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U. S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, D. C. 20555-0001

**Vogtle Electric Generating Plant**  
**Unit 1 Cycle 12 and Unit 2 Cycle 10 Core Operating Limits Reports**

Ladies and Gentlemen:

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 1 Cycle 12 Core Operating Limits Report (COLR) and Revision 1 of the Unit 2 Cycle 10 COLR.

This letter contains no NRC commitments. If you have any questions, please advise.

Sincerely,

Jeffrey T. Gasser

JTG/RJF

Enclosures: Unit 1 Cycle 12 and Unit 2 Cycle 10 Core Operating Limits Reports

cc: Southern Nuclear Operating Company  
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**VOGTLE ELECTRIC GENERATING PLANT (VEGP) UNIT 1 CYCLE 12**

**CORE OPERATING LIMITS REPORT**

**REVISION 0**

**SEPTEMBER 2003**

## COLR for VEGP UNIT 1 CYCLE 12

### 1.0 CORE OPERATING LIMITS REPORT

This Core Operating Limits Report (COLR) for VEGP UNIT 1 CYCLE 12 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 -  $F_{\Delta H}^N$
- 3.2.3 Axial Flux Difference
- 3.9.1 Boron Concentration

## COLR for VEGP UNIT 1 CYCLE 12

### 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  $-5.50 \times 10^{-4} \Delta k/k/^{\circ}F$ .<sup>1</sup>

- 2.3.2 The MTC Surveillance limits are:

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

The 60 ppm/ARO/RTP-MTC should be less negative than  $-5.35 \times 10^{-4} \Delta k/k/^{\circ}F$ .<sup>1</sup>

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.

<sup>1</sup>Applicable for full-power T-average of 586.4°F to 587.4°F.

## COLR for VEGP UNIT 1 CYCLE 12

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

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

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

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

$$2.6.2 \quad F_Q^{RTP} = 2.50$$

2.6.3  $K(Z)$  is provided in Figure 4.

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

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

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.

## COLR for VEGP UNIT 1 CYCLE 12

### 2.7 Nuclear Enthalpy Rise Hot Channel Factor - $F_{\Delta H}^N$ (Specification 3.2.2)

$$2.7.1 \quad F_{\Delta H}^N \leq F_{\Delta H}^{RTP} * (1 + PF_{\Delta H} * (1-P))$$

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

$$2.7.2 \quad F_{\Delta H}^{RTP} = 1.65$$

$$2.7.3 \quad PF_{\Delta H} = 0.3$$

### 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 1905 ppm.<sup>1</sup>

<sup>1</sup>This concentration bounds the condition of  $k_{\text{eff}} \leq 0.95$  (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<sup>10</sup> depletion.

COLR for VEGP UNIT 1 CYCLE 12

TABLE 1

$F_Q(Z)$  PENALTY FACTOR

Cycle Burnup (MWD/MTU)	$F_Q(Z)$ Penalty Factor
150	1.020
363	1.032
576	1.036
789	1.033
1003	1.029
1216	1.023
1429	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.
2. Linear interpolation is adequate for intermediate cycle burnups.
3. For all cycle burnups outside the range of the table, a penalty factor of 1.020 shall be used.

COLR for VEGP UNIT 1 CYCLE 12

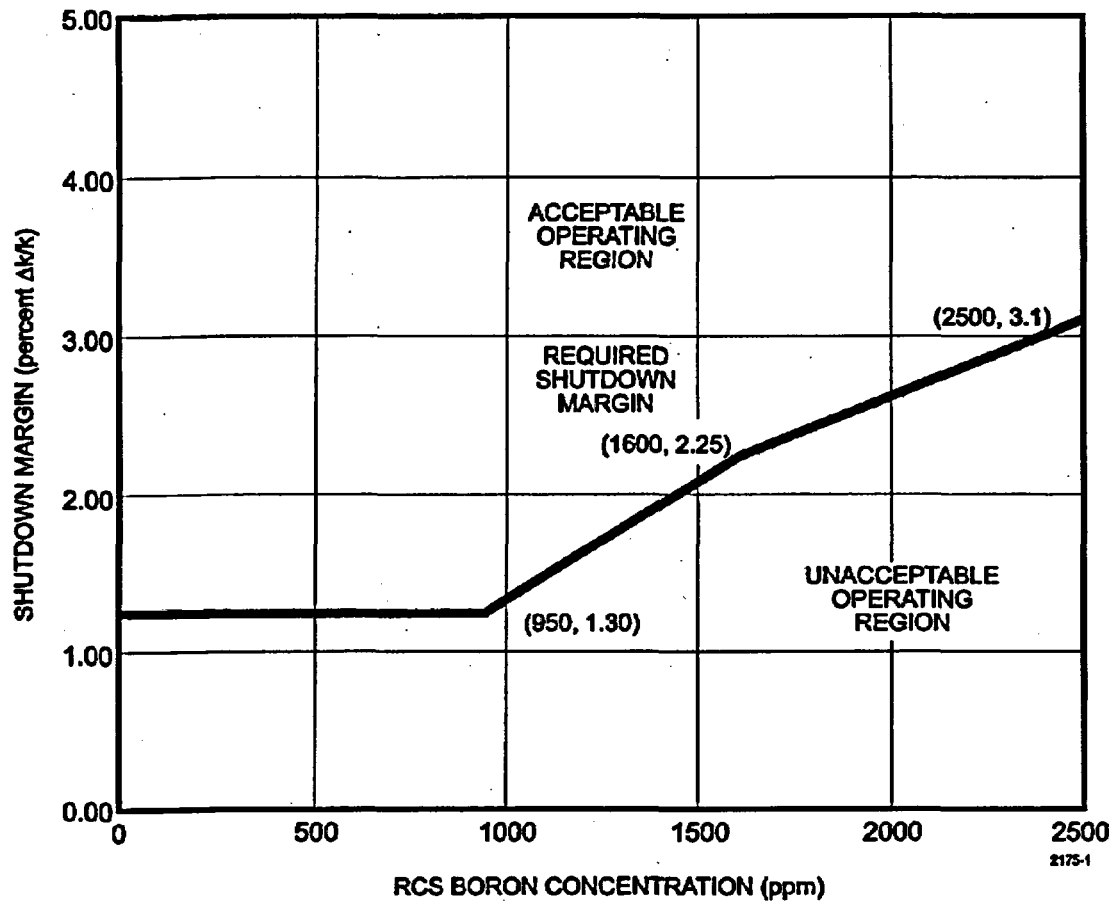


FIGURE 1

REQUIRED SHUTDOWN MARGIN FOR MODES 3 AND 4 (FOUR LOOPS FILLED AND VENTED  
AND AT LEAST ONE REACTOR COOLANT PUMP RUNNING)



COLR for VEGP UNIT 1 CYCLE 12

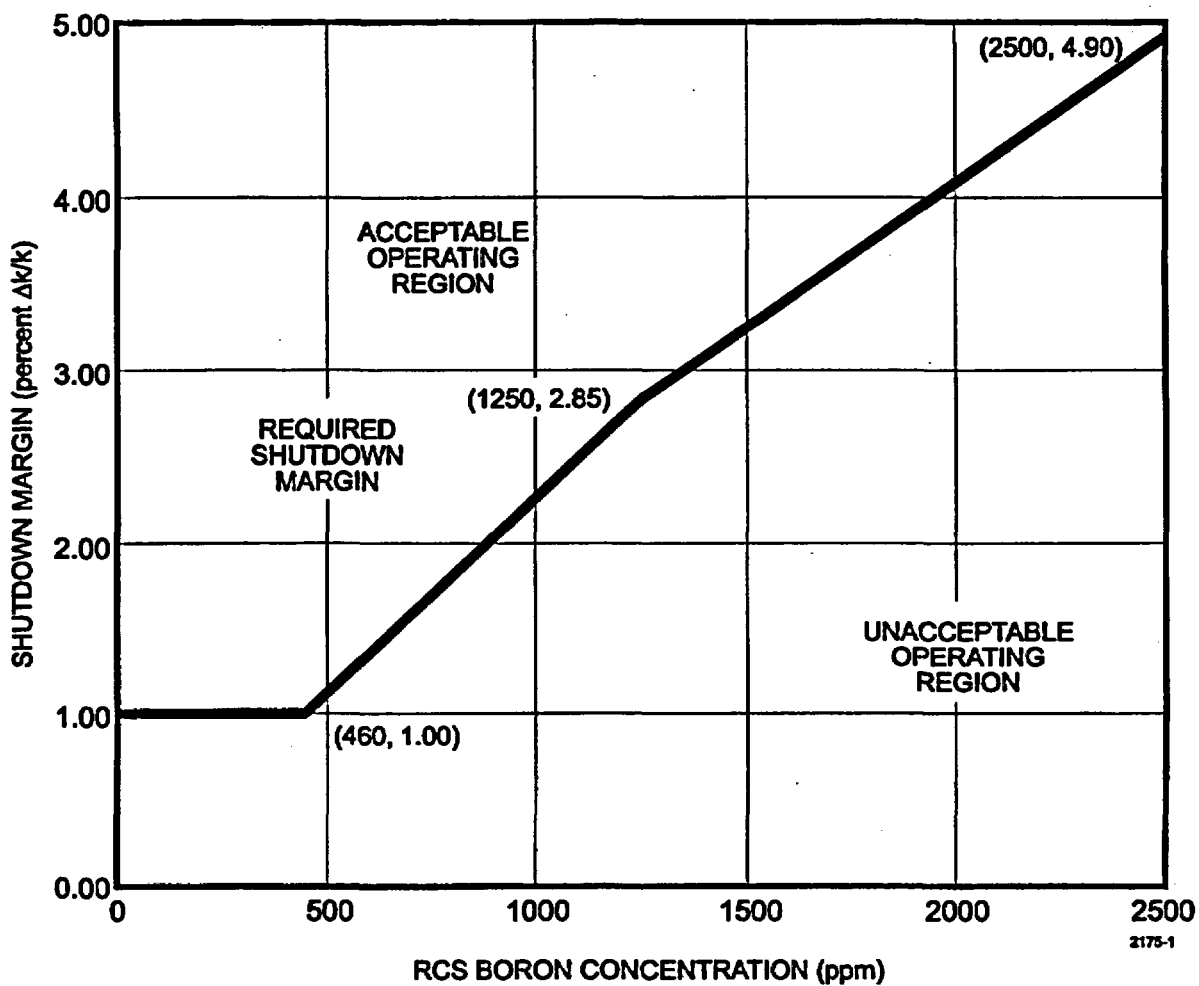
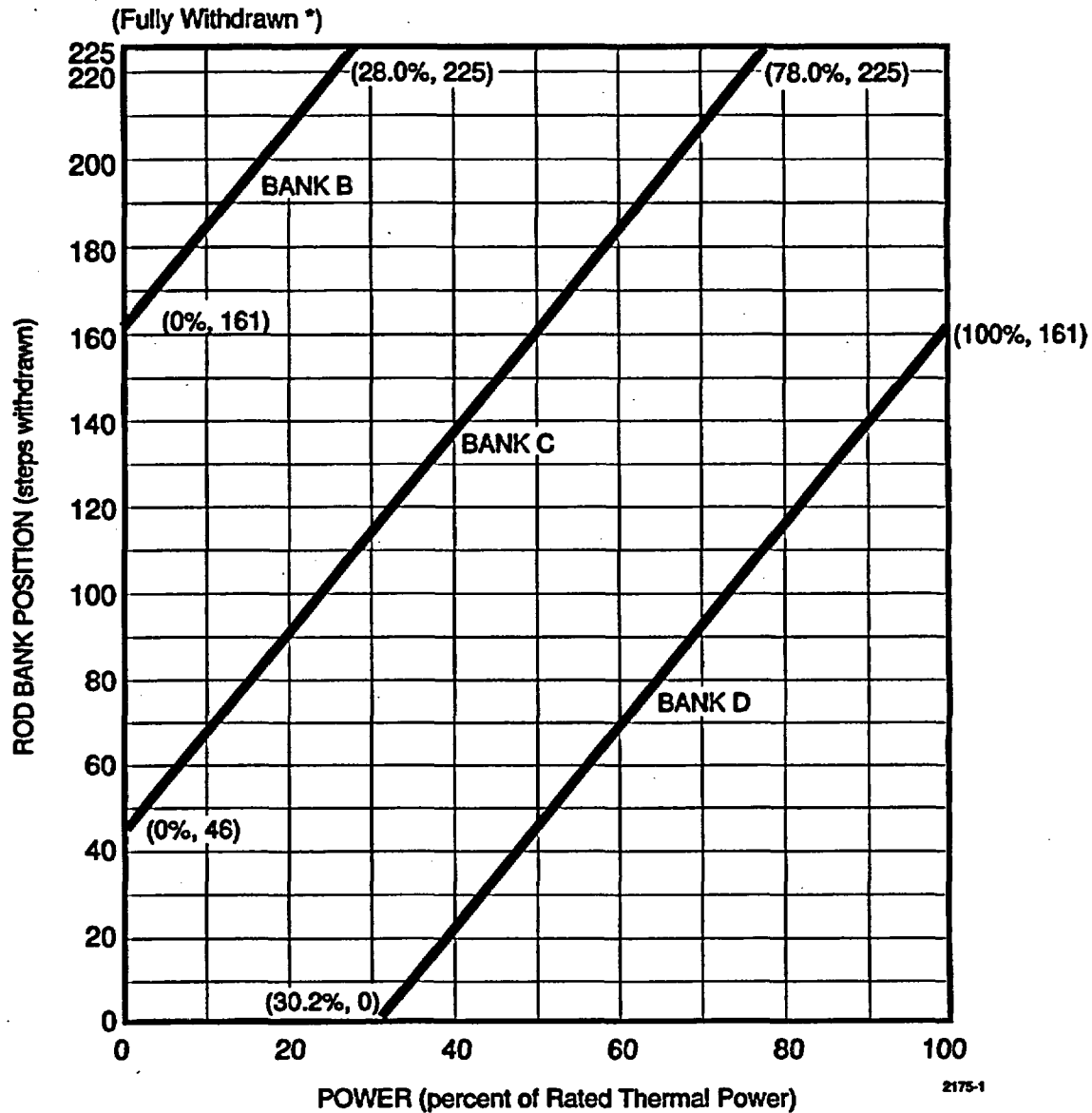


FIGURE 2

REQUIRED SHUTDOWN MARGIN FOR MODES 4 AND 5 (MODE 4 WHEN  
FIGURE 1 NOT APPLICABLE)

# COLR for VEGP UNIT 1 CYCLE 12



\* Fully withdrawn shall be the condition where control rods are at a position within the interval  $\geq 225$  and  $\leq 231$  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

COLR for VEGP UNIT 1 CYCLE 12

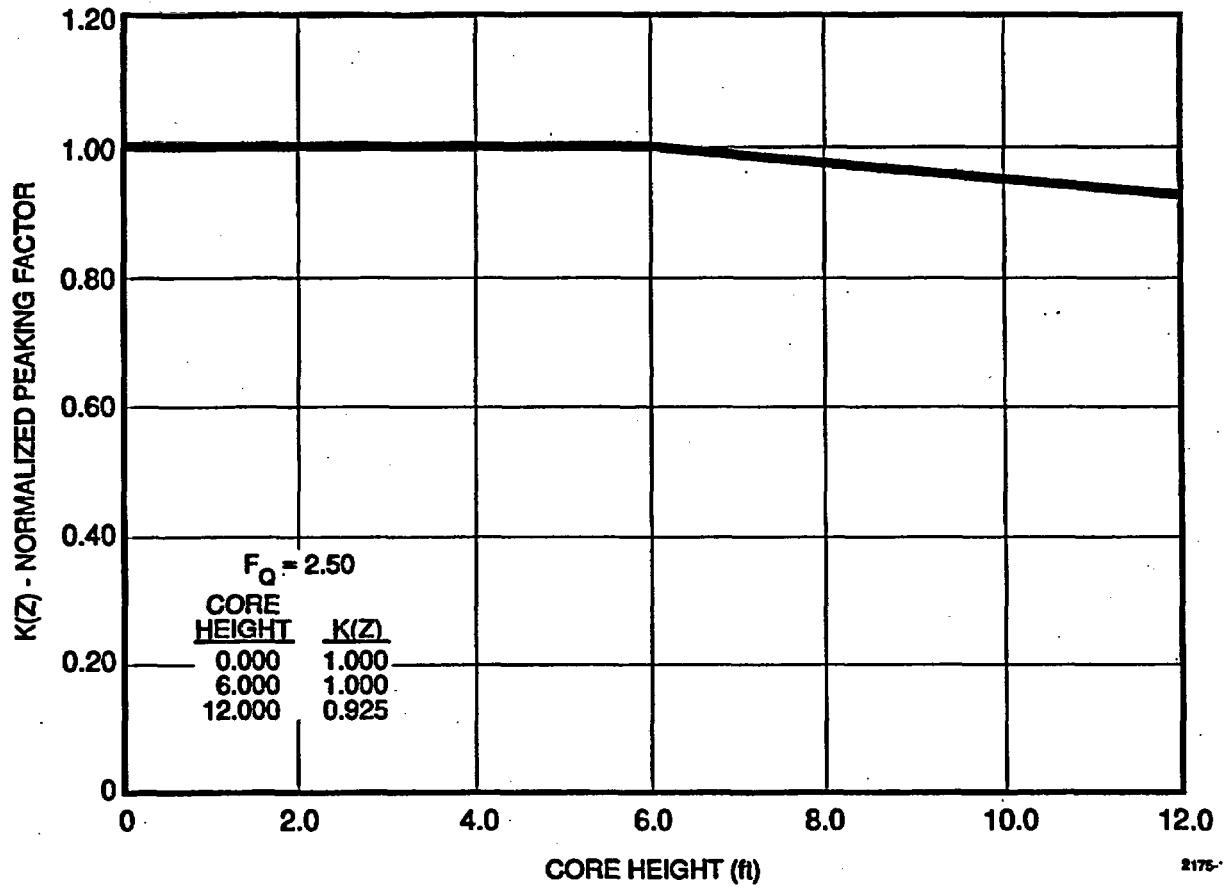


FIGURE 4

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

COLR for VEGP UNIT 1 CYCLE 12

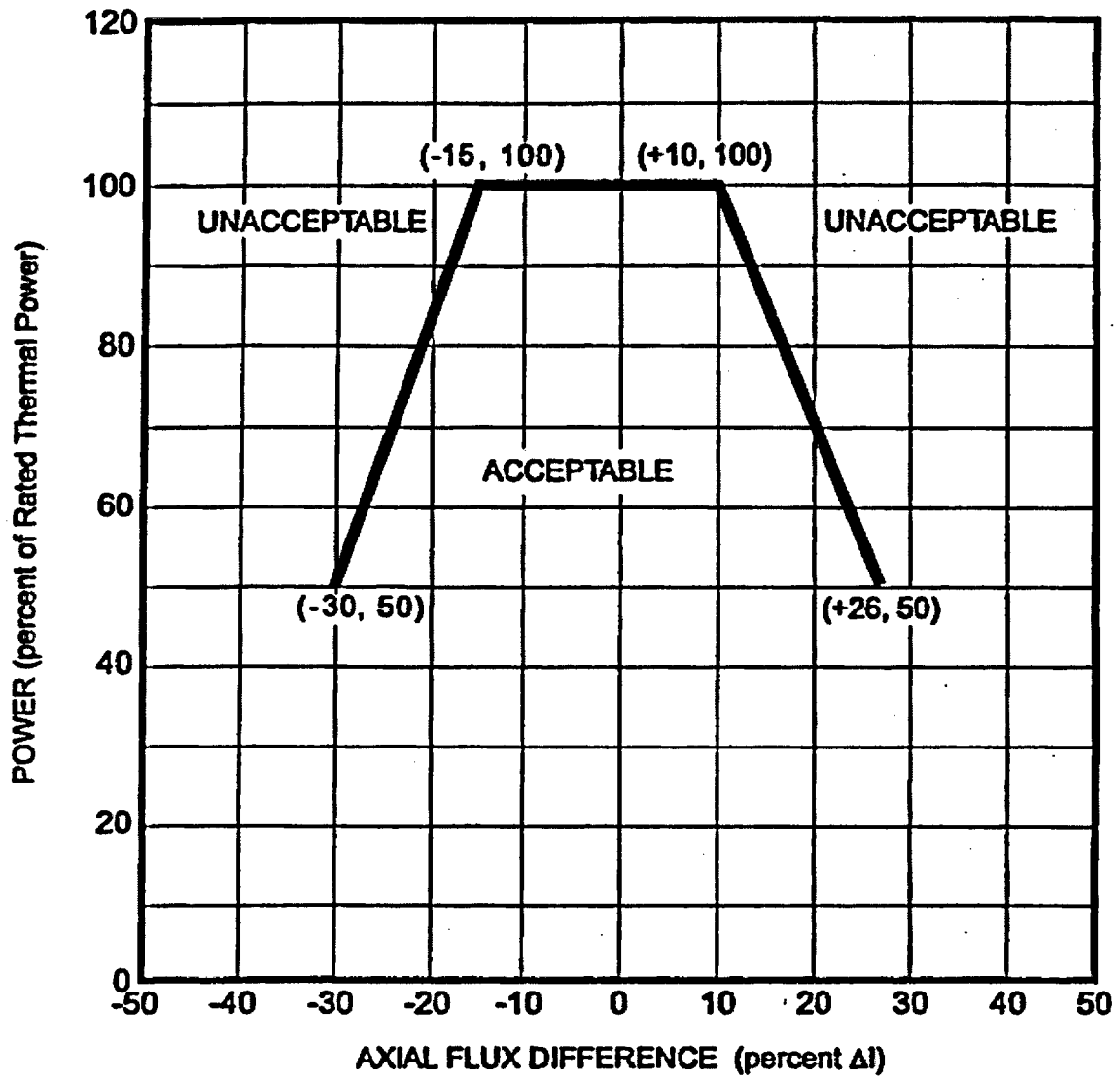
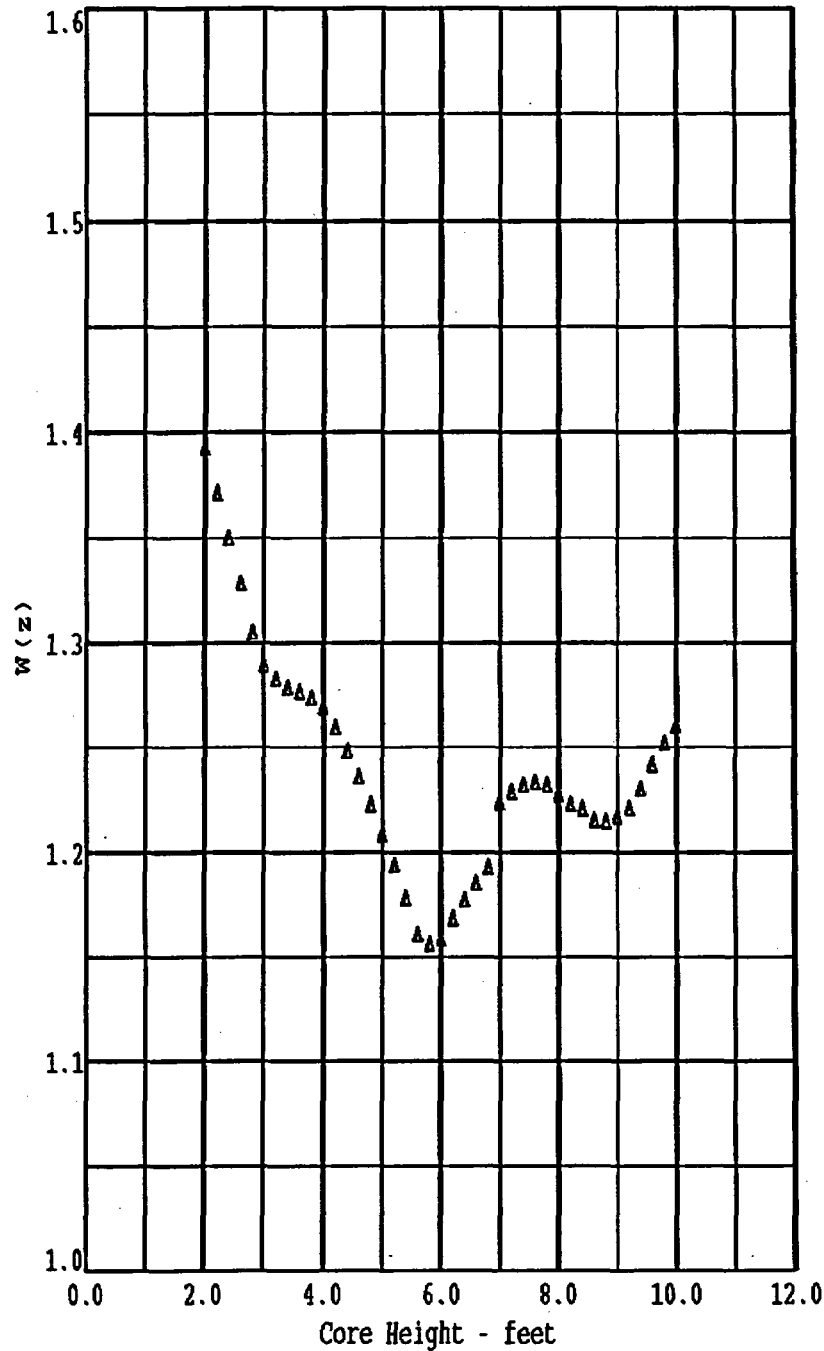


FIGURE 5

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

# COLR for VEGP UNIT 1 CYCLE 12



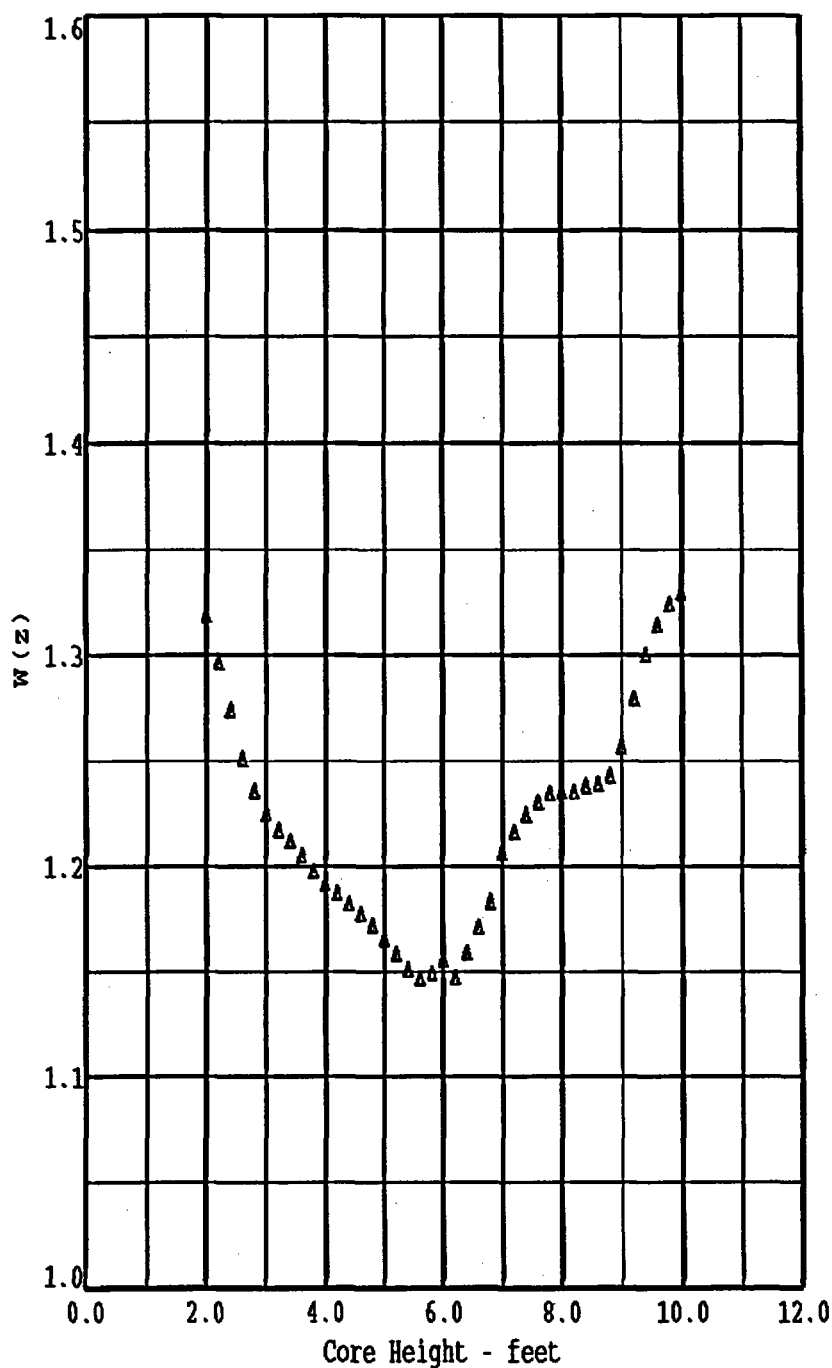
Axial Point	Elevation (feet)	BOL W(Z)
1	12.00	1.0000
2	11.80	1.0000
3	11.60	1.0000
4	11.40	1.0000
5	11.20	1.0000
6	11.00	1.0000
7	10.80	1.0000
8	10.60	1.0000
9	10.40	1.0000
10	10.20	1.0000
11	10.00	1.2600
12	9.80	1.2518
13	9.60	1.2419
14	9.40	1.2303
15	9.20	1.2210
16	9.00	1.2171
17	8.80	1.2148
18	8.60	1.2152
19	8.40	1.2208
20	8.20	1.2230
21	8.00	1.2277
22	7.80	1.2321
23	7.60	1.2333
24	7.40	1.2322
25	7.20	1.2290
26	7.00	1.2239
27	6.80	1.1929
28	6.60	1.1851
29	6.40	1.1773
30	6.20	1.1684
31	6.00	1.1580
32	5.80	1.1561
33	5.60	1.1606
34	5.40	1.1782
35	5.20	1.1938
36	5.00	1.2084
37	4.80	1.2227
38	4.60	1.2358
39	4.40	1.2481
40	4.20	1.2592
41	4.00	1.2689
42	3.80	1.2734
43	3.60	1.2764
44	3.40	1.2783
45	3.20	1.2827
46	3.00	1.2892
47	2.80	1.3049
48	2.60	1.3284
49	2.40	1.3500
50	2.20	1.3714
51	2.00	1.3925
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

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.

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

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

# COLR for VEGP UNIT 1 CYCLE 12



This figure is referred to by Specification B3.2.1

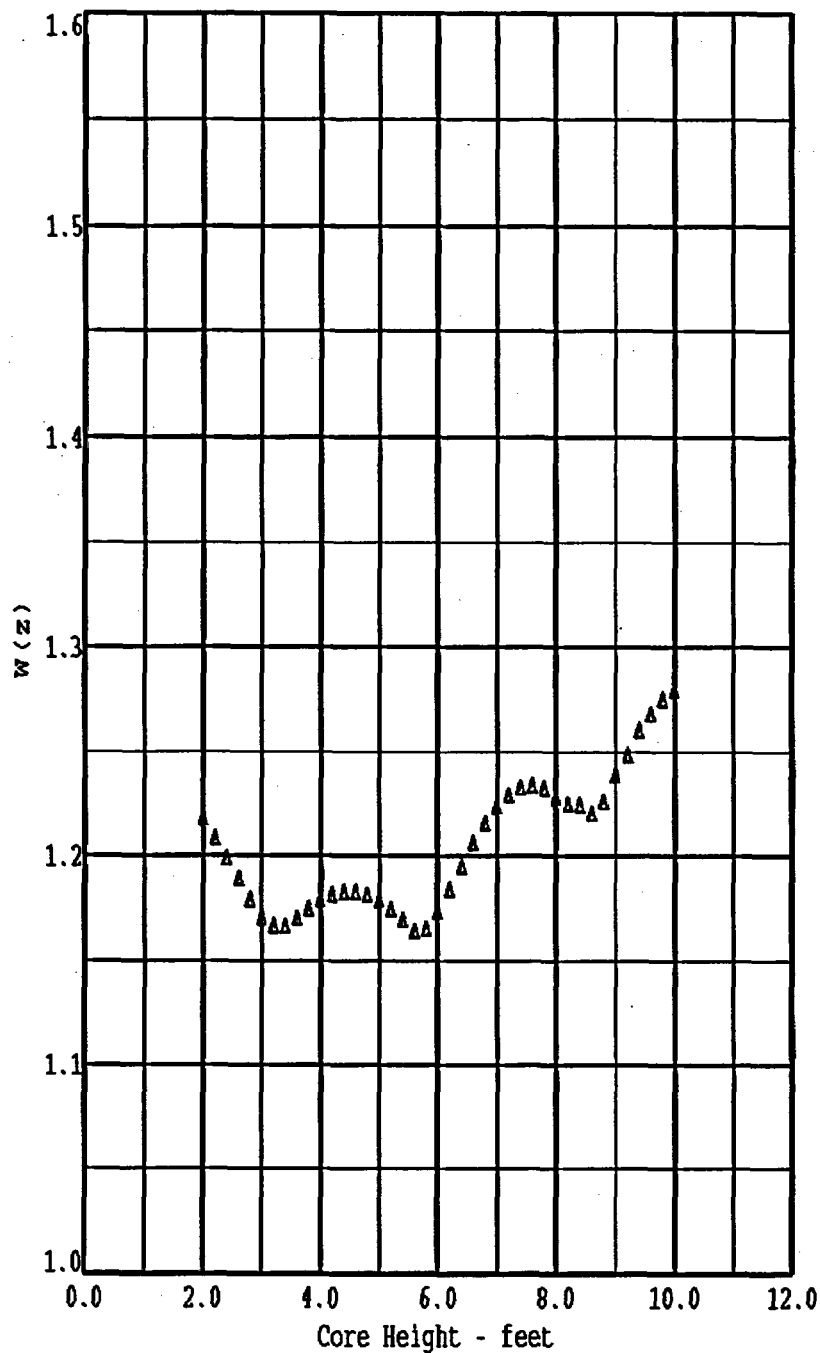
These W(Z) values are consistent with Figure 5, and are valid over the HFP  $T_{avg}$  temperature range from 586.4 to 587.4°F.

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	1.3294
12	9.80	1.3240
13	9.60	1.3142
14	9.40	1.3001
15	9.20	1.2792
16	9.00	1.2567
17	8.80	1.2429
18	8.60	1.2391
19	8.40	1.2381
20	8.20	1.2352
21	8.00	1.2354
22	7.80	1.2345
23	7.60	1.2304
24	7.40	1.2243
25	7.20	1.2162
26	7.00	1.2064
27	6.80	1.1830
28	6.60	1.1710
29	6.40	1.1590
30	6.20	1.1470
31	6.00	1.1554
32	5.80	1.1490
33	5.60	1.1466
34	5.40	1.1507
35	5.20	1.1583
36	5.00	1.1654
37	4.80	1.1718
38	4.60	1.1773
39	4.40	1.1821
40	4.20	1.1873
41	4.00	1.1914
42	3.80	1.1978
43	3.60	1.2052
44	3.40	1.2118
45	3.20	1.2171
46	3.00	1.2249
47	2.80	1.2355
48	2.60	1.2510
49	2.40	1.2737
50	2.20	1.2966
51	2.00	1.3189
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

# COLR for VEGP UNIT 1 CYCLE 12



This figure is referred to by Specification B3.2.1

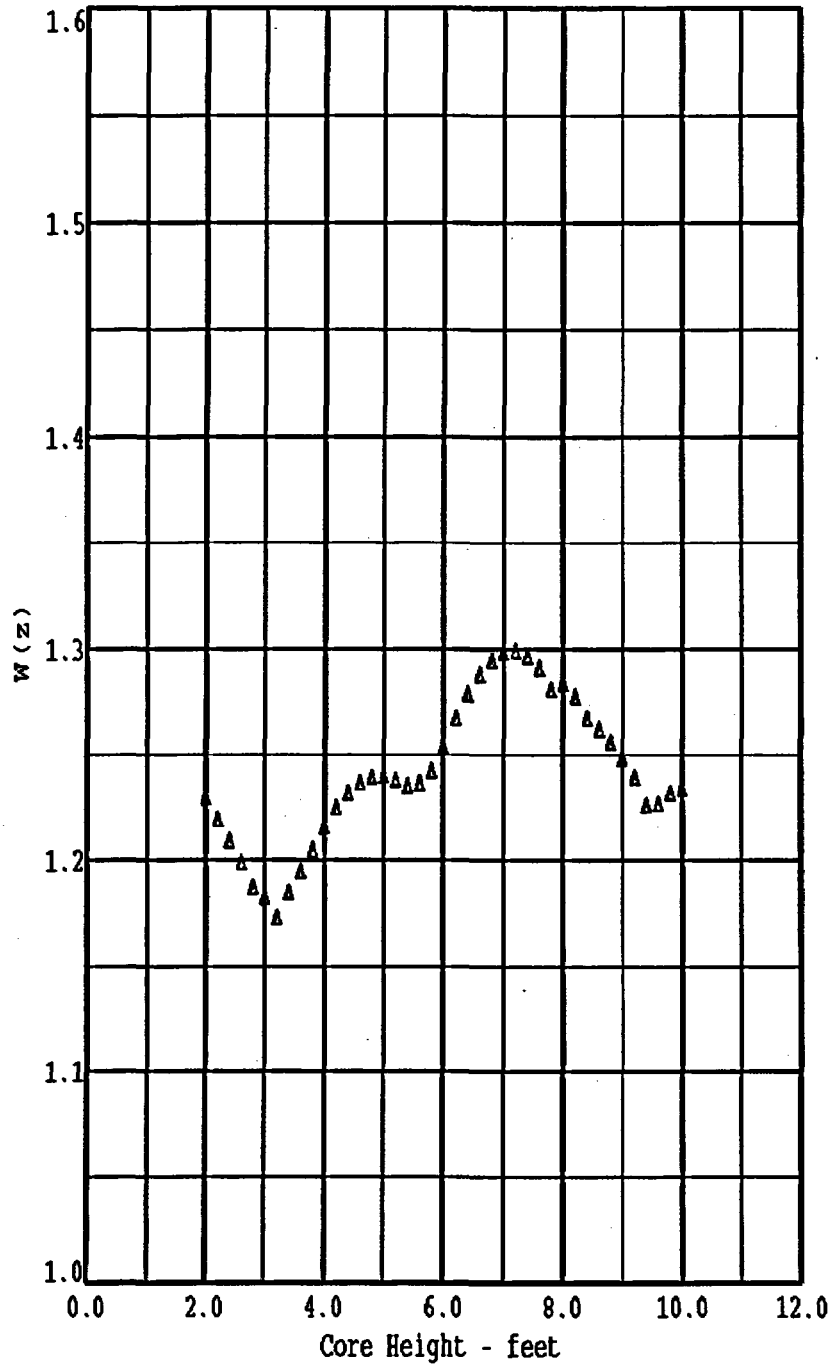
These W(Z) values are consistent with Figure 5, and are valid over the HFP  $T_{avg}$  temperature range from 586.4 to 587.4°F.

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	1.2793
12	9.80	1.2749
13	9.60	1.2679
14	9.40	1.2602
15	9.20	1.2486
16	9.00	1.2389
17	8.80	1.2261
18	8.60	1.2204
19	8.40	1.2244
20	8.20	1.2249
21	8.00	1.2279
22	7.80	1.2326
23	7.60	1.2338
24	7.40	1.2327
25	7.20	1.2292
26	7.00	1.2234
27	6.80	1.2156
28	6.60	1.2059
29	6.40	1.1949
30	6.20	1.1838
31	6.00	1.1731
32	5.80	1.1650
33	5.60	1.1638
34	5.40	1.1692
35	5.20	1.1744
36	5.00	1.1784
37	4.80	1.1811
38	4.60	1.1825
39	4.40	1.1825
40	4.20	1.1812
41	4.00	1.1786
42	3.80	1.1746
43	3.60	1.1699
44	3.40	1.1663
45	3.20	1.1665
46	3.00	1.1702
47	2.80	1.1787
48	2.60	1.1891
49	2.40	1.1988
50	2.20	1.2084
51	2.00	1.2179
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 1 CYCLE 12



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	1.2338
12	9.80	1.2316
13	9.60	1.2266
14	9.40	1.2260
15	9.20	1.2393
16	9.00	1.2481
17	8.80	1.2559
18	8.60	1.2620
19	8.40	1.2673
20	8.20	1.2774
21	8.00	1.2838
22	7.80	1.2809
23	7.60	1.2912
24	7.40	1.2968
25	7.20	1.2992
26	7.00	1.2983
27	6.80	1.2945
28	6.60	1.2879
29	6.40	1.2788
30	6.20	1.2673
31	6.00	1.2536
32	5.80	1.2424
33	5.60	1.2363
34	5.40	1.2350
35	5.20	1.2378
36	5.00	1.2396
37	4.80	1.2390
38	4.60	1.2364
39	4.40	1.2316
40	4.20	1.2247
41	4.00	1.2156
42	3.80	1.2049
43	3.60	1.1945
44	3.40	1.1847
45	3.20	1.1728
46	3.00	1.1825
47	2.80	1.1871
48	2.60	1.1988
49	2.40	1.2090
50	2.20	1.2192
51	2.00	1.2285
* 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



**VOGTLE ELECTRIC GENERATING PLANT (VEGP) UNIT 2 CYCLE 10**

**CORE OPERATING LIMITS REPORT**

**REVISION 1**

**SEPTEMBER 2003**

## 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 -  $F_{\Delta H}^N$

3.2.3 Axial Flux Difference

3.9.1 Boron Concentration

## COLR for VEGP UNIT 2 CYCLE 10

### 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  $-5.50 \times 10^{-4} \Delta k/k^{\circ}F$ .<sup>1</sup>

2.3.2 The MTC Surveillance limits are:

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

The 60 ppm/ARO/RTP-MTC should be less negative than  $-5.35 \times 10^{-4} \Delta k/k^{\circ}F$ .<sup>1</sup>

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.

<sup>1</sup> Applicable for full-power T-average of 586.4°F to 587.4°F.

COLR for VEGP UNIT 2 CYCLE 10

2.6 Heat Flux Hot Channel Factor -  $F_0(Z)$  (Specification 3.2.1)

$$2.6.1 \quad F_0(Z) \leq \frac{F_0^{RTP}}{P} * K(Z) \text{ for } P > 0.5$$

$$F_0(Z) \leq \frac{F_0^{RTP}}{0.5} * K(Z) \text{ for } P \leq 0.5$$

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

$$2.6.2 \quad F_0^{RTP} = 2.50$$

2.6.3  $K(Z)$  is provided in Figure 4.

$$2.6.4 \quad F_0(Z) \leq \frac{F_0^{RTP} * K(Z)}{P * W(Z)} \text{ for } P > 0.5$$

$$F_0(Z) \leq \frac{F_0^{RTP} * K(Z)}{0.5 * W(Z)} \text{ for } P \leq 0.5$$

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

2.6.6 The  $F_0(Z)$  penalty factors are provided in Table 1.

## COLR for VEGP UNIT 2 CYCLE 10

### 2.7 Nuclear Enthalpy Rise Hot Channel Factor - $F_{\Delta H}^N$ (Specification 3.2.2)

$$2.7.1 \quad F_{\Delta H}^N \leq F_{\Delta H}^{RTP} * (1 + PF_{\Delta H} * (1-P))$$

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

$$2.7.2 \quad F_{\Delta H}^{RTP} = 1.65$$

$$2.7.3 \quad PF_{\Delta H} = 0.3$$

### 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.<sup>1</sup>

<sup>1</sup>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<sup>10</sup> depletion.

COLR for VEGP UNIT 2 CYCLE 10

TABLE 1

$F_Q(Z)$  PENALTY FACTOR

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

COLR for VEGP UNIT 2 CYCLE 10

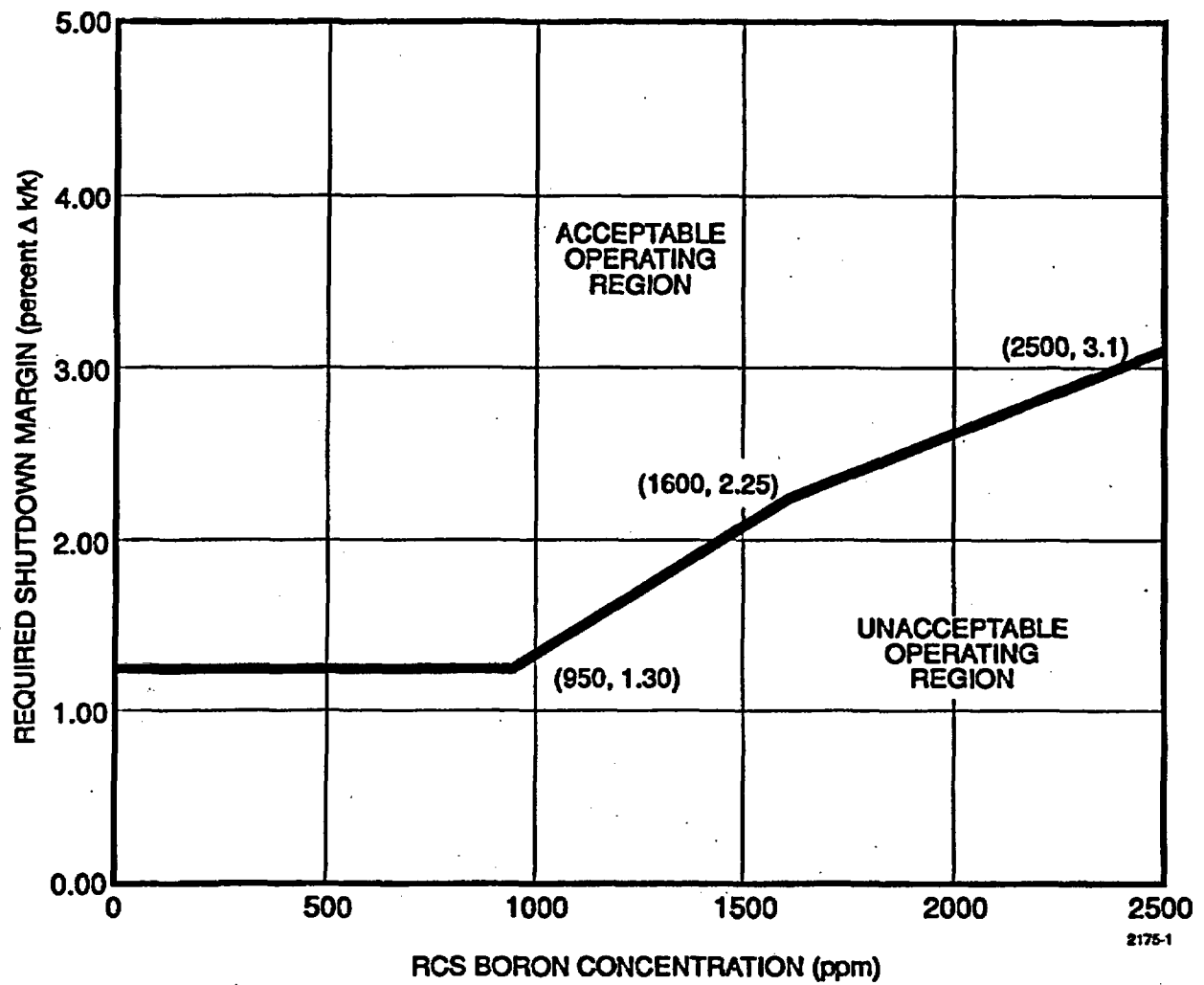


FIGURE 1

REQUIRED SHUTDOWN MARGIN FOR MODES 3 AND 4 (FOUR LOOPS FILLED AND VENTED  
AND AT LEAST ONE REACTOR COOLANT PUMP RUNNING)

COLR for VEGP UNIT 2 CYCLE 10

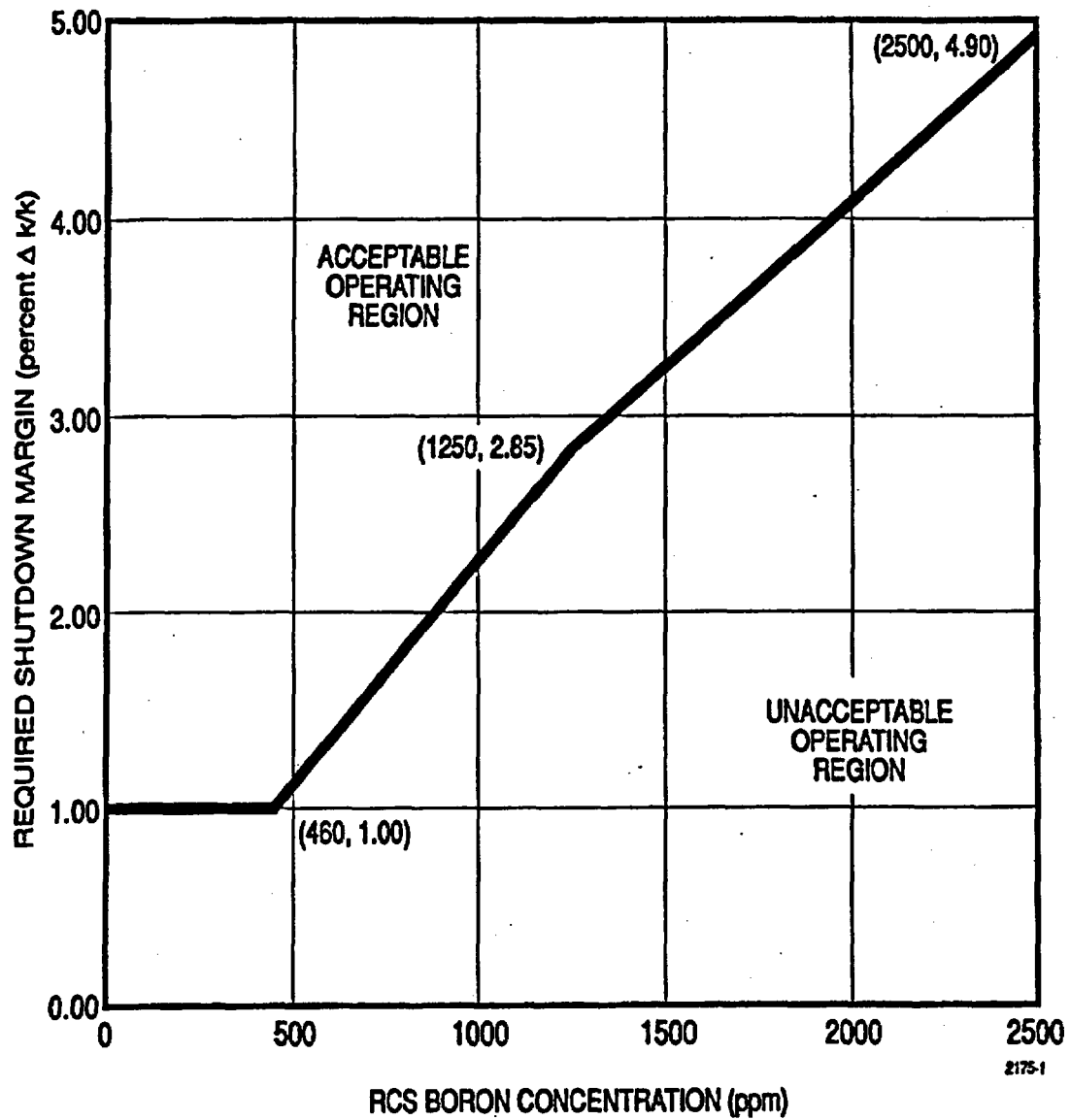
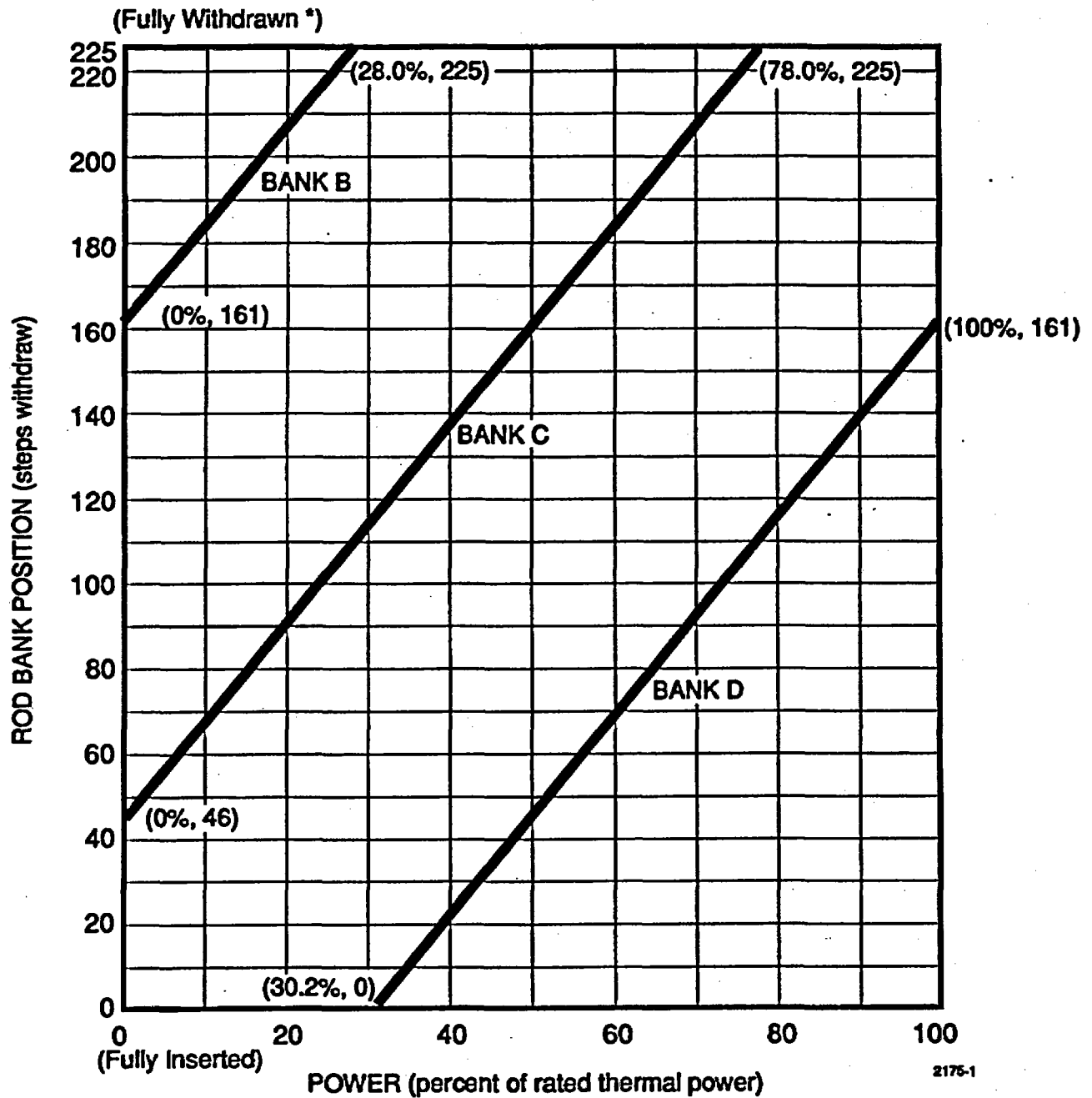


FIGURE 2

REQUIRED SHUTDOWN MARGIN FOR MODES 4 AND 5 (MODE 4 WHEN  
FIGURE 1 NOT APPLICABLE)



# COLR for VEGP UNIT 2 CYCLE 10



\* Fully withdrawn shall be the condition where control rods are at a position within the interval  $\geq 225$  and  $\leq 231$  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

COLR for VEGP UNIT 2 CYCLE 10

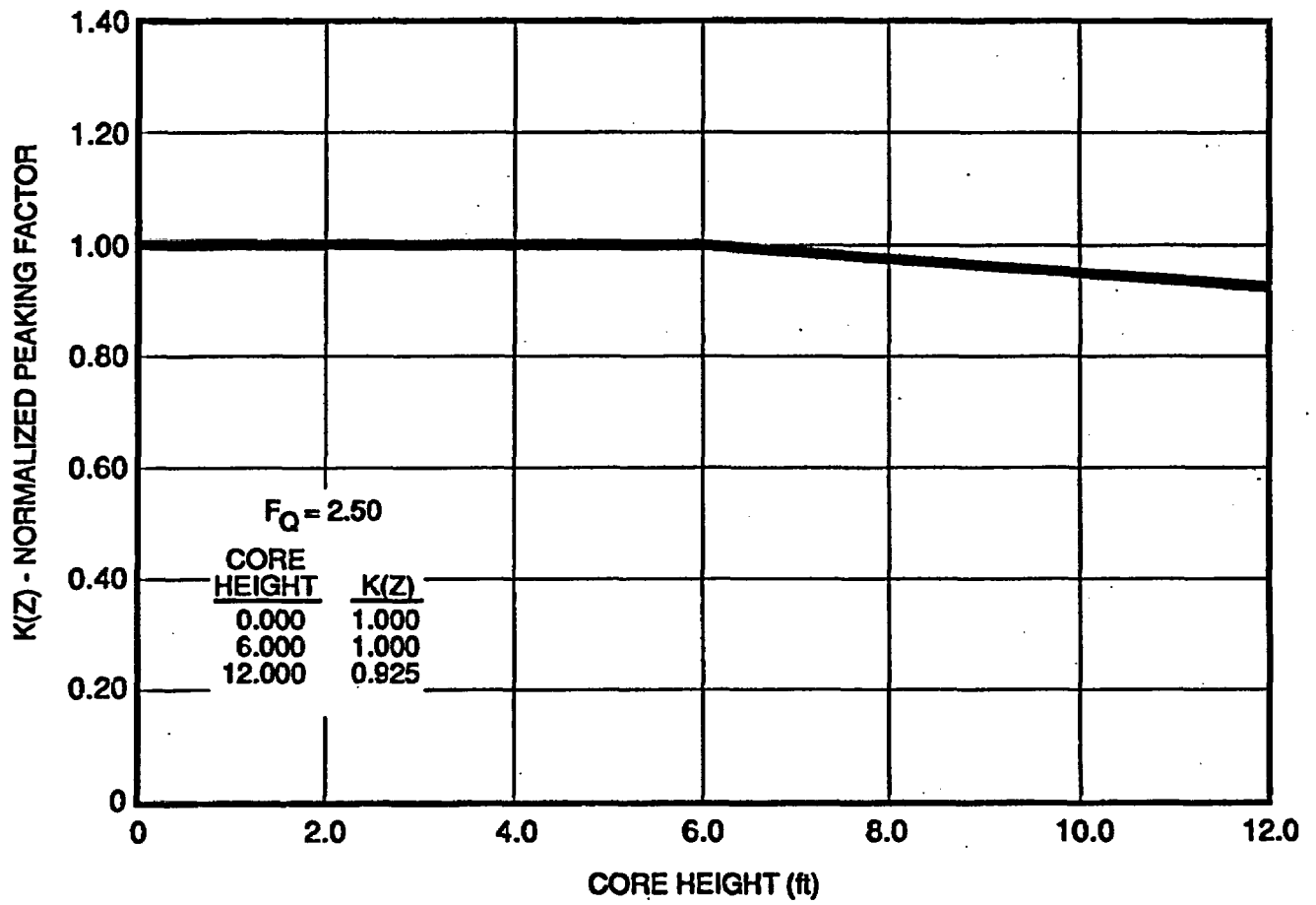


FIGURE 4

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

COLR for VEGP UNIT 2 CYCLE 10

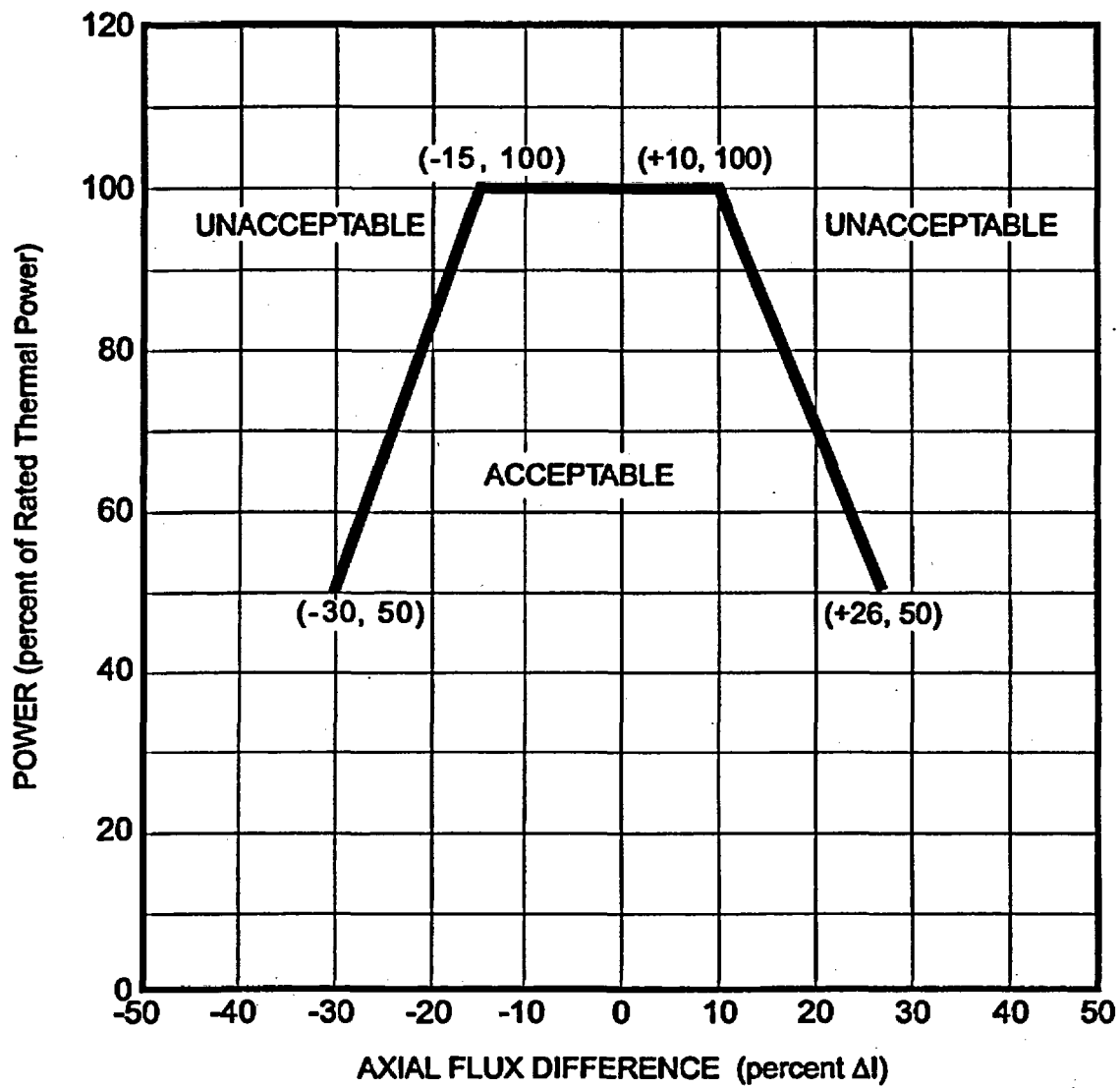
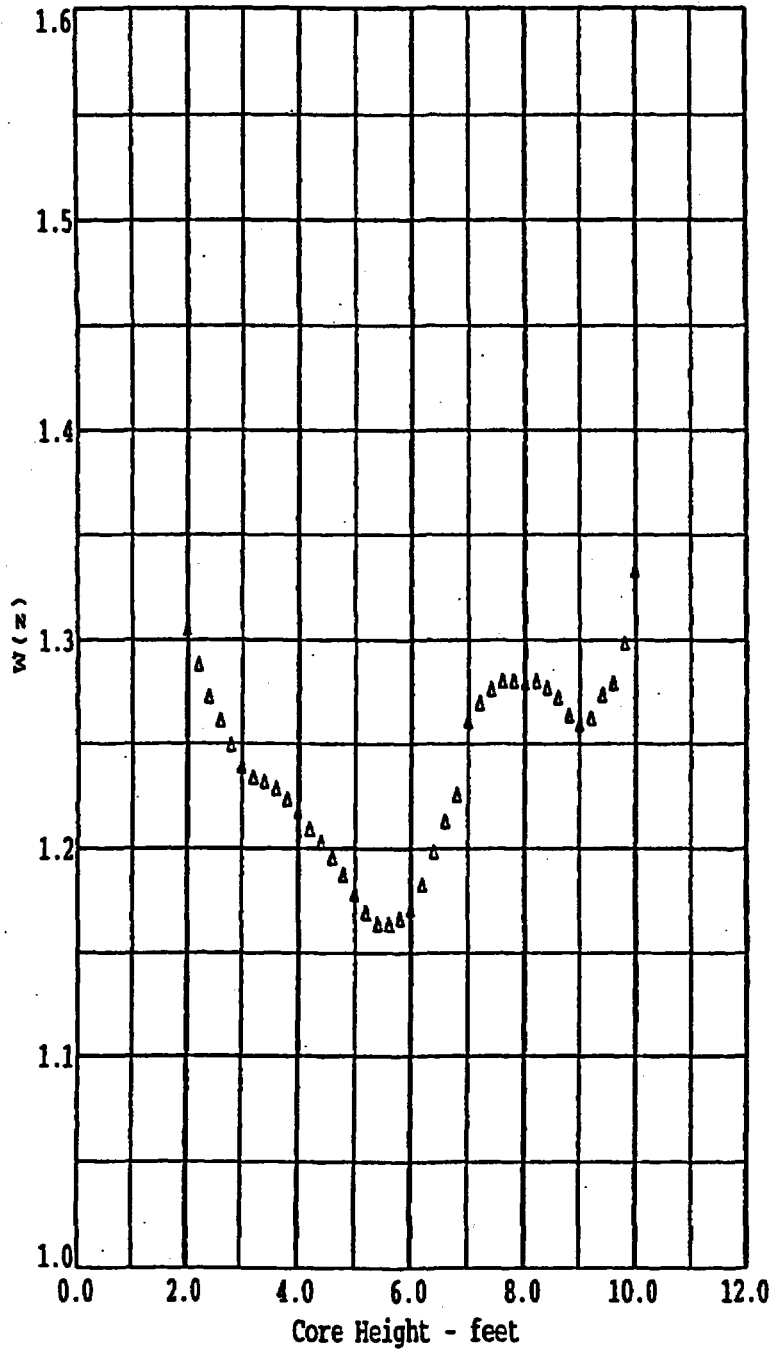


FIGURE 5

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

# COLR for VEGP UNIT 2 CYCLE 10



This figure is referred to by Specification B3.2.1

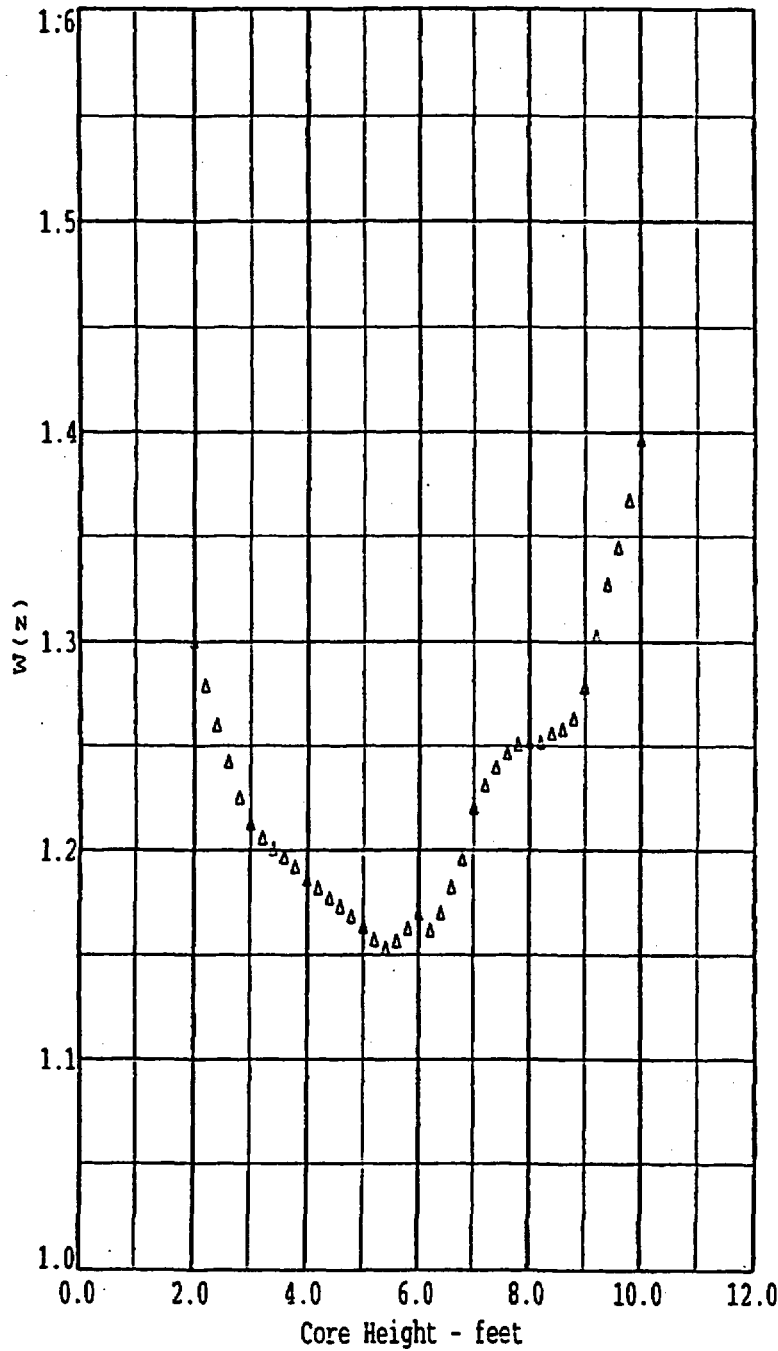
These W(Z) values are consistent with Figure 5 and are valid over the HFP  $T_{avg}$  temperature range from 586.4 to 587.4°F.

Axial Point	Elevation (feet)	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) AT 150 MWD/MTU

# COLR for VEGP UNIT 2 CYCLE 10



This figure is referred to by Specification B3.2.1

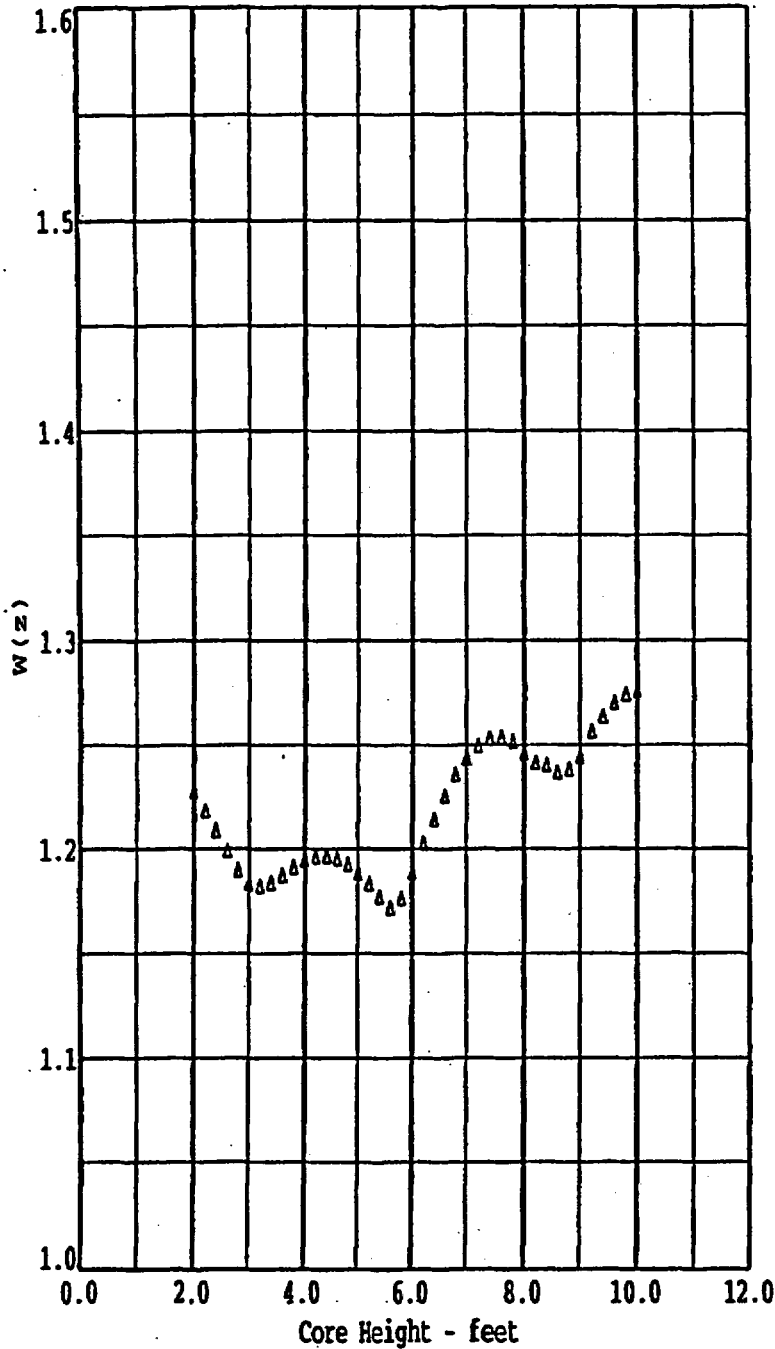
These  $W(Z)$  values are consistent with Figure 5 and are valid over the HFP  $T_{avg}$  temperature range from 586.4 to 587.4°F.

Axial Point	Elevation (feet)	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

# COLR for VEGP UNIT 2 CYCLE 10



This figure is referred to by Specification B3.2.1

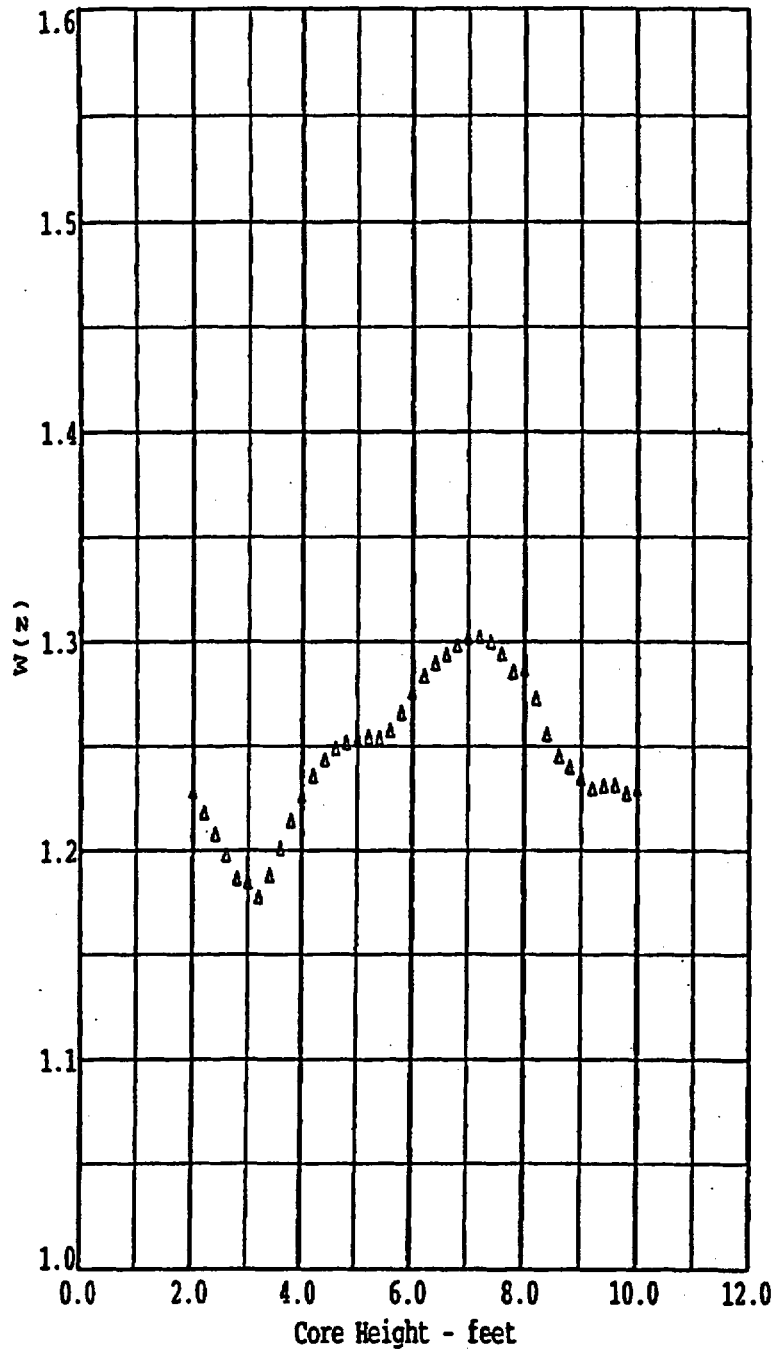
These W(Z) values are consistent with Figure 5 and are valid over the HFP  $T_{avg}$  temperature range from 586.4 to 587.4°F.

Axial Point	Elevation (feet)	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