

METROPOLITAN EDISON COMPANY

THREE MILE ISLAND NUCLEAR GENERATING STATION, UNIT 1

OPERATING
LICENSE NO. DPR-50

Technical Specification
Change Request No. 4
Docket No. 50-289

This Technical Specification Change Request is submitted in support of Metropolitan Edison Company's request for Commission authority to change Appendix A to Operating License No. DPR-50 for the Three Mile Island Nuclear Generating Station, Unit 1. This change would incorporate Technical Specification Change Request No. 4 in order to bring the Three Mile Island Unit 1 reactor into conformance with the requirements set forth in the Staff "Determination of Request for extension of time for submittal of Evaluations Required by Acceptance Criteria for Emergency Core Cooling Systems", dated August 5, 1974.

METROPOLITAN EDISON COMPANY

By

R. Arnold
Vice President - Generation

State of Pennsylvania
County of Berks

Sworn and subscribed to before me this 5th day of ^{SEPTEMBER} ~~August~~, 1974. *RR*

Richard L. Ruth
Notary Public

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Three Mile Island Nuclear Generating Station, Unit 1

Operating License No. DPR-50

Docket No. 50-289

Technical Specification Change Request No. 4

Applicant hereby requests the Commission to change Appendix A as shown by the enclosed changed pages designated "TMI-1 Change Request No. 4."

Reason for Change Request

Changes are requested to impose different operating limits as derived from sections of the B&W Topical ECCS analysis and thereby ensure compliance with 10CFR50.46.

Safety Analysis Justifying Change

Change Request No. 4 establishes operating limits that are in accordance with the results contained in the B&W Topical report, BAW-10091, B&W's ECCS Evaluation Model Report With Specific Application to 177 FA Class Plants With Lowered Loop Arrangement. The safety evaluation supporting these limits is included in B&W Topical Report Nos. BAW-10091 through 10095.



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3.5.2 CONTROL ROD GROUP AND POWER DISTRIBUTION LIMITS

Applicability

This specification applies to power distribution and operation of control rods during power operation.

Objective

To assure an acceptable core power distribution during power operation, to set a limit on potential reactivity insertion from a hypothetical control rod ejection, and to assure core subcriticality after a reactor trip.

Specification

- 3.5.2.1 The available shutdown margin shall not be less than one percent $\Delta K/k$ with the highest worth control rod fully withdrawn.
- 3.5.2.2 Operation with inoperable rods:
- a. Operation with more than one inoperable rod as defined in Specification 4.7.1 and 4.7.2.3 in the safety or regulating rod banks shall not be permitted.
 - b. If a control rod in the regulating and/or safety rod banks is declared inoperable in the withdrawn position as defined in Specification Paragraph 4.7.1.1 and 4.7.1.3, an evaluation shall be initiated immediately to verify the existence of one percent $\Delta k/k$ hot shutdown margin. Boration may be initiated to increase the available rod worth either to compensate for the worth of the inoperable rod or until the regulating banks are fully withdrawn, whichever occurs first. Simultaneously a program of exercising the remaining regulating and safety rods shall be initiated to verify operability.
 - c. If within one hour of determination of an inoperable rod as defined in Specification 4.7.1, it is not determined that a one percent $\Delta k/k$ hot shutdown margin exists combining the worth of the inoperable rod with each of the other rods, the reactor shall be brought to the hot standby condition until this margin is established.
 - d. Following the determination of an inoperable rod as defined in Specification 4.7.1, all rods shall be exercised within 24 hours and exercised weekly until the rod problem is solved.
 - e. If a control rod in the regulating or safety rod groups is declared inoperable per 4.7.1.2, power shall be reduced to 60% of the thermal power allowable for the reactor coolant pump combination.

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- f. If a control rod in the regulating or axial power shaping groups is declared inoperable per Specification 4.7.1.2., operation may continue provided the rods in the group are positioned such that the rod that was declared inoperable is maintained within allowable group average position limits of Specification 4.7.1.2.
- g. If the inoperable rod in Paragraph "E" above is in groups 5, 6, 7, or 8, the other rods in the group shall be trimmed to the same position. Normal operation of 100 percent of the thermal power allowable for the reactor coolant pump combination may then continue provided that the rod that was declared inoperable is maintained within allowable group average position limits in 3.5.2.5.

3.5.2.3

The worth of a single inserted control rod shall not exceed 0.65 percent $\Delta k/k$ at rated power or 1.0 percent $\Delta k/k$ at hot zero power except for physics testing when the requirement of Specification 3.1.9 shall apply.

3.5.2.4

Quadrant tilt:

- a. Except for physics tests if quadrant tilt exceeds 4 percent, power shall be reduced immediately to below the power level cutoff (see Figures 3.5-2A, 3.5-2B, and 3.5-2C). Moreover the power level cutoff value shall be reduced 2 percent for each 1 percent tilt in excess of 4 percent tilt. For less than four pump operation, thermal power shall be reduced 2 percent of the thermal power allowable for the reactor coolant pump combination for each 1 percent tilt in excess of 4 percent.
- b. Within a period of 4 hours, the quadrant power tilt shall be reduced to less than 4 percent except for physics tests, or the following adjustments in setpoints and limits shall be made:
 - 1. The protection system reactor power/imbalance envelope trip setpoints shall be reduced 2 percent in power for each 1 percent tilt.
 - 2. The control rod group withdrawal limits (Figures 3.5-2A, 3.5-2B, 3.5-2C, and 3.5-2D) shall be reduced 2 percent in power for each 1 percent tilt in excess of 4 percent.
 - 3. The operational imbalance limits (Figure 3.5-2E) shall be reduced 2 percent in power for each 1 percent tilt in excess of 4 percent.

- c. If quadrant tilt is in excess of 25 percent, except for physics tests or diagnostic testing, the reactor will be placed in the hot shutdown condition. Diagnostic testing during power operation with a quadrant power tilt is permitted provided the thermal power allowable for the reactor coolant pump combinations is restricted as stated in 3.5.2.4.a, above.
- d. Quadrant tilt shall be monitored on a minimum frequency of once every two hours during power operation above 15 percent of rated power.

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3.5.2.5

Control rod positions:

- a. Operating rod group overlap shall not exceed 25 percent, 15 percent, between two sequential groups except for physics tests.
- b. Except for physics tests or exercising control rods, the control rod insertion/withdrawal limits are specified on Figures 3.5-2A (for up to 100 full power days of operation), Figure 3.5-2B (for 100 to 440 full power days of operation), Figure 3.5-2C (for after 440 full power days of operation) for four pump operation, and Figure 3.5-2D for three or two pump operation. If the control rod position limits are exceeded, corrective measures shall be taken immediately to achieve an acceptable control rod position. Acceptable control rod positions shall be attained within four hours.
- c. Except for physics tests, power shall not be increased above the power level cutoff (See Figures 3.5-2A, 3.5-2B, and 3.5-2C) unless the xenon reactivity is within 10 percent of the equilibrium value for operation at rated power and asymptotically approaching stability.
- d. Core imbalance shall be monitored on a minimum frequency of once every two hours during power operation above 40 percent of rated power. Corrective measures (reduction of imbalance by APSR movement and/or reduction in reactor power) shall be taken to maintain operation within the envelope defined by Figure 3.5-2E. If the imbalance is not within the envelope defined by Figure 3.5-2E, corrective measures shall be taken to achieve an acceptable imbalance. If an acceptable imbalance is not achieved within four hours, reactor power shall be reduced until imbalance limits are met.
- e. Safety rod limits are given in 3.1.3.5.

3.5.2.6

The control rod drive patch panels shall be locked at all times with limited access to be authorized by the superintendent.

3.5.2.7

A power map shall be taken to verify the expected power distribution at periodic intervals of approximately 10 full power days using the incore instrumentation detection system.

Bases

The power-imbalance envelope defined in Figure 3.5-2E, is based on LOCA analyses which have defined the maximum linear heat rate (see Figure 3.5-2F) such that the maximum clad temperature will not exceed the Final Acceptance Criteria. Operation outside of the power imbalance envelope alone does not constitute a situation that would cause the Final Acceptance Criteria to be exceeded should a LOCA occur. The power imbalance envelope represents the boundary of operation

limited by the Final Acceptance Criteria only if the control rods are at the withdrawal/insertion limits as defined by Figures 3.5 2A, 3.5 2B, 3.5-2C, and 3.5-2D and if a ⁴ percent quadrant power tilt exists. Additional conservatism is introduced by application of:

- a. Nuclear uncertainty factors
- b. Thermal calibration uncertainty
- c. Fuel densification effects
- d. Hot rod manufacturing tolerance factors

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The 30 percent overlap between successive control rod groups is allowed since the worth of a rod is lower at the upper and lower part of the stroke. Control rods are arranged in groups or banks defined as follows:

<u>Group</u>	<u>Function</u>
1	Safety
2	Safety
3	Safety
4	Safety
5	Regulating
6	Regulating
7	Xenon transient override
8	APSR (axial power shaping bank)

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Control rod groups are withdrawn in sequence beginning with group 1. Groups 5, 6 and 7 are overlapped 25 percent. The normal position at power is for groups 6 and 7 to be partially inserted.

The minimum available rod worth provides for achieving hot shutdown by reactor trip at any time assuming, the highest worth control rod remains in the full out position(1).

Inserted rod groups during power operation will not contain single rod worths greater than 0.65 percent $\Delta k/k$. This value has been shown to be safe by the safety analysis of the hypothetical rod ejection accident(2). Single inserted control rod worth of 1.0 percent $\Delta k/k$ at beginning of life, hot, zero power would result in the same transient peak thermal power, and therefore, the same environmental consequences as a 0.65 percent $\Delta k/k$ ejected rod worth at rated power.

The plant computer will scan for tilt and imbalance and will satisfy the technical specification requirements. If the computer is out of service, then manual calculation for tilt above 15 percent power and imbalance above 40 percent power must be performed at least every two hours until the computer is returned to service.

The quadrant power tilt limits set forth in Specification 3.5.2.4 have been established within the thermal analysis design base using the definition of quadrant power tilt given in Technical Specifications, Section 1.6.

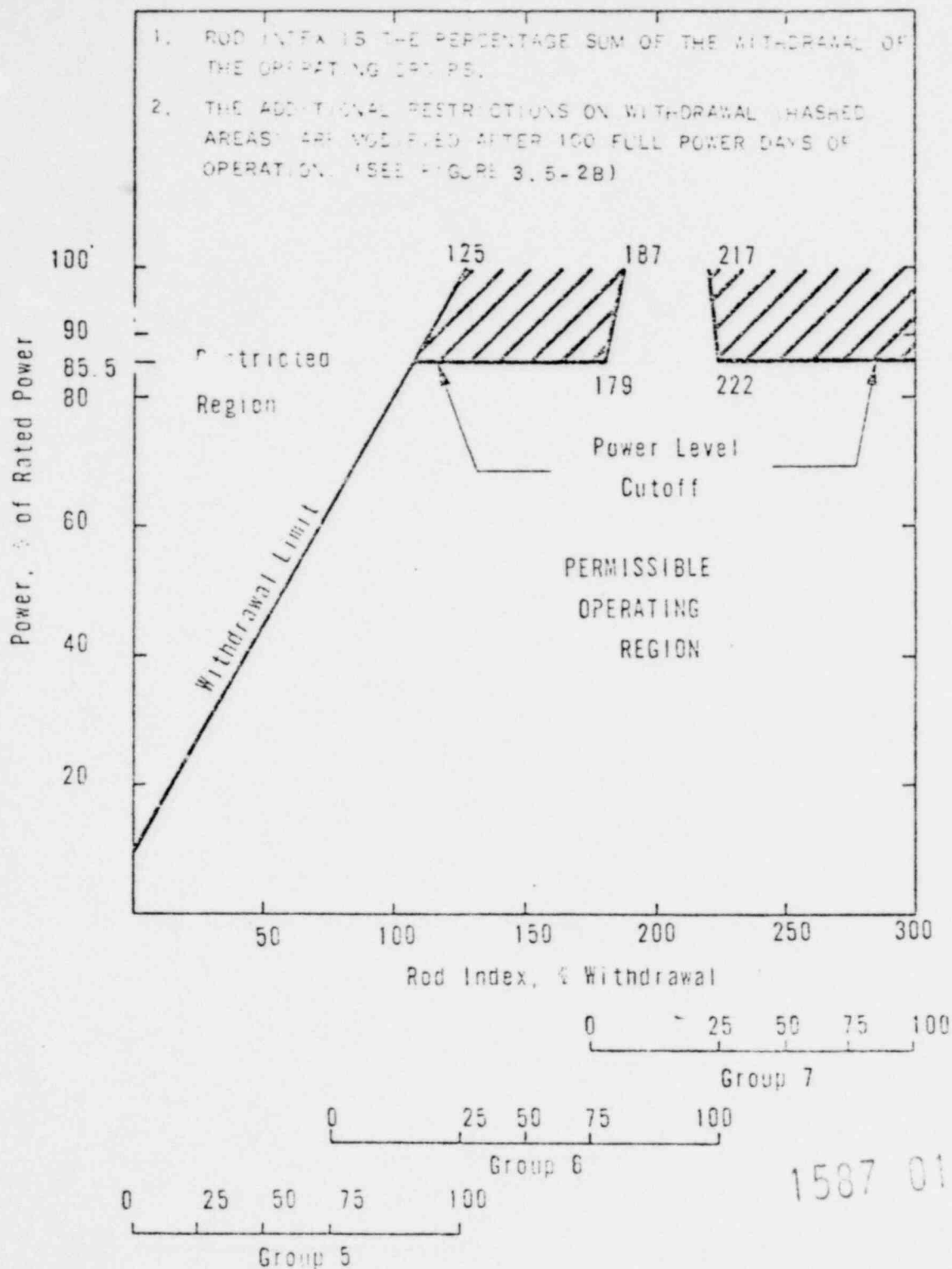
During the physics testing program, the high flux trip setpoints are administratively set as follows to assure an additional safety margin is provided:

<u>Test Power</u>	<u>Trip Setpoint</u>
0	<5%
15	50%
40	50%
50	60%
75	85%
>75	105.5%

REFERENCES

- (1) FSAR, Section 3.2.2.1.2
- (2) FSAR, Section 14.2.2.2

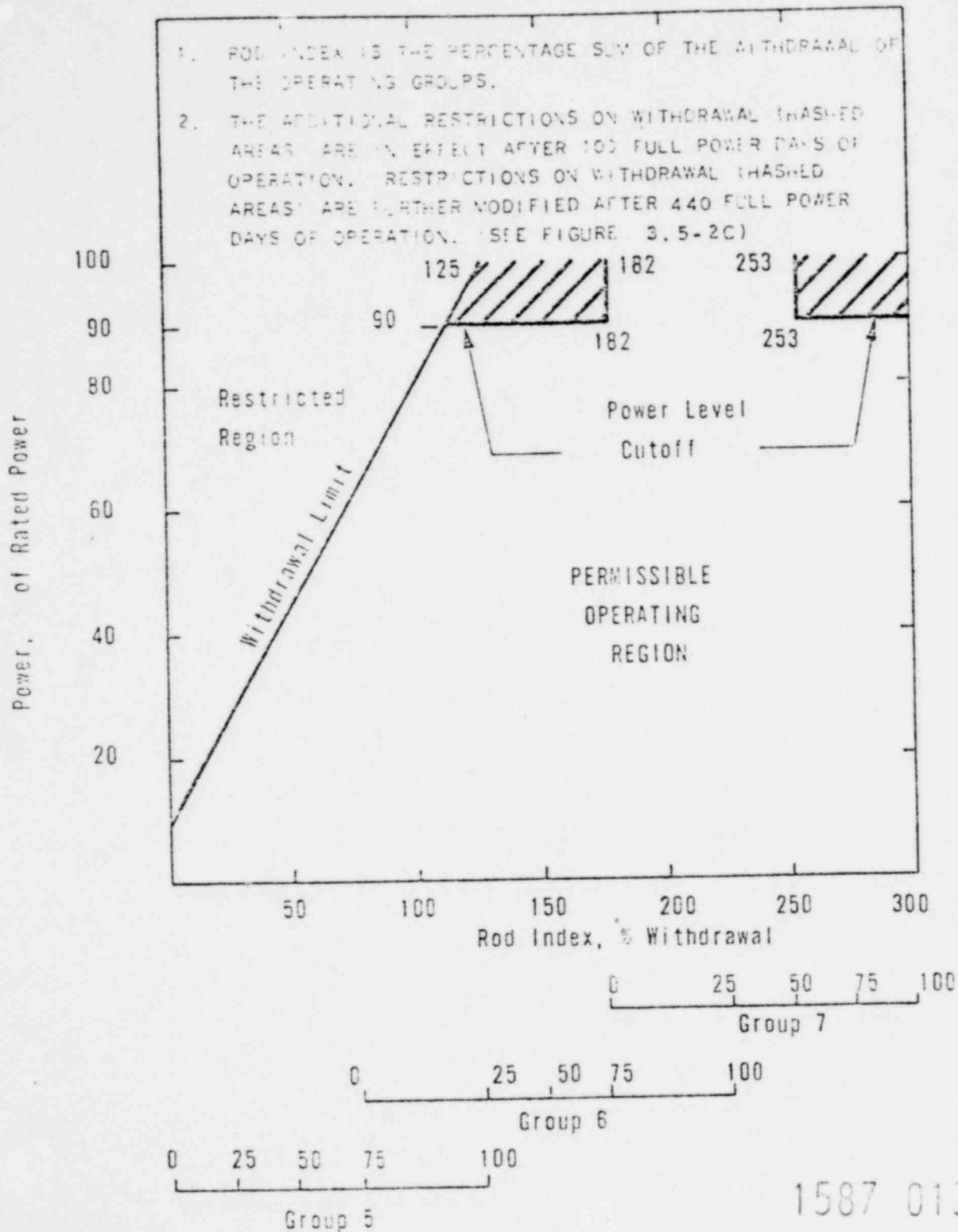
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CONTROL ROD GROUP WITHDRAWAL LIMITS
FOR 4 PUMP OPERATION

Figure 3.5-2A

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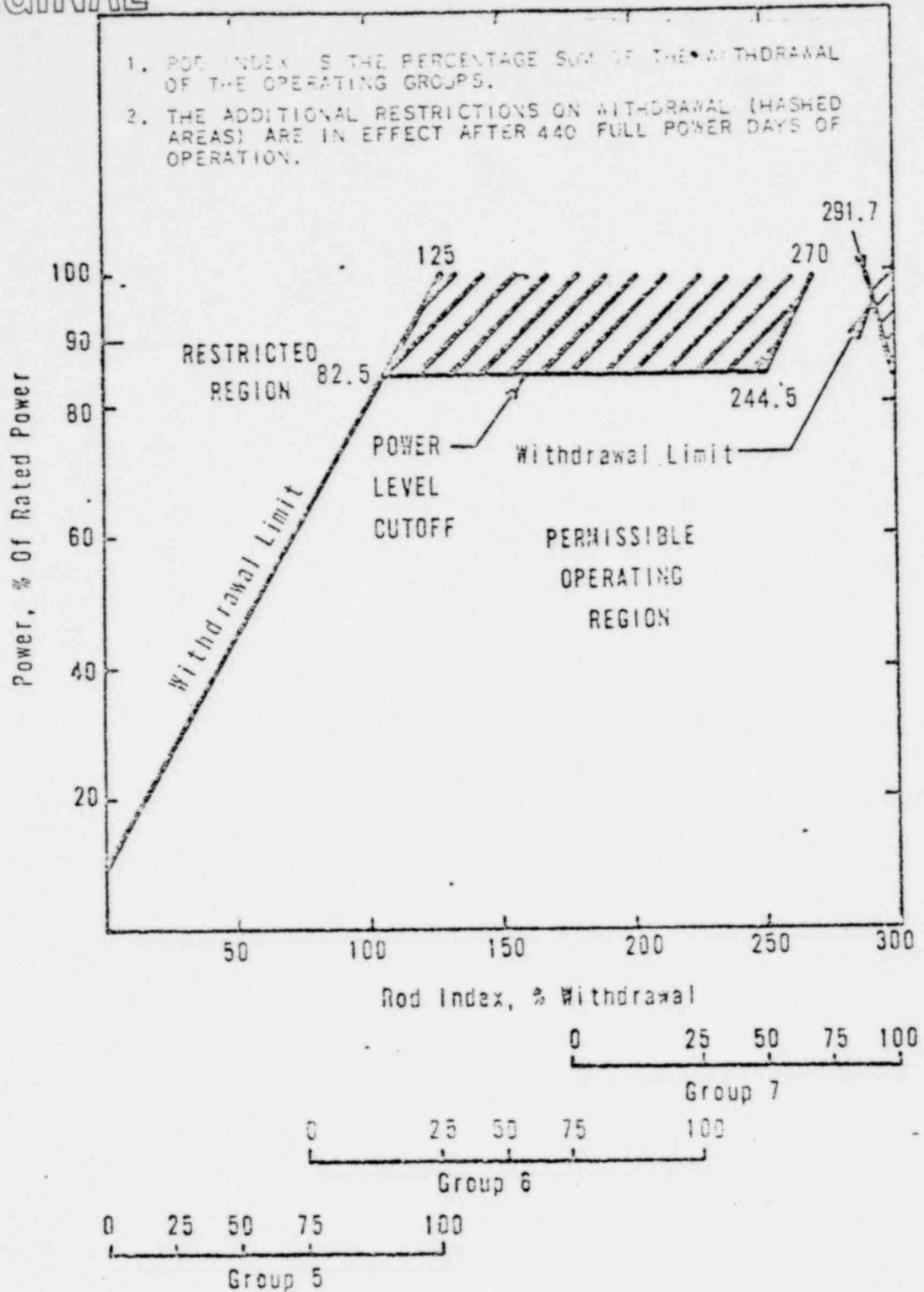


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CONTROL ROD GROUP WITHDRAWAL LIMITS
FOR 4 PUMP OPERATION

Figure 3.5-2B

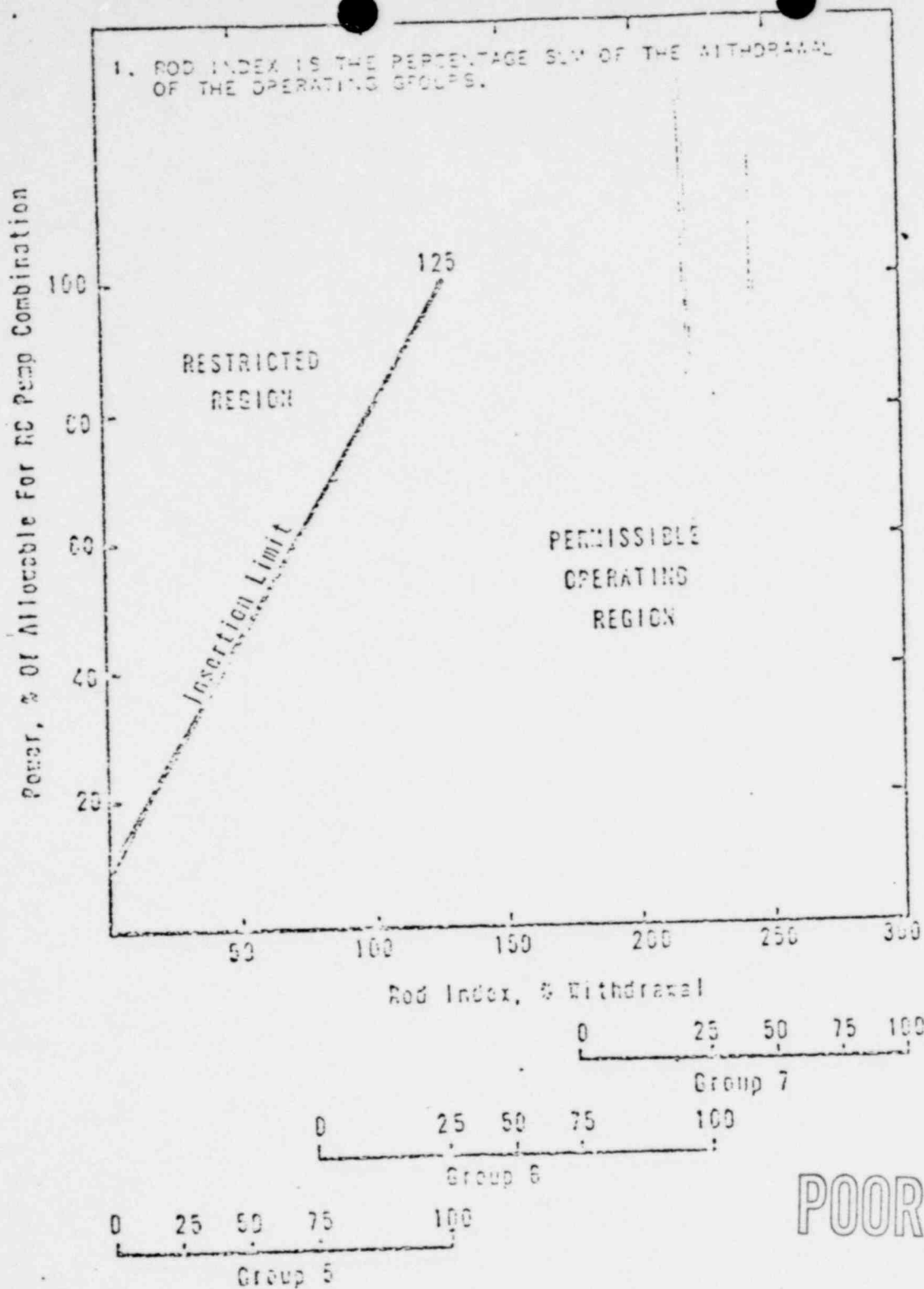
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CONTROL ROD GROUP WITHDRAWAL LIMITS FOR 4 PUMP OPERATION

Figure 3.5-2C

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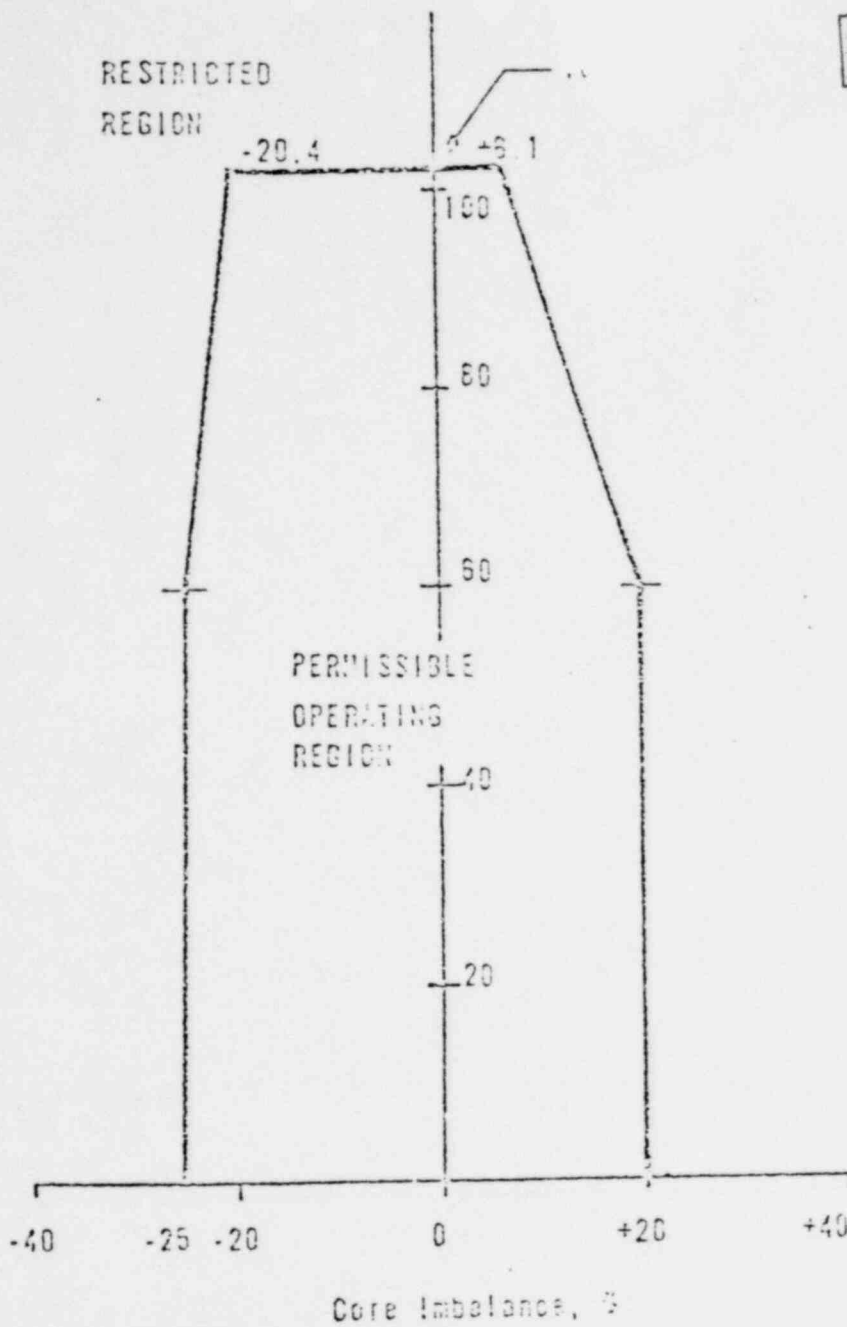
CONTROL ROD GROUP WITHDRAWAL LIMITS FOR
3.0% D27 PUMP OPERATION
TWINHARBOR AND NUCLEAR STATION 1

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FIGURE 2D-2D

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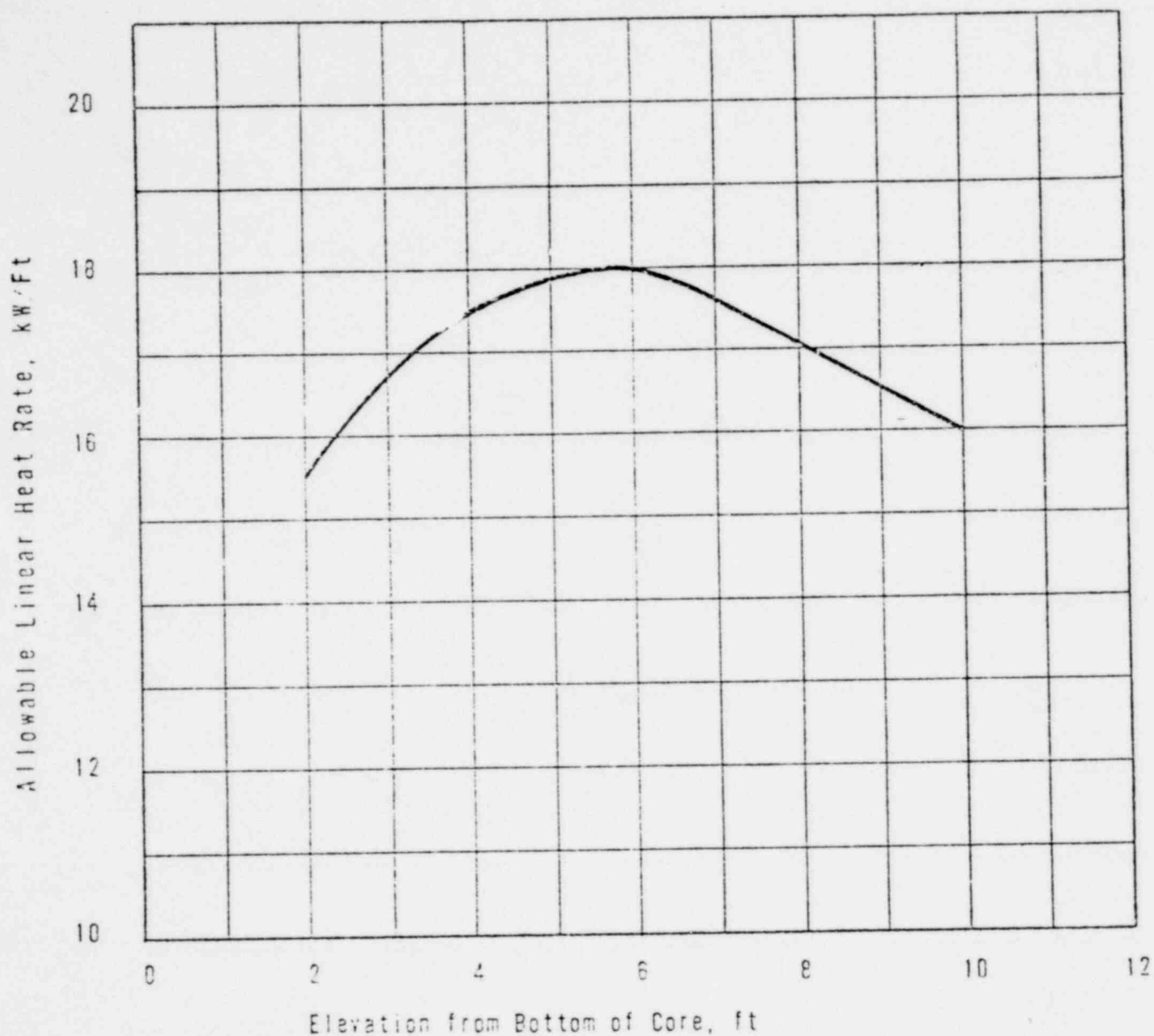
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OPERATIONAL POWER IMBALANCE ENVELOPE
FOR THE ISL-10 NUCLEAR STEAM UNIT

FIGURE 3.5-2E



LOCA LIMITED MAXIMUM ALLOWABLE
LINEAR HEAT RATE
Figure 3.5-2F

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