


 DEPARTMENT OF NUCLEAR PLANT OPERATIONS
 DIABLO CANYON POWER PLANT UNIT NO(S) 1 AND 2
 EMERGENCY OPERATING PROCEDURE
 TITLE NATURAL CIRCULATION OF REACTOR COOLANT

 APPROVED _____
 PLANT MANAGER
SCOPE

If forced reactor coolant flow is terminated, (all 4 RCP's tripped) Natural Circulation of the coolant will occur when a temperature gradient exists between the core and the steam generators. OP-23 provides guidance for the operator when Natural Circulation is required.

OP-23 assumes that off-site power is available but that all reactor coolant pumps (RCP) are unavailable to cool the core (e.g. loss of CCW to RCP's, low RCS pressure, RCP's failure).

SYMPTOMS

1. RTD bypass line low flow alarms.
2. Reactor Coolant low flow protection bistable monitor lights on.
3. Reactor coolant flow indication decreases to near zero in all loops.
4. RCP breaker lights and motor ammeters indicate breakers tripped.
5. Possibly RCP bus undervoltage or underfrequency.

AUTOMATIC ACTIONS

1. Reactor trip if above P-7.
2. Turbine trip if above P-7.
3. Steam Dump Valve Operation.

OBJECTIVES

1. Remove decay heat from the Reactor Coolant System (RCS) and maintain subcooled state.
2. Maintain the Reactor subcritical.



IMMEDIATE OPERATOR ACTIONS

<u>ACTIONS</u>	<u>COMMENTS</u>
1. Verify Reactor Trip or trip manually if below P-7.	1. Observe zero or negative startup rate, zero or decreasing flux levels and all rods in. Emergency Borate 100 ppm for each stuck rod.
2. Verify Turbine Trip or trip manually if below P-7.	2. Observe stop valves closed, speed decreasing and PCB's 532 and 632 open within 30 seconds.
3. Verify Steam Dump System operating.	3. Steam header pressure should be stable at approx. 1000 psig. If required use the 10% atmosphere dump valves.
4. Verify Auxiliary Feedwater to all available Steam Generators.	4. Manually start pumps if required.

SUBSEQUENT ACTIONS

<u>ACTIONS</u>	<u>COMMENTS</u>
1. Monitor Steam Generator water levels.	
a. Verify feedwater isolation at T_{avg} .	
b. Verify auxiliary feedwater LCV's operating to maintain steam generator levels in the narrow range.	b. LCV 110, 111, 113 and 115 in AUTO with toggle switches closed.
2. Terminate any Reactor Coolant System dilution operations which may be in progress.	
3. Establish RCS conditions to enhance Natural Circulation.	
a. Pressurizer pressure between 2200 and 2300 psig.	a. Heater control in MANUAL. If necessary, use Aux. Spray (valve 8145 or valve 8148) to depressurize
b. Pressurizer level above 22%.	

ACTIONSCOMMENTS

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| <p>4. Verify core outlet temperature (thermocouple average) is less than or equal to 600°F. <u>Increase steam dump flow as necessary to limit core outlet temperature.</u></p> | <p>4. Assures 50°F subcooling at 2200 psig RCS pressure. Reduce HC507 (steam header pressure) setpoint or use manual valve control to increase steam flow.</p> |
| <p>5. The effectiveness of Natural Circulation is verified by:</p> <p>a. Core exit temperature is at least 50°F cooler than pressurizer temperature and exhibits stable or decreasing values.</p> <p>b. Cold leg temperatures in all active loops are approximately equal to S/G saturation temperature.</p> <p>c. Hot leg temperatures in all active loops are showing a stable or decreasing trend. Hot to cold leg ΔT should be less than 64°F.</p> <p>d. All available Steam Generators steaming and steam header pressure stable.</p> | <p>5. <u>CAUTION:</u> Trends in parameter values are most significant in verifying Natural Circulation. Absolute values may vary.</p> <p>a. P-250 averages T/C data address: U0091. May also take short form T/C core map every 10 min.</p> <p>b. Cold leg temps in TR413,423,433 and 443. S/G pressure will determine sat. temp.</p> <p>c. High ΔT (>64°F) tends to inhibit natural circulation</p> |
| <p>6. If the core exit T/C average reading increases for 3 consecutive measurement intervals, reduce steam header pressure to obtain greater natural circulation flows.</p> | <p>6. Open steam dump valves slowly and allow time for the temperature to stabilize.</p> |
| <p>7. Verify shutdown margin is maintained during all phases of natural circulation.</p> <p>a. Monitor NIS channels to verify the reactor remains subcritical.</p> <p>b. Perform shutdown margin calculations for anticipated final RCS conditions.</p> <p>c. Verify RMCS flows to blender are set to provide the proper boron concentration.</p> | <p>7. <u>NOTE:</u> If uncontrolled cooldown is anticipated, inject contents of Boron Injection Tank immediately.</p> <p>a. Reset source range detectors when below P-6 setpoint.</p> <p>c. Boric Acid HC110, Primary Water HC111.</p> |

APPENDIX Z

EMERGENCY PROCEDURE NOTIFICATION INSTRUCTIONS

1. When this emergency procedure has been activated and upon direction from the Shift Foreman proceed as follows:
 - a. Notify the Plant Superintendent and Supervisor of Operations or their designated alternates.
 - b. Designate this event a Notification of Unusual Event. Notify those agencies given in General Appendix 2 of the Emergency Procedures (Notification of Outside Agencies in the Event of an Emergency).
 - c. Within one hour notify the NRC Operations Center using the red phone in the Control Room. Gather sufficient information from all sources prior to calling so that the phone call is meaningful. Notify the NRC that your call is pursuant to 10CFR Part 50.72, (Notification of Significant Events).