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SOUTHERN COMPANY
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October 16, 2002

LCV-1639

Docket Nos: 50-424
50-425

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

Ladies and Gentlemen:

VOGTLE ELECTRIC GENERATING PLANT
UNIT 2 CYCLE 10 CORE OPERATING LIMITS REPORT

Pursuant to the reporting requirements of Vogtle Electric Generating Plant (VEGP) Technical Specification 5.6.5, Southern Nuclear Operating Company (SNC) is submitting Revision 0 of the Unit 2 Cycle 10 Core Operating Limits Report (COLR).

Sincerely,

J. T. Gasser

JTG/RJF

Attachment

cc: Southern Nuclear Operating Company
Mr. G. R. Frederick
Mr. M. Sheibani
SNC Document Management

U. S. Nuclear Regulatory Commission
Mr. L. A. Reyes, Regional Administrator
Mr. F. Rinaldi, Vogtle Project Manager, NRR
Mr. J. Zeiler, Senior Resident Inspector, Vogtle

A001

VOGTLE ELECTRIC GENERATING PLANT (VEGP) UNIT 2 CYCLE 10

CORE OPERATING LIMITS REPORT

REVISION 0

OCTOBER 2002

COLR for VEGP UNIT 2 CYCLE 10

1.0 CORE OPERATING LIMITS REPORT

This Core Operating Limits Report (COLR) for VEGP UNIT 2 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% RTP with a linear ramp to 0 $\Delta k/k/^{\circ}F$ at 100% 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 to 587.4°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: $P = \frac{\text{THERMAL POWER}}{\text{RATED THERMAL POWER}}$

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 1810 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 2 CYCLE 10

TABLE 1

$F_Q(Z)$ PENALTY FACTOR

Cycle Burnup (MWD/MTU)	$F_Q(Z)$ Penalty Factor
All Burnups	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.

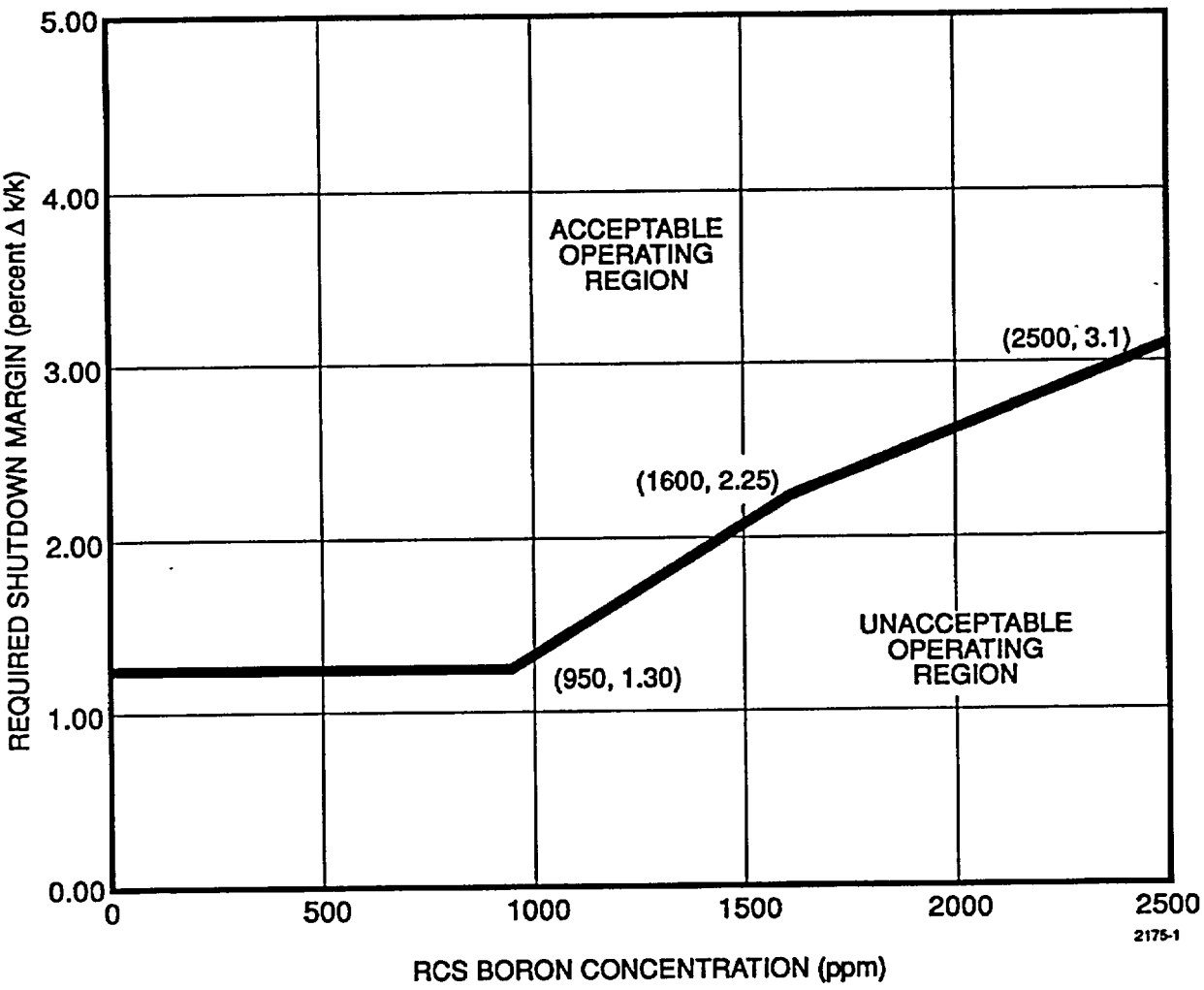


FIGURE 1

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

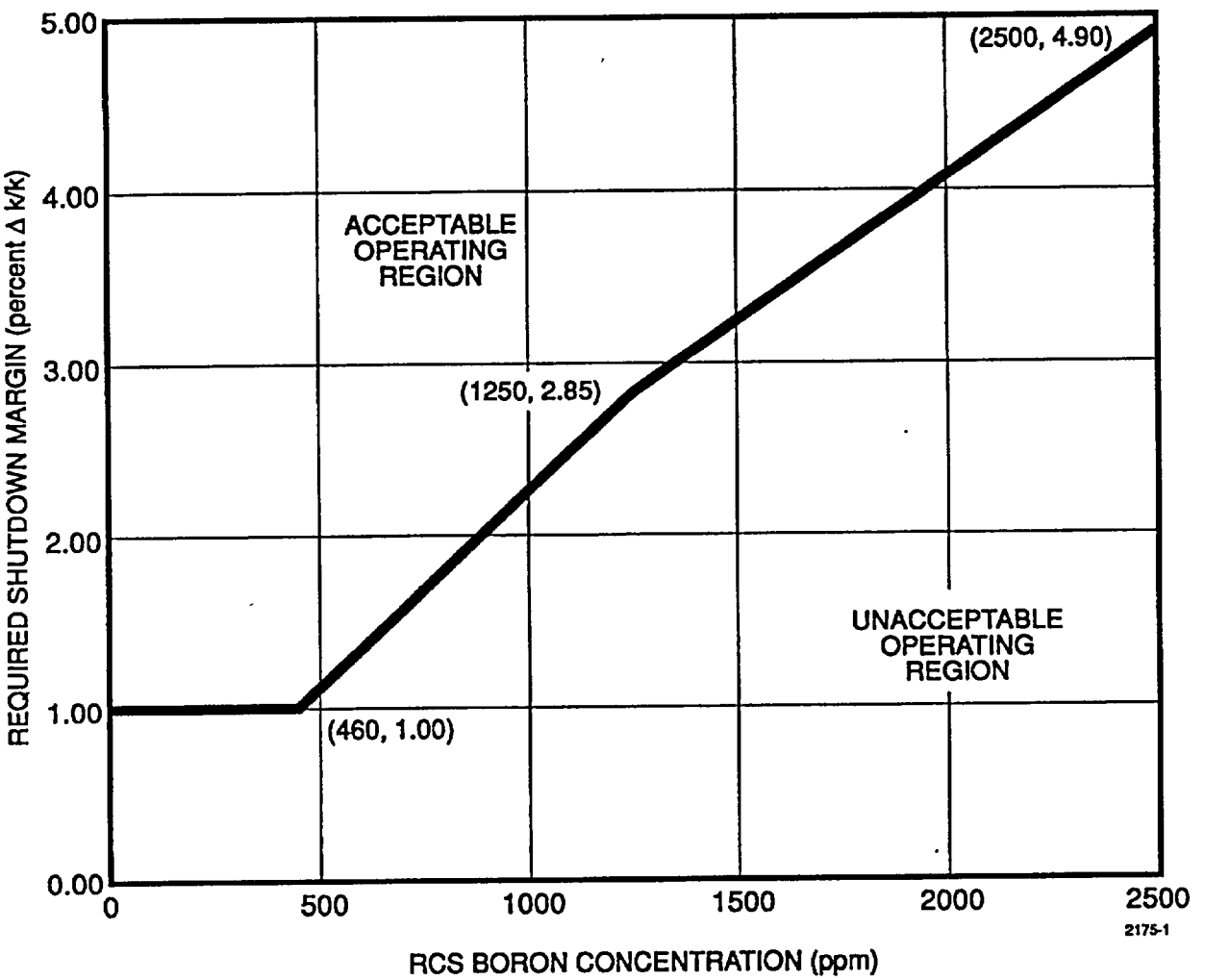
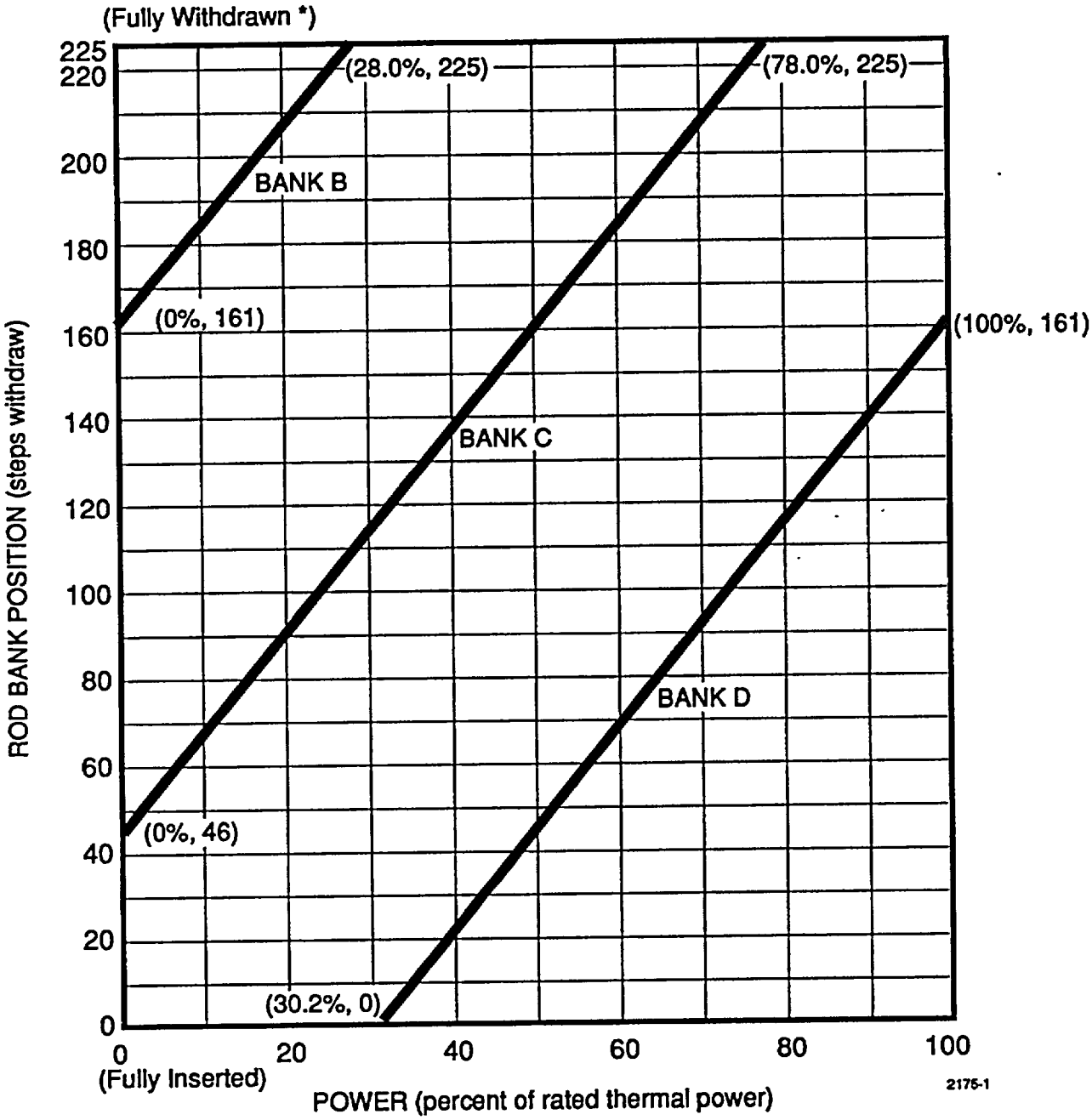


FIGURE 2

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

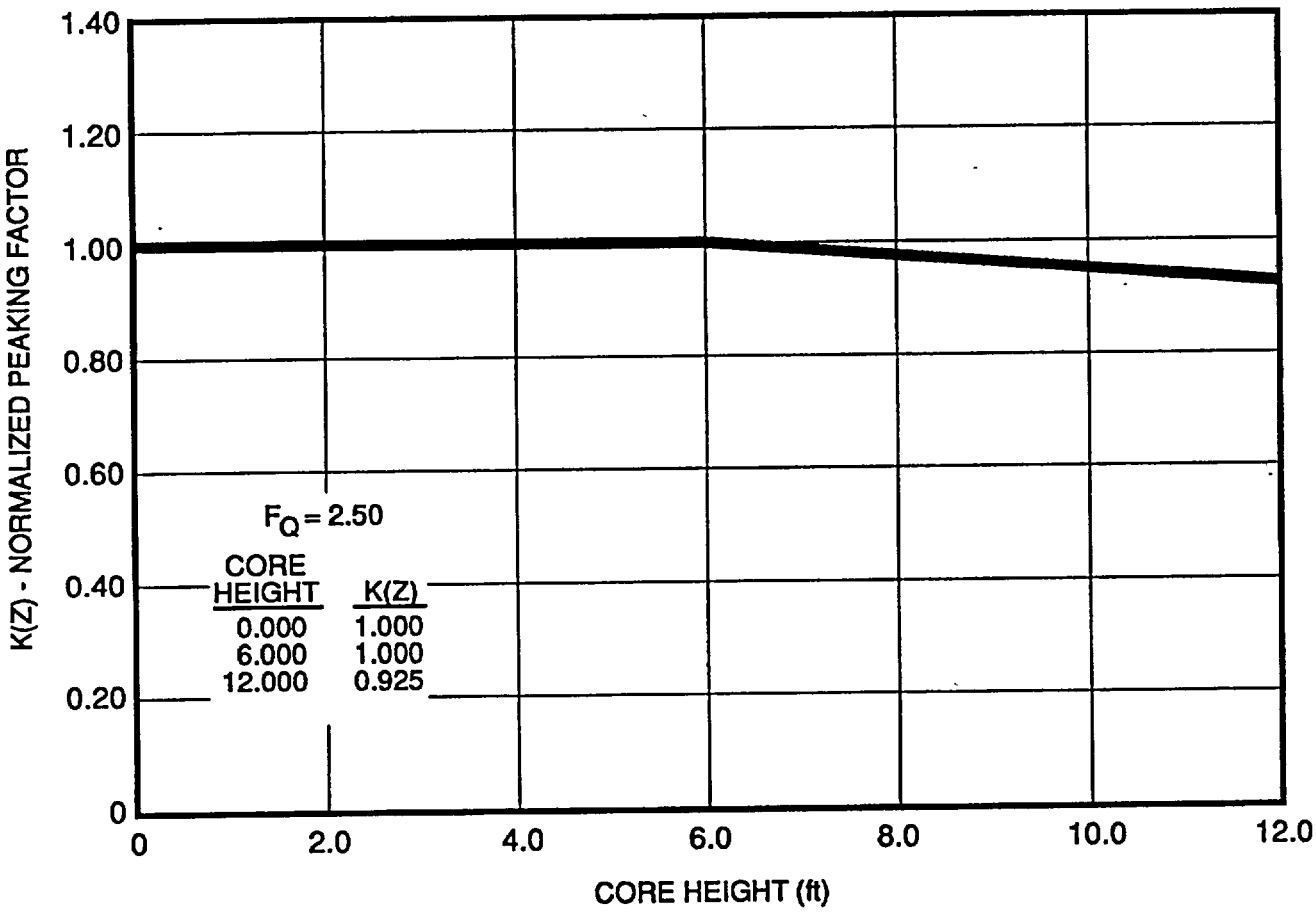


FIGURE 4

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

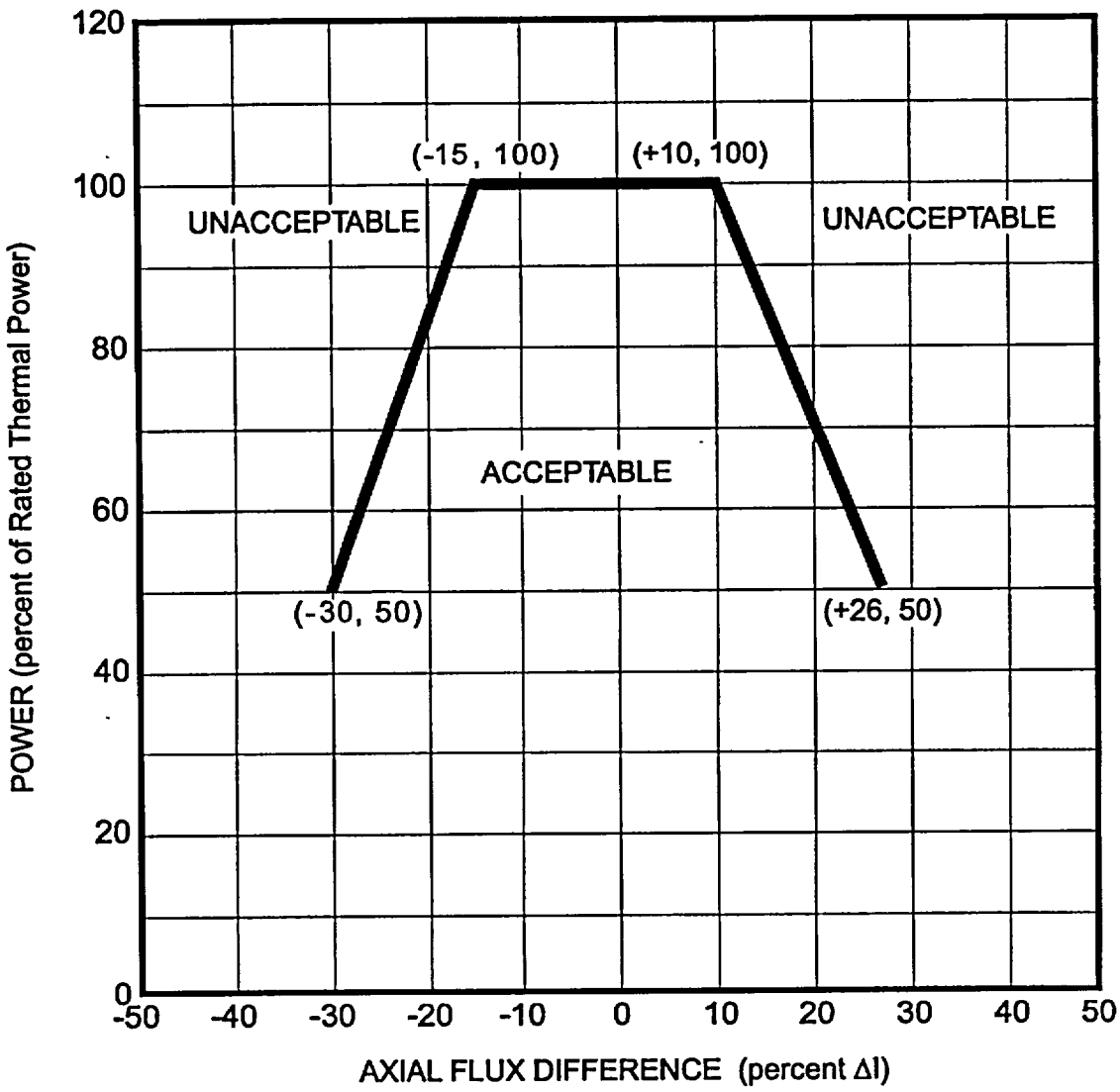
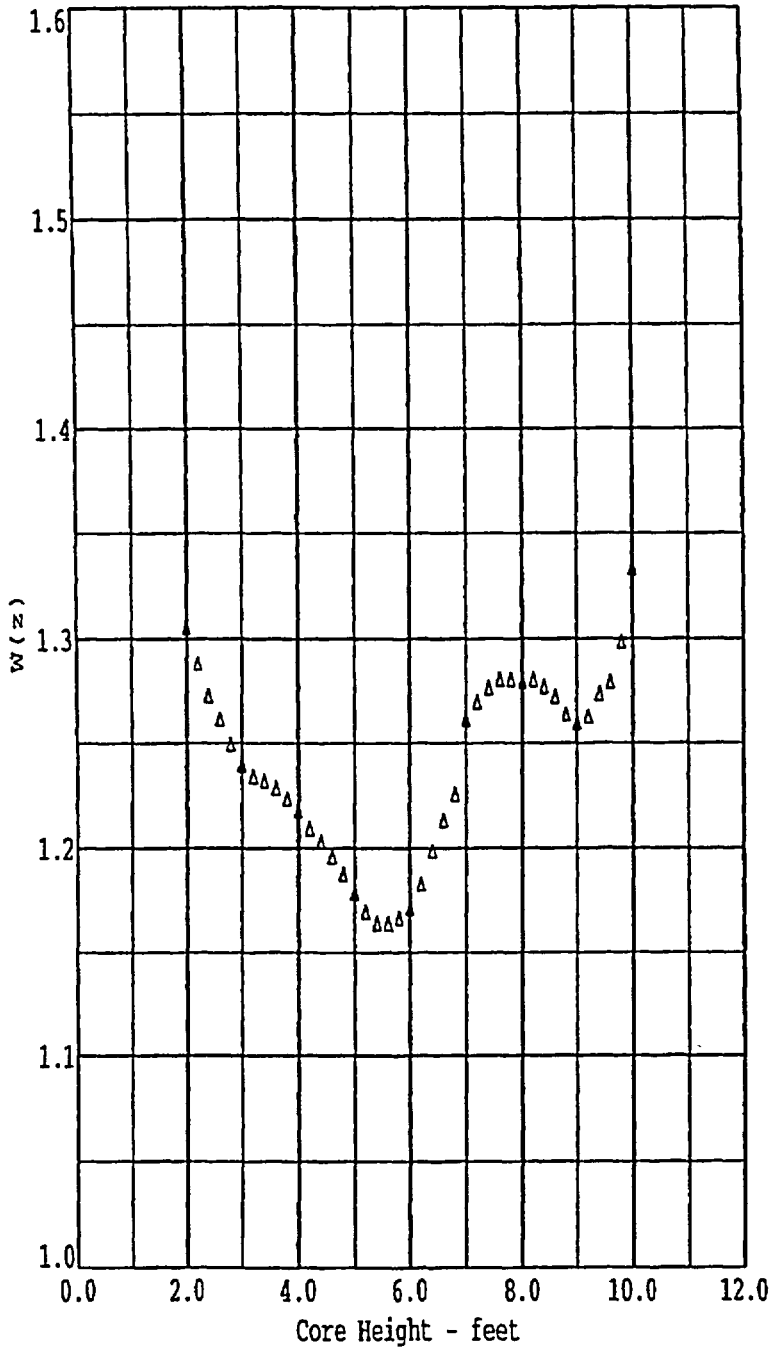


FIGURE 5

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



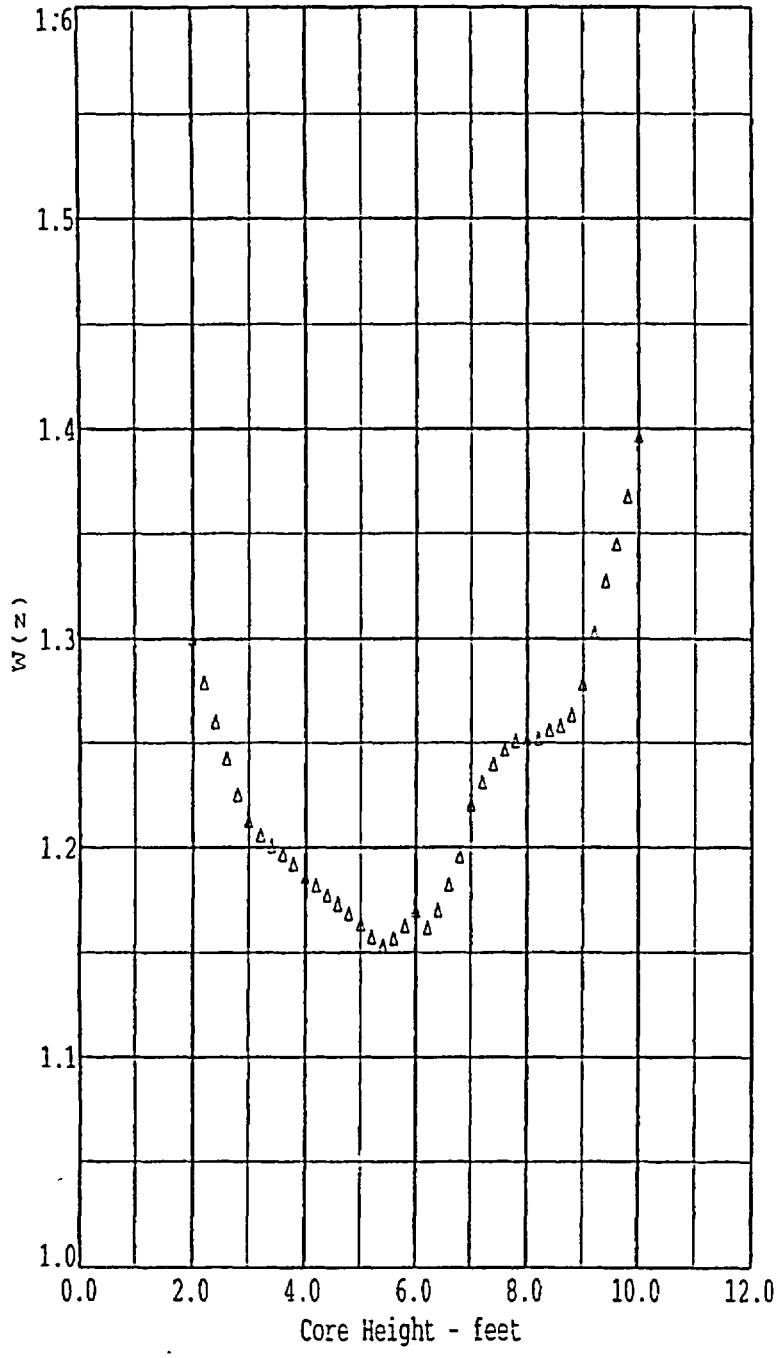
This figure is referred to by Specification B3.2.1

These W(Z) values are consistent with Figure 5 and are valid over the HFP T_{avg} temperature range from 586.4 to 587.4°F.

	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	1.3331
	12	9 80	1.2984
	13	9.60	1.2789
	14	9.40	1.2734
	15	9 20	1.2625
	16	9 00	1.2592
	17	8.80	1.2636
	18	8.60	1.2723
	19	8.40	1.2770
	20	8 20	1.2800
	21	8.00	1.2794
	22	7.80	1.2802
	23	7.60	1.2801
	24	7.40	1.2762
	25	7.20	1.2697
	26	7.00	1.2609
	27	6.80	1.2252
	28	6 60	1.2127
	29	6.40	1.1985
	30	6.20	1.1828
	31	6.00	1.1708
	32	5.80	1.1662
	33	5.60	1.1635
	34	5.40	1.1638
	35	5.20	1.1692
	36	5.00	1.1783
	37	4.80	1.1875
	38	4 60	1.1957
	39	4.40	1.2029
	40	4.20	1.2090
	41	4 00	1.2173
	42	3.80	1.2231
	43	3 60	1.2281
	44	3.40	1.2316
	45	3.20	1.2337
	46	3.00	1.2390
	47	2 80	1.2492
	48	2.60	1.2612
	49	2.40	1.2727
	50	2.20	1.2881
	51	2 00	1.3053
*	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) AT150 MWD/MTU



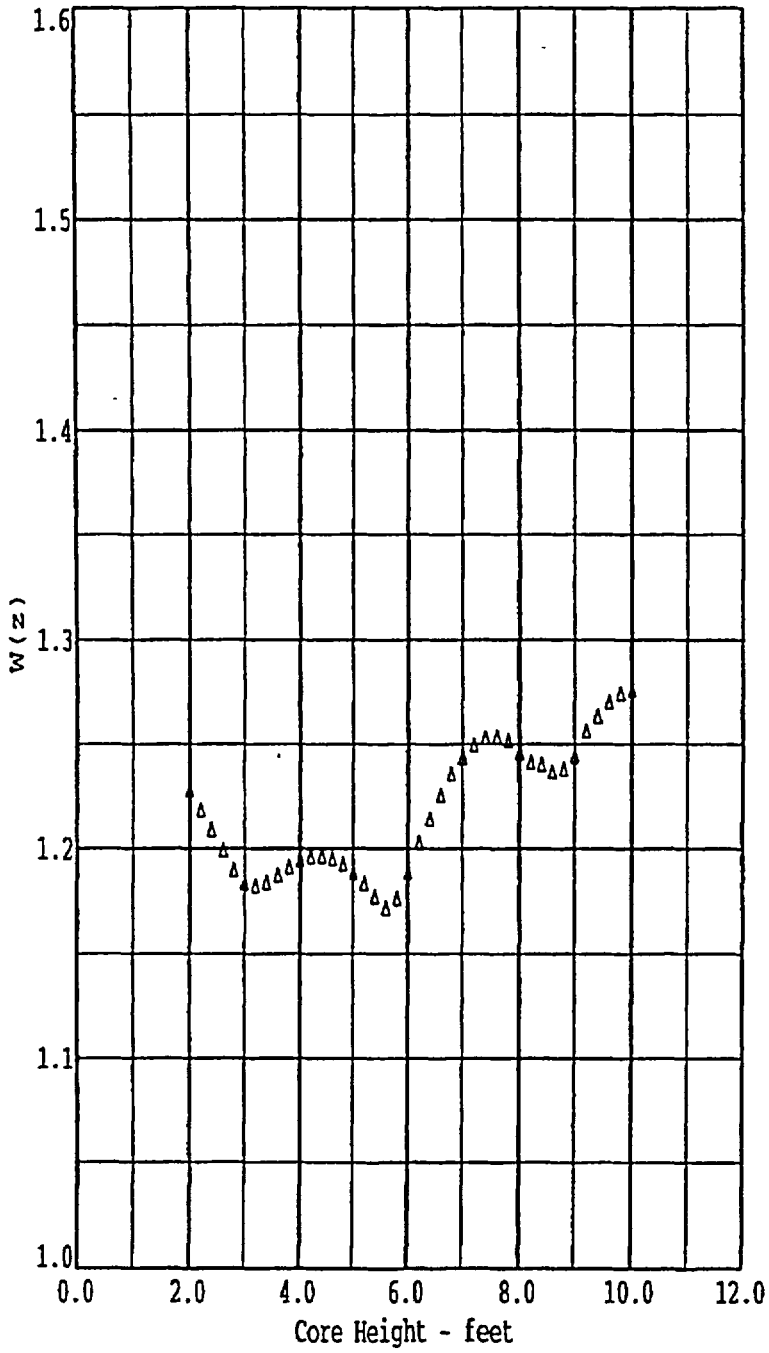
This figure is referred to by Specification B3.2.1

These W(Z) values are consistent with Figure 5 and are valid over the HFP T_{avg} temperature range from 586.4 to 587.4°F.

	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	1.3967
	12	9 80	1.3673
	13	9 60	1.3446
	14	9 40	1.3272
	15	9 20	1 3026
	16	9 00	1 2783
	17	8 80	1 2633
	18	8.60	1 2582
	19	8 40	1 2560
	20	8 20	1 2516
	21	8 00	1.2518
	22	7 80	1 2508
	23	7 60	1.2464
	24	7.40	1 2397
	25	7 20	1 2309
	26	7.00	1 2201
	27	6.80	1.1958
	28	6 60	1.1824
	29	6.40	1.1701
	30	6.20	1.1617
	31	6 00	1.1700
	32	5 80	1 1626
	33	5 60	1.1566
	34	5 40	1.1528
	35	5.20	1 1573
	36	5.00	1.1634
	37	4.80	1.1685
	38	4.60	1.1731
	39	4.40	1.1773
	40	4.20	1 1819
	41	4.00	1.1863
	42	3.80	1.1922
	43	3 60	1.1967
	44	3 40	1.2005
	45	3.20	1.2056
	46	3.00	1.2126
	47	2 80	1 2250
	48	2.60	1.2424
	49	2.40	1.2600
	50	2.20	1.2790
	51	2.00	1.3003
*	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

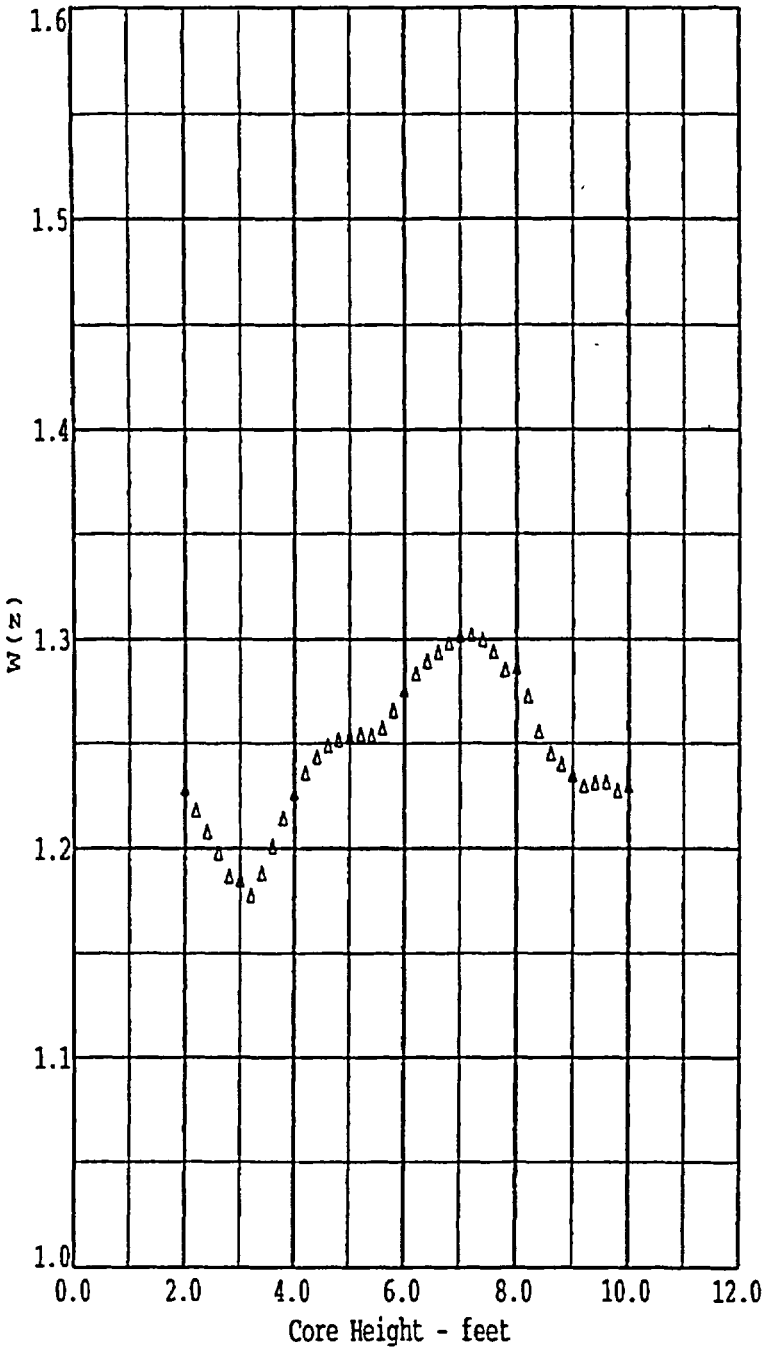
These W(Z) values are consistent with Figure 5 and are valid over the HFP T_{avg} temperature range from 586.4 to 587.4°F.

	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	1.2757
	12	9.80	1.2740
	13	9.60	1.2701
	14	9.40	1.2635
	15	9.20	1.2563
	16	9.00	1.2442
	17	8.80	1.2380
	18	8.60	1.2368
	19	8.40	1.2404
	20	8.20	1.2415
	21	8.00	1.2457
	22	7.80	1.2515
	23	7.60	1.2535
	24	7.40	1.2529
	25	7.20	1.2495
	26	7.00	1.2437
	27	6.80	1.2356
	28	6.60	1.2254
	29	6.40	1.2140
	30	6.20	1.2024
	31	6.00	1.1887
	32	5.80	1.1762
	33	5.60	1.1718
	34	5.40	1.1771
	35	5.20	1.1833
	36	5.00	1.1886
	37	4.80	1.1926
	38	4.60	1.1952
	39	4.40	1.1964
	40	4.20	1.1961
	41	4.00	1.1944
	42	3.80	1.1911
	43	3.60	1.1871
	44	3.40	1.1836
	45	3.20	1.1821
	46	3.00	1.1834
	47	2.80	1.1897
	48	2.60	1.1991
	49	2.40	1.2087
	50	2.20	1.2182
	51	2.00	1.2276
*	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

COLR for VEGP UNIT 2 CYCLE 10



This figure is referred to by Specification B3.2.1

These W(Z) values are consistent with Figure 5 and are valid over the HFP T_{avg} temperature range from 586.4 to 587.4°F.

	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	1.2297
	12	9.80	1.2271
	13	9.60	1.2312
	14	9.40	1.2309
	15	9.20	1.2297
	16	9.00	1.2348
	17	8.80	1.2400
	18	8.60	1.2451
	19	8.40	1.2556
	20	8.20	1.2726
	21	8.00	1.2865
	22	7.80	1.2853
	23	7.60	1.2940
	24	7.40	1.2995
	25	7.20	1.3020
	26	7.00	1.3017
	27	6.80	1.2982
	28	6.60	1.2936
	29	6.40	1.2893
	30	6.20	1.2834
	31	6.00	1.2758
	32	5.80	1.2660
	33	5.60	1.2573
	34	5.40	1.2539
	35	5.20	1.2543
	36	5.00	1.2532
	37	4.80	1.2514
	38	4.60	1.2487
	39	4.40	1.2434
	40	4.20	1.2358
	41	4.00	1.2260
	42	3.80	1.2141
	43	3.60	1.2008
	44	3.40	1.1880
	45	3.20	1.1776
	46	3.00	1.1848
	47	2.80	1.1865
	48	2.60	1.1977
	49	2.40	1.2078
	50	2.20	1.2179
	51	2.00	1.2281
*	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