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May 13, 2003

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NL-03-1078

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

Vogtle Electric Generating Plant
Unit 1 Cycle 11 Core Operating Limits Report

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 1 of the Unit 1 Cycle 11 Core Operating Limits Report (COLR).

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

Sincerely,

Jeffrey T. Gasser

JTG/RJF

Enclosure: Unit 1 Cycle 11 Core Operating Limits Report

cc: Southern Nuclear Operating Company
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Mr. W. F. Kitchens, General Manager – Plant Vogtle
Mr. M. Sheibani, Engineering Supervisor – Plant Vogtle
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U. S. Nuclear Regulatory Commission
Mr. L. A. Reyes, Regional Administrator
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A001

VOGTLE ELECTRIC GENERATING PLANT (VEGP) UNIT 1 CYCLE 11

CORE OPERATING LIMITS REPORT

REVISION 1

MAY 2003

COLR for VEGP UNIT 1 CYCLE 11

1.0 CORE OPERATING LIMITS REPORT

This Core Operating Limits Report (COLR) for VEGP UNIT 1 CYCLE 11 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 $+0.7 \times 10^{-4}$ $\Delta k/k/°F$ for power levels up to 70 percent RTP with a linear ramp to 0 $\Delta k/k/°F$ at 100 percent RTP.

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

The 60 ppm/ARO/RTP-MTC should be less negative than -5.35×10^{-4} $\Delta k/k/°F$.[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 $$F_Q(Z) \leq \frac{F_Q^{RTP}}{P * W(Z)} * K(Z) \quad \text{for } P > 0.5$$

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

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.

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 1970 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 11

TABLE 1

$F_Q(Z)$ PENALTY FACTOR

Cycle Burnup (MWD/MTU)	$F_Q(Z)$ Penalty Factor
30	1.020
150	1.030
363	1.029
576	1.025
789	1.022
1002	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.

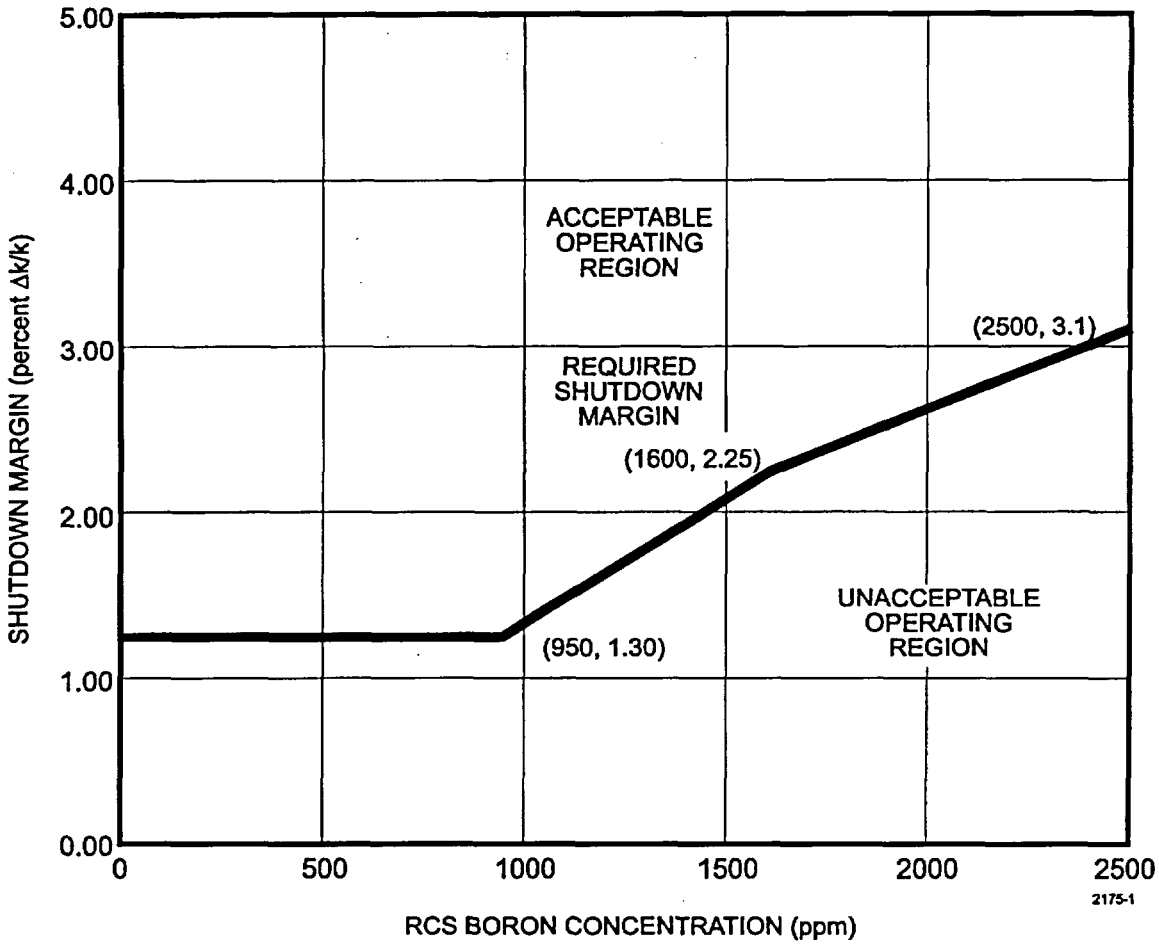


FIGURE 1

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

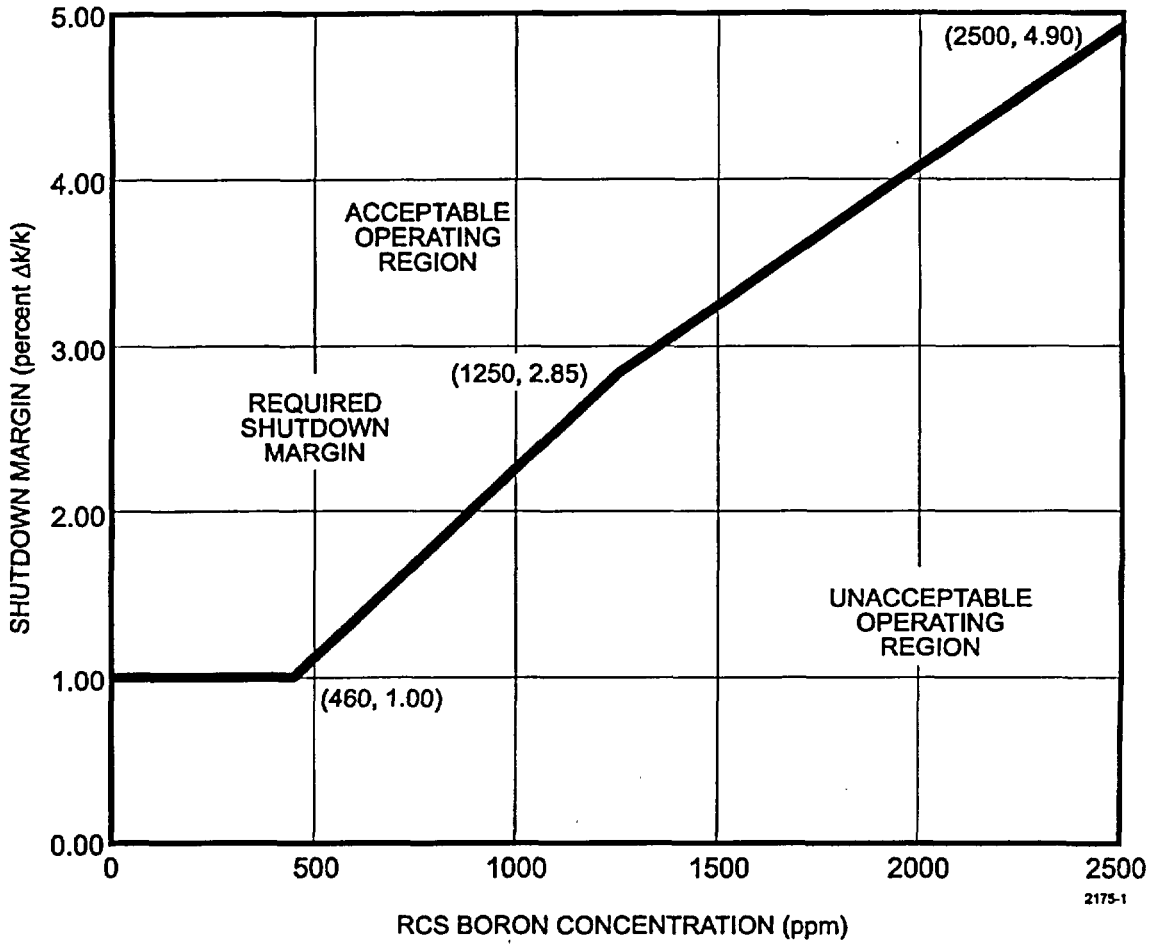
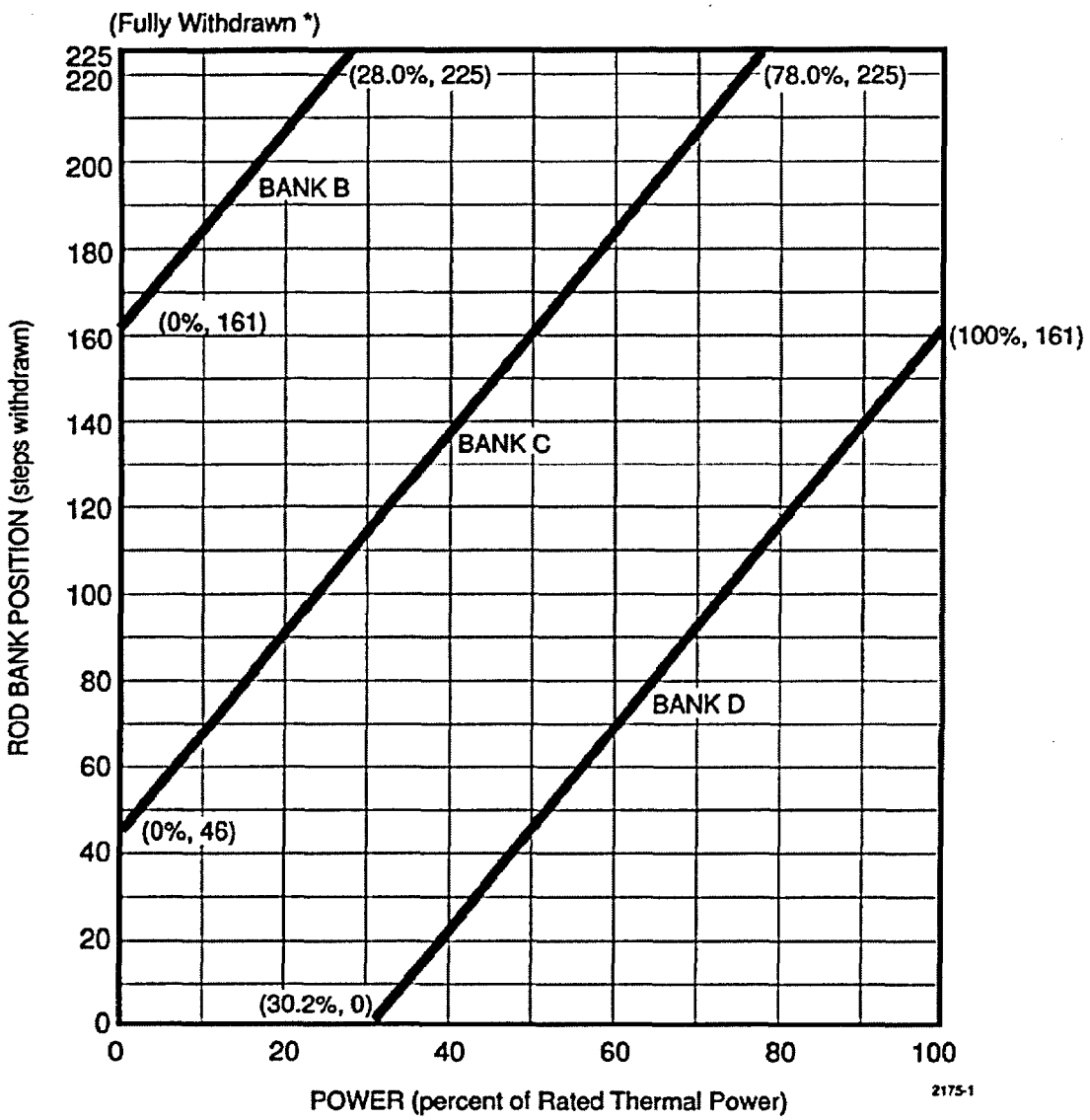


FIGURE 2

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

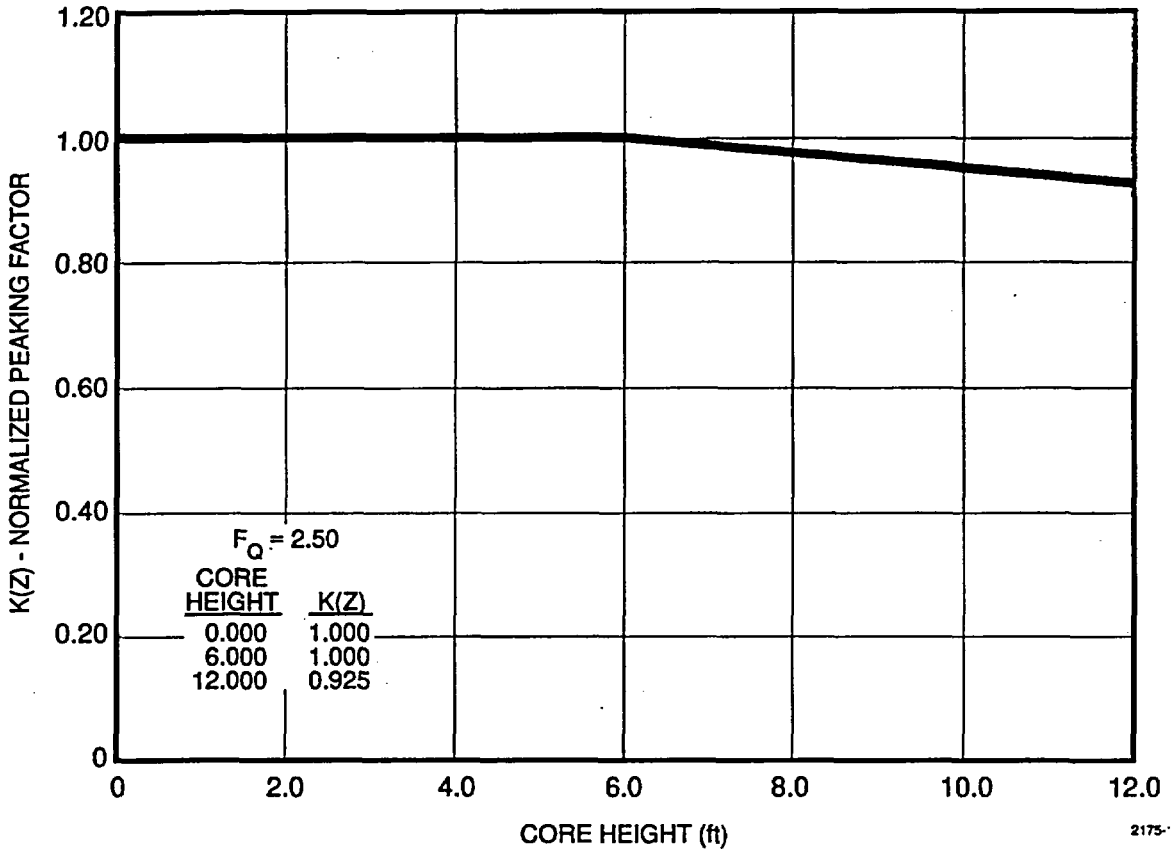


FIGURE 4

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

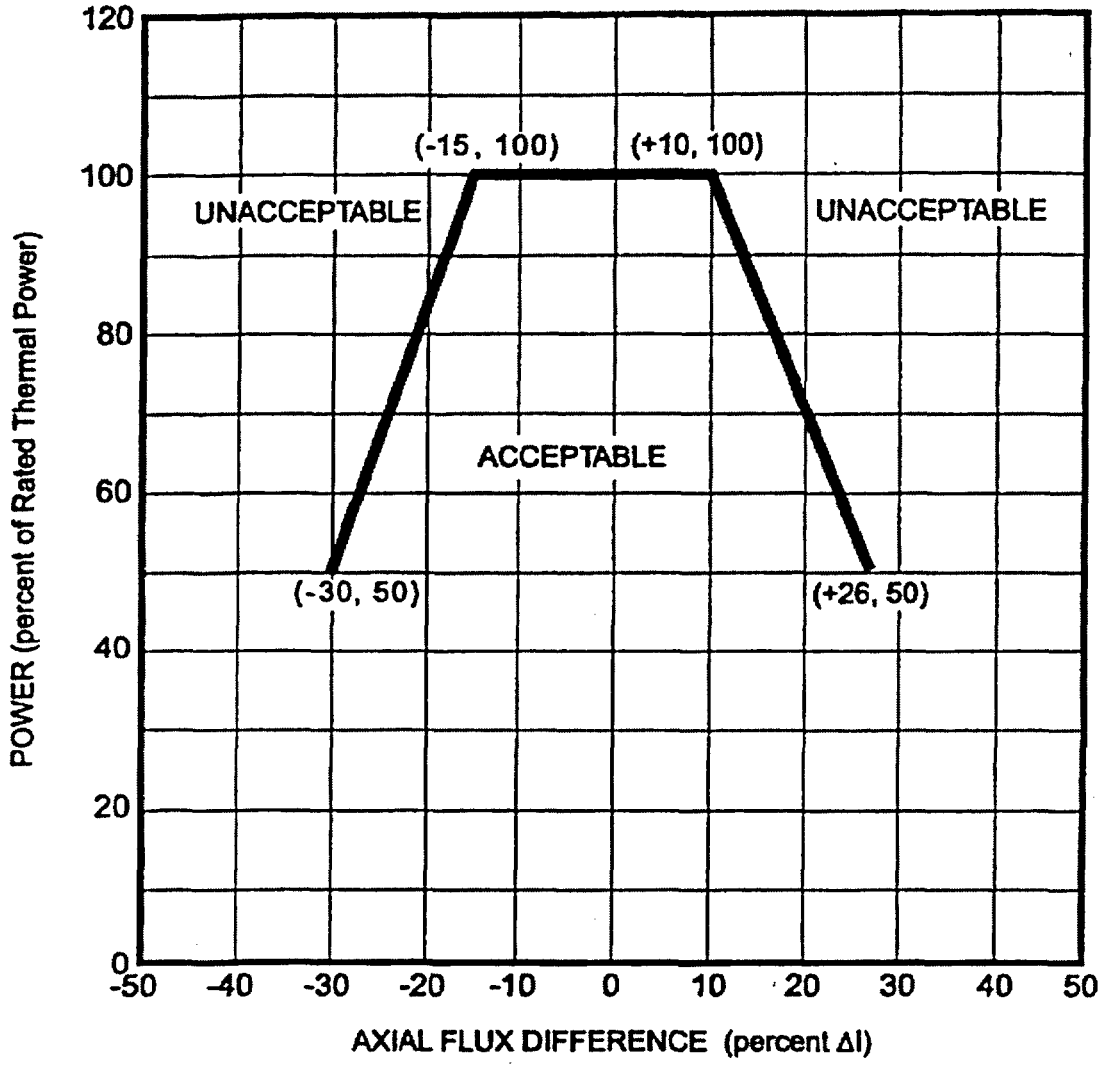
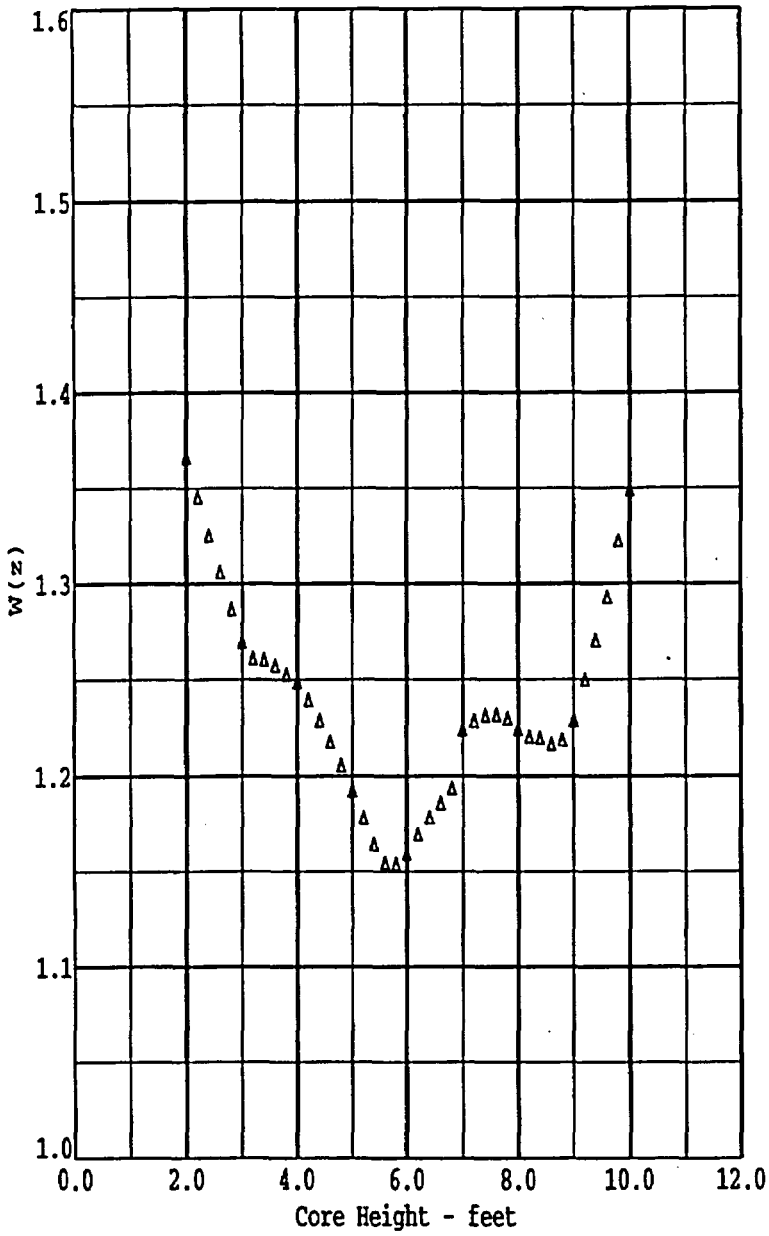


FIGURE 5

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



This figure is referred to by Specification B3.2.1

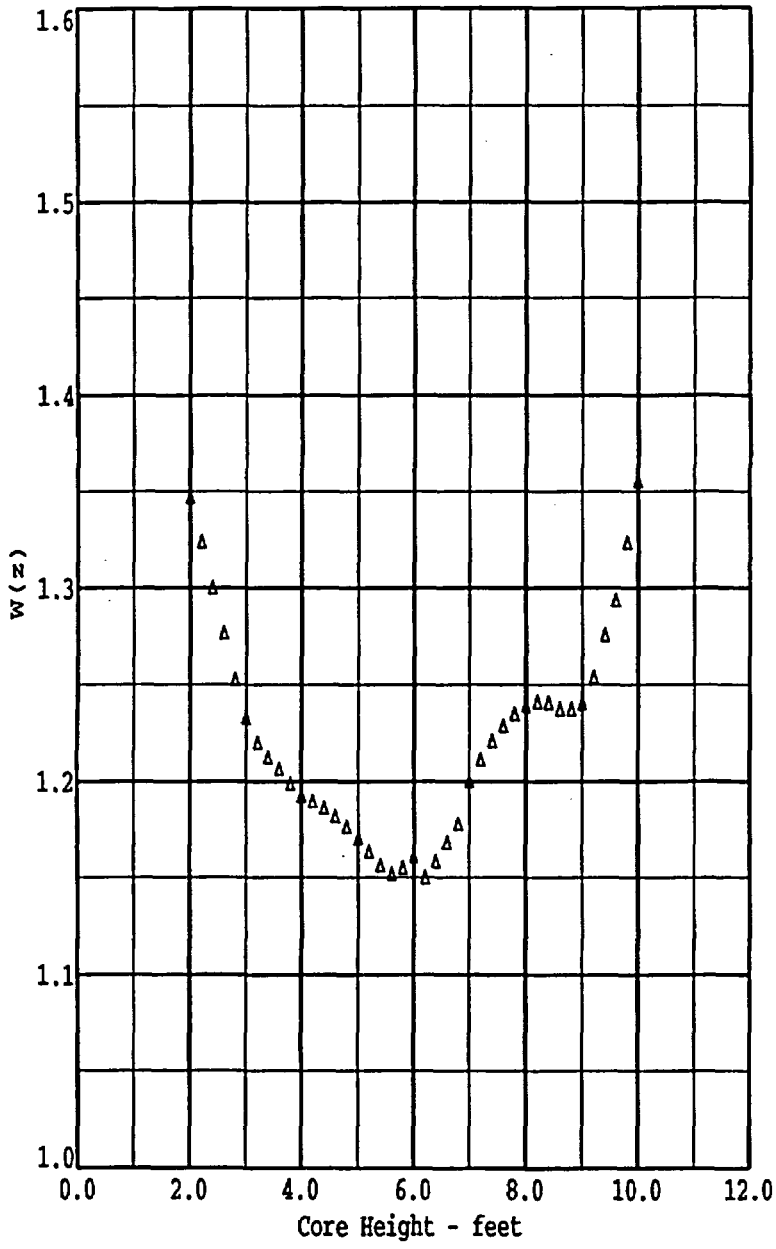
	Axial Point	Elevation (feet)	BOL W(Z)
*	1	12.00	1.0000
*	2	11.80	1.0000
*	3	11.60	1.0000
*	4	11.40	1.0000
*	5	11.20	1.0000
*	6	11.00	1.0000
*	7	10.80	1.0000
*	8	10.60	1.0000
*	9	10.40	1.0000
*	10	10.20	1.0000
	11	10.00	1.3488
	12	9.80	1.3221
	13	9.60	1.2927
	14	9.40	1.2699
	15	9.20	1.2496
	16	9.00	1.2289
	17	8.80	1.2186
	18	8.60	1.2164
	19	8.40	1.2196
	20	8.20	1.2203
	21	8.00	1.2243
	22	7.80	1.2299
	23	7.60	1.2317
	24	7.40	1.2313
	25	7.20	1.2286
	26	7.00	1.2240
	27	6.80	1.1935
	28	6.60	1.1859
	29	6.40	1.1784
	30	6.20	1.1696
	31	6.00	1.1592
	32	5.80	1.1539
	33	5.60	1.1546
	34	5.40	1.1643
	35	5.20	1.1783
	36	5.00	1.1924
	37	4.80	1.2053
	38	4.60	1.2176
	39	4.40	1.2290
	40	4.20	1.2393
	41	4.00	1.2484
	42	3.80	1.2526
	43	3.60	1.2570
	44	3.40	1.2602
	45	3.20	1.2609
	46	3.00	1.2694
	47	2.80	1.2865
	48	2.60	1.3060
	49	2.40	1.3252
	50	2.20	1.3451
	51	2.00	1.3659
*	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

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

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

COLR for VEGP UNIT 1 CYCLE 11



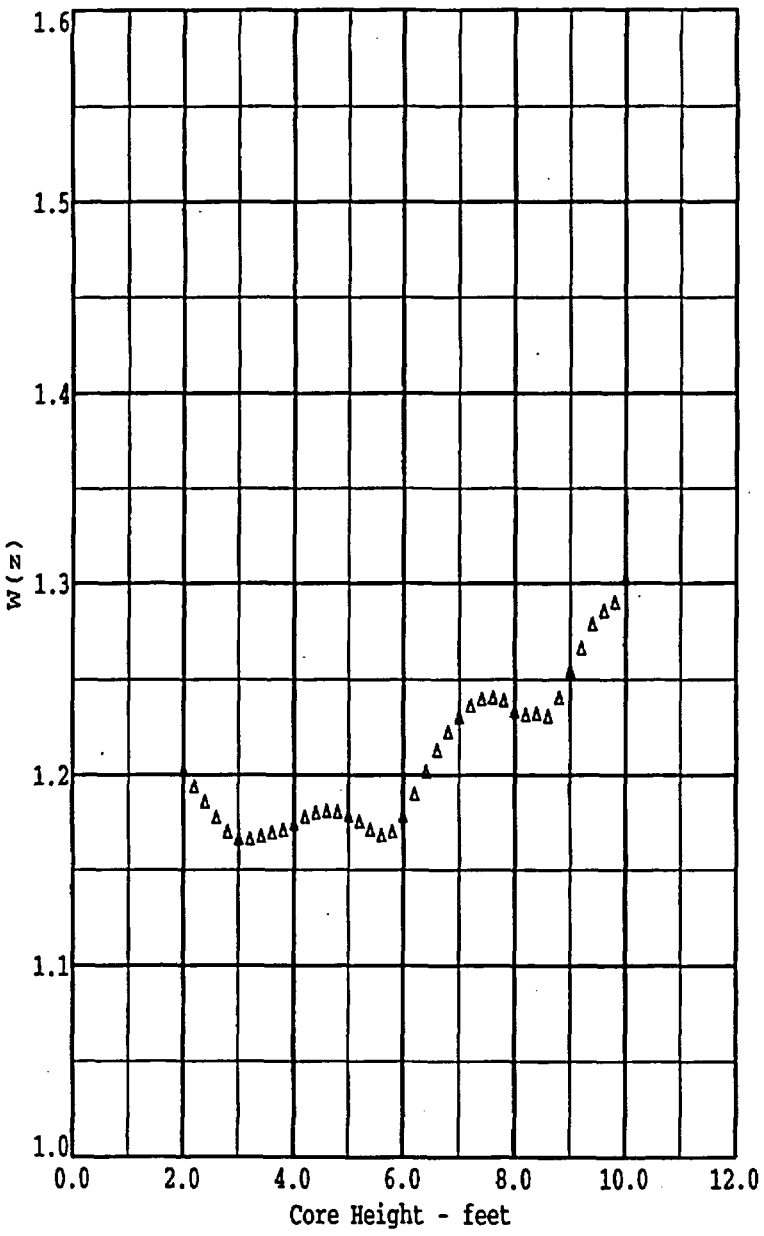
This figure is referred to by Specification B3.2.1

	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	1.3554
	12	9.80	1.3231
	13	9.60	1.2937
	14	9.40	1.2756
	15	9.20	1.2540
	16	9.00	1.2404
	17	8.80	1.2374
	18	8.60	1.2374
	19	8.40	1.2406
	20	8.20	1.2412
	21	8.00	1.2392
	22	7.80	1.2351
	23	7.60	1.2290
	24	7.40	1.2211
	25	7.20	1.2114
	26	7.00	1.2001
	27	6.80	1.1776
	28	6.60	1.1680
	29	6.40	1.1582
	30	6.20	1.1499
	31	6.00	1.1606
	32	5.80	1.1548
	33	5.60	1.1516
	34	5.40	1.1560
	35	5.20	1.1633
	36	5.00	1.1702
	37	4.80	1.1763
	38	4.60	1.1816
	39	4.40	1.1861
	40	4.20	1.1896
	41	4.00	1.1924
	42	3.80	1.1987
	43	3.60	1.2063
	44	3.40	1.2125
	45	3.20	1.2202
	46	3.00	1.2329
	47	2.80	1.2525
	48	2.60	1.2766
	49	2.40	1.3002
	50	2.20	1.3236
	51	2.00	1.3469
*	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

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

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



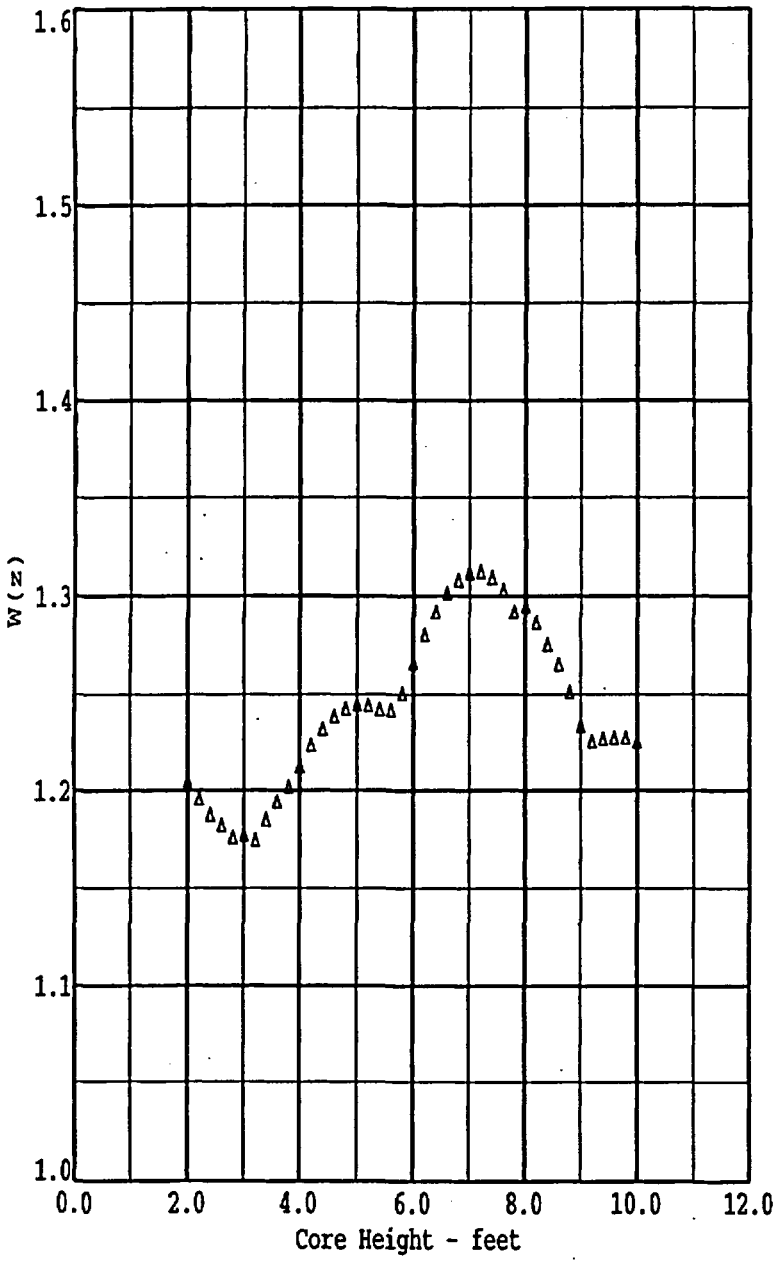
This figure is referred to by Specification B3.2.1

	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	1.3024
	12	9.80	1.2899
	13	9.60	1.2855
	14	9.40	1.2785
	15	9.20	1.2662
	16	9.00	1.2544
	17	8.80	1.2405
	18	8.60	1.2309
	19	8.40	1.2321
	20	8.20	1.2315
	21	8.00	1.2334
	22	7.80	1.2390
	23	7.60	1.2405
	24	7.40	1.2397
	25	7.20	1.2362
	26	7.00	1.2305
	27	6.80	1.2225
	28	6.60	1.2127
	29	6.40	1.2015
	30	6.20	1.1898
	31	6.00	1.1781
	32	5.80	1.1699
	33	5.60	1.1679
	34	5.40	1.1710
	35	5.20	1.1753
	36	5.00	1.1785
	37	4.80	1.1803
	38	4.60	1.1808
	39	4.40	1.1799
	40	4.20	1.1778
	41	4.00	1.1739
	42	3.80	1.1707
	43	3.60	1.1693
	44	3.40	1.1673
	45	3.20	1.1659
	46	3.00	1.1659
	47	2.80	1.1698
	48	2.60	1.1775
	49	2.40	1.1856
	50	2.20	1.1937
	51	2.00	1.2025
*	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

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

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	1.2251
	12	9.80	1.2274
	13	9.60	1.2273
	14	9.40	1.2268
	15	9.20	1.2255
	16	9.00	1.2335
	17	8.80	1.2507
	18	8.60	1.2647
	19	8.40	1.2749
	20	8.20	1.2862
	21	8.00	1.2946
	22	7.80	1.2917
	23	7.60	1.3028
	24	7.40	1.3092
	25	7.20	1.3121
	26	7.00	1.3116
	27	6.80	1.3079
	28	6.60	1.3012
	29	6.40	1.2918
	30	6.20	1.2800
	31	6.00	1.2653
	32	5.80	1.2501
	33	5.60	1.2416
	34	5.40	1.2419
	35	5.20	1.2441
	36	5.00	1.2443
	37	4.80	1.2424
	38	4.60	1.2382
	39	4.40	1.2318
	40	4.20	1.2234
	41	4.00	1.2120
	42	3.80	1.2016
	43	3.60	1.1940
	44	3.40	1.1850
	45	3.20	1.1746
	46	3.00	1.1772
	47	2.80	1.1760
	48	2.60	1.1823
	49	2.40	1.1875
	50	2.20	1.1955
	51	2.00	1.2045
*	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

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

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