TVA TENNESSEE VALLEY AUTHORITY

Post Office Box 2000, Spring City, Tennessee 37381

WBL-23-023

April 27, 2023

10 CFR 50.4

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

Watts Bar Nuclear Plant, Unit 1
Facility Operating License No. NPF-90
NRC Docket No. 50-390

Subject: **REVISION 0 OF THE UNIT 1 CYCLE 19 CORE OPERATING LIMITS REPORT (COLR)**

Pursuant to Watts Bar Nuclear Plant Technical Specifications Section 5.9.5.d, Tennessee Valley Authority (TVA) has enclosed Revision 0 of the Unit 1 Cycle 19 Core Operating Limits Report (COLR). The analytical methods used to determine the core operating limits were previously reviewed and approved by the NRC.

There are no new regulatory commitments contained in this letter or the enclosure. Should you have questions regarding this submittal, please contact Jonathan Johnson, Site Licensing Manager, at jtjohnson0@tva.gov.

Respectfully,

Anthony L. Williams, IV
Site Vice President
Watts Bar Nuclear Plant

Enclosure

Watts Bar Nuclear Plant, Unit 1, Cycle 19 Core Operating Limits Report, Revision 0, April 2023

cc: (w/ enclosure)

NRC Regional Administrator - Region II
NRC Project Manager - Watt Bar Nuclear Plant
NRC Senior Resident Inspector - Watts Bar Nuclear Plant

ENCLOSURE

Watts Bar Nuclear Plant, Unit 1, Cycle 19
Core Operating Limits Report
Revision 0
April 2023

QA Record
L36 230223 800

WATTS BAR NUCLEAR PLANT, UNIT 1, CYCLE 19

CORE OPERATING LIMITS REPORT

Revision 0

March 2023

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Approved by:

DRLee Donald R Lee / 03-08-2023

PORC Chairman — Date

BJenkins / 3/8/23

Beth A. Jenkins, Plant Manager — Date

Revision	Date of PORC Approval	Affected Pages	Reason for Revision
0	See above	All	Initial issue

1.0 CORE OPERATING LIMITS REPORT

This Core Operating Limits Report (COLR) for Watts Bar Unit 1 Cycle 19 has been prepared in accordance with the requirements of the Technical Specifications 5.9.5.

The Technical Specifications affected by this report are listed below:

3.1.4 Moderator Temperature Coefficient (MTC)
3.1.5 Rod Group Alignment Limits
3.1.6 Shutdown Bank Insertion Limits
3.1.7 Control Bank Insertion Limits
3.2.1 Heat Flux Hot Channel Factor ($F_Q(Z)$)
3.2.2 Nuclear Enthalpy Rise Hot Channel Factor ($F_{\Delta H}^N$)
3.2.3 Axial Flux Difference (AFD)
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 the Technical Specifications Section 5.9.5.

The following abbreviations are used in this section:

BOL -- Beginning of Cycle Life
ARO -- All Rods Out
HZP -- Hot Zero Thermal Power
EOL -- End of Cycle Life
RTP -- Rated Thermal Power
ROS -- RAOC Operating Space
RA -- Required Action

2.1 MODERATOR TEMPERATURE COEFFICIENT - MTC (LCO 3.1.4)

2.1.1 The MTC limits are:

The ARO/HZP - MTC shall be less positive than or equal to 0 Δk/k/°F (upper limit). With the BOL/ARO/HZP - MTC more positive than -2.095 x 10-5 Δk/k/°F (BOL MTC limit), establish control rod withdrawal limits to ensure the MTC remains less positive than or equal to 0 Δk/k/°F (upper limit) for all times in core life.

The EOL/ARO/RTP - MTC shall be less negative than or equal to -4.5 x 10-4 Δk/k/°F (lower limit).

2.1.2 The 300 ppm surveillance limit is:

The 300 ppm /ARO/RTP-MTC should be less negative than or equal to -3.75 x 10-4 Δk/k/°F.

2.1.3 The 60 ppm surveillance limit is:

The measured 60 ppm /ARO/RTP-MTC should be less negative than or equal to -4.28 x 10-4 Δk/k/°F.

2.2 SHUTDOWN MARGIN – SDM (LCO 3.1.5, 3.1.6, 3.1.7)

2.2.1 For TS 3.1.5, SDM shall be ≥ 1.6% Δk/k in MODE 1 and MODE 2.

2.2.2 For TS 3.1.6, SDM shall be ≥ 1.6% Δk/k in MODE 1 and MODE 2.

2.2.3 For TS 3.1.7, SDM shall be ≥ 1.6% Δk/k in MODE 1 and MODE 2 with keff ≥ 1.0.

2.3 SHUTDOWN BANK INSERTION LIMITS (LCO 3.1.6)

2.3.1 The shutdown banks shall be withdrawn to a position greater than or equal to 224 steps withdrawn.

2.4 CONTROL BANK INSERTION LIMITS (LCO 3.1.7)

2.4.1 The control banks are fully withdrawn or shall be limited in physical insertion as shown in Figure 1.

2.4.2 Each control bank shall be considered fully withdrawn from the core at greater than or equal to 224 steps.

2.4.3 The control banks shall be operated in sequence by withdrawal of Bank A, Bank B, Bank C, and Bank D. The control banks shall be sequenced in reverse order upon insertion.

2.4.4 Each control bank not fully withdrawn from the core shall be operated with the following overlap as a function of park position.

Park Position (steps)	Bank Overlap (steps)	Bank Difference (steps)
224	108	116
225	109	116
226	110	116
227	111	116
228	112	116
229	113	116
230	114	116
231	115	116

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

$F_Q(Z) \leq [CFQ / P] * K(Z)$ for P > 0.5

$F_Q(Z) \leq [CFQ / 0.5] * K(Z)$ for P ≤ 0.5

Where P = Thermal Power / Rated Thermal Power

2.5.1 CFQ = 2.50

2.5.2 K(Z) is provided in Figure 2.

2.5.3 $F_Q^C(z) = 1.03 * F_Q^M(Z) * \left(1 + \frac{U_Q}{100}\right)$
where 1.03 is the fuel manufacturing tolerance,
$F_Q^M(Z)$ is the measured value of $F_Q(Z)$ and
U_Q is the measurement uncertainty ($U_Q \geq 5$).

2.5.4 $F_Q^W(Z)$ equations are:

$$F_Q^W(Z) \equiv 1.03 * \frac{[T(Z)]^{COLR}}{P} * A_{XY}(Z) * F_{XY}^M(Z) * R_j * \left(1 + \frac{U_Q}{100}\right) \quad for\ P > 0.5$$

$$F_Q^W(Z) \equiv 1.03 * \frac{[T(Z)]^{COLR}}{0.5} * A_{XY}(Z) * F_{XY}^M(Z) * R_j * \left(1 + \frac{U_Q}{100}\right) \quad for\ P \leq 0.5$$

Where $F_{XY}^M(Z)$ is the measured planar radial peaking factor.

$F_Q^W(Z)$ evaluations are not applicable for axial core regions, measured in percent of core height:

a. Lower core region, from 0 to 10% inclusive,
b. Upper core region, from 90 to 100% inclusive,
c. Grid plane regions, +2% inclusive, and
d. Core plane regions, within 2% of the bank demand positions of the control banks.

2.5.5 $[T(Z)]^{COLR}$ values are provided in Tables A.1 and A.2 for ROS 1 and ROS 2, respectively.

2.5.6 $A_{XY}(Z)$ factors adjust the surveillance to the reference conditions assumed in generating the $[T(Z)]^{COLR}$ factors. $A_{XY}(Z)$ may be assumed to be equal to 1.0 or may be determined for specific surveillance conditions using the approved methods listed in TS 5.9.5.

2.5.7 The R_j penalty factors account for the potential decrease in transient F_Q margin between surveillances. The R_j factors for ROS 1 and ROS 2 are provided in Tables A.3 and A.4 respectively.

2.5.8 Table A.5 provides the required limits on THERMAL POWER and the required AFD reductions for each ROS in the event that additional margin is required.

2.6 NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR – $F_{\Delta H}^{N}$ (LCO 3.2.2)

$F_{\Delta H}^{N} \leq F_{\Delta H}^{RTP} * (1 + PF * (1-P))$

where P = Thermal Power / Rated Thermal Power

$F_{\Delta H}^{RTP}$ = 1.65 for RFA-2 fuel

PF = 0.3

2.7 AXIAL FLUX DIFFERENCE - AFD (LCO 3.2.3)

2.7.1 The AFD limits for RAOC operating spaces (ROS 1 and ROS 2) and corresponding AFD reduction limits (RA-1 and RA-2) are provided in Figure 3.

2.8 REFUELING BORON CONCENTRATION (LCO 3.9.1)

2.8.1 The refueling boron concentration shall be ≥ 2300 ppm.

3.0 NUMBER OF TPBARS IN REACTOR CORE (TS 4.2.1)

3.0.1 There are 1792 tritium producing burnable absorber rods (TPBARs) in the reactor core for Cycle 19.

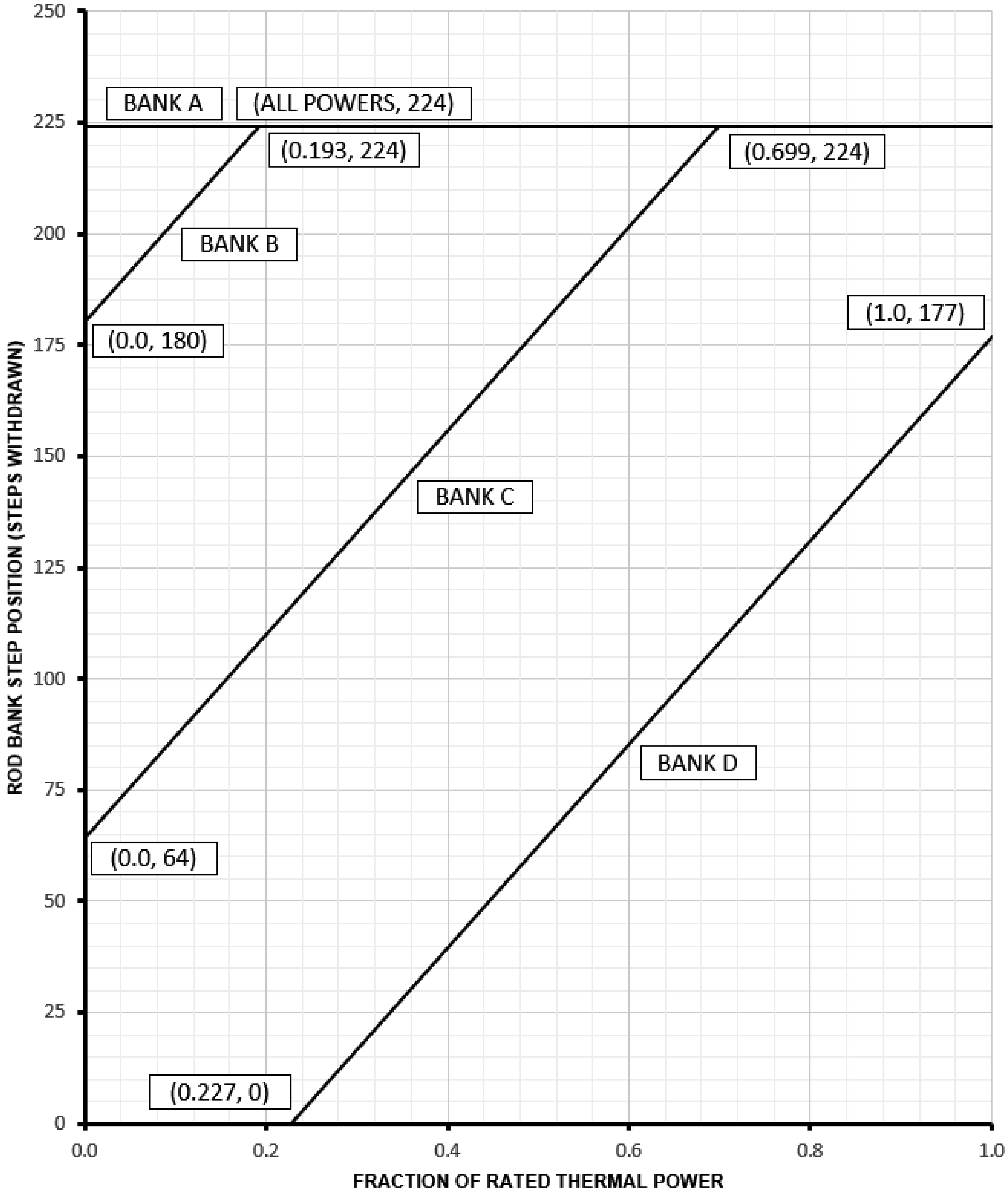


Figure 1
Control Bank Insertion Limits Versus Thermal Power
Four Loop Operation

Note: Fully withdrawn region shall be the condition where shutdown and control banks are at a position within the interval of ≥ 224 and ≤ 231 steps withdrawn.

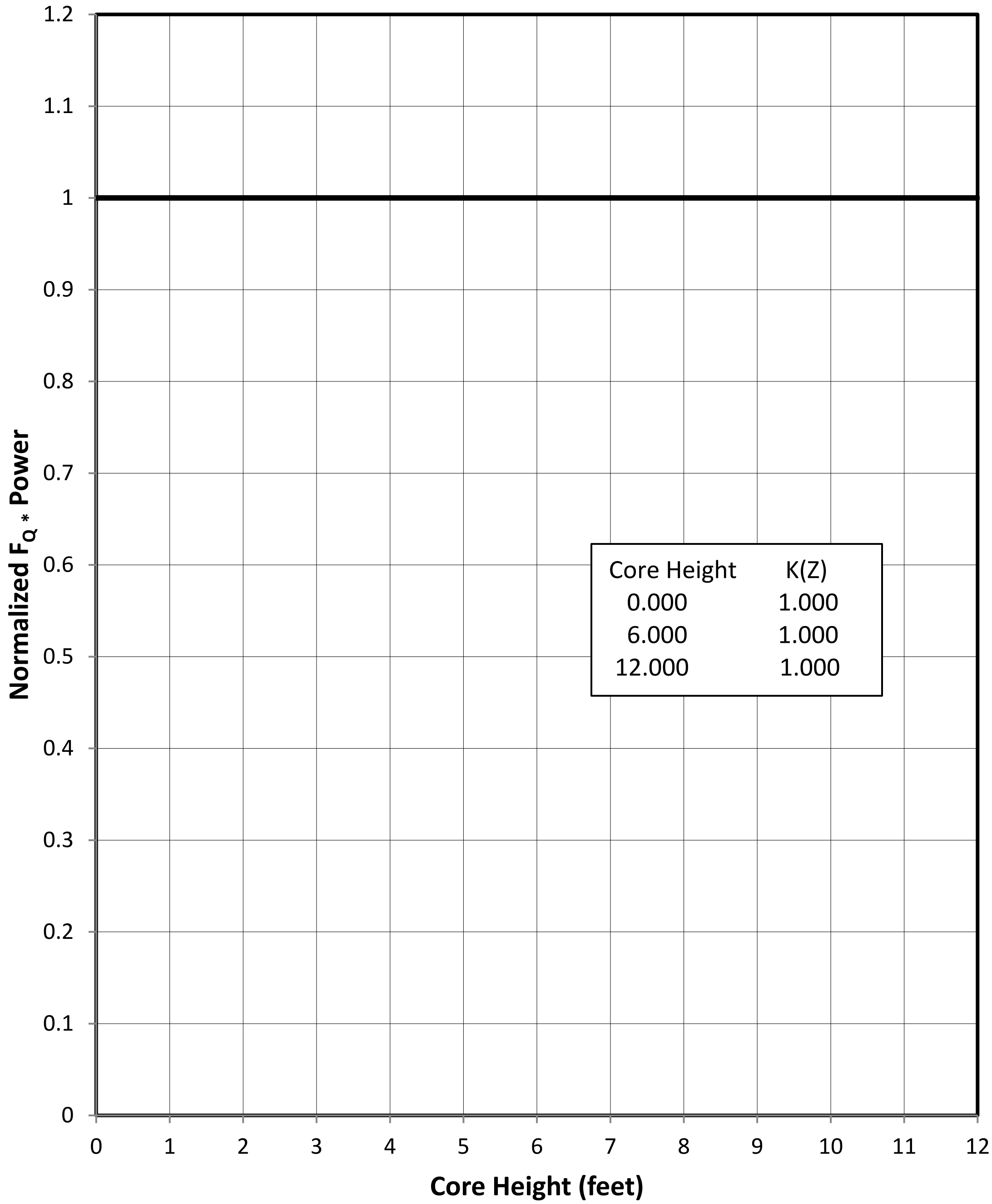
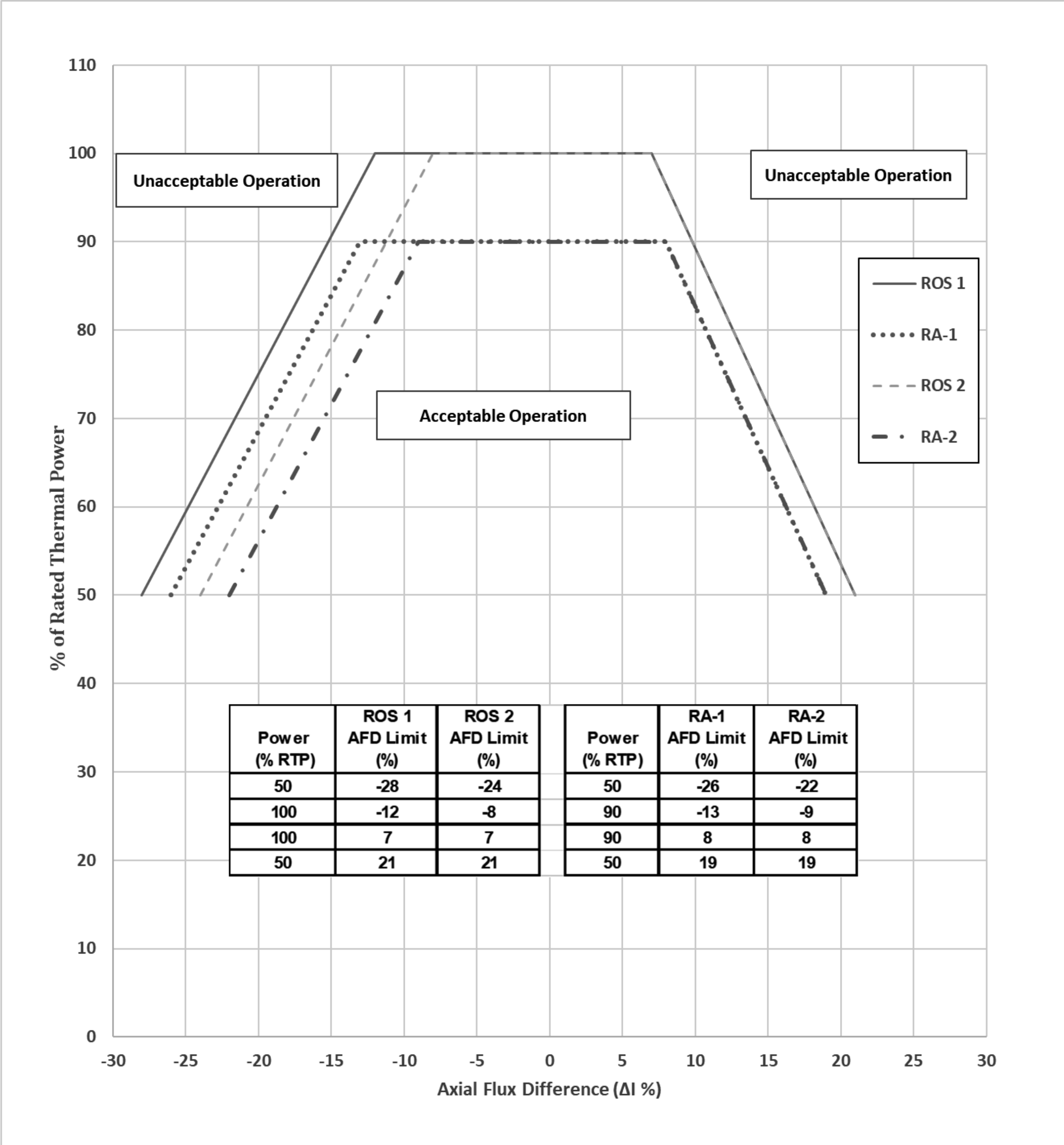


Figure 2
K(Z) - Normalized $F_Q(Z)$ as a Function of Core Height



Power (% RTP)	ROS 1 AFD Limit (%)	ROS 2 AFD Limit (%)
50	-28	-24
100	-12	-8
100	7	7
50	21	21

Power (% RTP)	RA-1 AFD Limit (%)	RA-2 AFD Limit (%)
50	-26	-22
90	-13	-9
90	8	8
50	19	19

Figure 3
Axial Flux Difference Acceptable Operation Limits as a function of Rated Thermal Power (RAOC)

Table A.1
$[T(Z)]^{COLR}$ Factors for ROS 1

Height (ft)	150 MWD/MTU	4000 MWD/MTU	8000 MWD/MTU	12000 MWD/MTU	14000 MWD/MTU	18000 MWD/MTU
12.0720	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11.8708	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11.6696	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11.4684	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11.2672	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11.0660	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
10.8648	0.9796	0.9230	0.9580	1.0419	1.0744	1.1355
10.6636	1.0442	0.9999	1.0417	1.1230	1.1493	1.1986
10.4624	1.1460	1.1090	1.1499	1.2256	1.2555	1.2860
10.2612	1.1735	1.1527	1.1884	1.2542	1.2714	1.3002
10.0600	1.1248	1.1256	1.1572	1.2109	1.2256	1.2472
9.8588	1.1405	1.1559	1.1828	1.2207	1.2322	1.2469
9.6576	1.2263	1.2457	1.2664	1.2941	1.2991	1.2978
9.4564	1.2408	1.2639	1.2858	1.2987	1.3020	1.2949
9.2552	1.1828	1.2107	1.2344	1.2454	1.2468	1.2347
9.0540	1.1601	1.1942	1.2128	1.2157	1.2174	1.2074
8.8528	1.2475	1.2808	1.2856	1.2820	1.2780	1.2651
8.6516	1.3083	1.3406	1.3377	1.3283	1.3204	1.3033
8.4504	1.2826	1.3161	1.3168	1.3015	1.2971	1.2820
8.2492	1.2278	1.2628	1.2667	1.2465	1.2449	1.2346
8.0480	1.2954	1.3286	1.3261	1.2970	1.2942	1.2811
7.8468	1.3550	1.3870	1.3772	1.3373	1.3333	1.3181
7.6456	1.3229	1.3564	1.3460	1.3031	1.3000	1.2878
7.4444	1.2487	1.2843	1.2761	1.2343	1.2329	1.2260
7.2432	1.2748	1.3073	1.2952	1.2465	1.2437	1.2366
7.0420	1.3574	1.3865	1.3615	1.3014	1.2956	1.2854
6.8408	1.3775	1.4065	1.3714	1.3032	1.2946	1.2850
6.6396	1.3112	1.3458	1.3081	1.2436	1.2333	1.2256
6.4384	1.2960	1.3335	1.2887	1.2238	1.2120	1.2006
6.2372	1.3809	1.4169	1.3553	1.2803	1.2637	1.2425
6.0360	1.3993	1.4323	1.3610	1.2839	1.2645	1.2372
5.8348	1.3331	1.3670	1.2997	1.2246	1.2060	1.1810
5.6336	1.2851	1.3204	1.2523	1.1802	1.1582	1.1393
5.4324	1.3634	1.3947	1.3180	1.2346	1.2109	1.1815
5.2312	1.4162	1.4444	1.3642	1.2719	1.2468	1.2155
5.0300	1.4085	1.4359	1.3594	1.2658	1.2415	1.2127
4.8288	1.4005	1.4280	1.3549	1.2625	1.2374	1.2095
4.6276	1.4053	1.4320	1.3618	1.2701	1.2444	1.2179
4.4264	1.4209	1.4458	1.3785	1.2873	1.2630	1.2334
4.2252	1.3988	1.4235	1.3638	1.2795	1.2564	1.2261
4.0240	1.3161	1.3426	1.2971	1.2283	1.2076	1.1807
3.8228	1.3122	1.3365	1.2989	1.2385	1.2180	1.1896
3.6216	1.3787	1.3978	1.3618	1.3051	1.2838	1.2471
3.4204	1.3903	1.4069	1.3790	1.3277	1.3124	1.2726
3.2192	1.3680	1.3820	1.3669	1.3260	1.3171	1.2793
3.0180	1.3514	1.3639	1.3619	1.3347	1.3270	1.2918
2.8168	1.3520	1.3679	1.3707	1.3663	1.3541	1.3207
2.6156	1.3605	1.3754	1.3869	1.4017	1.3914	1.3620
2.4144	1.3192	1.3308	1.3563	1.3909	1.3879	1.3682
2.2132	1.2306	1.2412	1.2824	1.3379	1.3437	1.3451
2.0120	1.2427	1.2462	1.3000	1.3751	1.3881	1.3917
1.8108	1.2754	1.2696	1.3344	1.4290	1.4491	1.4627
1.6096	1.2248	1.2127	1.2887	1.4027	1.4324	1.4625
1.4084	1.1456	1.1276	1.2108	1.3396	1.3781	1.4249
1.2072	1.0806	1.0553	1.1423	1.2843	1.3316	1.3967
1.0060	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.8048	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.6036	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.4024	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.2012	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table A.2
$[T(Z)]^{COLR}$ Factors for ROS 2

Height (ft)	150 MWD/MTU	4000 MWD/MTU	8000 MWD/MTU	12000 MWD/MTU	14000 MWD/MTU	18000 MWD/MTU
12.0720	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11.8708	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11.6696	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11.4684	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11.2672	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11.0660	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
10.8648	0.9796	0.9185	0.9427	1.0323	1.0554	1.1118
10.6636	1.0442	0.9945	1.0270	1.1138	1.1284	1.1780
10.4624	1.1460	1.1056	1.1411	1.2168	1.2304	1.2666
10.2612	1.1735	1.1527	1.1862	1.2467	1.2592	1.2835
10.0600	1.1248	1.1255	1.1552	1.2052	1.2163	1.2342
9.8588	1.1406	1.1559	1.1829	1.2169	1.2318	1.2343
9.6576	1.2235	1.2457	1.2664	1.2826	1.2991	1.2845
9.4564	1.2337	1.2639	1.2858	1.2885	1.3008	1.2803
9.2552	1.1771	1.2107	1.2325	1.2405	1.2447	1.2320
9.0540	1.1606	1.1849	1.2087	1.2152	1.2148	1.2074
8.8528	1.2473	1.2613	1.2829	1.2820	1.2757	1.2651
8.6516	1.3083	1.3180	1.3352	1.3283	1.3189	1.3033
8.4504	1.2826	1.2939	1.3133	1.3015	1.2943	1.2820
8.2492	1.2278	1.2414	1.2619	1.2465	1.2416	1.2346
8.0480	1.2954	1.3083	1.3195	1.2970	1.2901	1.2811
7.8468	1.3550	1.3687	1.3685	1.3373	1.3285	1.3181
7.6456	1.3229	1.3420	1.3357	1.3031	1.2949	1.2878
7.4444	1.2487	1.2741	1.2646	1.2343	1.2278	1.2260
7.2432	1.2748	1.3022	1.2817	1.2465	1.2384	1.2366
7.0420	1.3574	1.3846	1.3457	1.3014	1.2900	1.2854
6.8408	1.3775	1.4064	1.3498	1.3032	1.2890	1.2850
6.6396	1.3112	1.3458	1.2902	1.2436	1.2279	1.2256
6.4384	1.2960	1.3335	1.2751	1.2238	1.2076	1.2006
6.2372	1.3809	1.4169	1.3472	1.2803	1.2599	1.2425
6.0360	1.3993	1.4324	1.3594	1.2839	1.2618	1.2375
5.8348	1.3333	1.3658	1.2997	1.2246	1.2043	1.1782
5.6336	1.2819	1.3148	1.2520	1.1802	1.1574	1.1379
5.4324	1.3533	1.3848	1.3121	1.2336	1.2055	1.1802
5.2312	1.3991	1.4291	1.3508	1.2677	1.2400	1.2080
5.0300	1.3865	1.4156	1.3402	1.2595	1.2334	1.1985
4.8288	1.3721	1.3999	1.3306	1.2533	1.2279	1.1907
4.6276	1.3739	1.3994	1.3323	1.2576	1.2325	1.1932
4.4264	1.3845	1.4068	1.3435	1.2712	1.2462	1.2043
4.2252	1.3586	1.3798	1.3243	1.2586	1.2353	1.1933
4.0240	1.2745	1.2985	1.2552	1.2023	1.1832	1.1456
3.8228	1.2667	1.2904	1.2520	1.2061	1.1886	1.1503
3.6216	1.3275	1.3473	1.3118	1.2639	1.2461	1.2046
3.4204	1.3314	1.3501	1.3260	1.2815	1.2617	1.2282
3.2192	1.3075	1.3221	1.3095	1.2777	1.2648	1.2320
3.0180	1.3033	1.2990	1.3054	1.2836	1.2716	1.2419
2.8168	1.3115	1.2989	1.3169	1.3056	1.2903	1.2642
2.6156	1.3211	1.3056	1.3346	1.3333	1.3193	1.2984
2.4144	1.2794	1.2625	1.3053	1.3213	1.3135	1.3016
2.2132	1.1927	1.1772	1.2336	1.2688	1.2689	1.2768
2.0120	1.2034	1.1817	1.2499	1.3021	1.3080	1.3181
1.8108	1.2340	1.2038	1.2824	1.3510	1.3629	1.3827
1.6096	1.1843	1.1500	1.2379	1.3244	1.3448	1.3801
1.4084	1.1069	1.0694	1.1625	1.2633	1.2918	1.3426
1.2072	1.0434	1.0001	1.0963	1.2098	1.2463	1.3141
1.0060	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.8048	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.6036	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.4024	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.2012	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table A.3
Rj Margin Decrease Factors for ROS 1

Cycle Burnup (MWD/MTU)	R_j	Cycle Burnup (MWD/MTU)	R_j	Cycle Burnup (MWD/MTU)	R_j
≤150	1.0000	7727	1.0096	15304	1.0000
339	1.0000	7916	1.0093	15493	1.0000
529	1.0000	8106	1.0091	15683	1.0000
718	1.0021	8295	1.0087	15872	1.0000
908	1.0054	8485	1.0083	16061	1.0000
1097	1.0081	8674	1.0123	16251	1.0000
1287	1.0102	8863	1.0116	16440	1.0000
1476	1.0118	9053	1.0108	16630	1.0000
1665	1.0133	9242	1.0099	16819	1.0000
1855	1.0147	9432	1.0089	17009	1.0000
2044	1.0153	9621	1.0084	17198	1.0000
2234	1.0152	9811	1.0103	17387	1.0000
2423	1.0146	10000	1.0120	17577	1.0000
2612	1.0134	10189	1.0091	17766	1.0000
2802	1.0118	10379	1.0108	17956	1.0000
2991	1.0100	10568	1.0125	18145	1.0003
3181	1.0080	10758	1.0141	18334	1.0002
3370	1.0061	10947	1.0158	18524	1.0002
3560	1.0045	11136	1.0168	18713	1.0003
3749	1.0030	11326	1.0153	18903	1.0002
3938	1.0018	11515	1.0132	19092	1.0002
4128	1.0009	11705	1.0119	19282	1.0002
4317	1.0003	11894	1.0106	19471	1.0002
4507	1.0000	12084	1.0095	19660	1.0002
4696	1.0000	12273	1.0084	≥19850	1.0001
4886	1.0000	12462	1.0075		
5075	1.0000	12652	1.0065		
5264	1.0000	12841	1.0057		
5454	1.0000	13031	1.0057		
5643	1.0000	13220	1.0049		
5833	1.0000	13410	1.0041		
6022	1.0000	13599	1.0034		
6211	1.0000	13788	1.0026		
6401	1.0002	13978	1.0020		
6590	1.0028	14167	1.0014		
6780	1.0050	14357	1.0010		
6969	1.0069	14546	1.0006		
7159	1.0083	14735	1.0003		
7348	1.0097	14925	1.0001		
7537	1.0097	15114	1.0000		

Table A.4
Rj Margin Decrease Factors for ROS 2

Cycle Burnup (MWD/MTU)	R_j	Cycle Burnup (MWD/MTU)	R_j	Cycle Burnup (MWD/MTU)	R_j
≤150	1.0000	7727	1.0051	15304	1.0000
339	1.0000	7916	1.0067	15493	1.0000
529	1.0033	8106	1.0073	15683	1.0000
718	1.0084	8295	1.0065	15872	1.0000
908	1.0117	8485	1.0057	16061	1.0000
1097	1.0126	8674	1.0052	16251	1.0000
1287	1.0123	8863	1.0042	16440	1.0000
1476	1.0129	9053	1.0033	16630	1.0000
1665	1.0122	9242	1.0025	16819	1.0000
1855	1.0113	9432	1.0018	17009	1.0000
2044	1.0111	9621	1.0013	17198	1.0000
2234	1.0102	9811	1.0009	17387	1.0000
2423	1.0089	10000	1.0006	17577	1.0000
2612	1.0075	10189	1.0000	17766	1.0000
2802	1.0064	10379	1.0012	17956	1.0001
2991	1.0058	10568	1.0027	18145	1.0006
3181	1.0062	10758	1.0043	18334	1.0012
3370	1.0055	10947	1.0059	18524	1.0019
3560	1.0045	11136	1.0074	18713	1.0021
3749	1.0031	11326	1.0089	18903	1.0021
3938	1.0019	11515	1.0088	19092	1.0021
4128	1.0010	11705	1.0071	19282	1.0020
4317	1.0003	11894	1.0060	19471	1.0018
4507	1.0000	12084	1.0051	19660	1.0016
4696	1.0000	12273	1.0043	≥19850	1.0014
4886	1.0000	12462	1.0036		
5075	1.0000	12652	1.0029		
5264	1.0000	12841	1.0024		
5454	1.0000	13031	1.0032		
5643	1.0000	13220	1.0029		
5833	1.0000	13410	1.0025		
6022	1.0000	13599	1.0021		
6211	1.0000	13788	1.0017		
6401	1.0000	13978	1.0014		
6590	1.0000	14167	1.0011		
6780	1.0000	14357	1.0008		
6969	1.0000	14546	1.0006		
7159	1.0000	14735	1.0004		
7348	1.0009	14925	1.0002		
7537	1.0030	15114	1.0001		

Table A.5
Required THERMAL POWER Limits and AFD Reductions

RAOC Operating Space	Required $F_Q^W(Z)$ Margin Improvement (%)	Required THERMAL POWER Limit (%RTP)	Required AFD Reduction
ROS 1	≤5.5	≤90	See Figure 3 RA-1
	>5.5	<50	N/A
ROS 2	≤6.3	≤90	See Figure 3 RA-2
	>6.3	<50	N/A