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Rev. 6

Effective Date 11/5/99

EMERGENCY PLAN IMPLEMENTING PROCEDURE

EM-225

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

DUTIES OF THE TECHNICAL SUPPORT CENTER ACCIDENT ASSESSMENT TEAM

CONTROLLED COPY
NUCLEAR OPERATIONS
Holder # 1242

APPROVED BY: Procedure Owner

(SIGNATURE ON FILE)

DATE: 11/3/99

PROCEDURE OWNER: Manager, Nuclear Plant Operations

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1.0 PURPOSE

This procedure provides guidance for the establishment and operation of the Technical Support Center Accident Assessment Team (AAT), for the determination of core and fission product barrier status, and for the interface with the Dose Assessment Team. Information from these assessments will be used in conjunction with other guidance for development of accident mitigation strategies. This procedure also provides guidance to the AAT to perform actions described in the EOPs. [NOCS 062718]

2.0 REFERENCES

2.1 DEVELOPMENTAL REFERENCES

2.1.1 Response Technical Manual (RTM-96); USNRC; Volume 1, Rev. 3

2.1.2 Radiological Emergency Response Plan

2.1.3 Emergency Operating Procedures (EOPs)

2.1.4 NUREG-1228, Source Term Estimation During Incident Response to Severe Nuclear Power Plant Accidents

2.1.5 B&W Technical Bases Document

2.1.6 FPC I0C CR97-0122, Dated 12/23/97

2.1.7 NEI 91-04, Revision 1, Severe Accident Issue Closure Guidelines

2.1.8 FPC IOC SE99-0184, Dated 9/14/99

3.0 PERSONNEL INDOCTRINATION

3.1 DEFINITIONS

3.1.1 Accident Assessment Team (AAT) - Consists of Coordinator, TSC Ringdown Communicator, Control Room Ringdown Communicator, Engineer, Operations Support, and NRC Communicator.

3.1.2 Candidate High Level Actions (CHLA) - Actions described in the CR-3 Severe Accident Guideline which could be taken to mitigate a Severe Accident and are deemed appropriate based on Plant Damage Conditions.

3.1.3 Critical Safety Functions (CSFs) - Those functions needed to ensure adequate core cooling and to preserve the integrity of the fission product barriers thereby protecting the health and safety of the general public and plant personnel. They include: reactivity control, coolant inventory control, decay heat removal capability, fission product barrier status, electrical power availability and control room status.

3.1.4 Emergency Action Levels (EALs) - Conditions or indications that may be used as thresholds for initiating specific emergency measures (see EM-202, Enclosure 1).

3.1.5 Plant Damage Conditions (PDC) - Damage conditions used in the CR-3 Severe Accident Guideline to describe the status of the reactor coolant system, reactor core, and the containment during the progression of a Severe Accident.

3.1.6 Protective Action Recommendations (PARs) - Emergency measures recommended for purposes of preventing or minimizing radiological exposures to the Generating Complex personnel or members of the general public.

3.1.7 Severe Accident - An accident (beyond that assumed in the CR-3 design and licensing basis) that results in catastrophic fuel rod failure, core degradation and fission product release into the Rx vessel, Reactor Building or the environment.

3.2 RESPONSIBILITIES

3.2.1 Control Room Ringdown Communicator

- Reports to the Control Room and establishes communication with the TSC Ringdown Communicator on the Accident Assessment Ringdown phone.
- Relays status of overall plant conditions and questions to the TSC AAT.
- Relays instructions to Control Room Operators for mitigating actions as directed by the Emergency Coordinator (EC).
- If a Severe Accident is occurring, directs Control Room personnel regarding actions to take to mitigate the Severe Accident, based on actions approved by the TSC EC.

3.2.2 AAT Coordinator

- Informs the EC of any developments in plant status that may impact EALs and PARs.
- Ensures appropriate AAT personnel have staffed the TSC.
- Ensures additional AAT members are notified as needed.
- Identifies plant parameters to be tracked.
- Coordinates AAT activities and ensures that team members remain focused on objectives.
- Keeps the EC informed of AAT activities.
- If a Severe Accident is occurring, reviews recommended Candidate High Level Actions and mitigation plans prior to submitting to the Emergency Coordinator. [NOCS 100056]
- If a Severe Accident is occurring, coordinates efforts of the Accident Assessment team to ensure the development of mitigation strategies using the CR-3 Severe Accident Guideline.
- If additional resources are needed, coordinates with the EOF Accident Assessment Team to provide required support.

3.2.3 TSC Ringdown Communicator

- Establishes communications with the Control Room Ringdown Communicator in the Control Room on the Accident Assessment Ringdown phone.
- Relays information on changing radiological conditions and maintenance activities to the Control Room.
- Relays plant conditions from the Control Room to the TSC AAT.
- Maintains the Accident Assessment Team Log.
- Establishes communications with the Emergency Operating Facility (EOF) AAT, if the EOF is staffed.
- Relays information and directions to the Control Room of actions required to mitigate a Severe Accident based on approved Candidate High Level Actions.
- Monitors progression through EOPs and APs.

3.2.4 AAT Engineers

- Assesses plant conditions and provides engineering support for developing accident mitigation strategies as needed.
- Aids in determining additional Engineering resources.
- Monitors plant parameters for indications of core damage and status of fission product barriers.
- During Severe Accident conditions, evaluates plant parameters, determines Plant Damage Conditions, and develops Candidate High Level Action recommendations using appropriate calculational aids from the CR-3 Severe Accident Guideline.

3.2.5 AAT Operations Support

- Monitors overall plant status during an emergency with emphasis on Critical Safety Functions.
- Functions as a technical resource for Operations in assessing plant conditions and in development of accident mitigation strategies that are outside the scope of Emergency Operating Procedures (EOPs). [NOCS 13010]
- Maintains the CSF Status Board at the TSC.
- During Severe Accident Conditions, provides support to the AAT Engineers in determining Plant Damage Conditions and developing mitigation strategies using the CR-3 Severe Accident Guideline.

3.2.6 NRC Communicator [NOCS 96042]

- Maintains an open, continuous communication line on the Emergency Notification System with the NRC Operations Center upon request by the Headquarters Operations Officer.
- Log times NRC is notified of Emergency Classification changes and Protective Action Recommendations.

3.2.7 EOF Accident Assessment Team

- Functions as a technical resource for the EOF Director in development of PARs by monitoring plant conditions (particularly the CSFs).
- Assists the TSC AAT team as needed in development of mitigation strategies and in research of solutions to plant problems.
- Responsible for the development of long-term recovery plans.

3.2.8 Emergency Coordinator (EC) or designee

- Controls all activities at CR-3 during activation of the Radiological Emergency Response Plan.
- Implements EM-202.
- Determines EAL and PAR changes based on information obtained from the Accident Assessment Team and Dose Assessment Team.
- Functions as the decision maker during a Severe Accident. The EC will approve all recommended Severe Accident mitigation strategies prior to implementation.
- Is authorized to declare 10CFR50.54(x and y) to implement emergency actions deemed necessary to protect the health and safety of the public.

3.2.9 Dose Assessment Team

- Supports the Accident Assessment team with on-site radiological data and with chemical and radiological analysis of samples as needed to assess the accident.
- Provides Plant Radiation Monitor readings and assessments.
- Provides projected radiological data (on-site and off-site doses, dose rates, and deposition) (> 1 hour to obtain).
- Provides RCS PASS data (> 1 hour to obtain) on Radionuclide composition, Chloride concentration, Dissolved Hydrogen concentration, and Boron concentration.
- Provides Reactor Building and/or Auxiliary Building Atmosphere Radionuclide composition (> 1 hour to obtain).
- Provides in-plant radiological data.
- Provides chemical and radiological analysis of OTSGs and secondary samples.
- Provides Reactor Building sump boron concentration (> 1 hour to obtain).

3.3 LIMITS AND PRECAUTIONS

3.3.1 Under Severe Accident Conditions, plant instrumentation may provide false or highly inaccurate readings due to harsh environments beyond their qualifications. Several instruments should be monitored along with trends to assess plant conditions.

4.0 INSTRUCTIONS

4.1 ACCIDENT ASSESSMENT INITIATION

4.1.1 The AAT Coordinator or designee performs the duties of Enclosure 1, AAT Coordinator Checklist.

4.1.2 The TSC Ringdown Communicator performs the duties of Enclosure 3, TSC Ringdown Communicator Checklist.

4.1.3 The AAT Operations Support member performs the duties of Enclosure 4, AAT Operations Support Checklist.

4.1.4 The AAT Engineers perform the duties of Enclosure 5, AAT Engineers Checklist.

4.1.5 The Control Room Ringdown Communicator reports to the Control and performs the duties of Enclosure 6, Control Room Ringdown Communicator Checklist.

4.1.6 The NRC Communicator performs the duties of Enclosure 7, NRC Communicator Checklist.

AAT COORDINATOR CHECKLIST

- ☐ Sign in on TSC Staffing Board.
- ☐ Determine current plant status and conditions using Enclosure 2. (Enclosure 2 will normally be completed by AAT Operations support member.)
- ☐ Ensure the Plant Status Board Critical Safety Functions are updated.
- ☐ Ensure phone contact is established with the Control Room Ringdown Communicator.
- ☐ Notify the EC when Accident Assessment is operational.
- ☐ Evaluate plant conditions and assist the EC in making timely and proper Emergency Classifications and Protective Action Recommendations.
- ☐ Ensure appropriate AAT personnel staff the TSC. Contact additional AAT members as needed. (Refer to EM-206, Enclosure 1.)
    - ☐ Alternate Coordinator (optional): ____________________
    - ☐ TSC Ringdown Communicator (required): ____________________
    - ☐ Control Room Ringdown Communicator (required): ____________________
    - ☐ Operations Support (required): ____________________
    - ☐ 2 Engineers (required): ____________________
    - ☐ NRC Communicator (required): ____________________
- ☐ Ensure all AAT members have badged in at TSC Card Reader.
- ☐ Determine parameters or parameter groups to monitor and ensure the desired parameters are displayed.
- ☐ Ensure times and results of significant actions are documented throughout the emergency.
- ☐ Ensure functions of the AAT are performed in accordance with applicable enclosures.
- ☐ Ensure the EC is informed of significant AAT activities and developments in plant status.
- ☐ During TSC briefing, use Enclosure 2 to provide a high level status of Critical Safety Functions and plant status.

TSC BRIEFING GUIDELINE

Use the following as guidance for establishing minimum input to TSC Briefings. Use the information in Enclosures 8 and 10 to aid the evaluation.

		YES	NO
I.	IS THE REACTOR SUB-CRITICAL?	☐	☐
II.	IS THE CORE ADEQUATELY COOLED? (CORE COVERED, DECAY HEAT BEING REMOVED)	☐	☐
III.	ARE THE FISSION PRODUCT BARRIERS INTACT?		
	Fuel clad intact?	☐	☐
	RCS intact?	☐	☐
	Containment intact?	☐	☐
IV.	IS ADEQUATE ELECTRICAL POWER AVAILABLE?		
	Off-site AC Power available?	☐	☐
	Emergency Diesel Generators available?	☐	☐
	DC power available?	☐	☐
V.	ARE THERE SIGNIFICANT CONTROL ROOM PROBLEMS?		
	Control Complex ventilation operable?	☐	☐
	Necessary Control Room instrumentation operable?*	☐	☐

VI. DISCUSS OTHER PLANT CONDITIONS AND CHALLENGES AS NECESSARY.

____

* Necessary refers to specific instruments and annunciators that are needed to identify, diagnose, and track the problems that are causing the emergency.

TSC RINGDOWN COMMUNICATOR CHECKLIST

- ☐ Establish contact with the Control Room Communicator via the Accident Assessment Ringdown phone.

- ☐ Ensure the Control Room is informed of changing radiological conditions, ongoing TSC maintenance and repair activities, and accident mitigation priorities.

- ☐ If the EOF is staffed, establish communication with the EOF AAT using plant extensions (6720, 6205).

  NOTE: The EOF AAT can monitor the Accident Assessment Ringdown phone, but cannot be heard.

- ☐ Maintain the Accident Assessment Team log book with all significant events, changes in plant status, and requests to and from the Control Room.

- ☐ Relay information and directions to the Control Room as appropriate.

- ☐ Monitor progression through EOPs and APs (using a copy of the applicable procedures), anticipating problems created by unavailable equipment or other unusual plant conditions. Mark place keeping aids as appropriate to allow other AAT members to determine status of procedure usage. Provide periodic status to AAT Operations Support member.

AAT OPERATIONS SUPPORT CHECKLIST

[NOCS 62764]

- ☐ Begin assessment of Critical Safety Functions to ensure adequate core cooling and fission product barrier preservation, using Enclosure 8 as applicable.

- ☐ Complete Enclosure 2 and provide the results to the AAT Coordinator. Enclosure 2 should be completed periodically or as conditions change.

- ☐ Maintain the CSF Status Board at the TSC.

- ☐ Complete Enclosure 9 and provide the results to the Dose Assessment Team Leader. If conditions change, Enclosure 9 should be reassessed and submitted to the Dose Assessment Team.

- ☐ Coordinate activities of operators dispatched from TSC to support EOP or AP Actions, or maintenance repair efforts. Refer to SP-306 for a list of EOB and EOL locations and contents.

- ☐ If RCS LOCA conditions exist, coordinate performance of EM-225A, "Post Accident RB Hydrogen Control." [NOCS 62767]

- ☐ If RCS LOCA conditions exist, coordinate performance of EM-225E, "Guidelines For Long Term Cooling."

- ☐ If EFW or AFW is operating, coordinate performance of EM-225F, "Long Term Emergency Feedwater Management."

- ☐ If a Severe Accident is in progress, assist engineering in developing appropriate mitigation strategies using the Candidate High Level Actions in the CR-3 Severe Accident Guideline. [NOCS 100056]

AAT ENGINEERS CHECKLIST
[NOCS 62764]

- ☐ Perform Enclosure 10. Perform an initial and periodic assessment of core damage and fission product barriers, and provide the results to the AAT Operations Support Member and the Dose Assessment Team Leader.

- ☐ If RCS LOCA conditions exist, coordinate performance of EM-225B, "Post-Accident Boron Concentration Management."

- ☐ Maintain the Plant Parameters Status Board (if required). Based on plant conditions, place key parameters on status board for trending.

- ☐ Monitor for conditions listed in Enclosure 11. Provide the AAT Operations Support member with recommended actions.

- ☐ If RB temperatures are elevated, coordinate the performance of EM-225C, "Post Accident Monitoring Of Reactor Building Temperature."

- ☐ If any OTSG level is $\leq$ 12.5 inches (indicating a dry OTSG), coordinate the performance of EM-225D, "Guidance For Dry OTSG Tube To Shell Delta T Monitoring And Control."

- ☐ Evaluate the effects of proposed maintenance repair activities and operational manipulations on plant equipment.

- ☐ Develop contingency plans and support emergency repair efforts as applicable.

- ☐ If a Severe Accident is in progress, develop mitigation strategies using the Candidate High Level Actions in the CR-3 Severe Accident Guideline.

CONTROL ROOM RINGDOWN COMMUNICATOR CHECKLIST

- ☐ Report to the Control Room and establish communication with the TSC Ringdown Communicator on the Accident Assessment Ringdown.

- ☐ Relay status of overall plant conditions and questions to the TSC AAT.

- ☐ Relay instructions to Control Room Operators for mitigating actions as directed by the EC.

- ☐ Inform Control Room Operators of the following:
  - ______ Changes in Emergency Classifications
  - ______ TSC repair efforts
  - ______ Operators activities dispatched from the TSC/OSC
  - ______ Changing radiological conditions
  - ______ Mitigation priorities

- ☐ EOPs or APs in use by Control Room.

- ☐ If a Severe Accident is in progress, direct control room personnel regarding mitigation strategies, based on actions approved by the TSC Emergency Coordinator.

NRC COMMUNICATOR CHECKLIST

- ☐ Contact the TSC Report Preparation to determine if continuous communication with the NRC is required.
- ☐ Obtain copies of any previously submitted NRC reports.
- ☐ If the NRC has requested continuous communication, establish communication with the NRC Communicator on the Emergency Notification System (ENS). [NOCS 3054, 9405]
- ☐ Maintain a log book of significant communications between the NRC and CR-3, including a summary of responses to NRC questions and transmittal of information.
- ☐ Maintain an open line on the ENS until the NRC agrees to terminate communications. [NOCS 10528]
- ☐ Log time(s) when NRC is notified of Emergency Classification changes.
- ☐ Log time(s) when NRC is notified of Protective Action Recommendations.
- ☐ When communication with the NRC is not required, provide support to other AAT members as needed.

CRITICAL SAFETY FUNCTION CHECKLIST

Monitor the parameters associated with the Critical Safety Functions. The parameter tables below are for reference only. It is not intended that the tables be completed during each evaluation. Plant computer point numbers or SPDS/RECALL point numbers are listed, if available.
Using pre-established RECALL Groups based on accident type in progress is recommended.

Notify the AAT Coordinator immediately if any of the CSFs cannot be verified.

I. IS THE REACTOR SUB-CRITICAL? ☐ YES ☐ NO

REACTIVITY CONTROL

PARAMETER	COMPUTER POINT	RECALL POINT			
All Rods at in-limits Y/N	P057	RECL-375			
Intermediate Range detector NI-3 amps	P212	RECL-150			
Intermediate Range detector NI-4 amps	P213	RECL-151			
Source Range NI-1 cps	P202	RECL-152			
Source Range NI-2 cps	P203	RECL-153			
Low Range NI-14/15		RECL-102,103			
Adequate Shutdown Margin					

II. IS THE CORE ADEQUATELY COOLED (core covered, decay heat being removed)? ☐ YES ☐ NO

ECCS/SUPPORT STATUS

PARAMETER	COMPUTER POINT	RECALL POINT			
Subcooling Margin	M114				
A HPI Pump operating		RECL-209			
B HPI Pump operating		RECL-210			
C HPI Pump operating		RECL-211			
MUV-23 flow	W704	RECL-52			
MUV-24 flow	W706	RECL-54			
MUV-25 flow	W703	RECL-51			
MUV 26 flow	W705	RECL-53			
DHPs operating A/B (run/stop)	X063 X064	RECL-207 RECL-208			
DHP-1A flow	W409	RECL-55			
DHP-1B flow	W410	RECL-56			
CFT A level	P200				
CFT B level	P201				
CFT A press					
CFT B press					
BWST level (ft)	X335	RECL-57			
RWPs operating 1/2A/2B/3A/3B					
DCPs operating A/B (yes/no)					
SWPs operating A/B/C					

SECONDARY SYSTEM STATUS

PARAMETER	COMPUTER POINT	RECALL POINT			
EFIC OTSG A press	W449	RECL-252			
EFIC OTSG B press	W452	RECL-255			
OTSG A level	S285	RECL-92			
OTSG B level	S286	RECL-93			
MFW flow A	S301	RECL-100			
MFW flow B	S302	RECL-101			
EFPs operating 1/2/3/7					
EFW flow to A OTSG	S300	RECL-245			
EFW low to B OTSG	S312	RECL-247			

III. ARE THE FISSION PRODUCT BARRIERS INTACT? (See Enclosure 10 for Fuel Clad Status)

RCS ☐ YES ☐ NO CONTAINMENT ☐ YES ☐ NO

RCS STATUS

PARAMETER	COMPUTER POINT	RECALL POINT			
RCS Press loop A	R208	RECL-4			
RCS Press loop B	R210	RECL-5			
Hot Leg temp loop A	R704				
Hot Leg temp loop B	R705				
Cold Leg temp loop A	R317				
Cold Leg temp loop B	R319				
In-core temp (8H)	R258				
RCPs operating A/B/C/D	R313 R314 R315 R316	RECL-162 RECL-163 RECL-164 RECL-165			

CONTAINMENT STATUS

PARAMETER	COMPUTER POINT	RECALL POINT			
RB Press	X147	RECL-82			
RB Temp 180'/235'	S382 S383	RECL-80 RECL-81			
RB Sump Level	W416	RECL-76			
RB Flood level	W402	RECL-33			
RB Fans operating on SW (yes/no)					
BSPs operating A/B (yes/no)	X055 X056				
RB Spray flow					
RM-G29/30	W322 W323	RECL-35 RECL-36			

OTHER SIGNIFICANT RADIATION MONITOR TREND

TIME				
RM-				
RM-				

IV. IS ADEQUATE ELECTRICAL POWER AVAILABLE?

OFFSITE AC POWER ☐ YES ☐ NO EGDGs ☐ YES ☐ NO DC ☐ YES ☐ NO

OFF-SITE POWER STATUS

PARAMETER	AVAILABLE	UNAVAILABLE
500 KV SWITCHYARD		
230 KV SWITCHYARD		
OFF-SITE POWER XFRM		
BEST		
A-ES 4160V BUS		
B-ES 4160V BUS		
A-UNIT 4160V BUS		
B-UNIT 4160V BUS		
VITAL BUSES		

EMERGENCY DIESEL GENERATOR STATUS

PARAMETER	RECALL PT.	LOADED	AVAILABLE	UNAVAILABLE
A-EDG	RECL-133,171			
B-EDG	RECL-134,172			

DC ELECTRICAL POWER

PARAMETER Note (1)	AVAILABLE	UNAVAILABLE
A-BATTERY		
B-BATTERY		
C-BATTERY		

Note (1) Battery failure will occur if associated battery chargers are de-energized.

V. ARE THERE SIGNIFICANT CONTROL ROOM PROBLEMS? ☐ YES ☐ NO

CONTROL COMPLEX VENTILATION STATUS

PARAMETER	AVAILABLE	OPERATING	UNAVAILABLE
A-TRAIN EMERGENCY RECIRC			
B-TRAIN EMERGENCY RECIRC			
A-CHILLER			
B-CHILLER			

CONTROL ROOM INSTRUMENTATION STATUS

PARAMETER	AVAILABLE	UNAVAILABLE
NNI-X		
NNI-Y		
ICS		
EFIC		
RPS		

COMMENTS: ____

DOSE ASSESSMENT TEAM NOTIFICATION

1. The Accident Assessment Team is responsible for supplying the Dose Assessment Team with an evaluation of the accident type, the release pathway, and the release flow rate. The accident type affects the radionuclide distribution (i.e., percentage of each isotope) used by Dose Assessment to predict off-site doses.
2. The accident type is determined by physical parameters and instrument readings throughout the plant.
3. Complete the checklist below to the extent possible and give to the Dose Assessment Team Leader.

ACCIDENT TYPE

_____ LOCA	_____ W G Decay Tank Rupture	_____ OTSG Tube Leak
_____ Fuel Handling	_____ Other:______________________________	

☐ **LOSS-OF-COOLANT ACCIDENT** **TIME OF RX TRIP:**____________

a. Normal Activity _____ Clad damage ____ Fuel melt____ (from Enclosure 10)
b. Release pathway information (leak from where to where)____________________
c. Release path flow rate (estimated for unmonitored releases)________________
d. Estimated duration_____________ Unknown_______
e. Reactor Building spray on/off times_____________________________________
f. Aux. Bldg. Ventilation: Flow rate_______ Charcoal banks in service A:B:C:D
g. Containment pressure _____________PSIG
h. Loose Parts Monitor indications No___ Yes___ Location:___________________

☐ **WASTE GAS DECAY TANK RUPTURE**

a. Release pathway: Tank rupture_____ Valve leakage_____ Other________________
b. Tank volume______ pressure______
c. Release rate Unknown______ Estimate _______CFM
d. Estimated duration: Unknown_______ Time______
e. Aux. Bldg. Ventilation: Flow rate_______ Charcoal banks in service A:B:C:D

☐ **STEAM GENERATOR TUBE RUPTURE** **TIME OF RX TRIP:**____________

a. Primary-to-secondary leak rate:________gpm
b. Core status: Cladding damage_______ Fuel melt_______ Normal________
c. Leaking OTSG isolated: Yes_____ No_____
d. MSSV Open: Yes____ No____ ADV Open: Yes____ No____
e. Condenser vacuum: Yes____ No____ RM-A2 In Service?: Yes____ No____
f. Potential for change in status of leak: Yes_____ No_____
g. Estimated duration of leak:___________
h. Aux. Bldg. Ventilation: Flow rate_______ Charcoal banks in service A:B:C:D

☐ **FUEL HANDLING ACCIDENT**

a. Location of damaged fuel: Pool A____ Pool B____ Number of Elements______
b. Damage caused by: Mechanical impact_____ Overheating_____ Unknown_______
c. Aux. Bldg. Ventilation: Flow rate_______ Charcoal banks in service A:B:C:D
d. Release pathway:____________ Unknown_______
e. Estimated duration__________ Unknown_______

Status as of __________ Date:___________ Completed By:____________________________

CORE DAMAGE AND FISSION PRODUCT BARRIER ASSESSMENT

DETERMINE IF CORE DAMAGE HAS OCCURRED USING ONE OR MORE OF THE FOLLOWING METHODS. ESTIMATE THE EXTENT OF THE DAMAGE. EVALUATE THE STATUS OF THE FISSION PRODUCT BARRIERS. REPORT THE RESULTS OF THE EVALUATION TO THE AAT OPERATIONS SUPPORT MEMBER AND THE DOSE ASSESSMENT TEAM LEADER. CONTINUE TO RE-ASSESS CORE AND FISSION PRODUCT BARRIER STATUS AS CONDITIONS CHANGE.

☐ ESTIMATE CORE DAMAGE BASED ON RM-G29/30 RADIATION LEVELS

NOTE: (1) **Use of RM-G29/30 for determining core status requires a failure of the RCS (i.e., LOCA or PORV open).**

(2) **Low monitor reading does not necessarily indicate lack of core damage. The release from the core may bypass the Containment, may be retained in the RCS, may be over a long period of time, or may not be uniformly mixed.**

(3) **Inconsistent readings may be due to the uneven mixing in the Containment (e.g., steam rising to the top). IT MAY TAKE SEVERAL HOURS FOR UNIFORM MIXING.**

ASSUMPTIONS:

The below table assumes a short release. A long-term release cannot be characterized using these tables.

TIME	____:____	____:____	____:____	____:____	____:____
RM-G29	R/HR	R/HR	R/HR	R/HR	R/HR
RM-G30	R/HR	R/HR	R/HR	R/HR	R/HR

☐ NO CORE DAMAGE
< 100 R/HR

☐ POSSIBLE CLAD FAILURE AND GAS GAP RELEASE
100 - 25,000 R/HR WITH RB SPRAY
100 - 75,000 R/HR WITHOUT RB SPRAY

☐ POSSIBLE CORE MELTING
> 25,000 R/HR WITH RB SPRAY
> 75,000 R/HR WITHOUT RB SPRAY

CORE DAMAGE vs RCS ACTIVITY

☐ IF A CURRENT RCS RADIONUCLIDE SAMPLE IS AVAILABLE,
THEN ESTIMATE THE LEVEL OF CORE DAMAGE USING THE FOLLOWING TABLE:

ASSUMPTIONS:

All fuel pin gap and melt releases are assumed to be uniformly mixed in the coolant.

No dilution due to injection is assumed.

Cesium and Strontium concentrations are overestimated in the new core.

Concentrations are based on a decay time of 30 minutes after shutdown. The half-life of the fission products should be considered in analyzing samples taken hours after shutdown.

NOTE: RCS samples could take an hour or more to obtain.

NOTE: Ensure samples are taken from a point representative of the RCS.

NOTE: This table demonstrates that a gap release produces concentrations 2-4 orders of magnitude greater than normal, and core melting another 1-2 orders of magnitude greater than gap. (Gross estimate only.)

TIME OF RCS SAMPLE:______________ TIME OF RX TRIP:__________________

NUCLIDE	SAMPLE RESULT µCi/gram	NORMAL RCS CONCENTRATION µCi/gram	POSSIBLE RCS CONCENTRATION WITH GAP RELEASE µCi/gram	POSSIBLE RCS CONCENTRATION WITH FUEL MELT µCi/gram
Kr-85		4.3E-1	6.7E+1	2.2E+3
Kr-85m		1.6E-1	2.9E+3	9.6E+4
Xe-133		2.6E00	2.0E+4	6.8E+5
Xe-135		8.5E-1	4.1E+3	1.4E+5
I-131		4.5E-2	6.8E+3	3.4E+5
I-133		1.4E-1	1.4E+4	6.8E+5
I-135		2.6E-1	1.2E+4	6.0E+5
Cs-134		7.1E-3	1.5E+3	3.0E+4
Cs-137		9.4E-3	9.4E+2	1.9E+4
Sr-90		1.2E-5	1.2E-5	1.0E+3
Np-239		2.2E-3	2.2E-3	6.4E+2

SOURCE: NUREG-1228

CORE DAMAGE PROGRESSION ONCE UNCOVERED

☐ IF inadequate subcooling margin exists,
THEN determine if the core is uncovered.

Reactor vessel level indication (RC-163A/B-LR1) can monitor vessel level from the top of the reactor vessel to the bottom of the hot leg with zero flow conditions. The bottom of the hot leg is approximately two feet above the top of the fuel. An off-scale low reading would indicate a high probability of loss of level below core level. Any flow (including natural circulation) in the RCS will result in a lower than actual reading. Thus, any indicated level will provide assurance that coolant level is above the core.

Reactor Void Trend recorder (RC-169-XR) monitors void trends in the RCS when RCPs are running. RCP motor power and Tcold are used to infer average density of fluid passing through the pump (liquid or two-phase). A 0% reading infers no voiding, while 100% reading infers complete voiding.

Recorders are on the PSA panel in the Control Room and display on RECALL (points 62,63,64,65,70,71).

A-HOT LEG	B-HOT LEG	A-VESSEL	B-VESSEL	VOID TREND
RC-163A-LR1	RC-163B-LR1	RC-163A-LR1	RC-163B-LR1	RC-169-XR
RECALL PT 63	RECALL PT 70	RECALL PT 62	RECALL PT 65	RECALL PT 64,71

☐ CORE REMAINS COVERED

TINCORE indicates saturated conditions
RCITS indicates level above the vessel (All RCPs off)

☐ UNCOVERED FOR 15 TO 45 MINUTES

Core temperature 1800-2400°F
Fuel cladding failure (occurred in 34 minutes at Three Mile Island)
Rapid hydrogen generation
Release of fission products out of fuel pin gap (gas gap failure)
Local fuel melt

☐ UNCOVERED FOR 30 TO 90 MINUTES

Core temperature 2400-4200°F
Possible uncoolable core
Possible slump of molten core
Rapid release of volatile fission products (grain boundary release)

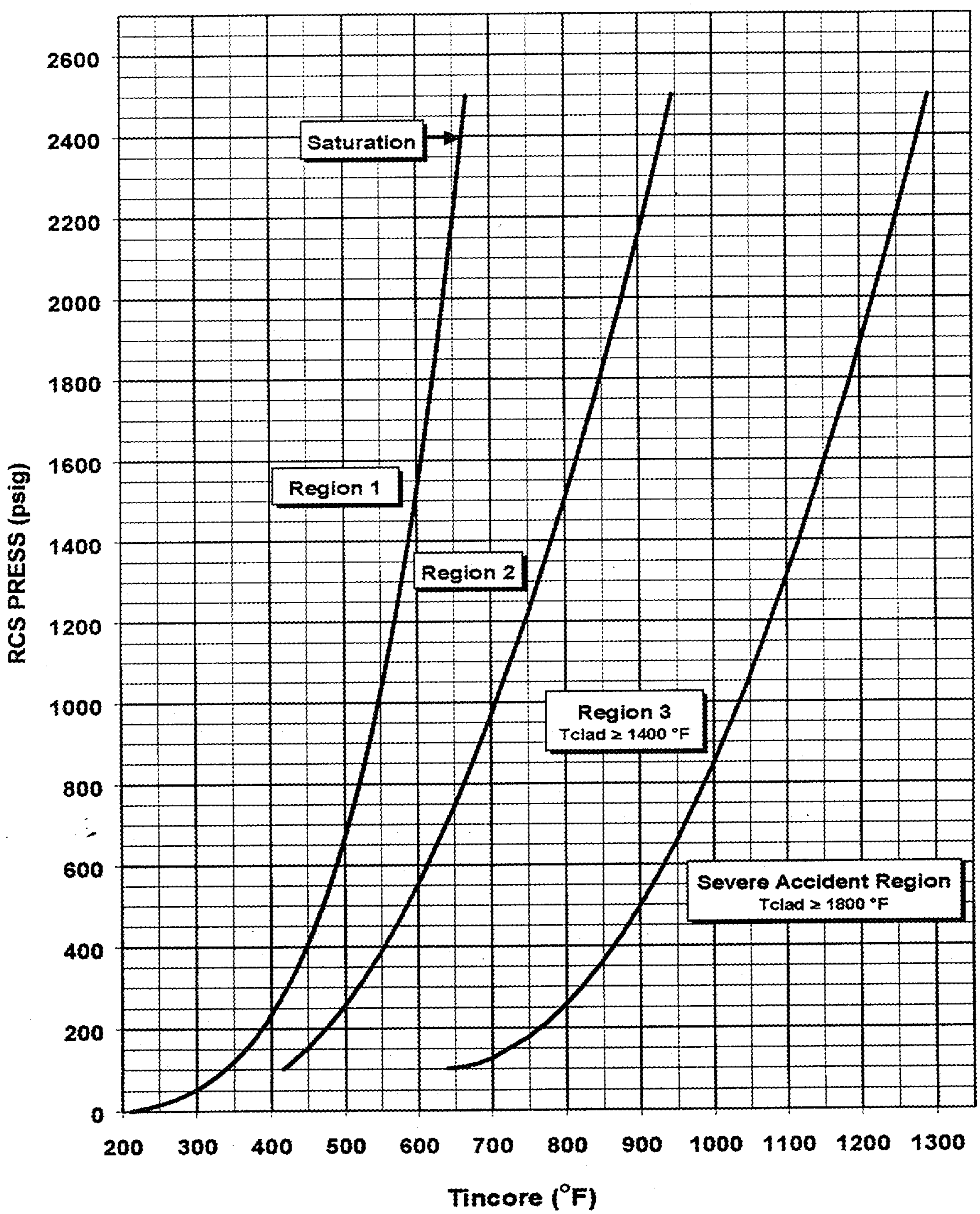
☐ UNCOVERED FOR 1 TO 3+ HOURS

Core temperature > 4200°F
Maximum core melt and hydrogen generation
Maximum in-vessel fission product release
Possible melt-through of vessel

CORE DAMAGE ASSESSMENT BASED ON ICC CURVE

☐ ASSESS CORE DAMAGE BY PLOTTING RCS PRESSURE/INCORE TEMPERATURE ON THE ICC CURVE BELOW.

- ☐ Regions 1 and 2 indicate no fuel damage (normal RCS activity).
- ☐ Region 3 indicates possible gas gap failure.
- ☐ Severe Action Region indicates possible core melt.



FISSION PRODUCT BARRIER ASSESSMENT

☐ DETERMINE STATUS OF FISSION PRODUCT BARRIERS BY PERFORMING A QUALITATIVE ASSESSMENT OF PLANT CONDITIONS.

☐ **FUEL CLAD FAILURE INDICATIONS:**

YES	NO	N/A	
☐	☐	☐	RM-L1 increasing (N/A if letdown is isolated)?
☐	☐	☐	PASS indicates increased RCS activity (per page 2, Enclosure 10)?
☐	☐		RM-G29/30 > 100 R/hr (per page 1, Enclosure 10)?
☐	☐		RCS press/temp in Region 3 or Severe Accident Region (per page 4, Enclosure 10)?
☐	☐		Loose Parts Monitor indicates possible mechanical damage to fuel?

☐ **RCS FAILURE INDICATIONS:**

YES	NO	N/A	
☐	☐		OTSG Tube Rupture in progress?
☐	☐		PORV/RCV-8/RCV-9 OPEN?
☐	☐		Inadequate Subcooling Margin exist?
☐	☐		Pressurizer level lowering?
☐	☐		RCS pressure decreasing?
☐	☐		RB pressure increasing?
☐	☐		RB temperature increasing?
☐	☐		RB sump level increasing?
☐	☐	☐	RM-A6 monitors increasing(N/A if RB is isolated)?
☐	☐		RM-G16 RB Fuel Handling Bridge increasing?
☐	☐		RM-G17 RB Personnel Hatch increasing?
☐	☐		RM-G18 RB Incore Instrument Removal Area increasing?
☐	☐		RM-G29/30 RB Top of "D" Rings increasing?

☐ **CONTAINMENT FAILURE INDICATIONS:**

YES	NO	N/A	
☐	☐	☐	RM-A2 Aux. Bldg. monitor increasing? (N/A if no AHF-14 fans running)
☐	☐		Other Auxiliary Building radiation monitors increasing?
☐	☐		Abnormal radiation levels in Intermediate Building?
☐	☐	☐	Berm surveys indicate elevated radiation levels?
☐	☐		Unexplained RB pressure decrease?
☐	☐		Containment Isolation valves failed to close?
☐	☐		OTSG Tube Rupture in Progress

Performed By:____________________ Date:______________ Time:__________

☐ Forward results to the AAT Operations Support member and Dose Assessment Team Leader.

TSC GUIDANCE FOR EOPs

[NOCS 62718, 62764, 62767]

This enclosure provides the relationship with the EOPs and TSC guidance during emergency events. It is management's expectation that the guidance steps will be implemented, based on the emergency condition of the plant, by either invoking 10 CFR 50.54 (x), (y), formal 10 CFR 50.59 reviews and approvals, or by existing approved procedures.

PARAMETER	EOP	TBD REF.	TSC GUIDANCE
RB Hydrogen Control	**EOP-3, 6, 7, 8**	HPIC, 5.4 III.F, 6.2, 10.0, 12.6b, 13.6b LBLO 4.4, 6.3 SBLO 12.4, 20.3, 9.3	1. Align hydrogen monitoring equipment using EOP-14, Enclosure 2, PPO Post Event Actions. 2. Monitor hydrogen concentrations using EOP-14, Enclosure 21, RB Hydrogen Monitor Log. 3. Purge RB when authorized per EM-225A. [NOCS 62767] Interfacing references are: EM-206 for telephone number for procurement representative to obtain recombiners MP-575 for installation of recombiners OP-417B for operation of recombiners MP-815 for installing H^2 purge flow indicators
Building Spray Termination Criteria	**EOP-3, 8**	None	Verify all of the following before terminating Building Spray: 1. BS has been on for > or equal to 5 hours. 2. RB pressure is < 10 psig. 3. RB pressure is stable or lowering. 4. RB atmosphere is < 13 µci/cc I-131. 5. RB temperature is stable or lowering (also refer to EM-225C). 6. Concurrence is obtained from EC and Dose Assessment to terminate BS.
Continue Cooldown With DHR System	**EOP-6, 8**	FF, 11.5 NC, 11.4	Verify all of the following: 1. Begin establishing a Post Accident Recovery Plan (this can be done during plant cooldown). 2. The reactor is being cooled by DHR. 3. DHR cooling is consistent with maintaining adequate SCM. 4. The RCS is subcooled (use DH cooler outlet temperature for cooldown rates). 5. The RCS is depressurized. 6. Prohibit establishing any flow path that was isolated by the ES system unless the potential for radioactive releases is evaluated and the release path, doses, and methods have been approved by the EC. 7. Control of containment penetrations has been established. 8. Monitor and maintain RCS boron concentration for required shutdown margin.

TSC GUIDANCE FOR EOPs

PARAMETER	EOP	TBD REF.	TSC GUIDANCE
RCS Leakage No Longer Exists	**EOP-8**	None	1. The RCS is capable of being cooled by DHR. 2. Prohibit establishing any flow path that was isolated by the ES system unless the potential for radioactive releases is evaluated and the release path, doses, and methods have been approved by the EC. 3. Begin DHR.
Break size > 1 HPI Pump Capability or unable to transition to DHR	**EOP-8**	None	1. Establish a Post Accident Recovery Plan. This plan is dependent on the scope of the applicable Emergency Event. 2. The Post Accident Recovery Plan is approved by the PRC, NGRC, and applicable regulatory agencies as determined by FPC Management. 3. Prohibit establishing any flow path that was isolated by the ES system unless the potential for radioactive releases is evaluated and the release path, doses, and methods have been approved by the EC. 4. The availability of borated water sources for required shutdown margin is maintained until the actions of the Post Accident Recovery Plan are completed or to the extent that plant and public safety is ensured. 5. Post and label protected train boundaries for the borated water sources and components that are available.
Break size < 1 HPI Pump Capability and able to transition to DHR	**EOP-8**	None	1. Transition to DHR cooldown. 2. Establish a Post Accident Recovery Plan. This plan is dependent on the scope of the applicable Emergency Event. 3. The Post Accident Recovery Plan is approved by the PRC, NGRC, and applicable regulatory agencies as determined by FPC Management. 4. Prohibit establishing any flow path that was isolated by the ES system unless the potential for radioactive releases is evaluated and the release path, doses, and methods have been approved by the EC. 5. The availability of borated water sources for required shutdown margin is maintained until the actions of the Post Accident Recovery Plan are completed or to the extent that plant and public safety is ensured. 6. Post and label protected train boundaries for the borated water sources and components that are available.

TSC GUIDANCE FOR EOPs

PARAMETER	EOP	TBD REF.	TSC GUIDANCE
Establishing Primary to Secondary Heat Transfer to One or Both OTSGs		SS-2	1. Refer to the entry conditions and recommendations of the Emergency Operating Procedures Technical Basis Document (TBD), Section SS-2 for guidance related to establishing primary to secondary heat transfer to one or both OTSGs. 2. Accident Assessment personnel in the TSC will provide recommended guidance to the EC for when and how to establish heat transfer using one or both OTSGs. 3. The EC will approve any actions recommended.
Termination of HPI and Shutdown of RCPs	**EOP-8**	LBLO, 2.2, 3.0	1. Recommended guidance is to stop HPI pumps and trip running RCPs when LPI flow has been in excess of 1400 gpm in each injection line for at least 20 minutes. Accident Assessment personnel will evaluate plant conditions and provide recommendations to the EC. 2. The EC will approve any actions recommended.
Control of Radioactive Release Paths from Containment Penetration Valves	**EOP-8**	SBLO 12.0	1. Prohibit establishing any flow path that was isolated by the ES system unless the potential for radioactive releases is evaluated and the release path, doses and methods have been approved by the EC.
Monitoring of RB Sump Level, RB Sump Boron Concentration, and RB Sump pH	**EOP-8**	None Other: IOC CR 97-0122	**NOTE: With the installation of the TSP baskets, pH data is not required but still desired if feasible.** 1. Accident Assessment personnel to monitor and trend RB sump level, boron concentration, and pH at intervals recommended by the EC. 2. Data for sump pH and boron concentration to be obtained using CH-632D or other PRC approved alternate methods dependent on the Emergency Event.
Venting of Non-Condensable Gases	**EOP-8**	None	1. Once subcooling margin is regained, all of the noncondensable gas production will have ceased. However, as the RCS is depressurized these gases will come out of solution and should be vented. If natural circulation is lost to an available OTSG, Accident Assessment personnel will recommend to the EC when to vent noncondensable gases. 2. The EC will approve any actions recommended.

TSC GUIDANCE FOR EOPs

PARAMETER	EOP	TBD REF.	TSC GUIDANCE
Reactor is Being Adequately Cooled Using HPI or LPI and OTSG Cooling is No Longer Desired	**EOP-8**	SBLO, 17.7	1. Verify TBVs/ADVs are closed. 2. Fill available OTSGs to 90%. 3. Close EFW/AFW/MFW Valves. 4. Stop all EFW/AFW Pumps. 5. Stop MFWPs and MFWBPs.
Boron Concentration Management When Adequate Sub Cooling Margin Does Not Exist (Boron Precipitation)	**EOP-8 EOP-14, Enc. 20**	None	Refer to EM-225B **NOTE: If a failure of ES MCC 3AB has occurred, ensure repair efforts are initiated to repower auxiliary pressurizer spray valve RCV-53 prior to the onset of boron precipitation.**
RB Temperature Monitoring (To Preserve EQ Standards)			Refer to EM-225C
Feeding a Dry OTSG (Tube to Shell Delta T Monitoring and Control)	**EOP-5, 9 EOP-14, Enc. 3**	III.D, 12.0 III.E, 17.7 NC, 5.2, 5.3, 6.4	Refer to EM-225D
Long-Term Core Cooling Using the RB Sump	**EOP-8**	LBLO, 6.4a, 6.4b, 6.6, 6.7	Refer to EM-225E
EFW or AFW is Operating	**EOP-14, Enc. 7 Enc. 22**		Refer to EM-225F
TBP-3 is Running. TBP-2 is Not Running. Generator Purge Complete	**EOP-14, Enc. 14**		TBP-3 will drain non-1E battery during LOOP. Stopping TBP-3 before 24 hours may result in Turbine bearing damage. Refer to IOC SE-99-0184

PROCEDURE DEVELOPMENT AND REVISION RECORD

Procedure: EM0225 New Rev: 6 PRR#: 17889

Title: DUTIES OF THE TECHNICAL SUPPORT CENTER ACCIDENT ASSESSMENT TEAM

MINOR CHANGES

If Minor Changes are included, check the applicable box(es) and provide a list of affected steps.
The following corrections are incorporated throughout:

_ Sentence Structure
_ Punctuation
_ Capitalization
_ Spelling
_ Organizational Changes: position titles, department names, or telephone numbers
_ Redundant words or phrases
_ Abbreviations
_ Obviously incorrect units of measure
_ Inadvertently omitted symbols (#, %, etc.)
_ Obvious step numbering discrepancies
_ Format

The following corrections are incorporated in the step(s) indicated: "Throughout" is used in lieu of Step# if a specific change affects a large number of steps.

	Correcting equipment nomenclature that does not agree with field labels or balance of procedure
	Changing information that is obviously incorrect and referenced correctly elsewhere
	Misplaced decimals that are neither setpoint values nor tolerances
	Reference to a procedure when an approved procedure has taken the place of another procedure
	Fixing branching points when it is clear the branching steps were originally intended but were overlooked or incorrectly stated due to step number changes
	Adding clarifying information such as NOTES and CAUTIONS
	Adding words to clarify steps, NOTES, or CAUTIONS which clearly do not change the methodology or intent of the steps

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	X Format

The following corrections are incorporated in the step(s) indicated: "Throughout" is used in lieu of Step# if a specific change affects a large number of steps.

Enclosure 10 Table on Page 3 of 5	**Correcting equipment nomenclature that does not agree with field labels or balance of procedure**
	Changing information that is obviously incorrect and referenced correctly elsewhere
	Misplaced decimals that are neither setpoint values nor tolerances
	Reference to a procedure when an approved procedure has taken the place of another procedure
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Procedure: EM0225 **New Rev:** 6 **PRR#:** 17889

Title: DUTIES OF THE TECHNICAL SUPPORT CENTER ACCIDENT ASSESSMENT TEAM

NON-INTENT CHANGES

Changes are incorporated for the reasons provided. "Throughout" is used in lieu of Step # if a specific change affects a large number of steps. For new or cancelled procedures the reason is provided.

Table of Contents	Deleted Section 2.1 and renumbered 2.2 to 2.1. Section 2.1 was deleted from procedure body
1.0	Added clarification to the purpose that this procedure provides guidance to the AAT to perform actions in the EOPs since this is what existing Enclosure 11 does.
2.1	Deleted "Implementing References" section of procedure as it is no longer required by the Writer's Guide
Old 2.2	Renumbered to 2.1 due to deletion of old section 2.1
New 2.1.8	Added developmental reference. This reference was used for providing guidance for TBP-2 and TBP-3 in Enclosure 11.
Enclosure 5	Added NOCS commitment identifier as required by the Writer's Guide and in response to NUPOST item 45357. Rearranged order of listed items for a more logical sequence.
Enclosure 11	Added MP-815 to list of interfacing references for RB Hydrogen Control due to NUPOST item 55250 and deleted incorrect reference to EM-202
Enclosure 10	Corrected a typographical error regarding the level recorders that display A and B Train vessel and Hot Leg level.
3.2.2	Added NOCS identifier 100056 as required by the Writer's Guide.
3.2.6	Added NOCS identifier 96042 as required by the Writer's Guide.
3.1 Definations	Reordered list to present in alphabetical order.

CHANGE OF INTENT, CANCELLATION, OR NEW PROCEDURE

Changes are incorporated for the reasons provided. "Throughout" is used in lieu of Step # if a specific change affects a large number of steps. For new or cancelled procedures the reason is provided.

Enclosure 11	Added additional direction for terminating OTSG cooling to maintain consistency with direction contained in EOP-08. Added guidance for when EFW or AFW is operating due to PC 99-1710. Added guidance for operation of TBP-2 and TBP-3 due to changes in EOP-14, Enclosure 14 and NUPOST item 54500.

PROCEDURE DEVELOPMENT AND REVISION RECORD

Procedure: EM0225 **New Rev:** 6 **PRR#:** 17889

Title: DUTIES OF THE TECHNICAL SUPPORT CENTER ACCIDENT ASSESSMENT TEAM

Enclsoure 4	Added a reference to a procedure for determining location of equipment for clarification and response to NUPOST item 54551. Added NOCS commitment identifiers as required by the Writer's Guide and in response to NUPOST item 45357. Added a reference to EM-225F for actions required if EFW or AFW is operating. EM-225F is a new procedure for long term feedwater management written as a sub procedure to EM-225 in response to PC 99-1710.
Enclosure 8	Added EFP-3 to list of parameters in secondary system status due to MAR 98-03-01. Added a note to table for DC Electrical Power to warn personnel that battery failure will occur if chargers are deenergized as a precaution.
Enclsoure 10	Replaced ICC figure curve with updated curve due to changes in Calculation I84-0003

Rev. 1

Effective Date 11/5/99

EMERGENCY PLAN IMPLEMENTING PROCEDURE

EM-225D

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

GUIDANCE FOR
DRY OTSG TUBE TO SHELL DELTA T MONITORING AND CONTROL

CONTROLLED COPY
NUCLEAR OPERATIONS
Holder # 1242

APPROVED BY: Procedure Owner

for M. Annacone

(SIGNATURE ON FILE)

DATE: 11/3/99

PROCEDURE OWNER: Manager, Nuclear Plant Operations

TABLE OF CONTENTS

1.0 PURPOSE

The purpose of this procedure is to provide guidance to the TSC Accident Assessment Team (AAT) to monitor OTSG conditions that may challenge OTSG tube-to-shell delta T limits, and provide recommendations to the Emergency Coordinator and Control Room on methods to prevent delta T limits from being exceeded.

These guidelines are applicable when a dry OTSG does not have integrity and cannot be recovered using EOP-14, Enclosure 3, "Dry OTSG Recovery."

2.0 REFERENCES

2.1 DEVELOPMENTAL REFERENCES

2.1.1 Framatome Technology Letter INS-97-4651, dated 11/25/97

2.1.2 FTI Document No. 51-1224886-02, OTSG Refill Summary Report

2.1.3 FPC Calculation M97-0156, CR-3 EOP Natural Circulation Tube Loads (FTI Document No. 51-1266247-00)

2.1.4 Emergency Operating Procedures Technical Bases Document, Volume 1

3.0 PERSONNEL INDOCTRINATION

3.1 DEFINITIONS

3.1.1 **Dry OTSG** - Any OTSG with an indicated level of ≤ 12.5 inches as read on the EFIC low range level instruments.

3.1.2 **OTSG integrity** - OTSG integrity exists if the secondary side pressure boundary is intact, allowing an OTSG to pressurize when supplied with feedwater.

3.1.3 **Shell Temperature** - The temperature of the bulk of the metal composing the shell of an OTSG. Shell temperature on a dry OTSG will lower over time as heat is lost to the Reactor Building. The shell is estimated to cool at approximately 6°F/hour. Figure 1 provides an estimate of shell temperature versus time.

3.1.4 **Tincore** - The temperature indication supplied by the incore thermocouples to SPDS, Tsat monitors and the core exit temperature recorders in the Control Room. Tincore is used to estimate average OTSG tube temperature when at least 1 RCP is running. Tincore can be determined from SPDS, or if SPDS is not available, use average Tincores from the core exit chart recorders on the MCB (RC-171-TR, RC-172-TR).

3.1.5 **Tube Temperature** - The temperature associated with the tubes of an OTSG. Tube temperature can be determined using Tincore when at least 1 RCP is running. If no RCPs are running, tube temperature can only be estimated if natural circulation exists in the OTSG. Natural Circulation will only occur if the dry OTSG is being fed. If natural circulation exists, Thot can be used to approximate tube temperatures.

3.1.6 **Tube to shell delta T** - The difference between OTSG tube temperature and the OTSG shell temperature. If the tubes are hotter than the shell, the tubes are in compression (compressive stress). If the tubes are colder than the shell, the tubes are in tension (tensile stress).

3.2 RESPONSIBILITIES

3.2.1 **TSC Accident Assessment Team:** Responsible for monitoring OTSG conditions that may result in excessive tube to shell delta T caused by a dry OTSG, and to recommend actions to the Emergency Coordinator and the Control Room to minimize tube stresses under these conditions.

3.2.2 **Emergency Coordinator:** Responsible for reviewing and approving all recommendations provided by the Accident Assessment Team prior to implementation by the Control Room staff.

3.3 LIMITS AND PRECAUTIONS

3.3.1 Initiating a source of feedwater to an OTSG that does not have integrity must be carefully evaluated and planned to prevent harm to personnel and damage to vital plant equipment.

3.3.2 If either ES 4160 volt bus is energized from an emergency diesel generator, then prior to starting any ES powered component ensure adequate load margin is available on the EDG. Refer to EOP-13, Rule 5.

3.3.3 Establishing feedwater flow to a faulted OTSG with a feedwater or steam line break in the Reactor Building could dilute sump recirculation fluid if a LOCA was in progress or subsequently occurs.

3.3.4 OTSG tube compression limit (tubes hotter than shell) is 60°F.

3.3.5 OTSG tube tensile limit (tubes cooler than shell) is 100°F.

3.3.6 All actions recommended to the Control Room as a result of this procedure must be pre-approved by the Emergency Coordinator.

3.3.7 The operating crew and the TSC staff should monitor for indications of a steam generator tube leak during the RCS cooldown.

4.0 INSTRUCTIONS

4.1 GENERAL GUIDELINES

4.1.1 Begin estimating OTSG shell temperature by using Figure 1. The OTSG shell is expected to cooldown at approximately 6°F/hour from the time the OTSG becomes dry. When using Figure 1, Time = 0 is based on when the OTSG boiled dry.

4.1.2 IF a steam or feedline failure has not occurred in the Reactor Building,
AND shell temperatures appear accurate,
THEN monitor shell temperatures using shell thermocouples referenced below. The shell thermocouples may provide useful trend data.

A-OTSG	A-730,731,732,733,734	Average R-771
B-OTSG	A-735,736,737,738,739	Average R-772

4.1.3 IF shell thermocouples are accurate,
THEN adjust 6°F/hour cooldown rates as necessary to control tube to shell delta T limits.

4.1.4 Begin plotting RCS temperature from Tincores on Figure 1. Tincore is an accurate indication of OTSG tube temperature only if forced flow (at least 1 RCP running) exists. Natural Circulation is not expected to exist on the faulted OTSG, therefore OTSG tube temperature is indeterminate. HPI flow or seal injection flow may result in false Tc indications even if natural circulation conditions exist.

4.1.5 If integrity is restored to a dry OTSG, it should be fed using EOP-14, Enclosure 3 "Dry OTSG Recovery." Once OTSG level is recovered to > 12.5", this procedure may be exited.

4.1.6 If a SBLOCA or RCS leak is in progress concurrent with a dry OTSG, HPI flow may result in RCS cooldown limits being in excess of 6°F/hour on the dry OTSG. Minimize OTSG cooling on the intact OTSG and attempt to maintain RCS temperature above the minimum RCS temperature curve in Figure 1 if forced flow exists. The minimum RCS temperature curve was generated assuming forced flow exists.

4.1.7 Prior to recommending feeding a faulted OTSG, determine if additional steaming could result in a personnel safety hazard or plant equipment damage.

4.1.8 IF a feedwater or steam line failure has occurred in the Reactor Building,
THEN ensure that Emergency RB Cooling is in service prior to initiating flow to a faulted OTSG. Monitor RB temperature and pressure during feeding.

4.1.9 IF a LOCA is in progress,
AND a feedwater or steam line failure has occurred in the Reactor Building,
THEN do not feed the faulted OTSG. Feeding the OTSG will result in dilution of the RB Sump recirculation fluid.

4.1.10 IF a feedwater or steam line failure has occurred in the Reactor Building,
AND a LOCA is not in progress,
THEN the RB sump pumps must remain in service to pump condensation from the Reactor Building sump. This may require bypassing ES and reopening WDV-3 and WDV-4. Begin processing water from the Miscellaneous Waste Storage Tank per OP-407R as soon as possible. Processing rates are 30 to 40 gpm.

4.1.11 Minimize subcooling margin based on Tincore to minimize tube pressure stresses.

4.1.12 Any source of feedwater flow to a dry OTSG must be established to the upper (EFW) nozzles to minimize tube stresses.

4.1.13 Determine appropriate section to be used based on RCP status. Enclosure 1 is presented in a logical format as an additional reference and presents the guidance contained in both sections.

IF any RCP is running,
THEN use Section 4.2.

IF no RCP is running,
THEN use Section 4.3.

4.2 FORCED FLOW GUIDELINES

4.2.1 When at least one RCP is running, tube to shell delta T can be maintained within limits by cooling down the RCS at approximately 6°F/hour using the good OTSG. This cooldown rate is the estimated cooldown rate of the OTSG shell and will minimize differential thermal expansion between the tubes and shell.

4.2.2 IF the 6°F/hour rate is not achieved or is exceeded,
THEN the cooldown for the following hour must be adjusted accordingly (i.e., increase or decrease cooldown to achieve a 12°F temperature change over the total 2 hour period).

4.2.3 Plot RCS temperature (Tincores) versus time on Figure 1 to estimate tube to shell differential temperature. Tincores provide reliable indication of tube temperatures when RCPs are running. Use SPDS to determine incore temperature.
IF SPDS is not available,
THEN use average Tincores from the core exit chart recorders on the MCB to determine RCS temperature (RC-171-TR, RC-172-TR).

4.2.4 Maintain Tincore above the "Min RCS Temp" curve shown in Figure 1 to prevent challenging the tensile limit of the tubes.
IF RCS temperature approaches the "Min RCS Temp" limit,
THEN stop or minimize the cooldown. This minimum temperature limit is only applicable when any RCP is operating.

4.3 NATURAL CIRCULATION GUIDELINES

4.3.1 With no RCPs running, natural circulation will not exist in the loop with the dry OTSG. Since the reactor coolant in the affected OTSG tubes is stagnant, cooling the RCS at 6°F/hour will not be an effective means to minimize tube to shell delta T on the dry OTSG.

4.3.2 With no RCPs running, the dry OTSG may exceed tube to shell compressive limits if feeding does not occur within approximately 5 hours.

4.3.3 IF forced flow is restored,
THEN cooldown the RCS within ITS limits (see cooldown tables in EOPS) using the good OTSG to equalize RCS temperature (Tincore) with the estimated shell temperature from Figure 1. Forced flow will provide a means to monitor and cooldown the idle OTSG. RCP restart guidance is included in EOP-14, Enclosure 16. Continue the RCS cooldown at a rate of approximately 6°F/hour and use the forced flow guidance in Section 4.2.

4.3.4 IF an RCP cannot be started,
THEN determine if the hot leg on the dry OTSG is saturated or subcooled by requesting a reading of the Tsat monitor in the Control Room when the loop is selected for "Thot" or by use of the steam tables.

4.3.5 IF the dry OTSG hot leg is subcooled,
AND the steaming path is acceptable,
THEN perform the following:

- o Establish EFW or AFW flow to the affected OTSG at < 300gpm to initiate natural circulation through the idle loop.
- o Control flow to both the intact and faulted OTSG to prevent exceeding ITS cooldown rates.
- o Attempt to equalize Thot with the estimated shell temperature of Figure 1 to limit the compressive tube to shell delta temperature.
- o Terminate flow to affected OTSG if steaming the faulted OTSG is causing a hazard to personnel or vital plant equipment.
- o IF OTSG integrity is restored,
  THEN feed the dry OTSG per EOP-14, Enclosure 3 "Dry OTSG Recovery."
- o Cooldown the RCS at approximately 6°F/hour to attempt to track the shell cooldown rate. The "Min RCS Temp" curve is not applicable with no RCP in operation.
- o WHEN DH is established,
  THEN ensure high point vents are closed.

4.3.6 If the dry OTSG hot leg is saturated,
AND the steaming path is acceptable,
THEN perform the following:

1. Estimate OTSG tube temperature on the faulted OTSG using T_{sat} of the primary side, based on RCS P_{sat}.

2. Stop the cooldown.

3. Ensure RB cooling is in service prior to opening high point vent valves. Opening the high point vents may result in Reactor Building Pressure reaching the ES actuation setpoint (4 psig nominal) and raise Reactor Building temperature.

4. Anticipate inventory makeup to the RCS and open the high point vent valves to reduce or eliminate the void.

5. Establish EFW or AFW flow to the affected OTSG at a rate of 250 gpm for 1 minute.

6. IF OTSG integrity is restored,
THEN feed the dry OTSG per EOP-14, Enclosure 3, "Dry OTSG Recovery."

7. IF natural circulation cannot be induced and the faulted OTSG cannot repressurize,
THEN do not reinitiate EFW unless the hot leg becomes subcooled due to natural circulation or by performance of Step 4.3.7.

8. IF the hot leg does become subcooled,
THEN follow the guidance in Step 4.3.5.

9. Cooldown the RCS at approximately 6°F/hour to attempt to track the shell cooldown rate. The "Min RCS Temp" curve is not applicable with no RCP in operation.

4.3.7 IF the dry OTSG hot leg remains saturated after feeding for 1 minute, OR a safe steaming path is not available, THEN perform the following:

- o Consider opening the high point vent valves on the idle hot leg to limit the tube temperature.

  - Flow through the high point vent will allow cooler RCS to refill the hot leg and lower compressive tube stresses.

  - Opening the high point vent may result in Reactor Building Pressure reaching the ES actuation setpoint (4 psig nominal) and raise Reactor Building temperature.

  - Opening the high point vent will require HPI flow to prevent loss of subcooling margin based on Tincores.

  - RB cooling should be in service prior to opening high point vent valves.

  - IF the hot leg becomes subcooled as a result of opening the high point vents,
    THEN close the high point vents and feed the Dry OTSG per Step 4.3.5.

- o IF feeding the OTSG is not possible,
  THEN cycle the high point vents as required to continue a cooldown of the idle hot leg.

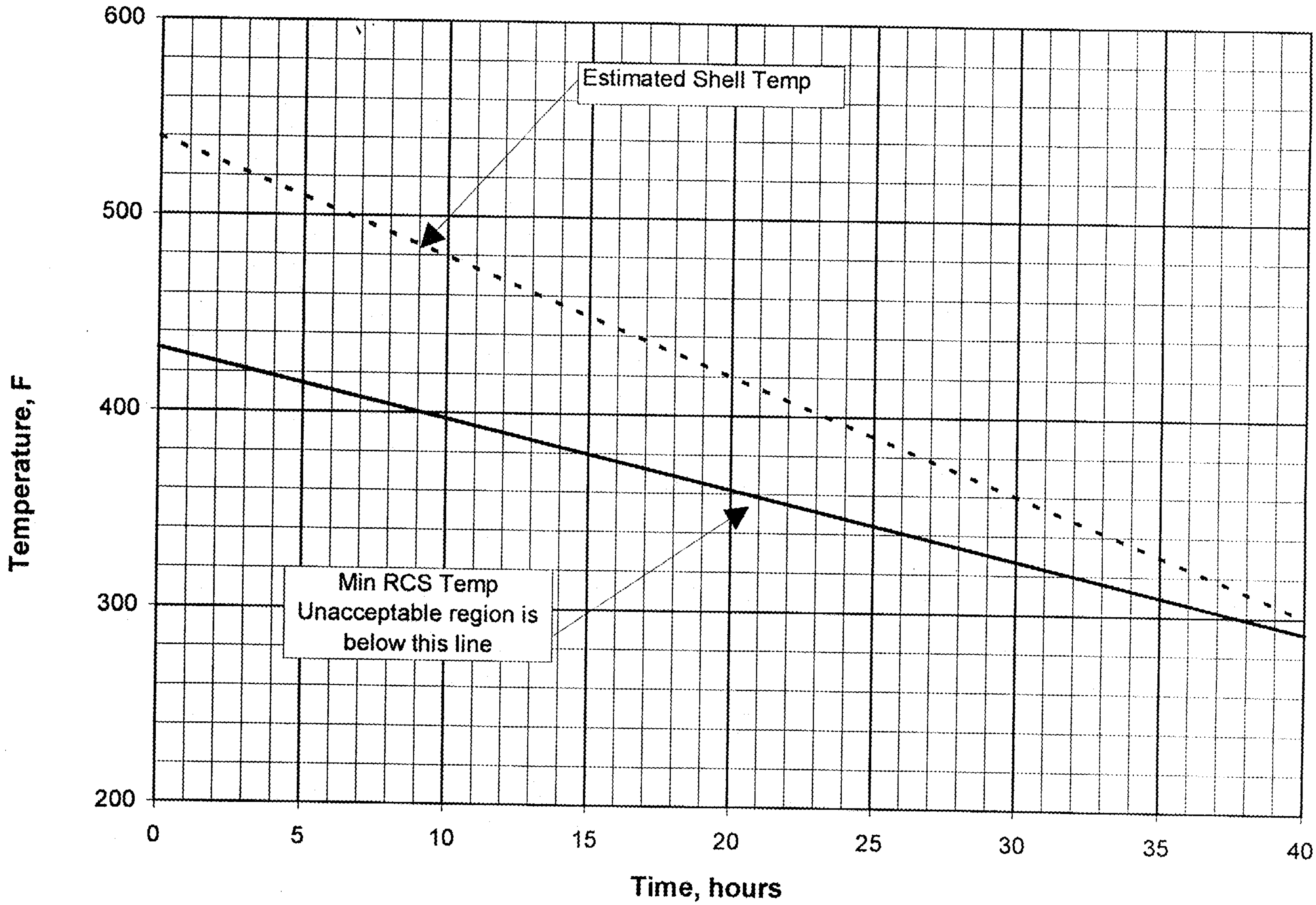
- o Cooldown the RCS at approximately 6°F/hour to attempt to track the shell cooldown rate. The "Min RCS Temp" curve is not applicable with no RCP in operation.

DRY OTSG DECISION MATRIX

	≥ 1 RCP RUNNING	NO RCP RUNNING AND IDLE HOT LEG SUBCOOLED	NO RCP RUNNING AND IDLE HOT LEG SATURATED
OTSG INTEGRITY EXISTS AND SOURCE OF FW AVAILABLE	MINIMIZE SUBCOOLING MARGIN FEED DRY OTSG PER EOP-14 ENCLOSURE 3. EXIT THIS PROCEDURE WHEN OTSG IS RECOVERED.	MINIMIZE SUBCOOLING MARGIN FEED DRY OTSG PER EOP-14 ENCLOSURE 3. EXIT THIS PROCEDURE WHEN OTSG IS RECOVERED.	MINIMIZE SUBCOOLING MARGIN VENT THE HOT LEG TO ELIMINATE THE VOID FEED FAULTED (DRY) OTSG AT 250 GPM FOR 1 MINUTE. If OTSG REPRESSURIZES, THEN FEED DRY OTSG PER EOP-14 ENCLOSURE 3. EXIT THIS PROCEDURE WHEN OTSG IS RECOVERED.
OTSG INTEGRITY DOES NOT EXIST	MINIMIZE SUBCOOLING MARGIN ESTABLISH AND MAINTAIN RCS COOLDOWN AT ≈ 6°F/HR. DO NOT ALLOW RCS TEMPERATURE (BASED ON $T_{incores}$) TO COOL BELOW THE MINIMUM RCS TEMPERATURE LIMIT OF FIGURE 1.	MINIMIZE SUBCOOLING MARGIN FEED FAULTED (DRY) OTSG < 300 GPM IF STEAMING PATH IS ACCEPTABLE. MAINTAIN COOLDOWN RATES WITHIN ITS LIMITS. EQUALIZE T_{hot} WITH ESTIMATED SHELL TEMP ON FIGURE 1 WHEN NATURAL CIRCULATION IS ESTABLISHED, CONTINUE RCS COOLDOWN AT 6°F/HR.	MINIMIZE SUBCOOLING MARGIN VENT THE HOT LEG TO ELIMINATE THE VOID FEED FAULTED (DRY) OTSG < 250 GPM FOR 1 MINUTE IF STEAMING PATH IS ACCEPTABLE. IF HOT LEG BECOMES SUBCOOLED, THEN CONTINUE FEEDING AT < 300 GPM IN ACCORDANCE WITH THE GUIDANCE FOR A SUBCOOLED HOT LEG. IF HOT LEG REMAINS SATURATED, DO NOT RE-FEED OTSG UNLESS OTSG INTEGRITY IS RESTORED. IF STEAMING PATH IS NOT ACCEPTABLE, OR THE HOT LEG REMAINS SATURATED AFTER A 1 MINUTE FEEDING, CONSIDER CYCLING HIGH POINT VENT ON THE HOT LEG OF THE FAULTED OTSG IF CONTAINMENT CONDITIONS PERMIT. CONTINUE RCS COOLDOWN AT 6°F/HR.

FIGURE 1

MINIMUM RCS TEMPERATURE CURVE



PROCEDURE DEVELOPMENT AND REVISION RECORD

Procedure: EM0225D New Rev: 1 PRR#: 17237
Title: GUIDANCE FOR DRY OTSG TUBE TO SHELL DELTA T MONITORING AND CONTROL

MINOR CHANGES

If Minor Changes are included, check the applicable box(es) and provide a list of affected steps.
The following corrections are incorporated throughout:

- _ Sentence Structure
- _ Punctuation
- _ Capitalization
- _ Spelling
- _ Organizational Changes: position titles, department names, or telephone numbers
- _ Redundant words or phrases
- _ Abbreviations
- _ Obviously incorrect units of measure
- _ Inadvertently omitted symbols (#, %, etc.)
- _ Obvious step numbering discrepancies
- _ Format

The following corrections are incorporated in the step(s) indicated: "Throughout" is used in lieu of Step# if a specific change affects a large number of steps.

	Correcting equipment nomenclature that does not agree with field labels or balance of procedure
	Changing information that is obviously incorrect and referenced correctly elsewhere
	Misplaced decimals that are neither setpoint values nor tolerances
	Reference to a procedure when an approved procedure has taken the place of another procedure
	Fixing branching points when it is clear the branching steps were originally intended but were overlooked or incorrectly stated due to step number changes
	Adding clarifying information such as NOTES and CAUTIONS
	Adding words to clarify steps, NOTES, or CAUTIONS which clearly do not change the methodology or intent of the steps

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PROCEDURE DEVELOPMENT AND REVISION RECORD

Procedure: EM0225D **New Rev:** 1 **PRR#:** 17237
Title: GUIDANCE FOR DRY OTSG TUBE TO SHELL DELTA T MONITORING AND CONTROL

NON-INTENT CHANGES

Changes are incorporated for the reasons provided. "Throughout" is used in lieu of Step # if a specific change affects a large number of steps. For new or cancelled procedures the reason is provided.

2.1	Deleted implementing references and renumbered subsequent steps. Implementing references are no longer listed per AI-402B.
4.1.2	Removed information regarding shell thermocouple monitoring from old Step 4.1.1 to a new step to enhance clarity. Added condition to monitor thermocouples if shell temperatures appear accurate. This change prompts the TSC to use thermocouples only if the containment environment is not degraded by a steam or feedwater leak.
3.1 (Definition Section)	Reordered to present in alphabetical order
4.3.7	Changed "HPV" to "high point vents" to be consistent with usage in the EOPs.

CHANGE OF INTENT, CANCELLATION, OR NEW PROCEDURE

Changes are incorporated for the reasons provided. "Throughout" is used in lieu of Step # if a specific change affects a large number of steps. For new or cancelled procedures the reason is provided.

4.1.3	Added new step to adjust cooldown rate to control tube to shell delta T limits (NUPOST 51811). Renumbered subsequent steps.
3.1.6 (Old Step), 4.2.3	Deleted reference to RC-173-TR which was removed under MAR 96-11-03-01.
4.3.5	Added detail to close high point vents when decay heat removal is established. This prevents forced DHR flow causing RCS inventory loss through the HPVs (NUPOST 50881).

Rev. 3

Effective Date 11/5/99

EMERGENCY PLAN IMPLEMENTING PROCEDURE

EM-225E

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

GUIDELINES FOR LONG TERM COOLING

CONTROLLED COPY
NUCLEAR OPERATIONS
Holder # 1242

APPROVED BY: Procedure Owner

(SIGNATURE ON FILE)

DATE: 11/3/99

PROCEDURE OWNER: Manager, Nuclear Plant Operations

TABLE OF CONTENTS

1.0 PURPOSE

The purpose of this procedure is to provide guidance to the TSC Accident Assessment Team for maintaining long term core cooling post LOCA.

2.0 REFERENCES

2.1 DEVELOPMENTAL REFERENCES

2.1.1 Babcock and Wilcox Topical Report BAW-10103A, Rev. 3, ECCS Analysis of B&W's 177-FA Lowered-Loop NSS

2.1.2 Calculation M90-0021, Building Spray and Decay Heat Pump NPSH a/r

2.1.3 Calculation I97-0008, LPI Crossover Flow Loop Accuracy Calculation

2.1.4 Calculation I91-0001, DH (LPI) Flow Indication and Control Loop Error Calculation

2.1.5 Calculation M98-0003, TSC Guidance For LPI Cross-Connect (Framatome Technologies Document 51-5001075-01)

2.1.6 Framatome Technologies Document 74-1152414, Emergency Operating Procedures Technical Bases Document

2.1.7 Calculation I90-0021, Decay Heat Removal Heat Exchanger Outlet Temperature Loop Accuracy Calculation

2.1.8 Calculation I88-0011, Containment Sump and Building Flood Level Indication

2.1.9 Calculation I91-0012, BWST Level Accuracy

2.1.10 Calculation M94-0053, Allowable MUT-1 Indicated Overpressure vs. Indicated Level

2.1.11 Calculation M95-0005, Minimum BWST Level to Prevent Vortexing during Drawdown

2.1.12 MAR 90-06-10-02, Reactor Building Instrument and Valve Relocation

2.1.13 Calculation M90-0023, Reactor Building Flooding

2.1.14 Calculation F98-0015, Minimum HPI flow for CR-3 at 72 hours post-LOCA

2.1.15 EEM98-001, MU/HPI Pump Qualification

2.1.16 Calculation I89-0036, Make-up/HPI Flow Loop Accuracy (High Range)

2.1.17 Calculation I89-0037, Make-up/HPI Flow Loop Accuracy (Low Range)

2.1.18 EEI98-001, HPI Total Flow Uncertainty

3.0 PERSONNEL INDOCTRINATION

3.1 DEFINITIONS

- Emergency Core Cooling Systems (ECCS) - Active components (i.e., High Pressure Injection, Low Pressure Injection, associated flow paths), combined with the passive systems (i.e., Core Flood Tanks (CFT) and the Borated Water Storage Tank), required to be operable to ensure the initial condition assumptions of the accident analysis are met.

- ECCS Suction Transfer - This necessary operator action involves manual alignments to allow the active ECCS, and Reactor Building Spray components to take suction from the Reactor Building sump.

- Onset of Long Term Core Cooling - The time after a LOCA, when operator action is required to ensure the ECCS systems are properly aligned, and the minimum performance requirements are met.

- End of ECCS Cooling - The time after a LOCA, when the core has been removed from the Reactor Vessel or other permanent means of core cooling has been established.

- Duration of Long Term Core Cooling - The time period between the Onset of Long Term Core Cooling, and the End of ECCS Cooling.

- Long Term Cooling Modes - There are three methods that may be available for long term core cooling. The three methods in their order of preference are:

  - Both LPI trains operating and providing flow through their respective injection lines.

  - One LPI train operating and providing flow through its respective injection line, and providing a suction source for the associated HPI pump.

  - One LPI train operating and providing flow through both LPI injection paths through the discharge cross-tie line.

3.2 RESPONSIBILITIES

- The TSC Accident Assessment Team is responsible for the following:
  - Monitoring ECCS system performance and providing recommendations to the EC regarding changes in the established flow paths.
  - Provide input to recovery plans for failed equipment, placing emphasis on the need for at least two ECCS injection paths before, during, and after required maintenance activities.
  - Assess plant conditions and equipment availability to determine the safest and most effective method to achieve LPI injection through both injection paths.

3.3 LIMITS AND PRECAUTIONS

- To ensure adequate NPSH is maintained, total actual decay heat pump flow from RB sump must be maintained ≤ 2986 gpm. This is derived from the following:
  - 2200 gpm indicated LPI flow (plus instrument uncertainties)
  - 600 gpm HPI flow (derived from hydraulic analysis)
- Total HPI flow must be limited 72 hours post accident to ensure long term mission time requirements are met.
- Any changes to the flow limits associated with Enclosures 4 through 10 must consider the following:
  - LPI pump NPSH
  - Instrumentation uncertainty
  - Required LPI flow
  - Required HPI flow
  - HPI pump mission time limitations
- Do not perform LPI crosstie during boron precipitation mitigation activities.
- Due to MOV considerations, limit bumps (motor starts) of the HPI valves to 5 consecutive times.
  - If more than 5 consecutive bumps are required, 1 bump may be performed every 7 minutes.
  - After a cooling period of 1.5 hours, 5 consecutive bumps may again be performed.

3.3 LIMITS AND PRECAUTIONS (Cont'd)

- If piggyback operations are in progress, do not perform LPI crosstie until one of the following is met:
  - DHHE outlet temperature ≤ 130°F AND > 32 hours since shutdown.
  - DHHE outlet temperature > 130°F to ≤ 175°F AND > 81 hours since shutdown.
- Prior to starting equipment, ensure adequate EDG load margin is available per EOP-13, Rule 5, "EDG Control".
- For work located in the Radiation Control Area, due consideration must be given to the ALARA program. This will likely result in special precautions and preparations.
- If indicated RB water level exceeds 6.0 feet, instrumentation may be lost.
- The HPI pump mission time study has qualified the pumps for a two month period. This analyzed mission time, relative to previous operational time, should be considered during decisions related to alignment changes.

4.0 INSTRUCTIONS

4.1 EMERGENCY LPI CROSSTIE AND PIGGYBACK OPERATIONS

- IF HPI piggyback operations are required,
  AND multiple failures result in the inability to align the ECCS systems for piggyback operation,
  THEN obtain EC concurrence and perform Enclosure 10, Emergency LPI Crosstie.

- IF only HPI pumps are taking suction from the BWST,
  THEN level can be lowered to 2.5 feet (actual) or 3.5 feet (indicated).

4.2 LONG TERM COOLING REQUIREMENTS

- The most desired long term cooling mode of operation is to supply LPI injection through both injection lines. Review plant conditions for the safest method for achieving this alignment

NOTE: Adequate SCM may be lost during HPI flow reduction. Analysis has shown the flow rates listed below will ensure continued core cooling. Loss of adequate SCM during establishment of the flow rates below is acceptable.

If adequate SCM does not exist, the flow limits below supersede the EOP requirement for full HPI.

The flow limits below are only valid when the flow path is limited to the HPI valves. Other configurations (recirc, seal injection, normal makeup) must be individually evaluated.

- IF total HPI flow is > 500 gpm,
  THEN provide direction to the Control Room to maintain HPI flow within the following limits (balanced between available digital low range indicators):

	≤ 64 hours	**> 64 hours and < 72 hours**	**≥ 72 hours without Adequate SCM**	**≥ 72 hours with Adequate SCM**
1 HPI pump	Per EOP-13, Rule 2	Reduce HPI flow to 72 hour limit.	> 440 gpm < 500 gpm	< 500 gpm
2 HPI pumps 4 indicators	Per EOP-13, Rule 2	Reduce HPI flow to 72 hour limit.	> 440 gpm < 760 gpm	< 760 gpm
2 HPI pumps 3 indicators	Per EOP-13, Rule 2	Reduce HPI flow to 72 hour limit.	> 440 gpm < 560 gpm	< 560 gpm

- After the EOP has been completed, request Control Room trending of the operating components by performance of:
  - Enclosure 1, ECCS Flow Log, every 24 hours
  - Enclosure 2, Long Term Cooling Equipment Log, every 12 hours

4.3 RB WATER LEVEL CONTROL

- Monitor and maintain the RB water level in the appropriate level limits. Consult with engineering personnel for the minimum and maximum levels for current plant conditions.

- If RB water level is lowering, perform walk downs of accessible areas to determine leakage location. If the AB is not accessible, the Control Room radiation monitoring reading may be helpful in determination.

- If RB water level is lowering and no AB leakage exists consider the following:

  - Inadvertent pumping, i.e., RB sump pumps, RCDT pumps

  - Leaking ECCS flow path isolation valves, i.e., DHP recirc to BWST, DHP recirc to SF pools, HPI pump recirc to MUT, RB spray recirc to BWST, etc.

  - Possible SGTR

- If the leaking component is found, review available equipment to determine possible Long Term Core Cooling alignments to allow faulted equipment isolation.

- Reduction in RB sump boron concentration may be indicative of the need to perform boron precipitation mitigation.

- Rising RB water level and lowering boron concentration may be indicative of unborated water leaking to containment. The following are possible sources of unborated water:

  - SW system
  - CI system
  - DW system
  - FW systems (AFW, EFW, MFW)
  - DC system via DHHEs

- RB sump boron concentration must be maintained to ensure the Rx remains shutdown. If unborated water is leaking to the RB, attempt isolation efforts.

- <u>IF</u> RB sump water must be drained/pumped to prevent exceeding RB flood plane,
  <u>THEN</u> the storage location must be evaluated to prevent excessive dose rates and releases.

4.4 LONG TERM CORE COOLING MODE ALIGNMENT CHANGES

- The most desired long term cooling mode of operation is to supply LPI injection through both injection lines.
- If power failures exist, using OP-700 series procedures ensure required equipment is energized.
- During transitions to LPI crosstie mode of operation, the Control Room will ask for TSC assistance for HPI termination. Ensure all the following exist prior to allowing HPI pump shutdown:
  - Stable LPI crosstie flow with in the limits of the applicable enclosure.
  - Tincore is <u>NOT</u> rising.
  - RCS pressure is <u>NOT</u> rising.
- If the above conditions are not observed, direct the Control Room to re-establish HPI injection flow by performing the following:
  1. Throttle the injection valves until total injection flow is > minimum pump flow.
  2. Close the recirc valves.
  3. Establish maximum allowable injection flow.
- During LPI crosstie operations, if stable LPI flow within the limits of the applicable enclosure can not be maintained, provide direction to the Control Room to establish HPI piggyback.
  - If Enclosures 8 or 9 are used to establish piggyback, the status statement will not be met. The two status statements regarding LPI system alignment are intended for normal transitions with adequate core cooling.
  - Provided the associated LPI train indicated flow is ≤ 2200 gpm, adequate NPSH margin exists for HPI pump operation.

4.5 MAINTENANCE DURING LONG TERM COOLING

- Prior to performing maintenance activities, any necessary temporary shielding must be installed, and the associated piping flushed.

- Storage location for draining and flushing operations must be evaluated to prevent excessive dose rates and releases.

- A possible flushing activity may be to drain or pump water from the BWST or SF pools to a suitable storage location.

4.6 LONG TERM COOLING TERMINATION

- WHEN the End of ECCS Cooling occurs,
  THEN exit this procedure.

ECCS FLOW LOG

Time Note 1	HPI flow Notes 2 and 3	A LPI flow Note 2	B LPI flow Note 2	LPI Crosstie flow Note 2

1) Suggested minimum time interval is 24 hours.

2) If an increasing trend is noted without a corresponding decrease in RCS pressure or increase in valve position, notify the TSC.

3) HPI flows must be maintained within the limits of Section 4.2

LONG TERM COOLING EQUIPMENT LOG

DHP-1A Computer Points (See Note 1)									
R250									
X318									
X319									
X320									

DHP-1B Computer Points (See Note 1)									
R251									
X321									
X322									
X323									

MUP-1A Computer Points (See Note 1)									
X324									
X326									
X325									
X070									
X366									
T217									
S292									
S294									

MUP-1B Computer Points (See Note 1)									
X327									
X329									
X328									
X071									
X367									
T253									
S311									
S295									

MUP-1C Computer Points (See Note 1)									
X330									
X332									
X331									
X072									
A298									
T236									
T216									
S296									

LONG TERM COOLING EQUIPMENT LOG (CONT'D)

BSP-1A Computer Points (See Note 1)									
X313									
X312									
X314									

BSP-1B Computer Points (See Note 1)									
X316									
X315									
X317									

Note 1: These instruments are not safety related or EQ qualified. However, this data may be useful for trending equipment condition.

OPERATOR ENCLOSURE FUNCTIONAL GOALS

Enclosure	Functional Goal
4	To provide LPI flow through both injection lines using DHP-1A. This alignment allows maintenance on the following equipment: • All HPI pumps • DHP-1B, provided the recirculation fluid down stream of DHV-111 does not result in excessive dose rates. The only alignment that should be performed from this alignment is starting the opposite LPI train.
5	To provide LPI flow through both injection lines using DHP-1B. This alignment allows maintenance on the following equipment: • All HPI pumps • DHP-1A, provided the recirculation fluid down stream of DHV-110 does not result in excessive dose rates. The only alignment that should be performed from this alignment is starting the opposite LPI train.
6	To provide LPI flow through A Train LPI using DHP-1A. Provided DHP-1B is operating, this alignment allows maintenance activities on all HPI pumps.
7	To provide LPI flow through B Train LPI using DHP-1B. Provided DHP-1A is operating, this alignment allows maintenance activities on all HPI pumps.
8	To provide HPI injection using the A Train ES selected HPI pump. This alignment allows maintenance on the following equipment: • Secured HPI pumps • DHP-1B
9	To provide HPI injection using the B Train ES selected HPI pump. This alignment allows maintenance on the following equipment: • Secured HPI pumps • DHP-1A
10	To provide emergency alignments should Piggyback alignments fail.

A LPI TRAIN CROSSTIE

ACTIONS	DETAILS

STATUS

- **ECCS suction transfer has been completed.**
- **DHP-1A is operating.**
- **A Train ES selected MUP is operating in piggyback.**
- **BSP-1B is shutdown.**
- **LPI crosstie NOT in progress.**
- **DHHE outlet TEMP is ≤ 130°F AND > 32 hours have elapsed since Rx shutdown.**

  OR

  DHHE outlet TEMP is > 130°F to ≤ 175°F AND > 81 hours have elapsed since Rx shutdown.

NOTE

Tincore should be closely monitored while changing ECCS alignments.

Step	Actions	Details
4.1 ___	Ensure B ES selected MUP is stopped.	___ MUP-1B ___ MUP-1C
4.2 ___	IF both LPI pumps are running, THEN stop DHP-1B.	

A LPI TRAIN CROSSTIE (CONT'D)

ACTIONS	DETAILS
4.3 ___ Isolate B LPI Train.	• Ensure the following valves closed: ___ DHV-35 ___ DHV-40 ___ DHV-43 ___ DHV-211 ___ DHV-12 • ___ Select BSV-4 to "MAN" and closed. • ___ Select DHV-111 to "MAN" and closed.

A LPI TRAIN CROSSTIE (CONT'D)

ACTIONS			DETAILS
4.4	___	Adjust DHV-110 setpoint to 1600 gpm.	

NOTE

During crosstie DHV-111 must remain in manual.

4.5	___	Establish LPI crosstie.	1 ___ Ensure DHV-6 is open. 2 Open LPI crosstie valves: ___ DHV-8 ___ DHV-7 3 ___ Throttle DHV-111 to achieve LPI crosstie flow of 900 (800 to 1000) gpm on DH-38-FI 4 ___ Adjust DHV-110 setpoint to obtain A Train LPI flow of 2100 (2000 to 2200) gpm on DH-1-FI1

A LPI TRAIN CROSSTIE (CONT'D)

ACTIONS	DETAILS
4.6 ___ Stop HPI flow.	1 ___ IF HPI flow is > 300 gpm, THEN throttle HPI flow to 300 (200 to 400) gpm. 2 Open all HPI recirc to sump valves: ___ MUV-543 ___ MUV-544 ___ MUV-545 ___ MUV-546 3 Close all HPI valves: ___ MUV-23 ___ MUV-24 ___ MUV-25 ___ MUV-26
4.7 ___ WHEN the TSC directs termination of the MUP, THEN stop the operating MUP.	1 Stop the A ES selected MUP: ___ MUP-1A ___ MUP-1B 2 ___ Close DHV-11

A LPI TRAIN CROSSTIE (CONT'D)

ACTIONS	DETAILS

NOTE

During crosstie DHV-111 must remain in manual.

4.8 ___ Increase LPI flow.

1 ___ Throttle DHV-111 to obtain LPI crosstie flow of 1250 (1150 to 1350) gpm on DH-38-FI

2 ___ Adjust DHV-110 setpoint to achieve A Train LPI flow 2700 (2600 to 2800) gpm on DH-1-FI1

4.9 ___ Close all HPI recirc to sump valves.

___ MUV-543
___ MUV-544
___ MUV-545
___ MUV-546

B LPI TRAIN CROSSTIE

ACTIONS | DETAILS

STATUS

- **ECCS suction transfer has been completed.**
- **DHP-1B is operating.**
- **B Train ES selected MUP is operating in piggyback.**
- **BSP-1A is shutdown.**
- **LPI crosstie NOT in progress.**
- **DHHE outlet TEMP is ≤ 130°F AND > 32 hours have elapsed since Rx shutdown.**

  OR

  DHHE outlet TEMP is > 130°F to ≤ 175°F AND > 81 hours have elapsed since Rx shutdown.

NOTE

Tincore should be closely monitored while changing ECCS alignments.

5.1 ___ Ensure A ES selected HPI pump is stopped.

___ MUP-1A
___ MUP-1B

B LPI TRAIN CROSSTIE (CONT'D)

ACTIONS	DETAILS
5.2 ___ IF both LPI pumps are running, THEN stop DHP-1A	
5.3 ___ Isolate A LPI Train.	• Ensure the following are closed: ___ DHV-34 ___ DHV-39 ___ DHV-42 ___ DHV-210 ___ DHV-11 • ___ Select BSV-3 to "MAN" and closed. • ___ Select DHV-110 to "MAN" and closed.

B LPI TRAIN CROSSTIE (CONT'D)

ACTIONS	DETAILS
5.4 ___ Adjust DHV-111 setpoint to 1600 gpm.	

NOTE

During crosstie DHV-110 must remain in manual.

ACTIONS	DETAILS
5.5 ___ Establish LPI crosstie.	1 ___ Ensure DHV-5 is open.
	2 Open LPI crosstie valves:
	___ DHV-8
	___ DHV-7
	3 ___ Throttle DHV-110 to achieve LPI crosstie flow of 900 (800 to 1000) gpm on DH-38-FI
	4 ___ Adjust DHV-111 setpoint to achieve B Train LPI flow of 2100 (2000 to 2200) gpm on DH-1-FI2

B LPI TRAIN CROSSTIE (CONT'D)

ACTIONS	DETAILS
5.6 ___ Stop HPI flow.	1 ___ IF HPI flow is > 300 gpm, THEN throttle HPI flow to 300 (200 to 400) gpm. 2 Open all HPI recirc to sump valves: ___ MUV-543 ___ MUV-544 ___ MUV-545 ___ MUV-546 3 Close all HPI valves: ___ MUV-23 ___ MUV-24 ___ MUV-25 ___ MUV-26

B LPI TRAIN CROSSTIE (CONT'D)

ACTIONS	DETAILS
5.7 ___ WHEN the TSC directs termination of the MUP, THEN stop the operating MUP.	1 Stop the B ES selected MUP: ___ MUP-1B ___ MUP-1C 2 ___ Close DHV-12

NOTE

During crosstie DHV-110 must remain in manual.

5.8 ___ Increase LPI flow.	1 ___ Throttle DHV-110 to achieve LPI crosstie flow of 1250 (1150 to 1350) gpm on DH-38-FI 2 ___ Adjust DHV-111 setpoint to achieve B Train LPI flow of 2700 (2600 to 2800) gpm on DH-2-FI2

5.9 ___ Close all HPI recirc to sump valves.

___ MUV-543
___ MUV-544
___ MUV-545
___ MUV-546

STARTING A TRAIN LPI PUMP

ACTIONS	DETAILS

STATUS

- **ECCS suction transfer has been completed.**
- **DHP-1B is operating.**
- **B Train ES selected MUP is operating in piggyback.**

  OR

  LPI crosstie in progress.

NOTE

Tincore should be closely monitored while changing ECCS alignments.

6.1 ___	Ensure proper alignment for the A Train LPI system.	1 Ensure the following valves are closed: ___ DHV-34 ___ DHV-39 ___ DHV-11 2 ___ IF LPI crosstie is NOT in progress, THEN close DHV-110 3 ___ Ensure DHV-42 is open. 4 ___ Ensure DHV-5 is open.

STARTING A TRAIN LPI PUMP (CONT'D)

ACTIONS	DETAILS
6.2 ___ Start A Train LPI. [Rule 5, EDG Control]	1 Ensure required cooling pumps are operating: ___ DCP-1A ___ RWP-3A 2 ___ Start DHP-1A 3 ___ Ensure DHV-210 is open.
6.3 ___ IF LPI crosstie operations are in progress, THEN stop crosstie flow.	• Close LPI crosstie valves: ___ DHV-8 ___ DHV-7
6.4 ___ Ensure LPI flow is properly controlled.	• Ensure LPI control valves are in "AUTO" and set for 2000 gpm: ___ DHV-110 ___ DHV-111

STARTING A TRAIN LPI PUMP (CONT'D)

ACTIONS		DETAILS
6.5 ___	WHEN all the following exist: ___ A Train LPI flow > 1400 gpm ___ B Train LPI flow > 1400 gpm THEN stop HPI.	1 Stop B ES selected MUP: ___ MUP-1B ___ MUP-1C 2 ___ Close DHV-12
6.6 ___	Increase LPI flow.	• Adjust LPI control valve setpoint to 2700 gpm: ___ DHV-110 ___ DHV-111

STARTING B TRAIN LPI PUMP

ACTIONS | DETAILS

STATUS

- **ECCS suction transfer has been completed.**
- **DHP-1A is operating.**
- **A Train ES selected MUP is operating in piggyback.**

OR

- **LPI crosstie in progress.**

NOTE

Tincore should be closely monitored while changing ECCS alignments.

7.1 ___ Ensure proper alignment for the B Train LPI system.

1 Ensure the following valves are closed:

___ DHV-35

___ DHV-40

___ DHV-12

2 ___ IF LPI crosstie is NOT in progress, THEN close DHV-111

3 ___ Ensure DHV-43 is open.

4 ___ Ensure DHV-6 is open.

STARTING B TRAIN LPI PUMP (CONT'D)

ACTIONS	DETAILS
7.2 ___ Start B Train LPI. [Rule 5, EDG Control]	1 Ensure required cooling pumps are operating: ___ DCP-1B ___ RWP-3B 2 ___ Start DHP-1B 3 ___ Ensure DHV-211 is open.
7.3 ___ IF LPI crosstie operations are in progress, THEN stop crosstie flow.	• Close LPI crosstie valves: ___ DHV-8 ___ DHV-7
7.4 ___ Ensure LPI flow is properly controlled.	• Ensure LPI control valves in "AUTO" and set for 2000 gpm: ___ DHV-110 ___ DHV-111

STARTING B TRAIN LPI PUMP (CONT'D)

ACTIONS		DETAILS
7.5 ___	WHEN all the following exist: ___ A Train LPI flow > 1400 gpm ___ B Train LPI flow > 1400 gpm THEN stop HPI.	1 Stop A ES selected MUP: ___ MUP-1A ___ MUP-1B 2 ___ Close DHV-11
7.6 ___	Increase LPI flow.	• Adjust LPI control valve setpoint to 2700 gpm: ___ DHV-110 ___ DHV-111

ESTABLISHING A TRAIN PIGGYBACK

ACTIONS	DETAILS

STATUS

- **ECCS suction transfer has been completed.**
- **Both LPI trains are operating and providing flow.**
- **LPI crosstie NOT in progress.**

NOTE

Tincore should be closely monitored while changing ECCS alignments.

8.1 ___ Ensure proper HPI alignment.

1 MUP recirc to MUT valves closed:

___ MUV-53

___ MUV-257

2 HPI recirc to sump valves closed:

___ MUV-543

___ MUV-544

___ MUV-545

___ MUV-546

3 HPI valves are open or throttled as directed by the TSC:

___ MUV-23

___ MUV-24

___ MUV-25

___ MUV-26

ESTABLISHING A TRAIN PIGGYBACK (CONT'D)

ACTIONS	DETAILS
8.2 ___ Align DHP-1A discharge to MUP suction.	• ___ Open DHV-11
8.3 ___ Ensure DHP-1A flow is within limits.	• ___ Ensure DHV-110 in "AUTO" and set for 2000 gpm.
8.4 ___ Start A Train HPI. [Rule 5, EDG Control]	• Start the A ES selected MUP and required cooling pumps: ___ MUP-1A ___ MUP-1B
8.5 ___ Stop B Train ECCS pumps.	1 Ensure the B ES selected MUP stopped: ___ MUP-1B ___ MUP-1C 2 ___ Ensure DHP-1B is stopped. 3 ___ Close DHV-12 4 ___ Close DHV-6

ESTABLISHING A TRAIN PIGGYBACK (CONT'D)

ACTIONS	DETAILS
8.6 ___ IF $\geq$ 72 hrs post accident, THEN ensure HPI flow is within limits (use digital low range).	• ___ IF adequate SCM does NOT exist, THEN throttle HPI flow to 470 gpm (440 to 500 gpm). • ___ IF adequate SCM exists, THEN throttle HPI flow to $<$ 500 gpm.
8.7 ___ IF $<$ 72 hrs post accident, THEN ensure HPI flow is within limits (use digital low range).	• ___ IF adequate SCM does NOT exist, THEN establish full HPI. • ___ IF adequate SCM exists, THEN throttle HPI to maintain minimum adequate SCM.

ESTABLISHING B TRAIN PIGGYBACK

ACTIONS	DETAILS

STATUS

- **ECCS suction transfer has been completed.**
- **Both LPI trains are operating and providing flow.**
- **LPI crosstie NOT in progress.**

NOTE

Tincore should be closely monitored while changing ECCS alignments.

9.1 ___ Ensure proper HPI alignment.

1 MUP recirc to MUT valves closed:

___ MUV-53

___ MUV-257

2 HPI recirc to sump valves closed:

___ MUV-543

___ MUV-544

___ MUV-545

___ MUV-546

3 HPI valves are open or throttled as directed by the TSC:

___ MUV-23

___ MUV-24

___ MUV-25

___ MUV-26

ESTABLISHING B TRAIN PIGGYBACK (CONT'D)

ACTIONS	DETAILS
9.2 ___ Align DHP-1B discharge to MUP suction.	• ___ Open DHV-12
9.3 ___ Ensure DHP-1B flow is within limits.	• ___ Ensure DHV-111 in "AUTO" and set for 2000 gpm.
9.4 ___ Start B Train HPI. [Rule 5, EDG Control]	• Start the B ES selected MUP and required cooling pumps: ___ MUP-1B ___ MUP-1C
9.5 ___ Stop A Train ECCS pumps.	1 Ensure the A ES selected MUP is stopped: ___ MUP-1A ___ MUP-1B 2 ___ Ensure DHP-1A is stopped. 3 ___ Close DHV-11 4 ___ Close DHV-5

ESTABLISHING B TRAIN PIGGYBACK (CONT'D)

ACTIONS		DETAILS
9.6	___ IF $\geq$ 72 hrs post accident, THEN ensure HPI flow is within limits (use digital low range).	• ___ IF adequate SCM does NOT exist, THEN throttle HPI flow to 470 gpm (440 to 500 gpm). • ___ IF adequate SCM exists, THEN throttle HPI flow to $<$ 500 gpm.
9.7	___ IF $<$ 72 hrs post accident, THEN ensure HPI flow is within limits (use digital low range).	• ___ IF adequate SCM does NOT exist, THEN establish full HPI. • ___ IF adequate SCM exists, THEN throttle HPI to maintain minimum adequate SCM.

EMERGENCY LPI CROSSTIE AND PIGGYBACK OPERATIONS

ACTIONS	DETAILS

STATUS

- **At least 1 LPI pump is operating.**
- **Multiple failures have resulted in the inability to establish Piggyback.**

ACTIONS	DETAILS
10.1 ___ IF all the following exist: ___ LPI flow exists ___ Only 1 LPI train is operating THEN crosstie LPI trains.	1 Ensure DHP isolation valve on idle train is closed: ___ DHV-210 (A Train) ___ DHV-211 (B Train) 2 Ensure LPI block valve on idle train is open: ___ DHV-5 (A Train) ___ DHV-6 (B Train) 3 Ensure LPI control valve on idle train is closed: ___ DHV-110 (A Train) ___ DHV-111 (B Train) 4 Open LPI crosstie valves: ___ DHV-8 ___ DHV-7 5 Establish the following flows using DHV-110 and DHV-111: ___ LPI crosstie flow 1250 (1150 to 1350) gpm on DH-38-FI ___ Operating LPI train flow 2700 (2600 to 2800) gpm

EMERGENCY LPI CROSSTIE AND PIGGYBACK OPERATIONS (CONT'D)

ACTIONS	DETAILS
10.2 ___ IF RCS PRESS prevents LPI flow, THEN establish alternate piggyback alignment.	• Open the necessary valves: ___ DHV-11 ___ DHV-12 ___ MUV-62 ___ MUV-69

PROCEDURE DEVELOPMENT AND REVISION RECORD

Procedure: EM0225E **New Rev:** 3 **PRR#:** 17853
Title: GUIDELINES FOR LONG TERM COOLING

MINOR CHANGES

If Minor Changes are included, check the applicable box(es) and provide a list of affected steps.
The following corrections are incorporated throughout:

- _ Sentence Structure
- _ Punctuation
- _ Capitalization
- _ Spelling
- _ Organizational Changes: position titles, department names, or telephone numbers
- _ Redundant words or phrases
- _ Abbreviations
- _ Obviously incorrect units of measure
- _ Inadvertently omitted symbols (#, %, etc.)
- _ Obvious step numbering discrepancies
- _ Format

The following corrections are incorporated in the step(s) indicated: "Throughout" is used in lieu of Step# if a specific change affects a large number of steps.

	Correcting equipment nomenclature that does not agree with field labels or balance of procedure
	Changing information that is obviously incorrect and referenced correctly elsewhere
	Misplaced decimals that are neither setpoint values nor tolerances
	Reference to a procedure when an approved procedure has taken the place of another procedure
	Fixing branching points when it is clear the branching steps were originally intended but were overlooked or incorrectly stated due to step number changes
	Adding clarifying information such as NOTES and CAUTIONS
	Adding words to clarify steps, NOTES, or CAUTIONS which clearly do not change the methodology or intent of the steps

PROCEDURE DEVELOPMENT AND REVISION RECORD

Procedure: EM0225E New Rev: 3 PRR#: 17853
Title: GUIDELINES FOR LONG TERM COOLING

MINOR CHANGES

If Minor Changes are included, check the applicable box(es) and provide a list of affected steps.
The following corrections are incorporated throughout:

X Sentence Structure
_ Punctuation
_ Capitalization
_ Spelling
_ Organizational Changes: position titles, department names, or telephone numbers
X Redundant words or phrases
_ Abbreviations
_ Obviously incorrect units of measure
_ Inadvertently omitted symbols (#, %, etc.)
_ Obvious step numbering discrepancies
X Format

The following corrections are incorporated in the step(s) indicated: "Throughout" is used in lieu of Step# if a specific change affects a large number of steps.

	Correcting equipment nomenclature that does not agree with field labels or balance of procedure
	Changing information that is obviously incorrect and referenced correctly elsewhere
	Misplaced decimals that are neither setpoint values nor tolerances
	Reference to a procedure when an approved procedure has taken the place of another procedure
	Fixing branching points when it is clear the branching steps were originally intended but were overlooked or incorrectly stated due to step number changes
	Adding clarifying information such as NOTES and CAUTIONS
	Adding words to clarify steps, NOTES, or CAUTIONS which clearly do not change the methodology or intent of the steps

PROCEDURE DEVELOPMENT AND REVISION RECORD

Procedure: EM0225E **New Rev:** 3 **PRR#:** 17853
Title: GUIDELINES FOR LONG TERM COOLING

NON-INTENT CHANGES

Changes are incorporated for the reasons provided. "Throughout" is used in lieu of Step # if a specific change affects a large number of steps. For new or cancelled procedures the reason is provided.

Table of Contents	Changed Table of Contents to delete "Implementing References" (old subsection 2.1) and renumbered old subsection 2.2, "Developmental References" as new 2.1. AI-402B, "Procedure Writing", does not include "Implementing References" as a component of the EM format. The "Implementing References" have been omitted from the body of the procedure. The Table of Contents change reflects that omission.
Table of Contents	A new section 4.3, "RB Water Level Control", is added and former section 4.3, "Long Term Core Cooling Mode Alignment Changes", is renumbered as 4.4. The Table of Contents change reflects the changes made in the body of the procedure. The specific details of these changes are addressed in the sequence where these procedure changes are made in the body of the procedure.
Table of Contents	Former sections 4.4, "Long Term Piggy Back Operation", and 4.5, "Long Term LPI Operation", are deleted. A new section 4.5, "Maintenance During Long Term Cooling", is added. The Table of Contents change reflects the changes made in the body of the procedure. The specific details of the addition and the deletions are addressed in the sequence where these procedure changes are made in the body of the procedure.
Table of Contents	Enclosure 1, "Component Power Supplies", and Enclosure 3, "Operator Enclosure Assumptions and Limitations", are deleted and the remaining enclosures renumbered accordingly. The Table of Contents change reflects the changes made in the body of the procedure. The specific details of these deletions are addressed in the sequence where these procedure changes are made in the body of the procedure.
1.0	Deleted the specific descriptions of what the alignments provided by this procedure are for. The generality of the remaining statement is adequate to define the purpose of the procedure. The specifics that were deleted required each modification to an alignment within the procedure (that fulfilled the general purpose of the procedure) to also result in a change to the purpose. The maintenance of this specific list of alignments in the purpose of the procedure served no useful purpose in the implementation of the procedure.
2.0	Deleted subsection 2.1, "Implementing References", and renumbered old subsection 2.2, "Developmental References", as new 2.1. AI-402B, "Procedure Writing", does not include "Implementing References" as a component of the EM format, therefore, this subsection is being omitted. EM-225E is used in the Technical Support Center where the necessary references that are required to implement this procedure are maintained. Identifying these specific references in this procedure lends no technical guidance and provides an opportunity for confusion in that any other procedure necessary to fulfill the requirements of EM-225E are applicable whether they are listed or not.
2.1.15	Changed reference to E12.5.580 to EEM98-001, "MU/HPI Pump Qualification". EEM98-001 is the FPC document that incorporated the HPI pump qualifications into the FPC document system.
3.1	Removed the specific numbers (3.1.1, 3.1.2, ...) for each definition and replaced with bullets. The definitions have no numerical relationship with each other, therefore, bullets are the more appropriate "line item" identifier.
3.2	Identified the specific responsibility of the TSC AAT with a bullet and each of the individual responsibilities with dashes. To provide a tiered relationship of the items listed with the major component (TSC AAT responsibility).

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3.3	Removed the specific numbers (3.3.1, 3.3.2, ...) for each Limit and Precaution (L&P) and replaced with bullets. The L&Ps have no numerical relationship with each other, therefore, bullets are the more appropriate "line item" identifier.
Old 3.3.1	Removed the specific instrument uncertainty qualifier from the indicated flow limit of 2200 gpm. The change explains the difference between the total and the sum of the 2 values given without specifying the exact amount. The uncertainty amount has no affect on the ability to maintain NPSH as long as the indicated flow limit is maintained. The instrument error calculation referenced in Section 2.1 contains this value.
Old 3.3.2	Deleted this L&P referencing the suction head margin provided by the flow limitation. The present calcs provide the assurance that NPSH will be satisfactory if the flowrate requirement is met without consideration of any margin that may be available. The BWST volume/ RB flood calculation will determine the effective margin that the total volume will provide when the suction transfer is implemented at the required BWST level. This margin will be over and above that necessary to satisfy the NPSH and may be used by the TSC, via the available calculations, to determine if any flow rate changes should be attempted.
Old 3.3.6	Deleted this L&P referencing increasing flow limits after an engineering assessment of actual plant conditions. This is the job of the TSC and can be implemented by following the considerations of the affected parameters listed and the associated calculations.
Old 3.3.6.1	Deleted this L&P referencing not decreasing flow limits prior to consultation with knowledgeable personnel (FTI). Relying upon an outside organization (i.e., FTI) during implementation of this procedure is unjustified. The TSC (when activated) is manned with engineering expertise to perform the engineering evaluations necessary to fulfill this need.
Old 3.3.6.2	Deleted this L&P referencing any change to the flow limits being evaluated in accordance with 10 CFR 50.59 or 10 CFR 50.54(x), (y). This concern is programmatically controlled by the procedure change process and by implementation of 50.54 (x) and (y) when necessary. A procedure step is not required to ensure the CFR requirements are met.
Old 3.3.6.3	Modified format to state the concern without referencing the calculations. The calculations are included in section 2.1 and available in the TSC.
Old 3.3.6.3.3	Deleted reference to FTI document 51-5001075-01. This information has been incorporated into the FPC documentation system as calculation M98-0003.
Old 3.3.6.3.5	Changed reference to Sulzer-Bingham Qualification in Report E12.5.580 to Engineering Evaluation EEM98-001. The EE is the FPC document containing the vendor qualification report.
Old 3.3.7	Reworded to state the direction "Do not perform LPI crosstie..." as a direct restriction rather than the former passive statement.
Old 3.3.10	Reworded to state the direction "...do not perform LPI crosstie..." as a direct restriction rather than the former passive statement. Reworded to avoid use of "either" for consistency with the conditional logic used in the EOPs.
Old 3.3.11	Deleted "on the emergency diesel generators" and added "EDG" before "margin" for common abbreviation. This L&P references EOP-13, Rule 5, which is the EDG control rule.

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Old 3.3.13	Deleted reference to crosstying to the opposite train to use it's discharge valve (DHV-5/DHV-6) if the running train discharge valve fails. This is an unanalyzed arrangement and (as stated) would require an evaluation prior to use. It is not a common practice to provide any of a variety of suggested possible activities that have not been analyzed and would require evaluation before use.
Old 3.3.14	Reworded to only address indicated level. Since it is expected that the only means of identifying the level would be indicated level, it is of little use to state what actual level could affect instrumentation. If actual level is desired for some diagnostic purpose, the calculations available in the TSC can be used to determine the instrument uncertainties for the present plant conditions.
4.1	Deleted specific step numbering. The substeps have no sequential or numerical relationship with each other. As such, using bullets avoids the confusion of whether or not the issues may be addressed out of the order presented.
Old 4.1.1	Deleted this step referencing subsequent use of the appropriate enclosures to establish piggyback after the crosstie is made. This type decision is best left to the expertise of the TSC AAT with consideration of the current plant conditions rather than relying on this step to always be the suggested action.
4.2	Deleted specific step numbering. The substeps have no sequential or numerical relationship with each other. As such, using bullets avoids the confusion of whether or not the issues may be addressed out of the order presented.
Old 4.2.4	Moved to be the first step in the section. Stating the most desireable long term cooling mode first in the section ensures that decisions made and guidance used can be based on this preference.
Old 4.2.2	Included the guidance referencing directing the Control Room to perform the ECCS Flow Log to be combined with the direction to perform the Long Term Cooling Equipment Log. This allows a common directive given to initiate these trending mechanisms.
Old 4.2.3.1	Deleted referencing use of data collected on the Long Term Cooling Equipment Log. A note has been added to the log making this statement. This provides the restriction for use of the data at the same place that the data will be present (the log).
4.3	The remainder of old section 4.2 has been reconstructed as a new section "RB Water Level Control". This is done to segregate this guidance from the long term cooling guidance as a separate entity. This allows separation of duties to respond to RB water level independently of providing long term core cooling.
Old 4.2.5	Added "for current plant conditions". This is expected to be "real time" guidance.
Old 4.2.5.1.1	Reformatted to provide a list of potential reasons for RB level lowering other than AB leakage. This is a user friendly change to make identifying these potential sources easier rather than them being embedded in a paragraph of text.
Old 4.2.5.1.2	Reworded to simplify.
Old 4.2.5.2.1	Split the contents of the old step into 2 steps to segregate RCS boron precipitation management guidance from RB sump boron dilution guidance. These two concerns, however similar, require different responses. By dividing them into separate steps they can be addressed independently.

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Old 4.2.5.2	Reformatted to provide a list of potential sources of unborated water. This is a user friendly change to make identifying these potential sources easier rather than them being embedded in a paragraph of text.
4.4	This section was old section 4.3 and was renumbered when new 4.3 was developed.
New step	Stating the most desireable long term cooling mode first in the section ensures that decisions made and guidance used can be based on this preference.
Old 4.3.1 and 4.3.1.1	These steps were replaced with a step referencing the OP-700 series of procedures for ensuring that equipment is energized if power failures exist. This series of normal operating procedures provide a complete listing of electrical power supply to plant components. These procedures are available in the TSC and using them is a more complete source of information and eliminates the need to maintain a limited enclosure for an incomplete list of specific equipment.
Old 4.3.2	Deleted this step referencing the enclosure for "Operator Assumptions and Limitations". This enclosure is deleted in this revision. The specific enclosures contain adequate entry status requirements and internal guidance to be performed without having to rely upon this additional requirement to evaluate another separate list prior to use of the guidance to ensure long term cooling.
Old 4.3.3, 4.3.3.1, & 4.3.3.2	These steps have been moved to new section 4.5, "Maintenance During Long Term Cooling". This new section is provided to separate the maintenance guidance into it's own section. This allows concurrent evaluation of the necessary maintenance efforts while long term cooling mode alignments are on-going.
Old 4.3.4 and 4.3.4.1	Reworded to provide specific directions to the TSC when the Control Room asks for TSC assistance for HPI termination.
Old 4.3.4.2	Reworded to provide specific direction to the TSC to provide guidance to the Control Room to establish HPI piggyback when stable LPI flow within the limits cannot be maintained. Reworded the LPI train flow description to reference "indicated flow" rather than "flow indicator" for correctness of the statement.
Old Enclosure 1	Deleted this enclosure, "Component Power Supplies". The steps referencing this enclosure were replaced with a step referencing the OP-700 series of procedures for ensuring that equipment is energized if power failures exist. This series of normal operating procedures provide a complete listing of electrical power supply to plant components. These procedures are available in the TSC and using them is a more complete source of information and eliminates the need to maintain a limited enclosure for an incomplete list of specific equipment.
Old Enclosure 2	This enclosure, "ECCS Flow Log", has been renumbered as Enclosure 1 since former Enclosure 1 has been deleted. Reworded Note 3 to reference Section 4.2 for HPI flow limits since this is where the table is located to provide these limits.
Old Enclosure 3	Deleted this enclosure, "Operator Enclosure Assumptions and Limitations". The specific enclosures contain adequate entry status requirements and internal guidance to be performed without having to rely upon this additional requirement to evaluate another separate list prior to use of the guidance to ensure long term cooling availability.

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Old Enclosure 4	This enclosure, "Long Term Cooling Equipment Log", has been renumbered as Enclosure 2 since former Enclosures 1 and 3 have been deleted. Also, a note has been added to this enclosure identifying that the instruments used for these readings are not safety related or EQ qualified, but, may be useful for trending. This information was previously embedded in the body of the procedure instead of being made readily apparent where the data was provided (i.e., the log).
Old Enclosure 6	This enclosure, "A LPI Train Crosstie to DHV-6", has been renumbered as Enclosure 4 since former Enclosures 1 and 3 have been deleted. Also, the title of the enclosure has been changed to delete "to DHV-6". Since DHV-6 is no longer used to throttle flow, it is not necessary to be specified in the title.
New Enclosure 4 Status	Changed "HPI pump" to "MUP". "MUP" is used as the nomenclature on the MCB and used in the EOPs. Deleted "operations are" from the fifth bullet to simplify the statement.
4.1 (Old 6.1)	Changed "HPI pump" to "MUP" and deleted the redundant instructions in the details. "MUP" is used as the nomenclature on the MCB and used in the EOPs. When the actions provide the necessary instructions and the details provide the list of components, it is not necessary to repeat the action in the details column.
4.6 (Old 6.6)	Deleted "injection" following "HPI" in 2 places to avoid the redundancy of "High Pressure Injection injection".
4.7 (Old 6.7)	Changed "HPI pump" to "MUP". "MUP" is used as the nomenclature on the MCB and used in the EOPs.
4.9 (Old 6.9)	Reworded to clarify the valve description.
Old Enclosure 7	This enclosure, "B LPI Train Crosstie to DHV-5", has been renumbered as Enclosure 5 since former Enclosures 1 and 3 have been deleted. Also, the title of the enclosure has been changed to delete "to DHV-5". Since DHV-5 is no longer used to throttle flow, it is not necessary to be specified in the title.
New Enclosure 5 Status	Changed "HPI pump" to "MUP". "MUP" is used as the nomenclature on the MCB and used in the EOPs. Deleted "operations are" from the fifth bullet to simplify the statement.
5.1 (Old 7.1)	Changed "HPI pump" to "MUP" and deleted the redundant instructions in the details. "MUP" is used as the nomenclature on the MCB and used in the EOPs. When the actions provide the necessary instructions and the details provide the list of components, it is not necessary to repeat the action in the details column.
5.6 (Old 7.6)	Deleted "injection" following "HPI" in 2 places to avoid the redundancy of "High Pressure Injection injection".
5.7 (Old 7.7)	Changed "HPI pump" to "MUP". "MUP" is used as the nomenclature on the MCB and used in the EOPs.
5.9 (7.9)	Reworded to clarify the valve description.

PROCEDURE DEVELOPMENT AND REVISION RECORD

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Old Enclosure 8	This enclosure, "Starting A Train LPI Pump", has been renumbered as Enclosure 6 since former Enclosures 1 and 3 have been deleted.
Status before 6.1 (Old 8.1)	Deleted the unnecessary description of choices of cooling modes in progress to simplify. Changed "HPI pump" to "MUP" to match the nomenclature on the MCB and used in the EOPs. Deleted "operation is" from the LPI crosstie condition to simplify the statement.
6.5 (Old 8.5)	Changed criteria to list the individual trains separately to ensure both are satisfied. Changed "HPI pump" to "MUP" to be consistent with the nomenclature used on the MCB and in the EOPs.
Old Enclosure 9	This enclosure, "Starting B Train LPI Pump", has been renumbered as Enclosure 7 since former Enclosures 1 and 3 have been deleted.
Status before 7.1 (Old 9.1)	Deleted the unnecessary description of choices of cooling modes in progress to simplify. Changed "HPI pump" to "MUP" to match the nomenclature on the MCB and used in the EOPs. Deleted "operation is" from the LPI crosstie condition to simplify the statement.
7.5 (Old 9.5)	Changed criteria to list the individual trains separately to ensure both are satisfied. Changed "HPI pump" to "MUP" to be consistent with the nomenclature used on the MCB and in the EOPs.
Old Enclosure 10	This enclosure, "Establishing A Train Piggyback", has been renumbered as Enclosure 8 since former Enclosures 1 and 3 have been deleted.
Status before 8.1 (Old 10.1)	Deleted "operations are" from the third bulleted item. This is superfluous wording that contributes nothing to the status.
8.1 (Old 10.1)	Deleted "system" as unnecessary since no particular component was specified to be aligned, the HPI system is understood.
8.4 (Old 10.4)	Combined details to reference ES selected MUP and required cooling pumps. Using "MUP" instead of "HPI pump" is consistent with MCB nomenclature and the EOPs. The rearrangement and improvement of the wording links the ES selected MUP to the "required cooling pumps" for that MUP. Also, a reference to Rule 5 has been added to re-inforce that the EDG margin considerations are in effect when pumps are started.
8.5 (Old 10.5)	Changed "HPI pump" to "MUP" for consistency with the nomenclature on the MCB and used in the EOPs.
Old Enclosure 11	This enclosure, "Establishing B Train Piggyback", has been renumbered as Enclosure 9 since former Enclosures 1 and 3 have been deleted.
Status before 9.1 (Old 11.1)	Deleted "operations are" from the third bulleted item. This is superfluous wording that contributes nothing to the status.
9.1 (Old 11.1)	Deleted "system" as unnecessary since no particular component was specified to be aligned, the HPI system is understood.

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9.4 (Old 11.4)	Combined details to reference ES selected MUP and required cooling pumps. Using "MUP" instead of "HPI pump" in consistent with MCB nomenclature and the EOPs. The rearrangement and improvement of the wording links the ES selected MUP to the "required cooling pumps" for that MUP. Also, a reference to Rule 5 has been added to re-inforce that the EDG margin considerations are in effect when pumps are started.
9.5 (Old 11.5)	Changed "HPI pump" to "MUP" for consistency with the nomenclature on the MCB and used in the EOPs.
Old Enclosure 12	This enclosure, "Emergency LPI Crosstie and Piggyback Operations", has been renumbered as Enclosure 10 since former Enclosures 1 and 3 have been deleted.
10.1 (Old 12.1)	Reworded the action to use consistent conditional format and removed reference to RCS pressure. RCS pressure is considered in a later step after the crosstie is aligned to determine if an alternate piggyback alignment is necessary.
10.2 (Old 12.2)	Changed to make RCS pressure preventing LPI flow the only conditional for establishing alternate piggyback alignment. The crosstie is established if only one LPI pump is running, therefore, the opposite LPI pump running criteria is no longer necessary. Piggyback prevented due to multiple failures is no longer a condition applied since this section (with RCS pressure greater than LPI discharge) could make it desirable to establish alternate piggyback with the operating train of LPI also providing piggyback.
3.1	Reworded the description of the Both trains method of Long Term Core Cooling editorially by referring to "their injection lines" instead of "its injection lines".
Old 3.3.4	Deleted the table and changed the text to only state that HPI flow must be limited 72 hours post accident to ensure long term mission time requirements are met. All the numerical values of this L&P are included in the same table that remains in section 4.2. It is not necessary to maintain this data in two separate places. The requirements of the table in section 4.2 will be applied the same as if from this table.
2.1.18 (New step)	Added new develompental reference to EEI-98-001. This evaluation was utilized as an input to the HPI flow control guidance.

CHANGE OF INTENT, CANCELLATION, OR NEW PROCEDURE

Changes are incorporated for the reasons provided. "Throughout" is used in lieu of Step # if a specific change affects a large number of steps. For new or cancelled procedures the reason is provided.

Old 3.3.1	Reworded to state why the limit is provided, to specify "indicated" LPI flow, and reduce the limit by 100 gpm. The 100 gpm deleted is the amount of the LPI pump minimum recirc line flow. This value is included in the flow model used to develop the data used in the calculation and is not necessary to be specifically identified here as it is not indicated and is assumed.
Old 3.3.1	Deleted the addition of LPI pump minimum recirc line flow. This value is included in the flow model used to develop the data used in the calculation and is not necessary to be specifically identified here as it is not indicated and is assumed.

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Old 3.3.9	Modified to remove reference to LPI valves and change time between bumps to 7 minutes and cooling period to 1.5 hours. The original values in the procedure were based on the more conservative of the restrictions on the LPI valves due to motor duty. When DHV-5 and DHV-6 were used to throttle LPI injection flow, their motor duty restrictions were the most limiting and the values were used consistently for LPI valves as well as HPI valves to avoid the operator being provided with 2 sets of values in high stress situations. Since MAR 98-12-04 has installed LPI injection control valves specifically to control the flow formerly controlled by throttling DHV-5 and DHV-6, these valves are no longer used as throttle valves. Therefore only the HPI valves need to be addressed. REA 98-0650 addresses the motor duty limitations for the HPI valves and the new values reflect the limitations provided by that REA.
Old 4.2.1 Table	The HPI flow upper limit for greater than or equal to 72 hours with 1 HPI pump is changed from 510 gpm to 500 gpm. This allows this line item to be applied to 1 HPI pump with 3 or 4 injection lines. Per EEI-98-001, to ensure that the maximum flowrate of 545 gpm is not exceeded due to instrument uncertainties the indicated flowrate limit must be reduced by 40 gpm using 4 flow loops and reduced by 35 gpm using 3 flow loops (505 gpm and 510 gpm respectively). The limit used in the procedure is conservatively set at 500 gpm to encompass both of these conditions to allow this value to be used for 1 HPI pump with either 3 or 4 indicators used. The HPI flow upper limit for greater than or equal to 72 hours with 2 HPI pumps is changed from 570 gpm to 560 gpm to reflect the new limit (565 gpm) provided in EEI-98-001 rounded conservatively to the nearest 10 gpm for consistency with the other ranges provided. The first column has been changed to reference the number of indicators rather than the number of nozzles. Referencing the indicators instead of the injection nozzles is due to the HPI MAR 97-02-12 which provided piping arrangements that could result in all injection lines experiencing balanced flow when in fact the flow was only through three indicators. This limitation then ensures that the pump flows are limited within the analytical instrument uncertainties.
8.6 & 8.7 (Old 10.6)	Split into 2 separate steps for the 2 time ranges involved to simplify conditional use of the details. Changed the upper flow limit in step 8.6 to match the table in section 4.0.
9.6 & 9.7 (Old 11.6)	Split into 2 separate steps for the 2 time ranges involved to simplify conditional use of the details. Changed the upper flow limit in step 9.6 to match the table in section 4.0.
Old 3.3.3	Deleted this L&P referencing the possible indications of erosion of HPI stop check valves. MAR 97-02-12 modified the HPI system and long term flow erosion of HPI stop check valves is no longer expected.
Old 3.3.5	Deleted this L&P referencing limiting LPI flow by adjusting DHV-5 and/or DHV-6. MAR 98-12-04 provided LPI injection control valves downstream of the cross-tie lines (DHV-110 and DHV-111). DHV-5 and DHV-6 are no longer used to throttle LPI injection flowrate.
Old 4.1.2	Deleted this step referencing difficulty in controlling flow with DHV-5/DHV-6. MAR 98-12-04 provided LPI injection control valves downstream of the cross-tie lines (DHV-110 and DHV-111). DHV-5 and DHV-6 are no longer used to throttle LPI injection flowrate.
Old 4.1.2.1.1	Deleted this step referencing radiation dose and local operation of DHV-5/DHV-6. MAR 98-12-04 provided LPI injection control valves downstream of the cross-tie lines (DHV-110 and DHV-111). DHV-5 and DHV-6 are no longer used to throttle LPI injection flowrate.
Old 4.3.1.2	Deleted this step which references using guidance in EOP-03 to energize the HPI valves. If these valves are required to be energized (and have not already been energized), the power supply swapover is a simple operation and it is not necessary to reference back into an EOP for a partial performance of instructions. The EOPs are not constructed for use in this manner. EOP-03 ensures that an adequate flow path exists.

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Old 4.3.4.3	Deleted this step referencing throttling DHV-5/DHV-6. MAR 98-12-04 provided LPI injection control valves downstream of the cross-tie lines (DHV-110 and DHV-111). DHV-5 and DHV-6 are no longer used to throttle LPI injection flowrate.
Old 4.4	"Long Term Piggy Back Operation" deleted. The only guidance provided in this section was related to HPI stop check valve erosion. This is no longer a concern since the HPI modification per MAR 97-02-12.
Old 4.5	"Long Term LPI Operation" deleted. This section provided guidance related to throttling LPI. With the new LPI injection control valves installed downstream of the crosstie lines by MAR 98-12-04, this is no longer necessary.
Old Enclosure 5	This enclosure, "Operator Enclosure Functional Goals", has been renumbered as Enclosure 3 and the column listing the enclosure has been updated since former Enclosures 1 and 3 have been deleted. Also, the line items in this enclosure have been reworded for clarity and to remove reference to throttling DHV-5 and DHV-6. MAR 98-12-04 provided LPI injection control valves downstream of the cross-tie lines (DHV-110 and DHV-111). DHV-5 and DHV-6 are no longer used to throttle LPI injection flowrate.
4.3 (Old 6.3)	Deleted DHV-6 from the list of valves to be closed and added DHV-211 to the list. MAR 98-12-04 installed LPI injection flow control valves downstream of the crosstie line. DHV-6 is no longer used to throttle LPI injection flow, therefore it is not necessary to set it up as a closed valve. It will be opened in a later step. The former pump discharge throttle valve was renumbered from DHV-111 to DHV-211, so it is added to the list of valves to be closed. The new throttle valve is numbered DHV-111, therefore, the detail to place it to manual and closed remains the same (only it operates a different valve).
4.4 (Old 6.4)	Reworded the actions to adjust DHV-110 setpoint instead of throttling LPI flow with DHV-5. MAR 98-12-04 installed LPI injection flow control valves downstream of the crosstie line. DHV-5 is no longer used to throttle LPI injection flow.
Caution before Old 6.5	Deleted this caution as it is no longer a major concern with installation of the flow control valves downstream of the crosstie lines. MAR 98-12-04 installed LPI injection flow control valves downstream of the crosstie line. This provides for more control of the injection flowrates rather than being controlled by throttling DHV-5 and DHV-6.
New Note before 4.5 (Old 6.5)	This note was added to ensure that the flowrate through the opposite LPI header via the crosstie is established at a manually controlled setpoint and controlled as such. This is required because the flowrate signal used to control the flow control valve comes from the flow element on the discharge of the idle pump. With this arrangement when the flow control valve is attempting to control crosstie flow it would never see flow and would essentially go full open to attempt to achieve the setpoint flow. To avoid this occurrence, the valve in the train with the idle pump is maintained in manual so the running pump flow control valve can control the total pump flowrate.
4.5 (Old 6.5)	The action is reworded for simplicity. A detail is added to ensure DHV-6 is open since it is no longer used as the throttle valve with the installation of the control valve downstream of the crosstie line per MAR 98-12-04. The detail to establish the flowrates has been modified to use the new control valves instead of DHV-5 and DHV-6. MAR 98-12-04 installed these new control valves downstream of the crosstie lines to be used instead of throttling flow with DHV-5 and DHV-6.

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New Note before 4.8	This note was added to ensure that the flowrate through the opposite LPI header via the crosstie is established at a manually controlled setpoint and controlled as such. This is required because the flowrate signal used to control the flow control valve comes from the flow element on the discharge of the idle pump. With this arrangement, when the flow control valve is attempting to control crosstie flow it would never see flow and would essentially go full open to attempt to achieve the setpoint flow. To avoid this occurrence, the valve in the train with the idle pump is maintained in manual so the running pump flow control valve can control the total pump flowrate.
4.8 (Old 6.8)	Reworded the details to use DHV-110 and DHV-111 instead of DHV-5 and DHV-6. MAR 98-12-04 installed LPI injection flow control valves downstream of the crosstie line. DHV-5 and DHV-6 are no longer used to throttle LPI injection flow.
5.3 (Old 7.3)	Deleted DHV-5 from the list of valves to be closed and added DHV-210 to the list. MAR 98-12-04 installed LPI injection flow control valves downstream of the crosstie line. DHV-5 is no longer used to throttle LPI injection flow, therefore it is not necessary to set it up as a closed valve. It will be opened in a later step. The former pump discharge throttle valve was renumbered from DHV-110 to DHV-210, so it is added to the list of valves to be closed. The new throttle valve is numbered DHV-110, therefore, the detail to place it to manual and closed remains the same (only it operates a different valve).
5.4 (Old 7.4)	Reworded the actions to adjust DHV-111 setpoint instead of throttling LPI flow with DHV-6. MAR 98-12-04 installed LPI injection flow control valves downstream of the crosstie line. DHV-6 is no longer used to throttle LPI injection flow.
Caution before Old 7.5	Deleted this caution as it is no longer a major concern with installation of the flow control valves downstream of the crosstie lines. MAR 98-12-04 installed LPI injection flow control valves downstream of the crosstie line. This provides for more control of the injection flowrates rather than being controlled by throttling DHV-5 and DHV-6.
New Note before 5.5 (Old 7.5)	This note was added to ensure that the flowrate through the opposite LPI header via the crosstie is established at a manually controlled setpoint and controlled as such. This is required because the flowrate signal used to control the flow control valve comes from the flow element on the discharge of the idle pump. With this arrangement when the flow control valve is attempting to control crosstie flow it would never see flow and would essentially go full open to attempt to achieve the setpoint flow. To avoid this occurrence, the valve in the train with the idle pump is maintained in manual so the running pump flow control valve can control the total pump flowrate.
5.5 (Old 7.5)	The action is reworded for simplicity. A detail is added to ensure DHV-5 is open since it is no longer used as the throttle valve with the installation of the control valve downstream of the crosstie line per MAR 98-12-04. The detail to establish the flowrates has been modified to use the new control valves instead of DHV-5 and DHV-6. MAR 98-12-04 installed these new control valves downstream of the crosstie lines to be used instead of throttling flow with DHV-5 and DHV-6.
New Note before 5.8	This note was added to ensure that the flowrate through the opposite LPI header via the crosstie is established at a manually controlled setpoint and controlled as such. This is required because the flowrate signal used to control the flow control valve comes from the flow element on the discharge of the idle pump. With this arrangement when the flow control valve is attempting to control crosstie flow it would never see flow and would essentially go full open to attempt to achieve the setpoint flow. To avoid this occurrence, the valve in the train with the idle pump is maintained in manual so the running pump flow control valve can control the total pump flowrate.
5.8 (Old 7.8)	Reworded the details to use DHV-110 and DHV-111 instead of DHV-5 and DHV-6. MAR 98-12-04 installed LPI injection flow control valves downstream of the crosstie line. DHV-5 and DHV-6 are no longer used to throttle LPI injection flow.

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6.1 (Old 8.1)	Changed the valve in the detail to be closed from DHV-5 to DHV-110 and added a new detail to open DHV-5. MAR 98-12-04 installed LPI injection flow control valves downstream of the crosstie line. DHV-5 is no longer used to throttle LPI injection flow, therefore the new valve (DHV-110) is closed and DHV-5 must be opened.
6.2 (Old 8.2)	Changed DHV-110 to DHV-210. MAR 98-12-04 installed LPI injection flow control valves downstream of the crosstie line. The original pump discharge throttle valves have been renumbered. With the LPI injection throttle valves downstream of the crosstie line, the original throttle valve (now numbered DHV-210) must be opened. The new LPI injection throttle valve (DHV-110) will be set in a later step. Also, a reference to Rule 5 has been added to re-inforce that the EDG margin considerations are in effect when pumps are started.
6.4 (Old 8.4)	Changed throttling DHV-5/DHV-6 to setting DHV-110/DHV-111 to AUTO and set for 2000 gpm. MAR 98-12-04 installed LPI injection flow control valves downstream of the crosstie line. DHV-5 and DHV-6 are no longer used to throttle LPI injection flowrate.
6.6 (Old 8.6)	Changed step to increase LPI flow rather than transfer to normal control valves. MAR 98-12-04 installed LPI injection flow control valves downstream of the crosstie line. These valves were the control valves used to establish the flowrate in an earlier step, therefore, the only action required is to adjust the flowrate.
7.1 (Old 9.1)	Changed the valve in the detail to be closed from DHV-6 to DHV-111 and added a new detail to open DHV-6. MAR 98-12-04 installed LPI injection flow control valves downstream of the crosstie line. DHV-6 is no longer used to throttle LPI injection flow, therefore the new valve (DHV-111) is closed and DHV-6 must be opened.
7.2 (Old 9.2)	Changed DHV-111 to DHV-211. MAR 98-12-04 installed LPI injection flow control valves downstream of the crosstie line. The original pump discharge throttle valves have been renumbered. With the LPI injection throttle valves downstream of the crosstie line, the original throttle valve (now numbered DHV-211) must be opened. The new LPI injection throttle valve (DHV-111) will be set in a later step. Also, a reference to Rule 5 has been added to re-inforce that the EDG margin considerations are in effect when pumps are started.
7.4 (Old (9.4)	Changed throttling DHV-5/DHV-6 to setting DHV-110/DHV-111 to AUTO and set for 2000 gpm. MAR 98-12-04 installed LPI injection flow control valves downstream of the crosstie line. DHV-5 and DHV-6 are no longer used to throttle LPI injection flowrate.
7.6 (Old 9.6)	Changed step to increase LPI flow rather than transfer to normal control valves. MAR 98-12-04 installed LPI injection flow control valves downstream of the crosstie line. These valves were the control valves used to establish the flowrate in an earlier step, therefore, the only action required is to adjust the flowrate.
8.3 (Old 10.3)	Reworded to reference DHP-1A flow instead of "total LPI pump flow" as the details only pertain to DHP-1A. Change the details to set DHV-110 in AUTO and set at 2000 gpm. MAR 98-12-04 installed LPI injection flow control valves downstream of the crosstie line. The new LPI injection control valve (DHV-110) accomplishes the function formerly provided by DHV-5.
9.3 (Old 11.3)	Reworded to reference DHP-1B flow instead of "total LPI pump flow" as the details only pertain to DHP-1B. Change the details to set DHV-111 in AUTO and set at 2000 gpm. MAR 98-12-04 installed LPI injection flow control valves downstream of the crosstie line. The new LPI injection control valve (DHV-111) accomplishes the function formerly provided by DHV-6.

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10.1 (Old 12.1)	Added a new detail to ensure the idle train DHP isolation is closed. Changed detail to ensure DHV-5/DHV-6 is open. Changed establishing flow with DHV-5 and DHV-6 to DHV-110 and DHV-111. MAR 98-12-04 installed LPI injection flow control valves downstream of the crosstie line. The new LPI injection control valves (DHV-110 and DHV-111) accomplishes the function formerly provided by DHV-5 and DHV-6, therefore they must be opened. The LPI pump discharge isolations that were the former LPI flow control valves have been renumbered as DHV-210 and DHV-211. Closing this valve on the idle pump prevents backflow and ensures the crosstie flow is directed to the core when the new control valves (DHV-110 DHV-111) are opened.
Old 4.2.1	Changed the HPI flowrate conditional for using this table to limit HPI flow to 500 gpm rather than 440 gpm and referenced balanced between available indicators. Any flow less than 500 gpm is acceptable (see the table limits). Referencing the indicators instead of the injection lines is due to the HPI MAR 97-02-12 which provided piping arrangements that could result in all injection lines experiencing balanced flow when in fact the flow was only through three indicators. This limitation then ensures that the pump flows are limited within the analytical instrument uncertainties.
3.3.8	Deleted reference to rapid bumping of DHV-5 and DHV-6. MAR 98-12-04 provided LPI injection control valves downstream of the cross-tie lines (DHV-110 and DHV-111). DHV-5 and DHV-6 are no longer used to throttle LPI injection flowrate.