Top of Header in Center		
FW-V1013	PT-64 Prim. Root	Open	_____
1014	PT-64 Sec. Root	Open	_____
	2nd Floor 20 ft. up at entry point of line to Inter. Bldg.		
45	Vent on Line to S.G. "B" Feed Control Valves	Open	_____
46	Vent on Line to S.G. "B" Feed Control Valves	Close	_____
	2nd Floor on Col. G-3 near F.W. Hdr.		
1081	DPS-542 Lo Side Drain	Close	_____
1113	DPS-542 Sec. Hi Side Drain	Close	_____
1082A	DPS-542 Hi Side Isol.	Open	_____
1082B	DPS-542 Lo Side Isol.	Open	_____
1082C	DPS-542 Equalizer	Close	_____
1082D	DPS-542 Equalizer Drain	Close	_____
	2nd Fl. on Col. G-4 near 1B FPT		
1083	DPS-543 Lo Side Drain	Close	_____
1114	DPS-543 Sec. Hi Side Drain	Close	_____
1084A	DPS-543 Hi Side Isol.	Open	_____
1084B	DPS-543 Lo Side Isol.	Open	_____
1084C	DPS-543 Equalizer	Close	_____
1084D	DPS-543 Equalizer Drain	Close	_____

Enclosure I (cont'd)

Valve	Name or Function	Position	Initial
	8 ft. below Turbine floor N. of S.G. Relief Valves at Upper Stairway Landing		
FW-V61	Cleanup Recycle Line Vent	Close	_____
62	Cleanup Recycle Line Vent	Close	_____
	4th Fl. 15' up in Center of 10A & 10B Htrs.		
33A	4th Stage H.P. Htr. A Inlet Line Drain	Close	_____
34A	4th Stage H.P. Htr. A Inlet Line Drain	Close	_____
33B	4th Stage H.P. Htr. B Inlet Line Drain	Close	_____
34B	4th Stage H.P. Htr. B Inlet Line Drain	Close	_____
	4th Flo. 15' up S. of 2A & 2B Heaters		
37A	Drain on Line between 4th & 2nd Stage A Htrs.	Close	_____
38A	Drain on Line between 4th & 2nd Stage A Htrs.	Close	_____
37B	Drain on Line between 4th & 2nd Stage B Htrs.	Close	_____
38B	Drain on Line between 4th & 2nd Stage B Htrs.	Close	_____
	4th Fl. East of 8A Heater 15' up		
1001	FE-7 Hi Side Prim. R.V.	Open	_____
1002	FE-7 Hi Side Sec. R.V.	Open	_____
1003	FE-7 Lo Side Prim. R.V.	Open	_____
1004	FE-7 Lo Side Sec. R.V.	Open	_____
	4th Fl. South end of 8B Htr. 15' up		
1005	FE-8 Hi Side Prim. R.V.	Open	_____
1006	FE-8 Hi Side Sec. R.V.	Open	_____
1007	FE-8 Lo Side Prim. R.V.	Open	_____
1008	FE-8 Lo Side Sec. R.V.	Open	_____

Enclosure I (cont'd)

Valve	Name or Function	Position	Initial
	5th Fl. 15' up on top of Line S.E. of 2A Htr.		
FW-V25	Feed Pump Bypass Line Vent	Close	_____
26	Feed Pump Bypass Line Vent	Close	_____
	5th Fl. 15' up between H.P. Htr. Hdr. and 4th Stage Htrs.		
31A	4th Stage H.P. Htr. "A" Inlet Line Vent	Close	_____
32A	4th Stage H.P. Htr. "A" Inlet Line Vent	Close	_____
31B	4th Stage H.P. Htr. "B" Inlet Line Vent	Close	_____
32B	4th Stage H.P. Htr. "B" Inlet Line Vent	Close	_____
	5th Fl. 20' up above Header on Right & Left		
35A	Vent on Line between 4th & 2nd "A" Htrs.	Close	_____
36A	Vent on Line between 4th & 2nd "A" Htrs.	Close	_____
35B	Vent on Line between 4th & 2nd "B" Htrs.	Close	_____
36B	Vent on Line between 4th & 2nd "B" Htrs.	Close	_____
	5th Fl. in center of Header on North Side		
27	H.P. Htr. Inlet Header Drain	Close	_____
28	H.P. Htr. Inlet Header Drain	Close	_____
	5th Fl. W. of 2B Htr. 15' up on top of S. & Centerlines		
39A	2nd Stage H.P. Htr. "A" Outlet Line Vent	Close	_____
40A	2nd Stage H.P. Htr. "A" Outlet Line Vent	Close	_____
39B	2nd Stage H.P. Htr. "B" Outlet Line Vent	Close	_____
40B	2nd Stage H.P. Htr. "B" Outlet Line Vent	Close	_____

Enclosure I (cont'd)

Valve	Name or Function	Position	Initial
	5th Fl. W. of 2B Htr. 15' up on top of North Line		
FW-V29	H.P. Heater Bypass Line Vent	Close	_____
30	H.P. Heater Bypass Line Vent	Close	_____
	5th fl. W. of 2B Htr. on W. Side of Centerline at Face Level		
1023	PX 58 Prim. Isol.	Close	_____
1024 (not inst.)	PX 58 Sec. Isol.	Close	_____
	5th Fl. W. of 2B Htr. on W. Side of South Line at Face Level		
1025	PX 59 Prim. Isol.	Close	_____
1026 (not inst.)	PX 59 Sec. Isol.	Close	_____
	5th Fl. North of Hdr. on Line to 2A Htr.		
1019	PX 56 Prim. Isol.	Close	_____
1020 (not inst.)	PX 56 Sec. Isol.	Close	_____
	5th Fl. North of Hdr. on Line to 2B Htr.		
1021	PX 57 Prim. Isol.	Close	_____
1022 (not inst.)	PX 57 Sec. Isol.	Close	_____
	5th Fl. South Side of Hdr. on Line to 4B Htr.		
1017	PX 55 Prim. Isol.	Close	_____
1018 (not inst.)	PX 55 Sec. Isol.	Close	_____
	5th Fl. South Side of Hdr. on Line to 4A Htr.		
1015	PX 54 Prim. Isol.	Close	_____
1016 (not inst.)	PX 54 Sec. Isol.	Close	_____

Valve	Name or Function	Position	Initial
	Rx Bldg. Basement S. of Elevator Platform on P.T. Rack on the Left		
FW-V1200	SP1A-LT1 Lo Side Isolation	Open	
1201	SP1A-LT1 Equalizing Valve	Close	
1202	SP1A-LT1 Hi Side Isolation	Open	
1203	SP1A-LT2 Lo Side Isolation	Open	
1204	SP1A-LT2 Equalizing Valve	Close	
1205	SP1A-LT2 Hi Side Isolation	Open	
1206	SP1A-LT3 Lo Side Isolation	Open	
1207	SP1A-LT3 Equalizing Valve	Close	
1208	SP1A-LT3 Hi Side Isolation	Open	
1209	SP1A-LT4 Lo Side Isolation	Open	
1210	SP1A-LT4 Equalizing Valve	Close	
1211	SP1A-LT4 Hi Side Isolation	Open	
1212	SP1A-LT5 Lo Side Isolation	Open	
1213	SP1A-LT5 Equalizing Valve	Close	
1214	SP1A-LT5 Hi Side Isolation	Open	
1215	SP1A-LT1 Lo Side Drain	Close	
1216	SP1A-LT1 Hi Side Drain	Close	
1217	SP1A-LT3 Lo Side Drain	Close	
	Rx. Bldg. 281 Elev. near R.C. Drain Tank Vault		
FW-V-87A	Steam Gen. 1A Hot Drains Isolation Valves	Open	
87B	Steam Gen. 1B Hot Drains Isolation Valves	Open	
88A	Steam Gen. 1A Hot Drains Cooler Drain	Close	
88B	Steam Gen. 1B Hot Drains Cooler Drain	Close	
95A	Steam Gen. 1A Hot Drains Cooler Upstream Drain	Close	
95B	Steam Gen. 1B Hot Drains Cooler Upstream Drain	Close	
	Rx Bldg. Basement South of Elevator Platform on P.T. Rack on the Left		
FW-V1218	SP1A-LT3 Hi Side Drain	Close	
1219	SP1A-LT2 Lo Side Drain	Close	
1220	SP1A-LT2 Hi Side Drain	Close	

Enclosure I (cont'd)

Valve	Name or Function	Position	Initial
	Rx Bldg. Basement South of Elevator Platform on P.T. Rack on the Left (cont'd)		
FW-V1221	SP1A-LT4 Lo Side Drain	Close	_____
1222	SP1A-LT4 Hi Side Drain	Close	_____
1223	SP1A-LT5 Lo Side Drain	Close	_____
1224	SP1A-LT5 Hi Side Drain	Close	_____
	Bsmt. on Walkway around SG at N.E. Check Hi		
83A	SG FW Shell Side Drain	Open	_____
	Bsmt. on Walkway at N.E. 8' Overhead		
78A	SG FW Annulus Bottom Drain	Close	_____
	Bsmt. Walkway at N.W. Face Level		
82A	SG FW Shell Side Drain	Open	_____
	Bsmt. Lower Walkway around SG on W. Side at Head Level		
1097	SP1A-LT1 Lo Side Prim. Root	Open	_____
1098	SP1A-LT1 Lo Side Sec. Root	Open	_____
	W. Side of S.G. approx. 15' above Lower Walkway		
1091	SP1A-LT3 Lo Side Prim. Root	Open	_____
1092	SP1A-LT3 Lo Side Sec. Root	Open	_____
	Bsmt. Walkway S.W. at Face Level		
81A	SG FW Shell Side Drain	Open	_____
	Bsmt. Walkway S. 10' up		
79A	SG FW Annulus Bottom Drain	Close	_____
	Bsmt. Walkway S.E. Face Level		
80A	SG FW Shell Side Drain	Open	_____

Enclosure (cont'd)

Valve	Name or Function	Position	Initial
	Bsmt. "A" S.G. Walkway S.E. at Head Level		
FW-V1087	SP1A-LT4 & 5 Lo Side Prim. Root	Open	_____
1088	SP1A-LT4 & 5 Lo Side Sec. Root	Open	_____
	Bsmt. SG Walkway E. Side 8' above Platform above Walkway		
1095	SP1A-LT2 Lo Side Prim. Root	Open	_____
1096	SP1A-LT2 Lo Side Sec. Root	Open	_____
	Bsmt. "B" SG Walkway N.E. 8' Overhead		
78B	SG FW Annulus Bottom Drain	Close	_____
	Bsmt. Walkway N.E. Face Level		
82B	SG FW Shell Side Drain	Open	_____
	Bsmt. Walkway N.W. Waist Level		
83B	SG FW Shell Side Drain	Open	_____
	Bsmt. Walkway N.W. Head Level		
1101	SP1B-LT4 & 5 Lo Side Prim. Root	Open	_____
1102	SP1B-LT4 & 5 Lo Side Sec. Root	Open	_____
	Bsmt. Walkway W. 8' above Platform above Walkway		
1109	SP1B-LT2 Lo Side Prim. Root	Open	_____
1110	SP1B-LT2 Lo Side Sec. Root	Open	_____
	Bsmt. Walkway S.W. 8' above Walkway		
79B	SG FW Annulus Bottom Drain	Close	_____
	Bsmt. Walkway S.W. Chest Level		
80B	SG FW Shell Side Drain	Open	_____
	Bsmt. Walkway S.E. Chest Level		
81B	SG FW Shell Side Drain	Open	_____

Enclosure I (cont'd)

Valve	Name or Function	Position	Initial
	Bsmt. Walkway S.E. Head Level		
FW-V1111	SP1B-LT1 Lo Side Prim. Root	Open	_____
1112	SP1B-LT1 Lo Side Sec. Root	Open	_____
	E. Side "B" SG approx. 30' above Bsmt. Flr. Just W. of DH-V-1		
1105	SP1B-LT3 Lo Side Prim. Root	Open	_____
1106	SP1B-LT3 Lo Side Sec. Root	Open	_____
	20' W. of Entrance to R.C. Drain Pump Room & 20' Overhead		
53B	Feed Hdr. Drain to S.G. "B" Prim.	Close	_____
54B	Feed Hdr. Drain to S.G. "B" Sec.	Close	_____
	Rx Bldg. Bsmt. W. of "B" S.G. on Outside Wall of Secondary Shield on P.T. Rack		
FW-V1225	SP1B-LT1 Lo Side Isolation	Open	_____
1226	SP1B-LT1 Equalizing Valve	Close	_____
1227	SP1B-LT1 Hi Side Isolation	Open	_____
1228	SP1B-LT2 Lo Side Isolation	Open	_____
1229	SP1B-LT2 Equalizing Valve	Close	_____
1230	SP1B-LT2 Hi Side Isolation	Open	_____
1231	SP1B-LT3 Lo Side Isolation	Open	_____
1232	SP1B-LT3 Equalizing Valve	Close	_____
1233	SP1B-LT3 Hi Side Isolation	Open	_____
1234	SP1B-LT4 Lo Side Isolation	Open	_____
1235	SP1B-LT4 Equalizing Valve	Close	_____
1236	SP1B-LT4 Hi Side Isolation	Open	_____

Enclosure I (cont'd)

Valve	Name or Function	Position	Initial
	RX Bldg. Bsmt. W. of "B" S.G. on Outside Wall of Secondary Shield on P.T. Rack (cont'd)		
FW-V1237	SP1B-LT5 Lo Side Isolation	Open	_____
1238	SP1B-LT5 Equalizing Valve	Close	_____
1239	SP1B-LT5 Hi Side Isolation	Open	_____
1240	SP1B-LT1 Lo Side Drain	Close	_____
1241	SP1B-LT1 Hi Side Drain	Close	_____
1242	SP1B-LT3 Lo Side Drain	Close	_____
1243	SP1B-LT3 Hi Side Drain	Close	_____
1244	SP1B-LT2 Lo Side Drain	Close	_____
1245	SP1B-LT2 Hi Side Drain	Close	_____
1246	SP1B-LT4 Lo Side Drain	Close	_____
1247	SP1B-LT4 Hi Side Drain	Close	_____
1248	SP1B-LT5 Lo Side Drain	Close	_____
1249	SP1B-LT5 Hi Side Drain	Close	_____
	N.W. Side S.G. "B" above FW Nozzles		
1107	SP1B-LT3 & 5 Hi Side Prim. Root	Open	_____
1108	SP1B-LT3 & 5 Hi Side Sec. Root	Open	_____
	Inside Sec. Shield on W. Wall below the T in Line to FW nozzles		
57B	Feed Hdr. Drain to S.G. "B" Prim.	Close	_____
58B	Feed Hdr. Drain to S.G. "B" Sec.	Close	_____
	E. Side of "B" S.G. & W. of Prim. Coolant Hotlegs 6' above 90° Bend in 36" Line (above FW Nozzles)		
1103	SP1B-LT2 & 4 Hi Side Prim. Root	Open	_____
1104	SP1B-LT2 & 4 Hi Side Sec. Root	Open	_____

1135 211

Enclosure I (cont'd)

Valve	Name or Function	Position	Initial
	N.W. Side of S.G. "A" above FW Nozzles and S. of R.C. Pump		
FW-V1089	SP1A-LT2 & 4 Hi Side Prim. Root	Open	_____
1090	SP1A-LT2 & 4 Hi Side Sec. Root	Open	_____
	Inside Sec. Shield on E. Wall below the T in Liine to FW Nozzles		
57A	Feed Hdr. Drain to S.G. "A"	Close	_____
58A	Feed Hdr. Drain to S.G. "A"	Close	_____
	S.E. Side of S.G. "A" above FW Nozzles		
1093	SP1A-LT3 & 5 Hi Side Prim. Root	Open	_____
1094	SP1A-LT3 & 5 Hi Side Sec. Root	Open	_____
	E. of 2nd Landing of Up Stairway at Equipment Hatch on top of FW Line		
55B	Feed Hdr. Vent to S.G. "B" Prim.	close	_____
56B	Feed Hdr. Vent to S.G. "B" Sec.	Close	_____
	2nd Fl. Elev. S. from Elevator 10' up at 90° Bend & Entry to Sec. Shield		
55A	Feed Hdr. Vent to S.G. "A" Prim.	Close	_____
56A	Feed Hdr. Vent to S.G. "A" Sec.	Close	_____
	S.E. Side of SG "A" at Very Top of S.G. Just below the Dome		
1085	SP1A-LT1 Hi Side Prim. Root	Open	_____
1086	SP1A-LT1 Hi Side Sec. Root	Open	_____
	N.W. Side of SG "B" at Very Top of SG Just below the Dome		
1099	SP1B-LT1 Hi Side Prim. Root	Open	_____
1100	SP1B-LT1 Hi Side Sec. Root	Open	_____

Performed By_____ Date_____
Signature

Reviewed By SRO
or RO License_____ Date_____
Signature