PROCEDURE TO ASSURE ADEQUATE CORE COOLING

A. SYMPTOMS

ECCS initiation setpoint has been reached and:

1. Reactor water level indication is continuing to decrease with ECCS operating.
2. Reactor water level is remaining at a level below the top of the active fuel as indicated by available level indications.
3. Reactor water level indication is unavailable.
4. Less than design flow is indicated on Feedwater or ECC Systems when design flow is required.

B. AUTOMATIC ACTIONS

None.

C. IMMEDIATE OPERATOR ACTIONS

NOTE

The highest priority action is to have any one ECCS pump injecting. Indication that any one ECCS pump is injecting is a reliable confirmation that inadequate core cooling effects are being mitigated. Confirmation of ECCS injection indication is a reliable backup for water level instrumentation.

1. Recheck and compare water level indications.

   a. Panel 902(3)-3

Wide Range Yarway A	(0 to 400 in.)	_____
Wide Range Yarway B	(0 to 400 in.)	_____
Wide Range GEMAC Recorder	(0 to 400 in.)	_____

   b. Panel 902(3)-4

Wide Range GEMAC	(-70 to +330 in.)	_____

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c. Panel 902(3)-5

Narrow Range Yarway A	(-60 to +60 in)	_____
Narrow Range Yarway B	(-60 to +60 in.)	_____
Narrow Range GEMAC A	(0 to 60 in.)	_____
Narrow Range GEMAC B	(0 to 60 in.)	_____

Reactor Vessel Level/Feedwater Flow Recorder (Black Pen)

(Utilize Vessel Level Select Switch)

Level A	(0-60 in.)	_____
Level B	(0-60 in.)	_____

2. IF LPCI System flow has been diverted for Containment Cooling, restore all flow to the core. If Containment Cooling is essential, injection water should be routed through the LPCI Heat Exchanger.

3. IF high pressure systems have failed to maintain level, Auto Blowdown has initiated and reactor pressure is greater than 350 psig, VERIFY that all Auto Blowdown Valves OPENED by checking temperature recorder and accoustical monitor on Panel 902(3)-21.

4. IF LPCI initiated and reactor pressure is <350 psig, VERIFY the following:

a. With Recirculation Loop A Selected for Injection

Panel 902(3)-3

MO-2(3)-1501-21A	OPEN _____
MO-2(3)-1501-22A	OPEN _____
MO-2(3)-1501-21B	CLOSED _____
MO-2(3)-1501-22B	CLOSED _____

Panel 902(3)-4

MO-2(3)-202-5A	CLOSED _____
MO-2(3)-202-7A	CLOSED _____
MO-2(3)-202-6A	CLOSED _____
MO-2(3)-202-9A	CLOSED _____

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b. Wi[redacted] Recirculation Loop B Selected [redacted]or Injection

Panel 902(3)-3

MO-2(3)-1501-21B	OPEN _____
MO-2(3)-1501-22B	OPEN _____
MO-2(3)-1501-21A	CLOSED _____
MO-2(3)-1501-22A	CLOSED _____

Panel 902(3)-4

MO-2(3)-202-5B	CLOSED _____
MO-2(3)-202-7B	CLOSED _____
MO-2(3)-202-6B	CLOSED _____
MO-2(3)-202-9B	CLOSED _____

5. MONITOR LPCI injection and core flow by observing the following:

Panel 902(3)-5

Core Flow Recorder (Black Pen)	0-125 Mlb/hr_____	
Core Differential Pressure (Red Pen)	0-25 psid_____	

Panel 902(3)-4

JP-1	0-150%_____	
JP-6	0-150%_____	(100% = 49 Mlb/hr under normal operating conditions)
JP-11	0-150%_____	
JP-16	0-150%_____	
JP Loop A Flow	0-150%_____	
JP Loop B Flow	0-150%_____	

Panel 902(3)-3

Reactor Differential Pressure	0-30 psid_____

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D. SUBSEQUENT OPERATOR ACTIONS

1. Core Spray System effectiveness may be checked by:

a. System I

Pump A Flow	0-6000 GPM_____
Pump A Discharge Pressure	0-400 psig_____
MO-2(3)-1402-3A	OPEN_____
MO-2(3)-1402-24A	OPEN_____
MO-2(3)-1402-25A	OPEN_____
MO-2(3)-1402-9A	OPEN_____
VALVE-2(3)-1402-6A	OPEN_____
MO-2(3)-1402-38A	CLOSED_____
MO-2(3)-1402-4A	CLOSED_____

b. System II

Pump C Flow	0-6000 GPM_____
Pump C Discharge Pressure	0-400 psig_____
MO-2(3)-1402-3B	OPEN_____
MO-2(3)-1402-24B	OPEN_____
MO-2(3)-1402-25B	OPEN_____
MO-2(3)-1402-9B	OPEN_____
VALVE-2(3)-1402-6B	OPEN_____
MO-2(3)-1402-38B	CLOSED_____
MO-2(3)-1402-4B	CLOSED_____

2. LPCI System effectiveness may be checked by:

a. System I Panel 902(3)-3

Pump Flow	0-20,000 GPM_____
MO-2(3)-1501-5A	OPEN_____

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MO-2(3)-1501-5B	OPEN
MO-2(3)-1501-11A	OPEN
MO-2(3)-1501-21A	(Condition dependent on
MO-2(3)-1501-22A	LPCI Loop Selection)
MO-2(3)-1501-25A	OPEN
VALVE 2(3)-1501-26A	OPEN
MO-2(3)-1501-32A	OPEN
MO-2(3)-1501-32B	OPEN
MO-2(3)-1501-13A	CLOSED
MO-2(3)-1501-18A	CLOSED
MO-2(3)-1501-19A	CLOSED
MO-2(3)-1501-38A	CLOSED
MO-2(3)-1501-20A	CLOSED
MO-2(3)-1501-27A	CLOSED
MO-2(3)-1501-28A	CLOSED

b. System II Panel 902(3)-3

Pump Flow	0-20,000 GPM
LPCI Flow Recorder	0-20,000 GPM
MO-2(3)-1501-5C	OPEN
MO-2(3)-1501-5D	OPEN
MO-2(3)-1501-11B	OPEN
MO-2(3)-1501-21B	(Condition dependent on
MO-2(3)-1501-22B	LPCI Loop Selection)
MO-2(3)-1501-25B	OPEN
VALVE 2(3)-1501-26B	OPEN
MO-2(3)-1501-32A	OPEN
MO-2(3)-1501-32B	OPEN

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MO-2(3)-1501-13B	CLOSED_____
MO-2(3)-1501-18B	CLOSED_____
MO-2(3)-1501-19B	CLOSED_____
MO-2(3)-1501-38B	CLOSED_____
MO-2(3)-1501-20B	CLOSED_____
MO-2(3)-1501-27B	CLOSED_____
MO-2(3)-1501-28B	CLOSED_____

3. HPCI System effectiveness may be checked by:

Pump Flow	0 to 100% (94% = 5600 GPM)_____	
Pump Discharge Pressure	0 to 1500 psig_____	
Pump Inlet Pressure	30 in Hg to + 30 psig_____	
Turbine RPM	0-6000 RPM_____	
Turbine Inlet Pressure	0-1500 psig_____	
Turbine Exhaust Pressure	0-150 psig_____	
MO-2(3)-2301-6	OPEN (CLOSE)_____	(Condition
OR		dependent
MO-2(3)-2301-35	CLOSED (OPEN)_____	on source
AND		of HPCI
MO-2(3)-2301-36	CLOSED (OPEN)_____	suction)
MO-2(3)-2301-9	OPEN_____	
MO-2(3)-2301-8	OPEN_____	
AO-2(3)-2301-7	OPEN_____	
MO-2(3)-2301-4	OPEN_____	
MO-2(3)-2301-5	OPEN_____	
MO-2(3)-2301-3	OPEN_____	
Turbine Stop Valve	OPEN_____	

4. Feedwater and Condensate System effectiveness may be checked by:

Condensate Pump Amps	0-300 amps_____

Condensate Pump Discharge Header Pressure	0-200 psig_____
Condensate Booster Pump Suction Pressure	0-200 psig_____
Condensate Booster Pump Discharge Header Pressure	0-600 psig_____
RFP Suction Header (common)	0-600 psig_____
RFP Amps	0-1.5 KVA_____
RFP Flow	0-6000 lbs/hr_____
RFP Discharge Header (common)	0-2000 psig_____
Feedwater Temperature	0-500°F_____
Hotwell Level	0-50 in_____
Condensate Storage Tank Level 2/3A	0-32 ft_____
Condensate Storage Tank Level 2/3B	0-32 ft_____
Condensate Makeup Recorder Normal (Black)	0-500 GPM_____
Emergency (Red)	0-1000 GPM_____
MO-2-3304	OPEN (if desired)_____
MO-2-3303	OPEN (if desired)_____
MO-2-3403	OPEN (if any LP Heater String isolated)_____
RFP Minimum Flow Valve 2-3201A	CLOSED_____
RFP Minimum Flow Valve 2-3201B	CLOSED_____
RFP Minimum Flow Valve 2-3201C	CLOSED_____
MO-2-3201-A	OPEN (if A Pump running)_____
MO-2-3201-B	OPEN(if B Pump running)_____
MO-2-3201-C	OPEN (if C Pump running)_____
MO-2-3206-A	OPEN_____

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AO-2-642A	OPEN_____
MO-2-3206-B	OPEN_____
AO-2-642B	OPEN_____
Low Flow Feed Regulating Valve	OPEN_____
MO-2-3202	OPEN (if any HP Heater String isolated)_____
MO-2-3205A	OPEN_____
MO-2-3205B	OPEN_____

5. The effectiveness of Primary Containment Isolation can be checked by verifying the following:

a. Group I

AO-203-1A	CLOSED_____
AO-203-2A	CLOSED_____
AO-203-1B	CLOSED_____
AO-203-2B	CLOSED_____
AO-203-1C	CLOSED_____
AO-203-2C	CLOSED_____
AO-203-1D	CLOSED_____
AO-203-2D	CLOSED_____
MO-220-1	CLOSED_____
MO-220-2	CLOSED_____
MO-220-44	CLOSED_____
MO-220-45	CLOSED_____
AO-1301-17	CLOSED_____
AO-1301-20	CLOSED_____

b. Group II

AO-2001-105	CLOSED_____
AO-2001-106	CLOSED_____

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AO-2001-5 CLOSED_____

AO-2001-6 CLOSED_____

AO-1599-61 CLOSED_____

AO-1599-62 CLOSED_____

c. Group III

MO-1201-1 CLOSED_____

MO-1201-2 CLOSED_____

MO-1201-3 CLOSED_____

MO-1201-7 CLOSED_____

MO-1001-1A CLOSED_____

MO-1001-2A CLOSED_____

MO-1001-4A CLOSED_____

MO-1001-5A CLOSED_____

MO-1001-1B CLOSED_____

MO-1001-2B CLOSED_____

MO-1001-4B CLOSED_____

MO-1001-5B CLOSED_____

MO-1001-2C CLOSED_____

MO-1001-4C CLOSED_____

d. Group IV

MO-2301-4 CLOSED_____

MO-2301-5 CLOSED_____

MO-2301-35 CLOSED_____

MO-2301-36 CLOSED_____

e. Group V

MO-1301-1 CLOSED_____

MO-1301-2 CLOSED_____

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MO-1301-3	CLOSED_____
MO-1301-4	CLOSED_____
AO-1301-17	CLOSED_____
AO-1301-20	CLOSED_____

6. If the inadequacy of cooling is due to insufficient water supplies in the Condensate Storage tanks, Torus and Condensate Hotwell, the following sources of water should be considered available:

CAUTION

Standby Coolant Supply is a last resort and should only be used as directed by the Operating Assistant Superintendent or the GSEP Technical Director.

a. Unprocessed Water in Radwaste tanks.

b. Standby Coolant Supply.

E. DISCUSSION

This procedure is a supplementary guideline to the General Abnormal procedures. The symptoms which dictate the use of this procedure would most probably occur after the immediate actions of the procedures for breaks inside the drywell, breaks outside the drywell, reactor low water level and stuck open relief valve have been followed.

If the operator already has an inference as to the cause of the inadequate cooling, he need not follow the procedure step by step. He should refer to the steps affecting that system first. (Even immediate actions may be skipped.) The blank lines next to parameters are not intended to make this a checklist. These blanks are a convenience item that the operator can use at his discretion.

The immediate actions within this procedure attempt to detect some of the more probable causes of inadequate core cooling.

The indicated water level, where provided by Yarway instrumentation utilizing reference legs in the drywell, is dependent upon drywell temperature. Very large increases in drywell temperature (an increase from 135°F to 340°F) could result in a level inaccuracy (as much as 14 inches depending on drywell temperature and type of instrument) with indicated level being higher than actual level.

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During rapid reactor depressurization (with ADS operation for example), and particularly below 500 psig, the operator should utilize the GEMAC level indication to give backup information on vessel water level. The operator should not turn off any ECCS unless there is sufficient confirming information from GEMAC reference leg level instrumentation that vessel water level has been restored. The operators should not rely on the Yarways if erratic behavior, indicative of reference leg flashing, has occurred until the Yarway readings are on scale and in reasonable agreement with GEMAC level instruments. The operator should VERIFY that automatic ECCS actuations occur when the levels are at the trip points. The operator should be prepared to manually actuate ECCS during a suspected LOCA if automatic actuation is not achieved.

It should be noted that core flow instrumentation such as core differential pressure, reactor differential pressure and core flow will not provide conclusive evidence as to the adequacy of core cooling. These instruments are intended to be used in conjunction with other indications. Recirculation loop temperatures and vessel temperatures may be consulted but the validity of such indication is questionable as it relates to core cooling.

Subsequent actions address effectiveness of various inventory makeup systems and containment isolations. Some parameters such as LPCI pump amps and discharge pressure and Core Spray header dp are not listed within the procedure. These instruments may be used but must be read locally. Before attempting to confirm core cooling by local indications, consideration must be given to the effect of radiation levels and atmospheric contamination on personnel.

The only valves listed under Group II Isolation are those which could result in a significant water inventory loss from the containment.

The highest priority action is to have any one ECCS pump injecting. Indication that any one ECCS pump is injecting is a reliable confirmation that inadequate core cooling effects are being mitigated. Confirmation of ECCS injection indication is a reliable backup for water level instrumentation.

Indications such as incore instrumentation are not considered sufficiently reliable to include in this procedure.

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