

THREE MILE ISLAND NUCLEAR STATION
UNIT #1 OPERATING PROCEDURE 1102-10
PLANT SHUTDOWNPORC CHAIRMAN
UNIT 1

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Unit 1 Staff Recommends Approval

Approval NA Date —
Cognizant Dept. Head

Unit 2 Staff Recommends Approval

Approval NA Date —
Cognizant Dept. Head

Unit 1 PORC Recommends Approval

C. Hartman Date 8/15/79
Chairman of PORC

Unit 2 PORC Recommends Approval

NA Date —
Chairman of PORC

Unit 1 Superintendent Approval

WEH Date 8/15/79

Unit 2 Superintendent Approval

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STANDING PROCEDURE

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7910100

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THREE MILE ISLAND NUCLEAR STATION
UNIT #1 OPERATING PROCEDURE 1102-10
PLANT SHUTDOWN TO HOT SHUTDOWN

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 - 10.2.1 Equipment
 - 10.2.1.1 Maintain gland sealing after turbine is taken off line.
 - 10.2.1.2 Maintain pressurizer level within the limits of Figure 1.
 - 10.2.1.3 When turbine load is less than 65 MWE (15% reactor power) verify that the turbine bypass valves operate to maintain header pressure setpoint.
 - 10.2.2 Administrative
 - 10.2.2.1 During boration verify boron concentration every estimated 30 ppm.
 - 10.2.2.2 Maintain makeup tank level above the low level alarm.
 - 10.2.2.3 Cooldown rate to 525° F shall be no greater than 140° F/hr.
 - 10.2.2.4 Cooldown of the R.C. System without degassing may result in excess hydrogen and airborne radioactivity when reactor vessel head is removed.

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10.2.2.5 When reactor power is less than 15% FP, do not request a printout of the following computer groups:

Gp.#	Description
20	Worst Case Thermal Condition
31	Fluid Condition
38	Core Average Thermal Condition
39	Core Map Thermal Condition
40	All Thermal Output
54	Selected Assembly Thermal Condition

10.2.2.6 If any Safety Limit (defined in Technical Specification 2.1 and 2.2) is exceeded, the shift supervisor shall notify the Station/Unit Superintendent. The reactor shall be shut down. The licensee shall notify the Commission, review the matter and record the results of the review, including the cause of the condition and the basis for corrective action taken to preclude reoccurrence. Operation shall not be resumed until authorized by the Commission.

10.2.2.7 If, during operation, the automatic safety system does not function as required, the Station/Unit Superintendent shall be notified. The shift supervisor shall take appropriate action as outlined in the Tech Specs. Note that this appropriate action may include shutting down the reactor:
Examples of "failure to function as required" are: (1) Setpoints exceeding limiting safety system settings (2) failure of a protection system component in an untripped state.

10.2.2.8 When a Limiting Condition for Operation (defined in Section 3 of the Technical Specifications) is not met, the shift supervisor shall notify the Station/Unit Superintendent. The reactor shall be shut down or remedial action taken as permitted by the Technical Specifications until the condition can be met. In the event an LCO is not met and the remedial action permitted by the Tech. Specs. does not correct the situation, the licensee shall notify the Commission, review the matter and record the results of the review, including the cause of the condition and the basis for corrective action taken to preclude reoccurrence.

10.3 OPERATING PROCEDURE

NOTE: If plant shutdown is occurring before the refueling shutdown date, follow the plant shutdown procedure which follows.

If plant shutdown is in preparation for the refueling outage, begin boration of the RCS immediately upon start of power reduction. DO NOT flood feedwater nozzles UNTIL the RCS boron concentration is greater than the cold shutdown value from Figure 2. Continue borating toward refueling boron concentration.

Regard all other sections of shutdown procedure which follows.

10.3.1 Prerequisites

NOTE: Indicate satisfactory completion of prerequisites by initialing each step and sign name at end of applicable section.

10.3.1.1 Reactor Operating at Power

10.3.1.2 If shutdown is preparatory to cooldown, degassification should be in progress as per OP 1102-12 and should be completed before reactor power is decreased below 15 percent. OP 1102-12 also includes degassification if forced to shutdown. Degassing may be delayed until the cooldown is started (if modifications to the pressurizer gas space sample system are not completed) to eliminate uncontrolled gas releases. If cooldown is preparatory to opening the Reactor Coolant System for maintenance, degassification should be continued until the hydrogen concentration is reduced to less than 5 cc/kg or as low as practicable.

10.3.1.3 Verify that the required Reactor Coolant System boron concentration has been determined to maintain the reactor at 5% $\Delta k/k$ subcritical at 532°F.

NOTE: Boron concentration depends on length of time at hot shutdown in regard to xenon buildup or whether cooldown is intended.

If the RCS is to be opened to R.B. atmosphere, i.e., safety valve removed, head off, etc., and containment integrity not maintained, it will be necessary to borate to refueling shutdown concentration.

10.3.1.4 If stay at hot shutdown is expected to be less than the time to reach the equilibrium xenon which existed at the time of shutdown (see figure 3), calculate boron concentration requirement to meet 5% $\Delta k/k$ subcriticality limit taking credit for the negative reactivity for 100% FP equilibrium xenon worth.

10.3.1.5 If stay at hot shutdown is expected to approach or be greater than the time to reach the equilibrium xenon which existed at the time of shutdown (see figure 3), commence boration to achieve the boron concentration specified for 5% $\Delta k/k$ subcriticality at 532°F.

NOTE: In case of a stuck Rod or cooldown is certain, Borate immediately to 70°F, 1% $\Delta k/k$ shutdown concentration as shown on Figure 2.

10.3.1.6 Verify that makeup water at the required boron concentration is lined up to be added to the makeup tank when required as per OP 1103-4.

Performed By _____
Signature

Date _____

Reviewed By
SRO or RO License _____
Signature

Date _____

10.3.2 Procedure

NOTE: Indicate satisfactory completion of below steps by initialing each step and sign name at end of applicable section.

10.3.2.1 Log the following in the Control Room Operator's Log Book:

- a) Date and Time
- b) Reactivity Balance from the computer (Operators Group 22)
- c) Rod Position
- d) Boron Concentration
- e) Reactor Coolant Average Temperature
- f) Effective Full Power Days (EFPD)

10.3.2.2 Reduce reactor power using "unit master" to approximately 40%.

10.3.2.3 At approximately 80% reactor power, secure moisture separator drain pumps in accordance with OP 1106-12.

✓ 10.3.2.4 At approximately 305 MWE (40% reactor power):

- a) Reduce the number of operating Main Feedwater Pumps to one (1) as per OP 1106-3.
- b) Reduce the number of operating heater drain pumps to one (1).

10.3.2.4.1 Secure one (1) booster pump and one (1) condensate pump at approximately 25% Reactor Power.

10.3.2.5 Continue reducing ULD to 15% reactor power.

- a) Open turbine drains as per OP 1106-14.

NOTE: When either OTSG goes on low level limit, place SG Load Ratio ΔT_c H/A station to hand as per OP 1105-4.

- b) Place the Loose Parts Monitor Neutron Noise and Loose Parts low alarm switches in DEFEAT per 1105-14.

10.3.2.6 At approximately 15% power, notify Chemistry Department to place OTSG sample lines (CE-8 and 9) in service, obtain samples and maintain flow during shutdown.

10.3.2.7 Place the turbine EHC control to manual, verify that ICS trips to "track" if not already in track and then reduce generator load from the EHC controller to minimum load specified in OP 1106-1. Verify that the turbine bypass valves operate to maintain the turbine header pressure between 895 and 885 psig.

10.3.2.8 If shutdown is preparatory to cooldown reduce the number of operating reactor coolant pumps to one per loop as per OP 1103-6.

10.3.2.9 Shut the letdown isolation valve MU-V3.

10.3.2.10 Add water to the makeup tank to maintain MU tank level in normal operating range as per OP 1104-2.

NOTE: Boric acid concentration of makeup water was previously determined based on shutdown/cooldown condition intended.

10.3.2.11 With both steam generators at low level limit, place the "SG/Reactor Demand Hand/Auto Station in Hand and reduce SG/reactor demand to zero as per OP 1105-4.

10.3.2.12 Place Reactor Demand station in Hand. Decrease reactor power to 10 percent and hold at that level while performing the following:

- a. Take the main generator off line and trip turbine as specified in OP 1106-1. When TMI #1 Generator is tripped (GB102 and GB112 opened), open GB105 and GB115 on order of the Lebanon Dispatcher unless the unit is to be resynchronized within one (1) hour.
- b) Fill the pressurizer water level to 320 inches.

NOTE: Monitor turbine header pressure and turbine bypass valve demand to insure that the bypass valves open to maintain turbine header pressure setpoint.

NOTE: Increase in pressurizer level is necessary to insure makeup capability is not exceeded during following step.

CAUTION: Power reduction to 5% must not exceed a cooldown rate of 140° F/hr.

NOTE: Do not allow pressurizer level to drop below 220 inches.

10.3.2.13 At 5 percent reactor power place the Diamond Rod Control Station to manual and gradually reduce reactor power to 10^{-8} amp on the intermediate range instrumentation.

NOTE: While decreasing reactor power from 5 percent to 10^{-8} amp (a) maintain cooldown limitations of 140° F/hr. (b) if shutdown is to hot shutdown only, place the pressurizer level controller to manual and reduce the pressurizer level to 100 inches, maintaining limits shown in Figure 1. (c) if preparatory to cooldown maintain pressurizer

level controller in auto and maintain level at
220 inches.

- 10.3.2.14 When the reactor is stable at 10^{-8} amps with zero startup rate, record critical data: boron ppm, RCS temperature, rod position, and time/date.
- 10.3.2.15 Insert regulating groups 7, 6 & 5 and leave group 8 at previous operating position.
- 10.3.2.16 If not already done, change to one R.C.P. operating in each loop. Insure that the reactor is 5% $\Delta k/k$ subcritical, borate if necessary (Safety rod groups 2, 3 and 4 can be inserted if necessary).
- 10.3.2.17 Raise OTSG level to 97-99% on the operating range.
- NOTE: Open the bypass line (FWV 85 A & B) around the feedwater control valves fully open, and control OTSG level by opening the Turbine Bypass Valves as necessary to lower level (see Figure #4).
- 10.3.2.18 With the Reactor Coolant Average Temperature between 532 and 525°F, the Safety Rod Group 1 (2, 3 and 4 can also be withdrawn), and the reactor greater than 5% $\Delta k/k$ subcritical (as per Figure 2 boron concentration) the plant is in hot shutdown condition. If cooldown is intended, utilize OP 1102-11 - Plant Cooldown.

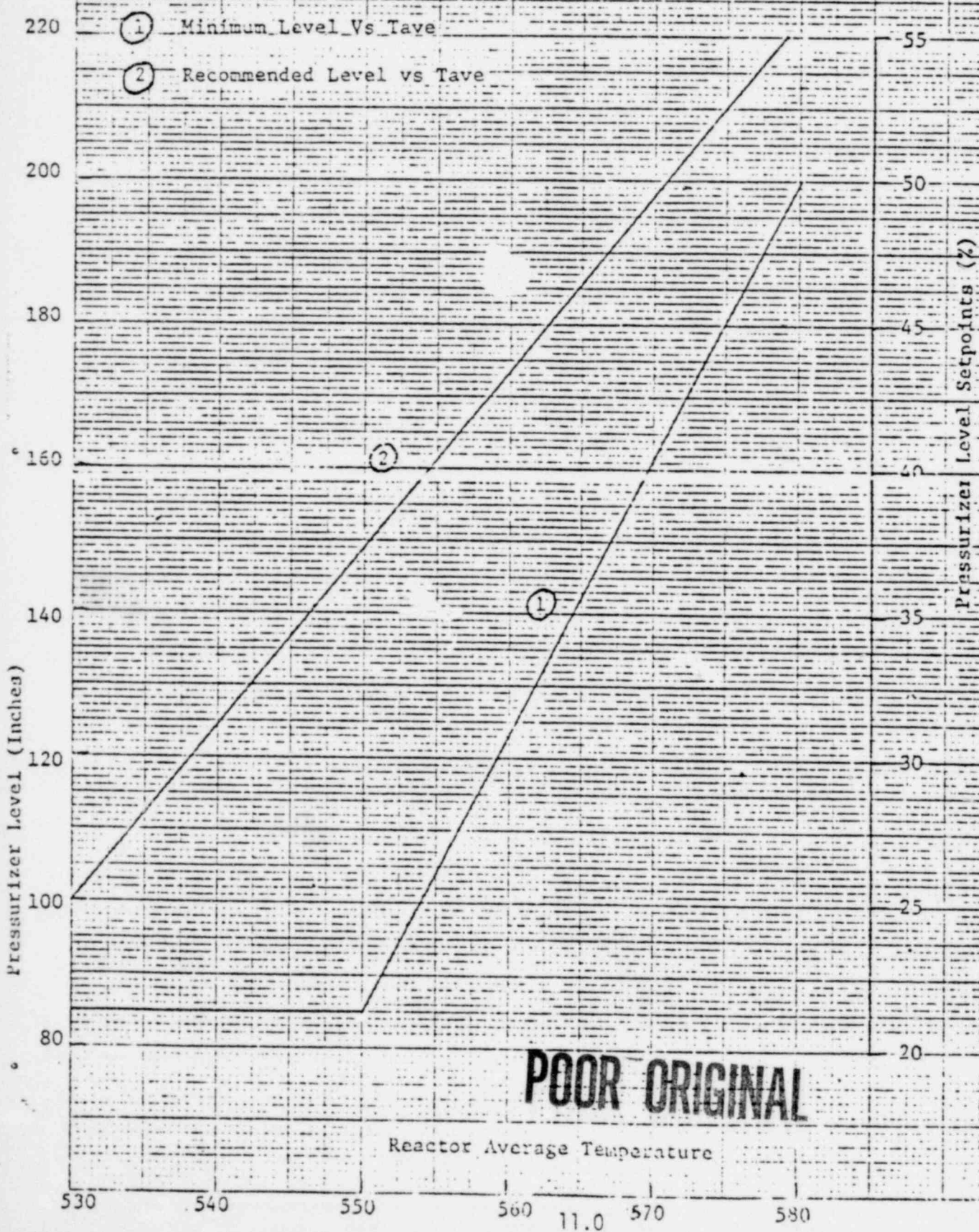
Performed By _____
Signature

Date _____

Reviewed by SRO
or RO License _____
Signature

Date _____

Figure 1

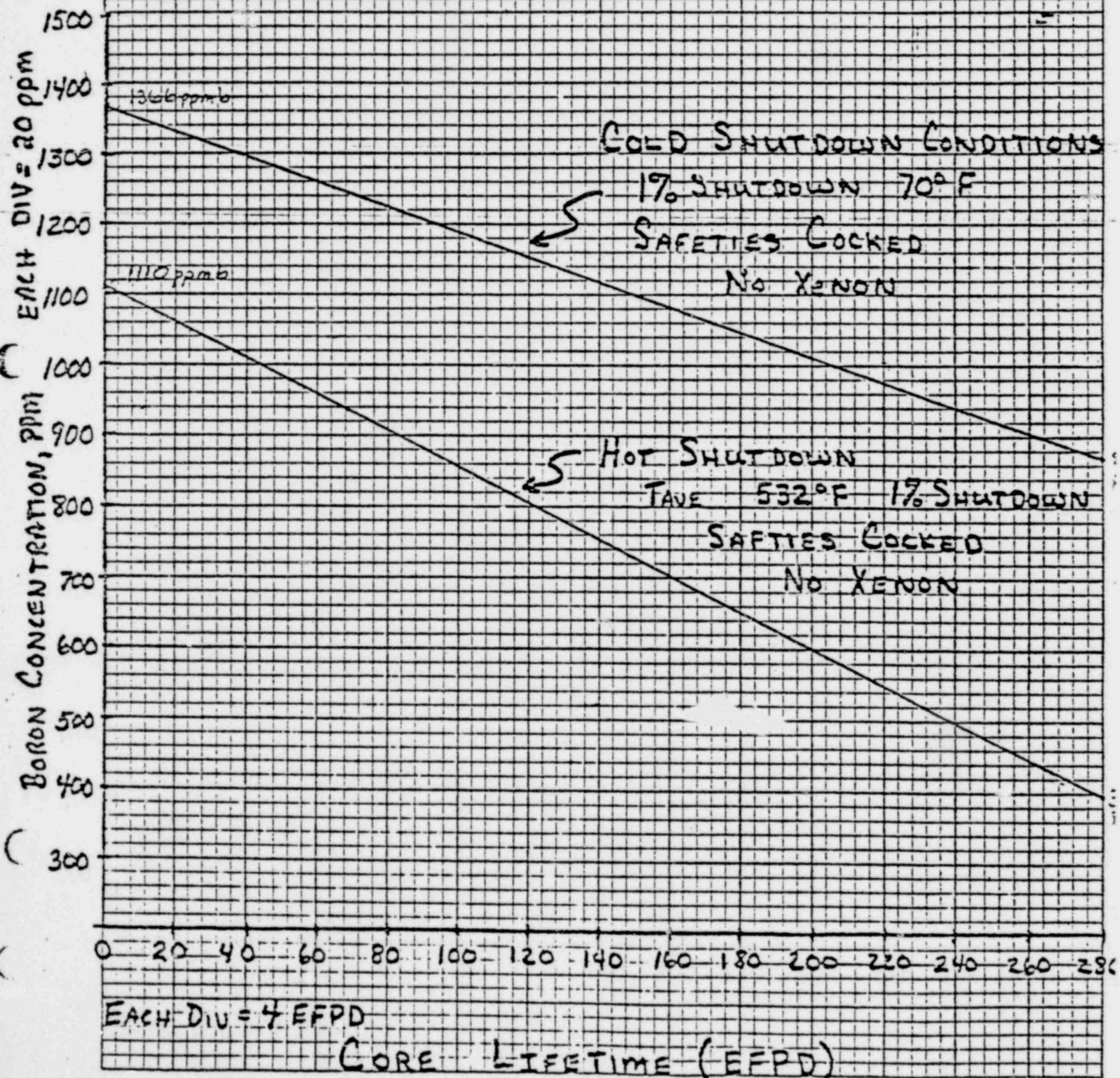


Pressurizer Level Setpoints (°F)

55
50
45
40
35
30
25
20

Reactor Average Temperature

BORON CONCENTRATION VS. CORE LIFETIME CYCLE 5

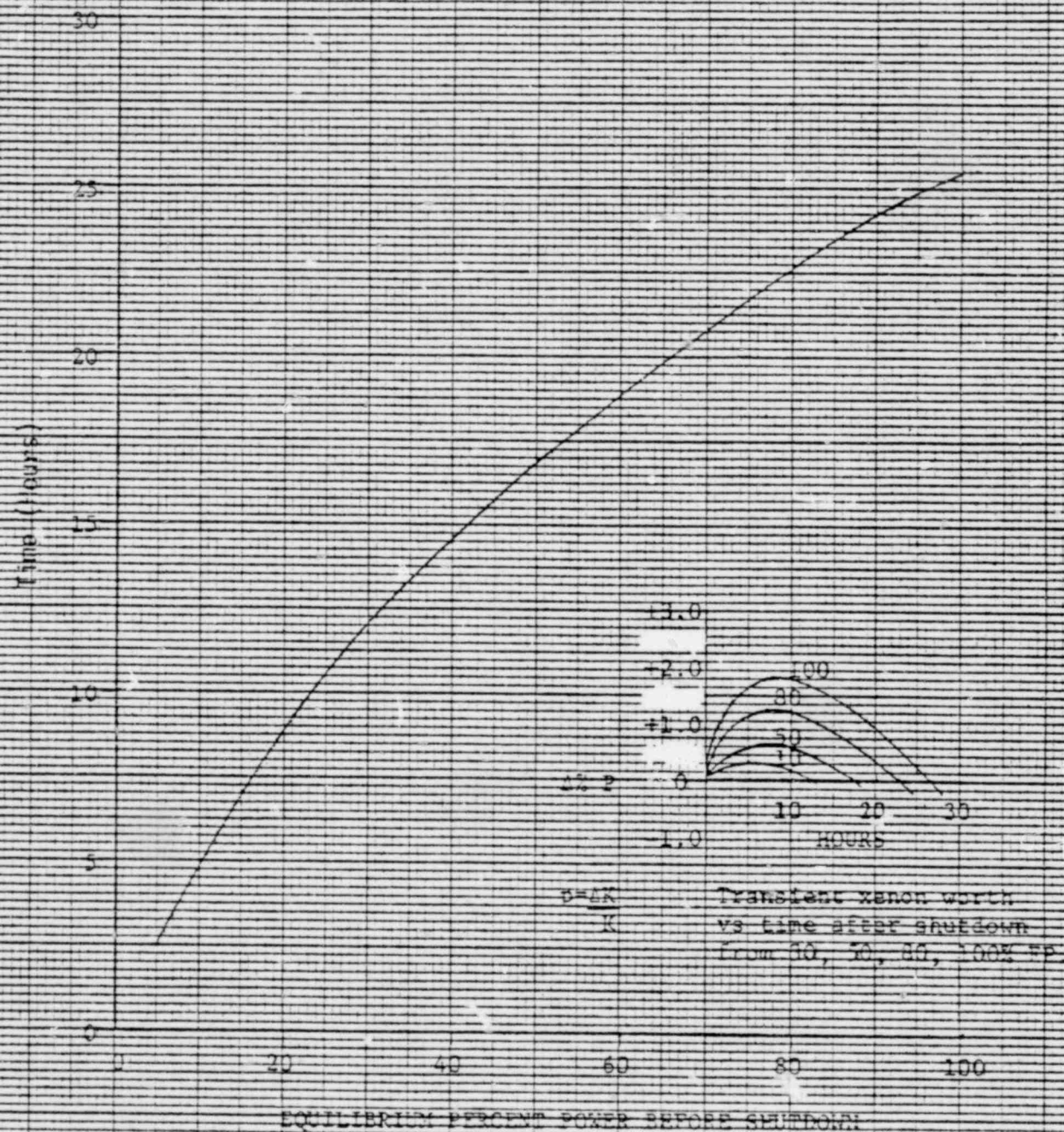


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Figure 3



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FIGURE 1102 10 -4

OTSG LEVEL CONTROL
BELOW 5% POWER

WIDE RANGE OTSG LEVEL, IN.

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MAXIMUM LEVEL

MINIMUM LEVEL

R.C.S. COLD LEG TEMPERATURE, °F

REV 1510N 16
08/15/79

P.F.S.
11/19/73