REACTOR SHUTDOWN TO HOT STANDBY
(Mode 2 to Mode 3)

1.0 PURPOSE

This procedure will direct the shut down of the reactor to enter stable conditions in Mode 3, Hot Standby.

2.0 PRECAUTIONS AND LIMITATIONS

2.1 PRECAUTIONS

2.1.1 Xenon level variations should be anticipated following a load reduction and boron concentration adjustments may be required.

2.1.2 The shutdown banks should remain fully withdrawn unless the RCS has been borated to at least the hot, xenon-free boron concentration and is being maintained at hot standby.

2.1.3 The boron concentration in the pressurizer should not be different from the RCS by more than 50 ppm. Pressurizer backup heaters may be energized as necessary to equalize the boron concentration.

2.1.4 Vacuum should be maintained on the Main Turbine following unit shutdown until the turbine coasts down to approximately 66% of rated speed (1200 rpm) unless an emergency dictates rapid coastdown of the turbine rotor.

2.1.5 The Main Turbine should be kept on the turning gear until metal casing temperatures have returned to ambient. Bearing lube oil circulation must also be maintained.

2.2 LIMITATIONS

2.2.1 While in Modes 1 and 2, all reactor coolant loops shall remain in operation. (Technical Specification 3.4.1.1)

2.2.2 While in Mode 3, at least two reactor coolant loops shall be in operation when the reactor trip breakers are closed and at least one reactor coolant loop in operation when the reactor trip breakers are open.

2.2.3 While in Modes 1 and 2, shutdown margin shall be greater than or equal to 1300 pcm (1.3% delta k/k). (Technical Specification 3.1.1.1)

2.2.4 While in Modes 3 and 4, Shutdown margin shall be greater than or equal to the limit specified in Technical Specification 3.1.1.2, Figure 3.1-1.

2.2.5 While in Modes 1 and 2 with the reactor critical:

a. All reactor coolant loops temperature shall be greater than or equal to 551°F, (Technical Specification 3.1.1.4)

b. All shutdown rods shall be fully withdrawn, (Technical Specification 3.1.3.5)

c. The control banks shall be maintained above the rod bank LO-LO limit. (Technical Specification 3.1.3.6)

2.2.6 While in Modes 3, 4 and 5, both channels of Source Range Nuclear Instrumentation shall be operable. (Technical Specifications Table 3.3-1, 6.E)

2.2.7 While in Modes 3, 4 and 5, at least one channel of Source Range Nuclear Instrumentation should be selected to Recorder NR-45 and the SOURCE RANGE HI FLUX LEVEL AT SHUTDOWN alarm operable.

3.0 INITIAL CONDITIONS

NOTE

Variations in the alignment of systems may be justified by maintenance or operational considerations; but suitability should be determined by the Unit Shift Supervisor (USS).

3.1 Reactor power level is less than 5%.

3.2 RCS temperature is stabilized at no load Tavg under control of the steam dumps in Steam Pressure mode or by operation of the Steam Generator Atmospheric Relief Valves.

3.3 RCS pressure is stable at normal operating pressure.

3.4 All RCP's are in operation.

3.5 Pressurizer level is at program level with either the PD pump or a CCP operating to supply normal charging and seal injection flow.

3.6 AFW pumps are operating to supply auxiliary feedwater to steam generators.

3.7 The Main Turbine has been tripped and is coasting down to or at turning gear speed with normal or stable condenser pressure.

3.8 If required, the Auxiliary Boiler is in hot standby to provide auxiliary steam.

3.9 One channel of Intermediate Range and the highest reading Power Range channel of nuclear instrumentation are selected to indicate on Recorder NR-45.

4.0 INSTRUCTIONS

INITIALS

NOTE

Asterisk (*) steps beside INITIALS spaces indicates steps that generate additional documents.

4.1 PREPARATION FOR REACTOR SHUTDOWN

4.1.1 If a cooldown to cold shutdown is necessary following reactor shutdown and the RCS is to be opened to the Containment atmosphere, then INITIATE RCS/Pressurizer gaseous activity degasification if not currently in progress by performing the following:

a. DIRECT Chemistry sample the RCS hydrogen and gas activity concentration, _____

INITIALS

b. ENSURE that pressurizer steam space sample line is in operation with pressurizer steam space sample containment isolations, HV-3513 and HV-3514 open, _____

c. NOTIFY Chemistry to adjust the pressurizer steam space sample flow rate to maximum, _____

d. ENERGIZE the pressurizer back-up heaters to enhance RCS degassing, _____

e. While maintaining hydrogen cover gas, DEGAS the RCS by raising VCT gas purge flow rate to the Gaseous Waste Processing System to approximately 1.2 scfm using HIC-1094, as limited by the hydrogen recombiners. _____

4.1.2 MAXIMIZE CVCS letdown purification flowrate. _____

_____ / _____
Date Time

4.1.3 ENSURE RCS temperature is being controlled at approximately no load Tavg by either steam dumps in Steam Pressure Mode or by the Steam Generator Atmospheric Relief Valves. _____

a. If Tavg lowers to 561°F with the Tavg-Tref deviation alarm not reset while the reactor is critical, then COMMENCE recording Tavg every 30 minutes per 14915, "Special Condition Surveillance Logs",

b. If Tavg lowers to 551°F, while the reactor is critical, then RAISE Tavg to greater than 551°F within 15 minutes or TAKE the reactor subcritical within the next 15 minutes.

4.1.4 ENSURE all Steam Generator levels are stable between 45-55% NR. _____

INITIALS

4.1.5 MAINTAIN one condensate pump running on recirc until condenser vacuum is broken and high pressure feedwater header temperature is less than 200°F. _____

4.1.6 If requested by Chemistry, PLACE the condensate and Feedwater System on Long cycle recirc per 13615, "Condensate And Feedwater Operation". _____

4.1.7 If No-Load Tavg can not be maintained due to excessive steam demand, REDUCE steam demand by performing the following:

a. TRANSFER the Auxiliary Steam System steam supply to either the alternate unit or to the Auxiliary Boiler per 13761, "Auxiliary Steam System", _____

b. TRANSFER the Turbine Steam Seal supply to the Auxiliary Steam Supply per 13825, "Turbine Steam Seal System", _____

c. TRANSFER the SJAE steam supply to the Auxiliary Steam Supply per 13620, "Condenser Air Ejector System". _____

4.2 REACTOR SHUTDOWN

NOTE

OBSERVE for expected range overlap on NIs during shutdown.

During rod insertion CHECK for:

(1) Proper group alignment.

(2) DRPI and group step counter indication agreement.

(3) Proper bank overlap.

4.2.1 INSERT all control banks. _____

RECORD reactor shutdown time and date in the Unit Control Logbook.

INITIALS

4.2.3 At approximately 5×10^{-11} amps IR, VERIFY that both channels of Source Range indication automatically energize. _____

a. OBSERVE the following status lights extinguish:

(1) IR P6 NC35D (TSLB-4,3.1),

(2) IR P6 NC36D (TSLB-4,32),

(3) SOURCE RANGE BLOCK PERMISSIVE P6,

(4) SR TRAIN A TRIP BLK'D HI VOLT OFF,

(5) SR TRAIN B TRIP BLK'D HI VOLT OFF.

b. VERIFY annunciator SOURCE RANGE HI VOLTAGE FAILURE ALB-10 A01 resets,

c. VERIFY annunciator SOURCE RNG HI SHUTDOWN FLUX ALARM BLOCKED ALB-10 B01 illuminated,

d. If the Source Range channels fail to energize below 5×10^{-11} amps, then RESET the applicable Source Range using SR BLOCK RESET -A/B HS-40030 and/or HS-40031.

If manual reset attempt fails to energize source range, then NOTIFY I&C to immediately restore the affected channels to service.

4.2.4 SELECT both channels of Source Range indication on Recorder NR-45. _____

ANNOTATE chart to reflect channels selected.

INITIALS

4.2.5 When the Source Range channels indication stabilize, PLACE the SOURCE RANGE HI FLUX LEVEL AT SHUTDOWN alarm in operation by performing the following:

a. RESET the SOURCE RANGE HI FLUX LEVEL AT SHUTDOWN alarm setpoint to 3.16 X normal background, _____

b. ENABLE the SOURCE RANGE HI FLUX AT SHUTDOWN alarm by placing the HIGH FLUX AT SHUTDOWN NORMAL/BLOCK switches to the NORMAL position, _____

c. VERIFY annunciator SOURCE RNG HI SHUTDOWN FLUX ALARM BLOCKED ALB-10 B01 reset. _____

4.2.6 CALCULATE SHUTDOWN MARGIN per 14005, "Shutdown Margin Calculations". _____*

4.2.7 If necessary, BORATE the RCS per 13009, "CVCS Reactor Makeup Control System" or 13010, "Boron Thermal Regeneration System". _____

4.2.8 CHECK the following plant conditions:

a. RCS borated as necessary to maintain shutdown margin greater than the limit specified in Technical Specification 3.1.1.2, Figure 3.1-1,

b. RCS activity and chemistry samples have been obtained by Chemistry.

4.2.9 If the reactor will be returned to power operation, then PROCEED to 12003-C, "Reactor Startup" (Mode 3 to Mode 2).

4.2.10 Either OPERATE plant systems as necessary to maintain the conditions of this procedure; or PROCEED to 12006-C, "Unit Cooldown to Cold Shutdown".

Completed: _____ / _____
Signature Date

Reviewed: _____ / _____
Signature Date

COMMENTS: [redacted]

5.0 REFERENCES

5.1 PROCEDURES

5.1.1	13007,	"VCT Gas Control And RCS Chemical Addition"
5.1.2	14005,	"Shutdown Margin Calculations"
5.1.3	13009,	"CVCS Reactor Makeup Control System"
5.1.4	13010,	"Boron Thermal Regeneration System"
5.1.5	12003-C,	"Reactor Startup"
5.1.6	12006-C,	"Unit Cooldown To Cold Shutdown"
5.1.7	14915,	"Special Conditions Surveillance Logs"
5.1.8	13615,	"Condensate And Feedwater Operation"
5.1.9	13761,	"Auxiliary Steam System"
5.1.10	13825,	"Turbine Steam Seal System"
5.1.11	13620,	"Condenser Air Ejector System"

END OF PROCEDURE TEXT