ATTACHMENT 2

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DUKE POWER COMPANY
PROCEDURE PREPARATION
PROCESS RECORD

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Change(s) — to
— Incorporated

(2) STATION: Oconee

(3) PROCEDURE TITLE: PLANNED INITIATION OF NATURAL CIRCULATION AND NATURAL CIRCULATION COOLDOWN

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(8) MISCELLANEOUS:

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Reviewed/Approved By: _____ Date: _____

DUKE POWER COMPANY

OCONEE NUCLEAR STATION

PLANNED INITIATION OF NATURAL CIRCULATION

AND NATURAL CIRCULATION COOLDOWN

1.0 Purpose

To outline the procedure for establishing Natural Circulation in the RC System in a pre-planned mode when the steam generators are being used to remove decay heat. Guidance is also provided to continue a natural circulation cooldown if required.

2.0 Limitations and Precautions

2.1 RC System must be maintained subcooled and within the curves shown in Enclosure 5.1.

2.2 Maintain normal cooldown limits per OP/1102/10 (Controlling Procedure for Unit Shutdown).

2.3 Maintain pressurizer level > 80" to prevent uncovering pressurizer heater bundles.

2.4 Monitor pressurizer level and LDST level during natural circulation. A sudden increase in either level while presure is constant or decreasing indicates void formation in the RC System. If void formation occurs or saturated conditions are observed, refer to the Inadequate Core Cooling Operating Procedure (OP/0/A/1106/35).

2.5 If emergency feedwater is to be used to provide decay heat removal, overcooling could result during operation with low decay heat levels. If necessary, emergency feedwater flow should be throttled.

2.6 Natural Circulation Cooldown using one steam generator can provide adequate core cooling. However, cooldown of the loop with the isolated steam generator will lag behind the steaming steam generator. Carefully monitor subcooling in both loops. If there is water in the isolated steam generator, it will become a heat source instead of a heat sink and could add enough heat to cause void formation in the hot leg.

3.0 Establishing Natural Circulation in the RC System (Planned)	Date Init./Time	Verification Date Init./Time
3.1 Initial Conditions		
3.1.1 Reactor tripped.	_____	
3.1.2 One or more RC Pumps operating.	_____	
3.1.3 Pressurizer Heaters operable to maintain RC pressure.	_____	
3.1.4 Feedwater System in normal operation per OP/1106/02 (Condensate and Feedwater).	_____	
3.2 Procedure		
3.2.1 Verify proper RC System subcooling margin per Enclosure 5.1 and the Subcooled Margin Monitors.	_____	
3.2.2 Energize pressurizer heaters in manual.	_____	
3.2.3 Slowly increase steam generator level to 50% on the operating range as RC System pressure increases. Maintain pressurizer level > 80"		

		Date Init./Time	Verification Date Init./Time
	since filling of OTSG with cold water will also cool RC System.	_____	
	CAUTION: RC System subcooling margin must be maintained while increasing steam generator level to 50% on the operating range.		
3.2.4	Establish pressurizer level between 100 and 200 inches. When level and pressure have stabilized. Place pressurizer heaters in AUTO.	_____	
3.2.5	Secure operating RC Pump(s) per OP/1103/06 (RC Pump Operation).	_____	
	NOTE: Securing all RC Pumps will shift feedwater flow to the auxiliary header.		
3.2.6	Verify natural circulation by monitoring the following parameters:	_____	_____
	1. ΔT increases and stabilizes to a value less than full load ΔT ($< 50^{\circ}F$). (stability may not occur in less than 15 minutes).		

	Date Init./Time	Verification Date Init./Time

2. Heat removal from steam generators verified by operation of turbine bypass valves and feedwater valve positions.

3. Incore thermocouple temperatures stabilize.

4. RC System is > 50°F subcooled by the subcooling Margin Monitors.

5. S/G levels are ~ 50% on the operating range.

CAUTION: If natural circulation cannot be confirmed or if the limits of Enclosure 5.1 will be exceeded, restart a RC pump (if available) or initiate High Pressure Injection Cooling.

CAUTION: If feedwater flow is lost, attempt to restore feedwater flow and reverify natural circulation

	Date Init./Time	Verification Date Init./Time

or attempt to restart a RC pump.

CAUTION: High Pressure Injection must be initiated before the 50°F subcooling margin is lost. Refer to Enclosure 5.1.

4.0 Natural Circulation Cooldown

4.1 Initial Conditions

4.1.1 Reactor Tripped. _____

4.1.2 Reactor Coolant Pumps tripped. _____

4.1.3 Pressurizer Heaters operable. _____

4.1.4 Feedwater System in normal operation per OP/1106/02 (Condensate and Feedwater) or Emergency Feedwater System providing heat removal. _____

4.1.5 Natural Circulation is established: _____ _____

1. ΔT (between T_H and T_C) is less than full load ΔT (< 50°F).
2. Incore thermocouples are stable.
3. RC System is >50°F subcooled by the Subcooling Margin Monitors.
4. S/G levels are ~50% on the operating range.

	Date Init./Time	Verification Date Init./Time

5. Heat removal from steam generators verified by operation of turbine bypass valves and feedwater valve positions.

4.2 Procedure

4.2.1 If Reactor Coolant Pumps are unavailable but will be available within a few hours, it is preferable to maintain hot shutdown conditions until a pump can be restarted.

4.2.1.1 Verify the Pressurizer Heaters in Auto. _____

4.2.1.2 Verify (1)(2)(3) HP-120 (PZR Level Control) in Auto. _____

4.2.1.3 Verify normal letdown maintained through (1)(2)(3) HP-7 (Letdown Control). _____

4.2.1.4 Continuously monitor the items listed in 4.1.5 to ensure natural circulation.

4.2.1.5 Borate the RC System per OP/1103/04 (Soluble Poison Control) to maintain greater

	Date Init./Time	Verification Date Init./Time

than 1% Δk/k shutdown margin with worse case stuck rod fully withdrawn as determined in Reactivity Balance (OP/1103/15). _____

NOTE: If the length of the shutdown is not known, run a Xenon profile from time of shutdown to Xenon ∿ 0%. Borate the RCS, as necessary, to maintain 1% Δk/k shutdown margin. Calculate the shutdown margin every eight (8) hours and borate for Xenon decay.

Unit Supervisor _____

4.2.1.6 Set the Source Range NI-1 and NI-2 Reactor Building Evacuation Alarm Bistable setpoint 1/2 decade above source level and enable the REACTOR BUILDING EVACUATION Alarm. _____

4.2.2 If a rapid natural circulation cooldown is necessary, reduce RC System Pressure gradually by opening (1)(2)(3) RC-66 (PORV) for 10 to 15 seconds per vent. This will decrease system pressure ∿75 to 100 PSIG at high pressures. At lower

	Date Init./Time	Verification Date Init./Time

pressures the pressure decrease per PORV vent will be less. Do not decrease RC System pressure in large steps; maintain subcooling margin >50°F on the Subcooled Monitors.

NOTE: (1)(2)(3) RC-4 (PORV BLOCK) should be shut immediately if the PORV does not reseat.

4.2.2.1 Continue cooldown with 4.2.4.

4.2.3 If a slow, gradual natural circulation cooldown is desirable, do not utilize the PORV as mentioned in 4.2.2, but allow pressure to decrease gradually as the RC System and Pressurizer cool.

NOTE: Since Pressurizer Spray is lost with the loss of the RC pumps, depressurization will proceed at the rate heat is transferred from the pressurizer to the Reactor Building as long as RCS inventory is maintained and the pressurizer is not vented.

4.2.4 Place the Pressurizer Heaters in MANUAL and off. _____

	Date Init./Time	Verification Date Init./Time

NOTE: During a slow, gradual natural circulation cooldown the pressurizer may cool faster than the vessel head area. Pressurizer heaters may have to be utilized to maintain proper subcooling margin.

4.2.5 Maintain RC Pressure versus temperature within the specified limits of OP/1102/10 (Controlling Procedure for Unit Shutdown - RC System Cooldown Limitiations).

NOTE: The fuel in compression curve need not be observed if rapid natural circulation cooldown is required.

4.2.6 Place the Turbine Bypass valves on Manual Control and adjust to give the desired cooldown rate.

NOTE: Because no indication of vessel head temperature exists to ensure metal

		Date Init./Time	Verification Date Init./Time
	temperature has cooled below RC System saturated conditions, the cooldown rate must be maintained <50°F/hr to prevent void formation in the top of the vessel.		
4.2.7	Bypass ES Channels 1 and 2 when RC System Pressure decreases to ~1700 PSIG if applicable to plant status.	_____	_____
4.2.8	When Main Feedwater Pump(s) discharge pressure is 800 psig, perform the following:		
4.2.8.1	Close (1)(2)(3) FDW-315 and (1)(2)(3) FDW-316 from the manual loader and place the Auto/Manual Switches in the "Manual" position.	_____	_____
4.2.8.2	Place the control switches for the "A" and "B" Motor Driven EFWPs in the "Tripped" position.	_____	_____
4.2.8.3	Place (1)(2)(3) MS-93 (TDEFWP Control Switch) in the "LOCKOUT" position.	_____	_____

		Date Init./Time	Verification Date Init./Time
4.2.9	When feedwater is ~ 180°F go to Feedwater Cleanup as per OP/1106/02 (Feedwater and Condensate). _____		
	Unit Supervisor _____		
4.2.10	When Reactor Coolant pressure decreases below 900 psig, bypass ES Channels 3 and 4 before pressure reaches 500 psig. _____	_____	_____
4.2.11	When the main steam pressure decreases below 550 psig, stop the second feedwater pump per OP/1106/02 (Condensate and Feedwater System). _____		
	Unit Supervisor _____		
4.2.12	When RC System pressure reaches approximately 700 psig, remove tag and lock from (1)(2)(3) CF-1 (Tank "A" Outlet) and (1)(2)(3) CF-2 (Tank "B" Outlet) power supply. Close the breakers and isolation valves (1)(2)(3) CF-1 and (1)(2)(3) CF-2.		
	(1)(2)(3) CF-1 BKR White Tag Number _____	_____	_____
	(1)(2)(3) CF-2 BKR White Tag Number _____	_____	_____

		Date Init./Time	Verification Date Init./Time
	NOTE: If the RC system is to be cooled below DTT, depressurize the core flood tanks to ~ 350 psig per OP/1104/01 (Core Flood System). _____ Unit Supervisor _____		
4.2.13	Close power supply to (1)(2)(3) CF-5 CFT "A" Vent) and (1)(2)(3) CF-6 (CFT "B" Vent) (1)(2)(3) CF-5 BKR White Tag Number _____	_____	
	(1)(2)(3) CF-6 BKR White Tag Number _____	_____	
4.2.14	When RC System pressure decreases to $\leq$ 600 psig have the Instrument Department valve in the RC System Low Range Pressure indicator.	_____	
4.2.15	Sample the RC System and verify that the required boron concentration to maintain shutdown margin at ambient temperature and xenon free core is in the Reactor Coolant System.	_____	_____
	NOTE: If the length of shutdown is not known to be longer		

		Date Init./Time	Verification Date Init./Time
	than the time for Xenon decay to ~ 0%, calculate the shutdown margin every eight (8) hours and borate for Xenon decay to maintain 1% $\Delta k/k$ shutdown margin.		
4.2.16	When the RC System pressure is < 500 psig and RC temperature is <275°F, select LOW on the pressurizer power operated relief setpoint selector.	_____	_____
	CAUTION: Immediately check Quench Tank temperature and pressure in case (1)(2)(3) RC-66 lifts unexpectedly.		
4.2.17	Line up to use the HPI System for auxiliary spray; however, pressure reductions should be made slowly and in small increments while watching closely for abnormal pressurizer level behavior. Ensure proper subcooling margin is maintained.		

		Date Init./Time	Verification Date Init./Time
	Close (1)(2)(3) HP-356 (Nozzle Warming Clock).	_____	_____
	Open (1)(2)(3) HP-340 (HPI to Auxiliary Spray Line).	_____	_____
	Open (1)(2)(3) LP-45 (Auxiliary Spray).	_____	_____
4.2.18	Slowly decrease the pressurizer level control setpoint to 100".	_____	
4.2.19	Sample and verify the degassification of the Reactor Coolant and the pressurizer is within limits as being performed by OP/1102/12 (Degassification of RC System and Pressurizer).	_____	
	Unit Supervisor _____		
4.2.20	When RC System pressure < 350 psig and RC temp. < 250°F, rack out and white tag open the RC spray pump breakers.		
	'A' RB Spray Pump BRK White Tag #_____	_____	_____
	'B' RB Spray Pump BKR White Tag#_____	_____	_____
4.2.21	Close (1)(2)(3) SD-348 (MS Pumping Trap Bypass) when MS header pressure decreases to < 15 psig.	_____	

		Date Init./Time	Verification Date Init./Time
4.2.22	Close (1)(2)(3) BS-3 ("A" Pump Suction) and (1)(2)(3) BS-4 ("B" Pump Suction).	_____	_____
4.2.23	When the RC System pressure is reduced $\leq$ 350 psig and < 250°F valve in the Low Pressure Injection System per OP/1104/04 (Low Pressure Injection System) and continue cooldown to cold shutdown conditions.	_____	

5.0 Enclosures

5.1 RCS Pressure/Temperature Curves

RCS Pressure / Temperature Curves