

W.F. Kitchens

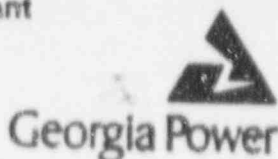
Vogtle Electric Generating Plant  
NUCLEAR OPERATIONS

Procedure No.  
18019-C

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7

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05-090

ABNORMAL OPERATING PROCEDURE

LOSS OF RESIDUAL HEAT REMOVAL

8

PURPOSE

The purpose of this procedure is to identify and correct a loss of RHR capability. The scope of this procedure includes contingency actions for the following cases:

- A. LOSS OF RESIDUAL HEAT REMOVAL WHILE IN MODES 4 OR 5.
- B. LOSS OF RESIDUAL HEAT REMOVAL WHILE IN MODE 6 (Head Removed)

SYMPTOMS

- Unexplained change in RHR flow or discharge pressure.
- Detected RHR system excessive leakage while RHR is in operation.
- Any unexplained raise in RCS temperature while RHR is in operation.
- Any observed loss of RHR system capability while RHR is in operation.

FOR INFORMATION ONLY

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A. LOSS OF RESIDUAL HEAT REMOVAL WHILE IN MODES 4 OR 5

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

CAUTION

During midloop operation with HL dams installed and inadequate RCS venting, a loss of RHR cooling will result in saturated RCS conditions within 10 minutes subsequently resulting in core uncover and requiring containment closure initiation by initiating 14210, CONTAINMENT BUILDING PENETRATION VERIFICATION - REFUELING.

NOTE

- System status information on loss of RHR:
  - Figure 2 - Time to Boiling
  - Figure 3 - Time for Core Uncovery
  - Figure 4 - Heatup Rate
- Continue performing Steps A1 thru A3 until exiting this subprocedure.

A1. Monitor Core Exit TCs.

A1.

- a. IF RHR is lost while in Mode 5,  
THEN check Core Exit TCs less than 200°F.

a.

- Initiate 91001-C, EMERGENCY CLASSIFICATION AND IMPLEMENTATING INSTRUCTIONS.
- Evacuate non-essential personnel and initiate Containment Isolation.
- Go to A11 and initiate charging for core heat removal.

ACTION/EXPECTED RESPONSERESPONSE NOT OBTAINED

b. IF while operating at mid-loop Core Exit TC indication is lost,  
THEN raise the RCS level to 188 ft. 3 in. (Top of Hot Leg)  
AND monitor the RCS temperature with the wide range T-hot.

A2. Check One Train Of RHR - OPERATING.

A2.

- Suspend all operation involving a reduction of RCS boron concentration.
- IF in Mode 4  
AND IF SGs are available for RCS cooling,  
THEN Maintain Tavg below 350°F by maintaining at least one SG filled in the NR and by using steam dumps or SG ARVs.

Go to Step A6.

NOTE

When there are indications of RHR pump cavitation while in Section A of this procedure, return to Step A3.

A3. Monitor operating RHR pump - NOT CAVITATING:

- RHR Pump Amps - NOT FLUCTUATING.
- Discharge flow - NORMAL FOR RCS PRESSURE.
- Discharge pressure - STABLE.

A3. IF running RHR pump is cavitating,  
THEN stop affected RHR pump(s).

Realign misaligned valves in affected RHR train.

Vent affected RHR pump(s):

- HV-10465 (Train A)
- HV-10466 (Train B)

Go to Step A5.

ACTION/EXPECTED RESPONSE

A4. Check Core Exit TCs -  
STABLE OR LOWERING.

Go To Appropriate UOP.

RESPONSE NOT OBTAINED

A4. IF Core exit TCs rising,  
THEN verify affected train  
RHR and CCW flow - Normal.

IF Flows Are Normal,  
AND Core Exit TCs rising,  
THEN go to Step A6.

NOTE

If opening the RHR HL suction valves from the QMCB is blocked due to HV-8804A or HV-8804B being disabled, the HL suction valves may be opened from the Remote Shutdown Panels.

A5. Check Affected RHR Suction  
Valves - OPEN:

- HV-8701A (Train A)
- HV-8701B (Train A)
- HV-8702A (Train B)
- HV-8702B (Train B)

A5. Depressurize RCS - LESS THAN  
365 PSIG:

- a. Use Normal sprays.
- b. Use Aux Spray if letdown  
in service.
- c. Use PRZR PORVs.

Check IF RCS Is Above  
Mid-loop:

- RVLIS YR level - GREATER  
THAN 72% with NO RCPs  
running..
- Local or Remote  
indications - GREATER THAN  
187 FT. ELEV.

IF RCS is NOT Above  
Mid-Loop,  
THEN go to Step A6.

IF RCS is above midloop,  
THEN Open RHR Loop Suction  
valves  
AND THEN go to Step A6.

-OR-

AND THEN go to Step A9.

IF neither Train RHR Suction  
Valves can be opened,  
THEN go to Step A11 for  
alternate RCS cooling.

ACTION/EXPECTED RESPONSERESPONSE NOT OBTAINEDNOTE

If in Mode 5 it may be necessary to vent reactor vessel by opening RHR suction vents or RV head vents to allow gravity flow from RWST.

A6. Check Reactor Vessel level indications above RCS mid-loop:

- RVLIS FR level - GREATER THAN 72% with NO RCPs Running.
- Local Or Remote indications - GREATER THAN 187 FT. ELEV.

A6. a. Dispatch an Operator to locate and isolate any identified leaks.

b. Adjust charging flow to a closed cold leg as necessary to restore RCS level to 189 ft. elev.

c. IF charging NOT available, THEN gravity fill by initiating 13011, RESIDUAL HEAT REMOVAL SYSTEM.

d. IF Reactor Vessel Level NOT restored, THEN shut RHR Suction Valves, one loop at a time, to isolate leak.

e. Initiate ECCS flow using any pumps available:

- SIPs.

- RHR in Injection Mode (depressurize RCS if necessary to obtain injection flow).

f. IF Reactor Vessel Level restored above mid loop:

- RVLIS FR level - GREATER THAN 72% with NO RCPs running.

- Local or Remote indications - GREATER THAN 187 ft.

THEN go to Step A9.

ACTION/EXPECTED RESPONSERESPONSE NOT OBTAINEDNOTE

If either train of RHR becomes inoperable, shut inoperable RHR Train HL Suction valves and shut HL Cross-Connect valves HV-8716A and HV-8716B.

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| <p>A7. Start Other RHR Train By Initiating 13011, RESIDUAL HEAT REMOVAL SYSTEM, with flow throttled - LESS THAN 1300 GPM.</p> <p>A8. Slowly increase RHR flow to 3000 gpm, while monitoring for cavitation actions.<br/>Return To Step A3.</p> <p>A9. IF Open Due To Cavitating RHR Pump,<br/>THEN Shut RHR Suction Vent Valves In Affected RHR Train:<br/><br/> <ul style="list-style-type: none"> <li>• HV-10465 (Train A)</li> <li>• HV-10466 (Train B)</li> </ul> </p> <p>A10. Restart RHR Pump With Flow throttled - LESS THAN 1300 GPM.<br/><br/>           Slowly increase RHR flow to 3000 gpm, while monitoring for cavitation actions.<br/>Return To Step A3.</p> <p>A11. Check if RCS Intact.<br/><br/> <ul style="list-style-type: none"> <li>• No RCS manways open.</li> </ul> </p> | <p>A7. IF Other Train RHR can not be established,<br/>THEN go to Step A9.</p> <p>A10. Go to Step A11 for alternate RCS cooling.</p> <p>A11. IF RCS manways are open,<br/>THEN go to Step A26.</p> |
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ACTION/EXPECTED RESPONSERESPONSE NOT OBTAINED

- A12. Determine what alternate RCS Cooling Is Desired:
- RCS Temperature - LESS THAN 200°F.
  - Maintain RCS cooled by maintaining PRZR level - GREATER THAN 9% using:
    - CCP
    - OR-
    - IF SGs are available for RCS cooling, SG AFW Feed with SGBD bleed.
- A13. IF SGs are available for RCS cooling, THEN verify At Least Two SGs - GREATER THAN 17% NR.
- A14. Start All CRDM Fans.
- A15. Start all Containment Cooling Fans.
- A16. Control RCS Pressure - AT 365 PSIG.
- IF PRZR has bubble, THEN operate PRZR heaters or sprays to control RCS pressure.
  - IF PRZR is solid, THEN control charging and letdown.
- A17. Try To Start An RCP On An Operable SG By Initiating 13003, REACTOR COOLANT PUMP OPERATION.
- A12. IF RCS Temperature is greater than 200°F AND IF SGs are available for RCS cooling, THEN Maintain RCS Temperature using:
- Steam Dumps.
  - OR-
  - SG ARVs.
- IF NO SGs are available for RCS cooling, THEN Open SI Accumulators discharge MOVs for RCS cooling.
- A17. Continue with Step A19.

ACTION/EXPECTED RESPONSERESPONSE NOT OBTAINED

- A18. Initiate Repairs And Applicable Tech. Spec. Requirements.
- A19. Check Core Exit TCs - STABLE OR LOWERING.
- A19. Go to Step A21.
- A20. Continue Attempts To Start One Train RHR.
- IF one train RHR started, THEN return to Step A3.
- A21. Arm COPS And Open Both PRZR PORVs Or Head Vents.
- A22. Operate CCPs At Required Flowrate Per Figure 1.
- A22. Start PDP or align SI Accumulators to establish flowrate. Align flowpath as required.
- A23. Check RHR and RCP Status -
- a. RHR in operation.
- A23. Consult TSC For Appropriate Contingency Actions.
- OR-
- b. One RCP operating on operable SG with two SG levels - GREATER THAN 17% NR.
- A24. Terminate RCS Bleed And Feed.
- A25. Consult TSC For Appropriate UOP.
- A26. Evacuate all non-essential personnel from containment and ensure all personnel are clear of RCS openings.



ACTION/EXPECTED RESPONSERESPONSE NOT OBTAINEDNOTE

Charging should be directed to closed Cold Leg(s) if possible.

A27. Control Charging Flowrate Using Figure 1 To Maintain Core Heat Removal And Vessel Level Above Midloop.

A27. Dispatch an operator to rack in SI Accumulator's Discharge MOV's Breakers.

Open Accumulator discharge MOV's.

Continue attempts to inject borated water into RCS.

Align ~~WEST~~ for gravity drain to RCS.

A28. WHEN Reactor Vessel level Restored Above Midloop, THEN Continue Controlling Level And Return to Step A7.

A29. Consult TSC for recovery actions.

END OF SUB-PROCEDURE TEXT

B. LOSS OF RESIDUAL HEAT REMOVAL WHILE IN MODE 6ACTION/EXPECTED RESPONSERESPONSE NOT OBTAINED

- |  |   |
|--|---|
| <p>B1. Check RCS level - ABOVE RV FLANGE WITH CAVITY FILLED.</p> <p>B2. Suspend all operations involving a reduction of boron concentration.</p> <p>B3. Verify Hot Leg loop suction valves - OPEN:</p> <ul style="list-style-type: none"> <li>• HV-8701A Train A</li> <li>• HV-8701B Train A</li> <li>• HV-8702A Train B</li> <li>• HV-8702B Train B</li> </ul> <p>B4. Check reactor cavity level - GREATER THAN 23 FEET ABOVE RV FLANGE (ELEVATION 217 FT).</p> <p>B5. a. Check for NO LOSS of RCS Inventory:</p> <ul style="list-style-type: none"> <li>• Local Tygon tube steady 23 ft or more above RV flange.</li> <li>• Remote indications 23 ft or more above RV flange.</li> </ul> <p>b. Go to Step B8.</p> <p>B6. Check AUX BLDG &amp; CNMT leak detection system - NORMAL.</p> | <p>B1. Go To Section A of this procedure.</p> <p>B3. Stop affected RHR pump(s) and open loop suction valves.</p> <p>B4. Suspend all fuel movement.</p> <p>a. Maintain RCS level above RV flange.</p> <p style="text-align: center;">-OR-</p> <p>Go to Section A of this procedure.</p> <p>B6. Stop the RHR pumps if a break occurs on RHRS. Dispatch an operator to locate and isolate any leaks.</p> |
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ACTION/EXPECTED RESPONSERESPONSE NOT OBTAINED

- B7. Initiate repairs and applicable Technical Specification requirements.
- B8. IF either train of RHR becomes inoperable while in this section, THEN shut inoperable train HL Suction Valves and shut HL Cross-connect Valves HV-8716A and HV-8716B.
- B9. Try to place either RHR train in operation by initiating 13011, RESIDUAL HEAT REMOVAL SYSTEM.
- B10. WHEN RHR in operation THEN return to procedure in effect.
- B11. Start all Containment Cooling Fans.
- B12. Initiate 13719, SPENT FUEL POOL COOLING AND PURIFICATION SYSTEM, to place both trains in service.
- B13. Place a Normal FHB HVAC train (one normal supply, one normal exhaust, and 3 recirc units) in service by initiating 13320, FUEL HANDLING BUILDING HVAC SYSTEM.
- B14. Check RCS temperature - GREATER THAN 185°F.
- B14. Return to Step B9.

ACTION/EXPECTED RESPONSERESPONSE NOT OBTAINED

B15. Establish RCS feed path  
from RWST:

- CCPs - AT LEAST ONE  
RUNNING.

-OR-

- Verify valve alignment  
for operating pumps.

B15. Manually start pump and  
align valves as necessary.

IF a feedpath can NOT be  
established,  
THEN return to Step B9.

ACTION/EXPECTED RESPONSERESPONSE NOT OBTAINED

## B16. Establish RCS bleed path:

- a. Dispatch an operator to open the following valves inside CNMT:

- Drain valves on at least one RCS loop. (At intermediate legs)

Loop 1: 1201-U4-001  
1201-U4-002

Loop 2: 1201-U4-052  
1201-U4-208

Loop 3: 1201-U4-030  
1201-U4-209

Loop 4: 1201-U4-071  
1201-U4-206

- 1901-U6-242 (RCDT pump suction)

- b. Dispatch an operator to open the following valves in AUX BLDG on applicable unit:

UNIT 1

- 1-1901-U4-041 (Room RA27)
- 1-1901-U4-002 (Room RA49)

UNIT 2

- 2-1901-U4-041 (Room RA73)
- 2-1901-U4-002 (Room RA97)

ACTION/EXPECTED RESPONSERESPONSE NOT OBTAINED

B17. Operate RCDT pumps as required to maintain reactor cavity level greater than 23 feet above reactor vessel flange (elevation 217 ft) and temperature less than 185°F.

B18. Check RHR status - AVAILABLE:

Place RHR in operation.

B19. Terminate bleed and feed.

B20. Go to appropriate UOP.

B18. Return to Step B9.

END OF PROCEDURE TEXT

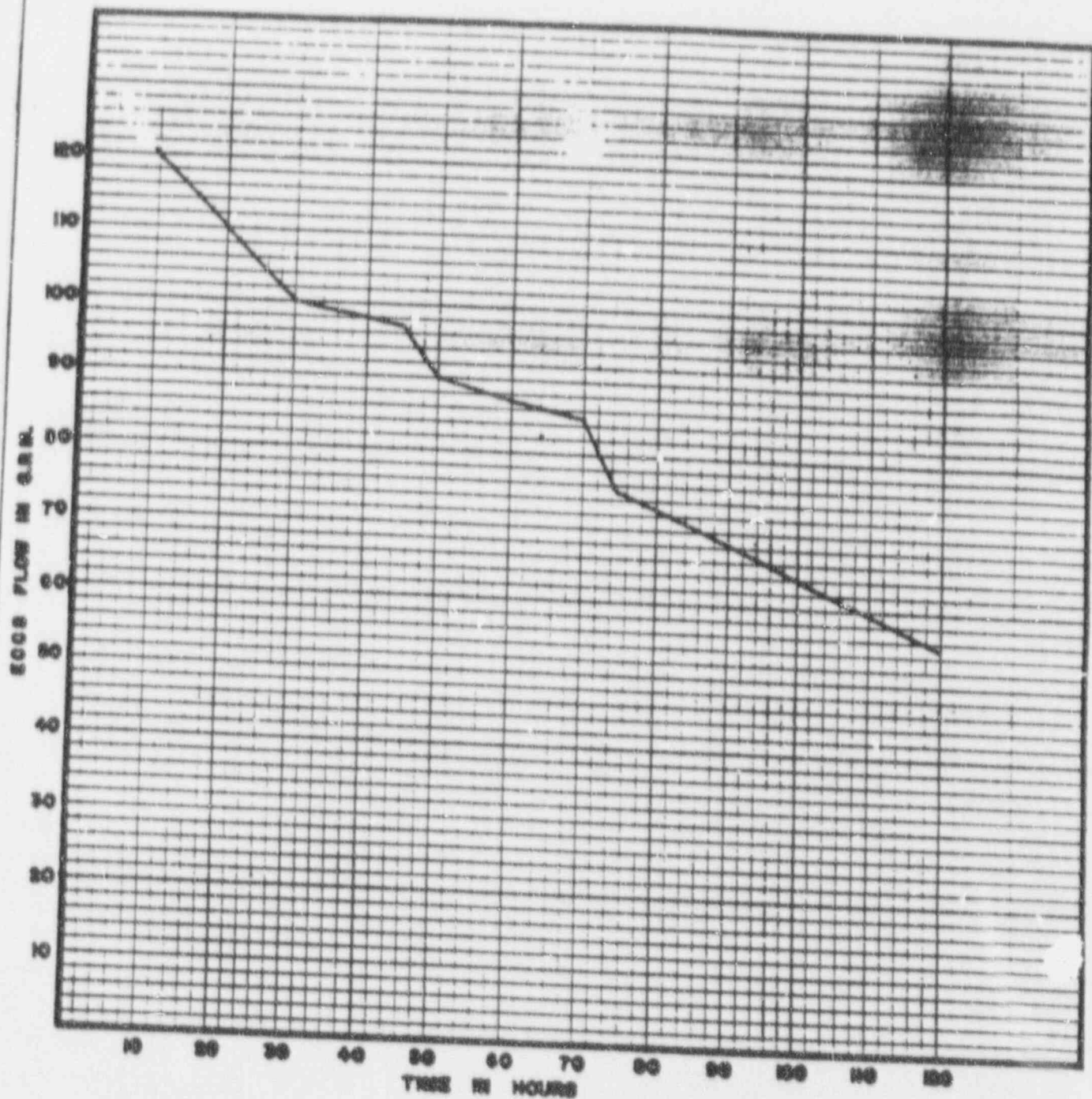


FIGURE 1 - MINIMUM ECCS FLOW VERSUS TIME AFTER REACTOR SHUTDOWN

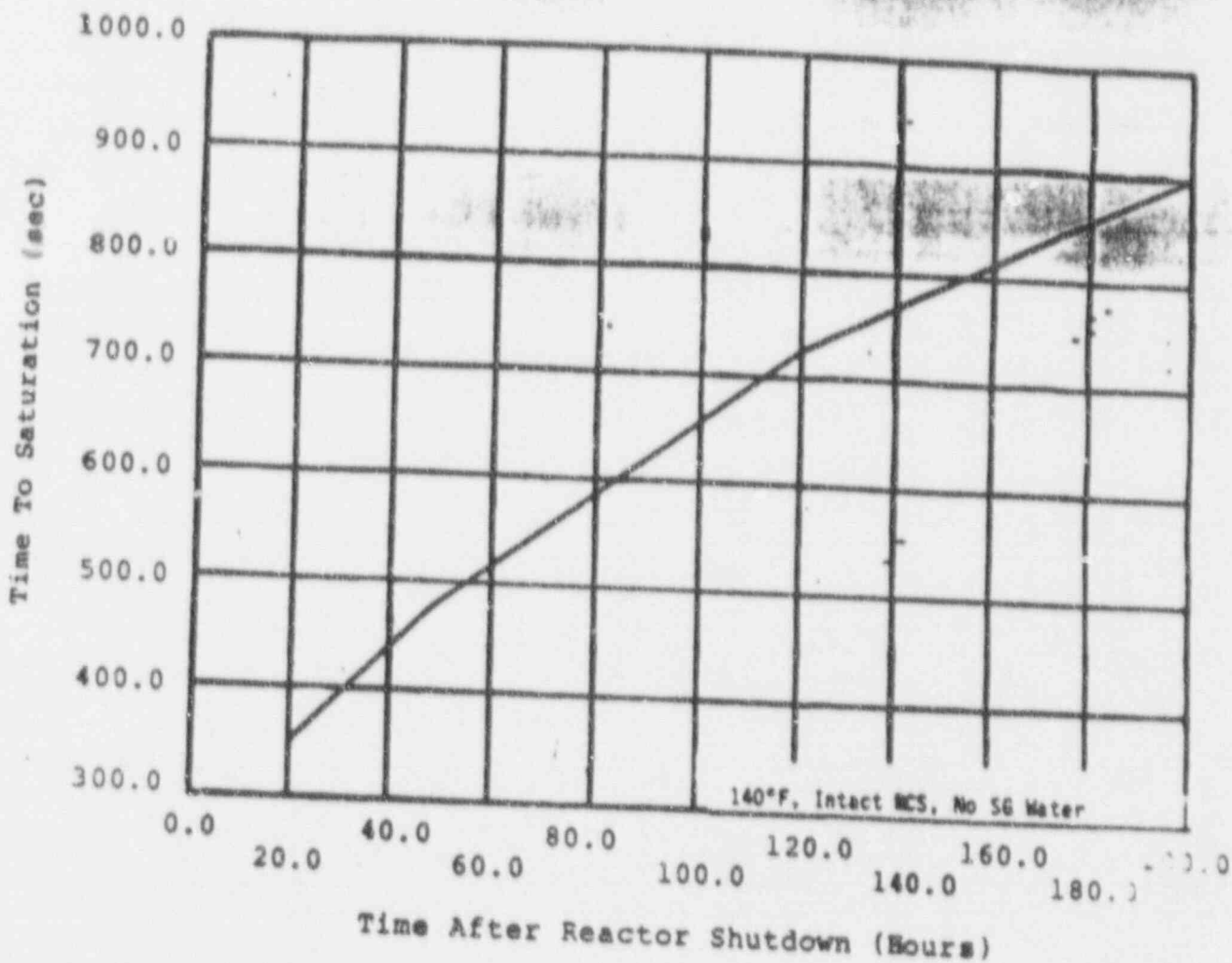


FIGURE 2 - TIME TO BOILING



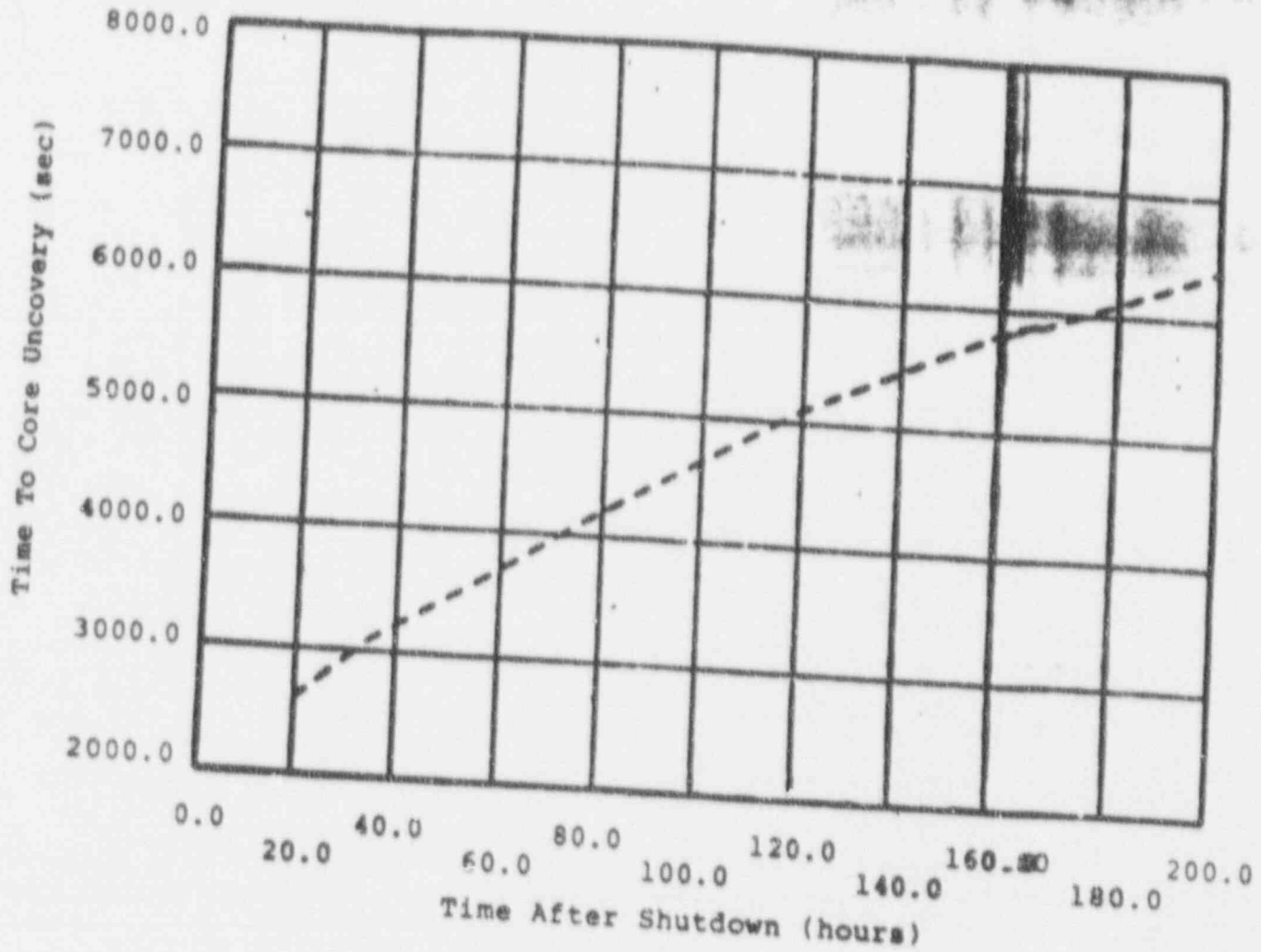


FIGURE 3 - TIME FOR CORE UNCOVERY

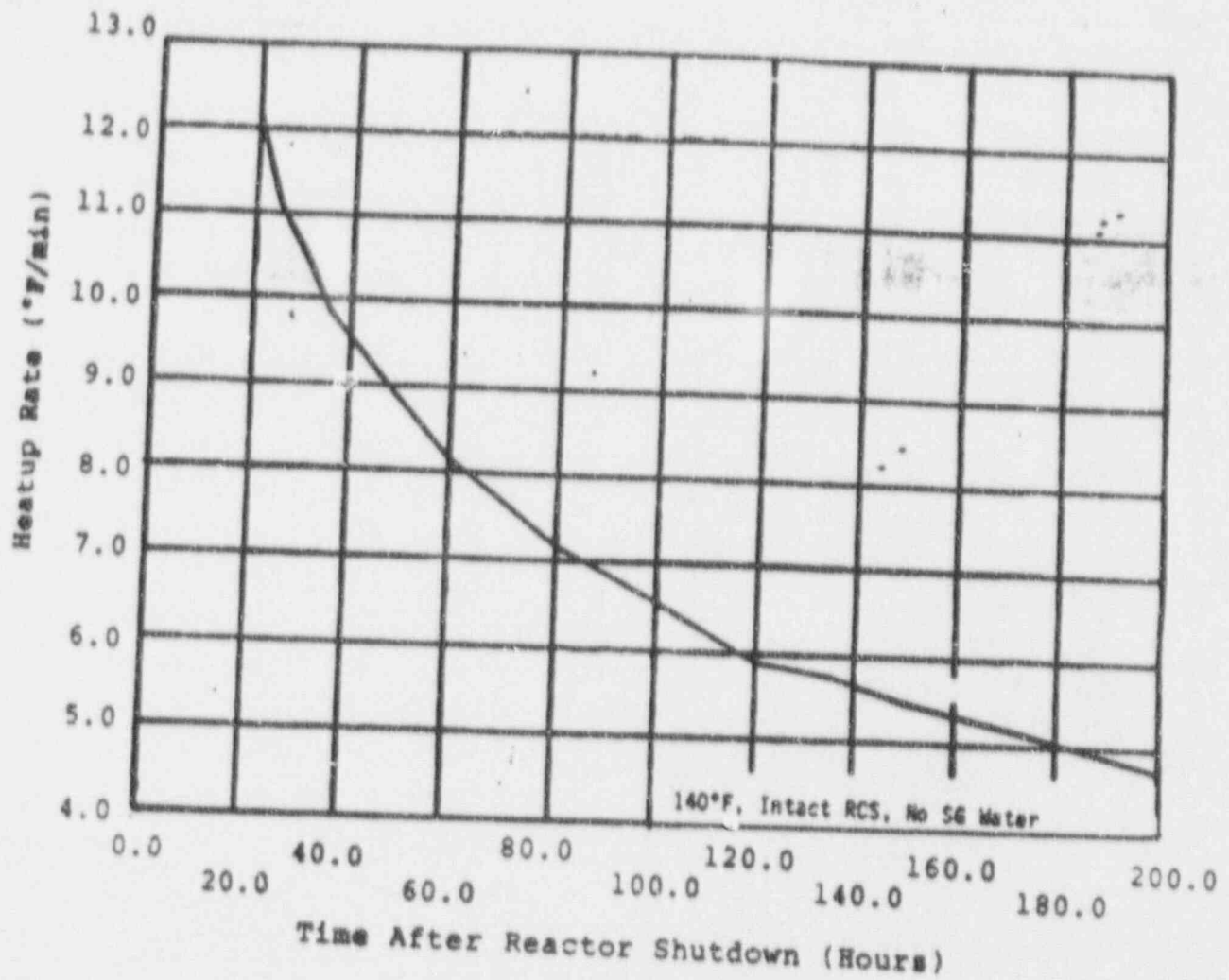


FIGURE 4 - HEATUP RATE