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SOUTHERN COMPANY
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October 17, 2000

LCV 1484-A

Docket Nos: 50-424

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555

Ladies and Gentlemen:

VOGTLE ELECTRIC GENERATING PLANT
ISSUANCE OF UNIT 1 CYCLE 10
CORE OPERATING LIMITS REPORT

Pursuant to Vogtle Electric Generating Plant Technical Specification 5.6.5.d, Southern Nuclear Operating Company is submitting the Unit 1 Cycle 10 Core Operating Limits Report (COLR). The COLR became effective during the Fall 2000 Unit 1 refueling outage.

If you have any questions, please contact this office.

Sincerely,

J. B. Beasley, Jr.

JBB/RJF

Attachment

cc: Southern Nuclear Operating Company
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SNC Document Management

U. S. Nuclear Regulatory Commission
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A001

VOGTLE ELECTRIC GENERATING PLANT (VEGP) UNIT 1 CYCLE 10

CORE OPERATING LIMITS REPORT

REVISION 0

SEPTEMBER 2000

COLR for VEGP UNIT 1 CYCLE 10

1.0 CORE OPERATING LIMITS REPORT

This Core Operating Limits Report (COLR) for VEGP UNIT 1 CYCLE 10 has been prepared in accordance with the requirements of Technical Specification 5.6.5.

The Technical Requirement affected by this report is listed below:

13.1.1	SHUTDOWN MARGIN - MODES 1 and 2

The Technical Specifications affected by this report are listed below:

3.1.1	SHUTDOWN MARGIN - MODES 3, 4 and 5
3.1.3	Moderator Temperature Coefficient
3.1.5	Shutdown Bank Insertion Limits
3.1.6	Control Bank Insertion Limits
3.2.1	Heat Flux Hot Channel Factor - $F_Q(Z)$
3.2.2	Nuclear Enthalpy Rise Hot Channel Factor - $F^N_{\Delta H}$
3.2.3	Axial Flux Difference
3.9.1	Boron Concentration

2.0 OPERATING LIMITS

The cycle-specific parameter limits for the specifications listed in section 1.0 are presented in the following subsections. These limits have been developed using NRC-approved methodologies, including those specified in Technical Specification 5.6.5.

2.1 SHUTDOWN MARGIN - MODES 1 AND 2 (Technical Requirement 13.1.1)

2.1.1 The SHUTDOWN MARGIN shall be greater than or equal to 1.30 percent $\Delta k/k$.

2.2 SHUTDOWN MARGIN - MODES 3, 4 AND 5 (Specification 3.1.1)

2.2.1 The SHUTDOWN MARGIN shall be greater than or equal to the limits shown in figures 1 and 2.

2.3 Moderator Temperature Coefficient (Specification 3.1.3)

2.3.1 The Moderator Temperature Coefficient (MTC) limits are:

The BOL/ARO/HZP - MTC shall be less positive than $+0.7 \times 10^{-4}$ $\Delta k/k/^{\circ}F$ for power levels up to 70 percent RTP with a linear ramp to 0 $\Delta k/k/^{\circ}F$ at 100 percent RTP.

The EOL/ARO/RTP-MTC shall be less negative than -5.50×10^{-4} $\Delta k/k/^{\circ}F$.[1]

2.3.2 The MTC Surveillance limits are:

The 300 ppm/ARO/RTP-MTC should be less negative than or equal to -4.75×10^{-4} $\Delta k/k/^{\circ}F$.[1]

The 60 ppm/ARO/RTP-MTC should be less negative than -5.35×10^{-4} $\Delta k/k/^{\circ}F$.[1]

where: BOL stands for Beginning of Cycle Life
ARO stands for All Rods Out
HZP stands for Hot Zero THERMAL POWER
EOL stands for End of Cycle Life
RTP stands for RATED THERMAL POWER

2.4 Shutdown Bank Insertion Limits (Specification 3.1.5)

2.4.1 The shutdown banks shall be withdrawn to a position greater than or equal to 225 steps.

2.5 Control Bank Insertion Limits (Specification 3.1.6)

2.5.1 The control banks shall be limited in physical insertion as shown in Figure 3.

[1]Applicable for full-power T-average of 586.4°F.

2.6 Heat Flux Hot Channel Factor - $F_Q(Z)$ (Specification 3.2.1)

2.6.1 $$F_Q(Z) \leq \frac{F_Q^{RTP}}{P} * K(Z) \quad \text{for } P > 0.5$$

$$F_Q(Z) \leq \frac{F_Q^{RTP}}{0.5} * K(Z) \quad \text{for } P \leq 0.5$$

where: $P = \dfrac{\text{THERMAL POWER}}{\text{RATED THERMAL POWER}}$

2.6.2 $F_Q^{RTP} = 2.50$

2.6.3 K(Z) is provided in figure 4.

2.6.4 $$F_Q(Z) \leq \frac{F_Q^{RTP} * K(Z)}{P * W(Z)} \quad \text{for } P > 0.5$$

$$F_Q(Z) \leq \frac{F_Q^{RTP} * K(Z)}{0.5 * W(Z)} \quad \text{for } P \leq 0.5$$

2.6.5 W(Z) values are provided in Figures 6 through 9.

2.6.6 The $F_Q(Z)$ penalty factors are provided in Table 1.

2.7 Nuclear Enthalpy Rise Hot Channel Factor - $F^N_{\Delta H}$ (Specification 3.2.2)

2.7.1 $F^N_{\Delta H} \leq F^{RTP}_{\Delta H} * (1 + PF_{\Delta H} * (1-P))$

where: $P = \frac{\text{THERMAL POWER}}{\text{RATED THERMAL POWER}}$

2.7.2 $F^{RTP}_{\Delta H} = 1.65$

2.7.3 $PF_{\Delta H} = 0.3$

2.8 Axial Flux Difference (Specification 3.2.3)

2.8.1 The Axial Flux Difference (AFD) acceptable operation limits are provided in Figure 5.

2.9 Boron Concentration (Specification 3.9.1)

2.9.1 The boron concentration shall be greater than or equal to 1953 ppm.[1]

[1]This concentration bounds the condition of $k_{eff} \leq 0.95$ (all rods in less the most reactive rod) and subcriticality (all rods out) over the entire cycle. This concentration includes additional boron to address uncertainties and B^{10} depletion.

COLR for VEGP UNIT 1 CYCLE 10

TABLE 1

$F_Q(Z)$ PENALTY FACTOR

Cycle Burnup (MWD/MTU)	$F_Q(Z)$ Penalty Factor
30	1.020
363	1.021
576	1.021
6323	1.023
6536	1.023
6749	1.022
6962	1.020

Notes:

1. The Penalty Factor, to be applied to $F_Q(Z)$ in accordance with SR 3.2.1.2, is the maximum factor by which $F_Q(Z)$ is expected to increase over a 39 EFPD interval (surveillance interval of 31 EFPD plus the maximum allowable extension not to exceed 25% of the surveillance interval per SR 3.0.2) starting from the burnup at which the $F_Q(Z)$ was determined.

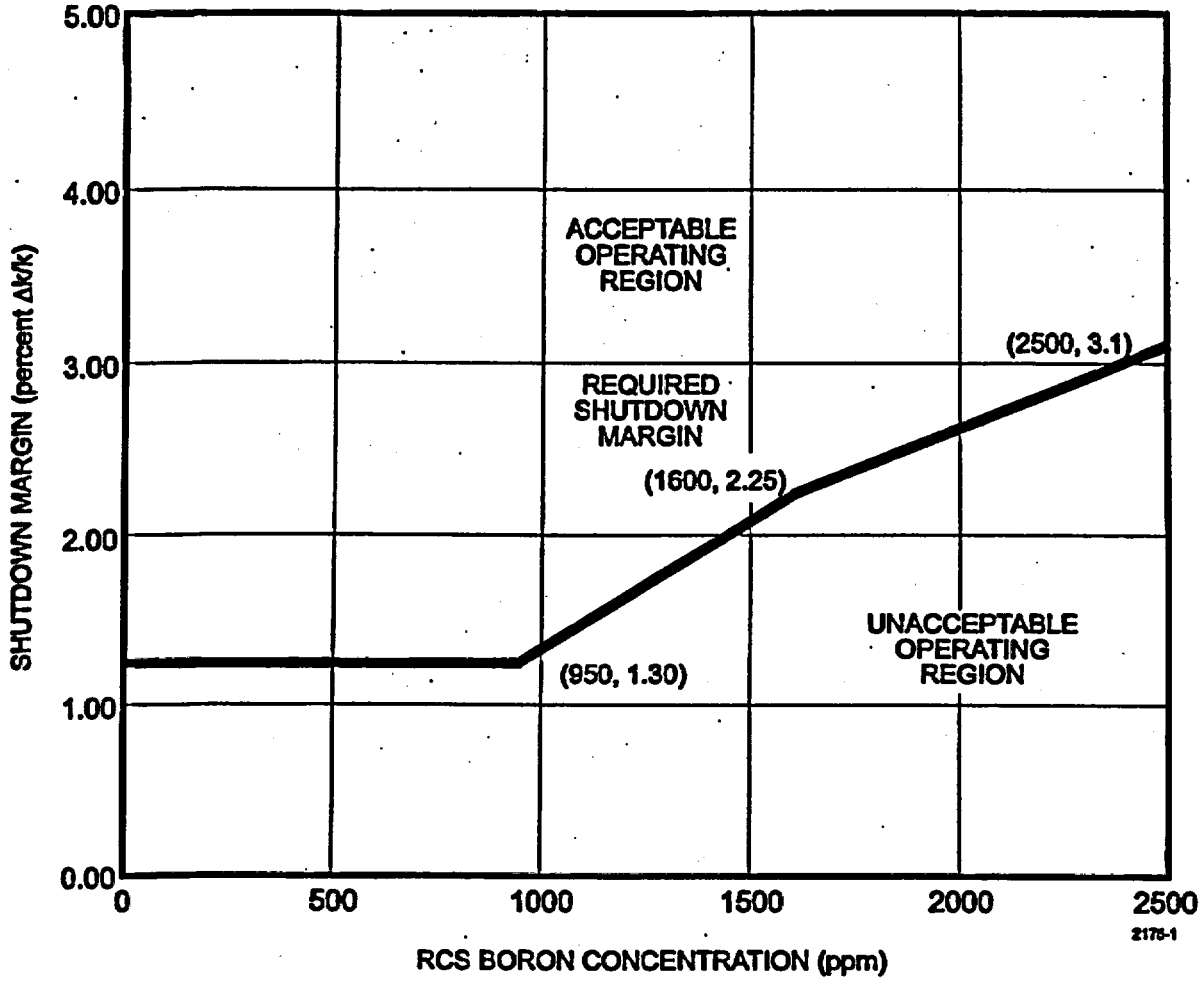


FIGURE 1

REQUIRED SHUTDOWN MARGIN FOR MODES 3 AND 4 (MODE 4 WITH AT LEAST ONE REACTOR COOLANT PUMP RUNNING)

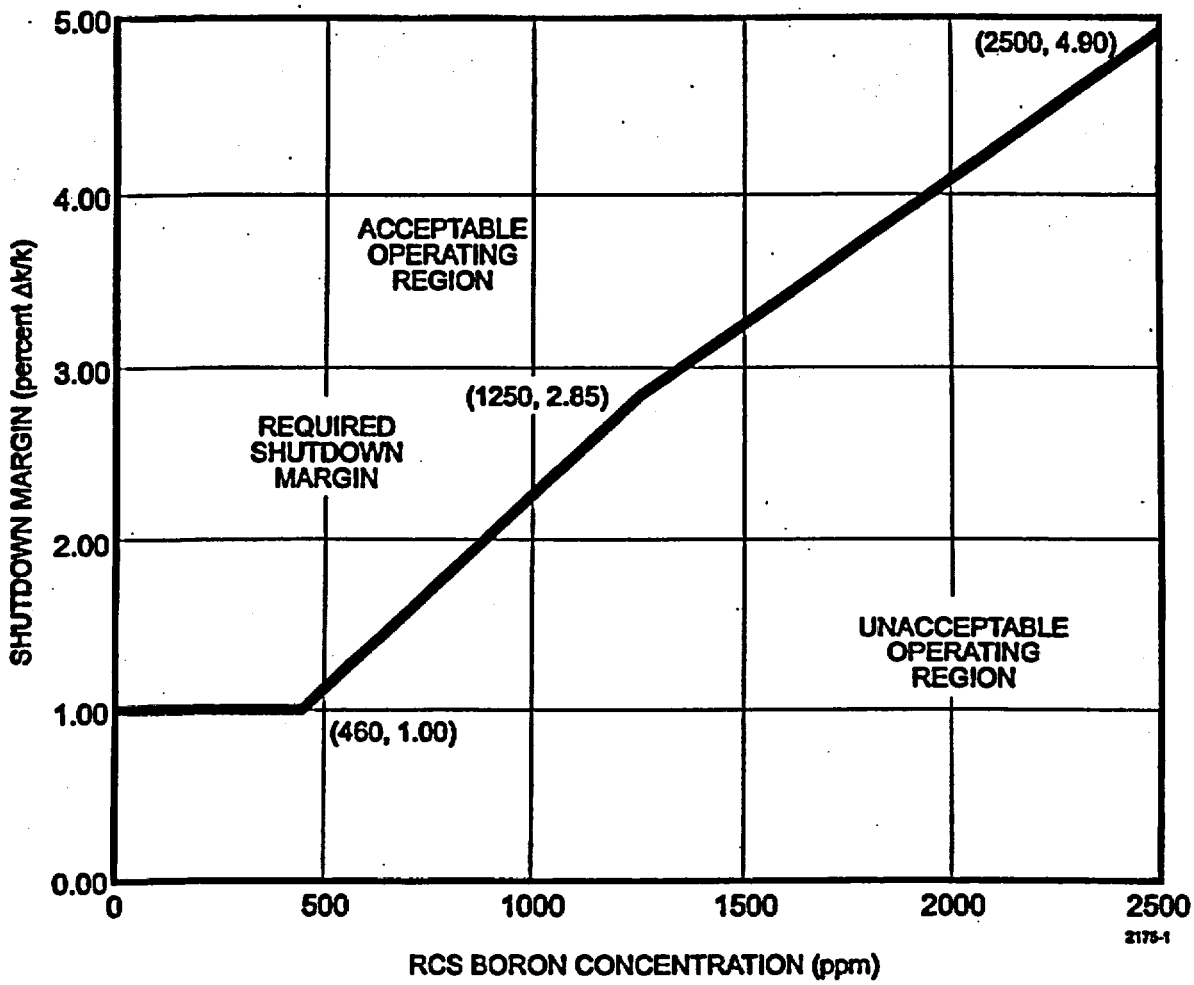
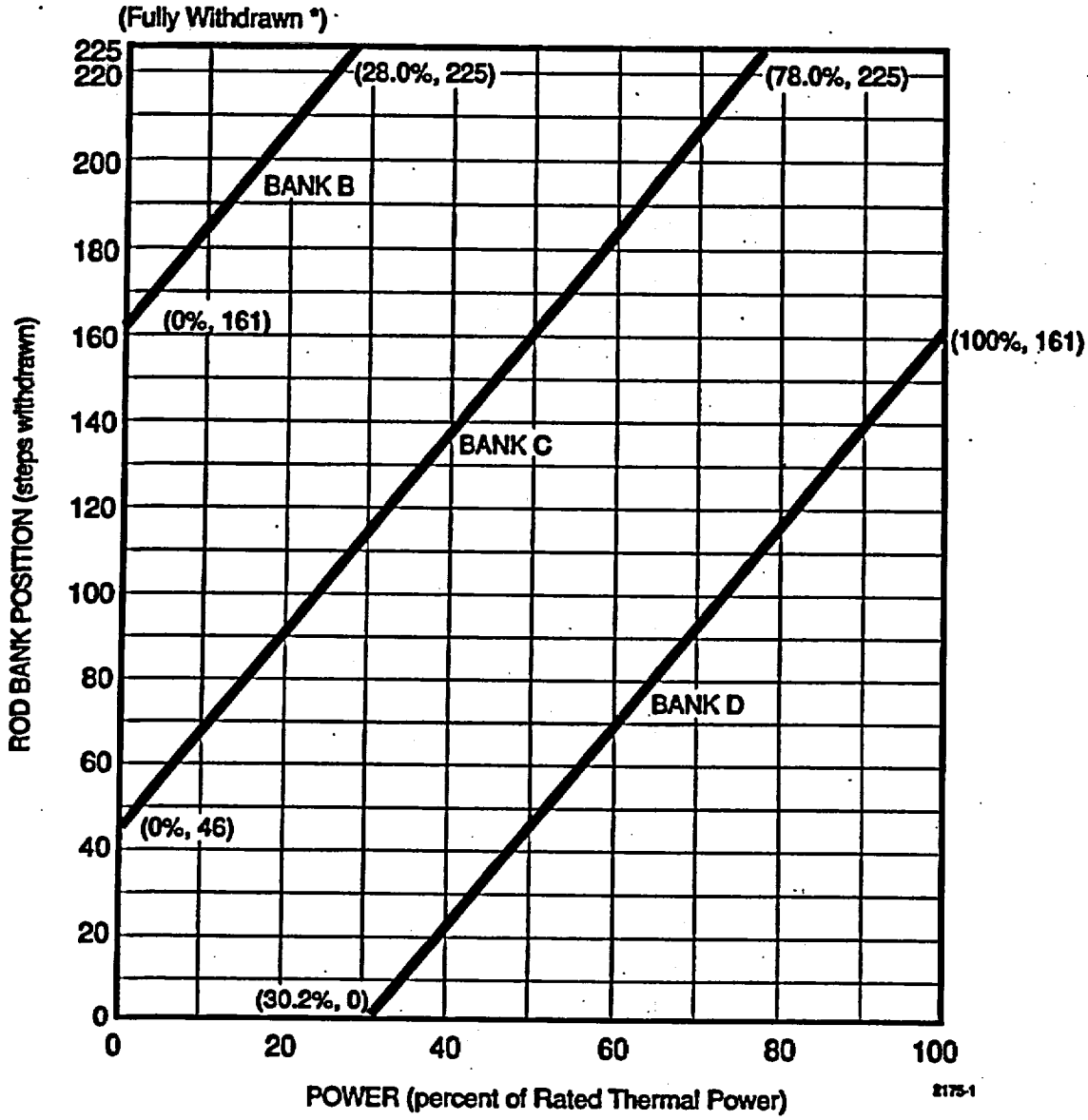


FIGURE 2

REQUIRED SHUTDOWN MARGIN FOR MODES 4 AND 5 (MODE 4 WITH NO REACTOR COOLANT PUMPS RUNNING)



* Fully withdrawn shall be the condition where control rods are at a position within the interval ≥225 and ≤231 steps withdrawn.

NOTE: The Rod Bank Insertion Limits are based on the control bank withdrawal sequence A, B, C, D and a control bank tip-to-tip distance of 115 steps.

FIGURE 3

ROD BANK INSERTION LIMITS VERSUS % OF RATED THERMAL POWER

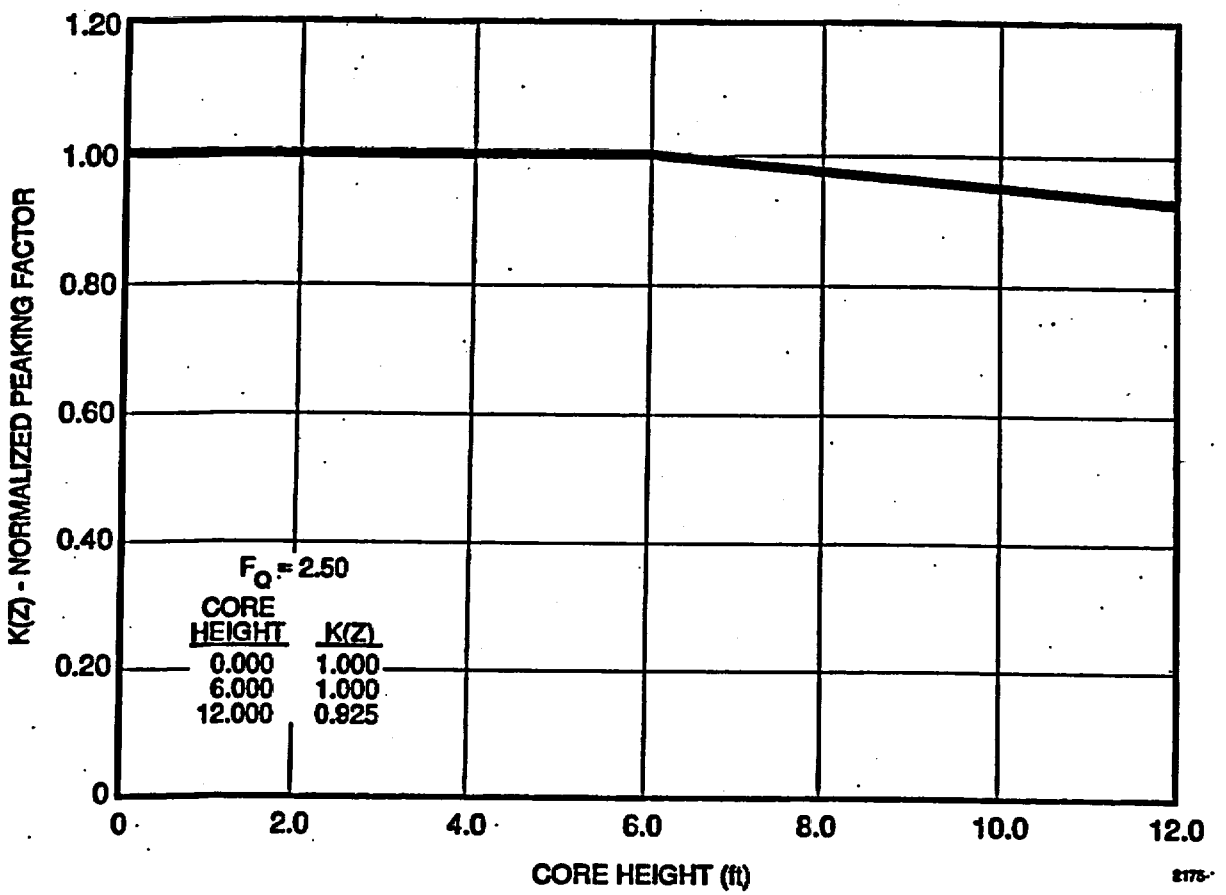


FIGURE 4

K(Z) - NORMALIZED $F_Q(Z)$ AS A FUNCTION OF CORE HEIGHT

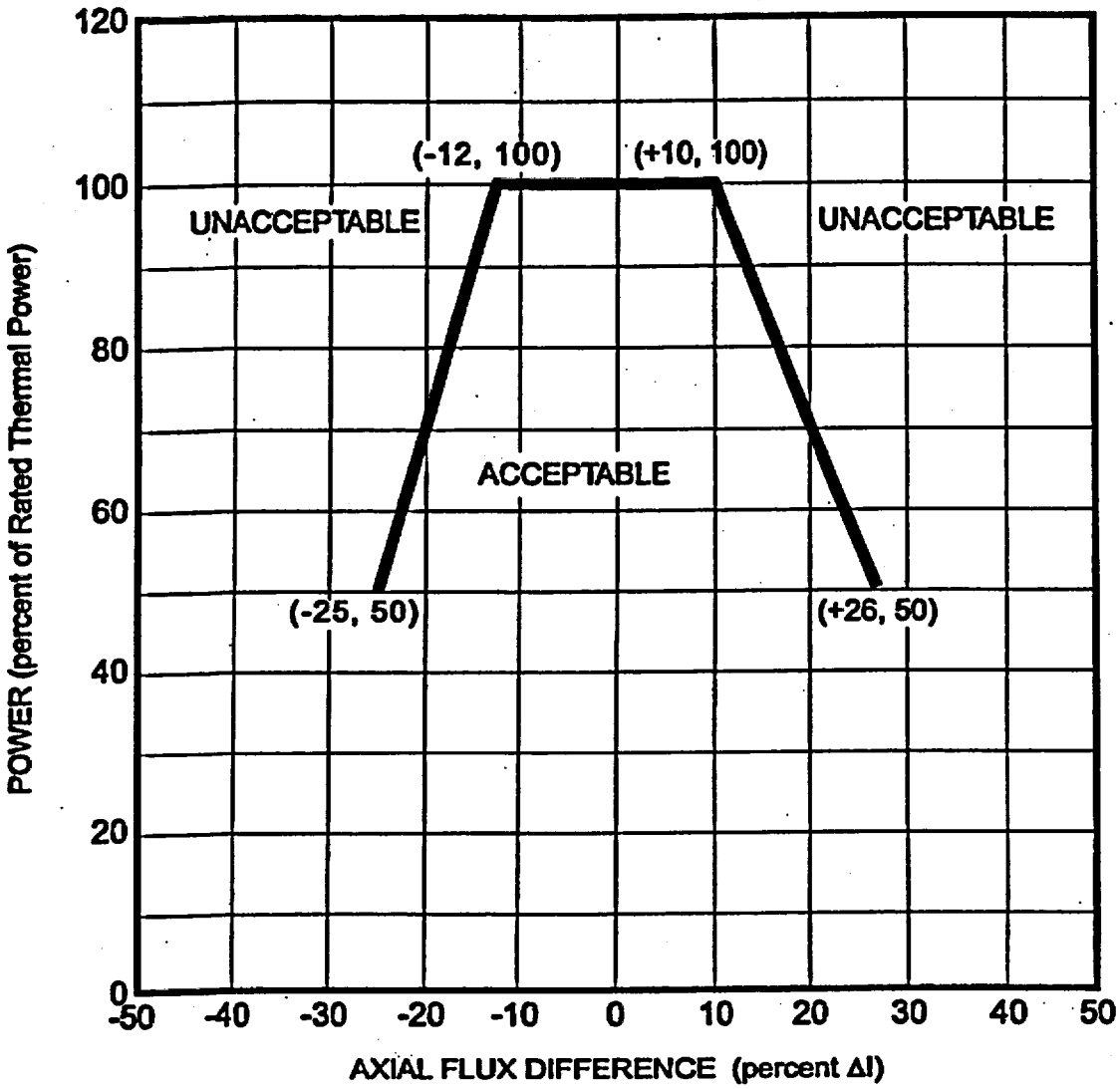
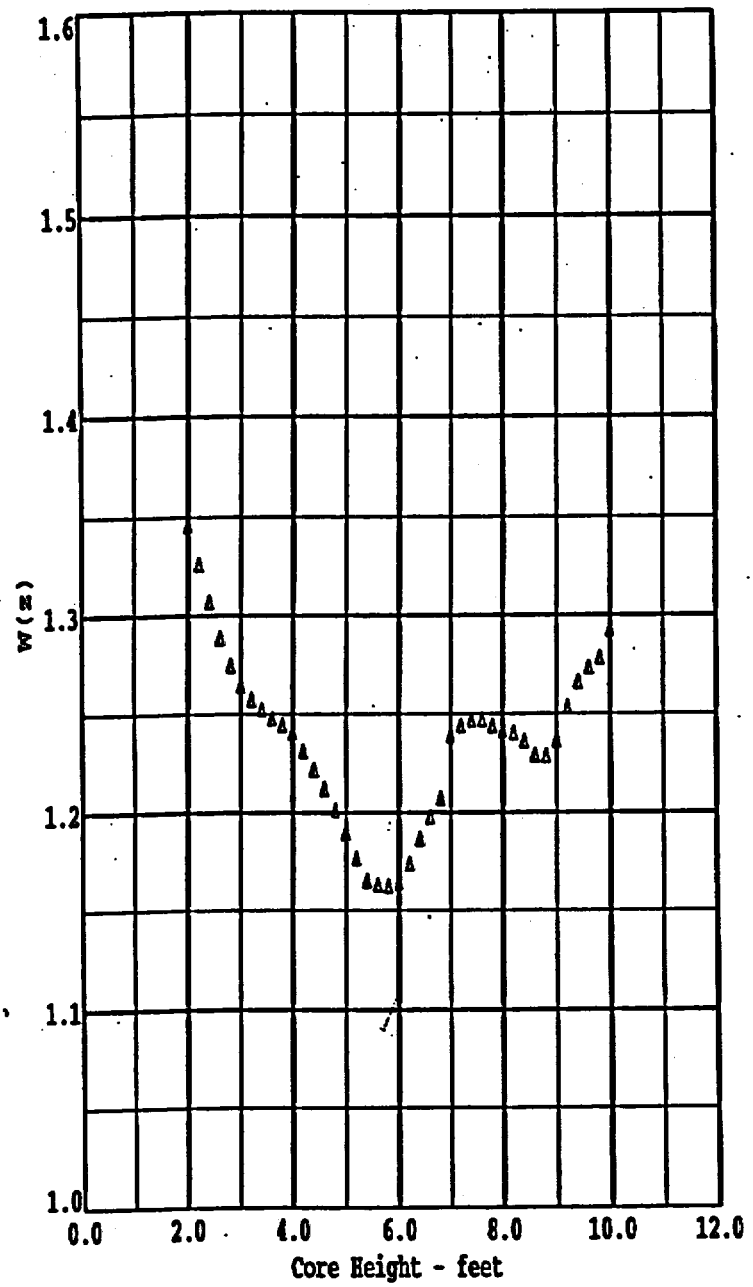


FIGURE 5

AXIAL FLUX DIFFERENCE LIMITS AS A FUNCTION OF % OF RATED THERMAL POWER FOR RAOC

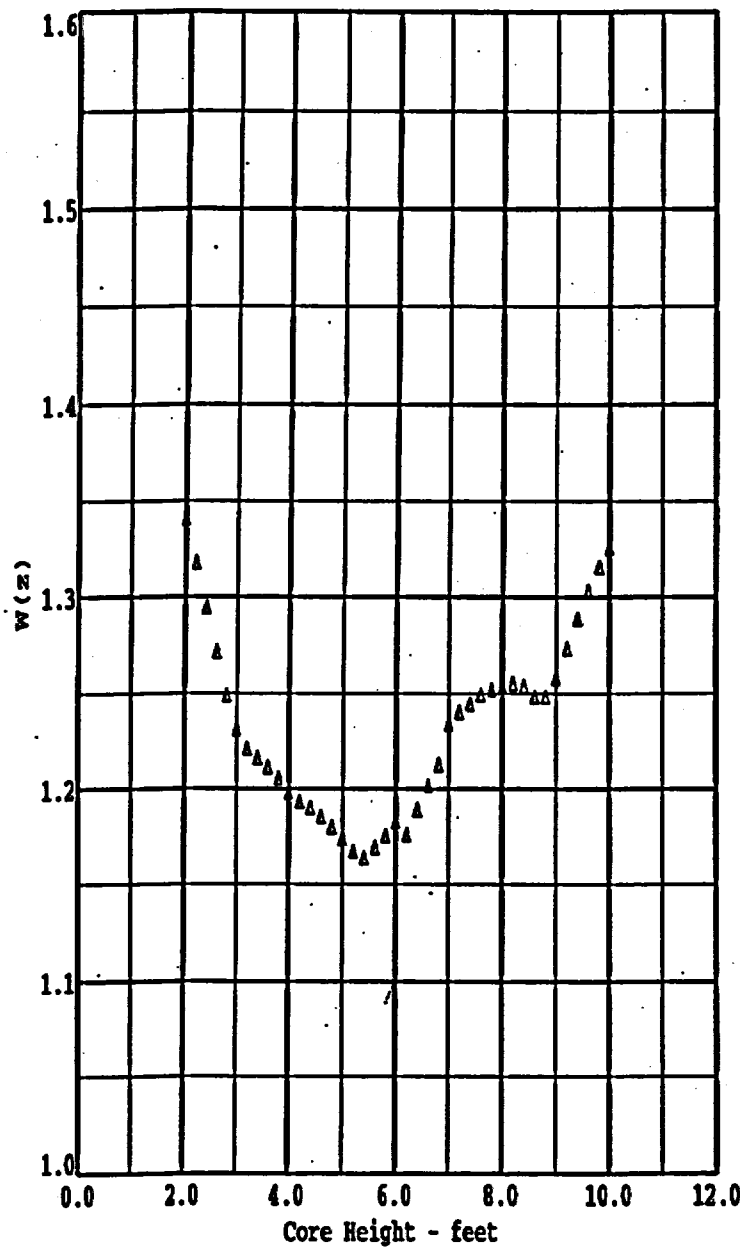


This figure is referred to by Specification B3.2.1

	Axial Point	Elevation (feet)	BOL W(Z)
*	1	12.00	1.0000
*	2	11.80	1.0000
*	3	11.60	1.0000
*	4	11.40	1.0000
*	5	11.20	1.0000
*	6	11.00	1.0000
*	7	10.80	1.0000
*	8	10.60	1.0000
*	9	10.40	1.0000
*	10	10.20	1.0000
	11	10.00	1.2922
	12	9.80	1.2778
	13	9.60	1.2728
	14	9.40	1.2656
	15	9.20	1.2530
	16	9.00	1.2360
	17	8.80	1.2281
	18	8.60	1.2285
	19	8.40	1.2358
	20	8.20	1.2401
	21	8.00	1.2412
	22	7.80	1.2437
	23	7.60	1.2467
	24	7.40	1.2464
	25	7.20	1.2437
	26	7.00	1.2385
	27	6.80	1.2067
	28	6.60	1.1976
	29	6.40	1.1866
	30	6.20	1.1739
	31	6.00	1.1641
	32	5.80	1.1625
	33	5.60	1.1630
	34	5.40	1.1652
	35	5.20	1.1766
	36	5.00	1.1896
	37	4.80	1.2009
	38	4.60	1.2116
	39	4.40	1.2213
	40	4.20	1.2308
	41	4.00	1.2402
	42	3.80	1.2443
	43	3.60	1.2475
	44	3.40	1.2520
	45	3.20	1.2570
	46	3.00	1.2640
	47	2.80	1.2741
	48	2.60	1.2883
	49	2.40	1.3067
	50	2.20	1.3257
	51	2.00	1.3455
*	52	1.80	1.0000
*	53	1.60	1.0000
*	54	1.40	1.0000
*	55	1.20	1.0000
*	56	1.00	1.0000
*	57	0.80	1.0000
*	58	0.60	1.0000
*	59	0.40	1.0000
*	60	0.20	1.0000
*	61	0.00	1.0000

* Top and Bottom 15% Excluded per Technical Specification B3.2.1

FIGURE 6 RAOC W(Z) AT 150 MWD/MTU

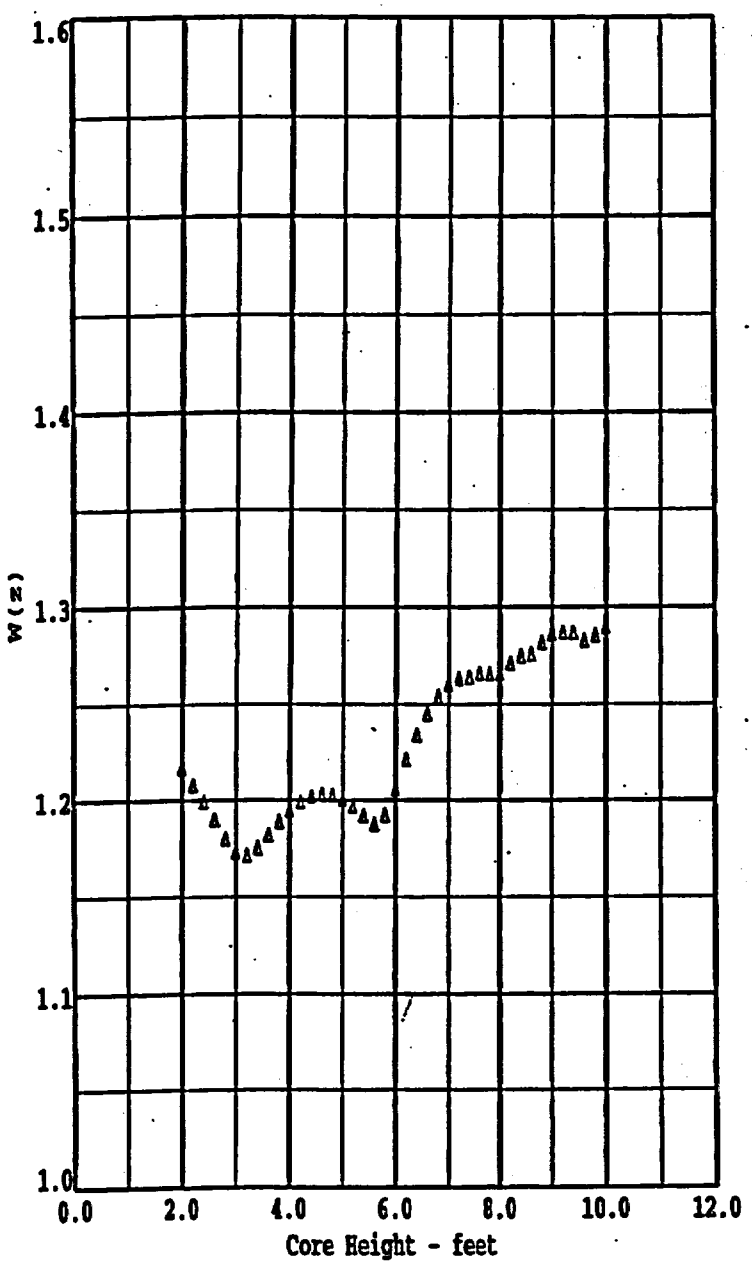


This figure is referred to by Specification B3.2.1

	Axial Point	Elevation (feet)	MOL-1 W(Z)
*	1	12.00	1.0000
*	2	11.80	1.0000
*	3	11.60	1.0000
*	4	11.40	1.0000
*	5	11.20	1.0000
*	6	11.00	1.0000
*	7	10.80	1.0000
*	8	10.60	1.0000
*	9	10.40	1.0000
*	10	10.20	1.0000
	11	10.00	1.3252
	12	9.80	1.3152
	13	9.60	1.3028
	14	9.40	1.2885
	15	9.20	1.2730
	16	9.00	1.2577
	17	8.80	1.2482
	18	8.60	1.2482
	19	8.40	1.2535
	20	8.20	1.2549
	21	8.00	1.2534
	22	7.80	1.2517
	23	7.60	1.2492
	24	7.40	1.2443
	25	7.20	1.2399
	26	7.00	1.2335
	27	6.80	1.2123
	28	6.60	1.2015
	29	6.40	1.1889
	30	6.20	1.1759
	31	6.00	1.1825
	32	5.80	1.1752
	33	5.60	1.1690
	34	5.40	1.1637
	35	5.20	1.1671
	36	5.00	1.1737
	37	4.80	1.1798
	38	4.60	1.1853
	39	4.40	1.1900
	40	4.20	1.1933
	41	4.00	1.1979
	42	3.80	1.2052
	43	3.60	1.2109
	44	3.40	1.2157
	45	3.20	1.2207
	46	3.00	1.2309
	47	2.80	1.2487
	48	2.60	1.2712
	49	2.40	1.2943
	50	2.20	1.3173
	51	2.00	1.3401
*	52	1.80	1.0000
*	53	1.60	1.0000
*	54	1.40	1.0000
*	55	1.20	1.0000
*	56	1.00	1.0000
*	57	0.80	1.0000
*	58	0.60	1.0000
*	59	0.40	1.0000
*	60	0.20	1.0000
*	61	0.00	1.0000

* Top and Bottom 15% Excluded per Technical Specification B3.2.1

FIGURE 7 RAOC W(Z) AT 4000 MWD/MTU

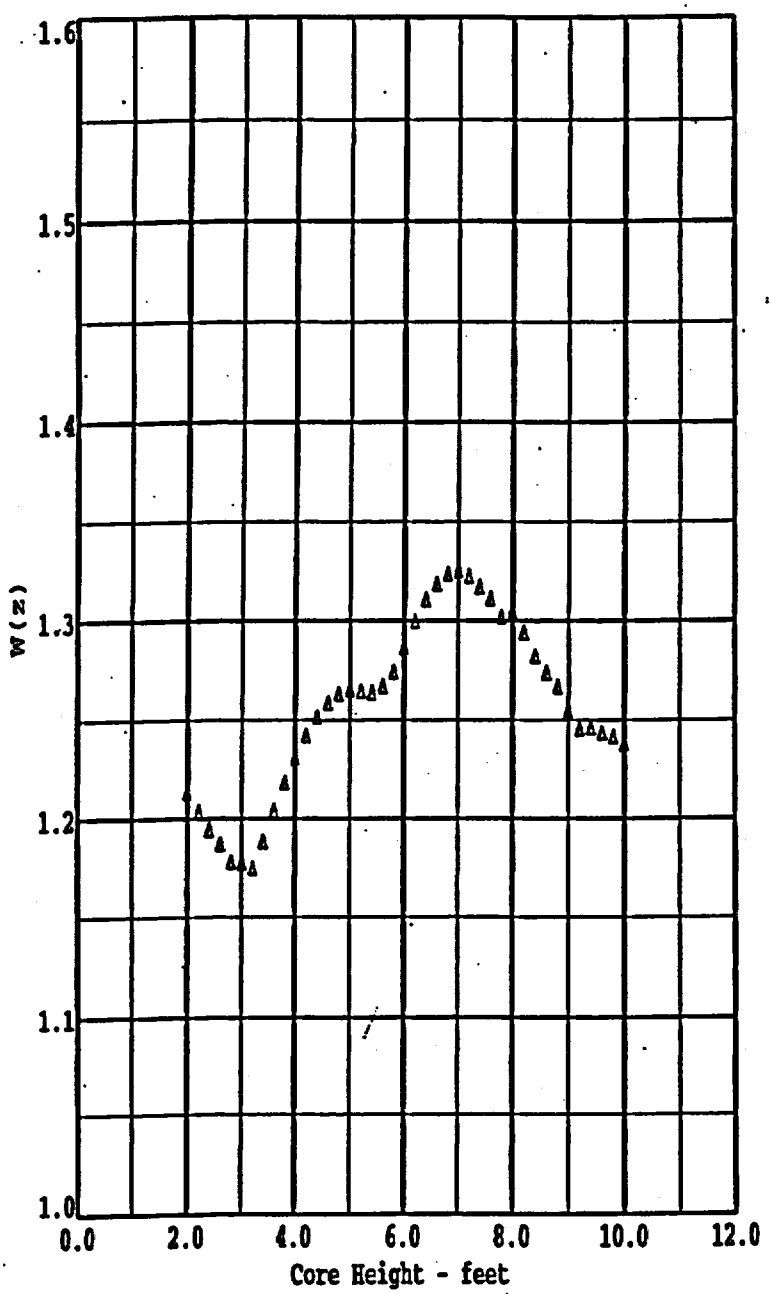


This figure is referred to by Specification B3.2.1

	Axial Point	Elevation (feet)	MOL-2 W(Z)
*	1	12.00	1.0000
*	2	11.80	1.0000
*	3	11.60	1.0000
*	4	11.40	1.0000
*	5	11.20	1.0000
*	6	11.00	1.0000
*	7	10.80	1.0000
*	8	10.60	1.0000
*	9	10.40	1.0000
*	10	10.20	1.0000
	11	10.00	1.2895
	12	9.80	1.2850
	13	9.60	1.2825
	14	9.40	1.2864
	15	9.20	1.2865
	16	9.00	1.2858
	17	8.80	1.2814
	18	8.60	1.2755
	19	8.40	1.2742
	20	8.20	1.2705
	21	8.00	1.2653
	22	7.80	1.2651
	23	7.60	1.2654
	24	7.40	1.2634
	25	7.20	1.2628
	26	7.00	1.2599
	27	6.80	1.2536
	28	6.60	1.2450
	29	6.40	1.2340
	30	6.20	1.2211
	31	6.00	1.2054
	32	5.80	1.1920
	33	5.60	1.1874
	34	5.40	1.1918
	35	5.20	1.1968
	36	5.00	1.2003
	37	4.80	1.2023
	38	4.60	1.2027
	39	4.40	1.2015
	40	4.20	1.1987
	41	4.00	1.1944
	42	3.80	1.1887
	43	3.60	1.1817
	44	3.40	1.1750
	45	3.20	1.1713
	46	3.00	1.1729
	47	2.80	1.1800
	48	2.60	1.1898
	49	2.40	1.1989
	50	2.20	1.2078
	51	2.00	1.2167
*	52	1.80	1.0000
*	53	1.60	1.0000
*	54	1.40	1.0000
*	55	1.20	1.0000
*	56	1.00	1.0000
*	57	0.80	1.0000
*	58	0.60	1.0000
*	59	0.40	1.0000
*	60	0.20	1.0000
*	61	0.00	1.0000

* Top and Bottom 15% Excluded per Technical Specification B3.2.1

FIGURE 8 RAOC W(Z) AT 12000 MWD/MTU



This figure is referred to by Specification B3.2.1

	Axial Point	Elevation (feet)	EOL W(Z)
*	1	12.00	1.0000
*	2	11.80	1.0000
*	3	11.60	1.0000
*	4	11.40	1.0000
*	5	11.20	1.0000
*	6	11.00	1.0000
*	7	10.80	1.0000
*	8	10.60	1.0000
*	9	10.40	1.0000
*	10	10.20	1.0000
	11	10.00	1.2373
	12	9.80	1.2412
	13	9.60	1.2432
	14	9.40	1.2457
	15	9.20	1.2450
	16	9.00	1.2542
	17	8.80	1.2664
	18	8.60	1.2735
	19	8.40	1.2820
	20	8.20	1.2941
	21	8.00	1.3043
	22	7.80	1.3017
	23	7.60	1.3109
	24	7.40	1.3167
	25	7.20	1.3223
	26	7.00	1.3247
	27	6.80	1.3231
	28	6.60	1.3183
	29	6.40	1.3104
	30	6.20	1.2996
	31	6.00	1.2861
	32	5.80	1.2739
	33	5.60	1.2664
	34	5.40	1.2632
	35	5.20	1.2642
	36	5.00	1.2647
	37	4.80	1.2627
	38	4.60	1.2582
	39	4.40	1.2512
	40	4.20	1.2418
	41	4.00	1.2302
	42	3.80	1.2176
	43	3.60	1.2038
	44	3.40	1.1884
	45	3.20	1.1749
	46	3.00	1.1775
	47	2.80	1.1782
	48	2.60	1.1870
	49	2.40	1.1943
	50	2.20	1.2032
	51	2.00	1.2127
*	52	1.80	1.0000
*	53	1.60	1.0000
*	54	1.40	1.0000
*	55	1.20	1.0000
*	56	1.00	1.0000
*	57	0.80	1.0000
*	58	0.60	1.0000
*	59	0.40	1.0000
*	60	0.20	1.0000
*	61	0.00	1.0000

* Top and Bottom 15% Excluded per Technical Specification B3.2.1

FIGURE 9 RAOC W(Z) AT 20000 MWD/MTU