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SOUTHERN COMPANY
Energy to Serve Your World℠

April 28, 2004

NL-04-0623

Docket Nos.: 50-424
50-425

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

Vogtle Electric Generating Plant
Unit 2 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 0 of the Unit 2 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/daj

Attachment: Unit 2 Cycle 11 Core Operating Limits Report

cc: Southern Nuclear Operating Company
Mr. J. B. Beasley, Jr., Executive Vice President
Mr. W. F. Kitchens, General Manager – Plant Vogtle
Mr. M. Sheibani, Engineering Supervisor – Plant Vogtle
RType: CVC7000

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

A001

VOGTLE ELECTRIC GENERATING PLANT (VEGP) UNIT 2 CYCLE 11

CORE OPERATING LIMITS REPORT

REVISION 0

APRIL 2004

COLR for VEGP UNIT 2 CYCLE 11

1.0 CORE OPERATING LIMITS REPORT

This Core Operating Limits Report (COLR) for VEGP UNIT 2 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 $+0.7 \times 10^{-4}$ $\Delta k/k/^{\circ}F$ 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: $P = \dfrac{\text{THERMAL POWER}}{\text{RATED THERMAL POWER}}$

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 1900 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 11

TABLE 1

$F_Q(Z)$ PENALTY FACTOR

Cycle Burnup (MWD/MTU)	$F_Q(Z)$ Penalty Factor
4201	1.020
4414	1.021
4628	1.025
4841	1.025
5054	1.025
5267	1.023
5480	1.021
5694	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.

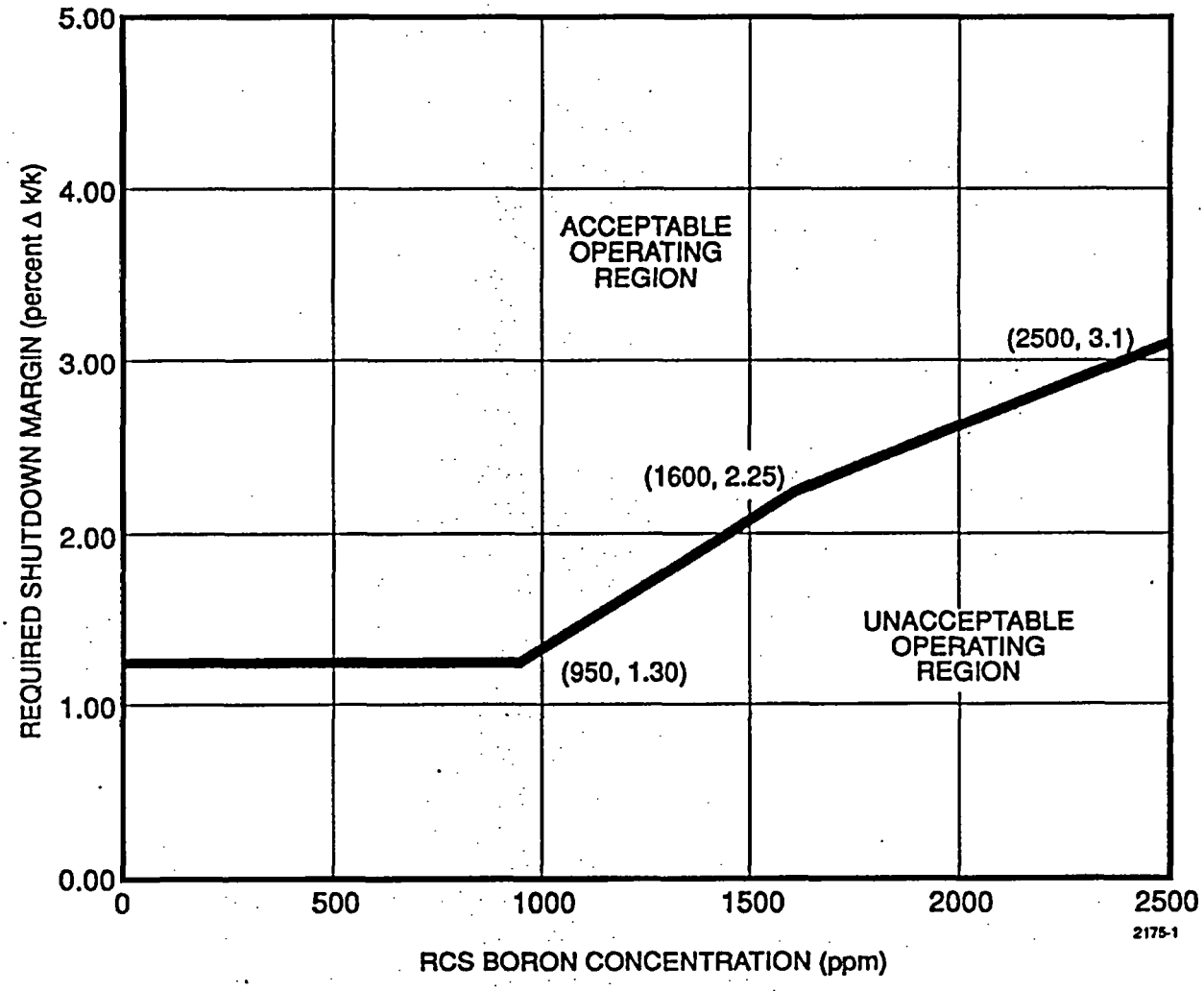


FIGURE 1

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

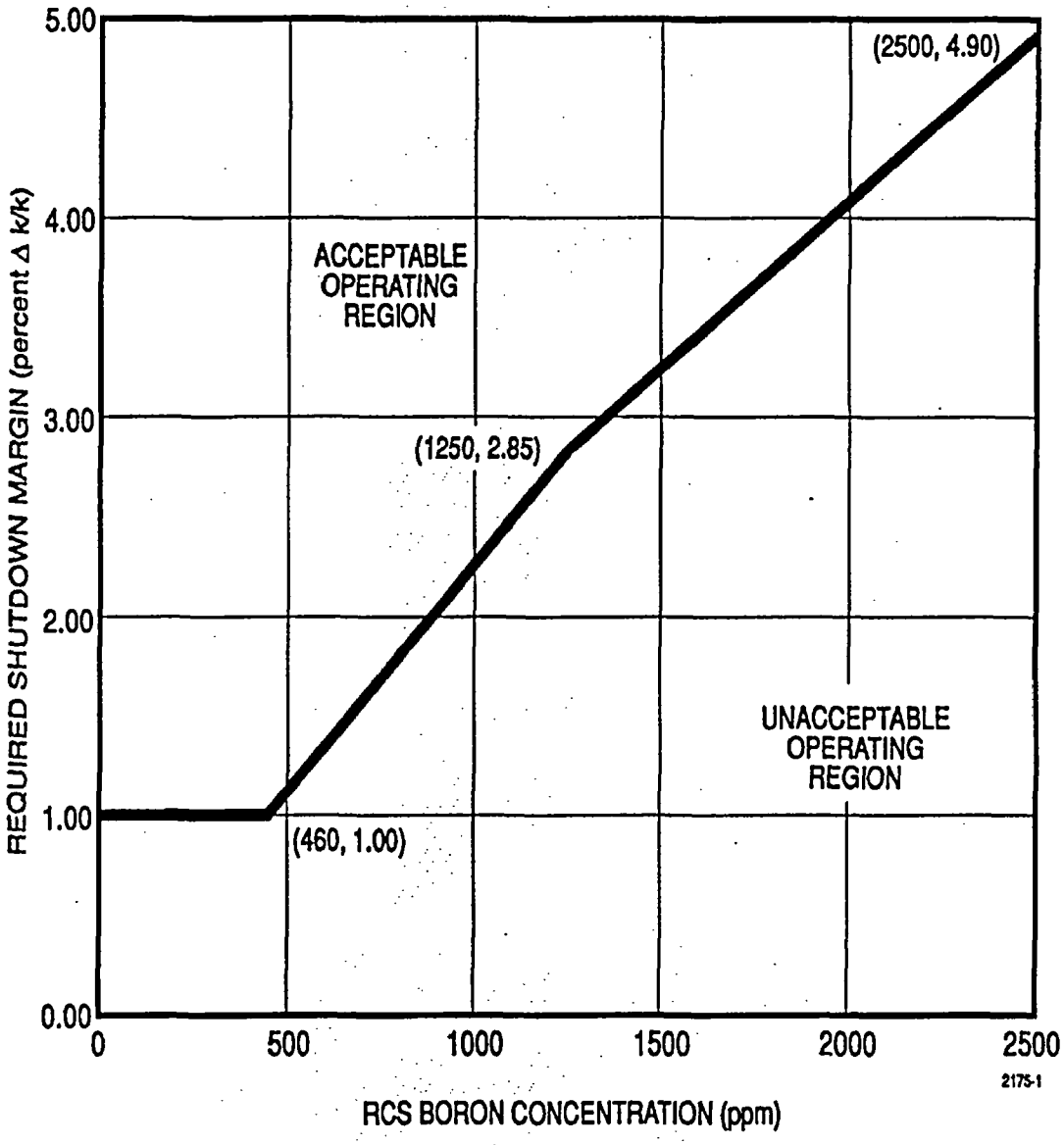
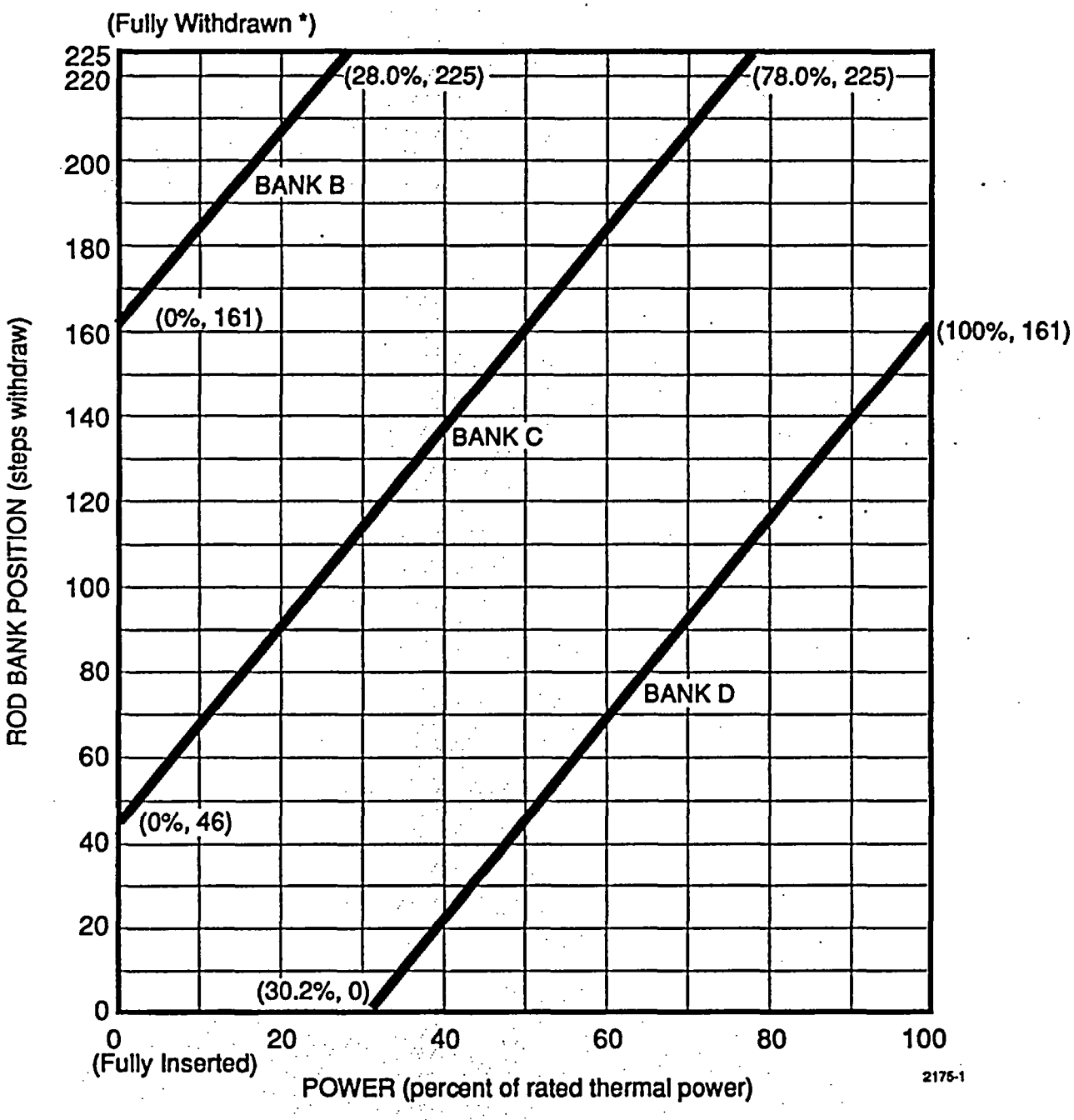


FIGURE 2

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



* 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

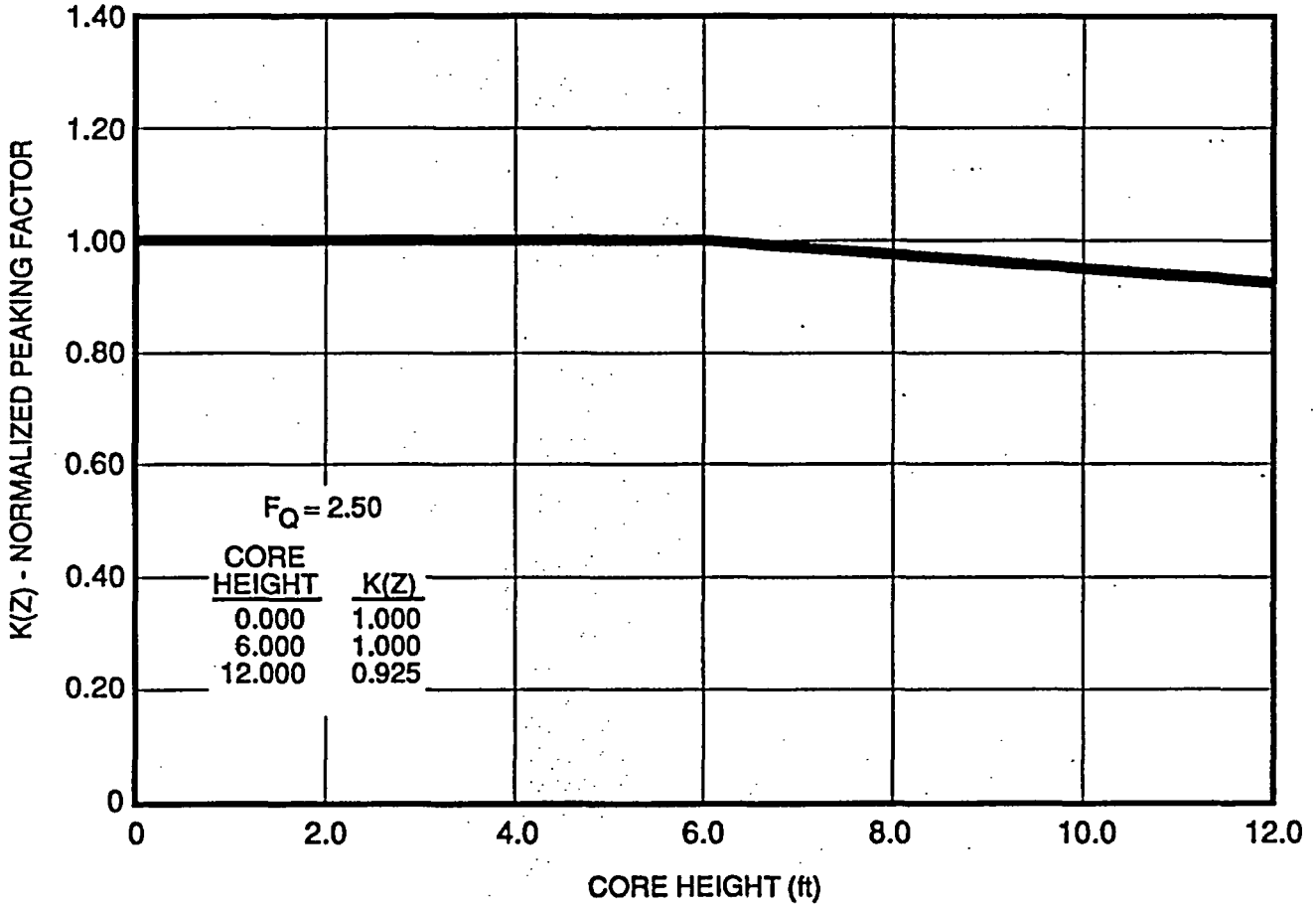


FIGURE 4

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

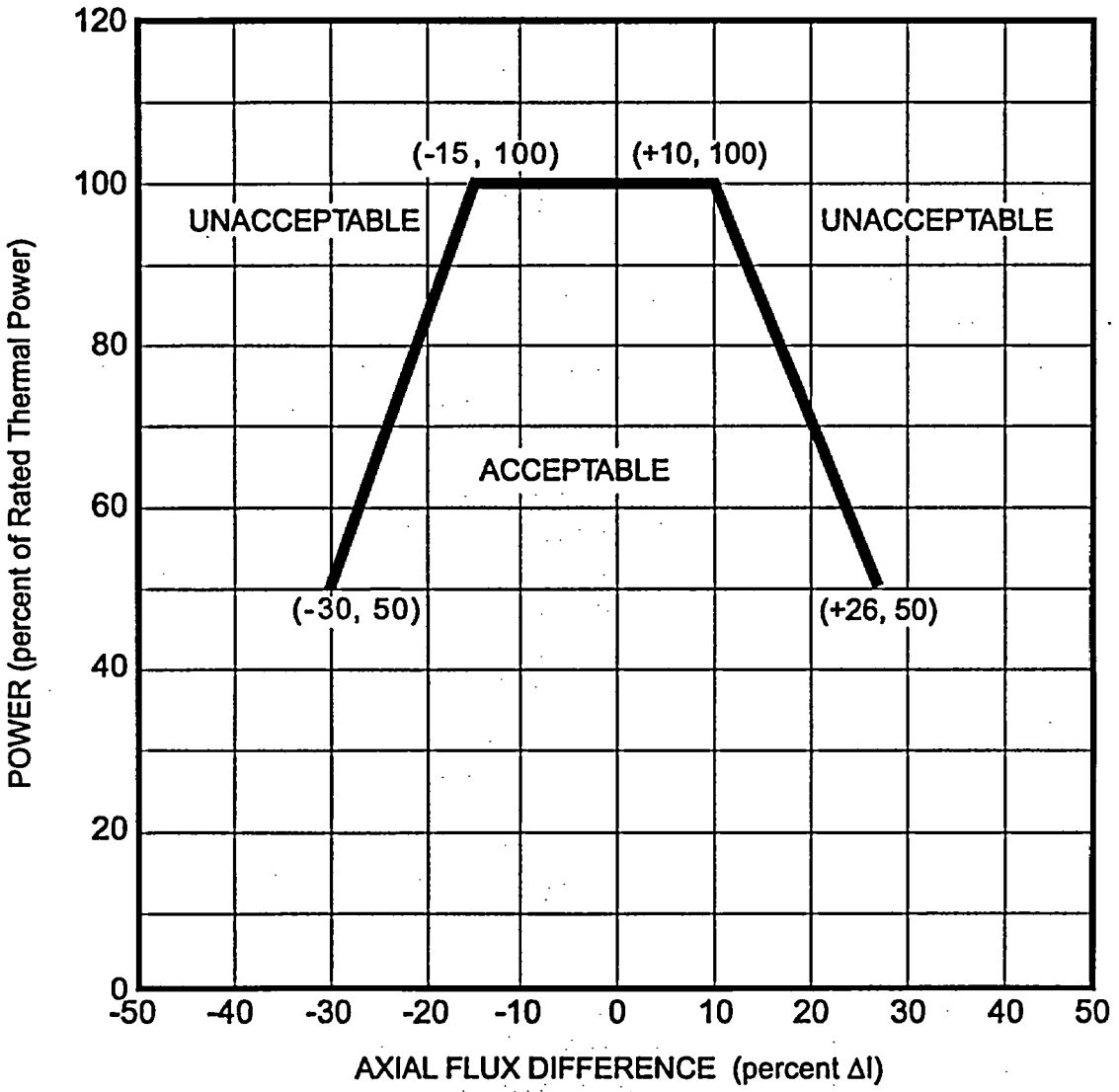
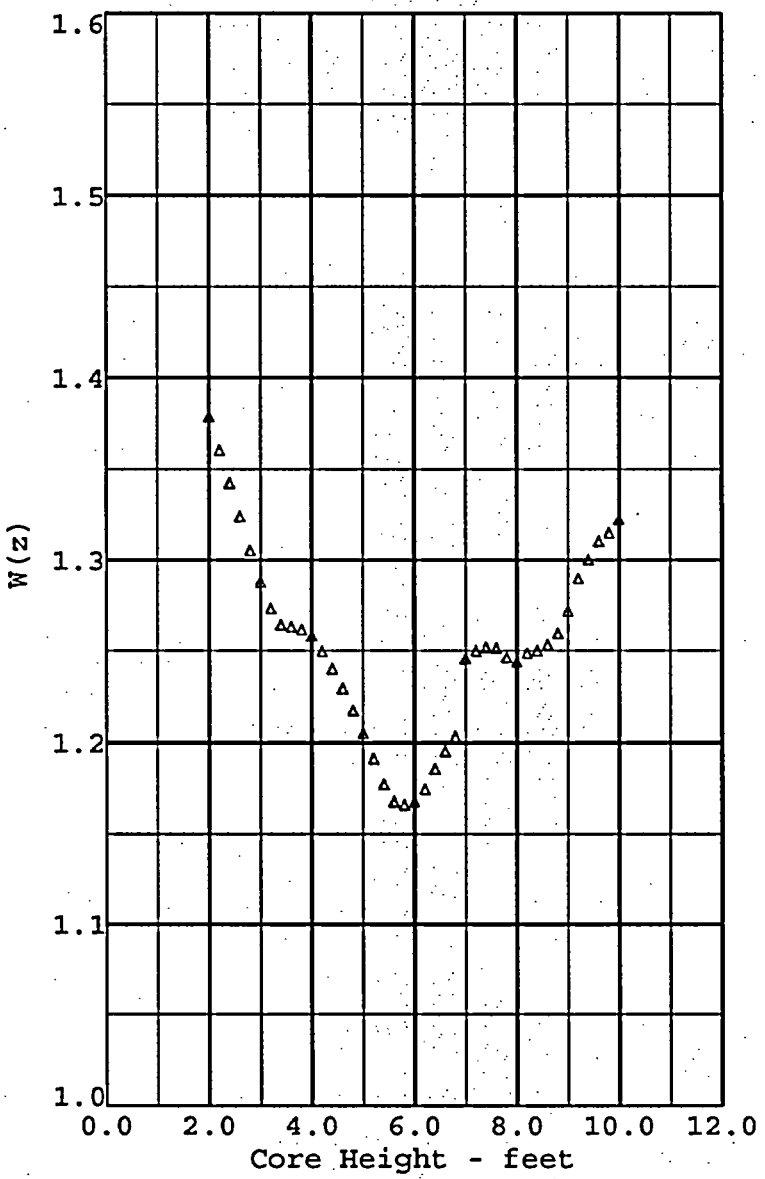


FIGURE 5

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



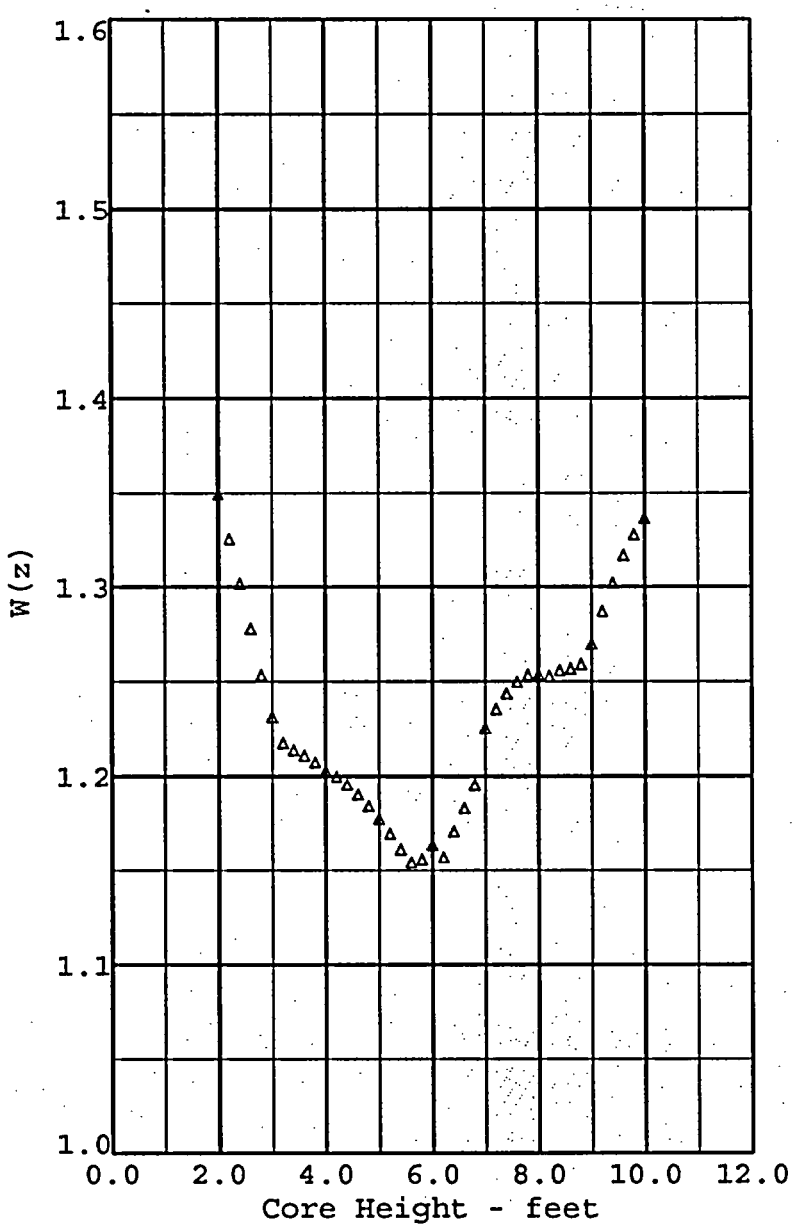
	Axial Point	Elevation (feet)	BOL W(Z)
*	1	12.00	1.0000
*	2	11.80	1.0000
*	3	11.60	1.0000
*	4	11.40	1.0000
*	5	11.20	1.0000
*	6	11.00	1.0000
*	7	10.80	1.0000
*	8	10.60	1.0000
*	9	10.40	1.0000
*	10	10.20	1.0000
	11	10.00	1.3225
	12	9.80	1.3149
	13	9.60	1.3104
	14	9.40	1.3001
	15	9.20	1.2895
	16	9.00	1.2718
	17	8.80	1.2592
	18	8.60	1.2532
	19	8.40	1.2499
	20	8.20	1.2485
	21	8.00	1.2439
	22	7.80	1.2463
	23	7.60	1.2513
	24	7.40	1.2517
	25	7.20	1.2498
	26	7.00	1.2456
	27	6.80	1.2031
	28	6.60	1.1953
	29	6.40	1.1857
	30	6.20	1.1746
	31	6.00	1.1677
	32	5.80	1.1660
	33	5.60	1.1676
	34	5.40	1.1772
	35	5.20	1.1913
	36	5.00	1.2049
	37	4.80	1.2174
	38	4.60	1.2292
	39	4.40	1.2399
	40	4.20	1.2496
	41	4.00	1.2581
	42	3.80	1.2614
	43	3.60	1.2630
	44	3.40	1.2641
	45	3.20	1.2731
	46	3.00	1.2876
	47	2.80	1.3052
	48	2.60	1.3240
	49	2.40	1.3423
	50	2.20	1.3603
	51	2.00	1.3787
*	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

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.

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



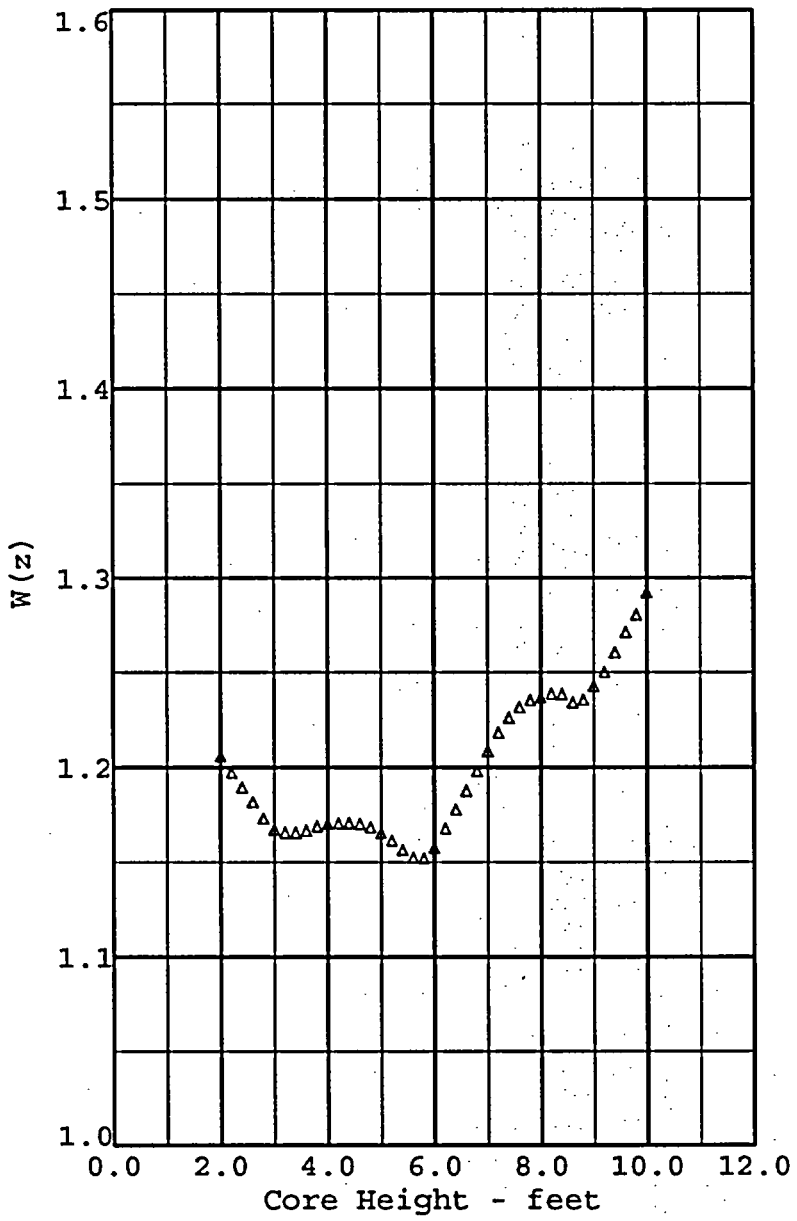
	Axial Point	Elevation (feet)	MOL-1 W(Z)
*	1	12.00	1.0000
*	2	11.80	1.0000
*	3	11.60	1.0000
*	4	11.40	1.0000
*	5	11.20	1.0000
*	6	11.00	1.0000
*	7	10.80	1.0000
*	8	10.60	1.0000
*	9	10.40	1.0000
*	10	10.20	1.0000
	11	10.00	1.3366
	12	9.80	1.3278
	13	9.60	1.3167
	14	9.40	1.3020
	15	9.20	1.2869
	16	9.00	1.2695
	17	8.80	1.2590
	18	8.60	1.2566
	19	8.40	1.2557
	20	8.20	1.2527
	21	8.00	1.2537
	22	7.80	1.2533
	23	7.60	1.2496
	24	7.40	1.2436
	25	7.20	1.2354
	26	7.00	1.2254
	27	6.80	1.1954
	28	6.60	1.1830
	29	6.40	1.1705
	30	6.20	1.1568
	31	6.00	1.1634
	32	5.80	1.1557
	33	5.60	1.1542
	34	5.40	1.1611
	35	5.20	1.1694
	36	5.00	1.1772
	37	4.80	1.1841
	38	4.60	1.1902
	39	4.40	1.1955
	40	4.20	1.1997
	41	4.00	1.2028
	42	3.80	1.2074
	43	3.60	1.2110
	44	3.40	1.2138
	45	3.20	1.2176
	46	3.00	1.2312
	47	2.80	1.2532
	48	2.60	1.2777
	49	2.40	1.3017
	50	2.20	1.3255
	51	2.00	1.3492
*	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 7
RAOC W (Z) AT 4000 MWD/MTU



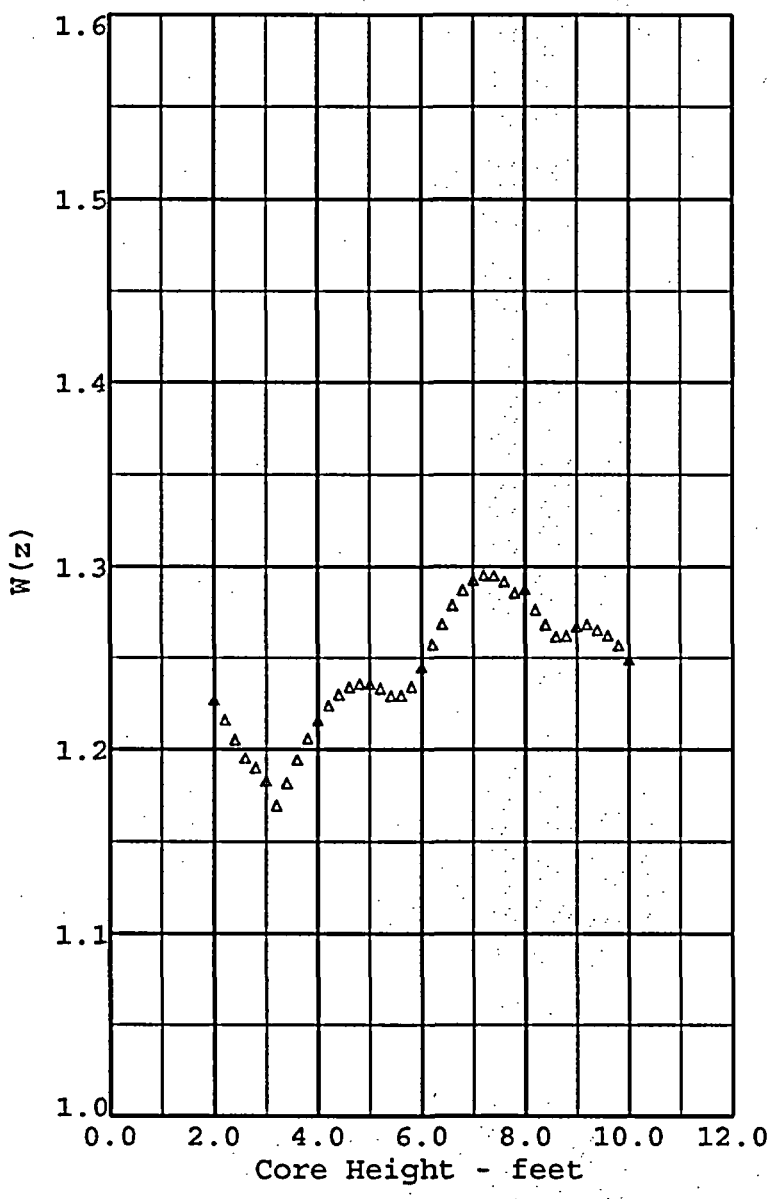
	Axial Point	Elevation (feet)	MOL-2 W(Z)
*	1	12.00	1.0000
*	2	11.80	1.0000
*	3	11.60	1.0000
*	4	11.40	1.0000
*	5	11.20	1.0000
*	6	11.00	1.0000
*	7	10.80	1.0000
*	8	10.60	1.0000
*	9	10.40	1.0000
*	10	10.20	1.0000
	11	10.00	1.2922
	12	9.80	1.2803
	13	9.60	1.2711
	14	9.40	1.2604
	15	9.20	1.2500
	16	9.00	1.2425
	17	8.80	1.2355
	18	8.60	1.2340
	19	8.40	1.2383
	20	8.20	1.2386
	21	8.00	1.2365
	22	7.80	1.2352
	23	7.60	1.2316
	24	7.40	1.2259
	25	7.20	1.2181
	26	7.00	1.2085
	27	6.80	1.1980
	28	6.60	1.1877
	29	6.40	1.1777
	30	6.20	1.1676
	31	6.00	1.1575
	32	5.80	1.1519
	33	5.60	1.1523
	34	5.40	1.1563
	35	5.20	1.1614
	36	5.00	1.1655
	37	4.80	1.1683
	38	4.60	1.1701
	39	4.40	1.1706
	40	4.20	1.1703
	41	4.00	1.1700
	42	3.80	1.1688
	43	3.60	1.1667
	44	3.40	1.1655
	45	3.20	1.1655
	46	3.00	1.1672
	47	2.80	1.1729
	48	2.60	1.1817
	49	2.40	1.1895
	50	2.20	1.1971
	51	2.00	1.2057
*	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 8
RAOC W (Z) AT 10000 MWD/MTU



	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	1.2488
	12	9.80	1.2565
	13	9.60	1.2619
	14	9.40	1.2649
	15	9.20	1.2679
	16	9.00	1.2666
	17	8.80	1.2617
	18	8.60	1.2613
	19	8.40	1.2678
	20	8.20	1.2760
	21	8.00	1.2874
	22	7.80	1.2852
	23	7.60	1.2916
	24	7.40	1.2949
	25	7.20	1.2951
	26	7.00	1.2923
	27	6.80	1.2868
	28	6.60	1.2785
	29	6.40	1.2681
	30	6.20	1.2570
	31	6.00	1.2444
	32	5.80	1.2337
	33	5.60	1.2292
	34	5.40	1.2290
	35	5.20	1.2329
	36	5.00	1.2353
	37	4.80	1.2354
	38	4.60	1.2336
	39	4.40	1.2296
	40	4.20	1.2236
	41	4.00	1.2156
	42	3.80	1.2057
	43	3.60	1.1944
	44	3.40	1.1816
	45	3.20	1.1695
	46	3.00	1.1829
	47	2.80	1.1900
	48	2.60	1.1954
	49	2.40	1.2050
	50	2.20	1.2159
	51	2.00	1.2268
*	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

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.

FIGURE 9
RAOC W (Z) AT 18000 MWD/MTU

SNC – Nuclear Licensing

NRC Correspondence Routing and Information Sheet

			Applicable to: 10 CFR 50 Docket No.					10 CFR 72 No.	
NRC Due Date:	4/27/04	Hatch	U1-321		U2-366			72-36	
Author:	R. J. Florian	Farley	U1-348		U2-364		LC #	72-42	
Lic Letter No.	NL-04-0623	Vogtle	U1-424	X	U2-425	X		N/A	

Subject of Letter: Plant Vogtle Unit 2 Cycle 11 Core Operating Limits Report

Response to: NRC

Review / Concurrence

	Person	Initials/Date			Person	Initials/Date
1	Site Mgmt. Concurrence	N/A		3	SRB Sub. Concurrence	N/A
2	PRB Concurrence	N/A		4	Other	N/A

Nuclear Licensing / Management Routing

	Person	Initials/Date			Person	Initials/Date
1	Preparer	RJF 4/13/04		7	~~General Manager – Hatch~~	N/A
2	LE – Review	RJF 4/13/04		7	~~General Manager – Farley~~	N/A
3	NL AA Spelling/Format	daj 4-12-04		7	General Manager – Vogtle	
~~4~~	~~NL Manager – Hatch~~	N/A		8	~~Vice President – Hatch~~	N/A
~~4~~	~~NL Manager – Farley~~	N/A		8	~~Vice President – Farley~~	N/A
4	NL Manager – Vogtle	MJF 4-13-04		8	Vice President – Vogtle	JTL 4/28/04
~~5~~	~~Safety Analysis~~ (if applicable)	N/A		9	Final Review – Preparer	RJF 4/28/04
6	NL Manager	BM 4/14/04		10	NL AA – Date & Distribution	daj 4-28-04

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- ☐ **OPC (HNP & VNP only)** – Laurence Bergen, Ken Rosanski and Bob Massey.
- ☐ **All LERs** to the respective LER Book, and LERevents@inpo.org as a WORD doc.
- ☐ **NRR Project Managers**: All TS Changes, RAI Responses and other items that require a response from the NRC. Farley: **Sean Peters (sep@nrc.gov)** Hatch & Vogtle: **Christopher Gratton (cxg1@nrc.gov)**

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