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Ref: Tech. Spec. 5.6.5

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

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION (CPSES)
DOCKET NO. 50-446
UNIT 2, CYCLE 8 CORE OPERATING LIMITS REPORT

Gentlemen:

Enclosed is the Core Operating Limits Report for Unit 2, Cycle 8 prepared and submitted pursuant to Technical Specification 5.6.5.

A001

TXU

This communication contains no new licensing basis commitments regarding CPSES Units 1 and 2.

Sincerely,

TXU Generation Company LP

By: TXU Generation Management Company LLC,
Its General Partner

M. R. Blevins
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ERX-03-005, Revision 0

CPSES UNIT 2 CYCLE 8

CORE OPERATING LIMITS REPORT

September 2003

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1.0 CORE OPERATING LIMITS REPORT

This Core Operating Limits Report (COLR) for CPSES UNIT 2 CYCLE 8 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
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 5 and 9 through 19, as supplemented by Items 20 and 21. 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% Δk/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 <u>ROD GROUP ALIGNMENT LIMITS</u> (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 <u>SHUTDOWN BANK INSERTION LIMITS</u> (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% $\Delta k/k$ in MODE 2 during PHYSICS TESTS.

2.8 HEAT FLUX HOT CHANNEL FACTOR ($F_Q(Z)$) (LCO 3.2.1)

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

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

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

2.8.2 $F_Q^{RTP} = 2.42$

2.8.3 K(Z) is provided in Figure 3.

2.8.4 Maximum elevation dependent W(Z) values are given in Figure 4. Figures 5, 6, and 7 give burnup dependent values for W(Z). Figures 5, 6, and 7 can be used in place of Figure 4 to interpolate or extrapolate (via a three point fit) the W(Z) at a particular burnup.

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 $F^{RTP}_{\Delta H} =$ 1.55

2.9.3 $PF_{\Delta H} =$ 0.3

2.10 AXIAL FLUX DIFFERENCE (AFD) (LCO 3.2.3)

2.10.1 The AFD target band is +5%, -12% at 100% RTP linearly expanding to +20%, -17% at 50% RTP. Below 50% RTP, the AFD target band remains constant at +20%, -17%.

2.10.2 The AFD Acceptable Operation Limits are provided in Figure 8.

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;

$K_1 = 1.13$

$K_2 = 0.0145$ /°F

$K_3 = 0.00075$ /psig

$T_c^\circ = 560.5$ °F

$P^1 \geq 2235$ psig

$T_1 \geq 10$ sec

$T_2 \leq 3$ sec

$f_1(\Delta q) = 0.00 \cdot \{(q_t - q_b) + 65\%\}$ when $(q_t - q_b) \leq -65\%$ RTP

$= 0\%$ when -65% RTP $< (q_t - q_b) < +6.55\%$ RTP

$= 2.27 \cdot \{(q_t - q_b) - 6.55\%\}$ when $(q_t - q_b) \geq +6.55\%$ 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)
	≤	592 °F	(3 channels)

The RCS average temperature limits correspond to the analytical limit of 595.7 °F 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 based on precision heat balance 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 317,000 gpm.

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

2.13.1 The required refueling boron concentration is 2044 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)
2640	2.00
2850	2.22
3050	2.60
3260	2.78
3470	2.76
3680	2.62
3880	2.42
4090	2.20
4300	2.00
4510	2.00
4710	2.07
4920	2.01
5130	2.00
5340	2.00
5540	2.04
5750	2.14
5960	2.26
6170	2.39
6370	2.50
6580	2.56
6790	2.59
7000	2.57
7200	2.51
7410	2.46
7620	2.38
7830	2.28
8030	2.20
8240	2.16
8450	2.07
8660	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

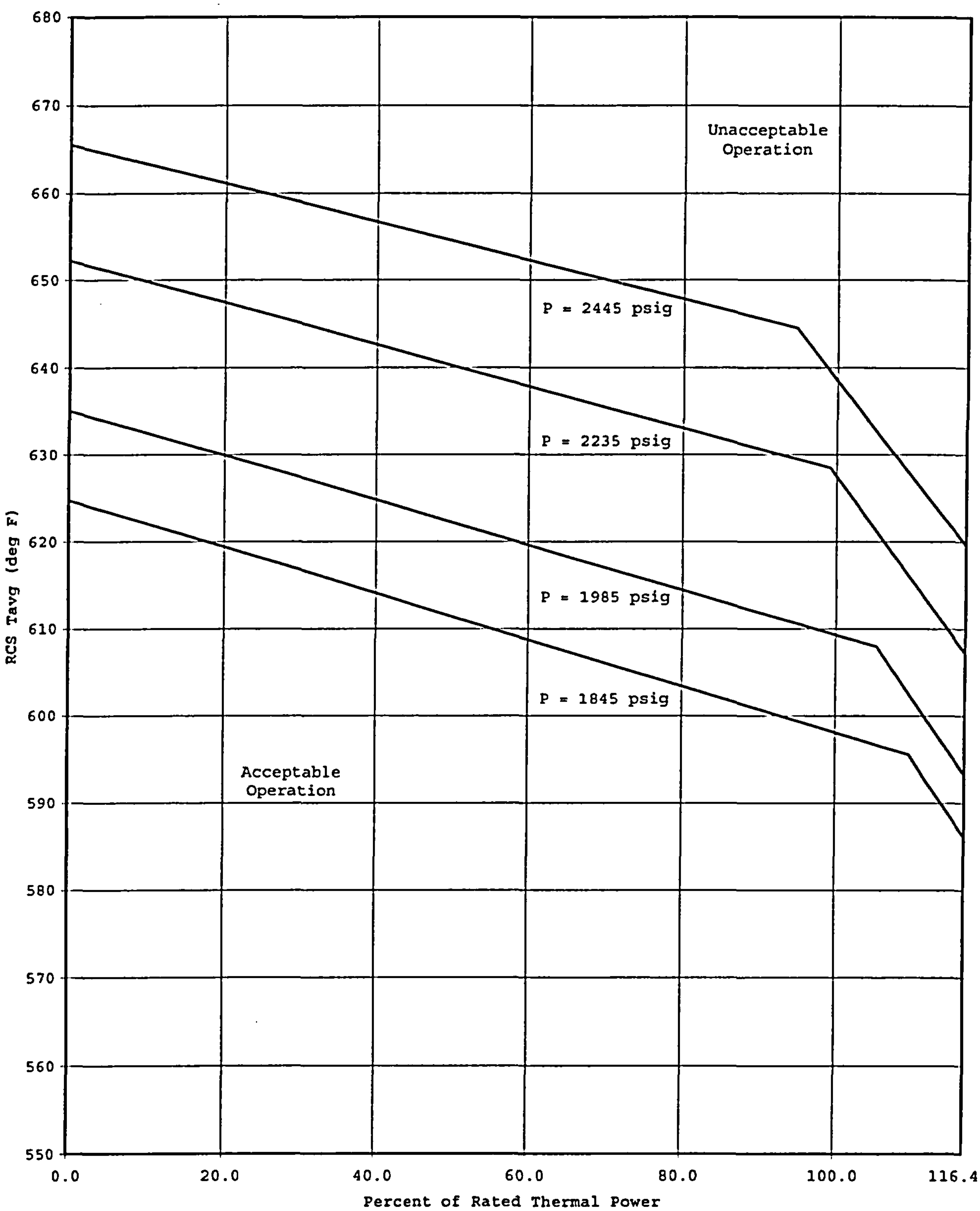
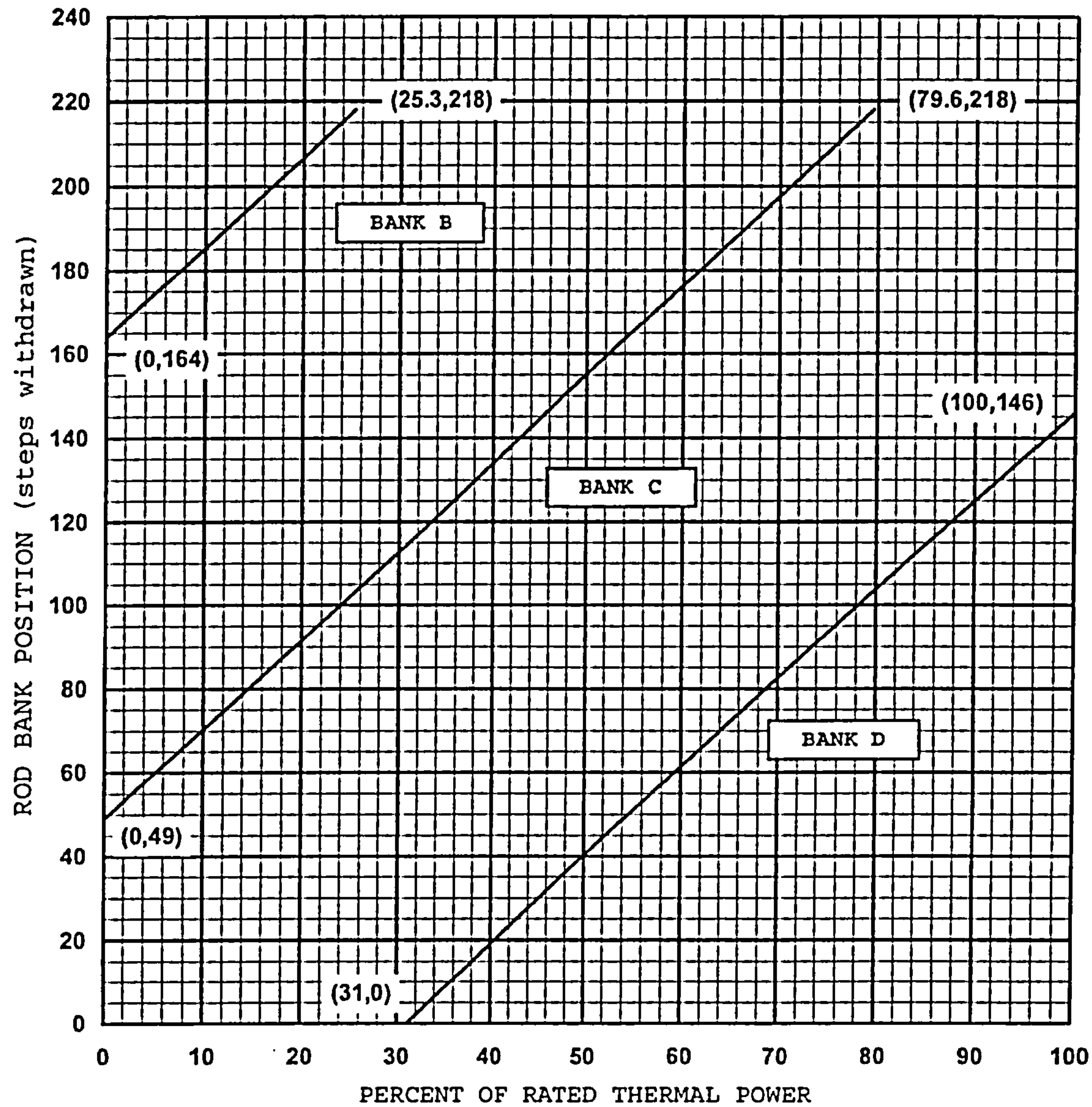


FIGURE 2

ROD BANK INSERTION LIMITS VERSUS THERMAL POWER



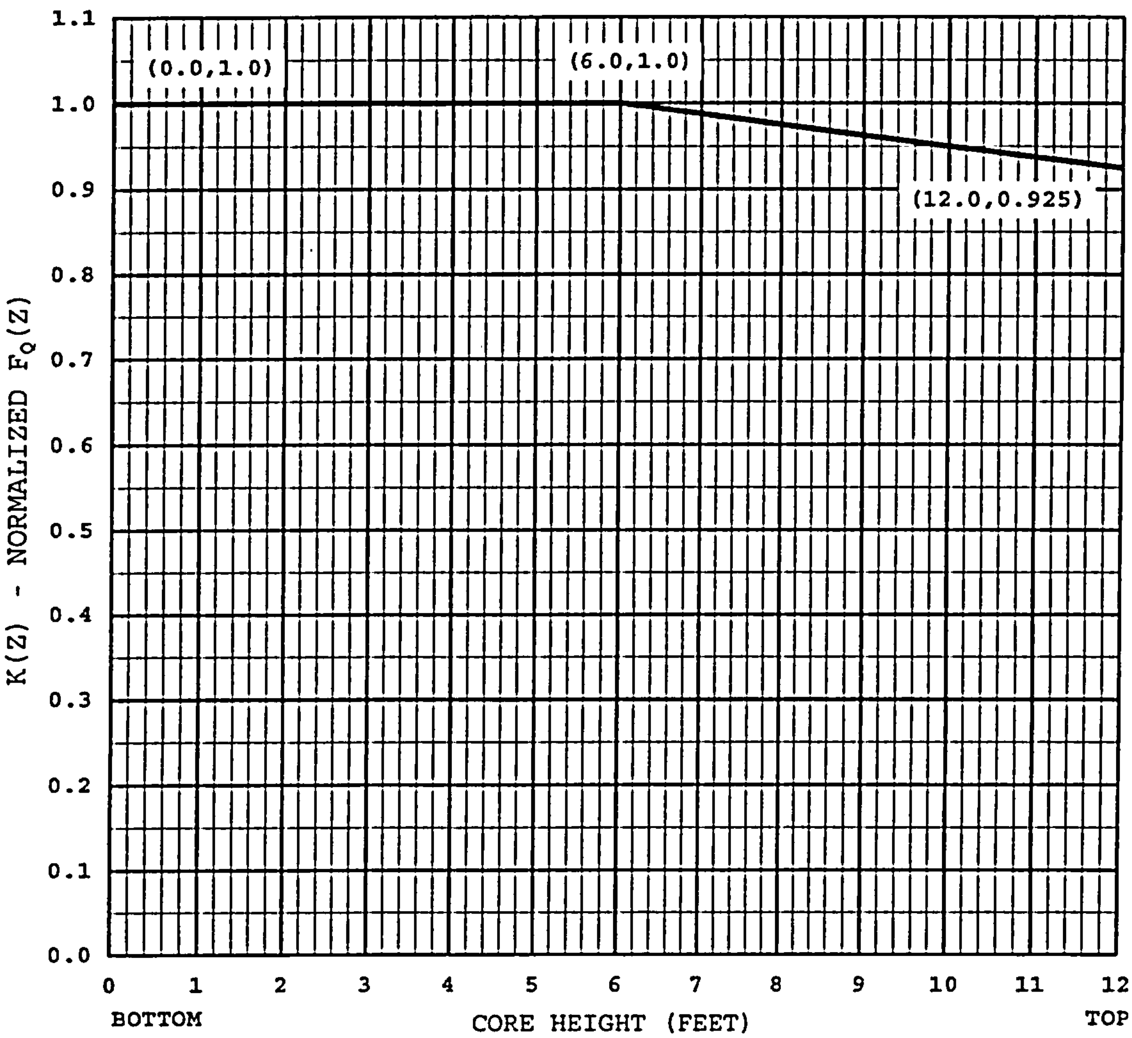
NOTES:

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

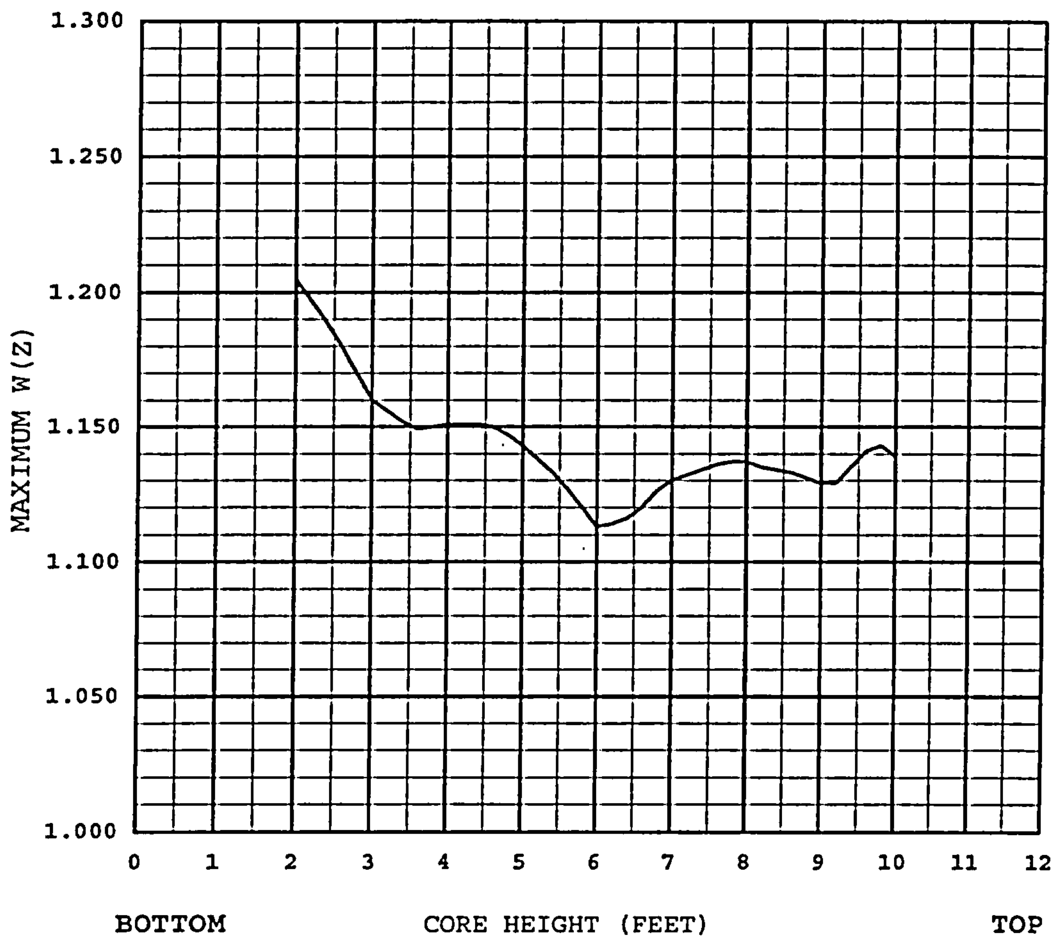
K(Z) - NORMALIZED $F_Q(Z)$ AS A FUNCTION OF CORE HEIGHT



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		

FIGURE 4

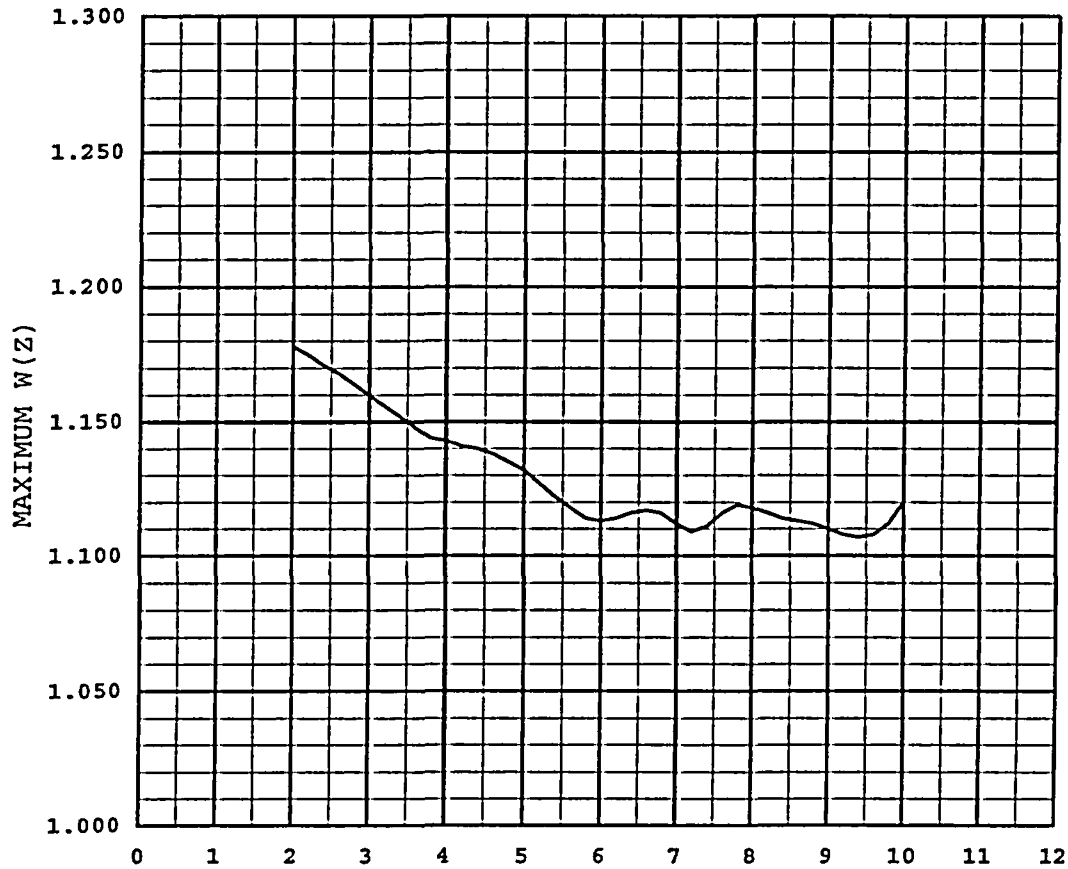
W(Z) AS A FUNCTION OF CORE HEIGHT (MAXIMUM)



Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)
52 - 61	---	41	1.137	30	1.120	19	1.149
51	1.139	40	1.137	29	1.127	18	1.152
50	1.143	39	1.136	28	1.133	17	1.156
49	1.141	38	1.134	27	1.138	16	1.160
48	1.135	37	1.132	26	1.143	15	1.170
47	1.129	36	1.130	25	1.147	14	1.180
46	1.129	35	1.126	24	1.150	13	1.189
45	1.131	34	1.120	23	1.151	12	1.197
44	1.133	33	1.116	22	1.151	11	1.205
43	1.134	32	1.114	21	1.151	1 - 10	---
42	1.135	31	1.113	20	1.150		

FIGURE 5

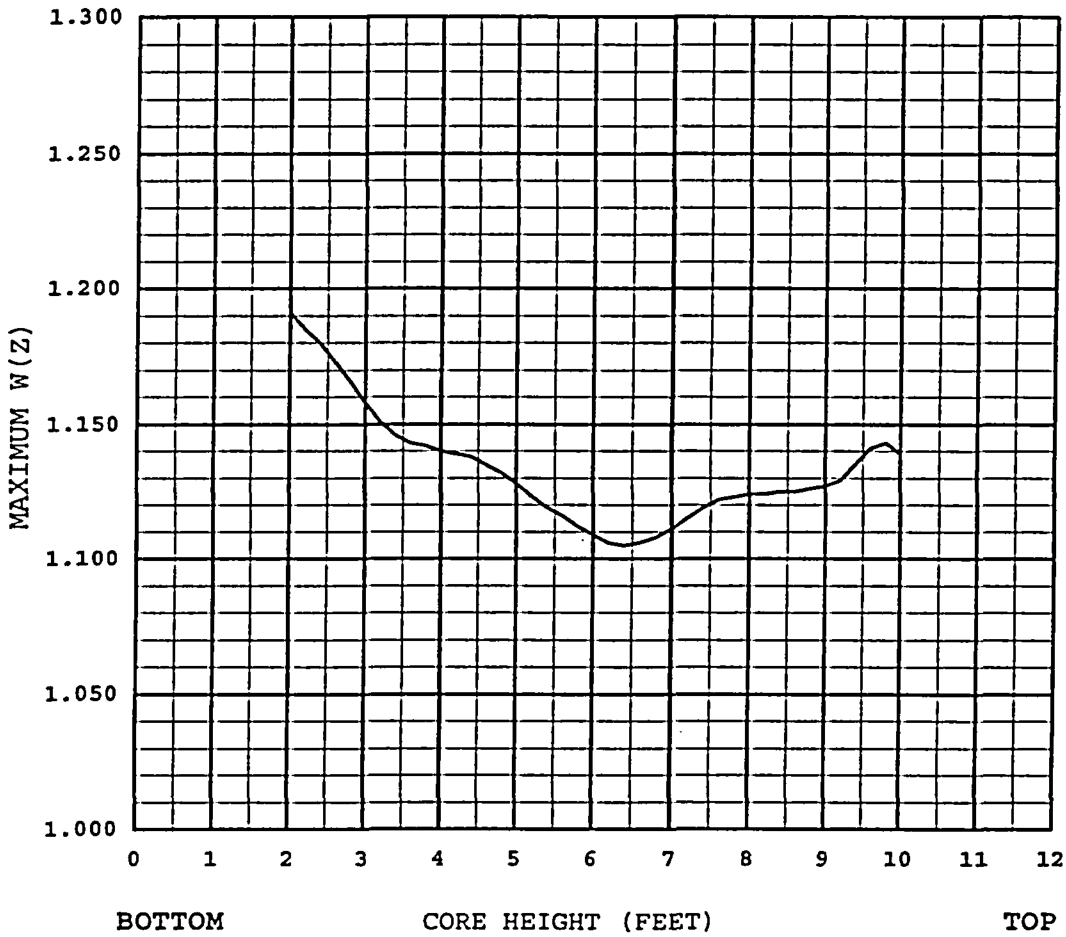
W(Z) AS A FUNCTION OF CORE HEIGHT (150 MWD/MTU)



Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)
52 - 61	---	41	1.118	30	1.114	19	1.148
51	1.120	40	1.119	29	1.118	18	1.152
50	1.112	39	1.116	28	1.122	17	1.156
49	1.108	38	1.111	27	1.127	16	1.160
48	1.107	37	1.109	26	1.132	15	1.164
47	1.108	36	1.112	25	1.135	14	1.168
46	1.110	35	1.116	24	1.138	13	1.171
45	1.112	34	1.117	23	1.140	12	1.175
44	1.113	33	1.116	22	1.141	11	1.178
43	1.114	32	1.114	21	1.143	1 - 10	---
42	1.116	31	1.113	20	1.144		

FIGURE 6

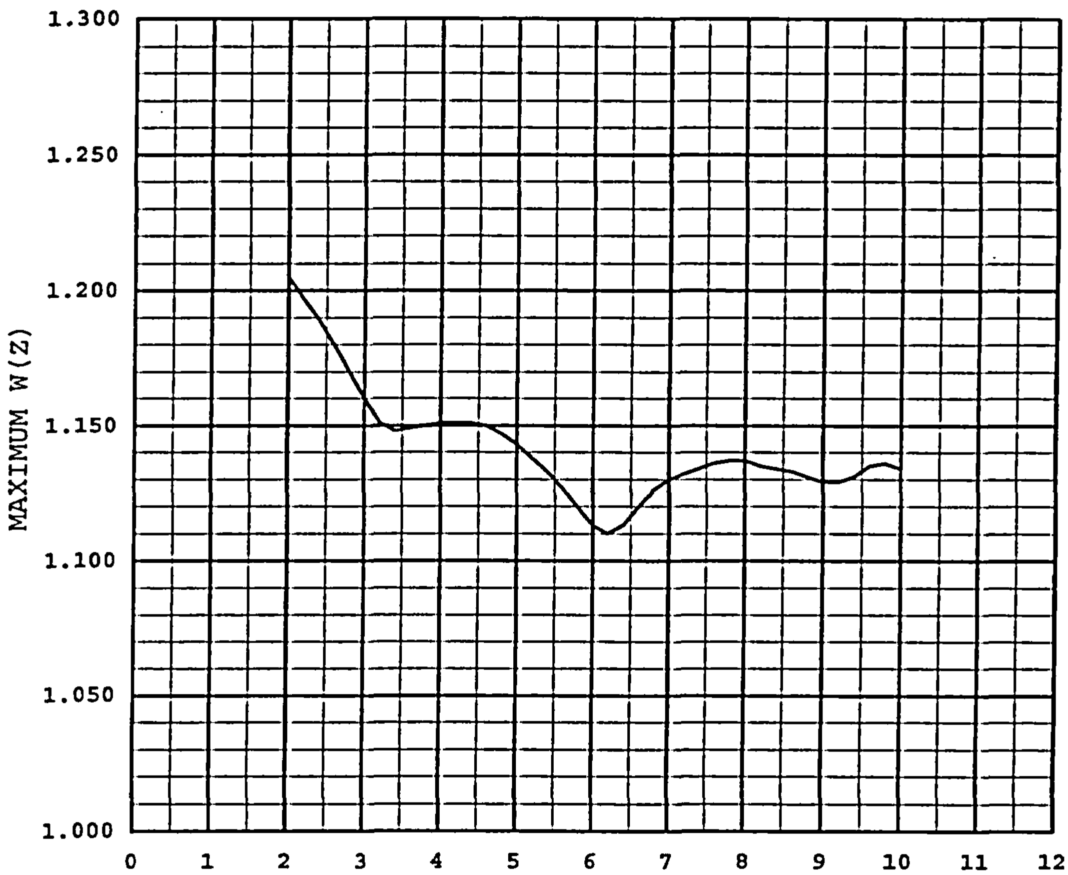
W(Z) AS A FUNCTION OF CORE HEIGHT
(10,000 MWD/MTU)



Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)
52 - 61	---	41	1.124	30	1.112	19	1.143
51	1.139	40	1.123	29	1.116	18	1.146
50	1.143	39	1.122	28	1.119	17	1.151
49	1.141	38	1.119	27	1.123	16	1.158
48	1.135	37	1.115	26	1.128	15	1.166
47	1.129	36	1.111	25	1.132	14	1.173
46	1.127	35	1.108	24	1.135	13	1.180
45	1.126	34	1.106	23	1.138	12	1.185
44	1.125	33	1.105	22	1.139	11	1.191
43	1.125	32	1.106	21	1.140	1 - 10	---
42	1.124	31	1.109	20	1.142		

FIGURE 7

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)
52 - 61	---	41	1.137	30	1.120	19	1.149
51	1.134	40	1.137	29	1.127	18	1.148
50	1.136	39	1.136	28	1.133	17	1.151
49	1.135	38	1.134	27	1.138	16	1.160
48	1.131	37	1.132	26	1.143	15	1.170
47	1.129	36	1.130	25	1.147	14	1.180
46	1.129	35	1.126	24	1.150	13	1.189
45	1.131	34	1.120	23	1.151	12	1.197
44	1.133	33	1.113	22	1.151	11	1.205
43	1.134	32	1.110	21	1.151	1 - 10	---
42	1.135	31	1.113	20	1.150		

FIGURE 8

AXIAL FLUX DIFFERENCE LIMITS AS A FUNCTION OF
RATED THERMAL POWER