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Oconee Unit 3

(2-P)

ENCLOSURE

Attachment 1:
Amendment to BAW-1432
Oconee 3, Cycle 2
Reload Report
October 20, 1976

Attachment 2:
Proposed Revisions to Oconee Nuclear Station
Technical Specifications
October 20, 1976

(19-P)

FOR ACTION/INFORMATION

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NRC FORM 195 (2-76)

DUKE POWER COMPANY
POWER BUILDING
422 SOUTH CHURCH STREET, CHARLOTTE, N. C. 28242

E. D. POWELL
ASSISTANT VICE PRESIDENT
PRODUCTION AND TRANSMISSION

October 20, 1976

TELEPHONE: AREA 704
374-4682

Mr. Benard C. Rusche, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. A. Schwencer, Chief
Operating Reactors Branch No. 1

Re: Oconee Unit 3
Docket No. 50-287

Dear Sir:

My letter dated July 21, 1976 proposed revisions to the Oconee Nuclear Station Technical Specifications to assure the operation of the Oconee 3, Cycle 2 core within acceptable fuel design and performance criteria. Subsequent to this submittal, it has become necessary to replace four of the proposed replacement fuel assemblies with those of a slightly different enrichment. Attachment 1 provides an amendment to Babcock & Wilcox Report BAW-1432, "Oconee Unit 3, Cycle 2 Reload Report" which demonstrates the acceptability of this action.

Pursuant to 10CFR50, §50.90 proposed changes to the Oconee Nuclear Station Technical Specifications are requested which will provide for the operation of Oconee Unit 3, Cycle 2 with the above changes. These revisions are incorporated in the revised figures shown in Attachment 2.

Very truly yours,

E. D. Powell

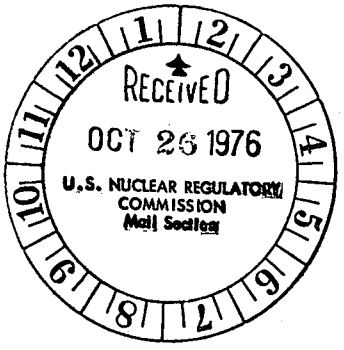
E. D. Powell

MST:ge
Attachment(s)

E. D. POWELL, being duly sworn, states that he is Assistant Vice President of Duke Power Company; that he is authorized on the part of said Company to sign and file with the Nuclear Regulatory Commission this request for amendment of the Oconee Nuclear Station Facility Operating Licenses DPR-38, DPR-47, and DPR-55; and that all statements and matters set forth therein are true and correct to the best of his knowledge.

E. D. Powell

E. D. Powell, Assistant Vice President



ATTEST:

John C. Goodman, Jr.

John C. Goodman, Jr.
Assistant Secretary

Subscribed and sworn to before me this 20th day of October, 1976.

Edna B. Farmer

Notary Public

My Commission Expires:

October 24, 1977

10819

DUKE POWER COMPANY
POWER BUILDING
422 SOUTH CHURCH STREET, CHARLOTTE, N. C. 28242

E. D POWELL
ASSISTANT VICE PRESIDENT
PRODUCTION AND TRANSMISSION

October 20, 1976

TELEPHONE: AREA 704
374-4682

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Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
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s/E. D. Powell
E. D. Powell, Assistant Vice President

ATTEST:

s/John C. Goodman, Jr.
John C. Goodman, Jr.
Assistant Secretary

Subscribed and sworn to before me this 20th day of October, 1976.

s/Edna B. Farmer
Notary Public

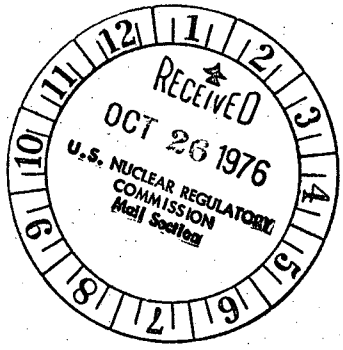
My Commission Expires:

October 24, 1977

ATTACHMENT 1

AMENDMENT TO BAW-1432
OCONEE 3, CYCLE 2

RELOAD REPORT



October 20, 1976

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1. Introduction

This report amends the Oconee Unit 3, Cycle 2 Reload Report BAW-1432 dated June, 1976 to account for modifications to the core loading plan. The revised core loading plan for Oconee Unit 3, Cycle 2 will have four 2.64 wt % uranium-235 Mark B fuel assemblies replacing four 2.53 wt % uranium 235 Mark B fuel assemblies originally intended to be inserted in Cycle 2.

The revised loading was selected because it yields minimum perturbation to the core power distribution and shutdown margin. Core operational margins do not change. Loading four assemblies introduces no quadrant power tilt into the core. The inclusion of these four fuel assemblies does not affect the results of the core safety analyses or limiting conditions for operations as documented in BAW-1432. Therefore, the operation of Oconee Nuclear Station, Unit 3 at the rated core power of 2568 is fully justified.

The following paragraphs describe the four replacement fuel assemblies and the effects of inserting these assemblies in Cycle 2.

2. General Description

Figure 1 is the revised core loading diagram for Oconee 3, Cycle 2. The initial enrichments of batches 2A, 2B, and 3 were 2.60, 2.67, and 3.00 wt % uranium-235, respectively. Batch 4A contains 52 fuel assemblies enriched to 2.53 wt % uranium-235 and batch 4B contains four fuel assemblies enriched to 2.64 wt % uranium-235. The nominal fuel assembly loadings are 463.6 kg of uranium for Batches 2A, 2B, 3 and 4A and 468.25 kg of uranium for Batch 4B. Figure 2 is an eighth-core map showing the assembly burnup and enrichment distribution at the beginning of Cycle 2. Control rod group designations are the same as shown in BAW-1432.

3. Fuel System Design

A comparison of the fuel rod design parameters for Oconee 3 Batches 4A and 4B is shown in Table 1. The mechanical evaluation of the minor differences in fuel rod design is discussed below.

Cladding Collapse

The Batch 4B fuel rods are identical to the Batch 4A fuel rods in pellet density and rod prepressure. These parameters indicate acceptable cladding collapse times as were determined for the Batch 4A fuel.

Cladding Stress

The Batch 4B fuel rods are identical to the Batch 4A fuel rods in pellet density and rod prepressure. Therefore, the Batch 4B fuel rods are completely equivalent with Batch 4A fuel rods from a cladding stress point of view.

Fuel Pellet Irradiation Swelling

The fuel design criteria specify a limit of 1.0% on cladding circumferential plastic strain. The Batch 4B pellet design is set so that the plastic cladding strain is less than 1% at 55,000 MWH/MTU. The conservatisms in this analysis are identical to those listed in Section 4.2.3 of BAW-1432.

TABLE 1

FUEL ROD DESIGN PARAMETERS

Component	Oconee III, Batch 4A	Oconee III, Batch 4B
Fuel Assembly Type	Mark B4	Mark B4
Initial Fuel Enrichment, Wt % ^{235}U	2.53	2.64
Fuel Rods		
OD, Inch	0.430	0.430
ID, Inch	0.377	0.377
Fuel Pellets		
Diameter, Inch	0.3695	0.3697
Fuel Density, % TD	94.0	94.0
Undensified Active Fuel Length, in.	142.2	143.5

Figure 1. Core Loading Diagram for Oconee 3, Cycle 2

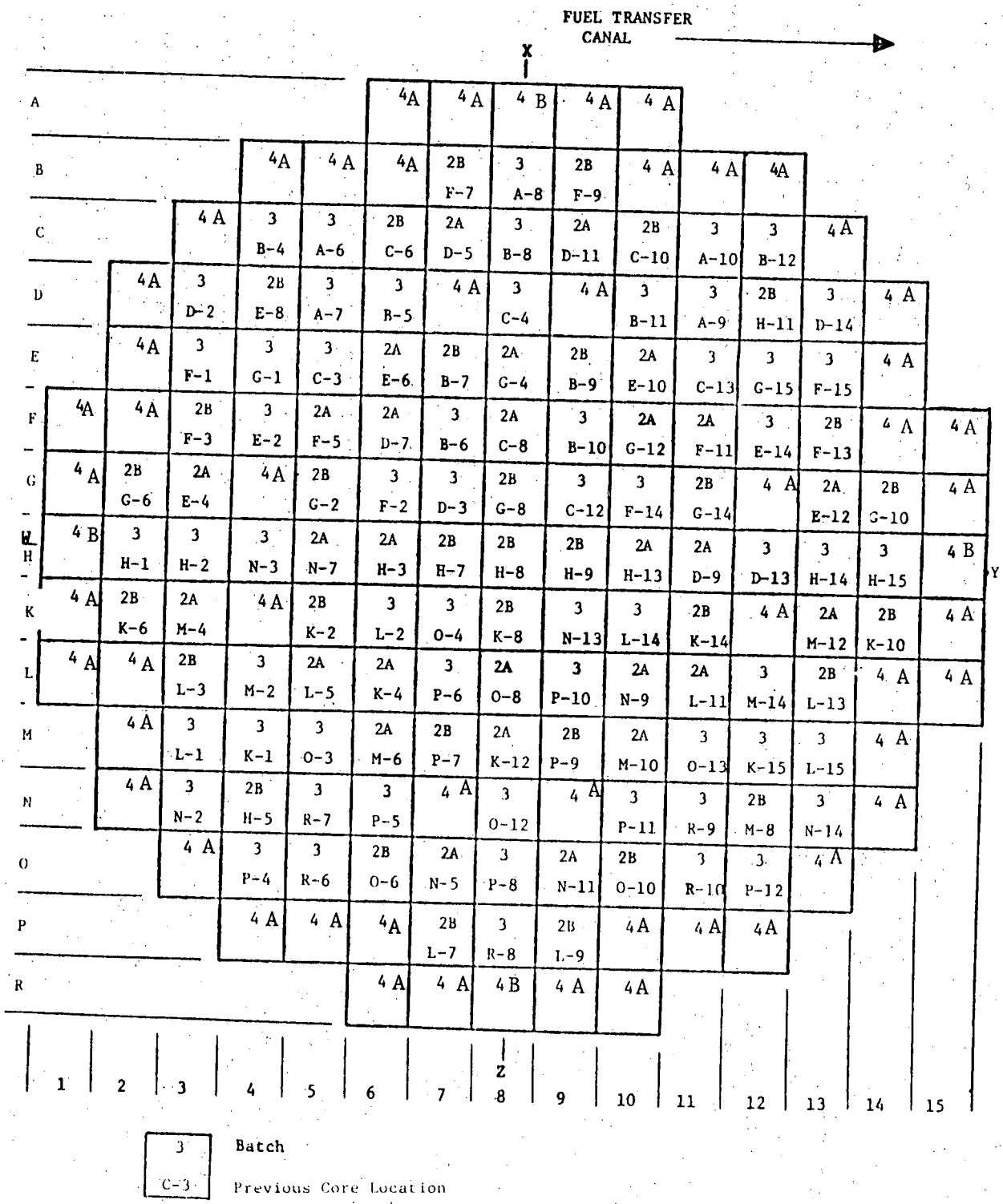


Figure 2. Enrichment and Burnup Distribution for Oconee 3, Cycle 2

	8	9	10	11	12	13	14	15
H	2.67 13,205	2.67 17,759	2.60 17,079	2.60 17,528	3.00 12,782	3.00 15,399	3.00 11,747	2.64 0
K		3.00 12,782	3.00 13,158	2.67 14,638	2.53 0	2.60 15,544	2.67 19,002	2.53 0
L			2.60 17,528	2.60 17,714	3.00 12,199	2.67 15,653	2.53 0	2.53 0
M				3.00 9,174	3.00 11,254	3.00 8,652	2.53 0	
N					2.67 19,018	3.00 8,577	2.53 0	
O						2.53 0		
P								
R								

XXX	Initial Enrichment
XXXX	BOC Burnup, MWd/mtU

5. Nuclear Design

The replacement of four 2.53 wt % uranium-235 fuel assemblies with four 2.64 wt % uranium-235 fuel assemblies will not have a significant effect on core nuclear performance. Analyses have shown that when the four replacement assemblies are loaded on the core major axes as shown in Figure 1, the radial and total power peaks for the core over the revised reload cycle will not exceed those calculated with the original Cycle 2 loading. Beginning of cycle power distributions for the revised loading and the original submittal are shown in Figure 3.

Because of the small relative change in fuel enrichments and core power distribution, the core physics parameters are essentially unchanged from those documented in BAW-1432. Analyses have also shown that the total control rod worth and the maximum ejected and stuck rod worths are only slightly affected.

The shutdown margin calculation for the revised loading is shown in Table 2.

Table 2. Shutdown Margin Calculation for Oconee 3, Cycle 2

	BOC, % Δk/k	EOC[a], % Δk/k
Available Rod Worth		
Total rod worth, HZP[b]	9.77	9.70
Worth reduction due to burnup of poison material	-0.19	-0.30
Maximum stuck rod, HZP	-2.27	-2.23
Net worth	7.31	7.17
Less 10% uncertainty	-0.73	-0.72
Total available worth	6.58	6.45
Required Rod Worth		
Power deficit, HFP to HZP	1.65	2.30
Max allowable inserted rod worth	1.22	1.58
Flux redistribution	0.40	1.00
Total required worth	3.27	4.88
Shutdown Margin		
Total avail. worth - total req. worth	3.31	1.57

Note: Required shutdown margin is 1.00% Δk/k.

(a) For shutdown margin calculations, this is defined as approximately 226 EFPD, the latest time in core life at which the transient bank is nearly full-in.

(b) HZP: hot zero power; HFP: hot full power.

Figure 3. BOC (4 EFPD), Cycle 2 Two-Dimensional Relative Power Distribution — Full Power, Equilibrium Xenon, Normal Rod Positions (Groups 7 and 8 Inserted)

	8	9	10	11	12	13	14	15
H	1.30 1.29	1.19 1.18	1.15 1.14	1.11 1.11	1.18 1.18	0.83 0.83	0.78 0.79	0.63 0.66
K	1.19 1.18	1.33 1.33	1.30 1.29	1.18 1.18	1.22 1.27	7 0.55 0.55	0.70 0.71	0.62 0.63
L	1.15 1.14	1.30 1.29	1.12 1.12	1.09 1.09	8 1.12 1.12	0.96 0.96	1.00 1.00	0.55 0.56
M	1.11 1.11	1.18 1.18	1.09 1.09	1.34 1.34	1.31 1.30	1.28 1.28	0.97 0.97	
N	1.18 1.18	1.22 1.22	8 1.12 1.12	1.31 1.30	1.12 1.12	1.14 1.14	0.70 0.69	
O	0.83 0.83	7 0.55 0.55	0.96 0.96	1.28 1.78	1.14 1.14	0.77 0.76		
P	0.78 0.79	0.70 0.71	1.00 1.00	0.97 0.97	0.70 0.69			
R	0.63 0.66	0.62 0.63	0.55 0.56					

7	Inserted Rod Group No.
X.XX	Relative Power Density with Original Cycle 2 Loading
Y.YY	Relative Power Density with Revised Cycle 2 Loading

6. Thermal-Hydraulic Design

The Batch 4B fuel assemblies are equal to or better than the Batch 4A fuel assemblies from a thermal-hydraulic view point. Hydraulically, the assemblies are identical so there will be no effect on core flow distribution. Batch 4B has a slightly larger pellet diameter, the same theoretical density, and a slightly longer active fuel length. This will result in the Batch 4B fuel assemblies having a higher fuel melt limit, higher DNB margin and a lower densification penalty. For these reasons the fuel assemblies in Batch 4B will not limit the performance of the core.

7. Accident and Transient Analysis

The changes in the Nuclear and Thermal-Hydraulic Design discussed in Sections 5 and 6, respectively, have been evaluated for effect on the transient analysis. However, due to the fact that the core physics parameters are essentially unchanged and that the fuel assemblies in Batch 4B are not thermal-hydraulically limiting, the results and conclusions in Section 7 of BAW-1432 remain valid.

8. Proposed Modifications to Technical Specifications

The revised loading plan will not affect the technical specifications from BOC to 115 EFPD and will not affect the limiting conditions for operation at power throughout the cycle. However, after 115 EFPD, the rod position limits for shutdown margin must be modified to account for the minor changes in rod worth. The limiting condition for operation at power is determined by the LOCA kw/ft rod position limits and not the shutdown margin rod position limits. Changes to the shutdown margin rod position limits are presented in Figures 4, 5, 6, and 7.

Figure 4. Oconee 3, Cycle 2 — Rod Position Limits for Four-Pump Operation From 115 (±10) EFPD to 226 (±10) EFPD

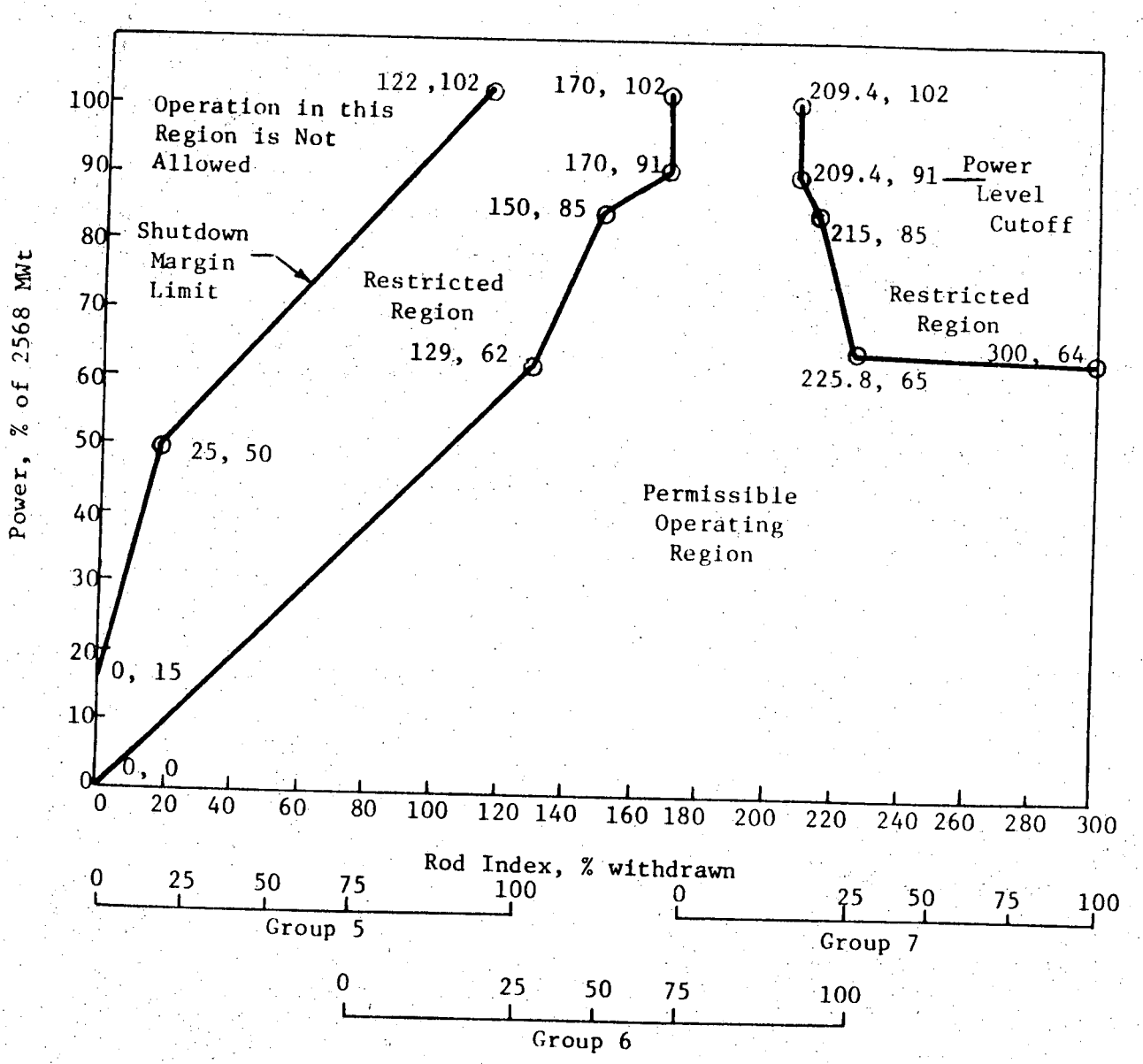


Figure 5. Oconee 3, Cycle 2 – Rod Position Limits for Four-Pump Operation After 226 (±10) EFPD

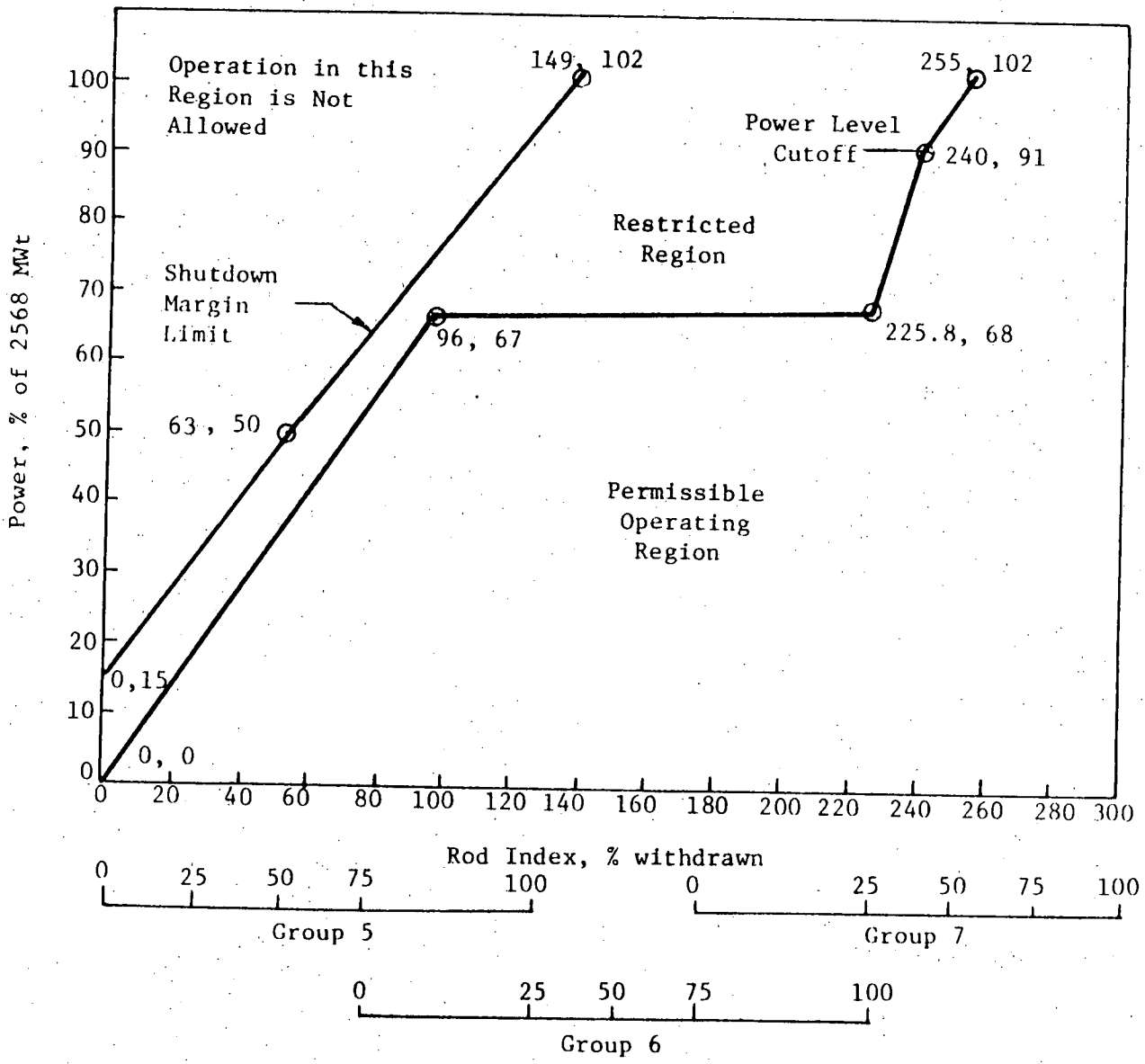


Figure 6. Oconee 3, Cycle 2 — Rod Position Limits for Two- and Three-Pump Operation From 115 (±10) to 226 (±10) EFPD

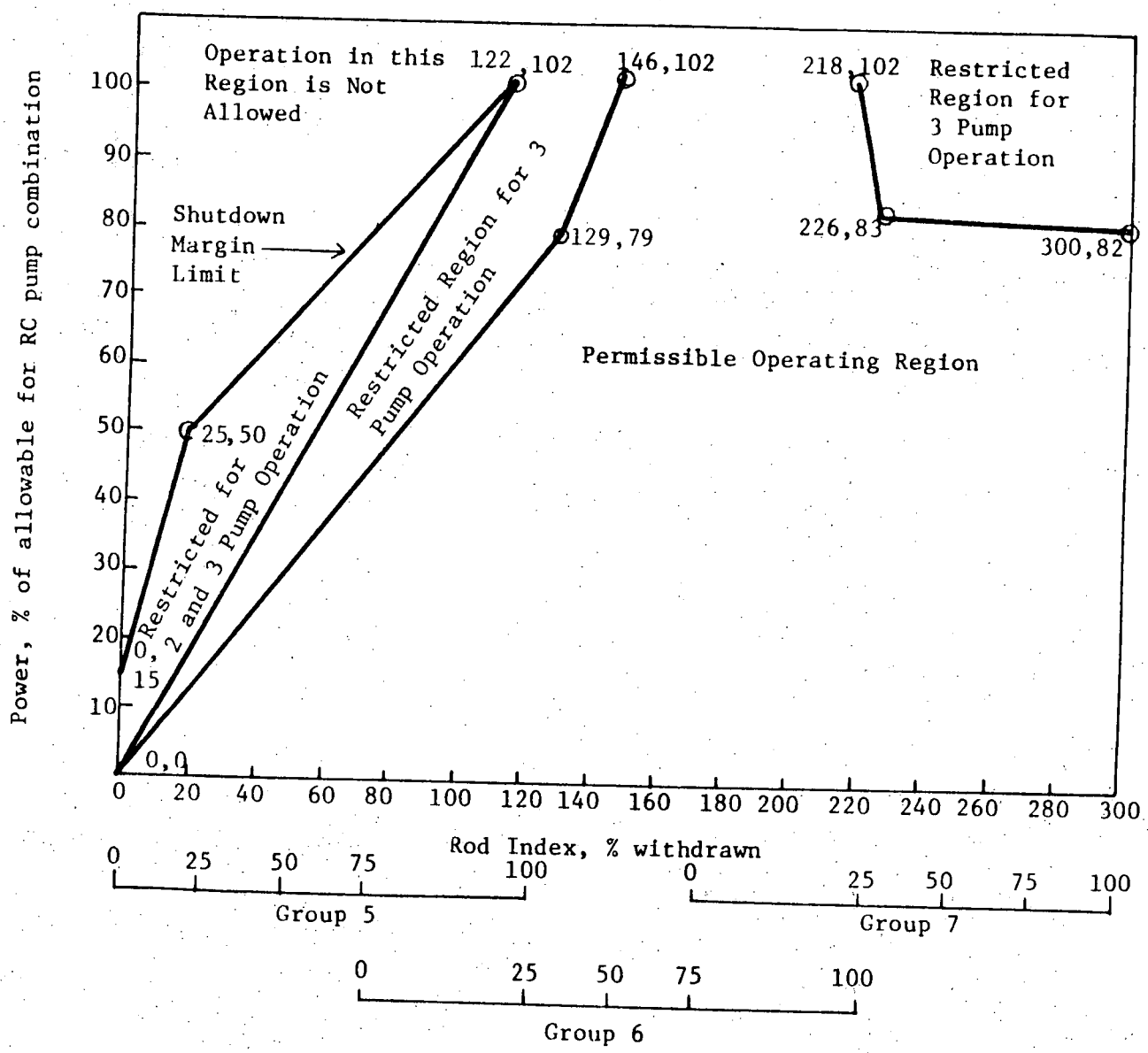
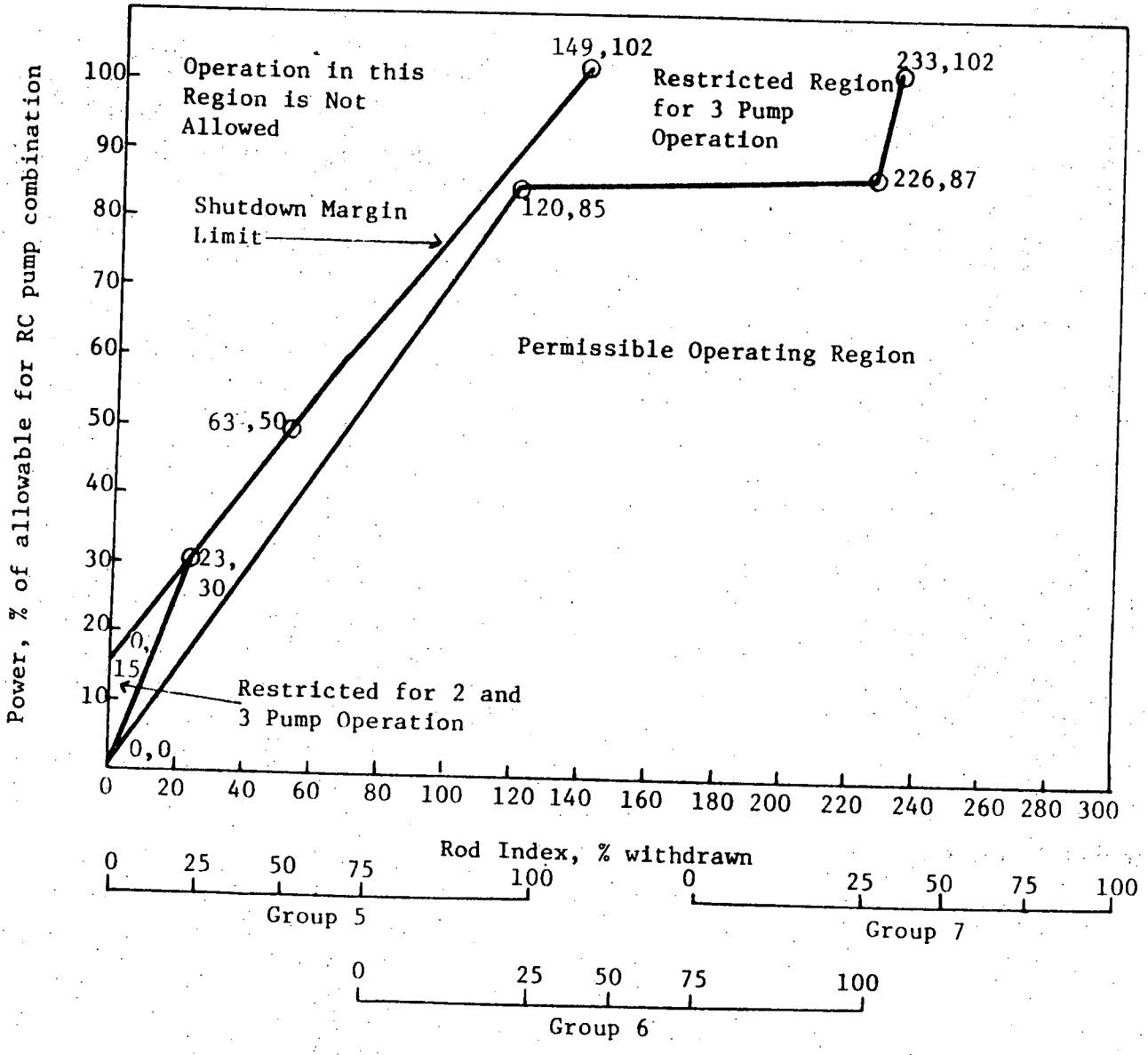


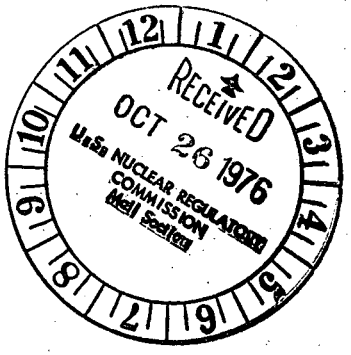
Figure 7. Oconee 3, Cycle 2 — Rod Position Limits for Two- and Three-Pump Operation After 226 (±10) EFPD



ATTACHMENT 2

PROPOSED REVISIONS TO OCONEE NUCLEAR STATION

TECHNICAL SPECIFICATIONS



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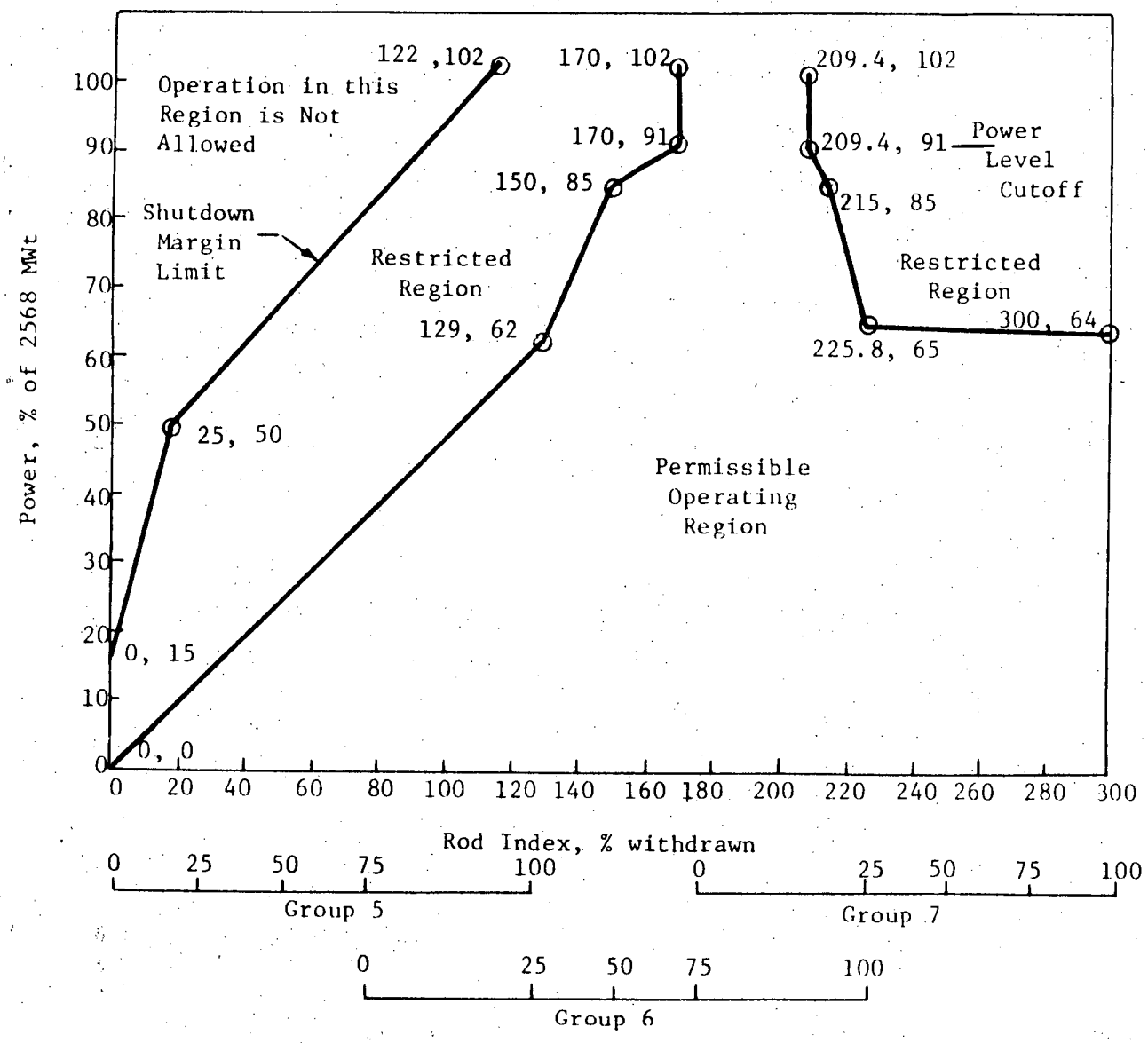
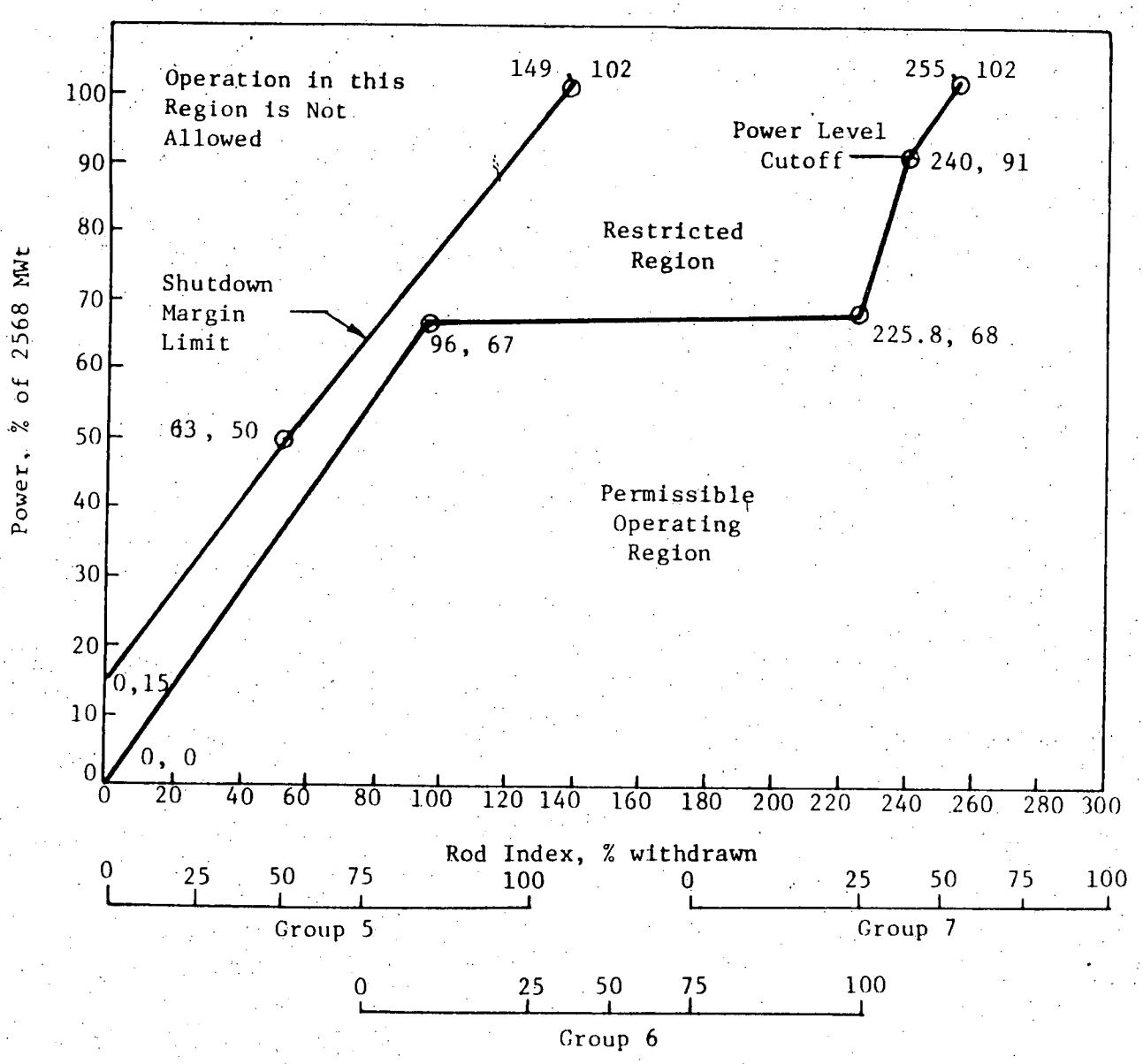


ROD POSITION LIMITS FOR FOUR PUMP OPERATION FROM 115 (± 10) EFPD TO 226 (± 10) EFPD UNIT 3

OCONEE NUCLEAR STATION

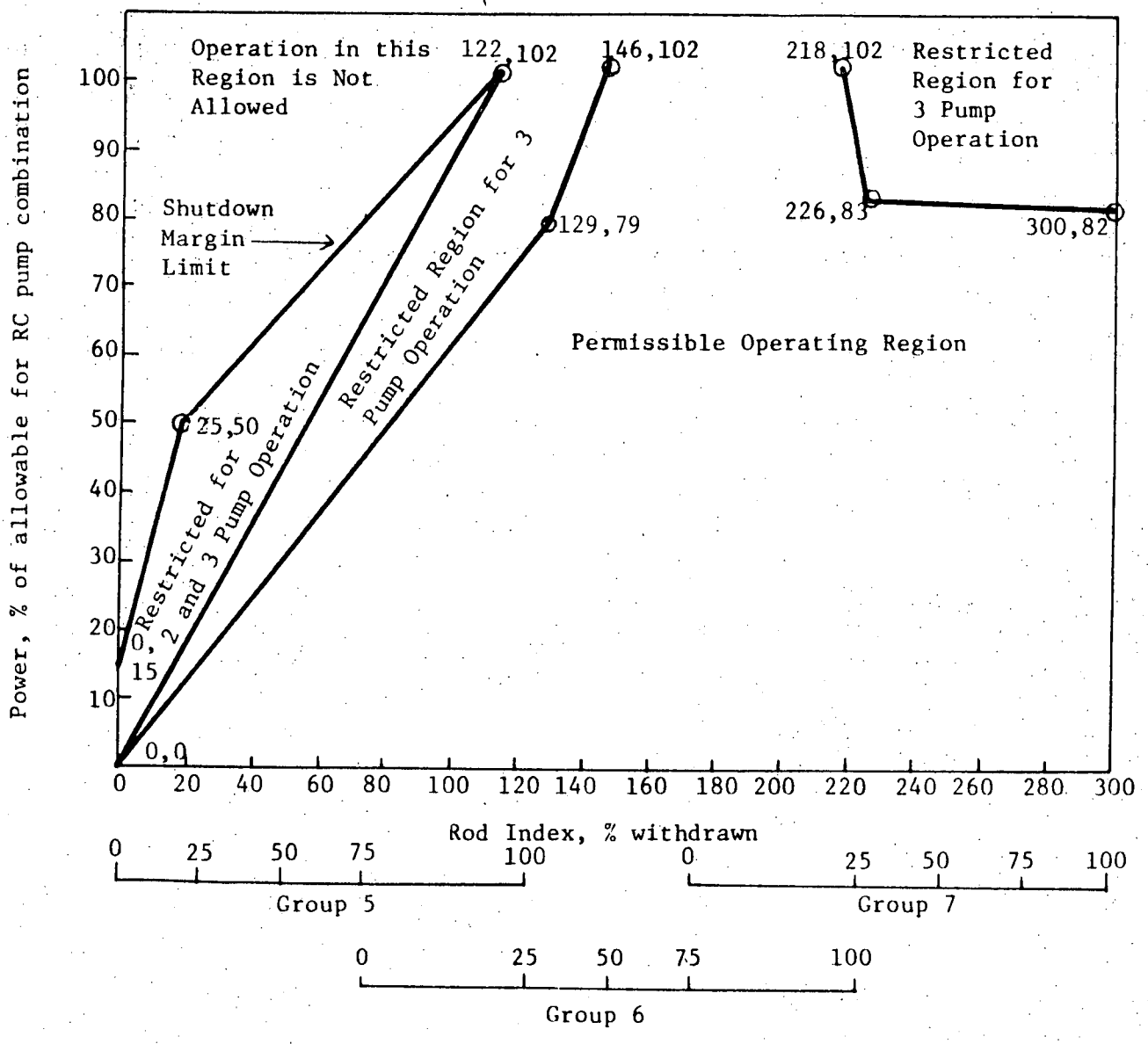
Figure 3.5.2-1C2



ROD POSITION LIMITS FOR FOUR PUMP OPERATION AFTER 226 (+ 10) EFPD
UNIT 3

OCONEE NUCLEAR STATION

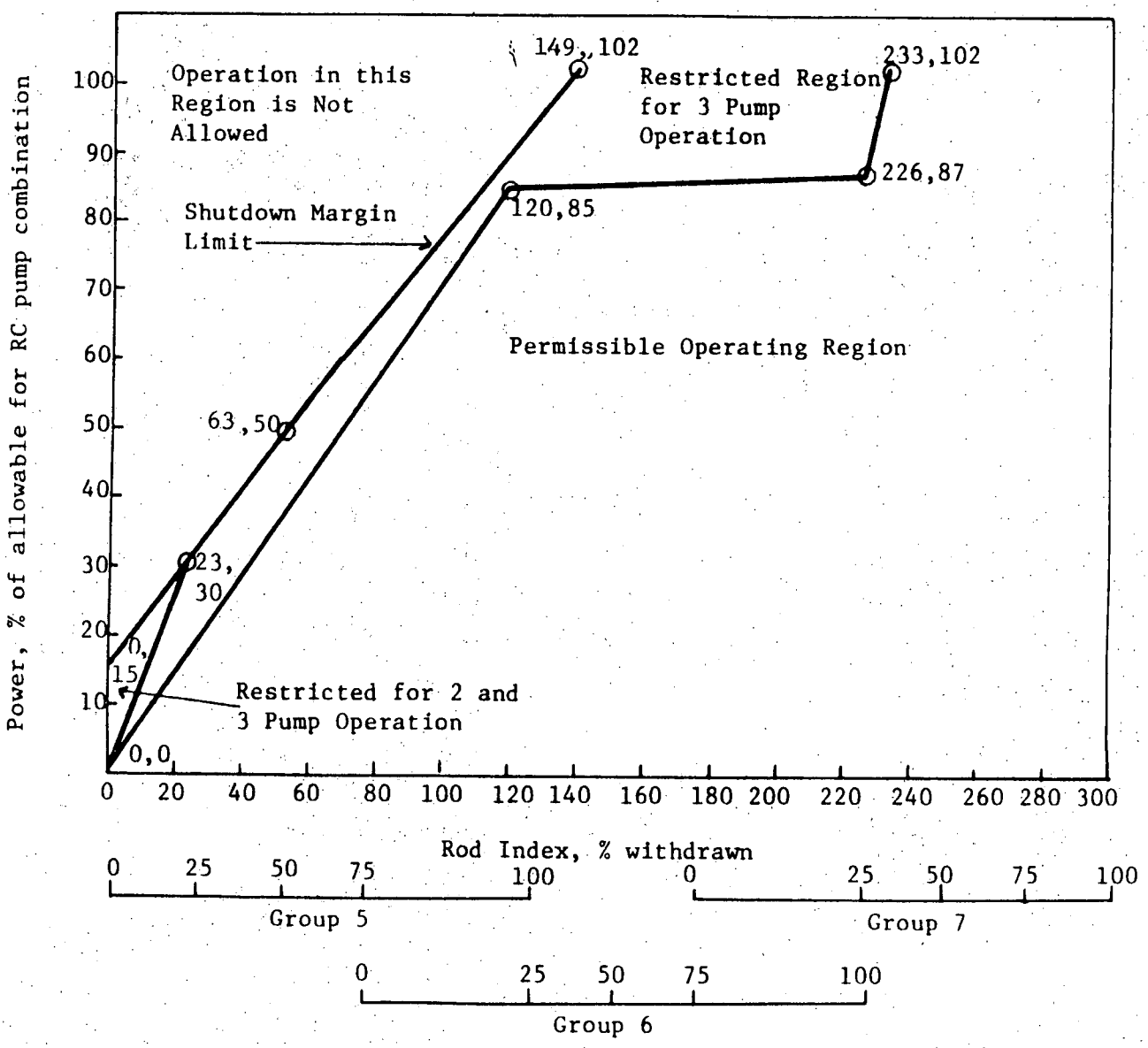
Figure 3.5.2-1C3



ROD POSITION LIMITS FOR TWO- AND THREE-PUMP OPERATION FROM 115 (± 10) TO 226 (± 10) EFPD UNIT 3

OCONEE NUCLEAR STATION

Figure 3.5.2-2C2



ROD POSITION LIMITS FOR TWO AND THREE-PUMP OPERATION AFTER 226 (± 10) EFPD
UNIT 3

OCONEE NUCLEAR STATION

Figure 3.5.2-2C3