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

SUBJECT: COMANCHE PEAK NUCLEAR POWER PLANT
DOCKET NO. 50-446 (UNIT 2)
CORE OPERATING LIMITS REPORT

Dear Sir or Madam:

Enclosed is Revision 0 of the Core Operating Limits Report for Comanche Peak Nuclear Power Plant (CPNPP) Unit 2, 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 Unit 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
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Enclosure – Unit 2 Cycle 15 Core Operating Limits Report, Revision 0

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A001
NRR

ERX-14-001, Rev. 0

CPNPP UNIT 2 CYCLE 15

CORE OPERATING LIMITS REPORT

March 2014

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1.0 CORE OPERATING LIMITS REPORT

This Core Operating Limits Report (COLR) for CPNPP UNIT 2 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	HEAT FLUX HOT CHANNEL FACTOR
LCO 3.2.2	NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR
LCO 3.2.3	AXIAL FLUX DIFFERENCE
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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 through 4 and 7 through 15. 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% Δk/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)

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

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

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

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.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 for all Fuel Assembly Regions

2.9.3 $PF_{\Delta H}$ = 0.3

2.10 AXIAL FLUX DIFFERENCE (AFD) (LCO 3.2.3)

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 ≤ 592 °F (4 channels)

≤ 591 °F (3 channels)

The RCS average temperature limits correspond to the analytical limit of 595.2 °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 ≥ 408,000 gpm.

2.12.5 SR 3.4.1.4

The RCS total flow rate based on precision heat balance shall be ≥ 408,000 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 BORON CONCENTRATION (LCO 3.9.1)

2.13.1 The required refueling boron concentration is ≥ 1950 ppm.

3.0 REFERENCES

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)
0	3.80
150	3.80
365	4.15
580	4.07
794	3.75
1009	3.25
1224	2.65
1439	2.04
1653	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.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

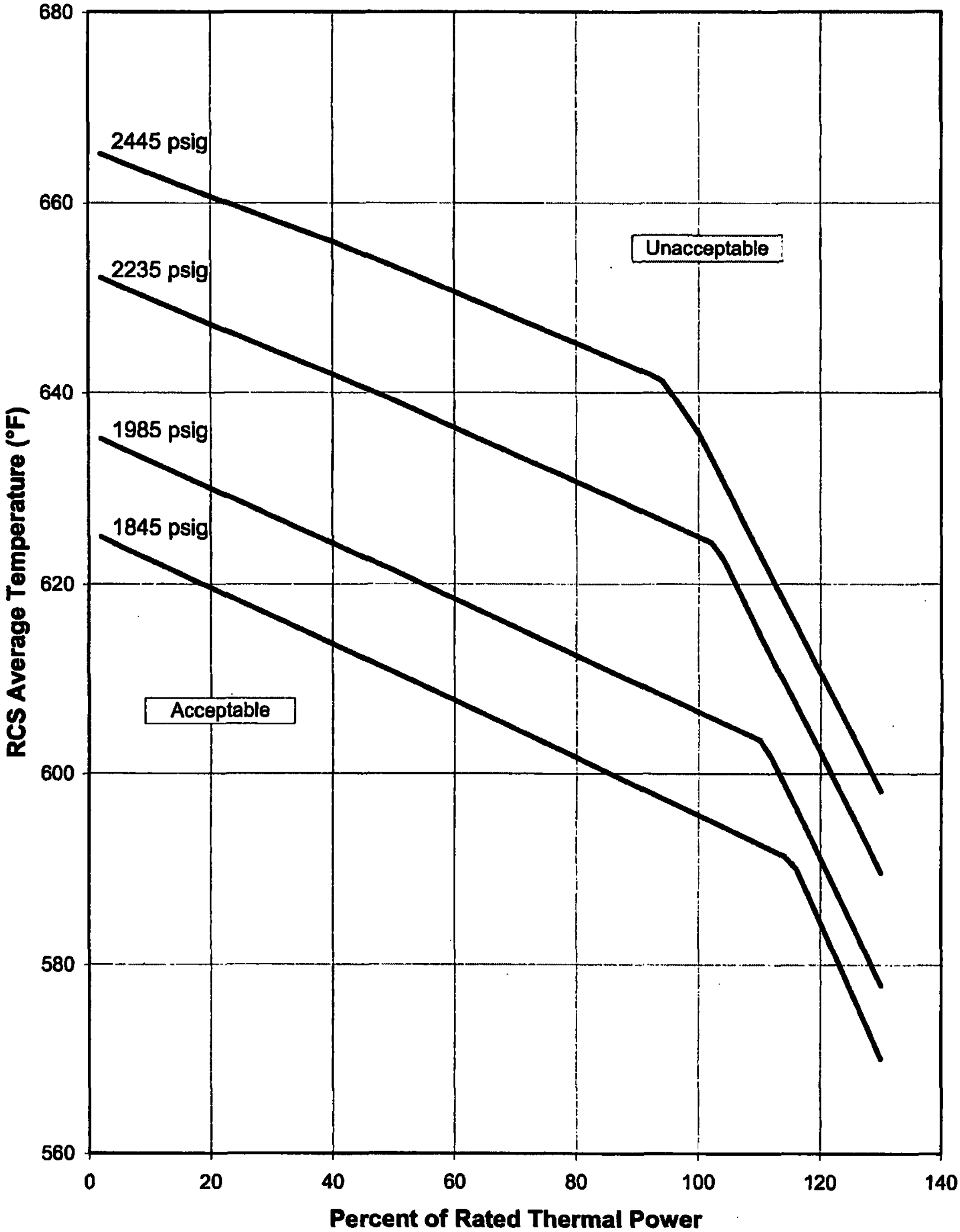
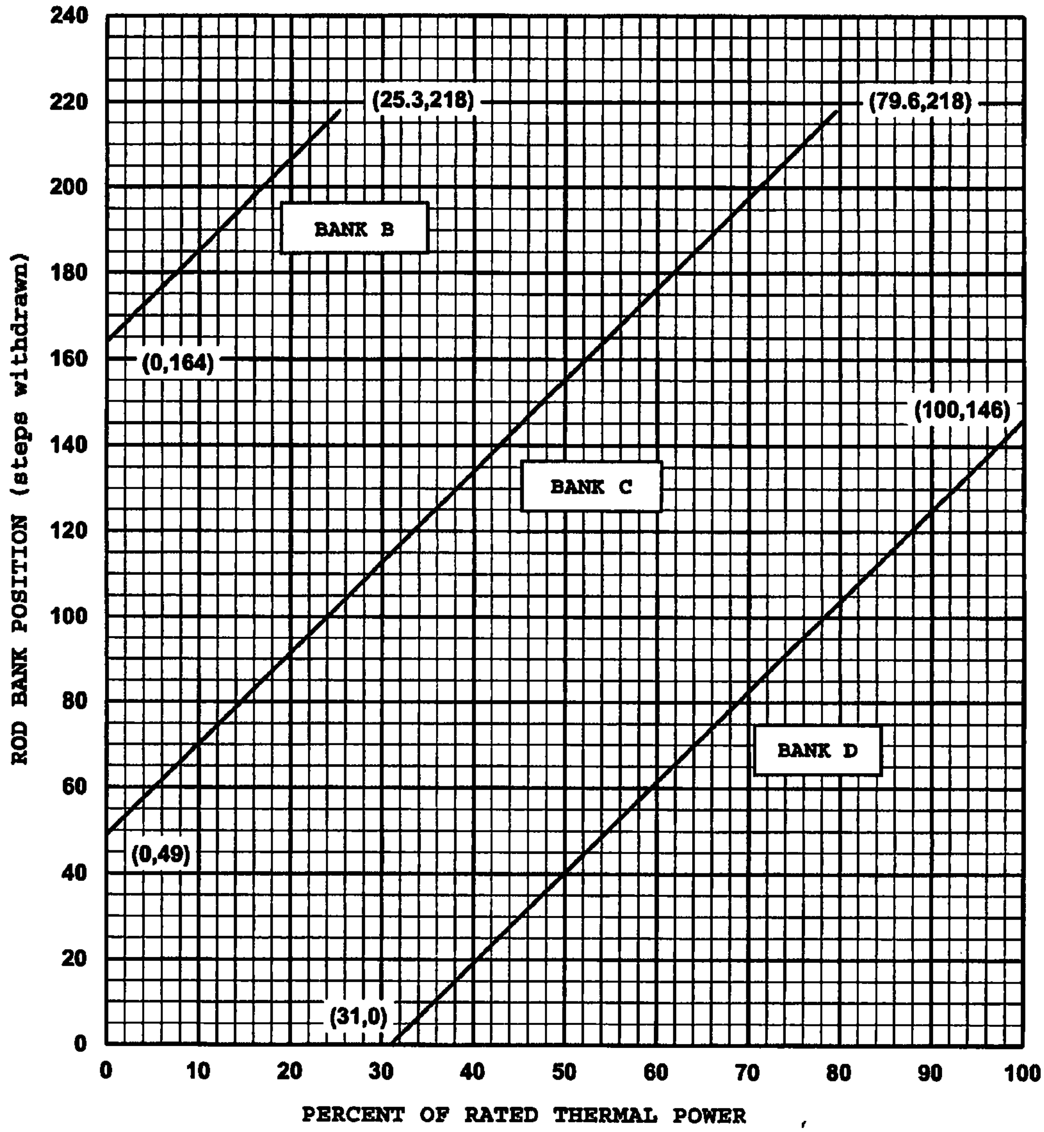


FIGURE 2

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

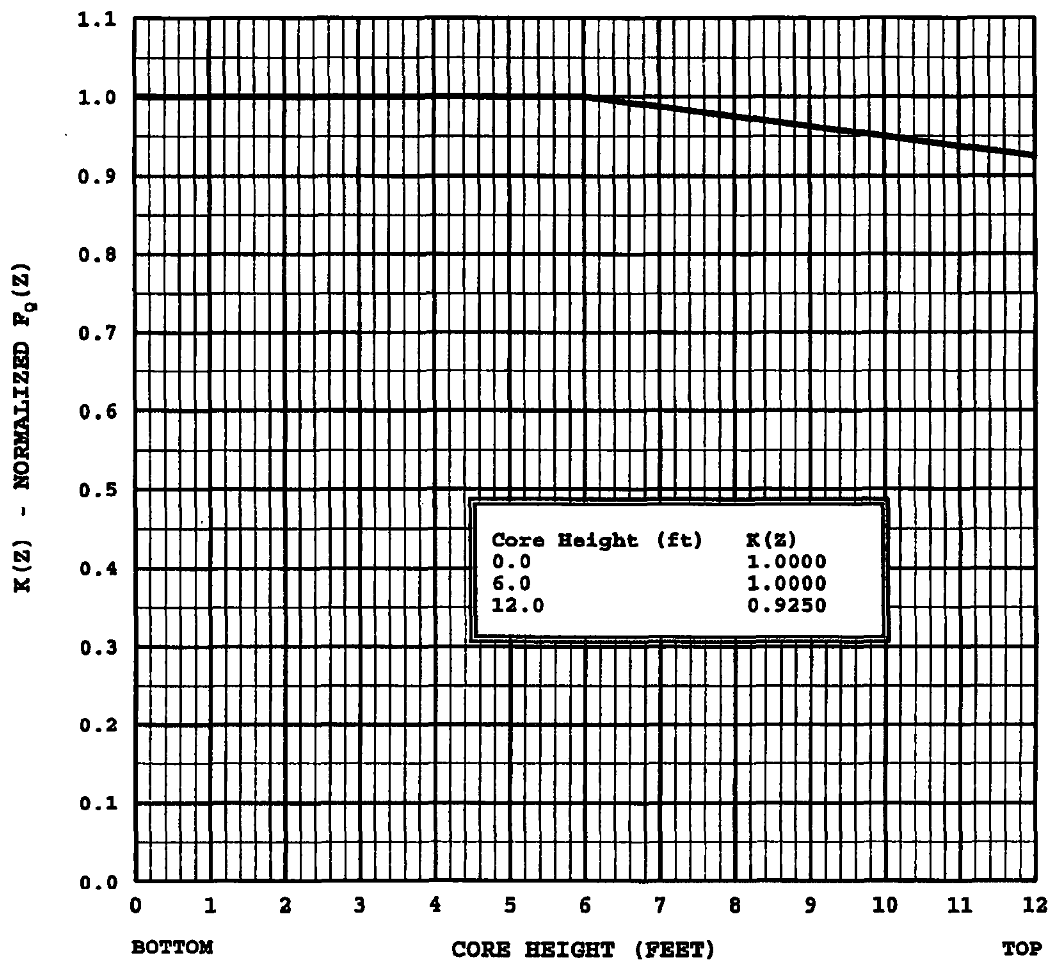
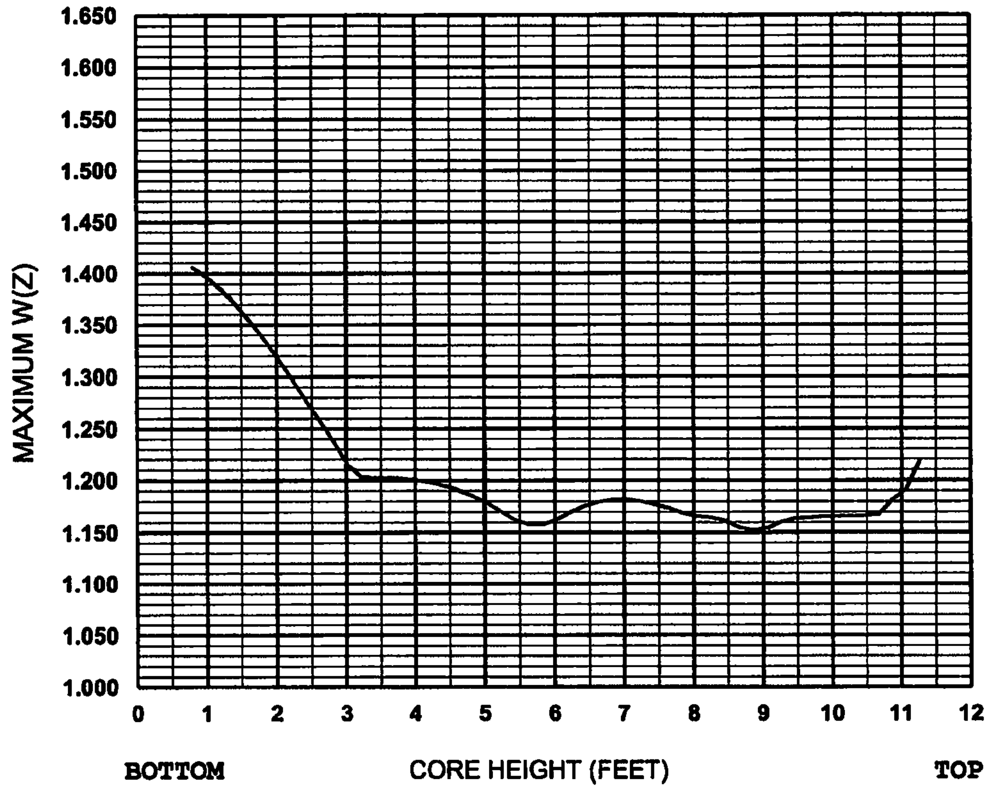


FIGURE 4

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

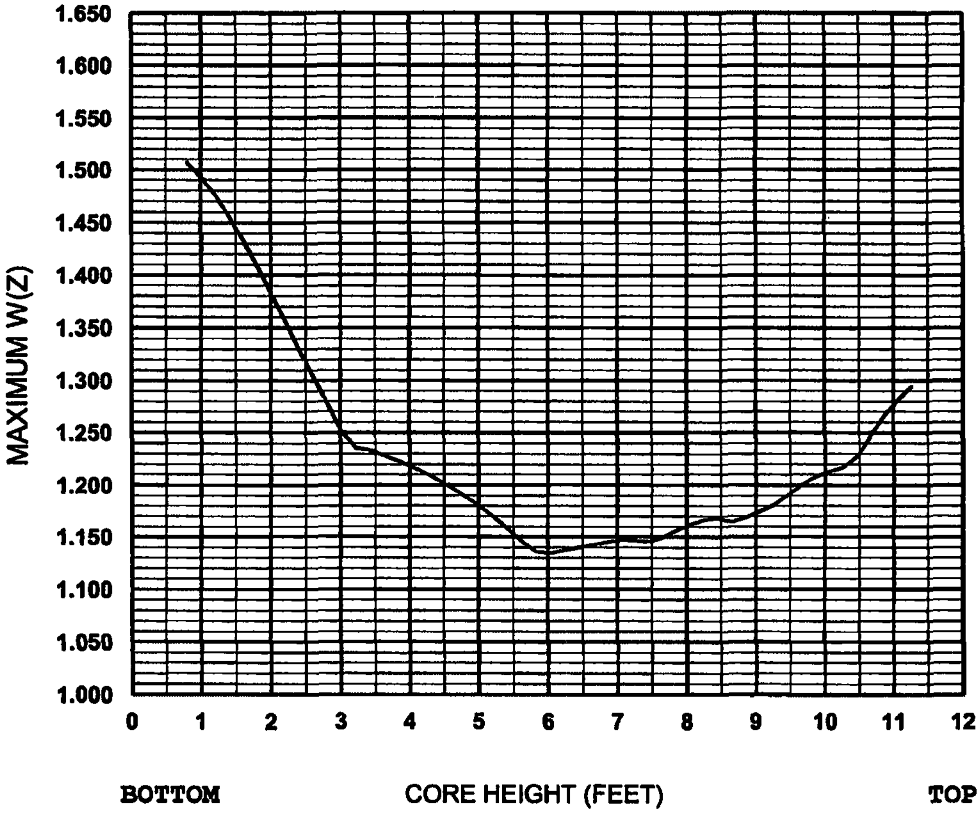


Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)
58 - 61	---	44	1.1550	30	1.1580	16	1.2147
57	1.2196	43	1.1618	29	1.1579	15	1.2377
56	1.1918	42	1.1648	28	1.1625	14	1.2578
55	1.1817	41	1.1660	27	1.1707	13	1.2783
54	1.1679	40	1.1690	26	1.1787	12	1.2984
53	1.1665	39	1.1734	25	1.1851	11	1.3179
52	1.1661	38	1.1770	24	1.1905	10	1.3367
51	1.1661	37	1.1801	23	1.1948	9	1.3545
50	1.1659	36	1.1820	22	1.1981	8	1.3708
49	1.1646	35	1.1820	21	1.2005	7	1.3851
48	1.1641	34	1.1799	20	1.2019	6	1.3964
47	1.1605	33	1.1760	19	1.2025	5	1.4062
46	1.1544	32	1.1703	18	1.2025	1 - 4	---
45	1.1524	31	1.1632	17	1.2033		

Core Height (ft) = (Node - 1) * 0.2013133

FIGURE 5

W(Z) AS A FUNCTION OF CORE HEIGHT
(3,000 MWD/MTU)

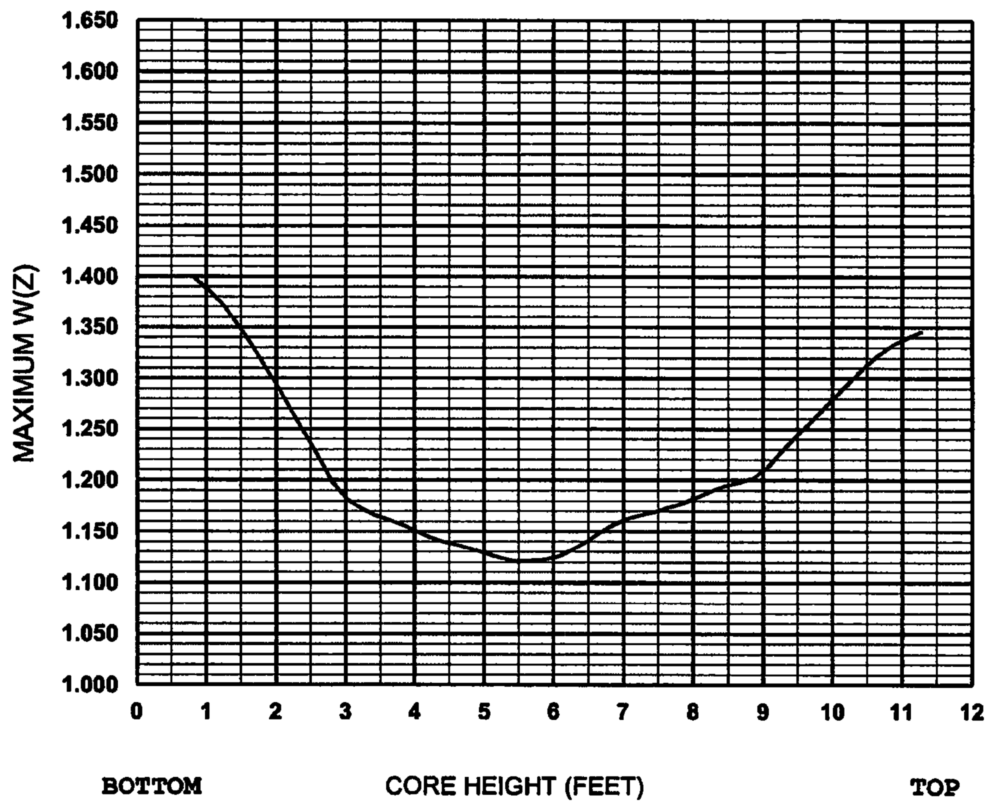


Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)
58 - 61	---	44	1.1648	30	1.1356	16	1.2508
57	1.2944	43	1.1682	29	1.1446	15	1.2770
56	1.2811	42	1.1668	28	1.1570	14	1.3029
55	1.2660	41	1.1623	27	1.1685	13	1.3292
54	1.2473	40	1.1563	26	1.1787	12	1.3552
53	1.2276	39	1.1495	25	1.1879	11	1.3814
52	1.2170	38	1.1460	24	1.1962	10	1.4077
51	1.2129	37	1.1467	23	1.2042	9	1.4329
50	1.2082	36	1.1470	22	1.2116	8	1.4560
49	1.2000	35	1.1450	21	1.2180	7	1.4764
48	1.1901	34	1.1422	20	1.2234	6	1.4927
47	1.1808	33	1.1399	19	1.2284	5	1.5071
46	1.1748	32	1.1373	18	1.2333	1 - 4	---
45	1.1691	31	1.1343	17	1.2355		

Core Height (ft) = (Node - 1) * 0.2013133

FIGURE 6

W(Z) AS A FUNCTION OF CORE HEIGHT
(6,000 MWD/MTU)

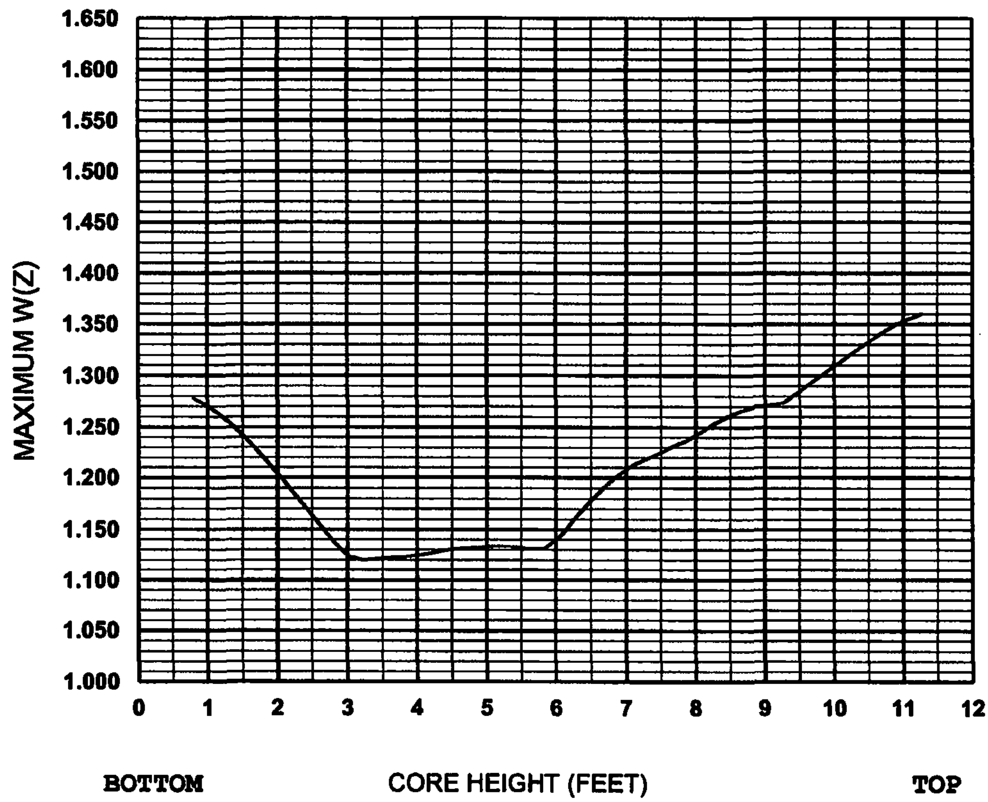


Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)
58 - 61	---	44	1.1980	30	1.1223	16	1.1815
57	1.3458	43	1.1945	29	1.1217	15	1.1975
56	1.3396	42	1.1895	28	1.1211	14	1.2221
55	1.3331	41	1.1832	27	1.1242	13	1.2457
54	1.3234	40	1.1779	26	1.1285	12	1.2693
53	1.3115	39	1.1738	25	1.1325	11	1.2928
52	1.2981	38	1.1692	24	1.1364	10	1.3154
51	1.2841	37	1.1664	23	1.1395	9	1.3369
50	1.2697	36	1.1626	22	1.1441	8	1.3568
49	1.2555	35	1.1564	21	1.1502	7	1.3743
48	1.2422	34	1.1484	20	1.1564	6	1.3881
47	1.2277	33	1.1389	19	1.1615	5	1.3999
46	1.2123	32	1.1308	18	1.1660	1 - 4	---
45	1.2018	31	1.1250	17	1.1730		

Core Height (ft) = (Node - 1) * 0.2013133

FIGURE 7

W(Z) AS A FUNCTION OF CORE HEIGHT
(10,000 MWD/MTU)

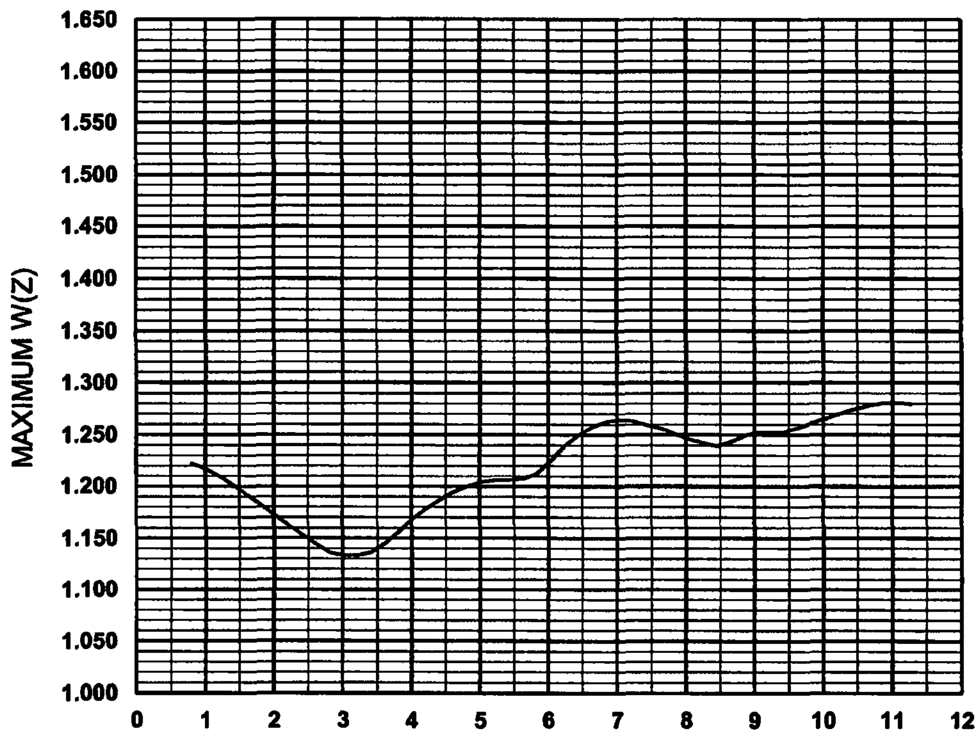


Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)
58 - 61	---	44	1.2657	30	1.1315	16	1.1235
57	1.3601	43	1.2601	29	1.1309	15	1.1368
56	1.3551	42	1.2531	28	1.1326	14	1.1535
55	1.3490	41	1.2441	27	1.1333	13	1.1701
54	1.3408	40	1.2362	26	1.1329	12	1.1867
53	1.3315	39	1.2306	25	1.1322	11	1.2031
52	1.3219	38	1.2232	24	1.1313	10	1.2191
51	1.3123	37	1.2175	23	1.1297	9	1.2343
50	1.3026	36	1.2103	22	1.1273	8	1.2482
49	1.2927	35	1.2003	21	1.1246	7	1.2606
48	1.2828	34	1.1882	20	1.1228	6	1.2699
47	1.2733	33	1.1742	19	1.1219	5	1.2774
46	1.2710	32	1.1584	18	1.1207	1 - 4	---
45	1.2701	31	1.1418	17	1.1196		

Core Height (ft) = (Node - 1) * 0.2013133

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	1.2431	30	1.2125	16	1.1333
57	1.2795	43	1.2396	29	1.2075	15	1.1361
56	1.2808	42	1.2420	28	1.2065	14	1.1442
55	1.2806	41	1.2458	27	1.2063	13	1.1533
54	1.2782	40	1.2505	26	1.2045	12	1.1626
53	1.2747	39	1.2561	25	1.2006	11	1.1721
52	1.2706	38	1.2591	24	1.1949	10	1.1819
51	1.2662	37	1.2629	23	1.1875	9	1.1917
50	1.2619	36	1.2645	22	1.1786	8	1.2012
49	1.2575	35	1.2624	21	1.1685	7	1.2100
48	1.2532	34	1.2574	20	1.1572	6	1.2170
47	1.2523	33	1.2495	19	1.1456	5	1.2221
46	1.2522	32	1.2391	18	1.1368	1 - 4	---
45	1.2494	31	1.2249	17	1.1330		

Core Height (ft) = (Node - 1) * 0.2013133

FIGURE 9

AXIAL FLUX DIFFERENCE LIMITS AS A FUNCTION OF RATED THERMAL POWER