Nuclear Operating Company

South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

December 11, 2002
NOC-AE-02001434
File No.: G25
10CFR50.36

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

South Texas Project
Unit 1
Docket No. STN 50-498
Revision 2 to the Unit 1 Cycle 11 Core Operating Limits Report

Reference: Letter from Mohan C. Thadani to William T. Cottle, "South Texas Project, Units 1 and 2 - Issuance of Amendments Approving Technical Specification Changes Revising the End of Life Moderator Temperature Coefficient Surveillance Requirements (TAC Nos. MB5160 and MB5161)", dated November 26, 2002 (ST-AE-NOC-02001002)

In accordance with Technical Specification 6.9.1.6.d, the attached Revision 2 to the Core Operating Limits Report (COLR) is submitted for South Texas Project (STP) Unit 1 Cycle 11. Revision 2 includes the changes to the end-of-life moderator temperature coefficient surveillance requirements approved in the above reference. Revised entries are indicated by bars in the margins.

If there are any questions concerning this report, please contact K. A. Work at (361) 972-7936 or me at (361) 972-7795.

David A. Leazar

David A. Leazar
Director,
Nuclear Fuel & Analysis

kaw

Attachment: Unit 1 Cycle 11 Core Operating Limits Report, Revision 2

A001

cc:

(paper copy)

Ellis W. Merschoff
Regional Administrator, Region IV
U.S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 400
Arlington, Texas 76011-8064

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

Richard A. Ratliff
Bureau of Radiation Control
Texas Department of Health
1100 West 49th Street
Austin, TX 78756-3189

Cornelius F. O'Keefe
U. S. Nuclear Regulatory Commission
P. O. Box 289, Mail Code: MN116
Wadsworth, TX 77483

C. M. Canady
City of Austin
Electric Utility Department
721 Barton Springs Road
Austin, TX 78704

(electronic copy)

A. H. Gutterman, Esquire
Morgan, Lewis & Bockius LLP

M. T. Hardt/W. C. Gunst
City Public Service

Mohan C. Thadani
U. S. Nuclear Regulatory Commission

R. L. Balcom
Texas Genco, LP

A. Ramirez
City of Austin

C. A. Johnson
AEP - Central Power and Light Company

Jon C. Wood
Matthews & Branscomb

31528290

G0906

SOUTH TEXAS
UNIT 1 CYCLE 11

CORE OPERATING LIMITS REPORT

REVISION 2

November 2002

1.0 CORE OPERATING LIMITS REPORT

This Core Operating Limits Report for STPEGS Unit 1 Cycle 11 has been prepared in accordance with the requirements of Technical Specification 6.9.1.6. The core operating limits have been developed using the NRC-approved methodologies specified in Technical Specification 6.9.1.6.

The Technical Specifications affected by this report are:

1)	2.1	SAFETY LIMITS
2)	2.2	LIMITING SAFETY SYSTEM SETTINGS
3)	3/4.1.1.3	MODERATOR TEMPERATURE COEFFICIENT LIMITS
4)	3/4.1.3.5	SHUTDOWN ROD INSERTION LIMITS
5)	3/4.1.3.6	CONTROL ROD INSERTION LIMITS
6)	3/4.2.1	AFD LIMITS
7)	3/4.2.2	HEAT FLUX HOT CHANNEL FACTOR
8)	3/4.2.3	NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR
9)	3/4.2.5	DNB PARAMETERS

2.0 OPERATING LIMITS

The cycle-specific parameter limits for the specifications listed in Section 1.0 are presented below.

2.1 <u>SAFETY LIMITS</u> (Specification 2.1):

2.1.1 The combination of THERMAL POWER, pressurizer pressure, and the highest operating loop coolant temperature (T_{avg}) shall not exceed the limits shown in Figure 1.

2.2 <u>LIMITING SAFETY SYSTEM SETTINGS</u> (Specification 2.2):

2.2.1 The Loop design flow for Reactor Coolant Flow-Low is 98,000 gpm.

2.2.2 The Over-temperature ΔT and Over-power ΔT setpoint parameter values are listed below:

Over-temperature ΔT Setpoint Parameter Values

τ_1 measured reactor vessel ΔT lead/lag time constant, $\tau_1 = 8$ sec
τ_2 measured reactor vessel ΔT lead/lag time constant, $\tau_2 = 3$ sec
τ_3 measured reactor vessel ΔT lag time constant, $\tau_3 = 0$ sec
τ_4 measured reactor vessel average temperature lead/lag time constant, $\tau_4 = 28$ sec
τ_5 measured reactor vessel average temperature lead/lag time constant, $\tau_5 = 4$ sec
τ_6 measured reactor vessel average temperature lag time constant, $\tau_6 = 0$ sec
K_1 Overtemperature ΔT reactor trip setpoint, $K_1 = 1.14$
K_2 Overtemperature ΔT reactor trip setpoint T_{avg} coefficient, $K_2 = 0.028/°F$
K_3 Overtemperature ΔT reactor trip setpoint pressure coefficient, $K_3 = 0.00143/\text{psig}$
T' Nominal full power T_{avg}, $T' \leq 592.0$ °F
P' Nominal RCS pressure, $P' = 2235$ psig
$f_1(\Delta I)$ is a function of the indicated difference between top and bottom detectors of the power-range neutron ion chambers; with gains to be selected based on measured instrument response during plant startup tests such that;

(1) For $q_t - q_b$ between -70% and +8%, $f_1(\Delta I) = 0$, where q_t and q_b are percent RATED THERMAL POWER in the top and bottom halves of the core respectively, and $q_t + q_b$ is total THERMAL POWER in percent of RATED THERMAL POWER;

(2) For each percent that the magnitude of $q_t - q_b$ exceeds -70%, the ΔT Trip Setpoint shall be automatically reduced by 0.0% of its value at RATED THERMAL POWER.

(3) For each percent that the magnitude of $q_t - q_b$ exceeds +8%, the ΔT Trip Setpoint shall be automatically reduced by 2.65% of its value at RATED THERMAL POWER.

Over-power ΔT Setpoint Parameter Values

τ_1 measured reactor vessel ΔT lead/lag time constant, $\tau_1 = 8$ sec
τ_2 measured reactor vessel ΔT lead/lag time constant, $\tau_2 = 3$ sec
τ_3 measured reactor vessel ΔT lag time constant, $\tau_3 = 0$ sec
τ_6 measured reactor vessel average temperature lag time constant, $\tau_6 = 0$ sec
τ_7 Time constant utilized in the rate-lag compensator for T_{avg}, $\tau_7 = 10$ sec
K_4 Overpower ΔT reactor trip setpoint, $K_4 = 1.08$
K_5 Overpower ΔT reactor trip setpoint T_{avg} rate/lag coefficient, $K_5 = 0.02/°F$ for increasing average temperature, and $K_5 = 0$ for decreasing average temperature
K_6 Overpower ΔT reactor trip setpoint T_{avg} heatup coefficient $K_6 = 0.002/°F$ for $T > T''$ and, $K_6 = 0$ for $T \leq T''$
T'' Indicated full power T_{avg}, $T'' \leq 592.0$ °F
$f_2(\Delta I) = 0$ for all (ΔI)

2.3 MODERATOR TEMPERATURE COEFFICIENT (Specification 3.1.1.3):

2.3.1 The BOL, ARO, MTC shall be less positive than the limits shown in Figure 2.
2.3.2 The EOL, ARO, HFP, MTC shall be less negative than –61.2 pcm/°F.
2.3.3 The 300 ppm, ARO, HFP, MTC shall be less negative than –53.6 pcm/°F (300 ppm Surveillance Limit).

Where: BOL stands for Beginning-of-Cycle Life,
EOL stands for End-of-Cycle Life,
ARO stands for All Rods Out,
HFP stands for Hot Full Power (100% RATED THERMAL POWER),
HFP vessel average temperature is 592 °F.

2.3.4 The Revised Predicted near-EOL 300 ppm MTC shall be calculated using the algorithm from T.S. 6.9.1.6.b.10:

Revised Predicted MTC = Predicted MTC + AFD Correction - 3 pcm/°F

If the Revised Predicted MTC is less negative than the S.R. 4.1.1.3b limit and all of the benchmark data contained in the surveillance procedure are met, then an MTC measurement in accordance with S.R. 4.1.1.3b is not required.

2.4 ROD INSERTION LIMITS (Specification 3.1.3.5 and 3.1.3.6):

2.4.1 All banks shall have the same Full Out Position (FOP) of at least 250 steps withdrawn but not exceeding 259 steps withdrawn.
2.4.2 The Control Banks shall be limited in physical insertion as specified in Figure 3.
2.4.3 Individual Shutdown bank rods are fully withdrawn when the Bank Demand Indication is at the FOP and the Rod Group Height Limiting Condition for Operation is satisfied (T.S. 3.1.3.1).

2.5 AXIAL FLUX DIFFERENCE (Specification 3.2.1):

2.5.1 AFD limits as required by Technical Specification 3.2.1 are determined by CAOC Operations with an AFD target band of +5, -10%.
2.5.2 The AFD shall be maintained within the ACCEPTABLE OPERATION portion of Figure 4, as required by Technical Specifications.

2.6 HEAT FLUX HOT CHANNEL FACTOR (Specification 3.2.2):

2.6.1 $F_{xy}^{RTP} = 2.55$.
2.6.2 K(Z) is provided in Figure 5.
2.6.3 The F_{xy} limits for RATED THERMAL POWER (F_{xy}^{RTP}) within specific core planes shall be:
2.6.3.1 Less than or equal to 2.102 for all core planes containing Bank "D" control rods, and
2.6.3.2 Less than or equal to the appropriate core height-dependent value from Table 1 for all unrodded core planes.
2.6.3.3 $PF_{xy} = 0.2$.

These F_{xy} limits were used to confirm that the heat flux hot channel factor $F_Q(Z)$ will be limited by Technical Specification 3.2.2 assuming the most-limiting axial power distributions expected to result for the insertion and removal of Control Banks C and D during operation, including the accompanying variations in the axial xenon and power distributions, as described in WCAP-8385. Therefore, these F_{xy} limits provide assurance that the initial conditions assumed in the LOCA analysis are met, along with the ECCS acceptance criteria of 10 CFR 50.46.

For Unit 1 Cycle 11, the L(Z) penalty is not applied (i.e., L(Z) = 1.0 for all core elevations).

2.7 ENTHALPY RISE HOT CHANNEL FACTOR (Specification 3.2.3):

2.7.1 WITHOUT RCS Loop-specific Temperature Calibrations:

Standard Fuel[1]	$F_{\Delta H}^{RTP} = 1.46$
VANTAGE 5H / RFA Fuel[2]	$F_{\Delta H}^{RTP} = 1.53$

WITH RCS Loop-specific Temperature Calibrations:

Standard Fuel[1]	$F_{\Delta H}^{RTP} = 1.49$
VANTAGE 5H / RFA Fuel[2]	$F_{\Delta H}^{RTP} = 1.557$

2.7.2 Standard Fuel / VANTAGE 5H / RFA Fuel $PF_{\Delta H} = 0.3$

2.8 DNB PARAMETERS (Specification 3.2.5):

2.8.1 The following DNB-related parameters shall be maintained within the following limits:[3]

a. Reactor Coolant System T_{avg}, $\leq$ 595 °F[4],

b. Pressurizer Pressure, > 2200 psig[5],

c. Minimum Measured Reactor Coolant System Flow $\geq$ 403,000 gpm[6].

3.0 REFERENCES

3.1 Letter from T. D. Croyle (Westinghouse) to Dave Hoppes (STPNOC), "Unit 1 Cycle 11 Rev. 2 Final Core Operating Limits Report (COLR) to Support a 1.4% Uprating," NF-TG-02-32 (ST-UB-NOC-02002248), May 2002.

3.2 NUREG-1346, Technical Specifications, South Texas Project Unit Nos. 1 and 2.

3.3 STPNOC Calculation ZC-7035, Rev. 1, "Loop Uncertainty Calculation for RCS T_{avg} Instrumentation," October 19, 1998.

3.4 STPNOC Calculation ZC-7032, Rev. 3, "Loop Uncertainty Calculation for Narrow Range Pressurizer Pressure Monitoring Instrumentation," June 27, 2001.

---

1 Applies to Region 5.

2 Applies to Regions 10A, 11A, 11B, 12A, 13A and 13B.

3 A discussion of the processes to be used to take these readings is provided in the basis for Technical Specification 3.2.5.

4 Includes a 1.9 °F measurement uncertainty.

5 Limit not applicable during either a Thermal Power ramp in excess of 5% of RTP per minute or a Thermal Power step in excess of 10% RTP. Includes a 10.7 psi measurement uncertainty as read on the QDPS display per Reference 3.4.

6 Includes a 2.8% flow measurement uncertainty.

Figure 1

Reactor Core Safety Limits - Four Loops in Operation

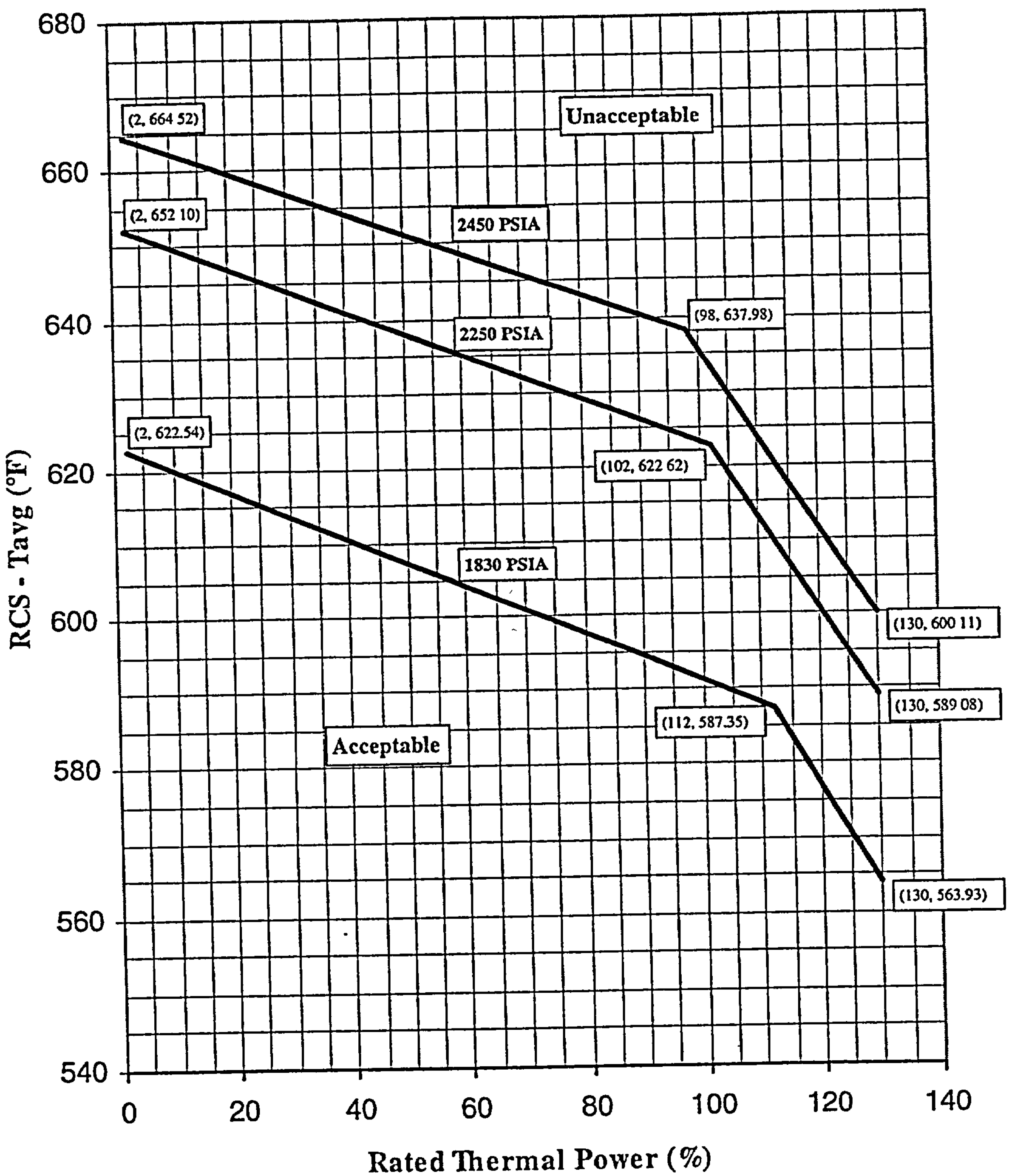
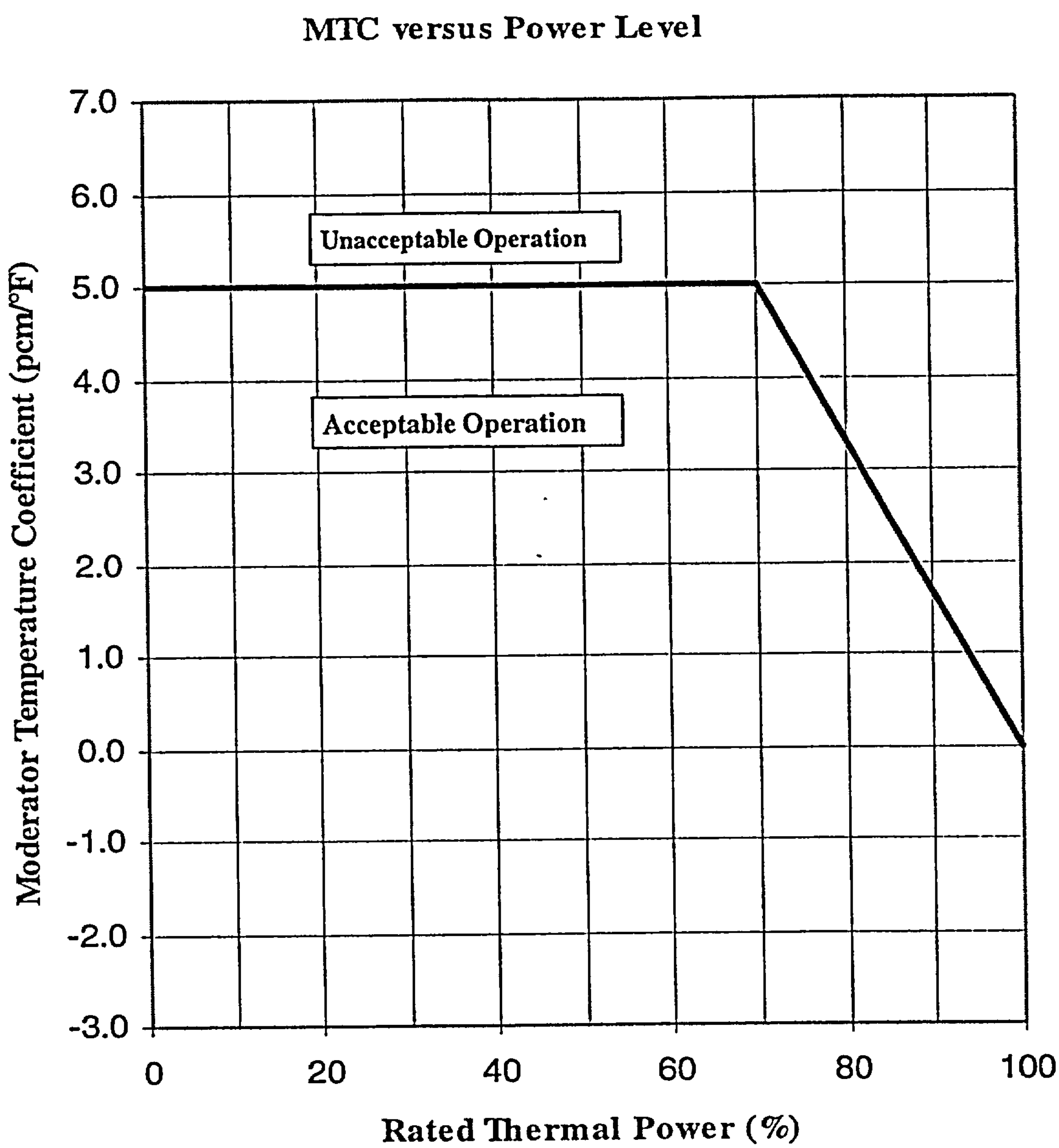
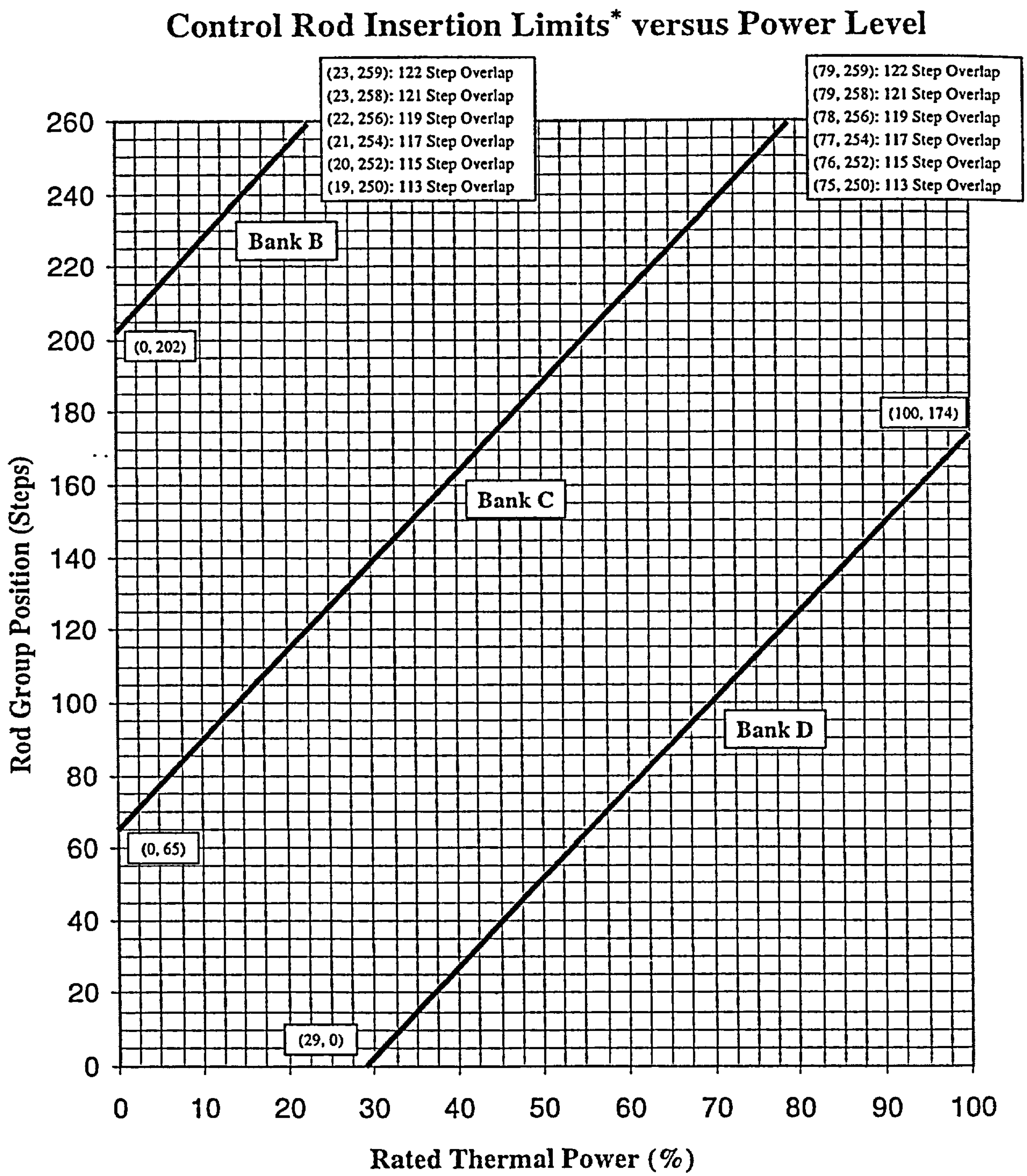


Figure 2



MTC versus Power Level
Unacceptable Operation
Acceptable Operation
Moderator Temperature Coefficient (pcm/°F)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
-1.0
-2.0
-3.0
0
20
40
60
80
100
Rated Thermal Power (%)

Figure 3



*Control Bank A is already withdrawn to Full Out Position Fully withdrawn region shall be the condition where shutdown and control banks are at a position within the interval of 250 and ≤259 steps withdrawn, inclusive.

Figure 4

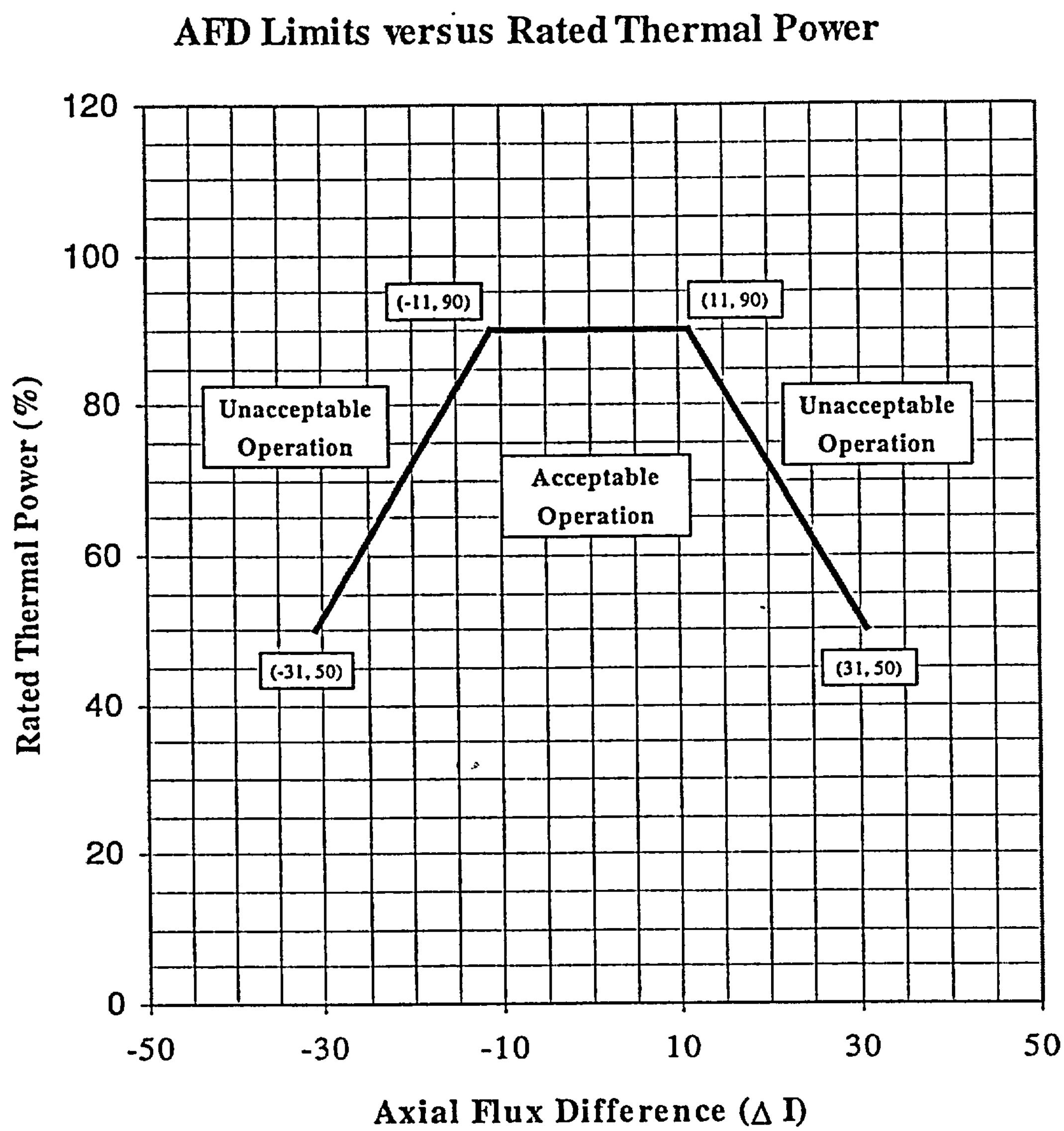

AFD Limits versus Rated Thermal Power
120
100
80
60
40
20
0
-50
-30
-10
10
30
50
Rated Thermal Power (%)
Axial Flux Difference (Δ I)
(-11, 90)
(11, 90)
(-31, 50)
(31, 50)
Unacceptable Operation
Acceptable Operation
Unacceptable Operation

Figure 5

K(Z) – Normalized $F_Q(Z)$ versus Core Height

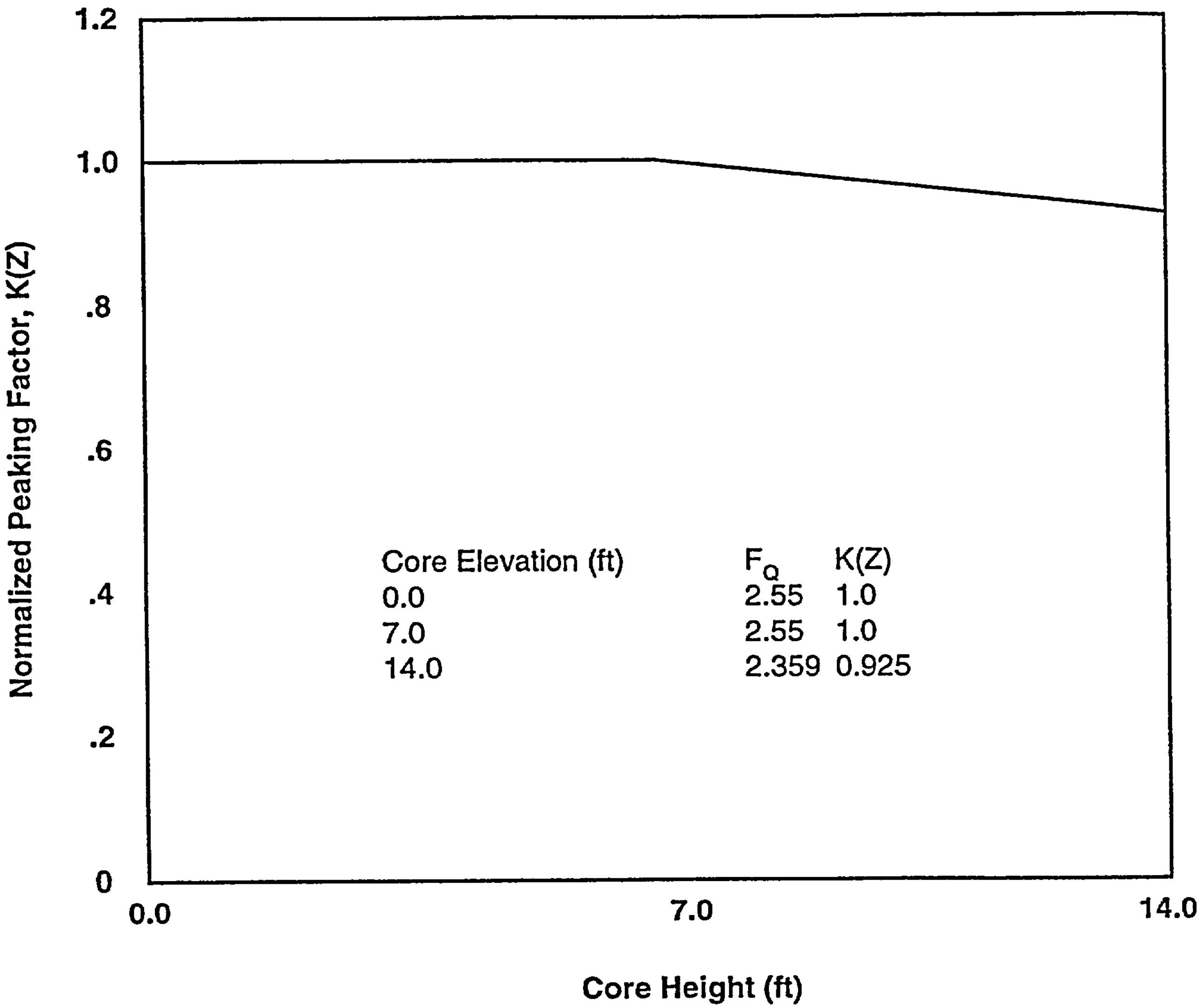


Table 1

Unrodded F_{xy} for Each Core Height*
For Cycle Burnups Less Than 9000 MWD/MTU

Core Height (Ft.)	Axial Point	Unrodded F_{xy}	Core Height (Ft.)	Axial Point	Unrodded F_{xy}
14.00	1	5.123	6.80	37	1.948
13.80	2	4.303	6.60	38	1.932
13.60	3	3.482	6.40	39	1.920
13.40	4	2.661	6.20	40	1.909
13.20	5	2.291	6.00	41	1.898
13.00	6	2.061	5.80	42	1.894
12.80	7	2.096	5.60	43	1.895
12.60	8	2.092	5.40	44	1.894
12.40	9	2.082	5.20	45	1.896
12.20	10	2.057	5.00	46	1.900
12.00	11	2.027	4.80	47	1.907
11.80	12	2.007	4.60	48	1.916
11.60	13	2.002	4.40	49	1.924
11.40	14	2.002	4.20	50	1.929
11.20	15	2.001	4.00	51	1.933
11.00	16	1.999	3.80	52	1.933
10.80	17	1.994	3.60	53	1.926
10.60	18	1.990	3.40	54	1.922
10.40	19	1.986	3.20	55	1.915
10.20	20	1.985	3.00	56	1.901
10.00	21	1.985	2.80	57	1.886
9.80	22	1.986	2.60	58	1.854
9.60	23	1.988	2.40	59	1.816
9.40	24	1.989	2.20	60	1.774
9.20	25	1.990	2.00	61	1.755
9.00	26	1.991	1.80	62	1.744
8.80	27	1.994	1.60	63	1.740
8.60	28	1.999	1.40	64	1.735
8.40	29	2.007	1.20	65	1.744
8.20	30	2.016	1.00	66	1.780
8.00	31	2.024	0.80	67	1.933
7.80	32	2.032	0.60	68	2.351
7.60	33	2.030	0.40	69	2.901
7.40	34	2.006	0.20	70	3.451
7.20	35	1.980	0.00	71	4.001
7.00	36	1.962			

* For Unit 1 Cycle 11, the L(Z) penalty is not applied
(i.e., L(Z) = 1.0 for all core elevations).

Table 2

Unrodded F_{xy} for Each Core Height*
For Cycle Burnups Greater Than or Equal to 9000 MWD/MTU

Core Height (Ft.)	Axial Point	Unrodded F_{xy}	Core Height (Ft.)	Axial Point	Unrodded F_{xy}
14.00	1	5.186	6.80	37	2.125
13.80	2	4.443	6.60	38	2.122
13.60	3	3.665	6.40	39	2.112
13.40	4	2.858	6.20	40	2.101
13.20	5	2.456	6.00	41	2.088
13.00	6	2.180	5.80	42	2.075
12.80	7	2.153	5.60	43	2.063
12.60	8	2.109	5.40	44	2.051
12.40	9	2.082	5.20	45	2.041
12.20	10	2.072	5.00	46	2.031
12.00	11	2.053	4.80	47	2.023
11.80	12	2.035	4.60	48	2.016
11.60	13	2.031	4.40	49	2.006
11.40	14	2.034	4.20	50	1.995
11.20	15	2.036	4.00	51	1.982
11.00	16	2.038	3.80	52	1.970
10.80	17	2.039	3.60	53	1.958
10.60	18	2.040	3.40	54	1.947
10.40	19	2.040	3.20	55	1.936
10.20	20	2.038	3.00	56	1.924
10.00	21	2.037	2.80	57	1.911
9.80	22	2.036	2.60	58	1.879
9.60	23	2.039	2.40	59	1.852
9.40	24	2.045	2.20	60	1.841
9.20	25	2.053	2.00	61	1.831
9.00	26	2.057	1.80	62	1.820
8.80	27	2.059	1.60	63	1.813
8.60	28	2.060	1.40	64	1.827
8.40	29	2.065	1.20	65	1.815
8.20	30	2.074	1.00	66	1.822
8.00	31	2.085	0.80	67	2.066
7.80	32	2.096	0.60	68	2.542
7.60	33	2.105	0.40	69	3.117
7.40	34	2.114	0.20	70	3.656
7.20	35	2.121	0.00	71	4.121
7.00	36	2.125			

* For Unit 1 Cycle 11, the L(Z) penalty is not applied
(i.e., L(Z) = 1.0 for all core elevations).