NORTHEAST UTILITIES
THE CONNECTICUT LIGHT AND POWER COMPANY
WESTERN MASSACHUSETTS ELECTRIC COMPANY
HOLYOKE WATER POWER COMPANY
NORTHEAST UTILITIES SERVICE COMPANY
NORTHEAST NUCLEAR ENERGY COMPANY

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Washington, D.C. 20555

Millstone Nuclear Power Station Unit No. 3
Transmittal of Startup Report

In accordance with Millstone Unit No. 3 Technical Specifications Section 6.9.1.1, Northeast Nuclear Energy Company (NNECo) hereby submits the Startup Report for Cycle 3 of operation within 90 days of completion of the Cycle 3 startup test program.

If you have any questions related to this submittal please contact Mr. David McDaniel at (203) 447-1791 directly.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

Stephen E. Scace
Station Superintendent
Millstone Nuclear Power Station

SES:clc

Attachment: Startup Report

cc: Mr. William Russell
Regional Administrator
U.S. Nuclear Regulatory Commission
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W. Raymond, Senior Resident Inspector, Millstone Unit 1, 2 and 3
D. Jaffe, NRC Project Manager, Millstone Unit 3

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Docket No. 50-423

MILLSTONE NUCLEAR POWER STATION

UNIT NO. 3

STARTUP TEST REPORT

CYCLE 3

OCTOBER 1989

INDEX

1. SUMMARY

Low power Physics Testing and Power Ascension Testing for Millstone 3 Cycle 3 identified no unusual situations or anomalies. All parameters measured were within their acceptance criteria and Technical Specification limits.

2. INTRODUCTION

The Millstone 3, Cycle 3 fuel loading was completed on June 13, 1989. The attached core map (Figure 1) shows the final core configuration. Seventy-six (76) new fuel assemblies were inserted into the core. Major changes from the Millstone 3 Cycle 2 core design are:

a) Use of reconstitutable top nozzle.

b) Use of debris filter bottom nozzle.

c) Use of Six Silver - Indium - Cadmium Control Rods.

d) Use of natural Uranium axial blankets and Integral Fuel Burnable Absorbers (IFBA).

Subsequent operation/testing milestones were completed as follows:

Initial Criticality	July 10, 1989
Low Power Physics Testing Completed	July 11, 1989
Main Turbine On-Line	July 13, 1989
30% Power Testing Completed	July 16, 1989
75% Power Testing Completed	July 17, 1989
100% Power Testing Completed	July 27, 1989

Cycle 3 operation is with 193 Westinghouse manufactured fuel assemblies. The Safety Analysis is supplied by Westinghouse.

3. LOW POWER PHYSICS TESTING RESULTS

Low Power Physics Testing was performed at a power level of $<5 \times 10^{-2}$% power to avoid heat addition from the nuclear fuel.

3.1 Critical Boron Concentrations

Critical Boron Measurements were taken at two different Rod Control Cluster Assembly (RCCA) configurations, at All Rods Out (ARO) and with RCCA Control Banks D, C, B, and A inserted. Figure 2 shows RCCA locations.

The Critical Boron Concentration (CBC) measured with RCCA Bank D at 210 steps was 2010 ppm. Adjusted to All Rods Out, the CBC is 2012.8 ppm. Therefore,

Measured CBC at BOL-HZP-ARO = 2012.8 ppm Boron

Predicted CBC at BOL-HZP-ARO = 2031 ppm

Δ = -18.2 ppm

The Acceptance Criteria is ±50 ppm.

Acceptance Criteria met? Yes.

The Critical Boron Concentration (CBC) measured with Control Banks D, C, B, & A inserted was 1551 ppm.

Measured CBC at BOL-HZP Bank D, C, B, A in = 1551 ppm Boron

Predicted CBC at BOL-HZP Bank D,C,B, A in = 1545 ppm

Δ = 6 ppm

The Acceptance Criteria is ±50 ppm.

Acceptance Criteria met? Yes.

3.2 Moderator Temperature Coefficients

The Moderator/Isothermal/ Temperature Coefficients (MTC/ITC) was measured at two different RCCA configurations, at All Rods Out and with Control Bank D, C, B, & A inserted.

All Rods Out MTC Measurement

The measured MTC value with Control Bank D at 210 steps, an average RCS temperature of 554°F, and an RCS boron concentration of 2010 ppm was .238 x 10^{-4} $\Delta K/K/°F$.

Comparing MTC value to the predicted value yields:

Measured MTC at BOL, ARO = .238 x 10^{-4} $\Delta K/K/°F$

Predicted MTC at = .167 x 10^{-4} $\Delta K/K/°$

Δ = .071 x 10^{-4} $\Delta K/K/°F$

The Acceptance Criteria is $\pm 0.2 \times 10^{-4}$ $\Delta K/K/°F$

Acceptance Criteria met? Yes

In addition to comparing the measured MTC value to the predicted value, it was also required to verify that the Technical Specification MTC limit of $<+.5 \times 10^{-4}$ $\Delta K/K/°F$ at ARO, HZP was met.

Control Banks D, C, B, and A Inserted ITC Measurement

The measured ITC value with Control Banks D, C, B, & A inserted at an average RCS temperature of 555°F and RCS boron concentration of 1546 ppm was $-.785 \times 10^{-4}$ ΔK/K/°F.

Comparing the measured ITC value to the predicted value yields:

ITC at Control Bank D Inserted = $-.785 \times 10^{-4}$ ΔK/K/°F

Predicted ITC BOL, = $-.789 \times 10^{-4}$ ΔK/K/°F

Bank D Inserted Δ = $.004 \times 10^{-4}$ ΔK/K/°F

The Acceptance Criteria is $\pm 0.2 \times 10^{-4}$ ΔK/K/°F

Acceptance Criteria met? Yes

3.3 Control Rod Reactivity Worths

Reactivity worth measurements were performed twice on Control Banks D, C, B, & A. The first measurement involved measuring the reactivity worth of each Bank individually. The second measurement involved measuring the reactivity worth of Control Banks A, B, C and D in their sequenced overlap mode of operation.

The results of the measurements were:

Individual Bank Measurements (by dilution)

Bank	Measured Worths (%ΔK/K)	Predicted Worths (%ΔK/K)	Delta (M-P)	% Difference ((M-P)/P)
CONTROL D	.475	.512	-.037	-7.2%
CONTROL C	.970	.999	-.029	-2.9%
CONTROL B	.967	.965	.002	.207%
CONTROL A	.979	1.067	-.088	-8.25%
Total	3.391	3.543	-.152	-4.3%

Overlap Measurements (by boration)

Control Bank Measured Worths (%ΔK/K) in a Sequenced Overlap

3.381

The Acceptance Criteria for the Total Worth of Measured Control and Shutdown Banks inserted is ±10% of the predicted total worth. The Acceptance Criteria for any individual Control Bank is the greater of either ±0.1% ΔK/K or ±15% of the predicted group worth.

Measurement of Control Rod Reactivity Worth also verifi d Technical Specification Surveillance requirements for SHUTDOWN MARGIN. Adequate SHUTDOWN MARGIN was verified to exist from the Hot Zero Power Rod Insertion Limit.

There is no acceptance criteria for the worth of control banks measured in sequenced overlap.

Acceptance Criteria met on all Banks? Yes

4. POWER ASCENSION TESTING RESULTS

4.1 Power Peaking, and Tilt Measurements

Flux Maps was performed to determine incore power distribution and tilt.

The measurements of these parameters including uncertainty were:

	Rodded			Unrodded			
Power Level	C Fxy	Limit Fxy	RTP Fxy	C Fxy	Limit Fxy	RTP Fxy	Maximum Incore Tilt
30%	1.69	2.03	1.79	1.69	1.90	1.67	1.009
50%	1.64	1.97	1.79	1.65	1.84	1.67	1.013
75%	1.59	1.88	1.79	1.65	1.75	1.67	1.008
100%	N/A	N/A	N/A	1.62	1.67	1.67	1.003

4.2 Boron Measurements

At 100% power, 212 MWD/MTU, Control Bank D at 221 steps and Equilibrium Xenon, the measured boron concentration was 1467 ppm.

Adjusted, Measured boron concentration 100% power, = 1481 ppm.

212 MWD/MTU, ARO, EQ. Xenon

Predicted boron concentration 100% power, = 1495 ppm

212 MWD/MTU, ARO, EQ. Xenon

Δ = - 14 ppm

Subsequent boron measurements made at 2269 MWD/MTU yielded the following results:

Adjusted measured boron concentration 100% power, = 1377.6 ppm

2269 MWD/MTU, ARO, EQ. Xenon

Predicted boron concentration, 100% power, = 1375 ppm

2269 MWD/MTU, ARO, EQ. Xenon

Δ = 2.6 ppm

The Acceptance Criteria is ±130 ppm Boron (±1% $\Delta K/K$)

Acceptance Criteria met? Yes

4.3 Doppler Only Power Coefficient

A Doppler Only Power Coefficient verification factor (C^M) was calculated at 100% and compared to the predicted doppler only power coefficient verification factor (C^P). Measurements were taken at an average power of 98.9%, 587.5°F and RCS boron concentration of 1467 ppm.

Measured	Predicted
C^M Average	C^P
-1.214 °F/%	-.855 °F/%

Acceptance Criteria

The absolute difference between C^M and C^P is <0.5 °F/%

|-1.214| - |-.855| = .359

Acceptance Criteria met? Yes

4.4 RCS Flow

The measured RCS flow at 75% power was 404,620 GPM.

The Acceptance Criteria per Millstone 3 Technical Specifications, is that RCS flow must be greater than 385,210 GPM prior to exceeding 75% power.

Acceptance Criteria met? Yes

4.5 Power Distribution

Power Distribution Maps are shown for 30% and 100% power conditions in Figures 3 and 4. The agreement between the measurements and the predictions is good.

The Acceptance Criteria is that all locations are within ±10% of the predicted value.

Acceptance Criteria met? Yes

5. REFERENCES

5.1 In-Service Test 3-89-008, Initial Criticality/Low Power Physics Test - Cycle 3.

5.2 In-Service Test 3-89-13, Power Ascension Test - Cycle 3.

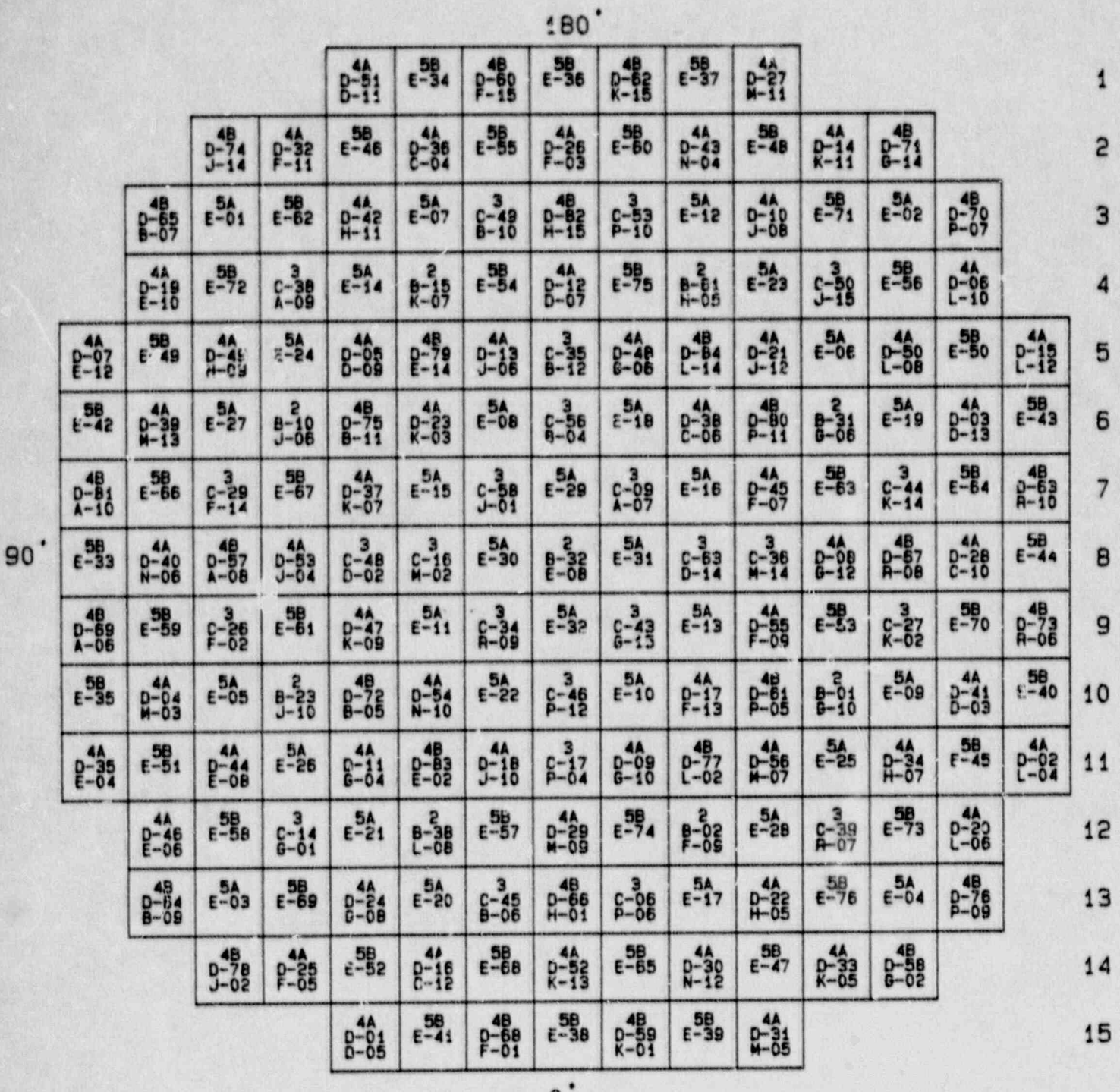
5.3 Westinghouse Nuclear Design Report - Cycle 3.

5.4 ANSI/ANS - 19.6.1 - 1985 Reload Startup Physics Tests for Pressurized Water Reactors.

FIGURE 1

Reference Core Loading Pattern

MILLSTONE UNIT 3 CYCLE 3



REGION # ASSEMBLIES W/O U-235

2	9	2.9
3	21	3.4
4A	56	3.5
4B	28	3.8
5A	32	4.1
5B	44	4.5

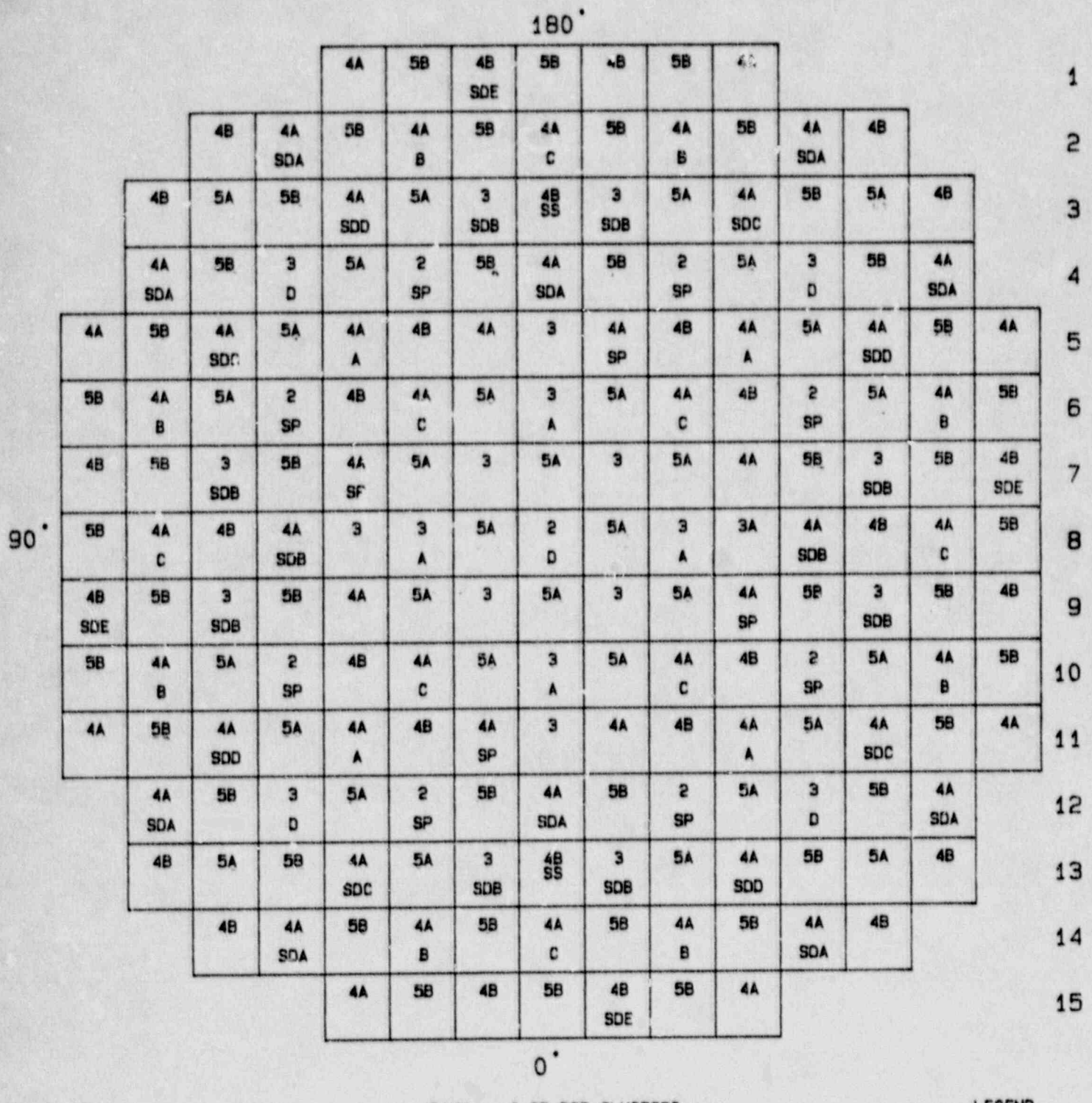
LEGEND

REGION
ASSEMBLY ID
PREV. LOC.

FIGURE 2

Reference Core Control Rod and Burnable Absorber Pattern

MILLSTONE UNIT 3 CYCLE 3



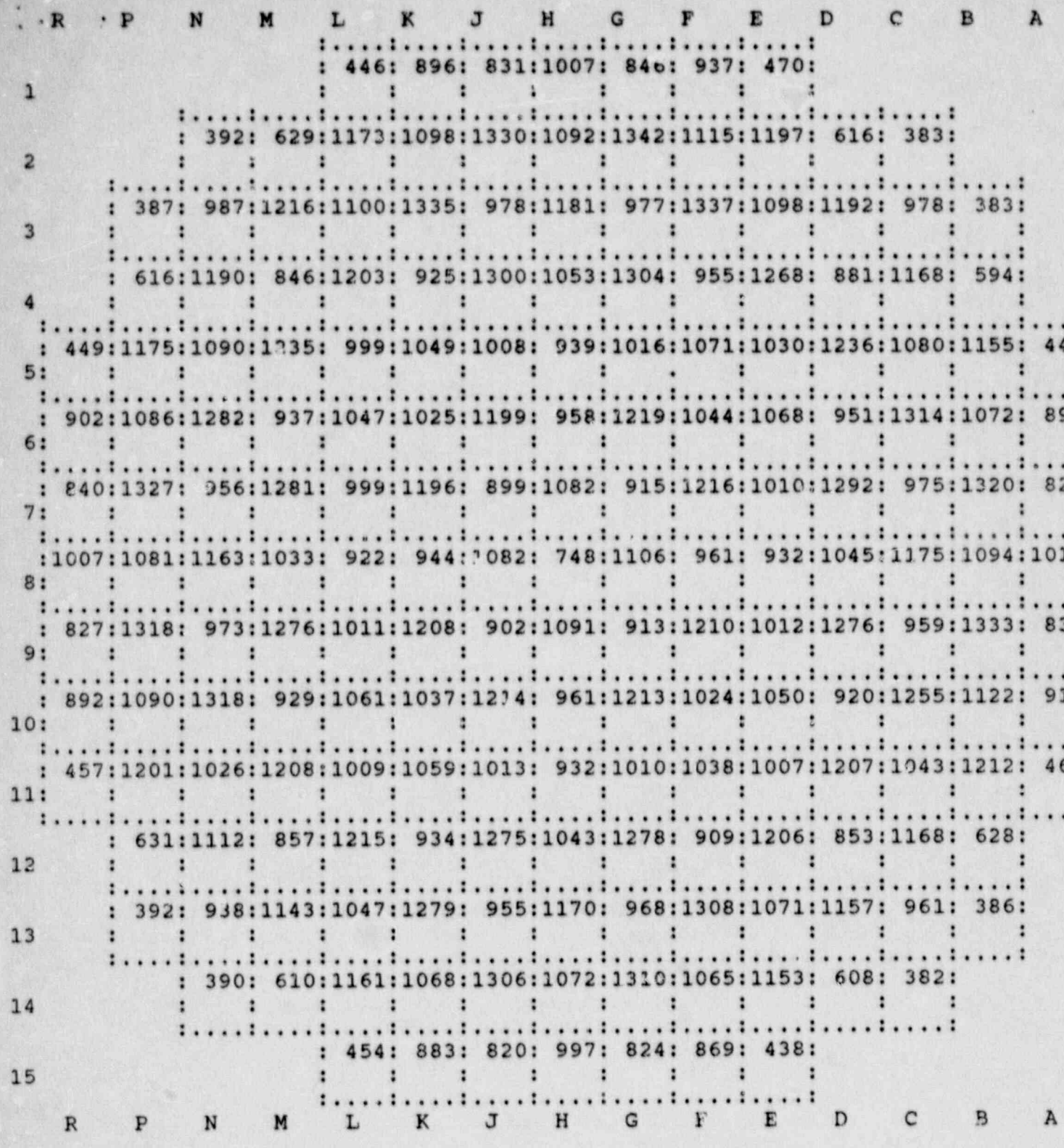
BANK	# OF ROD CLUSTERS
SDA	10
SDB	10
SDC	4
SDD	4
SDE	4
D	5
C	8
B	8
A	8

LEGEND

REGION

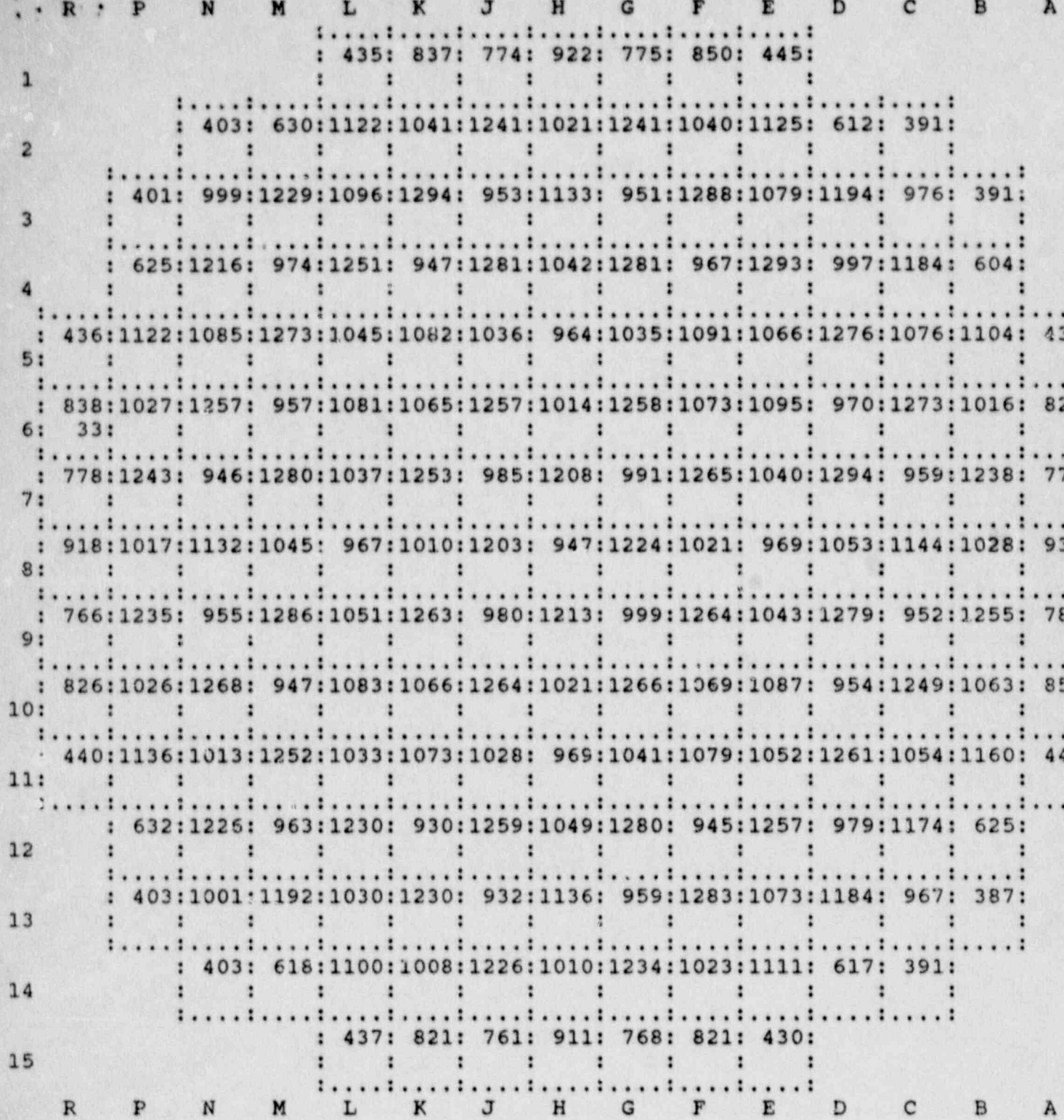
ROD BANK

FIGURE 3



INCORE ASSEMBLY POWER DISTRIBUTION 30% POWER

FIGURE 4



INCORE ASSEMBLY POWER DISTRIBUTION 100% POWER