USE OF ATOG GUIDELINES

ORGANIZATION

The Abnormal Transient Operating Guidelines (ATOG) have been implemented as Abnormal Transient Procedures, ATP 1210 series. This series of procedures is used following any reactor trip or forced shutdown. These same procedures will also be used if a transient occurs during a heatup, cooldown, or from a hot shutdown condition. The ATP's will be used to control overall plant response.

In some cases an EP (1202) or ABP (1203) may be in effect concurrently treating a specific condition. For example if a station blackout has occurred EP 1202-2 will be followed to protect equipment and restore power but the ATP's will be used to assure that the reactor is cooled.

Following a reactor trip ATP 1210-1 Reactor/Turbine Trip procedure will be entered. This procedure contains immediate actions that are required for any reactor trip. In addition systems that are required to control and monitor the plant are verified. The next step is a systematic check for ATOG symptoms that may occur singly or in combination. If present, the ATOG symptoms are treated in procedures that maybe thought of as "interim" procedures. These interim procedures treat the ATOG symptoms before any effort is made to identify the specific event that is causing the condition. This approach provides specific corrective action that assures core cooling for single or multiple events and for events that are not readily identified.

The conditions are prioritized to provide for treating the most rapid or the most severe condition first. The priorities are selected with two main objectives in mind. The objectives are:

1. Cooling the core.
2. Minimizing radioactive releases.

PRIORITY OF ATOG SYMPTOM TREATMENT

The four ATOG symptoms that are addressed by the procedures are:

1. Loss of Subcooled Margin.
2. Excessive primary to secondary heat transfer.
3. Lack of primary to secondary heat transfer.
4. OTSG Tube Rupture.

Loss of subcooled margin is the highest priority symptom. Subcooled margin is very significant for a certain range of RCS break sizes. Action is required within two minutes to prevent possible development of inadequate core cooling later in the transient.

Excessive heat transfer is the next priority because rapid response is required if excessive heat transfer is present. One potential cause (excessive MFW) has already been checked. MFW should be rechecked along with other potential causes such as steamline break. Other reasons that overcooling is high priority are tensile stresses in the steam generator and radioactive releases if an OTSG tube rupture occurs with a steam leak.

Lack of heat transfer must be treated to attain long term stability. Primary to secondary heat transfer is especially important for an OTSG tube rupture because of the importance of cooling down and maintaining minimum subcooled margin. Lack of heat transfer follows excessive heat transfer because more time is available to correct this condition before conditions degrade.

OTSG tube rupture is the last priority in the sequence even though it results in a radioactive release to the environment. This condition is treated after any other conditions that are present because difficulty in treating the tube rupture will occur if any of the other conditions are present. The long term radioactive release is minimized by assuring that RCS conditions are stable and that the core is being cooled.

Superheat is another high priority condition that has not been discussed. Superheat conditions in the RCS always demand immediate attention. Superheat was not discussed in the above sequence for two reasons: (1) It will not occur unless multiple failures or improper actions are present and (2) It will not occur immediately following a trip (unless trip was delayed). Superheat cannot occur unless subcooled margin is lost and if the appropriate actions are taken then superheat will not occur.

The sequence above was developed to provide guidance that would apply for single or multiple events. DO NOT KEY ON ANY ONE CONDITION. If symptoms are not obvious, do not wait for them to develop. Check for other symptoms and treat those present and come back and recheck for other symptoms. The sequence is not as important as treating all the conditions. Post trip stability may be achieved only to be followed by a transient due to subsequent equipment failure.

An important concept is to always be checking for these ATOG symptoms and taking the appropriate corrective action. This concept applies even after an event has been identified and is being treated by a specific procedure. Rechecking will prevent adverse effects of misdiagnosis of the plant status.

EVENT-COOLDOWN PROCEDURES

After the initial ATOG symptoms have been treated the reactor should be in a stable post trip condition. The followup actions in ATP 1210-1 are taken and a decision made on whether to cooldown or restart.

If failures are present, the cooldown procedure OP 1102-11 may not provide sufficient guidance. There are four events for which cooldown instructions have been provided:

1. Small break LOCA.
2. Large break LOCA.
3. HPI cooling.
4. Tube Rupture.

These procedures along with the "interim" procedures cover the analyzed accidents.

Small Break LOCA is indicated by inability to restore subcooled margin with heat transfer present. Large break LOCA and Tube Rupture must not be present.

Large Break LOCA entry condition is emptying of the Core Flood Tanks. For Large Break ECCS actuation and containment isolation and cooling are the emphasis.

HPI Cooling is required for sustained Lack of Heat Transfer. Conditions that would lead to lack of heat transfer are total loss of feedwater or interrupted natural circulation.

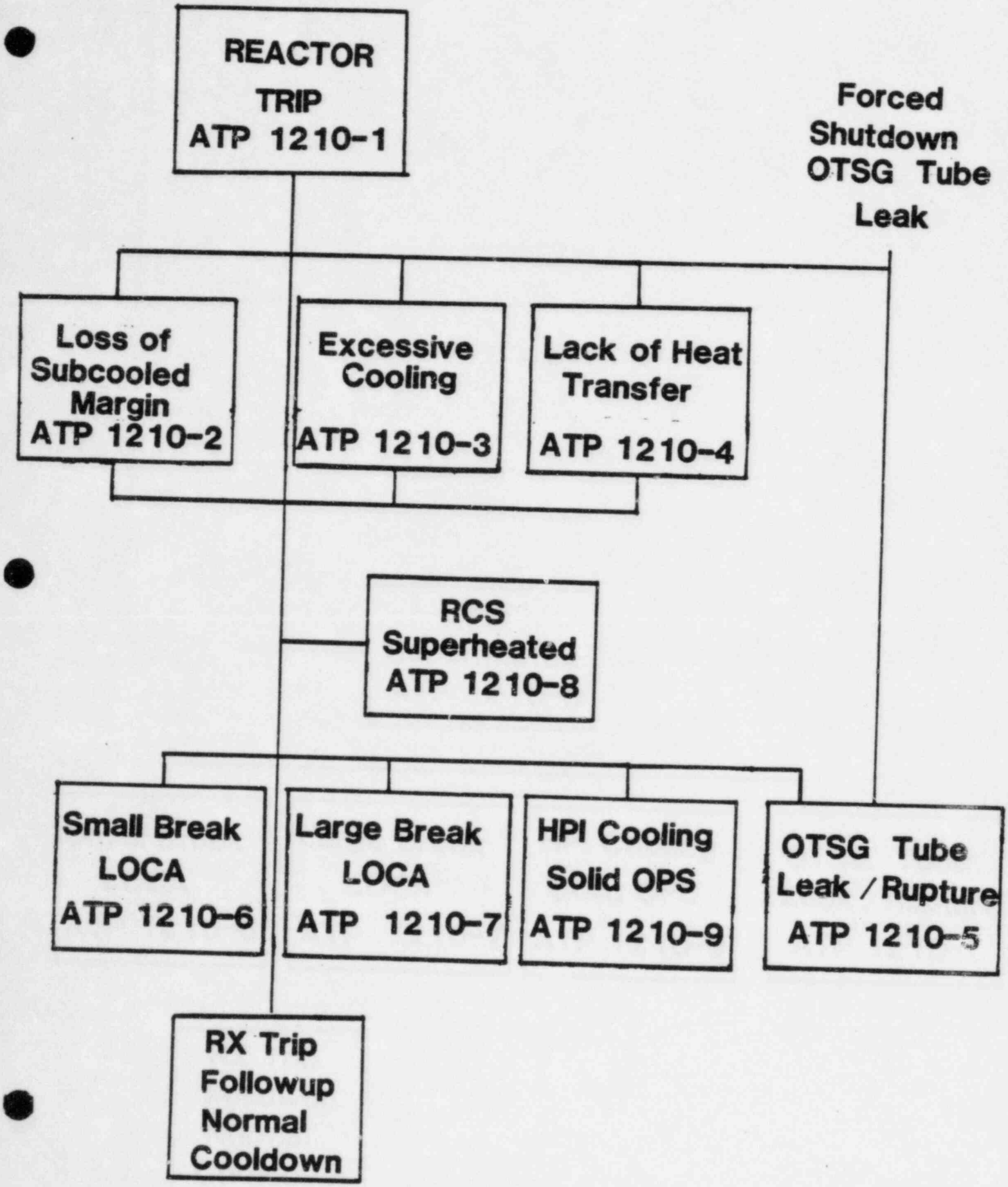
The OTSG Tube Rupture procedure provide both the initial response and cool-down instructions.

Even after an event has been identified it is important to continue to look for, and treat, other ATOG symptoms with a few exceptions. One exception is lack of heat transfer during a large break LOCA. Even though symptoms will exist, primary to secondary heat transfer is not necessary for core cooling during a large break LOCA. The procedures identify some but not all of these situations. The operator will have to determine appropriate actions for multiple failures to meet the objectives of cooling the core and limiting radioactive release.

SUMMARY

The Abnormal Transient Operating Guidelines do not change the actions for coping with an event. ATOG identifies symptoms that indicate degrading plant conditions and establishes a priority for treating those conditions.

Treating the appropriate symptoms before event identification allows the plant to stabilize permitting more accurate diagnosis. It also provides a more efficient means of proceduralizing response to multiple events. For example, actions to restore feedwater are currently in 6 or more emergency procedures. Since this is covered in an "interim" procedure it does not need to be repeated in each event procedure.


REACTOR TRIP ATP 1210-1
Forced Shutdown OTSG Tube Leak
Loss of Subcooled Margin ATP 1210-2
Excessive Cooling ATP 1210-3
Lack of Heat Transfer ATP 1210-4
RCS Superheated ATP 1210-8
Small Break LOCA ATP 1210-6
Large Break LOCA ATP 1210-7
HPI Cooling Solid OPS ATP 1210-9
OTSG Tube Leak / Rupture ATP 1210-5
RX Trip Followup Normal Cooldown

TRAINING CONTENT RECORD

Lesson Course Title - (N/A) Number - N/A)

Lesson Plan Title: ATOG Procedure Use Number - (N/A)

OBJECTIVES:

A. At the end of the presentation the student will be able to discuss in general terms:

1. ATOG integration with existing EP's, AP's and Alarm Responses.
2. Prioritization of ATOG Symptoms.
3. "Roadmap" concept as it refers to the ATP's.
4. The five (5) fundamental ATOG Control Concepts:
   a. Reactivity
   b. RCS inventory
   c. Heat Transfer Control
   d. Subcooling Margin
   e. Radioactive Releases
5. Concept of Rules vs Guidelines.
6. Human Factor concepts incorporated into ATP's Format.

RESPONSIBILITY	SIGNATURE	TITLE	DATE
ORIGINATOR	HBSherman C C Hartman	Ops Eng Sr II. Elect Engr	12/9/83 12/9/83
REVIEW/APPROVED	M J Ross	Mgr. Plant Operations	12/9/83
REVIEW/APPROVED	Brian Lemark	Ops, Training Manager	12-9-83

LESSON PLAN SUMMARY

A. INTRODUCTION

1. ATOG History and Regulatory Requirement NUREG 0737 Supplement.
2. June 1981 Simulator Introduction to TMI-I Operations and Training - Training Documents.
3. Phase I of ATOG Implementation - Committee Representation.
4. ATOG Simulator Experience with Plant Engineering, Tech. Functions, Plant Operations Personnel.
5. Phase II of ATOG Implementation - Committee Representation.
6. NRC Acceptance of Oconee ATOG as basis with qualifications and additional concerns to be addressed prior to site specific ATOG acceptance.
7. Phase III of ATOG Implementation - Committee Representation.

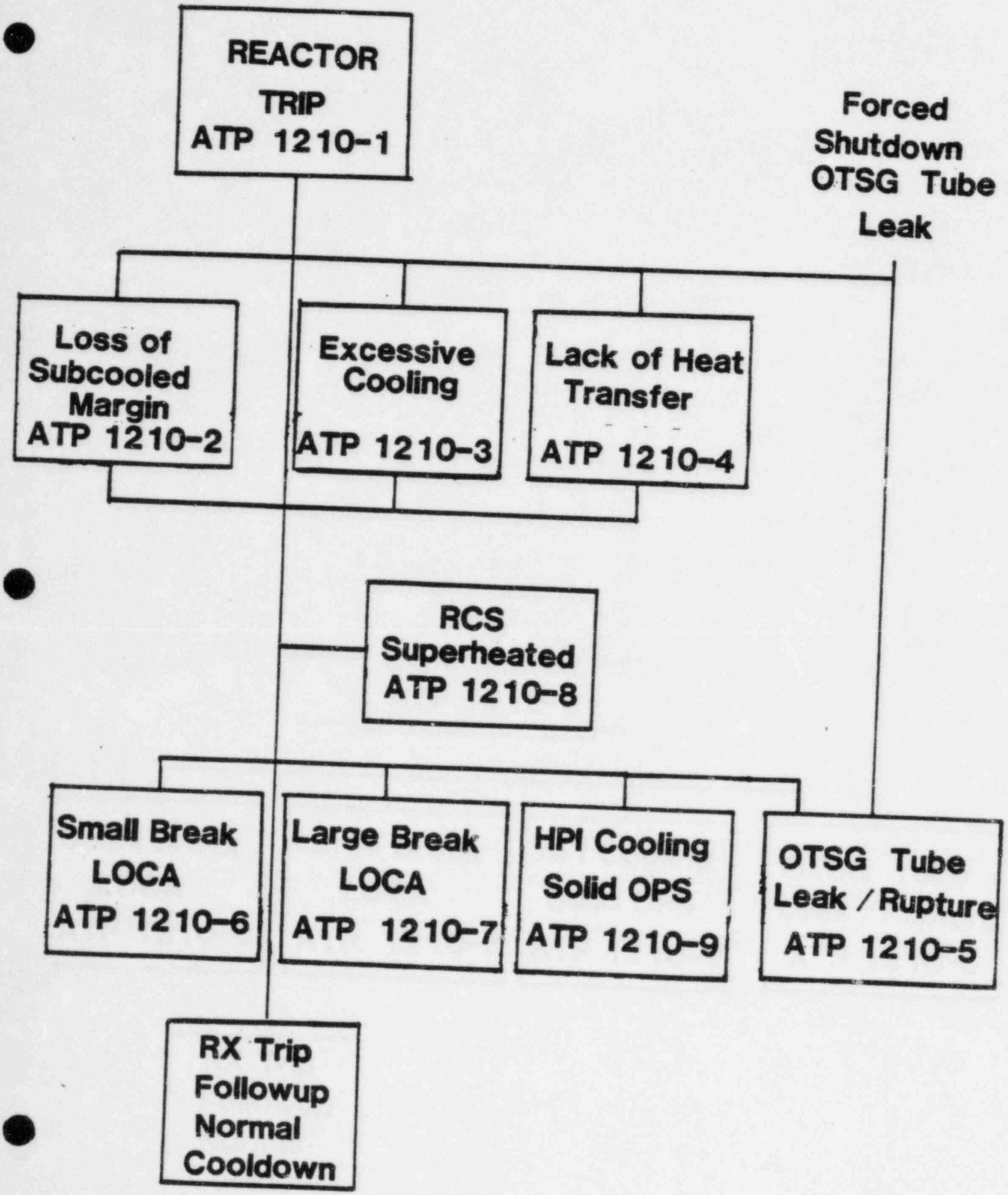
B. ATOG PHILOSOPHY

1. Organization
2. ATOG Symptoms
3. Event Cooldown Procedures

C. ATP REVIEW

1. ATP 1210-1 Reactor/Turbine Trip
2. ATP 1210-2 Loss of Subcooled Margin
3. ATP 1210-3 Excessive Cooling
4. ATP 1210-4 Lack of Heat Transfer
5. ATP 1210-5 OTSG Tube Leak/Rupture
6. ATP 1210-6 Small Break LOCA
7. ATP 1210-7 Large Break LOCA
8. ATP 1210-8 RCS Superheat
9. ATP 1210-9 Recovery from HPI Cooling - Solid Operations.
10. ATP 1210-10 Abnormal Transients Rules, Guides and Graphs.

D. QUESTIONS/COMMENTS


REACTOR TRIP ATP 1210-1
Forced Shutdown OTSG Tube Leak
Loss of Subcooled Margin ATP 1210-2
Excessive Cooling ATP 1210-3
Lack of Heat Transfer ATP 1210-4
RCS Superheated ATP 1210-8
Small Break LOCA ATP 1210-6
Large Break LOCA ATP 1210-7
HPI Cooling Solid OPS ATP 1210-9
OTSG Tube Leak / Rupture ATP 1210-5
RX Trip Followup Normal Cooldown

ATOG integration to existing EP's, AP's and Alarm Responses will cancel the following procedures:

Emergency Procedure 1202-3	Turbine Trip
Emergency Procedure 1202-4	Reactor Trip
Emergency Procedure 1202-5	OTSG Tube Leak/Rupture
Emergency Procedure 1202-6A	Loss of Reactor Coolant/Reactor Coolant Pressure Within Capability of Makeup System (RC Pressure above ESAS Setpoint).
Emergency Procedure 1202-6B	Loss of Reactor Coolant/Reactor Coolant Pressure (Small Break LOCA) Causing Automatic High Pressure Injection.
Emergency Procedure 1202-6C	Loss of Reactor Coolant/Reactor Coolant Pressure Causing automatic High Pressure Injection, Core Flood and Low Pressure Injection.
Emergency Procedure 1202-26A	Loss of Steam Generator Feed to Both OTSG's.
Emergency Procedure 1202-39	Inadequate Core Cooling (NO LOCA)

ENTRY CONDITION - Control Rod Drive Mechanisms have received an Automatic or Manual trip signal.

NOTE

The following sequence represents a prioritization of immediate actions. Although some or all steps may be performed in parallel it is essential that all immediate actions be performed at least once and within several minutes.

IMMEDIATE ACTION - (Vital System Action, Status Verification, and Remedial Action).

1. Manually trip Reactor.

   Verify less than 10% power.

IF power is not less than 10% power;	THEN initiate HPI, maximize letdown, trip 1G-02 and 1L-02 (panel PR), and maintain primary to secondary heat transfer.

   Verify Groups 1-7 rod bottom lights.

IF one or more rods are stuck out.	THEN emergency borate.

2. Manually trip Turbine.

   Verify T/G stop valves closed.

   Verify Generator Breakers open.

IF T/G stop valves are not closed;	THEN trip EHC-P-1A/B.
IF generator breakers remain closed;	THEN manually trip GB1-12, GBT-02 and locally trip field breaker.

3. Decrease Main Feedwater Flow.

   Verify ICS automatically is running back MFW flow.

IF ICS is not controlling MFW flow;	THEN take Hand control of the MFW regulating valves and run MFW back to control OTSG level.
IF MFW flow is still excessive;	THEN trip both MFW pumps.

4. Verify ICS/NNI Power On (PCL)

IF all subfeed power lights are off;	THEN trip MFW pumps, establish Primary to Secondary heat transfer using backup manual loader stations for EFW and TBV. Refer to EP 1202-40.
IF any subfeed power light remains off;	THEN refer to EP 1202-40/41/42.

5. Verify 4160 volt buses 1A,1B,1C,1D and 1E energized (CR and PR)

IF loss of offsite power has occurred;	THEN verify or manually start and load at least one D/G. Restore Make-up, seal injection and EFW.
IF both D/G fail to start;	THEN refer to EP 1202-2A.

6. Start 2nd Make-up Pump.

Verify pressurizer level is greater than 100 inches.

IF unable to maintain pressurizer level;	THEN open MU-V-217 as necessary.
IF MU Tank is less than 55";	THEN open MU-V-14A or B as necessary to maintain MU Tank level greater than 55".
IF unable to maintain pressurizer level greater than 20 inches;	THEN initiate HPI.

7. Verify Safety System Status.

Verify RCS greater than 1600 psig and RB less than 4 psig.

IF ESAS 1600 psig/or 4 psig actuation has occurred;	THEN verify HPI/LPI components started and RB isolation.
IF RB greater than 30 psig;	THEN verify RB spray.

Verify OTSG greater than 600 psig.

IF SLRDS has actuated;	THEN verify affected OTSG MFW isolation.

8. Announce Reactor Trip over plant page.

9. Verify subcooled margin greater than or equal to 25°F.

IF subcooled margin is less than 25°F;	THEN trip all RCP's, initiate full HPI, initiate EFW, raise OTSG level to 90-95% and go to ATP 1210-2.

10. Verify RCS temperature/pressure and OTSG pressure approaching post trip temperatures and pressures within 2 minutes.

IF Primary/Secondary Heat Transfer is excessive;	THEN throttle MFW/EFW isolate steam leak, increase RCS make-up as necessary and absent other priority symptoms go to ATP 1210-3.
IF Primary/Secondary Heat Transfer is inadequate;	THEN absent other priority symptoms verify MFW/EFW and go to ATP 1210-4.

11. Verify RM-A-5 (or equivalent if RM-A-5 is OOS) normal.

IF an OTSG Tube Leak/ Rupture has occurred;	THEN absent other priority symptoms go to ATP 1210-5.

FOLLOW-UP ACTION

OBJECTIVE

The objective of this procedure is to place the balance of plant components in a stable configuration and maintain RCS conditions stable until restart or cooldown direction is decided.

1. Close the following extraction valves:

_____ EX-V-1A	_____ EX-V-5C
_____ EX-V-1B	_____ EX-V-5D
_____ EX-V-4A	_____ EX-V-6A
_____ EX-V-4B	_____ EX-V-6B
_____ EX-V-5A	_____ EX-V-6C
_____ EX-V-5B	_____ EX-V-6D

_____2. Verify OTSG level is being maintained at proper level.

_____3. Verify that turbine bypass valves (or, if vacuum is lost, atmospheric relief valves) are controlling at desired pressure.

_____4. Verify RCS pressure stabilizes within normal pressure limits.

5. IF 1G-02 and 1L-02 were opened to trip the reactor, THEN:

_____a. Dispatch an operator to 338' elevation (3rd floor) Control Tower to trip main (Unit 10) and Secondary (Unit 11) AC CRDM Supply Breakers.

_____b. Once Unit 10 and 11 Supply Breakers are open, then reclose 1G-02 and 1L-02 on Control Room Panel (PR).

_____c. Restart previously running equipment fed from:

1. Pretreatment MCC
2. 1A Radwaste MCC
3. 1A Reactor Plant MCC
4. 1B Radwaste MCC
5. 1B Reactor Plant MCC
6. A.C. Dist. Panel D-9

6. Verify the following T/G support pumps are operating:

_____a. AC Motor Suction Pump
_____b. Turning Gear Oil Pump
_____c. Bearing Lift Pumps

____ 7. Reduce pressurizer level controller setpoint to 100 inches (25%).

____ 8. IF a turbine rotating component failure occurs causing the Reactor Trip; THEN declare an Unusual Event (carry out EPIP 1004.1).

____ 9. IF a turbine failure occurs resulting in casing penetration THEN declare an Alert (carry out EPIP 1004.2).

____ 10. IF the Reactor trip is coincident with a total loss of forced reactor coolant flow; THEN declare an Unusual Event (carry out EPIP 1004.1).

____ 11. IF the Reactor trip is coincident with a total loss of the ability to feed the OTSGs; THEN declare an Unusual Event (carry out EPIP 1004.1).

____ 12. IF the Reactor trip is coincident with either reactor coolant outlet temperature greater than or equal to 620°F; THEN declare an Alert (carry out EPIP 1004.2).

____ 13. IF the Reactor trip is coincident with a reactor building pressure greater than or equal to 4 psig; THEN declare an Alert (carry out EPIP 1004.2).

____ 14. IF more than one control rod is stuck out of the core following a Reactor trip; THEN declare an Alert (carry out EPIP 1004.2).

____ 15. IF an unplanned ESAS actuation occurs following Reactor Trip; THEN declare an Unusual Event (carry out EPIP 1004.1).

16. Verify the following Reactor trip RB isolation valves closed:

RB Sump

_____WDL-V-534 _____WDL-V-535

RC Drain Tank

_____WDG-V-3 _____WDL-V-303
_____WDG-V-4 _____WDL-V-304

RCS Sample

_____CA-V-1 _____CA-V-3
_____CA-V-2 _____CA-V-13

RB Purge

_____AH-V-1A _____AH-V-1C
_____AH-V-1B _____AH-V-1D

Core Flood Tank

_____CF-V-2A _____CF-V-2B
_____CF-V-19A _____CF-V-19B
_____CF-V-20A _____CF-V-20A

Demin Water

_____CA-V-189

OTSG Sample

_____CA-V-4A _____CA-V-5A
_____CA-V-4B _____CA-V-5B

Letdown Cooler

_____MU-V-3

_____17. Reduce the running balance of plant equipment to that which is required to maintain plant conditions (i.e. one FW-P-1, one CO-P-2, No HD-P-1).

_____18. To open Containment Isolation Valves (CIV's) automatically closed refer to ATP 1210-10.

_____19. Determine shutdown margin per OP 1103-15, Reactivity Balance Calculation.

_____20. Take hand control of TBV, reset the reactor trip and maintain hot shutdown conditions until decision on direction of plant movement is obtained.

_____21. Determine and evaluate cause of Reactor trip per Attachment I.

FOR USE IN UNIT 1 ONLY

12/14/14 Rev Nov 25

ATTACHMENT 1

THREE MILE ISLAND UNIT 1 REACTOR TRIP REPORT

1. Reactor Trip No.:_____(Yr. - Trip No.)

2. Date:_____(Month - Day - Year) Time_____

3. Cause of Reactor Trip:

4. Plant Conditions prior to trip:

Reactor Power Level_____. Tave_____.

RCS Pressure_____. RCP Combination_____.

MU Tank Level_____. Pressurizer Level_____.

RCS Boron_____. EFPD_____.

CRDM Percent withdrawn:

Group 1_____% Group 3_____% Group 5_____% Group 7_____%

Group 2_____% Group 4_____% Group 6_____% Group 8_____%

MU Pump Operating_____.

5. ICS Stations in Hand: _____.

6. Evolutions in progress prior to trip (include major components unavailable prior to trip).

7. Description of Transient (include any abnormal systems responses).

8. Maximum RCS pressure during transient_____. Did PORV actuate (Yes/No)_____.

9. Minimum pressurizer level during transient_____.

Were additional MU pumps started (Yes/No - Tag No.)_____.

10. Record the reset pressure at which the last main steam relief valve closed. (Use observation of steam reliefs or chart recorder for this information).

ATTACHMENT 1 (Cont'd)

11. Did RPS/ESAS/EFW systems appear to auto function at the required setpoint and in the appropriate time frame? (Indicate N/A if setpoints not reached)._____

12. Were any Technical Specification L.C.O's violated? (Yes/No - Specify)_____ (Submit 1044 as necessary).

13. Corrective Action taken to prevent future re-occurrence.

14. Radiological Impact of Transient (describe any abnormal readings from RMS).

15. Was the Emergency Plan Actuated? (Yes/No).
What level? _____ _____.

16. Review Transient Cycle Log Book and record component cycles as necessary. List affected components:

17. Notify the Operations and Maintenance Director or designee to make the B and W trip notification using the "Notepad" Systems and Format. Person Notified:_____.

18. Attach copies of the Bailey 855 sequence of events and any pertinent MOD Comp. Transient Monitor graphs.

19. Time and Date of next Reactor Criticality_____.

20. Completed by:_____.

21. Reviewed by Shift Supervisor:_____.

22. Reviewed by Manager Plant Operations:_____.

cc: Chairman - Plant Review Group
Director - Systems Engineering (Parsippany)
Director - Operations and Maintenance
Vice President - TMI Unit 1

ATP 1210-2 LOSS OF SUBCOOLED MARGIN

IMMEDIATE ACTIONS

1. Trip all RCPs.
2. Initiate HPI. (2 pumps full flow)
3. Verify EFW has auto started.
4. Raise OTSG level to 90%-95%.

FOLLOW-UP ACTIONS

____ 1. IF a valid plant saturation condition occurrs; THEN declare a Site Emergency (carry out EPIP 1004.3).

____ 2. IF excessive heat transfer exists; THEN go to ATP 1210-3

3. Isolate possible sources of leakage.

   ____ RC-V-2 (PORV Block)
   ____ RC-V-3 (Spray Block)
   ____ MU-V-3 (Letdown Block)

____ 4. IF subcooled margin has been established; THEN verify natural circulation and go to step 10

____ 5. IF incore thermocouples indicate superheat; THEN go to ATP 1210-8

____ 6. IF core flood tanks are emptying; THEN go to ATP 1210-7

____ 7. IF there is lack of primary to secondary heat transfer; THEN go to ATP 1210-4

____ 8. IF there is indication of a SGTR; THEN go to ATP 1210-5

____ 9. IF there is primary to secondary heat transfer and subcooled margin is not being recovered; THEN go to ATP 1210-6

____ 10. Restart RCPs, if possible, and establish pressurizer spray as follows:

10.1 Start one RCP per loop.

10.2 Monitor RCS pressure while opening RC-V-3 to detect failed open spray valve or spray line leak.

10.3 Throttle HPI. (Refer to ATP 1210-10 for Throttling Criteria).

__ __ 11. IF there is lack of primary to secondary heat transfer; THEN go to ATP 1210-4

____ 12. IF there is indication of a SGTR; THEN go to ATP 1210-5

____ 13. IF RCS is solid; THEN go to ATP 1210-9 to either draw a steam bubble or do a solid RCS cooldown.

____ 14. Return to ATP 1210-1.

ATP 1210-3 EXCESSIVE COOLING

IMMEDIATE ACTIONS

1. IF HPI has not been initiated; THEN increase makeup to maintain pressurizer level on scale.

2. IF OTSG level greater than 95%; THEN trip the MFW pumps.

3. IF OTSG pressure is less than 600 psig; THEN verify SLRDS has actuated.

4. Isolate the affected OTSGs (both if affected generator cannot be identified).

OTSG A	OTSG B
FW-V-16A	FW-V-16B
FW-V-17A	FW-V-17B
FW-V-5A	FW-V-5B
FW-V-92A	FW-V-92B
MS-V-3D	MS-V-3A
MS-V-3E	MS-V-3B
MS-V-3F	MS-V-3C
MS-V-4A	MS-V-4B
MS-V-1A	MS-V-1C
MS-V-1B	MS-V-1D

5. IF OTSG level and pressure did not stabilize; THEN close the following valves on affected OTSG:

OTSG A	OTSG B
EF-V-30A	EF-V-30B
MS-V-10A	MS-V-10B
MS-V-13A	MS-V-13B

FOLLOWUP ACTION

____ 1. IF OTSG pressure and level stabilize on either generator; THEN restore main or emergency feed to the good generator.

____ 2. IF subcooled margin is less than 25°F; THEN go to ATP 1210-2

____ 3. IF Steam line break is not in the Intermediate Bldg; THEN E.D. may direct feeding the affected OTSG.

____ 4. IF unable to restore primary to secondary heat transfer; THEN initiate HPI cooling and go to ATP 1210-9.

____ 5. IF OTSG tube rupture is indicated; THEN go to ATP 1210-5

____ 6. Feed one or both OTSGs to maintain level and control OTSG pressure and cold leg temperature.

____ 7. Prevent RCS Heatup and repressurization. Evaluate for PTS per ATP 1210-10, Figure 1 and 1A.

____ 8. Return to ATP 1210-1.

ATP 1210-4
LACK OF HEAT TRANSFER

IMMEDIATE ACTIONS

1. IF RC pressure increases to the PORV setpoint; THEN go to step 3.1

2. Initiate FW.

   2.1 Start EF-P1, EF-P2A, and EF-P2B. Open EF-V-30A and B by either the Hand/Auto station or the Manual Loader.

   2.2 IF EFW is not available; THEN use Main FW.

   2.3 IF neither MFW nor EFW are available; THEN attempt to restore emergency feedwater per ATP 1210-10.

3. IF neither MFW nor EFW can be established; THEN:

   3.1 Initiate HPI (2 pumps full flow).

   3.2 Open RC-V-2.

   3.3 Open PORV (RC-RV2)

   3.4 Run one RCP as long as subcooled margin exists.

   3.5 Go to HPI cooling procedure ATP 1210-9.

FOLLOWUP ACTIONS

____1. IF there is a total loss of MFW; THEN declare an Unusual Event (carry out EPIP 1004.2).

____2. Attain appropriate OTSG level based on RCP operation and subcooled margin.

____3. IF CFT's have emptied, THEN go to ATP 1210-7.

____4. IF while attempting to re-establish heat transfer RCS pressure increases to the PORV setpoint; THEN open the PORV until RCS decreases to 100 psi above OTSG pressure.

____5. Lower OTSG pressure until secondary Tsat is 40 to 60°F lower than incore T/C temperature. Maintain OTSG level.

____6. IF primary to secondary heat transfer is re-established; THEN close the PORV (if open) control HPI per HPI throttle criteria and return to ATP 1210-1.

___7. IF RCP's are not available for bumps; THEN initiate HPI Cooling and go to ATP 1210-9

___8. Use RCP bumps to induce heat transfer.

8.1 Bump either RCP in the loop with the highest OTSG level.

8.2 Allow RCS pressure to stabilize and determine whether heat transfer is established.

8.3 IF heat transfer is established; THEN go to step 12

8.4 Continue "bumping" remaining operable RCP(s) at 15 minute intervals until either:

a. Heat transfer has been established; THEN go step 12.

b. All operable RCPs have been "bumped" and heat transfer has not been established. THEN go to step 9

___9. Lower OTSG Pressure to induce heat transfer.

9.1 Decrease OTSG pressure until secondary Tsat is 90 to 100°F lower than incore T/C temperature. Maintain OTSG level.

___10. IF one hour has passed since reactor trip and a RCP is operable; THEN start and run one RCP.

___11. IF heat transfer has not been re-established; THEN initiate HPI cooling and go to ATP 1210-9

___12. Verify heat transfer is established and recover from HPI cooling, if initiated.

12.1 Close PORV (RC-RV-2).

12.2 IF the PORV does not close; THEN close RC-V2.

12.3 Throttle HPI, if permitted.

12.4 Restart RCP if restart criteria is met.

___13. Control OTSG pressure to stabilize RC temperature.

___14. IF OTSG tube rupture is indicated; THEN go to ATP 1210-5.

___15. IF subcooled margin does not exist cooldown per ATP 1210-6.

___16. Return to ATP 1210-1.

ATP 1210-5
OTSG TUBE LEAK/RUPTURE

NOTE

1. OTSG tube leak: greater than 1 and less than 50 gpm.
2. OTSG rupture: greater than or equal to 50 gpm.

IMMEDIATE ACTIONS

1. IF the reactor was not tripped;	THEN close MU-V-3 and begin to reduce load at a rate specified by the Shift Supervisor to minimize the risk of a MS Safety Valve lifting.
2. IF the reactor was tripped;	THEN absent other untreated priority symptoms, proceed with plant cooldown per this procedure.

FOLLOW-UP ACTION

NOTE

Refer to Table 1 for Emergency Action level Declaration guidance, and OTSG isolation considerations for Emergency Director.

_____1. Continue to reduce power to less than 20 percent at the selected load reduction rate. Consult OP 1102-10, Plant shutdown for guidance.

NOTE

When removing the first main feed pump (40 percent pwr), remove the feed pump that is being steam fed from the affected OTSG if known. Remove the feed pump per OP 1102-10.

_____2. By sampling OTSG's, surveying steam lines, observation of OTSG levels and feed rates, determine affected OTSG.

NOTE

Most affected OTSG should indicate higher level, lower feed rate, and/or higher Beta-Gamma, H^3, Na^{24}, I-133 and CS^{-137} sample results.

CAUTION

When the turbine is tripped it may be necessary to take manual control of turbine bypass valves to maintain secondary pressure below the main steam safety valve setpoints.

_____3. At less than 15 percent PWR take the turbine to manual and unload to "0" MWE. Verify that the turbine bypass valves automatically control header pressure below safety valve setpoints. At "0" MWE trip the turbine while closely monitoring OTSG pressure. Observe turbine stop valves closed.

CAUTION

The following power reduction and Rx Trip will cause a significant RCS shrinkage, insure sufficient make-up to maintain normal pressurizer level. Adhere to Pressurizer Level Guide.

_____4. Place the Diamond in manual and continue reducing Rx Pwr to less than 5%. When less than 5% reactor power, take manual control of the turbine bypass valves and then trip the Reactor. Immediately adjust TBV closed to control the initial cool down following Reactor trip and control OTSG pressure to prevent safety valve operation.

_____5. If the OTSG level rule of 90-95% is in effect, raise the unaffected OTSG to 90-95% before raising the affected OTSG to 90-95%.

_____6. Steam both OTSG's to reduce RCS to less than 540°F.

_____7. Turn off PZR Heaters and start pressurizer spray to depressurize RCS which minimizes the subcooled margin. The Pressurizer Vent may be used to reduce RCS pressure. If the pressurizer vent is not sufficient, the PORV may also be used.

NOTE

Minimizing subcooling margins above 25°F will cause RCS temp/press to violate the fuel pin compression curve (OP 1102-11). This is acceptable only during rupture emergencies, and requires Engineering Evaluation prior to next heat up. For other than tube rupture, fuel pin compression curves should not be violated.

_____8. When SCM has been minimized, control turbine bypass valves and commence plant cooldown at less than 100°F/HR (1.6°F/min). (Refer to OP 1102-11 for additional guidance on BOP equipment.)

_____9. Reduce RCP's to one per loop, when the additional spray is no longer required to control SCM. RCP's must be reduced to less than 4 RCP's before RCS temp is decreased below 500°F.

NOTE

Keep RC-P-1A on for PZR spray.

_____10. Monitor tube to shell delta T and maintain it less than 70°F using MFW. If this limit is approached while steaming, then reduce or secure the cooldown rate as necessary.

_____11. Confirm affected OTSG by sampling.

_____12. When RCS hotleg and incore thermocouples temperatures are less than 540°F, isolate the affected OTSG when BWST level is less than 21 ft. or off-site dose projections approach 50 mr/hr whole body or 250 mr/hr thyroid.

_____13. If required to isolate the affected OTSG, then close the following:

NOTE

Assure MFP is being fed from unaffected OTSG or Auxiliary Steam. Assure gland steam is from the Aux. Boiler.

MS-V-1A and B or C and D

FW-V-17 A or B

FW-V-5 A or B

FW-V-16 A or B

FW-V-92 A or B

FW-V-85 A or B

EF-V-30 A or B

MS-V-92

MS-V-89 A and B or C and D

MS-V-13 A or B (close manual hand wheel)

MS-V-10 A or B

MS-V-3 D/E/F or A/B/C

____14. If both OTSG's are required to be isolated and can no longer be used as a heat sink then go to ATP 1210-9.

NOTE

If OTSG pressure cannot be maintained less than 1000 psig, protect against any challenge to the MS Safety Valves by opening the Turbine Bypass and/or Atmospheric Dump Valves.

____15. Affected OTSG must be steamed without exceeding the cooldown rate limits to maintain less than 95 percent on operate range and less than 70°F tube to shell delta T, unless either the BWST is less than 21 Ft. or off-site dose projections approach 50 mr/hr whole body or 250 mr/hr thyroid.

NOTE

Under emergency situations, blocking/pinning of MS hangers when flooding the applicable MS lines is not necessary. If the MS lines are filled without blocking/pinning of the MS hangers, an engineering evaluation of the structural integrity of the MS lines must be performed prior to resuming normal operations.

____16. Maintain less than or equal to 100°F/hr. (1.6°F/min.) cooldown rate by steaming both OTSG's. If the cooldown rate is greater than 100°F/hr. (1.6°F/min.) due to three pump HPI cooling, secure the non-ES selected MU pump and observe HPI throttling criteria for the two ES selected MU pumps.

____17. If RCS pressure is being controlled and an adequate subcooling margin exists, then bypass ESAS at normal bypass pressure setpoints.

____18. If subcooled margin exists, then isolate CF-V-1A/B when RCS pressure is less than or equal to 700 psig.

_____19. Notify Radiological Controls of the shutdown due to OTSG tube leak and to continue to survey the Intermediate and Turbine Buildings to determine the need for controlled areas. Initiate Emergency Plan if required, as a result of the surveys.

____20. Notify Unit II Control Room to isolate auxiliary steam cross connect by closing AS-V-23 and its bypass AS-V-209.

_____21. For other than tube rupture, refer to NPSH curve in Figure 1 and 1A of 1102-11. Refer to Figure 1 and 1A of ATP 1210-10 for rupture emergency NPSH limits for one RCP in each loop operation.

NOTE

The emergency NPSH and SCM limits are plotted on a composite graph but are verified using different instruments. Use those instruments as noted on figure 1 and 1A.

_____22. Decay Heat Removal may be initiated at 300°F by first tripping all RCP's if the consequences of losing RCS loop forced flow are acceptable (i.e. hot leg steam bubble).

_____23. When on DH Removal, depressurize RCS to vent header pressure per OP 1104-4.

_____24. When time permits, initiate performance of condenser partition factor Surveillance Test No. 1301-9.6.

_____25. If OTSG tube leakage exceeded the limits of Tech. Spec. 3.1.6.3, then an unscheduled inservice inspection of the affected OTSG must be conducted prior to startup pursuant to Tech. Spec. 4.19.3.C.1.

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TABLE 1

EMERGENCY ACTION LEVEL DECLARATION CRITERIA

Condition	Unusual Event	Alert	Site	General
Tube Leak Alone	1gpm - 50 gpm	≥ 50 gpm	Any Tube Leak and Saturation < 25° Subcooled	N/A
Steam Generator Tube Leak Plus - Loss of Off-site Power	N/A	1 gpm - 50 gpm	≥ 50 gpm	N/A
Steam Generator Tube Leak Plus - Steam Line Break	N/A	1 gpm - 50 gpm	≥ 50 gpm	N/A
Steam Generator Tube Leak Plus - Loss of Condenser	N/A	1 gpm - 50 gpm	≥ 50 gpm	N/A
Steam Generator Tube Leak With 1% Failed Fuel	N/A	N/A	≥ 50 gpm	N/A
RMA-5 Low Range	High Alarm	N/A	N/A	N/A
Offsite Dose Projection/Report				
Whole Body	N/A	≥ 10mr/hr	≥ 50 mr/hr	≥ 1R/hr
Thyroid	N/A	≥ 50mr/hr	≥ 250 mr/hr	≥ 5R/hr

STEAM GENERATOR ISOLATION CONSIDERATIONS FOR THE E.D. WITH CONCURRENCE BY THE ESD

GENERAL

1. Isolation of one or both OTSG's reduces the RCS cooldown rate which increases the time to reach cold shutdown and to terminate the primary to secondary leak.

2. Isolation of one OTSG when both are leaking may increase the integrated dose since the release will continue frm the unisolated OTSG for a longer period.

3. Isolation of both OTSG's requires feed and bleed cooling which could result in releases of steam or steam and water directly to the atmosphere.

4. An isolated OTSG may flood, after which it may not be possible to unisolate and return the OTSG to service.

5. Isolation of direct steam releases to the atmosphere is expected to reduce the offsite thyroid dose by a factor of at least 8.

6. Isolation for dose reduction should be based on measured dose rate to preclude premature isolation.

I. ISOLATION OF ONE OTSG SHOULD BE AVOIDED IF

1. RCP's are not available - natural circulation cooldown may not be possible with one OTSG since flow in one loop can stagnate and bubble could form in the hot leg as primary pressure is reduced.

2. Both OTSG's leak but the difference in leak rate is less than a factor of eight. Otherwise, the delay in cooldown may negate the dose reduction fom isolating one OTSG.

II. OTSG ISOLATION MAY BE DESIRABLE IF

1. RCP's are operating, the condenser is unavailable, only one OTSG is leaking and iodine dose rates are high. In this situation high iodine release rates could be terminated by isolation of the leaking OTSG.

   Although cooldown time is increased, radioactivity releases will be terminated and RCP operation enables control of the RCS which in turn allows cooldown of the leaking OTSG.

III OTSG ISOLATION CRITERIA SHOULD BE REEVALUATED IN THE FOLLOWING SITUATIONS

1. RCP's Operating, condenser unavailable, both OTSG's leaking, iodine dose rates are high - isolation of one OTSG may be desirable if the leak rate in one OTSG is significantly (about 8) greater than in the other. The reduced dose rate from isolation of one OTSG must be weighed against the shorter cooldown time with steaming both OTSG's.

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2. Condenser available - Isolation of one or both OTSG's greatly increases cooldown times and increases risk of inadvertent or uncontrolled releases. A decision to isolate earlier than required by procedural guidelines should be based on measured dose rates if possible. In the absence of fuel failures, actual releases under such conditions are expected to be quite low.

3. Only one OTSG is leaking and BWST level is 21 feet. If the good OTSG is not expected to leak because shell/tube delta T is being controlled, then isolation is not required. Recall than the BWST level was based on both steam lines being flooded. If only one OTSG may be flooded, then BWST depletion could not occur until 15 ft.

SUMMARY

RCP	Condenser	One OTSG Leaking	Both OTSG Leaking more Than 90% to One	Both OTSG Leaking Equally
ON	Available	Avoid isolation (III.2)	Avoid isolation (III.2)	Avoid isolation (III.2, I.2)
ON	Not Available	Consider isolation (II.1)	Consider isolation (II.1)	Avoid isolation of one (I.2)
OFF	Available	Avoid isolation of one OTSG (I.1)	Avoid isolation of one OTSG (I.1)	Avoid isolation of one OTSG (I.1, I.2, III.2)
OFF	Not Available	Avoid isolation of one OTSG (I.1)	Avoid isolation of one OTSG (I.1)	Avoid isolation of one (I.1, I.2)

TEMPORARY-SHORT TERM MEASURES TO REDUCE OR TERMINATE RELEASES

1. Releases can be temporarily terminated by-

   a. Terminating steaming to the condenser and not steaming to atmosphere.

   b. Not more than 1 RCP should be run.

   c. If natural circulation is lost, steam again.
      If steam generator pressure reached 1000 psi., steam again.

   d. Heatup rate, following termination of steaming, is estimated to be 100-170°F.

   These steps may provide enough time to return an RCP to operation, restore a condenser to service, or initiate protective actions, while delaying the initiation of feed and bleed cooling.

IMMEDIATE ACTIONS

1. Verify that loss of subcooled margin is being treated.

   1.1 HPI initiated (2 pumps full flow).

   1.2 All RCP's off.

   1.3 EFW actuated and level being increased to 90-95%.

2. Verify that reactor trip containment isolation has occurred.

3. Verify that 1600 psi and 4 psi containment isolation has occurred.

4. Maintain primary to secondary heat transfer by reducing OTSG pressure.

5. IF primary to secondary heat transfer cannot be established; THEN open the PORV and keep it open until heat transfer is established or LPI is in operation.

FOLLOWUP ACTIONS

CAUTION

DO NOT START ANY MAJOR MOTORS DURING BLOCK LOADING.

CAUTION

DO NOT ATTEMPT TO OPERATE ES VALVES TO THE NON-ES POSITION AND DO NOT TRIP ANY ES COMPONENTS UNTIL THE ES SIGNAL IS BYPASSED. THE BREAKER ANTI-PUMP FEATURE WILL PREVENT RECLOSURE OF TRIPPED BREAKERS UNTIL THE ES START SIGNAL IS CLEARED.

___1. IF a valid plant saturation condition occurs; THEN declare a Site Emergency (carry out EPIP 1004.3).

___2. IF at any time the RCS becomes superheated; THEN go to ATP 1210-8

___3. IF at any time indications of OTSG tube rupture occur; THEN go to ATP 1210-5

___4. Maintain RCS pressure and temperature in the applicable region of the pressure temperature curve in ATP 1210-10. (Comply with Emergency NPSH requirements).

___5. Verify containment emergency cooling.

___6. Maintain RCP seal injection and seal cooling to assure long term availability of the RCPs.

____7. Control HPI and restart RCPs when conditions are met. (Refer to ATP 1210-10).

8. Close;

____RC-V-40A/B
____RC-V-41A/B
____RC-V-44
____RC-V-28
____RC-V-42
____RC-V-43.

____9. If the RCS is solid and subcooled, then refer ATP 1210-9 to establish a pzr steam bubble.

____10. Maintain steam generator tube to shell dT less than 70°F.

____11. Cooldown at approximately 100°F/hour (1.6°F/minute), using ATP 1210-10 figure 1 and 1A.

____12. Stop non-essential secondary equipment when time permits.

____13. IF subcooled margin is regained; THEN CF-V-1A and CF-V-1B may be closed when RCS pressure reaches 700 psig.

____14. Monitor BWST level. If a source of borated water is available makeup to the BWST to avoid transfer to the RB sump while the HPI pumps are on.

____15. If electrical loading permits, bypass ES and start a spent fuel pump (6 amp) and penetration cooling fan (10 amp). (IP and IS Bus Load Limit 180 amps.)

____16. Prior to going on DHR or establishing recirc. from the RB sump open DH-V-64 and MU-V-198 to minimize radiation exposure.

____17. IF after 20 minutes the diesel generators are not required; THEN bypass ES and place the diesels in standby.

18. IF BWST level reaches 36 inches (LO-LO level alarm) before LPI flow is established; THEN establish HPI/LPI operation in the "piggyback" mode as follows:

a. Open DH-V7A while observing HPI and LPI flow.
b. Open DH-V-6A.
c. Close DH-V-5A while observing LPI flow.
d. MU-V-14A may be left open in case the LPI pump trips.
e. Open DH-V-7B while observing HPI and LPI flow.
f. Open DH-V-6B.
g. Close DH-V-5B while observing LPI flow.
h. MU-V-14B may be left open in case the LPI pump trips.

____19. Place the RB hydrogen monitor in service per OP 1105-18 and start the Hydrogen Recombiner if hydrogen level reaches 0.5% (OP 1104-62).

____20. When BWST level reaches 36 inches and LPI flow is established transfer LPI suction to the RB sump.

____21. Stop emergency feedwater when LPI or DHR is in operation.

____22. Throttle DH-V-19A and B and re-open DH-V-4A and B.

____24. Within 24 hours assess Auxiliary Building radiation levels and establish one of the long term recirculation modes in OP 1104-4.

____25. IF controls for DC-V-2A/B and DC-V-65A/B are in-accessible; THEN control cooling rate by throttling DR-V-1A/B.

____26. Monitor RB sump for ph, boron concentration, and isotopic analysis. Add sodium hydroxide thru the DHR system as required to control ph.

____27. Containment isolation valves may be opened when the criteria is met. (Refer to ATP 1210-10).

IMMEDIATE ACTION

1. Verify that HPI and LPI pumps are operating and valves are full open.
2. Verify that both Core Flood valves are open.
3. Verify that RB Spray and RB Cooling are operating.
4. Verify that Reactor trip containment isolation has occurred.
5. Verify that 1600 psi and 4 psi containment isolation has occurred.

FOLLOW-UP ACTION

CAUTION

DO NOT START ANY MAJOR MOTORS DURING BLOCK LOADING.

CAUTION

DO NOT ATTEMPT TO OPERATE ES VALVES TO THE NON-ES POSITION AND DO NOT TRIP ANY ES COMPONENTS UNTIL THE ES SIGNAL IS BYPASSED, THE BREAKER ANTI-PUMP FEATURE WILL PREVENT RECLOSURE OF TRIPPED BREAKERS UNTIL THE ES START SIGNAL IS CLEARED.

____ 1. Declare a Site Emergency (carry out EPIP 1004.3).

____ 2. Close MS-V-1A,B,C and D.

____ 3. Verify RB isolation by checking the indicating lights for each valve on panel PCR.

____ 4. If only one LPI pump is operating, open DH-V-38A and B, to provide at least 1000 gpm per leg.

____ 5. IF RCS pressure is above the maximum pressure for LPI operation; THEN go to ATP 1210-6

____ 6. IF superheat is indicated by incore T/C; THEN go to ATP 1210-8.

____ 7. Monitor BWST and Sodium Hydroxide tank levels. Verify Hydroxide is being injected to control ph.

____ 8. Stop non-essential secondary equipment when time permits.

____ 9. Throttle LPI/BS pumps only if required to prevent pump runout (LPI 3500 gpm, BS 1800 gpm).

____ 10. Refer to ATP 1210-10 for criteria for HPI termination.

____ 11. Open DH-V-64 and MU-V-198 before recirculation is established from the RB sump.

12. IF BWST level reaches 36 inches (LO-LO level alarm) before HPI is terminated; THEN establish HPI/LPI operation in the "piggyback" mode as follows:

    a. Open DH-V-7A while observing HPI and LPI flow.
    b. Open DH-V-6A
    c. Close DH-V-5A while observing LPI flow.
    d. MU-V-14A may be left open in case the LPI pump trips.
    e. Open DH-V-7B while observing HPI and LPI flow.
    f. Open DH-V-6B
    g. Close DH-V-5B while observing LPI flow.
    h. MU-V-14B may be left open in case the LPI pump trips.

____ 13. Switch LPI suction to the RB sump when the BWST decreases to 36".

____ 14. Place the RB hydrogen monitor in service per OP 1105-18 and if hydrogen level reaches 0.5% start the Hydrogen Recombiner (1104-62).

____ 15. IF after 20 minutes the diesel generators are not required; THEN bypass ES and place the diesels in standby.

____ 16. Stop emergency feedwater when LPI or DHR is in operation.

____ 17. Start Spent Fuel Cooling (6 amps) electrical load permits (1P &1S bus load limit 180 amps).

____ 18. Stop RB Spray pumps when RB pressure is less than 4 psig.

____ 19. Throttle DH-V-19A and B and re-open DH-V-4A and B.

____ 20. Within 24 hours assess Auxiliary Building radiation levels and establish one of the long term recirculation modes in OP 1104-4.

____ 21. IF controls for DC-V-2A/B and DC-V-65A/B are in-accessible; THEN control cooling rate by throttling DR-V-1A/B.

____ 22. Monitor RB sump for ph, boron concentration, and isotopic analysis. Add sodium hydroxide thru the DHR system as required to control ph.

____ 23. Containment isolation valves may be opened when the criteria is met. (Refer to ATP 1210-10).

IMMEDIATE ACTION

1. Verify HPI and LPI have been initiated (all available pumps).

2. Verify OTSG levels are 90-95%.

3. Decrease OTSG pressure to achieve 100°F/hr decrease in secondary saturation temperature.

4. Verify core flood valves CF-V-1A and CF-V-1B are open.

5. IF RCS pressure is greater than 2300 psig; THEN open the PORV until RCS pressure decreases to 100 psig above OTSG pressure.

FOLLOW-UP ACTION

____ 1. IF the RCS hot leg temperature is greater than 620°F; THEN declare an Alert (carry out EPIP 1004.2).

____ 2. IF any two valid incore temperature readings greater than 700°F following a Rx trip; THEN declare a Site Emergency (carry out EPIP 1004.3).

____ 3. Determine region on PT curve, Figure 1 in ATP 1210-10, and proceed as follows:.

3.1 IF saturated THEN go to ATP 1210-2.

3.2 IF beyond curve 4 THEN go to Immediate Actions above.

3.3 IF beyond curve 5 THEN go to Step 4.

3.4 IF beyond curve 6 THEN go to Step 5.

4. Incore Thermocouple Temperature beyond Curve 5

____ 4.1 Start one RCP per loop if possible without defeating interlocks.

CAUTION

Do not go below steam pressure required for EF-P-1 (150 psig) unless EF-P-2A or EF-P-2B or auxiliary steam (for EF-P-1) is available.

____ 4.2 Decrease OTSG pressure to 400 psig or less to achieve a 100°F decrease in secondary T-sat.

____ 4.3 Open high point vents.

RC-V-40A
RC-V-40B
RC-V-42
RC-V-44
RC-V-41A
RC-V-41B
RC-V-43
RC-V-28

____ 4.4 Continue to decrease OTSG pressure to maintain a 100°F/hr decrease in secondary T-sat.

____ 4.5 Monitor reactor building hydrogen levels and start the recombiner if H_2 concentration is greater than 0.5% (OP 1104-62).

____ 4.6 If primary to secondary heat transfer cannot be established open the PORV (RC-RV-2) and block valve (RC-V-2) and keep them open. (Refer to Attachment 1 for the PORV jumper procedure.) When the RCS returns to saturation go to ATP 1210-9.

____ 4.7 IF primary to secondary heat transfer is established; THEN cycle the PORV to maintain RCS pressure at 25 to 100 psig above OTSG pressure.

____ 4.8 When the RCS returns to saturation close the high point vents and PORV and go to ATP 1210-2.

5. Incore Thermocouple Temperature beyond Curve 6.

____ 5.1 Defeat starting interlocks and start all available RCPs. Do not defeat overload trips. (Refer to Attachment 2 for the RCP interlock defeat procedure.)

____ 5.2 Decrease OTSG pressure as rapidly as possible to atmospheric pressure if auxiliary steam (For EF-P-1) or EF-P-2A or EF-P-2B is available (150 psig if not).

____ 5.3 Open the PORV (RC-RV-2) and block valve (RC-V-2). (Refer to Attachment 1 for the PORV jumper procedure.)

____ 5.4 Open high point vents.

RC-V-40A
RC-V-40B
RC-V-42
RC-V-44
RC-V-41A
RC-V-41B
RC-V-43
RC-V-28

____ 5.5 Operate all available RB fans to promote mixing of RB atmosphere.

____ 5.6 Monitor Reactor Building hydrogen levels (OP 1105-18) start the recombiner if hydrogen concentration is greater than 0.5% (OP 1104-62).

NOTE

The Emergency Director should consider RB purge if Hydrogen concentration exceeds 3%.

____ 5.7 Continue full HPI and LPI and maximum available primary to secondary cooling until incore T/C temperatures reach saturation temperature.

____ 5.8 IF RCS pressure is less than 150 psig; THEN close the PORV and high point vents. Re-open the PORV or pressurizer vent to maintain RCS pressure less than 150 psi.

____ 5.9 Decrease running RCPs to one per loop.

____ 5.10 Establish LPI cooling on recirc. from sump or establish Decay Heat removal per ATP 1210-6.

ATTACHMENT 1

PORV JUMPER PROCEDURE

NOTE

Where instructions require opening RC-RV-2, it must be accomplished using a jumper in the relay room cabinet XCC.

NOTE

____1. To open RC-RV-2 (PORV) install a jumper from Terminal Board "AG" Terminal "1", to Terminal Board AG Terminal "2". Verify that relay 63X/RC-3-PS8 energizes. Administratively control the jumper in accordance with AP 1013.

A. Verified 63X/RC-3-PS8 Energized _____

B. Verified (PORV) RC-RV-2 Opened _____

____2. To close RC-RV-2 (PORV) remove the jumper and verify that relay 63X/RC-3-PS8 de-energizes.

A. Verified 63X/RC-3-PS8 De-energized _____

B. Verified (PORV) RC-RV-2 Closed _____

ATTACHMENT 2

RC PUMP INTERLOCK DEFEAT PROCEDURE

NOTE

When instructions require defeating a RC pump starting interlock, it must be accomplished at the applicable breaker on the 6900 VAC switchgear.

NOTE

1. Determine which RC pump(s) are to be started as directed by the S/S or ED.

2. Locate the correct terminal boards and terminals inside the 6900 VAC switchgear breaker cabinet per the table below, and install a wire jumper between the two terminals. A bakelite covering over the terminal boards may need to be removed to gain access to the terminals.

RC Pump	6900 VAC Switchgear	Breaker Unit No.	Jumper "From" T.B.	Jumper "From" Term Number	Jumper "From" Term Designation	Jumper "To" T.B.	Jumper "To" Term Number	Jumper "To" Term Designation
RC-P-1A	1A	1A2	1	1	7	2	6	PC1
RC-P-1B	1B	1B2	1	1	7	2	6	PC1
RC-P-1C	1A	1A3	1	1	7	2	6	PC1
RC-P-1D	1B	1B3	1	1	7	2	6	PC1

NOTE

This procedure will only defeat the starting interlocks. All of the pump auto trip functions remain enabled.

NOTE

ATP 1210-9 RECOVERY FROM HPI COOLING - SOLID OPERATIONS

IMMEDIATE ACTION

1. IF HPI cooling is required; THEN;
   a). Start 2 HPI pumps
   b). open the PORV and the PORV block valve.
   c). Verify HPI flow (per the attached Enclosure 1).
2. IF subcooled margin is regained; THEN throttle HPI and start one RCP.

FOLLOW-UP ACTION

____ 1. If there is a total loss of MFW and EFW, then declare a Site Emergency. (Carry out EPIP 1004.3).

____ 2. IF superheat occurs; THEN go to ATP 1210-8

NOTE

If only one HPI pump is available RCS temperatures will rise until HPI cooling capacity matches decay heat (approximately 70 minutes after trip).

____ 3. Attempt to establish OTSG heat removal if plant conditions permit.

____ 4. If an OTSG tube leak exists and HPI cooling is required follow ATP 1210-5, and ATP 1210-9 concurrently..

____ 5. Comply with the pressure temperature limits of ATP 1210-10.

____ 6. Control tube to shell Delta T to less than 70°F by controlling cooldown rate.

____ 7. Begin makeup to the BWST with borated water to avoid (if possible) LPI/HPI "piggyback" operation from RB Sump.

____ 8. IF subcooled margin is maintained and RCS pressure less than 700 psig; THEN CF-V-1A and CF-V-1B may be closed.

9. IF OTSG heat removal is established THEN recover from solid operation as follows:

____ 9.1 Close PORV and RC-V2 and all high point vents while picking up the heat rejection with the OTSG's.

____ 9.2 Establish letdown and control makeup to maintain the stable RCS pressure at which a pressurizer bubble is to be drawn.

NOTE

Insure that this pressure will retain the 25°F subcooled margin.

NOTE

____ 9.3 Energize all pressurizer heaters.

CAUTION

Compensate for increasing pressure (due to heating pressurizer) by throttling open on MU-V-5.

____ 9.4 Monitor pressurizer water temperature. Do not exceed a 100°F/Hr. heatup rate.

____ 9.5 When pressurizer temperature reaches saturation temperature for the desired RCS pressure, increase letdown until letdown is 25 gpm greater than makeup. Monitor the RCS saturation margin and manually open turbine bypass valves to maintain 25°F subcooled.

____ 9.6 Place pressurizer heaters in auto control with setpoint at the desired pressure.

____ 9.7 Carefully monitor RCS pressure decrease to saturation pressure for pressurizer temperature at which point pressure stabilization should occur.

CAUTION

Do not let pressure decrease violate the 25°F subcooled margin requirement.

NOTE

1. Continued stable RCS pressure with letdown greater than makeup indicates formation of steam bubble in pressurizer.

2. With a 25 gpm excess letdown (vs. makeup), the pressurizer level will drop at approximately 1.5 inches per minute. At this rate it will take between 25 and 30 minutes for level to come onto scale. Select (search) alternate pressurizer level instruments during bubble formation to read on scale level as soon as it becomes available.

CAUTION

If pressurizer level is not on scale after 40 minutes with a 25 gpm excess letdown and if a stable RCS pressure is being maintained, reduce excess letdown and investigate level instruments for malfunction.

____ 9.8 Continue cooldown using OP 1102-11.

____ 10. If pressurizer steam bubble is not established then continue HPI cooling until recirculation from RB sump is required by BWST level.

____ 11. When RCS pressure and temperature conditons are met establish DHR and stop RCP.

____ 12. When RCS pressure is stable and DHR flow is greater than 1500 gpm close the PORV and high point vents. Stop the makeup pumps when seal injection is no longer required.

ENCLOSURE 1

Verify that total HPI flow exceeds the required flow for RCS pressure as indicated below.

RC Pressure, psig	Required HPI flow gpm
0	530
600	530
1200	470
1500	430
1600	420
1800	390
2400	280
2500	250

If flow requirements are not met verify valve positions and attempt to start another Make-Up Pump.

ATP 1210-10 ABNORMAL TRANSIENTS RULES, GUIDES AND GRAPHS

CONTENTS

1.0 RULES

1.1 Margin to Saturation Determination/Limit Rule

The minimal margin to saturation is 25°F as determined by the saturation margin meter and/or the average of the five (5) highest operable incore thermocouples and RC narrow or wide range pressure indication.

a. Use the most conservative operable indication of saturation margin.

b. The saturation margin meter is only to be used when RCP(s) are operating and RCS temperature greater than 300°F.

1.2 High Pressure Injection (HPI) Initiation Criteria

Full (2 MU pumps) HPI must be initiated at full capacity when:

a. 1600 psig ESAS has auto initiated or

b. Subcooling margin is less than 25°F or

c. Neither OTSG is available as a heat sink

1.3 High Pressure Injection (HPI) Throttling Criteria

Throttle HPI only if one or more of the following criteria are met:

a. HPI must be throttled to prevent pump runout (550 gpm/pump).

NOTE

Do not throttle to less than 500 gpm/pump unless one of the below criteria (b,c, or d) is met.

b. HPI must be throttled to prevent violation of the applicable brittle fracture/Thermal shock curve limitations.

c. HPI may be throttled if LPI flow is greater than 1000 gpm in each line and stable for 20 minutes.

d. HPI may be throttled if the required 25°F subcooling margin exists and pressurizer level is established greater than 0".

CAUTION

Open MU-V-36 and MU-V-37 when HPI is manually throttled below 500 gpm/pump.

1.4 Reactor Coolant Pump (RCP) Trip Criteria

A. If 25°F subcooling margin is lost immediately trip all operating reactor coolant pumps (RCPs).

CAUTION

If 25°F subcooling margin is lost and all operating RCPs are not tripped within two (2) minutes. Then leave one RCP per Loop on for at least two hours.

B. If 25°F subcooling margin is lost immediately following a RCP restart and does not return within 2 minutes, the RCP must be tripped again and not restarted until 25°F subcooling margin is regained.

1.5 Emergency Feedwater (EFW) Throttling Criteria

A. To prevent RCS overcooling due to excessive feed rates, manually control EFW flow as necessary to maintain OTSG pressure to within 100 psig of desired pressure.

Monitor RCS Cold Leg Temperatures to insure that EFW flow is not causing a significant RCS temperature decrease

B. To insure adequate EFW flow, verify decreasing incore T/C temperatures.

If incore T/C temperatures are not decreasing, increase EFW flow to at least 450 gpm (225 gpm per SG) until OTSG level setpoint is reached. If incore T/C's are decreasing, the 100 psig criteria takes priority.

1.6 OTSG Level Rule

A. If 25°F subcooling margin is lost raise level in the operable OTSG(s) to 90-95% (Operating Range).

NOTE

If the loss of subcooling margin was due to a loss of secondary system pressure do not attempt to raise level in the affected OTSG(s) until pressure control is regained.

B. Maintain OTSG level Greater than or equal to 30" start-up range with RCP's on.

C. Maintain OTSG level Greater than or equal to 50% operate range with RCP's off.

2.0 GUIDELINES

2.1 Reactor Coolant Pump (RCP) Restart Criteria

RCP(s) may be restarted if the minimum emergency NPSH is available (See Curve 3 Figure 1 or 1A) and greater than or equal to 25°F subcooling margin exists.

2.2 Pressurizer Level Guide

If the reactor is not tripped and pressurizer level cannot be maintained greater than or equal to 150 inches, then trip the reactor and initiate HPI.

2.3 Emergency Feedwater (EFW) Actuation Response

When EFW actuates respond as follows:

A. Verify EF-P-1, 2A, 2B start.

B. Verify Discharge pressure greater than 1010 psig.

C. Dispatch an Auxiliary Operator (A.O) to EF-V-30A/B. Take manual control of these valves in the event that emergency feedwater cannot be established from the Control Room.

NOTE

This A.O shall perform no other duties until EFW flow to the OTSG(s) has been verified by the Control Room.

D. Verify EFW flow by flow indication if below OTSG level setpoint.

E. Verify EF-V-30A/B control OTSG(s) level at setpoint.

2.4 Operation of Containment Isolation Valves After Auto Closure

A. Containment isolation valves may be opened to obtain samples in accordance with approved procedures. The isolation valves shall be reclosed after the sample is obtained.

B. Other containment isolation valves automatically closed shall remain closed until the following conditions are met.

1. Reactor building pressure is less than 2 psig.

2. Containment radiation levels have been assessed based on radiation monitor readings or samples.

3. The integrity of the system has been assessed. (Stable surge tank level, visual inspection or pressure test should be considered to verify integrity).

4. The Shift Supervisor or Emergency Director shall give permission to re-open containment isolation valves.

5. Installed radiation monitors or portable monitors shall be available to detect any release that may result from opening the valve.

2.5 Elevated Reactor Building (RB) Temperature/Rapid RCS Depressurization Effects on Instrumentation

Elevated Reactor Building temperature can affect fluid density in instrument reference legs and cause pressurizer and OTSG level indications to be erroneously high.

Instrument reference legs may be locally heated above average containment temperature. DO NOT rely solely on single level readouts.

Rapid RCS depressurization (to 600 psig within several minutes) will cause pressurizer level indication to be erroneously high due to off gassing and water ejection from the reference leg.

Extreme depressurization coupled with high reference leg temperature can cause reference leg boiling.

2.6 Reactor Coolant System (RCS) Natural Circulation Verification

Verify natural circulation by one or more of the following methods.

NOTE

Indication of natural circulation may not stabilize for 15 to 30 minutes.

1. RCS Delta T increases to approximately 30°F to 50°F (dependent on Decay Heat) and stabilizes and Th is less than 600°F.

2. Incore thermocouple temperatures stabilize, and are tracking T_H.

3. Cold leg temperatures approach saturation temperature for secondary side pressure (normally within 5 minutes).

4. Verify heat removal from OTSG's.

   a. Steam flow indication.
   b. Feed flow indication.

NOTE

Heat removal and RCS delta T may not be noticeable for low decay heat case.

2.7 Actions for Failure of the Emergency Feedwater System

NOTE

If EF-P-1 or either motor driven pump have started attempts to start additional pumps may be performed when plant conditions become stable.

A. Failure of EF-P-1 to Start.

1. Verify that MS-V-2A and MS-V-2B are open.
2. OPEN MS-V-13A and MS-V-13B.
3. If EF-P-1 fails to start go to defeat on all four auto-start-defeat switches and CLOSE MS-V-13A and MS-V-13B.
4. Have an auxiliary operator check locally that EF-P-1 overspeed trip is reset and that the Manual Operator for MS-V-6 is in the open position.
5. Open MS-V-13A and MS-V-13B.

B. Failure of EF-P-2A or EF-P-2B to Start.

1. Verify that there is voltage available at the associated bus.

NOTE

With an ES signal present there will be a 20 second delay in pump start.

2. Verify that control power is available as indicated by the green indicator light at the control switch.
3. Verify all four auto-start-defeat switches are in defeat. Manually start the pump using the control switch.
4. Check locally for targets on relays located at the switchgear and check the 10 amp closing fuses.
5. Use the 69 bypass key and attempt to start the pump locally.

C. Failure of EF-V-30A or EF-V-30B to Open.

1. Check steam generator level to determine whether an open signal is required.

2. Verify that EF-V-30A and EF-V-30B Hand-Auto stations are in AUTO.

3. If the valves have failed closed, place the hand-auto station in HAND and attempt to open the valve.

4. If the valves have not opened, switch to the back-up manual loader and attempt to open using the backup manual control station located in the Control Room.

5. If the valves are still not open, have the auxiliary operator establish communications with Control Room Operator and take local handwheel control of the valves and open them as directed by the Control Room Operator.

D. No Indicated Flow (Low Flow) With Steam Generator Level Below Setpoint.

1. Verify that EFP discharge pressure is higher than steam generator pressure. If not turbine header pressure setpoint may be reduced to get additional flow.

2. Verify that the following valves are open:

EF-V-2A	EF-V-30A	EF-V-1A
EF-V-2B	EF-V-30B	EF-V-1B

3. Have auxiliary operator check locally for pump malfunction and correct lineup of manual valves.

2.8 Actions for Low Level Alarms on Condensate Storage Tanks

1. If Condensate Storage Tanks low level alarms occur as a result of the Condensate Storage Tanks being used to supply emergency feedwater, continue supplying emergency feedwater from the Condensate Storage Tanks until the water level decreases to the low low level alarm point. This will leave 67,000 gallons of water in each tank.

2. When level has decreased below the low low level alarm point (about two feet on the indicating range on the Condensate Storage Tanks level gauges) break vacuum per OP 1106-15 (if not already broken). Take suction directly from the condenser hotwell by depressing the emergency alignment control pushbutton located on the control room console and verify CO-V-12 and CO-V-13 open.

Pushing the emergency alignment control pushbutton positions the valves as follows:

CO-V-6 - Close - prevents air from entering the pump suction line.
CO-V-7 - Close - prevents air from entering the pump suction line.
CO-V-8 - Open - permits the pump to take suction directly from the Hotwell.

3. While still supplying the emergency feedwater pump suction(s) from the condenser hotwell, make preparations to supply the EFP header directly from the Demineralized Water Storage Tank (DW-T-2) as follows:

   a. Insure closed DW-V-44, DW-V-30, DW-V-33, DW-V-49, DW-V-46 and DW-V-38.

   b. Close or verify closed CO-V-107, CO-V-108, DW-V-2, CO-V-24, CO-V-103A and CO-V-103B (CO-P-3A/B must be secured).

   c. Open DW-V-28, DW-V-29, DW-V-32.

   d. Verify open CO-V-13, CO-V-14A and CO-V-14B.

   Continue supplying emergency feedwater from the condenser hotwell until the hotwell level reaches 5 feet decreasing as indicated on the hotwell level gauge on the control room console. This will leave 6900 gallons of water in the hotwell before inadequate suction pressure exists.

4. When the condenser hotwell reaches 5 feet decreasing level as indicated on the hotwell level gauge, complete alignment of DW-T-2 to the EFP header and supply suction water as follows:

   a. Open DW-V-35 and DW-V-34.

   b. Start DW-P-2 if power is not available for DW-P-2, open DW-V-30 for gravity feed.

   c. Close CO-V-12.

   d. Close CO-V-8 using manual handwheel.

NOTE

Do not reset the Emergency Alignment Control pushbutton for CO-V-6, 7, 8.

Station an operator to monitor the EFP(s) suction gauge(s) and in communication with the Control Room.

5. When the EFP's suction pressure gauge(s) read 2.0 psig or if cavitation occurs due to inadequate suction pressure and when all other sources of Emergency Feedwater have been exhausted, shift emergency feedwater suction to the Reactor Building River water supply as follows:

   a. Start RR-P-1A or RR-P-1B (if not already running) to satisfy the opening interlock of EF-V-4 and EF-V-5.

   b. Unlock and close breakers for EF-V-4 and V5 on 1C E.S. V.C.C.

   c. Unlock EF-V-4 and EF-V-5 locally.

   d. Open EF-V-4 and EF-V-5.

   e. Close CO-V-13.

   f. Close CO-V-14A and CO-V-14B.

NOTE

After introduction of river water, OTSGs may not be used for subsequent heat up without engineering evaluation of OTSG integrity.

2.9 Feeding Dry OTSG

1. Feed a dry (less than 18" SU range) OTSG with Main Feedwater if available.

2. Feedrate not to exceed 0.05 x 10^6 lbm/hr until OTSG level is restored.

3. If MFW is not available, use EFW (maintain tube to shell Delta T to less than 70°F).

TABLE 1

Pressurizer Spray Flow for Various RC Pump Combinations

NUMBER OF RC PUMPS RUNNING		SPRAY FLOW (% FULL FLOW)
LOOP A	LOOP B	
2	2	100
2	1	92
2	0	84
1 (Spray line next to running pump)	2	60
1 (Spray line next to running pump)	1	53
1 (Spray line next to idle pump)	2	50
1 (Spray line next to running pump)	0	41
1 (Spray line next to idle pump)	1	38
1 (Spray line next to idle pump)	0	26
0	2	20
0	1	0

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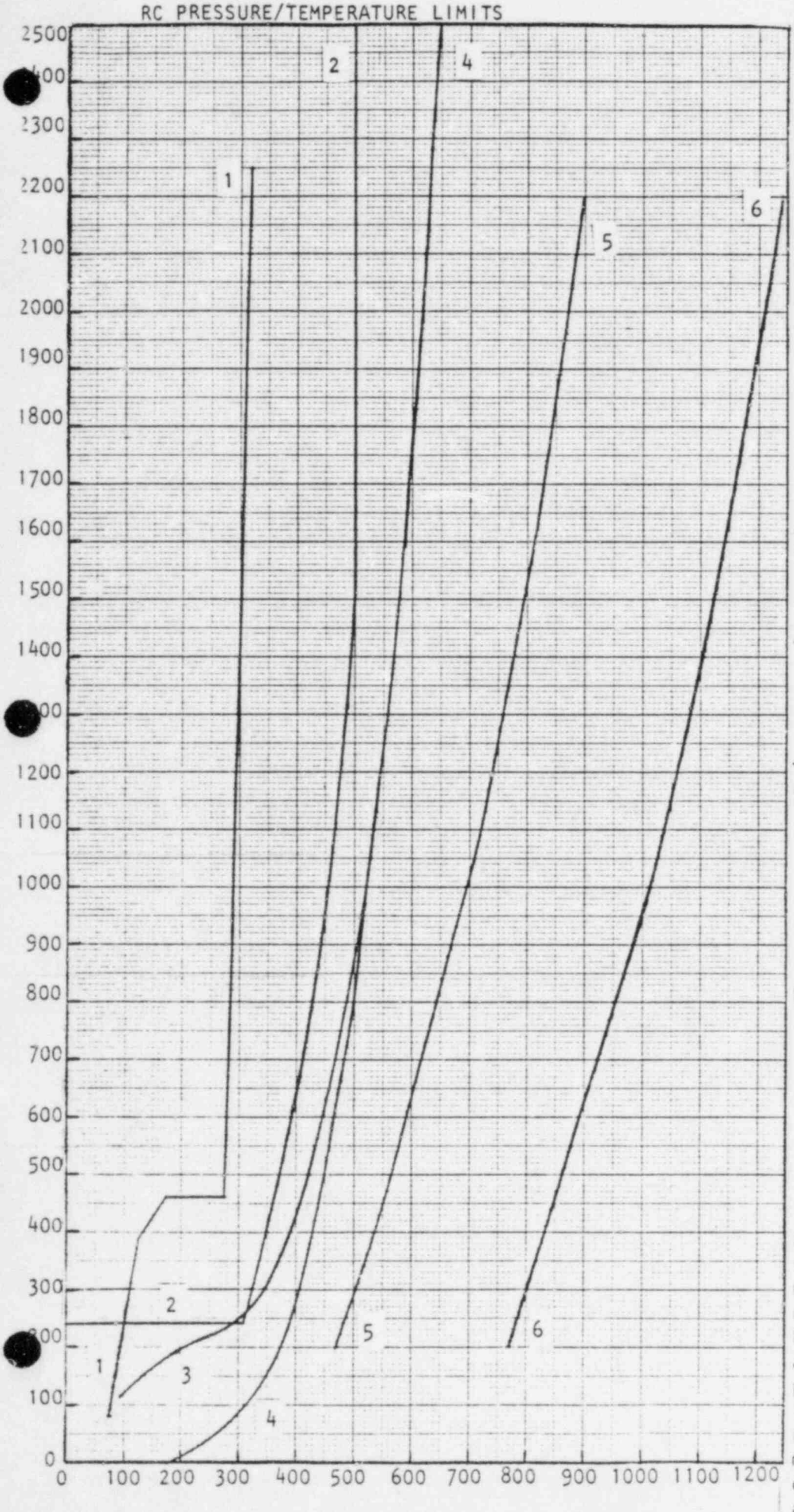
FIGURE 1: PTS GUIDANCE



CURVE DESCRIPTIONS

Instrument errors included as noted in parenthesis.

1. Tech. Spec. 3.1.2 Heatup & Cooldown Limitations to 5 EFPY (50 psig, 12°F). Tc
2. Thermal Shock Curve (no error included SCM/Incore T/C
3. Emergency NPSH Curve for 2 RCP Operation; i.e. one per loop (94.9 psig, 5.6°F) Tc
4. 25°F Subcooling Margin (no error included) T_H/Incore T/C
5. T Clad less than 1400°F (no error included) Incore T/C
6. T Clad less than 1800°F (no error included) Incore T/C

REQUIREMENTS

When indicated RCS pressure is less than 500 psig refer to Figure 1A.

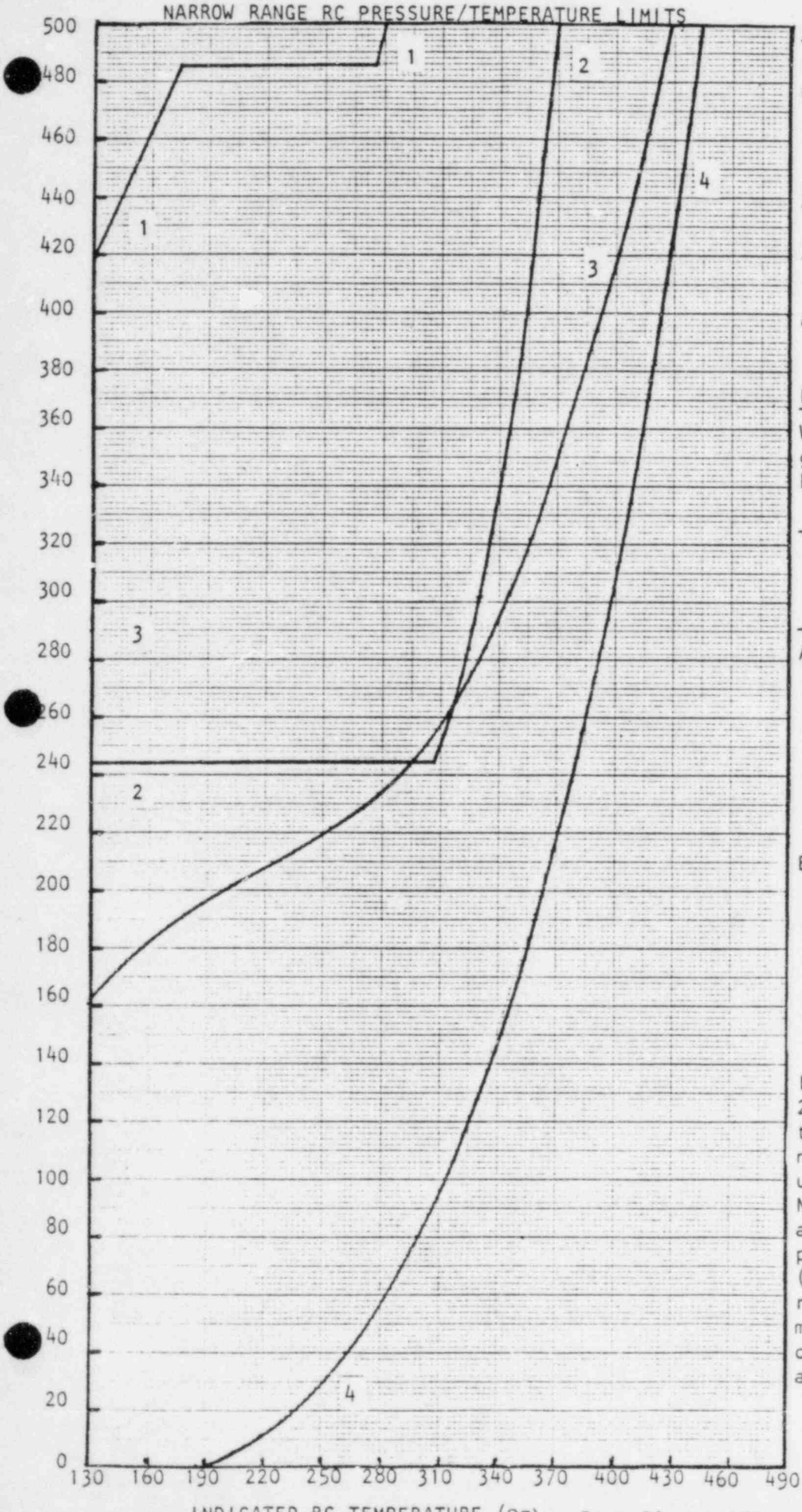
NOTE: Pressurized Thermal Shock Requirements are only a concern when RCS is less than 500°F.

A. During Emergency Conditions maintain RCS pressure/temperature between curves No. 2 and No. 4 (acceptable operating region for preventing thermal shock) maintaining minimum RC Pump NPSH if applicable.

B. Thermal Shock Prevention Guidance.
   1. With RCP's off & HPI on maintain RCS pressure/temperature between curves No. 2 & No. 4.
   2. During any cooldown maintain less than 100°F/hr. (1.6°F/min.)

If either statement No. 1 or No. 2 above is violated, stabilize the plant and depressurize as necessary to maintain RCS pressure/temperature between curves No. 2 and No. 4. Do not cause any significant heatup or repressurization. If possible (i.e. non loca, non OTSG tube rupture), a 3 hr. hold should be maintained at the stabilized condition between curves No. 2 and No. 4 of Fig. 1 and 1A.

FIGURE 1A: PTS GUIDANCE



CURVE DESCRIPTION

Instrument errors included as noted in parenthesis.

1. Tech. Spec. 3.1.2 Heatup & Cooldown limitations to 5 EFPY. (25 psig, 12°F). T_C
2. Thermal Shock Curve (no error included). SCM/Incore T/C
3. Emergency NPSH Curve for 2 RCP operation, i.e. one pump per loop (94.9 psig, 5.6°F). T_C
4. 25°F Subcooling Margin (no error included). T_H/Incore T/C

REQUIREMENTS

When indicated RCS pressure is greater than 500 psig refer to Fig. 1.

NOTE: Pressurized Thermal Shock Requirements are only a concern when RCS is less than 500°F.

A. During Emergency Conditions maintain RCS pressure/temperature between curves No. 2 and No. 4 (acceptable operating region for preventing thermal shock) maintaining minimum RC Pump NPSH if applicable.

B. Thermal Shock Prevention Guidance.
   1. With RCP's off & HPI on maintain RCS pressure/temperature between curves No. 2 & No. 4.
   2. During any cooldown maintain less than 100°F/hr. (1.6°F/min.)

If either statement No. 1 or No. 2 above is violated, stabilize the plant and depressurize as necessary to maintain RCS pressure/temperature between curves No. 2 and No. 4. Do not cause any significant heatup or repressurization. If possible (i.e. non loca, non OTSG tube rupture), a 3 hr. hold should be maintained at the stabilized condition between curves No. 2 and No. 4 of Fig. 1 and 1A.

ATTACHMENT 2

PROGRAM: ATOG TRAINING

UNIT I

WEEK OF _____ TO _____

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
1210-1 Rx Trip 1210-10 Abnormal Transient Rules, Guides & Graphs Prioritization of Cooling Methods	1210-2 Loss of Subcooling Margin 1210-6 Small Break LOCA 1210-7 Large Break LOCA	1210-3 Excessive Cooling 1210-4 Lack of Heat Transfer Mass/Energy for HPI Cooling	1210-8 RCS Super-heated 1210-9 HPI Cooling/ Recovery from Solid Operations	1210-5 OTSG Tube Rupture
Simulator: Unannounced Casualties & LER Drills	Simulator: Unannounced Casualties & LER Drills	Simulator: Unannounced Casualties	Simulator: Unannounced Casualties	Simulator: Unannounced Casualties

CLASSROOM: 0800 - 1130 SIMULATOR: 1200 - 1600