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1.0 SCOPE/APPLICABILITY

This procedure provides detailed instructions for performing the operations required to heatup and pressurize the reactor following criticality, and to increase reactor power to a level sufficient for main turbine loading.

2.0 DISCUSSION

This procedure involves the startup of turbine generator support systems, warming of the turbine generator, heatup and pressurizing the reactor to normal operating pressure and temperature, and increase reactor power to a level to allow turbine loading. Reactor heatup and pressurization will normally be integrated into an overall plant startup. Integrated Operating Procedures "Approach to Criticality" (IOP-1), "Heatup and Pressurization" (IOP-2), "Turbine Startup and Generator Synchronization" (IOP-3), and "Power Ascension and Power Changes " (IOP-4) should be initiated in such a manner as to provide an uninterrupted succession from one procedure to another.

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Reactor coolant system temperature[G33-TE-100] and pressure shall be determined to be within the applicable limits of Technical Specification Figure[later] at least once per 30 minutes during heatup and pressurization.

3.2 Maintain drywell pressure [B11-PIS-606 A,B,C,D]less than [0.06 kg/cm^2] in order to prevent inadvertent containment isolation and ECCS initiation.

3.3 Maintain drywell average temperature less than [57 °C].

3.4 Reactor vessel level [C31-LT-N004A,B,C,D]should be maintained between +[425.5 cm] and +[448.5 cm] throughout plant heatup by rejecting water using the Low Flow Control Mode in the Feedwater Control System and the dump valve in the CUW System until a reactor feedpump has been placed into service. During drywell inspection, use the CUW dump valve to control RPV water level, as necessary. The rejection rate should be limited so that the CUW filter demineralizer inlet temperature does not exceed [54 °C].

3.5 Perform a rod coupling check when a rod is fully withdrawn. If a rod uncoupling annunciator is received, refer to [procedure for control rod uncoupled].

3.0 PRECAUTIONS AND LIMITATIONS (continued)

3.6 Do not operate the mechanical vacuum pumps [identity, later] at reactor powers greater than [5] %.

3.7 Maintain the temperature differential between the core exit coolant [TE–later] and bottom head drain coolant [TE–later] less than [37 °C].

3.8 Do not increase reactor power or recirculation flow if temperature differential between steam dome [later] and bottom head drain [TE–later] exceeds [37 °C].

4.0 PREREQUISITES

4.1 Reactor power is at heating power level, at or above [later], per IOP-1, "Approach to Criticality"

4.2 Prior to rolling the reactor feed pump turbine above turning gear speed, it must have been rotating on the turning gear for a minimum of [2] hours. Refer to SOP-[later], "Condensate and Feedwater System."

4.3 The feedwater chemistry limits are within the following:

Chlorides	< 0.16 ppb
Conductivity at 25 °C	< 0.057 µS/cm
Dissolved Oxygen	20.0 – 30.0 ppb

5.0 PROCEDURE

Subsection 5.1, "Establishing Main Condenser Vacuum," may be conducted concurrently with subsection 5.2, "Preparation for Heatup and Pressurization." The remaining subsections of this procedure are to be conducted in sequence.

5.1 Establish Main Condenser Vacuum by executing subsection 5.1 of IOP–1, if necessary. If vacuum is already established, go to subsection 5.2.

5.2 Preparation for Reactor Heatup and Pressurization

5.2.1 Initiate recording of reactor heatup rate.

5.2.2 Verify that the setpoint on the Steam Bypass and Pressure Control System is set at [10 kg/cm^2] for startup.

5.3 Establishing Heatup

5.3.1 Verify that the Feedwater Control System is operating in the Low Flow Control Mode per SOP– [later] to automatically reject water via the CUW system and the reactor water level is being maintained in the range of 425.5 cm to 448.5 cm on the Narrow Range water level instruments.

5.3.2 Continue to withdraw control rods as necessary to establish and maintain a reactor heatup rate not to exceed [55] °C per hour averaged over any one hour period.

5.3.3 Prior to reactor water temperature (TE–later) reaching [90 °C], secure the condensate long–cycle cleanup mode and establish the Low Flow Control Mode in the Feedwater Control System in accordance with SOP–C31, with one low pressure condensate (LPCP) and one high pressure condensate (HPCP) in operation, per SOP–[later], "Condensate and Feedwater System".

5.3 Establishing Heatup(continued)

5.3.4 Prior to exceeding a reactor temperature of [80 °C] as indicated by TE–[later], verify reactor water dissolved oxygen concentration is less than [200 ppb] as indicated by [later] or by a chemistry sample. Otherwise, stop further heatup and verify that the main steam drain valves are lined up in accordance with SOP–B21. Resume heatup when the reactor water oxygen concentration is < [200 ppb].

5.3.5 Throughout reactor heatup, vent the wetwell and drywell, via the Atmospheric Control System, per SOP-[later], as necessary to maintain drywell pressure [B11-PIS-606A,B,C,D] less than [0.06 kg/cm^2].

5.3.6 To minimize the feedwater nozzle thermal duty due to cyclings of cold feedwater, slowly increase CUW reject flow to establish [later, m^3/hr] reject flow.

5.4 Heatup to [6 kg/cm^2].

5.4.1 Continue to withdraw control rods to maintain reactor heatup rate.

5.4.2 At a reactor pressure of [3.5 kg/cm^2], commence warmup of the RCIC System steam piping, and place the RCIC System in Standby Readiness per SOP-E51, sections 3.0 and 4.0, Reactor Core Isolation Cooling System.

5.4.3 At a reactor pressure of [6 kg/cm^2], commence warming of the main SJAEs per SOP–[later], "Condenser Evacuation System".

5.5 Heatup to [10 kg/cm²].

5.5.1 Continue to withdraw control rods to increase reactor pressure and maintain the heatup rate.

CAUTION

While shell warming per the following step, avoid a sudden change in shell pressure as it could result in a reactor scram (A pressure spike could make it appear as if the thermal power is greater than 40% and the turbine stop valves are less than 90% open.

5.5.2 At 7 kg/cm², startup the gland seal evaporator and shift sealing steam from the auxiliary steam to the gland seal evaporator in accordance with SOP-[later], "Turbine Sealing Steam System."

5.5.3 At a reactor pressure of [7 kg/cm²], commence main turbine shell * and chest warming per SOP-[later], "Main Turbine."

5.5.4 Verify the operability of the Steam Bypass and Pressure Control System by decreasing its regulator setpoint to below the reactor pressure until bypass valve No. 1 starts to open.

5.5.5 Close bypass valve No. 1 by raising the pressure regulator setpoint above the reactor pressure[to a setpoint of 10 kg/cm²].

5.5.6 At [10 kg/cm²], increase reactor power until the No. 1 bypass valve opens to [x % **] position. When RPV pressure control is stabilized, perform the RCIC surveillance test, if required, in accordance with [specified surveillance test procedure].

5.5.7 At the conclusion of the RCIC test, resume heatup by raising the pressure regulator setpoint to slowly close bypass valve NO. 1, maintaining a heatup rate at less than 55.5 °C per hour, insert control rods if necessary.

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* The necessity for turbine shell warming will be determined later.

** This bypass valve position shall have a steam flow equivalent greater than [1.10 times] that required for the RCIC test.

5.6 Heatup to [20 kg/cm^2].

5.6.1 Continue to withdraw control rods to maintain the heatup rate and maintain the pressure regulator setpoint [2 kg/cm^2] above the reactor pressure.

5.6.2 At [17.5 kg/cm^2], place the Off Gas System into normal operation in accordance with SOP-[later], "Off Gas System", and concurrently,

5.6.3 Place the main SJAEs in service and shut down the mechanical vacuum pumps and the startup SJAEs [device, later] in accordance with SOP-[later], "Main Condenser Evacuation System."

5.7 Heatup to [40 kg/cm^2].

5.7.1 Continue to withdraw control rods to increase reactor pressure and maintain the heatup rate until reactor pressure reaches [40 kg/cm^2]. Maintain the pressure regulator setpoint [2 kg/cm^2] above the reactor pressure.

5.7.2 At a reactor pressure ≥ [40 kg/cm^2], start the motor-driven feedpump, and place it into service to control water level in the Low Flow Control Mode in accordance with SOP-[later], "Feedwater Control System."

5.7.3 Stop rejecting water via the CUW System for reactor level control and transfer control from Low Flow Control Mode to Single-Element Control Mode per SOP-[later].

5.7.4 Commence warmup of a reactor feed pump turbine, per SOP-[later], "Condensate and Feedwater System."

5.8 Heatup to [66.5 kg/cm^2].

5.8.1 Continue to withdraw control rods to increase reactor pressure. Maintain the setpoint of the pressure regulator at [2 kg/cm^2] above reactor pressure, until a setpoint of [66.5 kg/cm^2] is reached.

5.8.2 Close the following main steam drain valves: | |

–Inboard Drain to Condenser, B21–F152,

–Main Steam Drain, B21–F211.

5.8.3 Check steamline drain operation per paragraph 4 or 5, as applicable, of SOP–21, "Nuclear Boiler System".

5.8.4 If lined up to vent the wetwell or drywell, secure the venting lineup in the Atmospheric Control System.

5.8.5 When reactor pressure stabilizes, perform drywell inspection according to [procedure, later], if required.

5.9 Transfer to the RUN Mode.

5.9.1 Continue to withdraw control rods to increase reactor power until all APRM DOWNSCALE annunciators are cleared.

5.9.2 As power is increased per step 5.9.1, verify the turbine bypass valves open in sequence to maintain reactor pressure at [66.5 kg/cm^2].

5.9.3 Verify the following conditions exist in preparation for transferring the reactor mode switch to the RUN Mode:

5.9.3.1 Main steam pressure greater than [60 kg/cm^2] and associated annunciators[A-xxx, later] are cleared.

5.9.3.2 Condenser pressure less than [x cm Hg absolute] and associated annunciators are cleared.

5.9.3.3 APRM DOWNSCALE annunciators are cleared.

5.9.3.4 All APRMs indicating between [5]% and [12]%.

5.9.3.5 The reactor coolant chemistry limits are within the following limits:

Chlorides	< 10 ppb
Conductivity at 25 °C	< 0.20 µS/cm
pH at 25 °C	6.4 – 7.8

5.9.4 Switch the reactor mode switch to the RUN Mode and record the date and time.

5.9.5 Verify APRM rod block setpoints transfer to the flow biased setpoints.

5.9.6 Verify the four divisional MSIV CLOSURE TRIP BYPASSED annunciators[A-xxx] have cleared.

5.9.7 Align CUW return flow to both feedwater lines and open the isolated feedwater line to feed the vessel with both feedwater lines in accordance with SOP–B21, "Nuclear Boiler System".***

5.9.9 Continue to withdraw control rods to increase reactor power until [1.5] bypass valves are open to roll the main turbine.

*** The CUW flow alignment will require further evaluation.

5.9 Transfer to the RUN Mode(continued)

5.9.10 Perform the RCIC surveillance testing, if required, in accordance with [specified surveillance test procedure].

5.9.11 Perform turbine startup and generator synchronization in accordance with IOP-3, "Turbine Startup and Generator Synchronization".

6.0 REFERENCES

6.1 Water Quality Specification, 22A8479, Revision 2, PAE No. 1.A.9.

6.2 GE Service Information Letter SIL-208, "Minimizing Feedwater Nozzle Thermal Duty", Revision 1, October, 1978.

6.3 GE Service Information Letter SIL-107, "Increasing Flexibility of Reactor Startups", October 31, 1974.