Luminant

Rafael Flores
Senior Vice President
& Chief Nuclear Officer
rafael.flores@Luminant.com

Luminant Power
P O Box 1002
6322 North FM 56
Glen Rose, TX 76043

T 254 897 5550
C 817 559 0403
F 254 897 6652

CP-201000611
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U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

SUBJECT: COMANCHE PEAK NUCLEAR POWER PLANT
DOCKET NO. 50-445
CORE OPERATING LIMITS REPORT

Dear Sir or Madam:

Enclosed is the Core Operating Limits Report for Comanche Peak Nuclear Power Plant (CPNPP) Unit 1, Cycle 15. This report is prepared and submitted pursuant to Technical Specification 5.6.5.

This communication contains no new licensing basis commitments regarding CPNPP Units 1 and 2. Should you have any questions, please contact Mr. J. D. Seawright at (254) 897-0140.

Sincerely,

Luminant Generation Company LLC

Rafael Flores

By: Fred W. Madden
Fred W. Madden
Director, Oversight & Regulatory Affairs

Enclosure

c - E. E. Collins, Region IV
B. K. Singal, NRR
Resident Inspectors, Comanche Peak

A001
NRR

ERX-10-002, Rev. 0

CPNPP UNIT 1 CYCLE 15

CORE OPERATING LIMITS REPORT

March 2010

Prepared: ______________________ Date: 3-24-2010
J. M. Ralston
Principal Engineer, Westinghouse Electric Co.

Reviewed: ______________________ Date: 3-24-2010
D. E. Brozak
Principal Engineer, Westinghouse Electric Co.

Reviewed: ______________________ Date: 3-24-2010
K. N. Roland
Principal Engineer, Westinghouse Electric Co.

Approved: ______________________ Date: 03-25-10
W. J. Boatwright, Manager
Westinghouse Engineering Services - Texas

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1.0 CORE OPERATING LIMITS REPORT

This Core Operating Limits Report (COLR) for CPNPP UNIT 1 CYCLE 15 has been prepared in accordance with the requirements of Technical Specification 5.6.5.

The Technical Specifications affected by this report are listed below:

SL 2.1	SAFETY LIMITS
LCO 3.1.1	SHUTDOWN MARGIN
LCO 3.1.3	MODERATOR TEMPERATURE COEFFICIENT
LCO 3.1.4	ROD GROUP ALIGNMENT LIMITS
LCO 3.1.5	SHUTDOWN BANK INSERTION LIMITS
LCO 3.1.6	CONTROL BANK INSERTION LIMITS
LCO 3.1.8	PHYSICS TESTS EXCEPTIONS - MODE 2
LCO 3.2.1.2	HEAT FLUX HOT CHANNEL FACTOR
LCO 3.2.2	NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR
LCO 3.2.3.2	AXIAL FLUX DIFFERENCE
LCO 3.3.1	REACTOR TRIP SYSTEM INSTRUMENTATION
LCO 3.4.1	RCS PRESSURE, TEMPERATURE, AND FLOW DEPARTURE FROM NUCLEATE BOILING LIMITS
LCO 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 the NRC-approved methodologies specified in Technical Specification 5.6.5b, Items 1, 2, 14, 16, and 21 through 29. These limits have been determined such that all applicable limits of the safety analysis are met.

2.1 SAFETY LIMITS (SL 2.1)

2.1.1 In MODES 1 and 2, the combination of thermal power, reactor coolant system highest loop average temperature, and pressurizer pressure shall not exceed the safety limits specified in Figure 1.

2.2 SHUTDOWN MARGIN (SDM) (LCO 3.1.1)

2.2.1 The SDM shall be greater than or equal to 1.3% $\Delta k/k$ in MODE 2 with $K_{eff} < 1.0$, and in MODES 3, 4, and 5.

2.3 MODERATOR TEMPERATURE COEFFICIENT (MTC) (LCO 3.1.3)

2.3.1 The MTC upper and lower limits, respectively, are:

The BOL/ARO/HZP-MTC shall be less positive than +5 pcm/°F.

The EOL/ARO/RTP-MTC shall be less negative than -40 pcm/°F.

2.3.2 SR 3.1.3.2

The MTC surveillance limit is:

The 300 ppm/ARO/RTP-MTC shall be less negative than or equal to -31 pcm/°F.

The 60 ppm/ARO/RTP-MTC shall be less negative than or equal to -38 pcm/°F.

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 ROD GROUP ALIGNMENT LIMITS (LCO 3.1.4)

2.4.1 The SDM shall be greater than or equal to 1.3% $\Delta k/k$ in MODES 1 and 2.

2.5 SHUTDOWN BANK INSERTION LIMITS (LCO 3.1.5)

2.5.1 The shutdown rods shall be fully withdrawn. Fully withdrawn shall be the condition where shutdown rods are at a position within the interval of 218 and 231 steps withdrawn, inclusive.

2.6 CONTROL BANK INSERTION LIMITS (LCO 3.1.6)

2.6.1 The control banks shall be limited in physical insertion as shown in Figure 2.

2.6.2 The control banks shall always be withdrawn and inserted in the prescribed sequence. For withdrawal, the sequence is control bank A, control bank B, control bank C, and control bank D. The insertion sequence is the reverse of the withdrawal sequence.

2.6.3 A 115 step Tip-to-Tip relationship between each sequential control bank shall be maintained.

2.7 PHYSICS TESTS EXCEPTIONS - MODE 2 (LCO 3.1.8)

2.7.1 The SDM shall be greater than or equal to 1.3% Δk/k in MODE 2 during PHYSICS TESTS.

2.8 HEAT FLUX HOT CHANNEL FACTOR ($F_Q(Z)$) (LCO 3.2.1.2)

2.8.1 $$F_Q(Z) \leq \frac{F_Q^{RTP}}{P} [K(Z)] \text{ for } P > 0.5$$

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

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

2.8.2 $F_Q^{RTP} = 2.50$

2.8.3 K(Z) is provided in Figure 3.

2.8.4 Elevation and burnup dependent W(Z) values are provided in Figures 4, 5, 6, 7 and 8. For W(Z) data at a desired burnup not listed in the figures, but less than the maximum listed burnup, values at 3 or more burnup steps should be used to interpolate the W(Z) data to the desired burnup with a polynomial type fit that uses the nearest three burnup steps. For W(Z) data at a desired burnup outside of the listed burnup steps, a linear extrapolation of the W(Z) data for the nearest two burnup steps can be used.

2.8.5 SR 3.2.1.2.2

If the two most recent $F_Q(Z)$ evaluations show an increase in the expression

maximum over Z $[\ F_Q^C(Z)\ /\ K(Z)\ ]$,

the burnup dependent values in Table 1 shall be used instead of a constant 2% to increase $F_Q^W(Z)$ per Surveillance Requirement 3.2.1.2.2.a. A constant factor of 2% shall be used for all cycle burnups that are outside the range of Table 1.

2.9 NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR ($F^N_{\Delta H}$) (LCO 3.2.2)

2.9.1 $F^N_{\Delta H} \leq F^{RTP}_{\Delta H} [1 + PF_{\Delta H} (1-P)]$

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

2.9.2 $F^{RTP}_{\Delta H} = 1.60$

2.9.3 $PF_{\Delta H} = 0.3$

2.10 AXIAL FLUX DIFFERENCE (AFD) (LCO 3.2.3.2)

2.10.1 The AFD Acceptable Operation Limits are provided in Figure 9.

2.11 REACTOR TRIP SYSTEM (RTS) INSTRUMENTATION (LCO 3.3.1)

2.11.1 The numerical values pertaining to the Overtemperature N-16 reactor trip setpoint are listed below;

K_1 = 1.15

K_2 = 0.0139 /°F

K_3 = 0.00071 /psig

T_c° = indicated loop specific T_c at Rated Thermal Power, °F

P^1 ≥ 2235 psig

τ_1 ≥ 10 sec

τ_2 ≤ 3 sec

$f_1(\Delta q) = -2.78 \cdot \{(q_t-q_b) + 18\%\}$ when $(q_t-q_b) \leq -18\%$ RTP

$= 0\%$ when -18% RTP $< (q_t-q_b) < +10.0\%$ RTP

$= 2.34 \cdot \{(q_t-q_b) - 10.0\%\}$ when $(q_t-q_b) \geq +10.0\%$ RTP

2.12 RCS PRESSURE, TEMPERATURE, AND FLOW DEPARTURE FROM NUCLEATE BOILING (DNB) LIMITS (LCO 3.4.1)

2.12.1 RCS DNB parameters for pressurizer pressure, RCS average temperature, and RCS total flow rate shall be within the surveillance limits specified below:

2.12.2 SR 3.4.1.1

Pressurizer pressure	≥	2220 psig (4 channels)
	≥	2222 psig (3 channels)

The pressurizer pressure limits correspond to the analytical limit of 2205 psig used in the safety analysis with allowance for measurement uncertainty. These uncertainties are based on the use of control board indications and the number of available channels.

2.12.3 SR 3.4.1.2

RCS average temperature	≤	588 °F (4 channels)
	≤	588 °F (3 channels)

The RCS average temperature limits correspond to the analytical limit of 591.9 °F which is bounded by that used in the safety analysis with allowance for measurement uncertainty. These uncertainties are based on the use of control board indications and the number of available channels.

2.12.4 SR 3.4.1.3

The RCS total flow rate shall be ≥ 403,700 gpm.

2.12.5 SR 3.4.1.4

The RCS total flow rate based on precision heat balance shall be ≥ 403,700 gpm.

The required RCS flow, based on an elbow tap differential pressure instrument measurement prior to MODE 1 after the refueling outage, shall be greater than 327,000 gpm.

2.13 <u>BORON CONCENTRATION</u> (LCO 3.9.1)

2.13.1 The required refueling boron concentration is ≥ 1842 ppm.

3.0 <u>REFERENCES</u>

Technical Specification 5.6.5.

Table 1
$F_Q(Z)$ MARGIN DECREASES IN EXCESS OF 2% PER 31 EFPD

Cycle Burnup (MWD/MTU)	Maximum Decrease In $F_Q(Z)$ MARGIN (Percent)
4448	2.00
4663	2.05
4877	2.01
5092	2.00
5307	2.00
5522	2.01
5737	2.08
5952	2.17
6167	2.26
6382	2.25
6597	2.08
6811	2.00
7026	2.19
7241	2.51
7456	2.25
7671	2.00

Note: All Cycle burnups outside the range of the table shall use a constant 2% decrease in $F_Q(Z)$ margin for compliance with the 3.2.1.2.2.a Surveillance Requirements. Linear interpolation is acceptable to determine the $F_Q(Z)$ margin decrease for cycle burnups which fall between the specified burnups.

Figure 1
Reactor Core Safety Limits

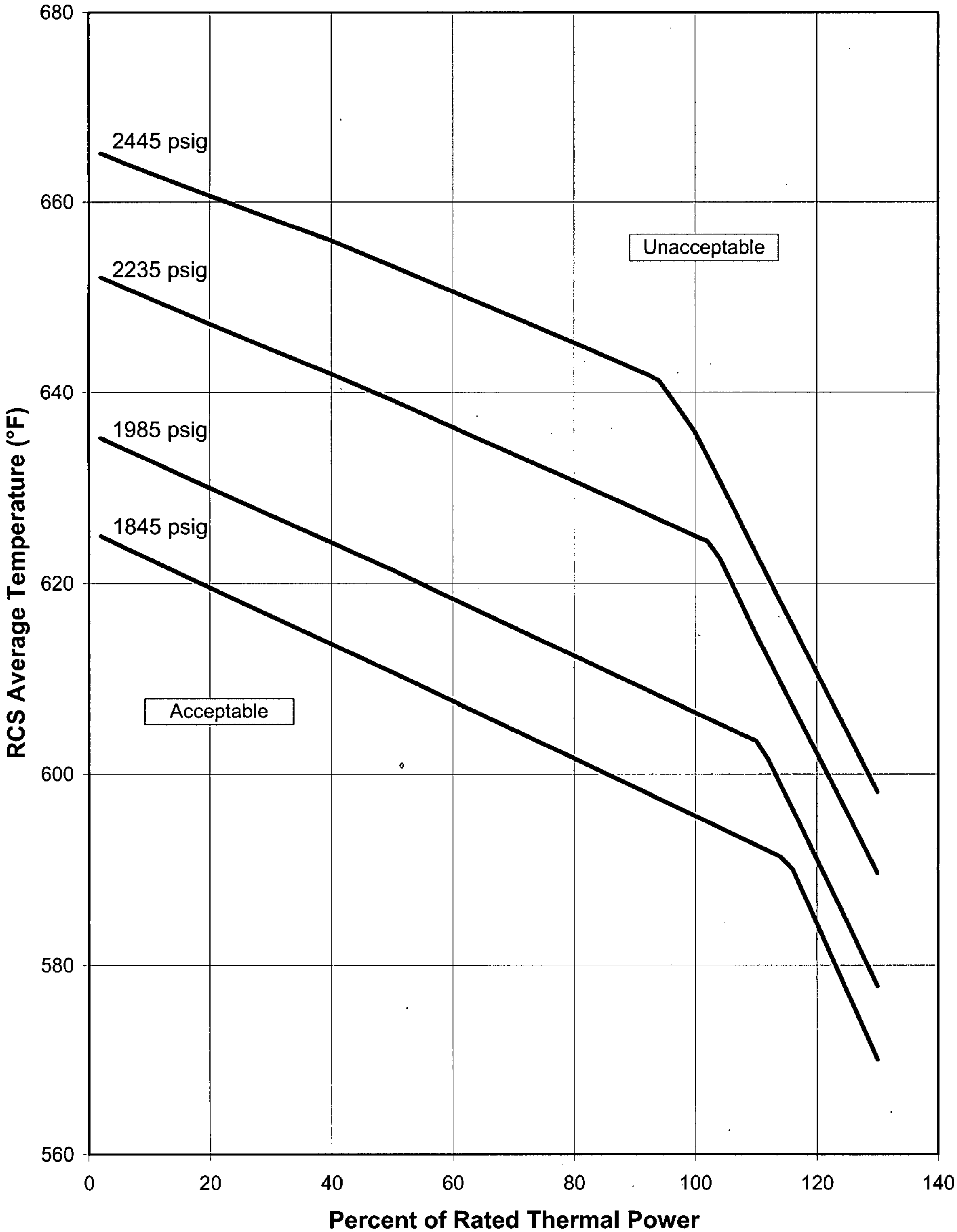
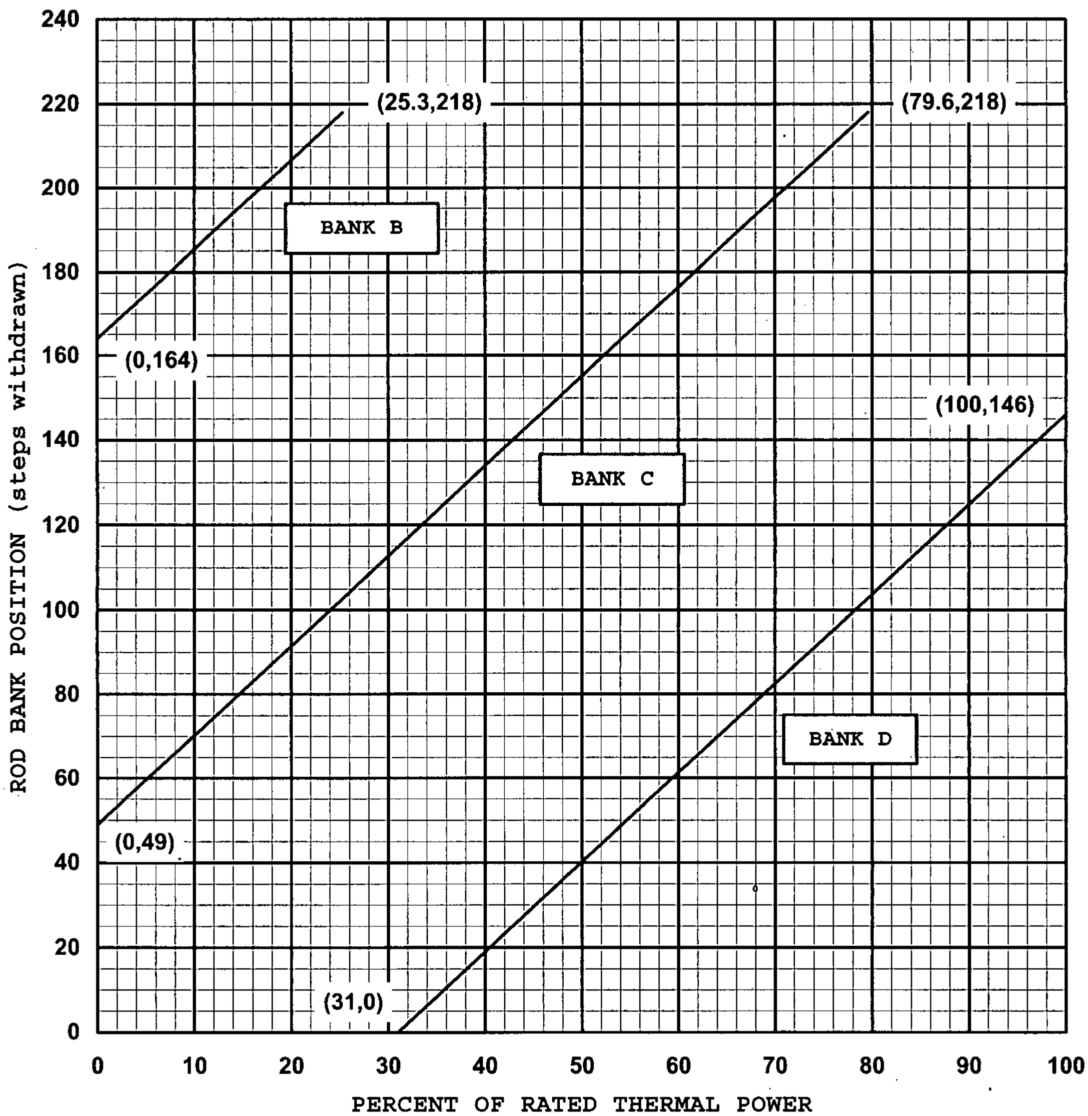


FIGURE 2

ROD BANK INSERTION LIMITS VERSUS THERMAL POWER



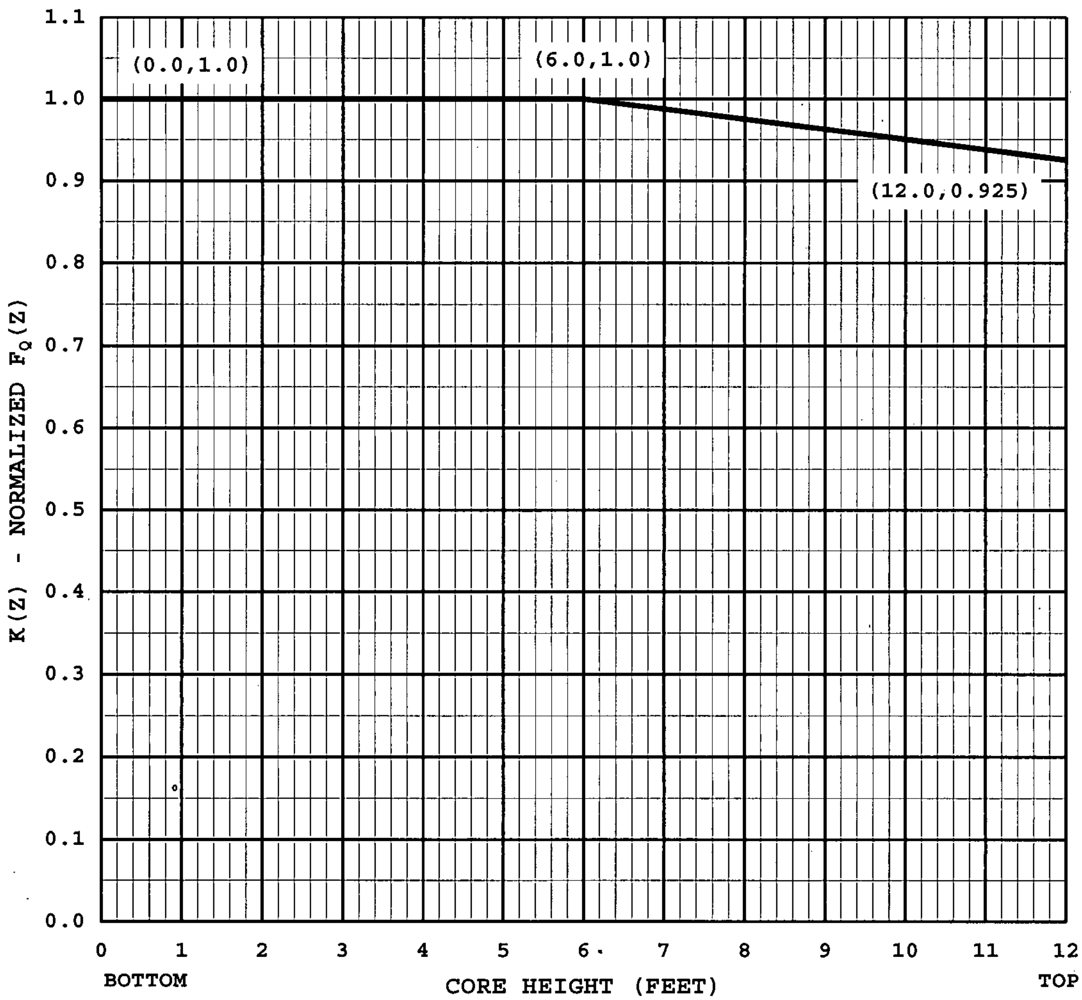
NOTES:

1. Fully withdrawn shall be the condition where control rods are at a position within the interval of 218 and 231 steps withdrawn, inclusive.

2. Control Bank A shall be fully withdrawn.

FIGURE 3

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

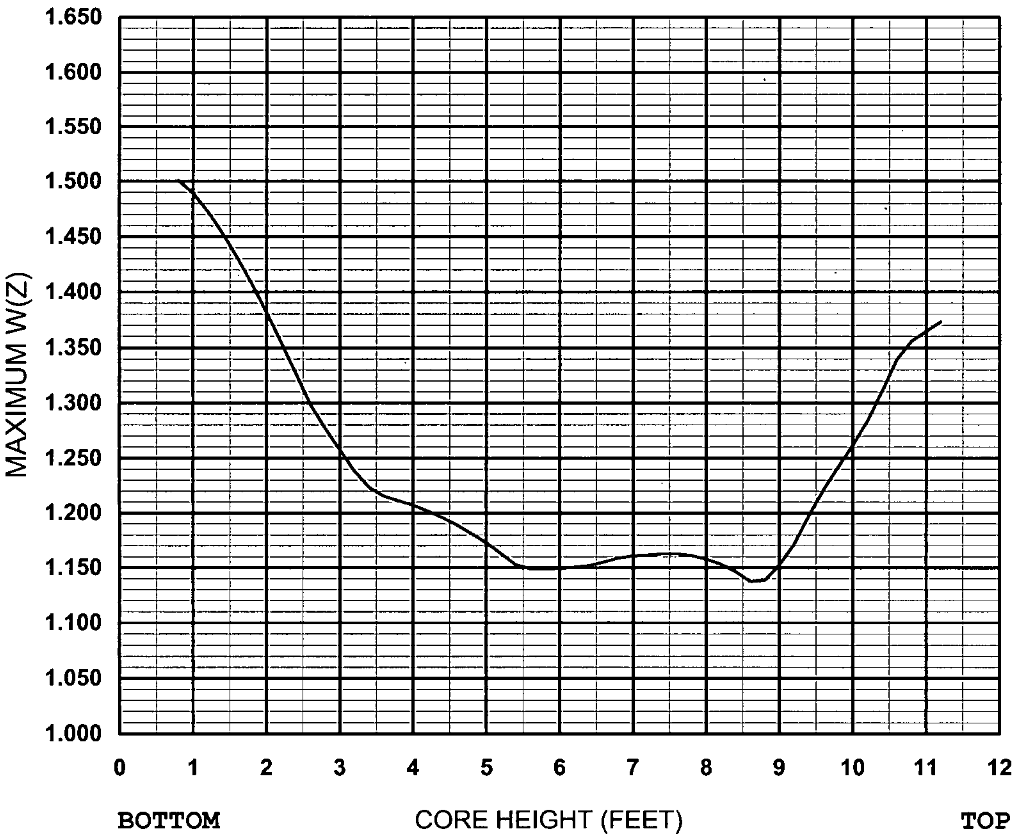


Axial Node	K(Z)	Axial Node	K(Z)	Axial Node	K(Z)	Axial Node	K(Z)
61	0.9250	53	0.9450	45	0.9650	37	0.9850
60	0.9275	52	0.9475	44	0.9675	36	0.9875
59	0.9300	51	0.9500	43	0.9700	35	0.9900
58	0.9325	50	0.9525	42	0.9725	34	0.9925
57	0.9350	49	0.9550	41	0.9750	33	0.9950
56	0.9375	48	0.9575	40	0.9775	32	0.9975
55	0.9400	47	0.9600	39	0.9800	1 - 31	1.0000
54	0.9425	46	0.9625	38	0.9825		

Core Height (ft) = (Node - 1) * 0.2

FIGURE 4

W(Z) AS A FUNCTION OF CORE HEIGHT
(150 MWD/MTU)

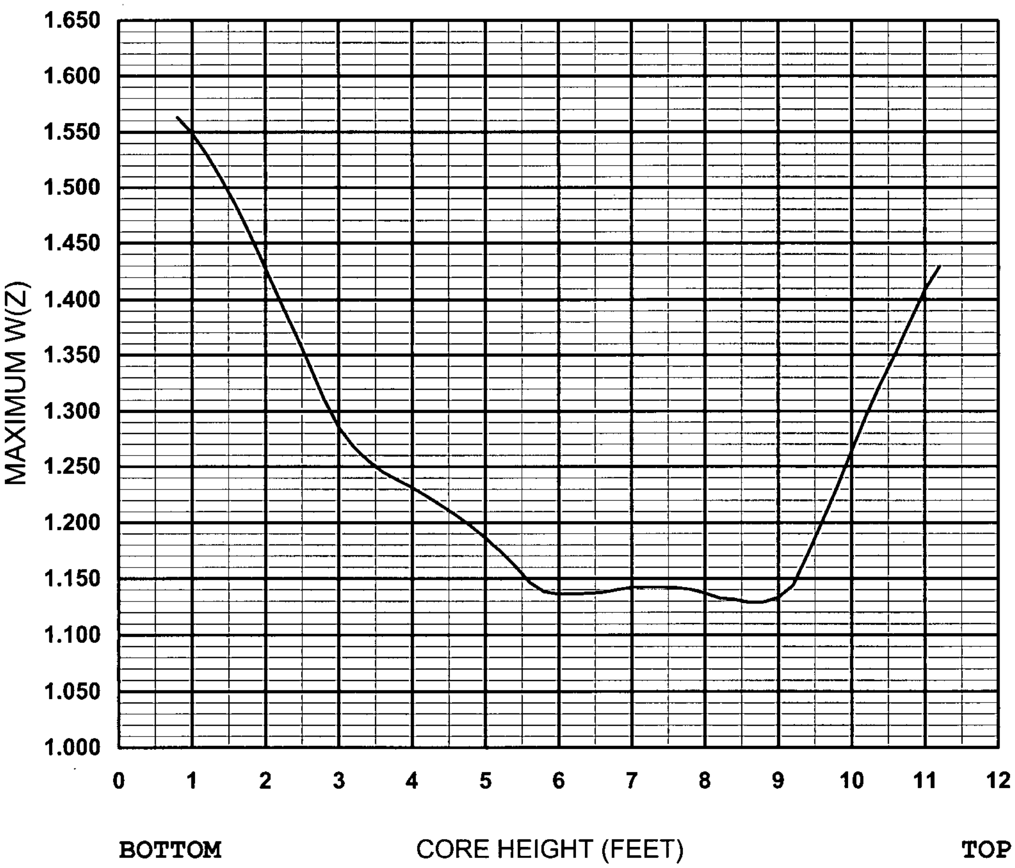


Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)
58 - 61	---	44	1.1374	30	1.1489	16	1.2576
57	1.3730	43	1.1466	29	1.1490	15	1.2768
56	1.3645	42	1.1529	28	1.1525	14	1.2983
55	1.3557	41	1.1577	27	1.1628	13	1.3268
54	1.3393	40	1.1610	26	1.1727	12	1.3546
53	1.3106	39	1.1626	25	1.1811	11	1.3814
52	1.2833	38	1.1626	24	1.1889	10	1.4072
51	1.2616	37	1.1615	23	1.1957	9	1.4312
50	1.2418	36	1.1608	22	1.2017	8	1.4532
49	1.2210	35	1.1587	21	1.2070	7	1.4729
48	1.1972	34	1.1550	20	1.2113	6	1.4893
47	1.1713	33	1.1517	19	1.2156	5	1.5009
46	1.1523	32	1.1503	18	1.2234	1 - 4	---
45	1.1384	31	1.1493	17	1.2383		

Core Height (ft) = (Node - 1) * 0.2

FIGURE 5

W(Z) AS A FUNCTION OF CORE HEIGHT
(2,000 MWD/MTU)



Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)
58 - 61	---	44	1.1291	30	1.1384	16	1.2856
57	1.4296	43	1.1317	29	1.1469	15	1.3110
56	1.4092	42	1.1328	28	1.1617	14	1.3412
55	1.3808	41	1.1370	27	1.1745	13	1.3705
54	1.3514	40	1.1404	26	1.1862	12	1.3993
53	1.3256	39	1.1420	25	1.1970	11	1.4282
52	1.2965	38	1.1424	24	1.2067	10	1.4565
51	1.2639	37	1.1425	23	1.2154	9	1.4833
50	1.2314	36	1.1423	22	1.2237	8	1.5079
49	1.2011	35	1.1401	21	1.2315	7	1.5301
48	1.1713	34	1.1377	20	1.2381	6	1.5490
47	1.1439	33	1.1370	19	1.2451	5	1.5630
46	1.1332	32	1.1363	18	1.2553	1 - 4	---
45	1.1294	31	1.1363	17	1.2679		

Core Height (ft) = (Node - 1) * 0.2

FIGURE 6

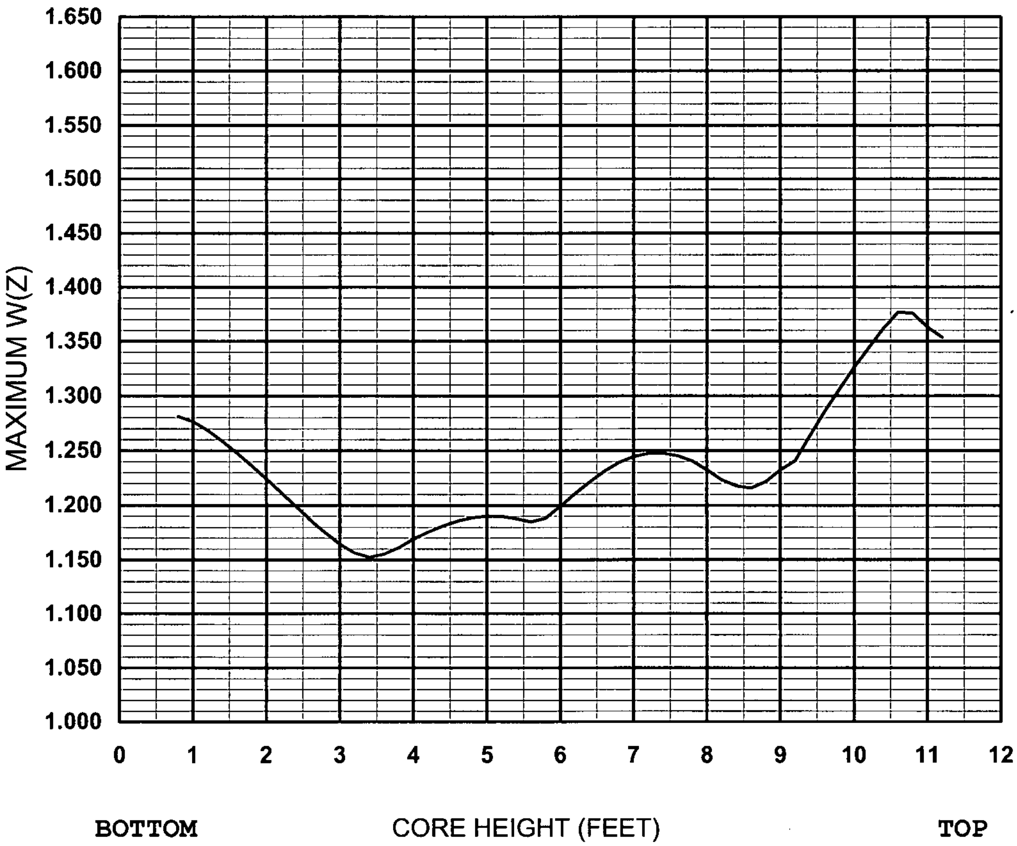
W(Z) AS A FUNCTION OF CORE HEIGHT
(8,000 MWD/MTU)

Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)
58 - 61	---	44	1.2550	30	1.1222	16	1.1895
57	1.4554	43	1.2538	29	1.1221	15	1.2066
56	1.4356	42	1.2464	28	1.1267	14	1.2284
55	1.4192	41	1.2366	27	1.1326	13	1.2513
54	1.4029	40	1.2242	26	1.1376	12	1.2742
53	1.3842	39	1.2120	25	1.1420	11	1.2967
52	1.3643	38	1.2006	24	1.1465	10	1.3183
51	1.3415	37	1.1871	23	1.1505	9	1.3386
50	1.3168	36	1.1805	22	1.1537	8	1.3573
49	1.2917	35	1.1741	21	1.1578	7	1.3740
48	1.2654	34	1.1642	20	1.1631	6	1.3881
47	1.2440	33	1.1525	19	1.1683	5	1.3979
46	1.2492	32	1.1389	18	1.1730	1 - 4	---
45	1.2550	31	1.1281	17	1.1788		

Core Height (ft) = (Node - 1) * 0.2

FIGURE 7

W(Z) AS A FUNCTION OF CORE HEIGHT
(16,000 MWD/MTU)

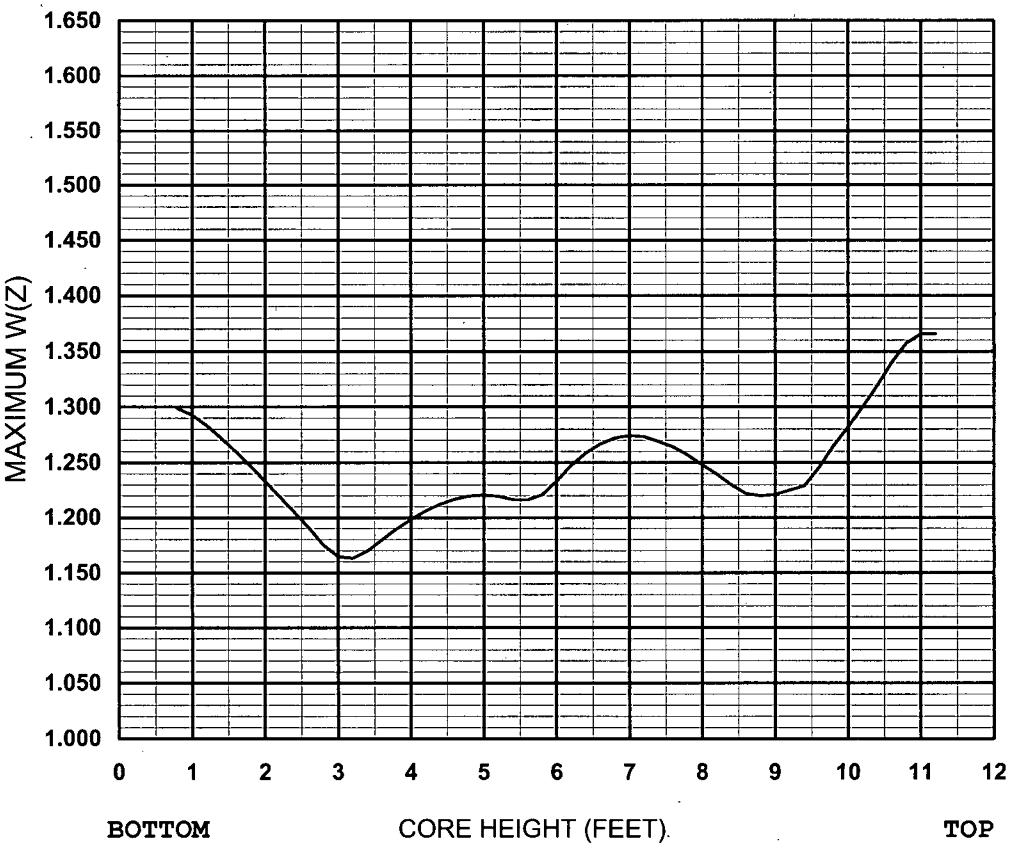


Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)
58 - 61	---	44	1.2157	30	1.1881	16	1.1645
57	1.3536	43	1.2177	29	1.1849	15	1.1749
56	1.3629	42	1.2232	28	1.1877	14	1.1865
55	1.3757	41	1.2325	27	1.1898	13	1.1992
54	1.3769	40	1.2405	26	1.1900	12	1.2119
53	1.3618	39	1.2453	25	1.1886	11	1.2243
52	1.3441	38	1.2477	24	1.1856	10	1.2364
51	1.3260	37	1.2475	23	1.1812	9	1.2478
50	1.3060	36	1.2446	22	1.1755	8	1.2586
49	1.2857	35	1.2393	21	1.1690	7	1.2685
48	1.2636	34	1.2313	20	1.1613	6	1.2766
47	1.2408	33	1.2213	19	1.1551	5	1.2813
46	1.2325	32	1.2108	18	1.1522	1 - 4	---
45	1.2216	31	1.1991	17	1.1562		

Core Height (ft) = (Node - 1) * 0.2

FIGURE 8

W(Z) AS A FUNCTION OF CORE HEIGHT
(20,000 MWD/MTU)



Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)
58 - 61	---	44	1.2221	30	1.2209	16	1.1645
57	1.3657	43	1.2300	29	1.2163	15	1.1750
56	1.3655	42	1.2396	28	1.2165	14	1.1904
55	1.3574	41	1.2481	27	1.2195	13	1.2049
54	1.3402	40	1.2568	26	1.2207	12	1.2192
53	1.3192	39	1.2641	25	1.2198	11	1.2333
52	1.2999	38	1.2689	24	1.2169	10	1.2469
51	1.2819	37	1.2733	23	1.2123	9	1.2598
50	1.2651	36	1.2743	22	1.2060	8	1.2720
49	1.2455	35	1.2721	21	1.1983	7	1.2833
48	1.2291	34	1.2668	20	1.1895	6	1.2927
47	1.2252	33	1.2586	19	1.1797	5	1.2985
46	1.2212	32	1.2476	18	1.1696	1 - 4	---
45	1.2200	31	1.2332	17	1.1632		

Core Height (ft) = (Node - 1) * 0.2

FIGURE 9

AXIAL FLUX DIFFERENCE LIMITS AS A FUNCTION OF RATED THERMAL POWER