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POWER AUTHORITY OF THE STATE OF NEW YORK

INDIAN POINT NO. 3 NUCLEAR POWER PLANT

POP-1.1 REV. 7

PLANT HEATUP FROM COLD SHUTDOWN CONDITION

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PORC Review [signature] Date 4/22/81

Approved by: [signature] Date 4/22/81

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Plant Heatup From Cold Shutdown Condition

1.0 Purpose

To provide a procedure for heatup of the plant from a cold shutdown condition.

2.0 Precautions and Limitations

2.1 In accordance with Technical Specifications the following items apply:

2.1.A The reactor shall be maintained subcritical by at least 1% Δ K/K until normal water level, approximately 23% of span, is established in the pressurizer.

2.1.B The minimum Technical Specification shutdown margin (specified in Figure RCS-6 of the Graphs Book) shall be maintained throughout.

NOTE: This shutdown margin will be assured if the minimum boron concentration is maintained above the appropriate values shown in curve RCS-4 of the Graphs Book.

2.1.C At least one reactor coolant pump, or RHR pump, when connected to the Reactor Coolant System, shall be in operation when a reduction is made in the boron concentration of the reactor coolant.

2.1.D The maximum allowable Δ T between the pressurizer and the reactor coolant loops is 320°F.

2.1.E The auxiliary spray should not be used if the Δ T between pressurizer and charging fluid exceeds 320°F.

2.1.F The maximum allowable heatup rate for the pressurizer is 200°F per hour. Administratively it should be limited to 100°F/hr.

2.1.G The secondary side of the steam generator must not be pressurized above 200 psig if the temperature of the steam generator is below 70°F.

2.1.H Engineered Safeguards equipment must be operable prior to going above cold shutdown or 350°F, as applicable.

2.1.I Containment integrity must be established prior to exceeding 200°F in the RCS.

2.1.J Containment ambient temperature is greater than 50°F prior to exceeding 200°F.

2.1.K Before exceeding 200°F the acoustic monitor must be in service.

2.1.L Before exceeding°200 F the saturation alarm must be in service (Prodac 250). If Saturation margin on Prodac 250 in not available use the Keenan & Keyes steam tables and the backup saturation recorder.

2.1.M At least one pressurizer code safety valve shall be operable whenever the reactor head is on the vessel, except for hydrostatic tests. All pressurizer safety valves shall be operable whenever the reactor is above cold shutdown except during Reactor Coolant System hydrostatic tests and/or safety valve settings.

2.1.N Before the Reactor Coolant System is heated above 250°F, the following chemistry specifications must be met:

Oxygen - Less than 0.10 ppm
Chloride - Less than 0.15 ppm
Fluoride - Less than 0.15 ppm

2.1.O The reactor shall not be heated above 350°F unless the following conditions are met:

1) A minimum ASME code approved steam relieving capability of 20 main steam valves shall be operable (except for testing).

2) Three auxiliary feedwater pumps must be operable.

3) A minimum of 360,000 gallons of water in the condensate storage tank.

4) System piping and valves directly associated with the above components operable.

5) The main steam stop valves are operable and capable of closing in five seconds or less.

6) The total Iodine activity on the secondary side of the steam generator shall be less than or equal to .10 uCi/cc of Dose Equivalent I-131.

7) City Water System piping and valves directly associated with providing backup supply to the auxiliary feedwater pumps are operable.

2.1.P The total specific activity of the reactor coolant shall be limited to 1.0 uCi/cc Dose Equivalent I-131 and $100/\bar{E}$ uCi/cc for all noble gases with half lives greater than 10 minutes, whenever the reactor is critical or average reactor coolant temperature is greater than 500°F.

2.1.Q The RCS Heatup Rate shall be in accordance with Pressure Temperature curve RCS-1 of the Graphs Book. An administrative limit of 50°F/hr. should be used unless otherwise restricted.

2.2 If the count rate of either source range channel increases by a factor of two or more during any step involving boron concentration change, the operation must be stopped immediately and suspended until a satisfactory evaluation of the situation has been made by the Shift Supervisor.

2.3 The shutdown banks must be at the fully withdrawn position whenever positive reactivity is being inserted by boron and xenon changes, reactor coolant temperature change, or motion of part length rods or control banks other than the shutdown banks. The following exception to this rule may be applied: The Reactor Coolant System has been borated to at least the xenon free shutdown margin consistent with the temperature being maintained. Refer to Figure RCS-4 of the Graphs Book.

2.4 The heatup rate for the Reactor Coolant System should not exceed 50°F per hour, this is an administrative limit. Figure 3.1-1 of Technical Specifications defines permissible heat-up rates.

2.5 Do not operate more than 3 circulating water pumps during the May 15 to July 31 period, while heating up.

2.6 Following a 25 ppm change in reactor coolant boron concentration, actuate one group of pressurizer backup heaters to permit the pressurizer spray valves to adjust the pressurizer boron concentration to the reactor coolant loop boron concentration. Verify final equalization of boron concentrations by either sampling pressurizer liquid space and reactor coolant system or by noting that rod movement is no longer necessary to maintain power level.

2.7 Do not admit steam downstream of the Main Steam Stop Valves unless the main turbine generator and main boiler feedwater pumps are placed on the turning gear.

2.8 The reactor coolant pumps must be started, operated and shutdown in accordance with SOP-RCS-1.

2.9 Pressurizer level indication is calibrated for specific temperatures. Reference should be made to the calibration curves located on Figure RCS-3A and 3B of the Graphs Book to obtain the true level when pressurizer temperature is between 70°F and 650°F.

2.10 Steam generator level indication is calibrated for specific temperatures. Reference should be made to the calibration curves located on Figure SP-5 of the Graphs Book when between 70°F and 547°F.

2.11 During secondary plant warmup, draw steam off slowly and regulate feedwater additions carefully to avoid uncontrolled cooling of the Reactor Coolant System. Steam removal from the steam generators which exposes the reactor to large, unexpected withdrawals while the reactor coolant is at low temperatures must be avoided. Therefore, when the reactor is critical:

a) Steam must not be admitted to the main turbine, condenser steam dump, atmospheric steam relief or auxiliary steam driven feed pump until the reactor coolant temperature is above 400°F.

b) Steam must not be used to increase the main turbine speed above 600 rpm until the reactor coolant temperature is at the reactor plant no-load temperature (547°F).

c) Steam may be withdrawn at any reactor coolant temperature to warm lines, to operate the air ejector and gland steam system or other auxiliary uses as directed by the Shift Supervisor.

2.12 Do not exceed 600 psig reactor coolant system pressure until the reactor vessel head studs have been fully tensioned.

NOTES: 1) No pressure may be applied to the reactor vessel unless the vessel metal, flange and bolt temperature is 70°F or greater.

2) Reactor Coolant System pressure shall not exceed 600 psi unless the vessel metal, flange and bolt temperature is 93°F or greater.

3) The maximum stud elongation which may be performed below 93°F yet above 70°F is .015 inches.

2.13 If hydrazine is added to scavenge oxygen during heatup, the demineralizers should be bypassed.

2.14 Hydrazine should not be added to the reactor coolant system with RCS temperature above 250°F since it is ineffective above this temperature. Hydrazine should not be added unless the volume control tank gas blanket contains less than 0.5% oxygen.

2.15 The Residual Heat Removal loop suction isolation valves 730 and 731 are pressure interlocked to prevent opening when the RCS is above 450 psig. If the valves are opened and reactor coolant system pressure increases to 550 psig the valves will close. If valve closure occurs, they cannot be re-opened until RCS pressure decreases below 450 psig.

2.16 The W-2 switches for safety related systems (Safety Injection System, Auxiliary Coolant System, Containment Spray System, Containment Ventilation System, Service Water System, Feedwater System, and Electrical Distribution System) shall be tested, to verify the continuity of the safety related automatic contacts, prior ot the required operability of the associated equipment for plant operation.

3.0 Initial Conditions

3.1 The required portions of pre-warmup checkoff list, COL-RPC-1, are completed prior to exceeding 200°F.

3.2 Nuclear and conventional support systems are in operation as required or are available for plant startup when required.

3.3 The reactor is shutdown with all full length rod banks fully inserted.

3.4 The Reactor Coolant System has been filled, vented and pressurized between 400 psig and 450 psig per SOP-RCS-9 with charging, letdown and low pressure purification in service.

3.5 The Reactor Coolant System is 200°F or less.

3.6 The residual heat removal loop is in service.

3.7 The steam generator levels are greater than 35% of span. If full, nitrogen blanket is being used for corrosion control.

3.8 The reactor coolant boron concentration is at or above the cold shutdown concentration.

3.9 OPS in service.

3.10 Reset Auto S.I. by:

A) Close the Reactor Trip Breakers. This need be done only momentarily and they need not be closed simultaneously.

OR

B) If Reactor Trip Breakers cannot be reclosed, the SIS logic maybe reset by momentarily depressing the test button on the SIS logic test panel. This must be done on one channel at a time.

Channel A on Safeguards Initiation Panel 1-1

1 - Depress test Button PBT1 Block and release
2 - Depress test Button PBTR1 Unblock and release
3 - Verify Safeguards Train A in test annunciator is extinguished

Channel B on Safeguards Initiation Panel 2-1

1 - Depress test Button PBT2 Block and release
2 - Depress test Button PBTR2 Unblock and release
3 - Verify Safeguards Trains B in test annunciator is extinguished.

Verify the auto SI blocked light on Supervisory Panel SBF-2 extinguished.

4.0 Procedure

4.1 Obtain permission from the Shift Supervisor to commence the heatup. _____

4.2 Notify plant personnel that heatup of the primary plant is about to begin and evacuate all unnecessary personnel from containment. _____

4.3 Establish containment integrity as per SOP-CB-1. _____

4.4 Reinstate links and clear up Jumper Log entry, for preventing auto closure of the UT-ST tie breakers which were opened during shutdown in POP-3.3:

86P-TS-1J	86 BU-TS-1J
86P-TS-2D	86 BU-TS-2D
86P-TS-2E	86 BU-TS-2E
86P-TS-2F	86 BU-TS-2F

_____

4.5 Lift water on one circulating water box per condenser and start the associated circulating water pumps per SOP-RW-1. No._____ _____

NOTE: Normally only one circulator is required to blowdown steam generators.

4.6 Secure the nitrogen blanket on all steam generators per SOP-SG-2.
31_____
32_____
33_____
34_____ _____

4.7 Adjust steam generator level between 35-65% of span by draining or using the Auxiliary Feedwater System per SOP-FW-4. _____

4.8 When oxygen concentration is steady and below .5% in the VCT, establish a hydrogen blanket in the volume control tank per CVCS-7 and return the letdown demineralizers to service _____

4.9 Maintain Reactor Coolant System pressure as per curves RCS 1A and 1B in the graphs book by varying charging pump speed and/or adjusting letdown flow and/or adjusting N_2 pressure. _____

4.10 Start reactor coolant pump 33 or 34 per SOP-RCS-1.

NOTE: Additional pumps may be run as necessary but it should be borne in mind that it is desirable to draw the pressurizer bubble before Reactor Coolant System temperature is increased above 200°F.

No._____

4.11 When reactor coolant pressure is stabilized, shutdown the running RHR pump.

CAUTION

When the RCS is solid and the RHR pumps are shutdown, a pressure spike will occur due to the decreased letdown flow through HCV-133. When the pump is tripped, HCV-133 will have to be opened further to re-establish the letdown flow to the previous value.

4.12 Place the PAB hot penetration blowers in service prior to exceeding 150°F in the reactor coolant system per SOP-V-7. The blowers associated with the feedwater and steam piping must be placed in service before exceeding 200°F.

4.13 Prior to exceeding 200°F in the reactor coolant system:

A. Complete the required portions of Pre-warmup checkoff list COL-RPC-1 7

B. Complete the required portion of 3PT-V19 "W-2 SWITCH TESTING IN CCR".

4.14 If not previously done, place the safety injection logics back in service for channel I and channel II.
"Manual Defeat S.I. Train A" Switch on SBF-2 Panel Returned to "normal"
"Manual Defeat S.I. Train B" swtich on SBF-2 Panel Returned to "Normal"
Keys removed from above and stored in the key locker

4.15 Open the High Head SI pump discharge valves shut per 4.14 of POP 3.3.

4.16 Prior to exceeding 250°F in the Reactor Coolant System or pressurizer verify plant chemistry meets the following Technical Specification requirements. If concentrations are not within specification refer to SOP-RCS-6.

Oxygen - Limited to .10 ppm. Value_____
Chloride - Limited to .15 ppm. Value_____
Fluoride - Limited to .15 ppm. Value_____

NOTE: The hottest coolant in the RCS (including the coolant in the pressurizer) shall determine the RCS temperature used in the above specification.

4.17 Prior to exceeding 250°F start the rod drive cooling fans. 31_____ 32_____ 33_____ 34_____ _____

4.18 Establish a steam bubble in the pressurizer per SOP-CVCS-5.

NOTE: Pressurizer temperature must not be raised above 250°F unless chemistry is within allowable limits. _____

4.19 Above 326°F verify OPS disarmed.

"Any RCS overpressurization channel armed" lamp on the FCF panel extinguished _____

Overpressure recorder on the SFF panel shut off and run downscale _____

4.20 When normal water level (approximately 23%) is established in the pressurizer, isolate the RHR System per SOP-RHR-1. _____

Note: Perform applicable portions of test 3PT-V9, RHR interfacing check valve test. This test must always be done when RHR is finally isolated prior to startup and whenever RCS is reduced to within 100 psig of RHR system pressure.

4.21 Place pressurizer level controller in automatic as per SOP-RCS-3 and adjust to maintain a level of 23%. _____

4.22 Start additional reactor coolant pumps to commence plant heatup. Pressurizer heaters may also be used to supplement the heatup rate.

CAUTION

Maintain heatup rate at or below 50°F/hr. unless restricted otherwise by the pressure temperature curve RCS-1 in the Graphs Book.

31_____ 32_____ 33_____ 34_____ _____

4.23 Place at least four Containment Fan Cooler units in service per SOP-CB-10.

31_____
32_____
33_____
34_____
35_____

4.24 Increase pressurizer pressure to 2235 psig during the heatup while observing the proper pressure-temperature relationships required by curve RCS-1 of the Graphs Book.

NOTE: Maintain the temperature differential between the pressurizer and reactor coolant system below 320°F.

4.25 Before Reactor Coolant System pressure is increased above 1000 psig, open accumulator isolation valves 894A, B, C and D, de-energize the valve motor operators and lock their disconnect switches in the open position at MCC-36A and MCC-36B.

MOV 894A_____
MOV 894B_____
MOV 894C_____
MOV 894D_____

4.26 Reduce letdown flow as heatup and pressurization continues by isolating letdown orifices as required so as not to exceed 120 gpm

4.27 When No. 1 seal return flow has increased above 1 gpm on all RCP's, close the No. 1 seal bypass valve. This should occur at approximately 1500 psig.

4.28 When pressurizer pressure is at 1900 psig, verify that pressurizer pressure/pressurizer level safety injection block has cleared. Place the high head safety injection pump control switches in auto if not previously done.

4.29 When normal operating pressure of 2235 psig is established, place pressurizer pressure control in automatic per SOP-RCS-2.

4.30 At 350°F, on the inside of the FCR panel, open the states links, disabling inadvertant OPS actuation.

4.31 The reactor shall not be heated above 350°F unless:

A. The following conditions are met in accordance with Technical Specifications:

1. 20 ASME Code approved Main Steam Safety Valves operable. _____

2. 3 ABFP's operable. 31 operable_____
32 operable_____
33 operable_____ _____

3. Condensate Storage Tank contains a minimum of 360,000 gallons.(greater than or equal to 19')
Level_____ _____

4. System piping and valves directly associated with aforementioned, operable. _____

5. 4 Main Steam stop valves operable and capable of closing in 5 seconds or less. _____

6. 2 Steam Generators capable of heat transfer. _____

7. Each steam generator equivalent Iodine-131 activity shall not exceed .1 uCi/gm equivalent I-131 activity.

#31 S/G Activity Satisfactory _____
#32 S/G Activity Satisfactory _____
#33 S/G Activity Satisfactory _____
#34 S/G Activity Satisfactory _____ _____

8. City Water System, piping and valves available for backup supply to ABFP's. _____

9. The following valves are in the positions indicated.

RHR Suction - 732	Locked Closed	_____
RHR Suction - MOV-731	Closed	_____
RHR Suction MOV-730	Closed	_____
RHR Hx Outlet - MOV-746	Closed	_____
RHR Hx Outlet - MOV-747	Opened	_____
RHR Hx Outlet - MOV-899A	Opened	_____
RHR Hx Outlet - MOV-899B	Opened	_____
RHR Hx Outlet - HCV-638	Opened	_____
RHR Hx Outlet - HCV-640	Opened	_____
CCW from RHR Hx - MOV-822A	Closed	_____
CCW from RHR Hx - MOV-822B	Closed	_____
CCW from RHR Hx - 820A	Preset Open	_____
CCW from RHR Hx - 820B	Preset Open	_____
RHR Miniflow - 1870	Opened	_____
RHR Miniflow - 743	Opened	_____
RHR Miniflow - 1869A	Opened	_____
RHR Miniflow - 1869B	Opened	_____
RHR Spray Drains - 864E	Closed	_____
RHR Spray Drains - 864F	Closed	_____ _____

B. The required portion of 3PT-V19 "W2 SWITCH TESTING IN CCR" HAS BEEN COMPLETED". 7

4.32 Calculate a critical rod estimate or boron concentration per SOP-RPC-3 when time permits. Adjust reactor coolant system boron concentration as necessary.

NOTE: 1) If the adjustment requires diluting below the cold shutdown margin depicted in curve RCS-4 of the Graphs Book do not dilute below the xenon free shutdown margin consistent with the existing temperature. Since the cold shutdown margin is based on a xenon free core, it is permissible to dilute below its value when xenon is present. to perform a dilution of this nature requires prior withdrawal of the shutdown rods.

4.33 When the temperature at which the ECP has been calculated is reached; commence reactor startup per POP-1.2. If criticality is to be delayed until Tavg is at 547°F continue heatup utilizing reactor coolant pumps and pressurizer heaters as desired.

Critical
Criticality

NOTE: Tave should be no lower than 450°F at all times during ciriical operation. 7

4.34 Place a condensate pump in service on recirculation per SOP-C-2.

4.35 When the reactor coolant system reaches approximately 400°F, secondary plant warmup may be initiated and the main steam isolation valves opened in accordance with SOP-MS-1.

NOTE: 1) Ensure main turbine and main boiler feedwater pumps are on turning gear before admitting steam downstream of the main steam isolation valves.

2) Avoid withdrawing steam if it will significantly compromise the Reactor Coolant System heatup rate.

4.36 Prior to RCS exceeding 500°F the specific activity shall be limited to:

1.0 uCi/cc Dose Equivalent I-131, and

100/E uCi/cc for all noble gases with half lives greater than 10 minutes.

Dose Equivalent I-131 _____

Noble Gases _____

100/E _____

4.37 When normal operating temperature of approximately 547°F is achieved, place the atmospheric steam dump control in the automatic mode to maintain 1005 psig.

4.38 Start all remaining operable circulating water pumps per SOP-RW-1.

NOTE: During the May 15 to July 31 period, no more than 3 circulating water pumps should be used.

4.39 Establish gland steam to the main turbine and main boiler feed pump turbines and establish condenser vacuum per SOP-C-1.

NOTE: This operation may require the reactor to be critical.

4.40 When sufficient vacuum is established place steam dump control in automatic or manual pressure mode, and verify atmospheric steam dumps are closed and set for 1005 psig.

4.41 Dissolved N_2 will slowly come out of the RCS and concentrate in the VCT. It is therefore necessary to periodically monitor the VCT H_2 concentration and vent/refill with H_2 to maintain the correct concentration.

4.42 Refer to POP-1.3 - Plant Startup from Zero Power Condition to Full Power.

POP Completed

Date _____
Time _____

Comments: _____
_____
_____
_____

Shift Supervisor _____