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

Vogtle Electric Generating Plant
Revision 1 of Unit 1 Cycle 13 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 13 Core Operating Limits Report (COLR).

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

Sincerely,

A handwritten signature in black ink, appearing to read "Don E. Grissette", is written over a horizontal line.

Don E. Grissette

DEG/RJF/daj

Enclosure: Unit 1 Cycle 13 Core Operating Limits Report (Revision 1)

cc: Southern Nuclear Operating Company
Mr. J. T. Gasser, Executive Vice President
Mr. T. E. Tynan, General Manager – Plant Vogtle
RType: CVC7000

U. S. Nuclear Regulatory Commission
Dr. W. D. Travers, Regional Administrator
Mr. C. Gratton, NRR Project Manager – Vogtle
Mr. G. J. McCoy, Senior Resident Inspector – Vogtle

VOGTLE ELECTRIC GENERATING PLANT (VEGP) UNIT 1 CYCLE 13

CORE OPERATING LIMITS REPORT

REVISION 1

NOVEMBER 2005

COLR for VEGP UNIT 1 CYCLE 13

1.0 CORE OPERATING LIMITS REPORT

This Core Operating Limits Report (COLR) for VEGP UNIT 1 CYCLE 13 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 13

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

- 2.3.2 The MTC Surveillance limits are:

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

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

¹Applicable for full-power T-average of 586.4°F to 587.4°F.

COLR for VEGP UNIT 1 CYCLE 13

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.

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

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

2.6.5 $W(Z)$ values are provided based on the following calculated Delta Axial Offset (D-AO):

Calculated D-AO		<u>W(Z) Figures</u>
<u>Max</u>	<u>Min</u>	
+3%	-3%	Figures 6-9
< -3%	-4%	Figure 10
< -4%	-5%	Figure 11
< -5%	-6%	Figure 12
< -6%	-7%	Figure 13
< -7%	-8%	Figure 14
< -8%	-10%	Figure 15
< -10%	-12%	Figure 16

Where: D-AO = [(Measured Axial Offset) – (Predicted Axial Offset)]

COLR for VEGP UNIT 1 CYCLE 13

BOL	=	150 MWD/MTU
MOL-1	=	4,000 MWD/MTU
MOL-2	=	12,000 MWD/MTU
EOL	=	20,000 MWD/MTU

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

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 1935 ppm.¹

¹This 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 13

TABLE 1

$F_Q(Z)$ PENALTY FACTOR

Cycle Burnup (MWD/MTU)	$F_Q(Z)$ Penalty Factor
30	1.036
150	1.036
363	1.038
577	1.037
790	1.035
1004	1.031
1217	1.024
1431	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 13

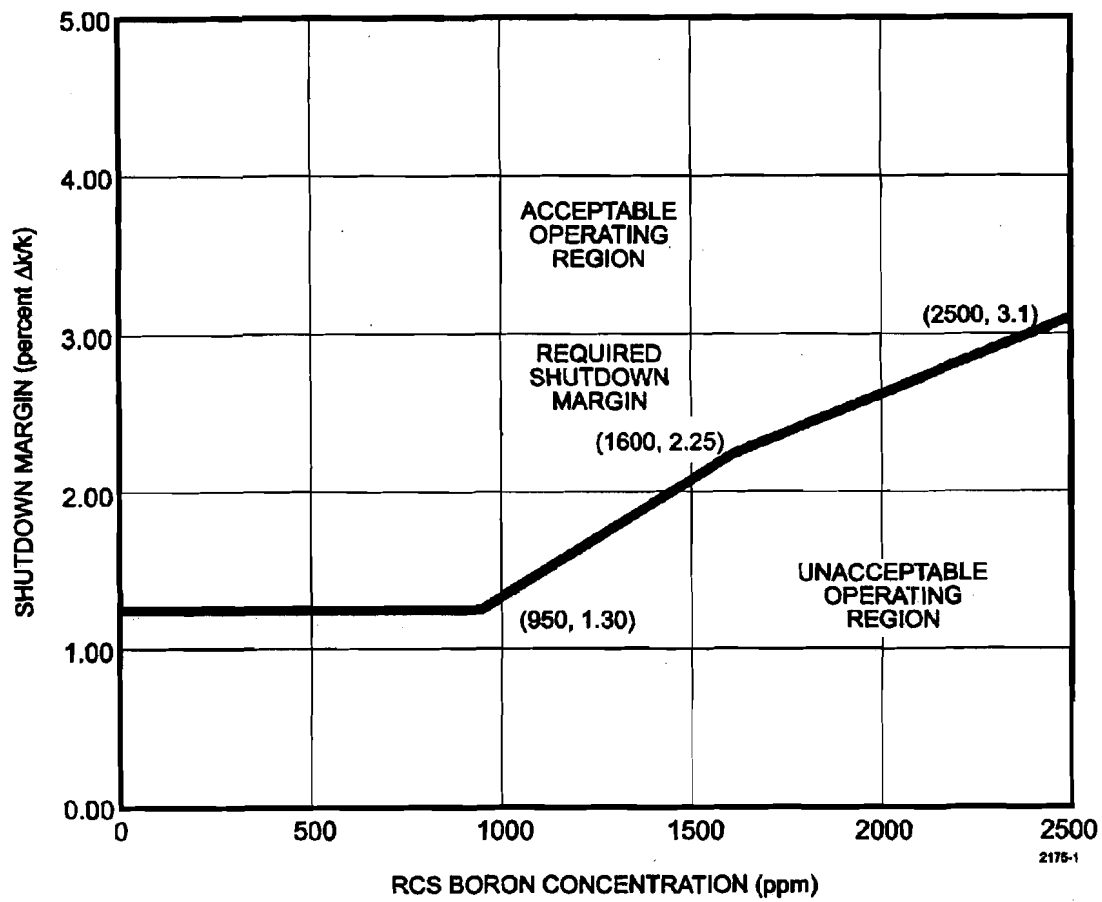


FIGURE 1

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

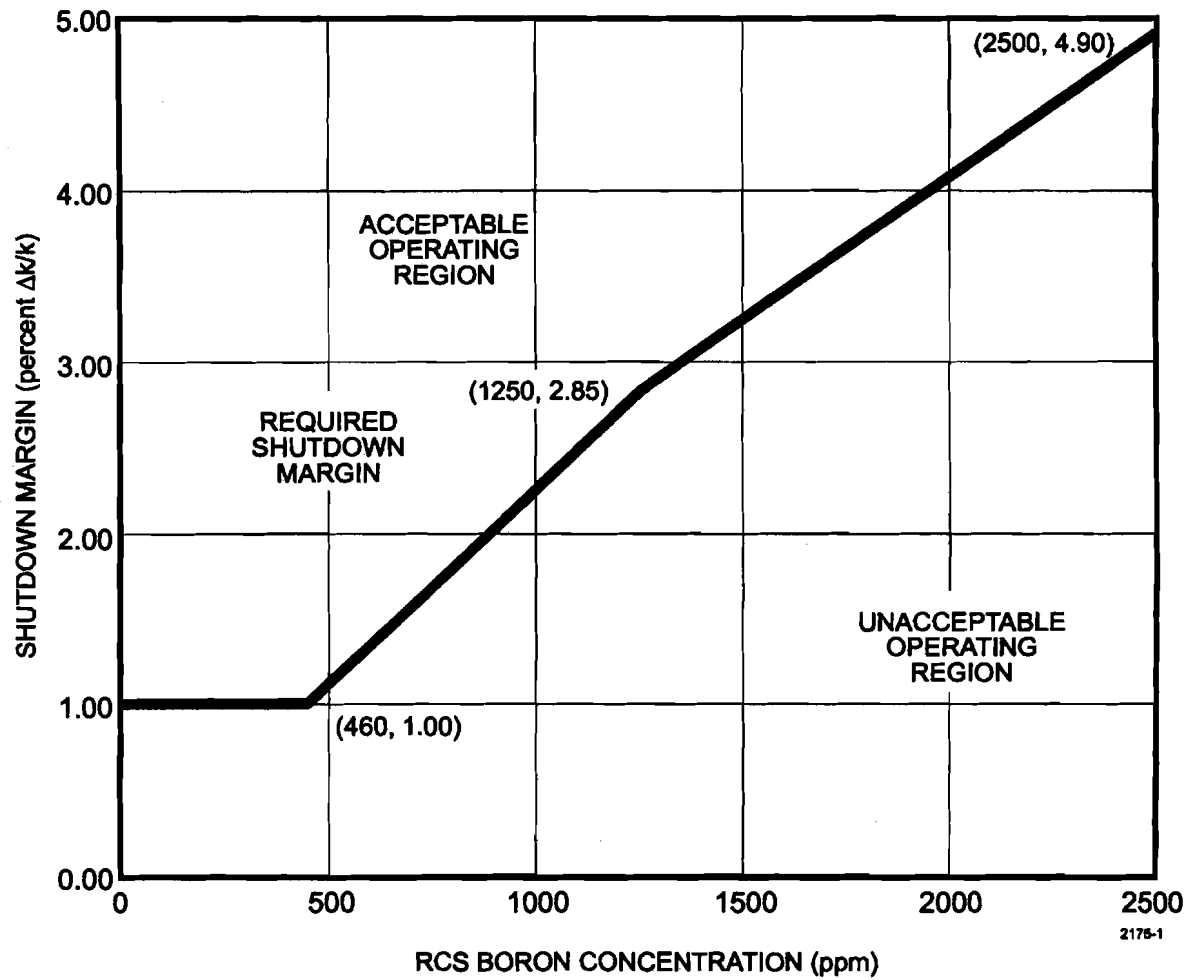
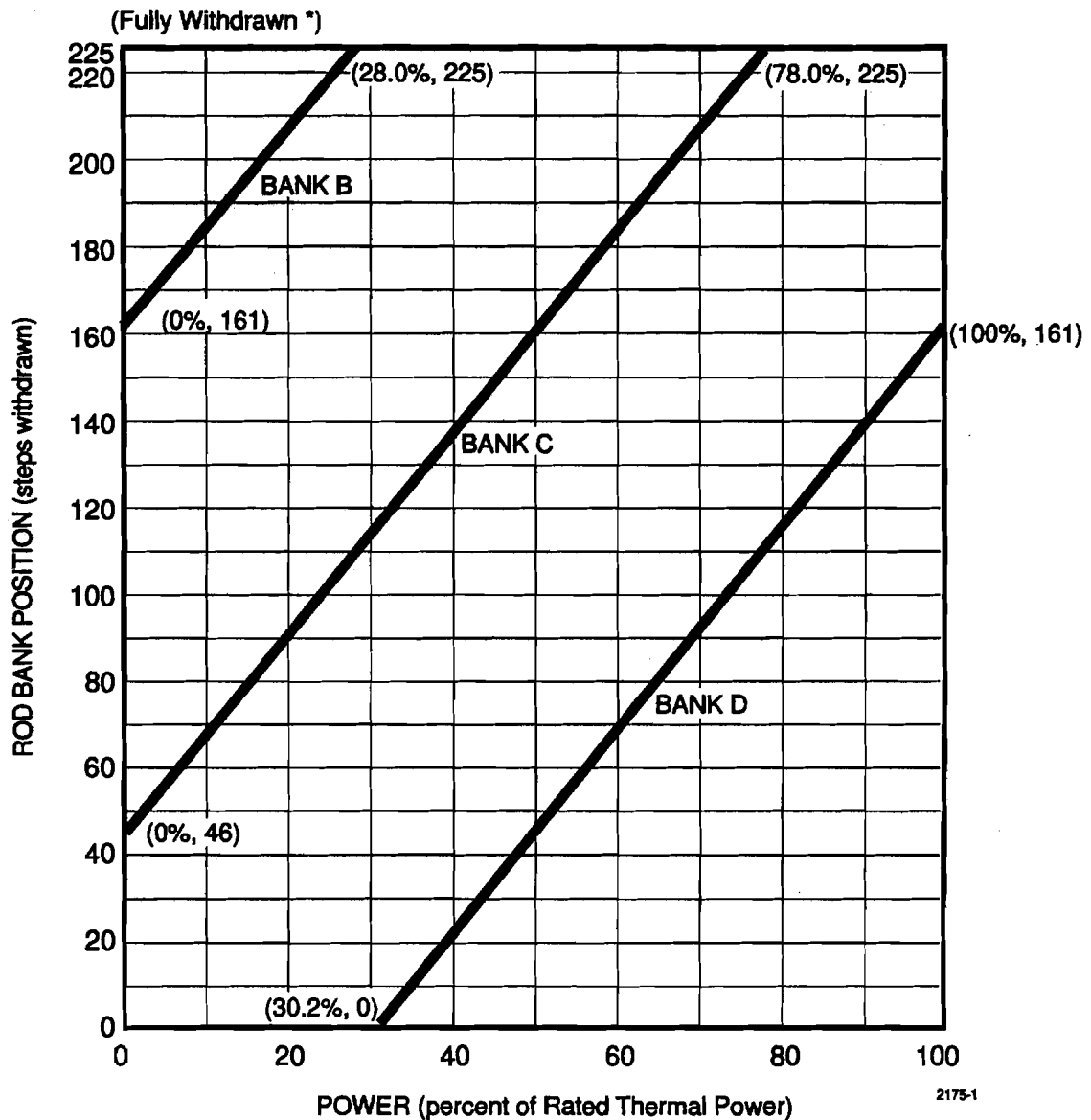


FIGURE 2

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

COLR for VEGP UNIT 1 CYCLE 13



* 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

COLR for VEGP UNIT 1 CYCLE 13

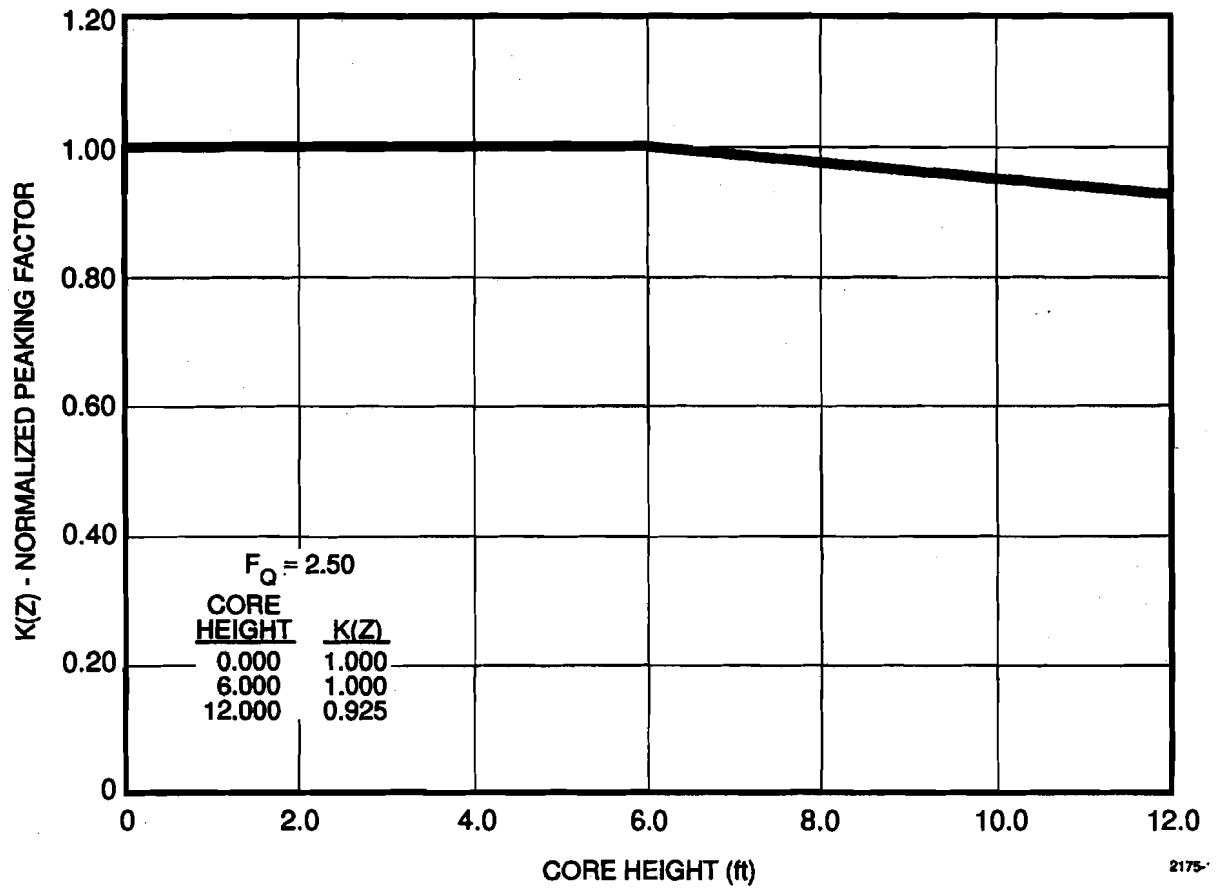


FIGURE 4

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

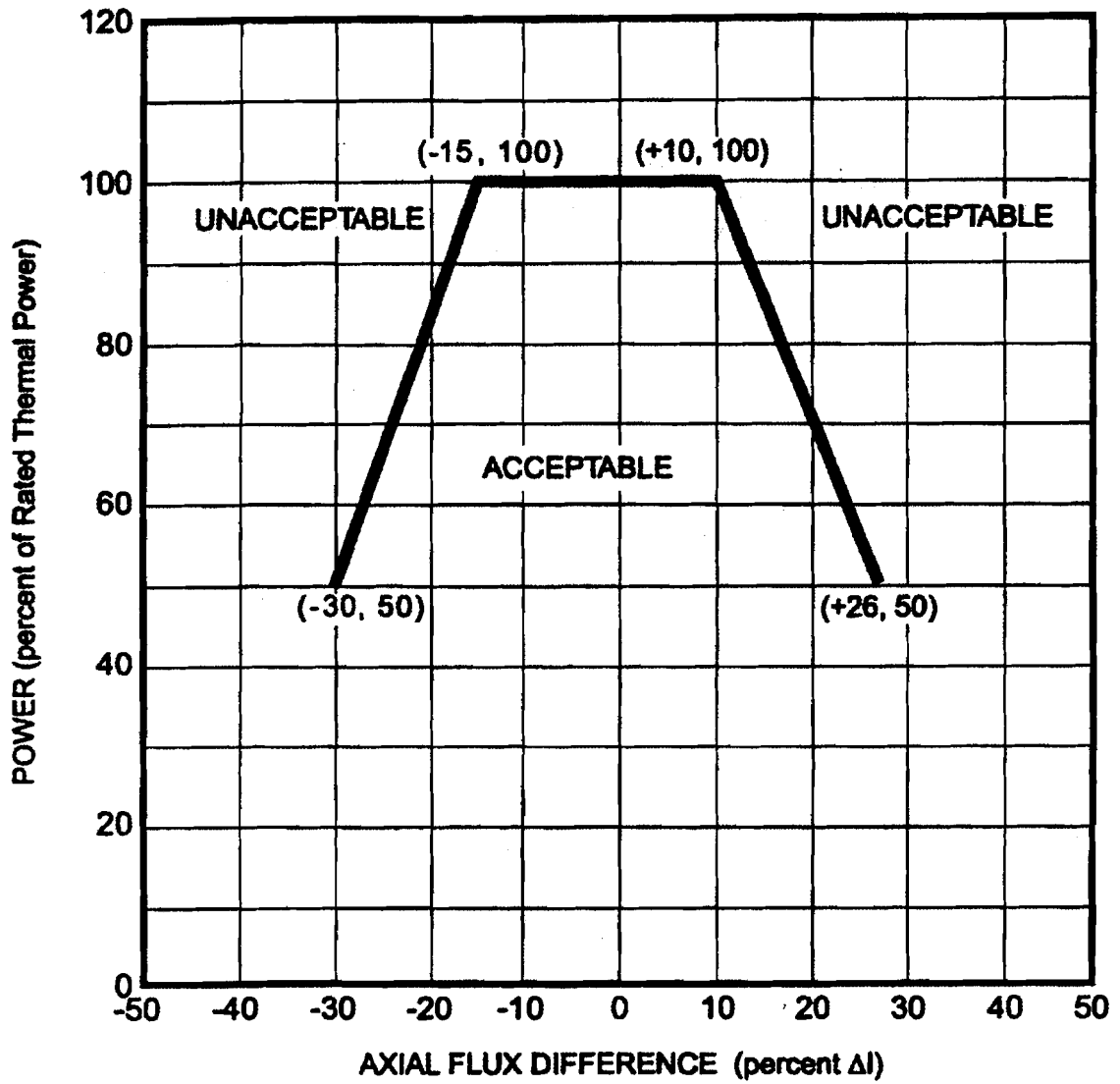
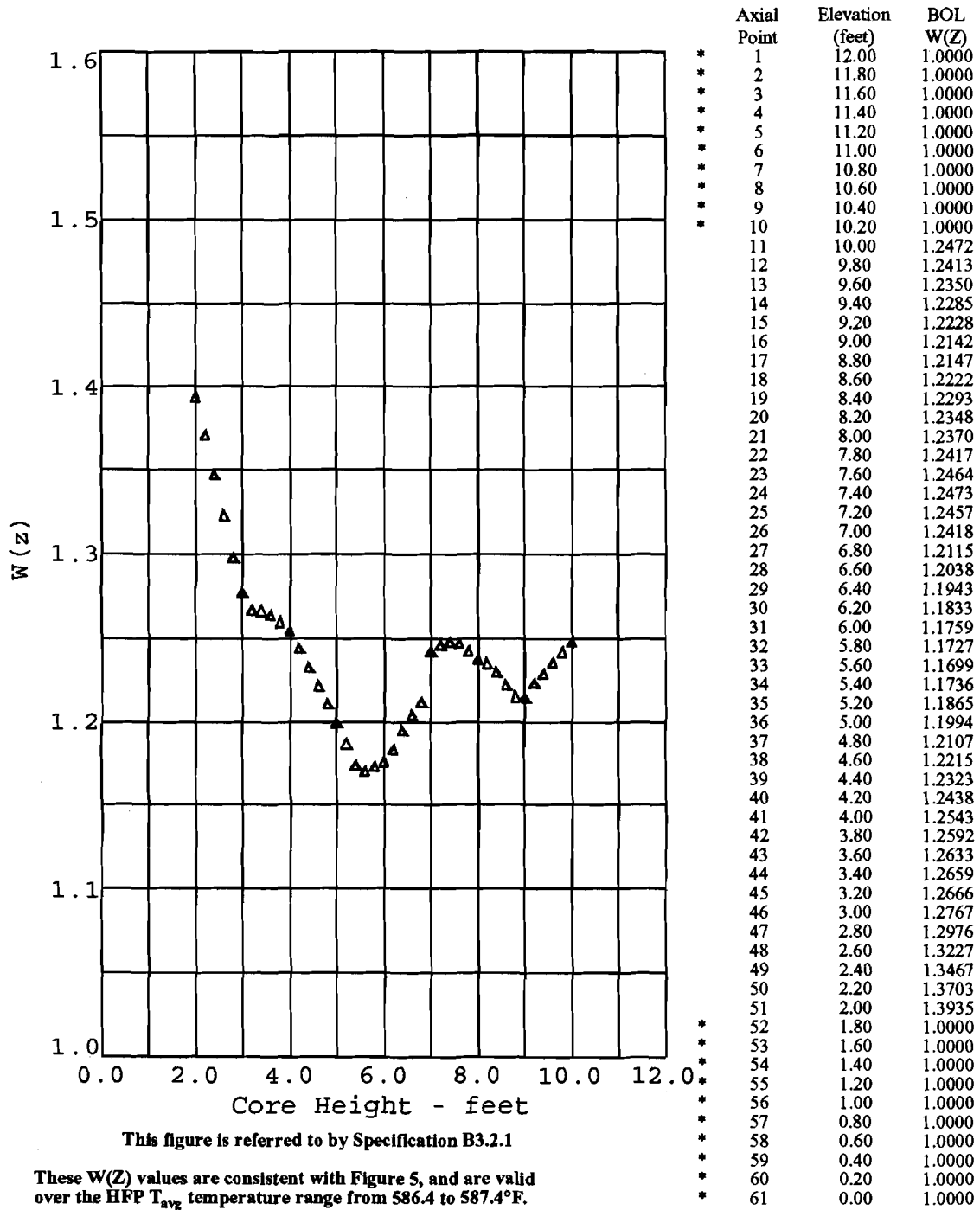


FIGURE 5

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

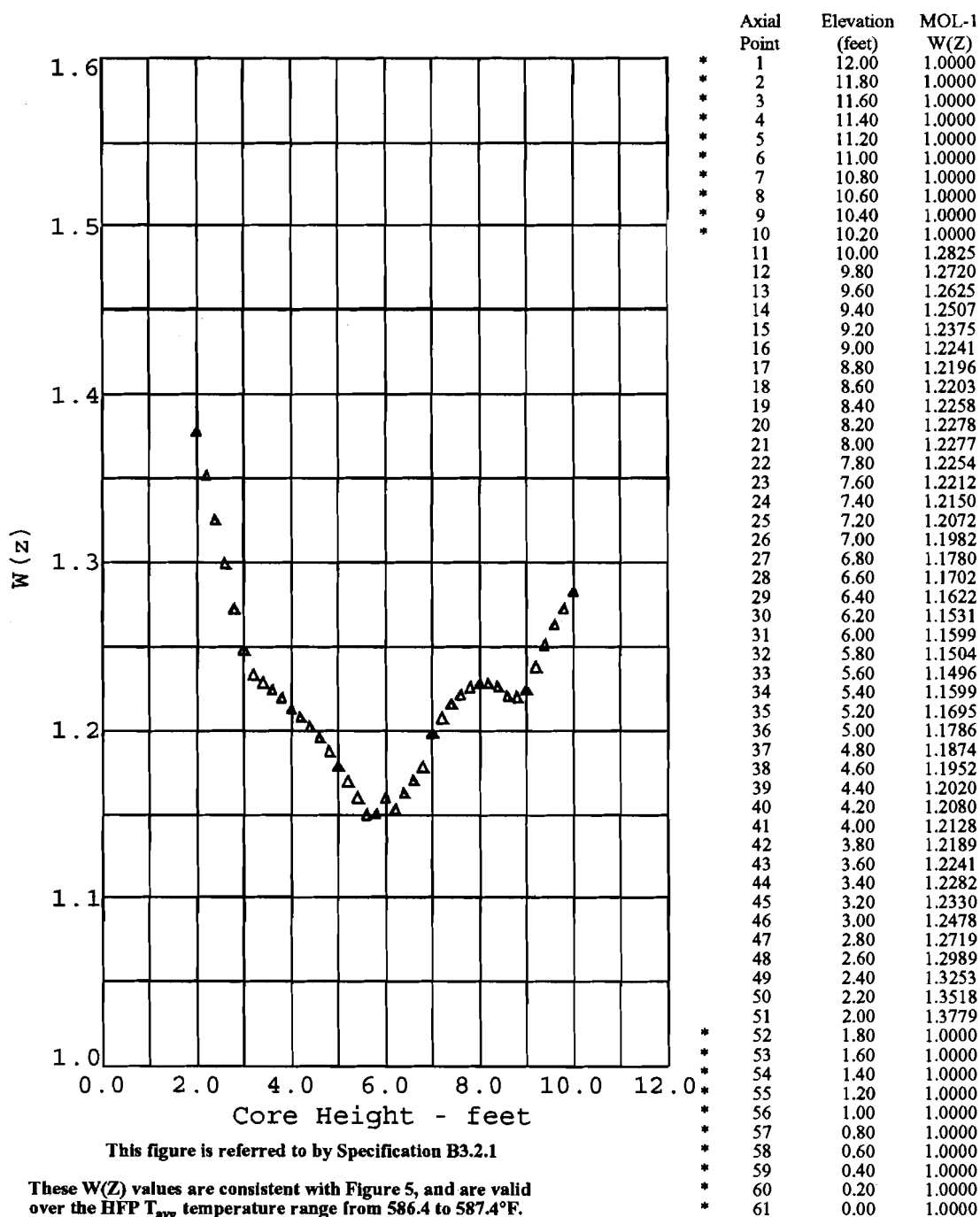
COLR for VEGP UNIT 1 CYCLE 13



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

**FIGURE 6 RAOC $W(Z)$ AT 150 MWD/MTU
 $W(Z)$ VALID FOR DELTA-AO OF +3% to -3%
 SEE COLR SECTION 2.6.5**

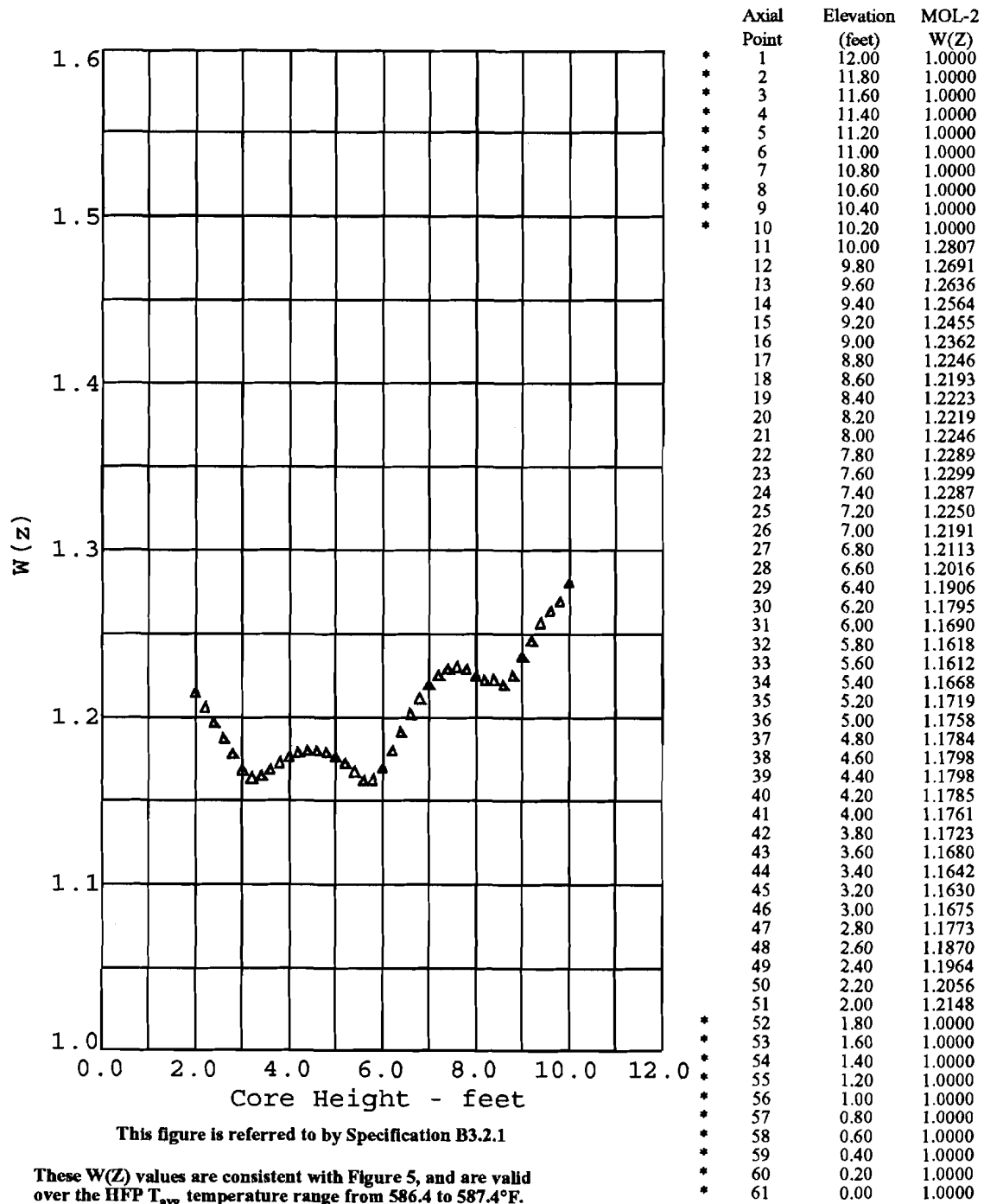
COLR for VEGP UNIT 1 CYCLE 13



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

**FIGURE 7 RAOC W(Z) AT 4000 MWD/MTU
W(Z) VALID FOR DELTA-AO OF +3% to -3%
SEE COLR SECTION 2.6.5**

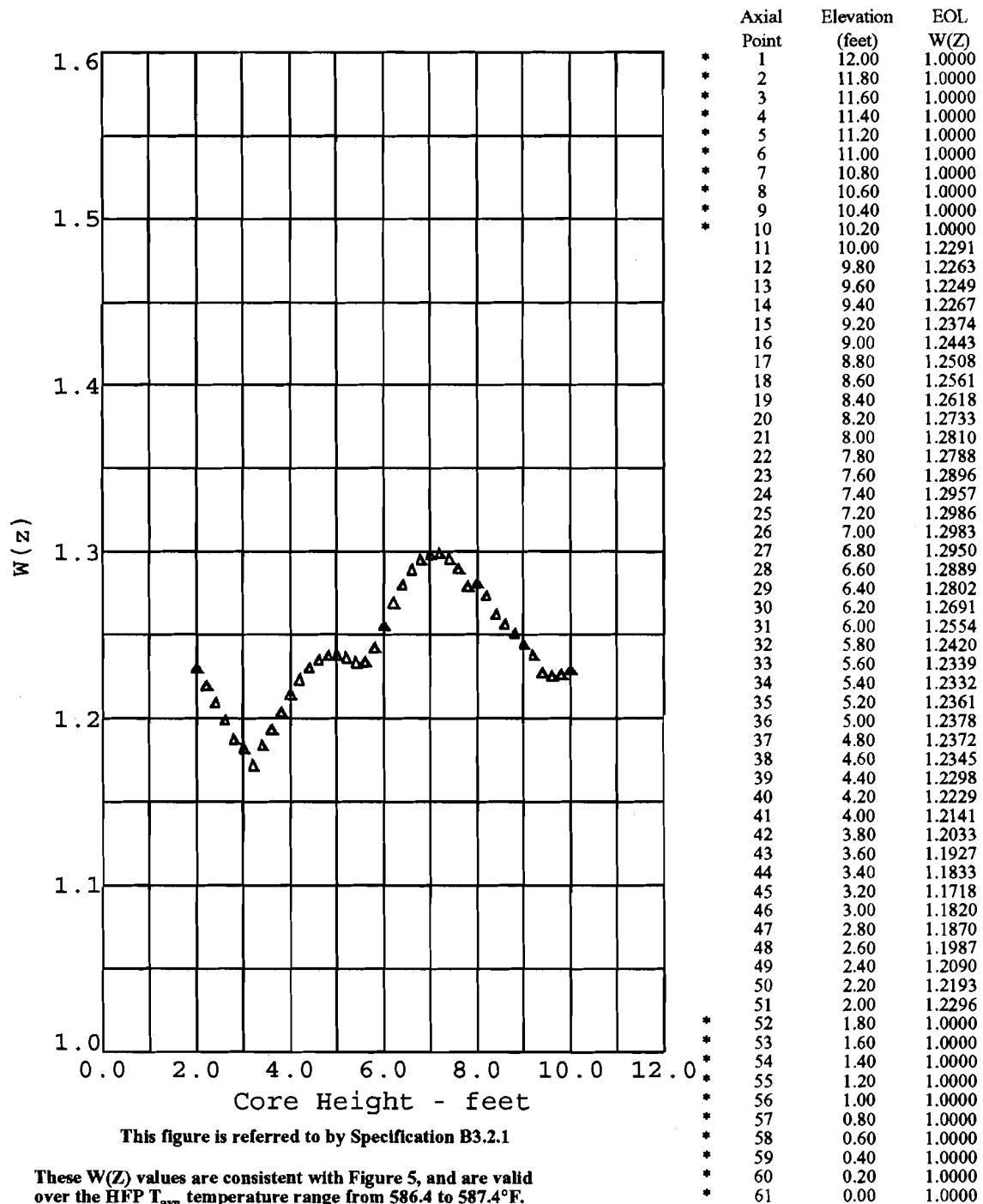
COLR for VEGP UNIT 1 CYCLE 13



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

**FIGURE 8 RAOC W(Z) AT 12000 MWD/MTU
W(Z) VALID FOR DELTA-AO OF +3% to -3%
SEE COLR SECTION 2.6.5**

COLR for VEGP UNIT 1 CYCLE 13



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

**FIGURE 9 RAOC W(Z) AT 20000 MWD/MTU
W(Z) VALID FOR DELTA-AO OF +3% to -3%
SEE COLR SECTION 2.6.5**

COLR for VEGP UNIT 1 CYCLE 13

	Point	Feet	BOL W(Z)	MOL-1 W(Z)	MOL-2 W(Z)	EOL W(Z)
*	1	12.00	1.0000	1.0000	1.0000	1.0000
*	2	11.80	1.0000	1.0000	1.0000	1.0000
*	3	11.60	1.0000	1.0000	1.0000	1.0000
*	4	11.40	1.0000	1.0000	1.0000	1.0000
*	5	11.20	1.0000	1.0000	1.0000	1.0000
*	6	11.00	1.0000	1.0000	1.0000	1.0000
*	7	10.80	1.0000	1.0000	1.0000	1.0000
*	8	10.60	1.0000	1.0000	1.0000	1.0000
*	9	10.40	1.0000	1.0000	1.0000	1.0000
*	10	10.20	1.0000	1.0000	1.0000	1.0000
	11	10.00	1.2721	1.3082	1.3063	1.2537
	12	9.80	1.2661	1.2974	1.2945	1.2508
	13	9.60	1.2597	1.2878	1.2889	1.2494
	14	9.40	1.2531	1.2757	1.2815	1.2512
	15	9.20	1.2473	1.2623	1.2704	1.2621
	16	9.00	1.2385	1.2486	1.2609	1.2692
	17	8.80	1.2390	1.2440	1.2491	1.2758
	18	8.60	1.2466	1.2447	1.2437	1.2812
	19	8.40	1.2539	1.2503	1.2467	1.2870
	20	8.20	1.2595	1.2524	1.2463	1.2988
	21	8.00	1.2617	1.2523	1.2491	1.3066
	22	7.80	1.2665	1.2499	1.2535	1.3044
	23	7.60	1.2713	1.2456	1.2545	1.3154
	24	7.40	1.2722	1.2393	1.2533	1.3216
	25	7.20	1.2706	1.2313	1.2495	1.3246
	26	7.00	1.2666	1.2222	1.2435	1.3243
	27	6.80	1.2357	1.2016	1.2355	1.3209
	28	6.60	1.2279	1.1936	1.2256	1.3147
	29	6.40	1.2182	1.1854	1.2144	1.3058
	30	6.20	1.2070	1.1762	1.2031	1.2945
	31	6.00	1.1994	1.1831	1.1924	1.2805
	32	5.80	1.1727	1.1504	1.1618	1.2420
	33	5.60	1.1699	1.1496	1.1612	1.2339
	34	5.40	1.1736	1.1599	1.1668	1.2332
	35	5.20	1.1865	1.1695	1.1719	1.2361
	36	5.00	1.1994	1.1786	1.1758	1.2378
	37	4.80	1.2107	1.1874	1.1784	1.2372
	38	4.60	1.2215	1.1952	1.1798	1.2345
	39	4.40	1.2323	1.2020	1.1798	1.2298
	40	4.20	1.2438	1.2080	1.1785	1.2229
	41	4.00	1.2543	1.2128	1.1761	1.2141
	42	3.80	1.2592	1.2189	1.1723	1.2033
	43	3.60	1.2633	1.2241	1.1680	1.1927
	44	3.40	1.2659	1.2282	1.1642	1.1833
	45	3.20	1.2666	1.2330	1.1630	1.1718
	46	3.00	1.2767	1.2478	1.1675	1.1820
	47	2.80	1.2976	1.2719	1.1773	1.1870
	48	2.60	1.3227	1.2989	1.1870	1.1987
	49	2.40	1.3467	1.3253	1.1964	1.2090
	50	2.20	1.3703	1.3518	1.2056	1.2193
	51	2.00	1.3935	1.3779	1.2148	1.2296
*	52	1.80	1.0000	1.0000	1.0000	1.0000
*	53	1.60	1.0000	1.0000	1.0000	1.0000
*	54	1.40	1.0000	1.0000	1.0000	1.0000
*	55	1.20	1.0000	1.0000	1.0000	1.0000
*	56	1.00	1.0000	1.0000	1.0000	1.0000
*	57	0.80	1.0000	1.0000	1.0000	1.0000
*	58	0.60	1.0000	1.0000	1.0000	1.0000
*	59	0.40	1.0000	1.0000	1.0000	1.0000
*	60	0.20	1.0000	1.0000	1.0000	1.0000
*	61	0.00	1.0000	1.0000	1.0000	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 Tavg temperature range from 586.4 to 587.4°F.

**FIGURE 10 RAOC W(Z) FOR DELTA-AO BETWEEN < -3% to -4%
SEE COLR SECTION 2.6.5**

COLR for VEGP UNIT 1 CYCLE 13

	Point	Feet	BOL W(Z)	MOL-1 W(Z)	MOL-2 W(Z)	EOL W(Z)
*	1	12.00	1.0000	1.0000	1.0000	1.0000
*	2	11.80	1.0000	1.0000	1.0000	1.0000
*	3	11.60	1.0000	1.0000	1.0000	1.0000
*	4	11.40	1.0000	1.0000	1.0000	1.0000
*	5	11.20	1.0000	1.0000	1.0000	1.0000
*	6	11.00	1.0000	1.0000	1.0000	1.0000
*	7	10.80	1.0000	1.0000	1.0000	1.0000
*	8	10.60	1.0000	1.0000	1.0000	1.0000
*	9	10.40	1.0000	1.0000	1.0000	1.0000
*	10	10.20	1.0000	1.0000	1.0000	1.0000
	11	10.00	1.2971	1.3338	1.3319	1.2783
	12	9.80	1.2910	1.3229	1.3199	1.2754
	13	9.60	1.2844	1.3130	1.3141	1.2739
	14	9.40	1.2776	1.3007	1.3067	1.2758
	15	9.20	1.2717	1.2870	1.2953	1.2869
	16	9.00	1.2628	1.2731	1.2856	1.2941
	17	8.80	1.2633	1.2684	1.2736	1.3008
	18	8.60	1.2711	1.2691	1.2681	1.3063
	19	8.40	1.2785	1.2748	1.2712	1.3123
	20	8.20	1.2842	1.2769	1.2708	1.3242
	21	8.00	1.2865	1.2768	1.2736	1.3322
	22	7.80	1.2914	1.2744	1.2781	1.3300
	23	7.60	1.2963	1.2700	1.2791	1.3412
	24	7.40	1.2972	1.2636	1.2778	1.3475
	25	7.20	1.2955	1.2555	1.2740	1.3505
	26	7.00	1.2915	1.2461	1.2679	1.3502
	27	6.80	1.2600	1.2251	1.2598	1.3468
	28	6.60	1.2520	1.2170	1.2497	1.3405
	29	6.40	1.2421	1.2087	1.2382	1.3314
	30	6.20	1.2306	1.1992	1.2267	1.3199
	31	6.00	1.2229	1.2063	1.2158	1.3056
	32	5.80	1.1727	1.1504	1.1618	1.2420
	33	5.60	1.1699	1.1496	1.1612	1.2339
	34	5.40	1.1736	1.1599	1.1668	1.2332
	35	5.20	1.1865	1.1695	1.1719	1.2361
	36	5.00	1.1994	1.1786	1.1758	1.2378
	37	4.80	1.2107	1.1874	1.1784	1.2372
	38	4.60	1.2215	1.1952	1.1798	1.2345
	39	4.40	1.2323	1.2020	1.1798	1.2298
	40	4.20	1.2438	1.2080	1.1785	1.2229
	41	4.00	1.2543	1.2128	1.1761	1.2141
	42	3.80	1.2592	1.2189	1.1723	1.2033
	43	3.60	1.2633	1.2241	1.1680	1.1927
	44	3.40	1.2659	1.2282	1.1642	1.1833
	45	3.20	1.2666	1.2330	1.1630	1.1718
	46	3.00	1.2767	1.2478	1.1675	1.1820
	47	2.80	1.2976	1.2719	1.1773	1.1870
	48	2.60	1.3227	1.2989	1.1870	1.1987
	49	2.40	1.3467	1.3253	1.1964	1.2090
	50	2.20	1.3703	1.3518	1.2056	1.2193
	51	2.00	1.3935	1.3779	1.2148	1.2296
*	52	1.80	1.0000	1.0000	1.0000	1.0000
*	53	1.60	1.0000	1.0000	1.0000	1.0000
*	54	1.40	1.0000	1.0000	1.0000	1.0000
*	55	1.20	1.0000	1.0000	1.0000	1.0000
*	56	1.00	1.0000	1.0000	1.0000	1.0000
*	57	0.80	1.0000	1.0000	1.0000	1.0000
*	58	0.60	1.0000	1.0000	1.0000	1.0000
*	59	0.40	1.0000	1.0000	1.0000	1.0000
*	60	0.20	1.0000	1.0000	1.0000	1.0000
*	61	0.00	1.0000	1.0000	1.0000	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 Tav_g temperature range from 586.4 to 587.4°F.

**FIGURE 11 RAOC W(Z) FOR DELTA-AO BETWEEN < -4% to -5%
SEE COLR SECTION 2.6.5**

COLR for VEGP UNIT 1 CYCLE 13

	Point	Feet	BOL W(Z)	MOL-1 W(Z)	MOL-2 W(Z)	EOL W(Z)
*	1	12.00	1.0000	1.0000	1.0000	1.0000
*	2	11.80	1.0000	1.0000	1.0000	1.0000
*	3	11.60	1.0000	1.0000	1.0000	1.0000
*	4	11.40	1.0000	1.0000	1.0000	1.0000
*	5	11.20	1.0000	1.0000	1.0000	1.0000
*	6	11.00	1.0000	1.0000	1.0000	1.0000
*	7	10.80	1.0000	1.0000	1.0000	1.0000
*	8	10.60	1.0000	1.0000	1.0000	1.0000
*	9	10.40	1.0000	1.0000	1.0000	1.0000
*	10	10.20	1.0000	1.0000	1.0000	1.0000
	11	10.00	1.3220	1.3595	1.3575	1.3028
	12	9.80	1.3158	1.3483	1.3452	1.2999
	13	9.60	1.3091	1.3383	1.3394	1.2984
	14	9.40	1.3022	1.3257	1.3318	1.3003
	15	9.20	1.2962	1.3118	1.3202	1.3116
	16	9.00	1.2871	1.2975	1.3104	1.3190
	17	8.80	1.2876	1.2928	1.2981	1.3258
	18	8.60	1.2955	1.2935	1.2925	1.3315
	19	8.40	1.3031	1.2993	1.2956	1.3375
	20	8.20	1.3089	1.3015	1.2952	1.3497
	21	8.00	1.3112	1.3014	1.2981	1.3579
	22	7.80	1.3162	1.2989	1.3026	1.3555
	23	7.60	1.3212	1.2945	1.3037	1.3670
	24	7.40	1.3221	1.2879	1.3024	1.3734
	25	7.20	1.3204	1.2796	1.2985	1.3765
	26	7.00	1.3163	1.2701	1.2922	1.3762
	27	6.80	1.2842	1.2487	1.2840	1.3727
	28	6.60	1.2760	1.2404	1.2737	1.3662
	29	6.40	1.2660	1.2319	1.2620	1.3570
	30	6.20	1.2543	1.2223	1.2503	1.3452
	31	6.00	1.2465	1.2295	1.2391	1.3307
	32	5.80	1.1727	1.1504	1.1618	1.2420
	33	5.60	1.1699	1.1496	1.1612	1.2339
	34	5.40	1.1736	1.1599	1.1668	1.2332
	35	5.20	1.1865	1.1695	1.1719	1.2361
	36	5.00	1.1994	1.1786	1.1758	1.2378
	37	4.80	1.2107	1.1874	1.1784	1.2372
	38	4.60	1.2215	1.1952	1.1798	1.2345
	39	4.40	1.2323	1.2020	1.1798	1.2298
	40	4.20	1.2438	1.2080	1.1785	1.2229
	41	4.00	1.2543	1.2128	1.1761	1.2141
	42	3.80	1.2592	1.2189	1.1723	1.2033
	43	3.60	1.2633	1.2241	1.1680	1.1927
	44	3.40	1.2659	1.2282	1.1642	1.1833
	45	3.20	1.2666	1.2330	1.1630	1.1718
	46	3.00	1.2767	1.2478	1.1675	1.1820
	47	2.80	1.2976	1.2719	1.1773	1.1870
	48	2.60	1.3227	1.2989	1.1870	1.1987
	49	2.40	1.3467	1.3253	1.1964	1.2090
	50	2.20	1.3703	1.3518	1.2056	1.2193
	51	2.00	1.3935	1.3779	1.2148	1.2296
*	52	1.80	1.0000	1.0000	1.0000	1.0000
*	53	1.60	1.0000	1.0000	1.0000	1.0000
*	54	1.40	1.0000	1.0000	1.0000	1.0000
*	55	1.20	1.0000	1.0000	1.0000	1.0000
*	56	1.00	1.0000	1.0000	1.0000	1.0000
*	57	0.80	1.0000	1.0000	1.0000	1.0000
*	58	0.60	1.0000	1.0000	1.0000	1.0000
*	59	0.40	1.0000	1.0000	1.0000	1.0000
*	60	0.20	1.0000	1.0000	1.0000	1.0000
*	61	0.00	1.0000	1.0000	1.0000	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 Tav_g temperature range from 586.4 to 587.4°F.

**FIGURE 12 RAOC W(Z) FOR DELTA-AO BETWEEN < -5% to -6%
SEE COLR SECTION 2.6.5**

COLR for VEGP UNIT 1 CYCLE 13

	Point	Feet	BOL W(Z)	MOL-1 W(Z)	MOL-2 W(Z)	EOL W(Z)
*	1	12.00	1.0000	1.0000	1.0000	1.0000
*	2	11.80	1.0000	1.0000	1.0000	1.0000
*	3	11.60	1.0000	1.0000	1.0000	1.0000
*	4	11.40	1.0000	1.0000	1.0000	1.0000
*	5	11.20	1.0000	1.0000	1.0000	1.0000
*	6	11.00	1.0000	1.0000	1.0000	1.0000
*	7	10.80	1.0000	1.0000	1.0000	1.0000
*	8	10.60	1.0000	1.0000	1.0000	1.0000
*	9	10.40	1.0000	1.0000	1.0000	1.0000
*	10	10.20	1.0000	1.0000	1.0000	1.0000
	11	10.00	1.3470	1.3851	1.3832	1.3274
	12	9.80	1.3406	1.3738	1.3706	1.3244
	13	9.60	1.3338	1.3635	1.3647	1.3229
	14	9.40	1.3268	1.3508	1.3569	1.3248
	15	9.20	1.3206	1.3365	1.3451	1.3364
	16	9.00	1.3113	1.3220	1.3351	1.3438
	17	8.80	1.3119	1.3172	1.3226	1.3509
	18	8.60	1.3200	1.3179	1.3168	1.3566
	19	8.40	1.3276	1.3239	1.3201	1.3627
	20	8.20	1.3336	1.3260	1.3197	1.3752
	21	8.00	1.3360	1.3259	1.3226	1.3835
	22	7.80	1.3410	1.3234	1.3272	1.3811
	23	7.60	1.3461	1.3189	1.3283	1.3928
	24	7.40	1.3471	1.3122	1.3270	1.3994
	25	7.20	1.3454	1.3038	1.3230	1.4025
	26	7.00	1.3411	1.2941	1.3166	1.4022
	27	6.80	1.3084	1.2722	1.3082	1.3986
	28	6.60	1.3001	1.2638	1.2977	1.3920
	29	6.40	1.2898	1.2552	1.2858	1.3826
	30	6.20	1.2780	1.2453	1.2739	1.3706
	31	6.00	1.2700	1.2527	1.2625	1.3558
	32	5.80	1.1727	1.1504	1.1618	1.2420
	33	5.60	1.1699	1.1496	1.1612	1.2339
	34	5.40	1.1736	1.1599	1.1668	1.2332
	35	5.20	1.1865	1.1695	1.1719	1.2361
	36	5.00	1.1994	1.1786	1.1758	1.2378
	37	4.80	1.2107	1.1874	1.1784	1.2372
	38	4.60	1.2215	1.1952	1.1798	1.2345
	39	4.40	1.2323	1.2020	1.1798	1.2298
	40	4.20	1.2438	1.2080	1.1785	1.2229
	41	4.00	1.2543	1.2128	1.1761	1.2141
	42	3.80	1.2592	1.2189	1.1723	1.2033
	43	3.60	1.2633	1.2241	1.1680	1.1927
	44	3.40	1.2659	1.2282	1.1642	1.1833
	45	3.20	1.2666	1.2330	1.1630	1.1718
	46	3.00	1.2767	1.2478	1.1675	1.1820
	47	2.80	1.2976	1.2719	1.1773	1.1870
	48	2.60	1.3227	1.2989	1.1870	1.1987
	49	2.40	1.3467	1.3253	1.1964	1.2090
	50	2.20	1.3703	1.3518	1.2056	1.2193
	51	2.00	1.3935	1.3779	1.2148	1.2296
*	52	1.80	1.0000	1.0000	1.0000	1.0000
*	53	1.60	1.0000	1.0000	1.0000	1.0000
*	54	1.40	1.0000	1.0000	1.0000	1.0000
*	55	1.20	1.0000	1.0000	1.0000	1.0000
*	56	1.00	1.0000	1.0000	1.0000	1.0000
*	57	0.80	1.0000	1.0000	1.0000	1.0000
*	58	0.60	1.0000	1.0000	1.0000	1.0000
*	59	0.40	1.0000	1.0000	1.0000	1.0000
*	60	0.20	1.0000	1.0000	1.0000	1.0000
*	61	0.00	1.0000	1.0000	1.0000	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 Tav_g temperature range from 586.4 to 587.4°F.

**FIGURE 13 RAOC W(Z) FOR DELTA-AO BETWEEN < -6% to -7%
SEE COLR SECTION 2.6.5**

COLR for VEGP UNIT 1 CYCLE 13

	Point	Feet	BOL W(Z)	MOL-1 W(Z)	MOL-2 W(Z)	EOL W(Z)
*	1	12.00	1.0000	1.0000	1.0000	1.0000
*	2	11.80	1.0000	1.0000	1.0000	1.0000
*	3	11.60	1.0000	1.0000	1.0000	1.0000
*	4	11.40	1.0000	1.0000	1.0000	1.0000
*	5	11.20	1.0000	1.0000	1.0000	1.0000
*	6	11.00	1.0000	1.0000	1.0000	1.0000
*	7	10.80	1.0000	1.0000	1.0000	1.0000
*	8	10.60	1.0000	1.0000	1.0000	1.0000
*	9	10.40	1.0000	1.0000	1.0000	1.0000
*	10	10.20	1.0000	1.0000	1.0000	1.0000
	11	10.00	1.3719	1.4108	1.4088	1.3520
	12	9.80	1.3654	1.3992	1.3960	1.3489
	13	9.60	1.3585	1.3888	1.3900	1.3474
	14	9.40	1.3514	1.3758	1.3820	1.3494
	15	9.20	1.3451	1.3613	1.3701	1.3611
	16	9.00	1.3356	1.3465	1.3598	1.3687
	17	8.80	1.3362	1.3416	1.3471	1.3759
	18	8.60	1.3444	1.3423	1.3412	1.3817
	19	8.40	1.3522	1.3484	1.3445	1.3880
	20	8.20	1.3583	1.3506	1.3441	1.4006
	21	8.00	1.3607	1.3505	1.3471	1.4091
	22	7.80	1.3659	1.3479	1.3518	1.4067
	23	7.60	1.3710	1.3433	1.3529	1.4186
	24	7.40	1.3720	1.3365	1.3516	1.4253
	25	7.20	1.3703	1.3279	1.3475	1.4285
	26	7.00	1.3660	1.3180	1.3410	1.4281
	27	6.80	1.3327	1.2958	1.3324	1.4245
	28	6.60	1.3242	1.2872	1.3218	1.4178
	29	6.40	1.3137	1.2784	1.3097	1.4082
	30	6.20	1.3016	1.2684	1.2975	1.3960
	31	6.00	1.2935	1.2759	1.2859	1.3809
	32	5.80	1.1727	1.1504	1.1618	1.2420
	33	5.60	1.1699	1.1496	1.1612	1.2339
	34	5.40	1.1736	1.1599	1.1668	1.2332
	35	5.20	1.1865	1.1695	1.1719	1.2361
	36	5.00	1.1994	1.1786	1.1758	1.2378
	37	4.80	1.2107	1.1874	1.1784	1.2372
	38	4.60	1.2215	1.1952	1.1798	1.2345
	39	4.40	1.2323	1.2020	1.1798	1.2298
	40	4.20	1.2438	1.2080	1.1785	1.2229
	41	4.00	1.2543	1.2128	1.1761	1.2141
	42	3.80	1.2592	1.2189	1.1723	1.2033
	43	3.60	1.2633	1.2241	1.1680	1.1927
	44	3.40	1.2659	1.2282	1.1642	1.1833
	45	3.20	1.2666	1.2330	1.1630	1.1718
	46	3.00	1.2767	1.2478	1.1675	1.1820
	47	2.80	1.2976	1.2719	1.1773	1.1870
	48	2.60	1.3227	1.2989	1.1870	1.1987
	49	2.40	1.3467	1.3253	1.1964	1.2090
	50	2.20	1.3703	1.3518	1.2056	1.2193
	51	2.00	1.3935	1.3779	1.2148	1.2296
*	52	1.80	1.0000	1.0000	1.0000	1.0000
*	53	1.60	1.0000	1.0000	1.0000	1.0000
*	54	1.40	1.0000	1.0000	1.0000	1.0000
*	55	1.20	1.0000	1.0000	1.0000	1.0000
*	56	1.00	1.0000	1.0000	1.0000	1.0000
*	57	0.80	1.0000	1.0000	1.0000	1.0000
*	58	0.60	1.0000	1.0000	1.0000	1.0000
*	59	0.40	1.0000	1.0000	1.0000	1.0000
*	60	0.20	1.0000	1.0000	1.0000	1.0000
*	61	0.00	1.0000	1.0000	1.0000	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 Tav_g temperature range from 586.4 to 587.4°F.

**FIGURE 14 RAOC W(Z) FOR DELTA-AO BETWEEN < -7% to -8%
SEE COLR SECTION 2.6.5**

COLR for VEGP UNIT 1 CYCLE 13

	Point	Feet	BOL W(Z)	MOL-1 W(Z)	MOL-2 W(Z)	EOL W(Z)
*	1	12.00	1.0000	1.0000	1.0000	1.0000
*	2	11.80	1.0000	1.0000	1.0000	1.0000
*	3	11.60	1.0000	1.0000	1.0000	1.0000
*	4	11.40	1.0000	1.0000	1.0000	1.0000
*	5	11.20	1.0000	1.0000	1.0000	1.0000
*	6	11.00	1.0000	1.0000	1.0000	1.0000
*	7	10.80	1.0000	1.0000	1.0000	1.0000
*	8	10.60	1.0000	1.0000	1.0000	1.0000
*	9	10.40	1.0000	1.0000	1.0000	1.0000
*	10	10.20	1.0000	1.0000	1.0000	1.0000
	11	10.00	1.4218	1.4621	1.4600	1.4012
	12	9.80	1.4151	1.4501	1.4468	1.3980
	13	9.60	1.4079	1.4393	1.4405	1.3964
	14	9.40	1.4005	1.4258	1.4323	1.3984
	15	9.20	1.3940	1.4108	1.4199	1.4106
	16	9.00	1.3842	1.3955	1.4093	1.4185
	17	8.80	1.3848	1.3903	1.3960	1.4259
	18	8.60	1.3933	1.3911	1.3900	1.4320
	19	8.40	1.4014	1.3974	1.3934	1.4385
	20	8.20	1.4077	1.3997	1.3930	1.4516
	21	8.00	1.4102	1.3996	1.3960	1.4603
	22	7.80	1.4155	1.3970	1.4009	1.4578
	23	7.60	1.4209	1.3922	1.4021	1.4701
	24	7.40	1.4219	1.3851	1.4007	1.4771
	25	7.20	1.4201	1.3762	1.3965	1.4804
	26	7.00	1.4157	1.3659	1.3898	1.4801
	27	6.80	1.3811	1.3429	1.3809	1.4763
	28	6.60	1.3723	1.3340	1.3698	1.4693
	29	6.40	1.3615	1.3249	1.3573	1.4594
	30	6.20	1.3490	1.3145	1.3446	1.4468
	31	6.00	1.3405	1.3223	1.3327	1.4312
	32	5.80	1.1727	1.1504	1.1618	1.2420
	33	5.60	1.1699	1.1496	1.1612	1.2339
	34	5.40	1.1736	1.1599	1.1668	1.2332
	35	5.20	1.1865	1.1695	1.1719	1.2361
	36	5.00	1.1994	1.1786	1.1758	1.2378
	37	4.80	1.2107	1.1874	1.1784	1.2372
	38	4.60	1.2215	1.1952	1.1798	1.2345
	39	4.40	1.2323	1.2020	1.1798	1.2298
	40	4.20	1.2438	1.2080	1.1785	1.2229
	41	4.00	1.2543	1.2128	1.1761	1.2141
	42	3.80	1.2592	1.2189	1.1723	1.2033
	43	3.60	1.2633	1.2241	1.1680	1.1927
	44	3.40	1.2659	1.2282	1.1642	1.1833
	45	3.20	1.2666	1.2330	1.1630	1.1718
	46	3.00	1.2767	1.2478	1.1675	1.1820
	47	2.80	1.2976	1.2719	1.1773	1.1870
	48	2.60	1.3227	1.2989	1.1870	1.1987
	49	2.40	1.3467	1.3253	1.1964	1.2090
	50	2.20	1.3703	1.3518	1.2056	1.2193
	51	2.00	1.3935	1.3779	1.2148	1.2296
*	52	1.80	1.0000	1.0000	1.0000	1.0000
*	53	1.60	1.0000	1.0000	1.0000	1.0000
*	54	1.40	1.0000	1.0000	1.0000	1.0000
*	55	1.20	1.0000	1.0000	1.0000	1.0000
*	56	1.00	1.0000	1.0000	1.0000	1.0000
*	57	0.80	1.0000	1.0000	1.0000	1.0000
*	58	0.60	1.0000	1.0000	1.0000	1.0000
*	59	0.40	1.0000	1.0000	1.0000	1.0000
*	60	0.20	1.0000	1.0000	1.0000	1.0000
*	61	0.00	1.0000	1.0000	1.0000	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 Tav_g temperature range from 586.4 to 587.4°F.

**FIGURE 15 RAOC W(Z) FOR DELTA-AO BETWEEN < -8% to -10%
SEE COLR SECTION 2.6.5**

COLR for VEGP UNIT 1 CYCLE 13

	Point	Feet	BOL W(Z)	MOL-1 W(Z)	MOL-2 W(Z)	EOL W(Z)
*	1	12.00	1.0000	1.0000	1.0000	1.0000
*	2	11.80	1.0000	1.0000	1.0000	1.0000
*	3	11.60	1.0000	1.0000	1.0000	1.0000
*	4	11.40	1.0000	1.0000	1.0000	1.0000
*	5	11.20	1.0000	1.0000	1.0000	1.0000
*	6	11.00	1.0000	1.0000	1.0000	1.0000
*	7	10.80	1.0000	1.0000	1.0000	1.0000
*	8	10.60	1.0000	1.0000	1.0000	1.0000
*	9	10.40	1.0000	1.0000	1.0000	1.0000
*	10	10.20	1.0000	1.0000	1.0000	1.0000
	11	10.00	1.4717	1.5134	1.5112	1.4503
	12	9.80	1.4647	1.5010	1.4975	1.4470
	13	9.60	1.4573	1.4898	1.4910	1.4454
	14	9.40	1.4496	1.4758	1.4826	1.4475
	15	9.20	1.4429	1.4603	1.4697	1.4601
	16	9.00	1.4328	1.4444	1.4587	1.4683
	17	8.80	1.4333	1.4391	1.4450	1.4759
	18	8.60	1.4422	1.4400	1.4388	1.4822
	19	8.40	1.4506	1.4464	1.4423	1.4889
	20	8.20	1.4571	1.4488	1.4418	1.5025
	21	8.00	1.4597	1.4487	1.4450	1.5116
	22	7.80	1.4652	1.4460	1.4501	1.5090
	23	7.60	1.4708	1.4410	1.4513	1.5217
	24	7.40	1.4718	1.4337	1.4499	1.5289
	25	7.20	1.4699	1.4245	1.4455	1.5323
	26	7.00	1.4653	1.4139	1.4385	1.5320
	27	6.80	1.4296	1.3900	1.4293	1.5281
	28	6.60	1.4205	1.3808	1.4179	1.5209
	29	6.40	1.4093	1.3714	1.4049	1.5106
	30	6.20	1.3963	1.3607	1.3918	1.4975
	31	6.00	1.3876	1.3687	1.3794	1.4814
	32	5.80	1.1727	1.1504	1.1618	1.2420
	33	5.60	1.1699	1.1496	1.1612	1.2339
	34	5.40	1.1736	1.1599	1.1668	1.2332
	35	5.20	1.1865	1.1695	1.1719	1.2361
	36	5.00	1.1994	1.1786	1.1758	1.2378
	37	4.80	1.2107	1.1874	1.1784	1.2372
	38	4.60	1.2215	1.1952	1.1798	1.2345
	39	4.40	1.2323	1.2020	1.1798	1.2298
	40	4.20	1.2438	1.2080	1.1785	1.2229
	41	4.00	1.2543	1.2128	1.1761	1.2141
	42	3.80	1.2592	1.2189	1.1723	1.2033
	43	3.60	1.2633	1.2241	1.1680	1.1927
	44	3.40	1.2659	1.2282	1.1642	1.1833
	45	3.20	1.2666	1.2330	1.1630	1.1718
	46	3.00	1.2767	1.2478	1.1675	1.1820
	47	2.80	1.2976	1.2719	1.1773	1.1870
	48	2.60	1.3227	1.2989	1.1870	1.1987
	49	2.40	1.3467	1.3253	1.1964	1.2090
	50	2.20	1.3703	1.3518	1.2056	1.2193
	51	2.00	1.3935	1.3779	1.2148	1.2296
*	52	1.80	1.0000	1.0000	1.0000	1.0000
*	53	1.60	1.0000	1.0000	1.0000	1.0000
*	54	1.40	1.0000	1.0000	1.0000	1.0000
*	55	1.20	1.0000	1.0000	1.0000	1.0000
*	56	1.00	1.0000	1.0000	1.0000	1.0000
*	57	0.80	1.0000	1.0000	1.0000	1.0000
*	58	0.60	1.0000	1.0000	1.0000	1.0000
*	59	0.40	1.0000	1.0000	1.0000	1.0000
*	60	0.20	1.0000	1.0000	1.0000	1.0000
*	61	0.00	1.0000	1.0000	1.0000	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 Tav_g temperature range from 586.4 to 587.4°F.

**FIGURE 16 RAOC W(Z) FOR DELTA-AO BETWEEN < -10% to -12%
SEE COLR SECTION 2.6.5**