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PSEG
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LR-N00-0438

United States Nuclear Regulatory Commission
Document Control Desk
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Gentlemen:

CORE OPERATING LIMITS REPORT - CYCLE 10, REVISION 2
HOPE CREEK GENERATING STATION
FACILITY OPERATING LICENSE NPF-57
DOCKET NO. 50-354

In accordance with section 6.9.1.9 of the Hope Creek Technical Specifications, PSEG Nuclear LLC submits Revision 2 of the Core Operating Limits Report (COLR) for Hope Creek Cycle 10 (Report NFS-0181) as Attachment 1 to this letter.

Revision 2 of the COLR corrects typographical errors and relocates the lattice dependent average planar linear heat generation rates (APLHGRs) for GE9B fuel into the body of the report. In addition, errors in planar exposure for fuel bundle HD08 were corrected in Tables 2.1-7 and 2.1-8 and the associated APLHGR limits were recalculated. The changes have no effect on core operating limits in Cycle 10 to date.

Should you have any questions, please contact Mr. Paul Duke at (856) 339-1466.

Sincerely,

G. Salamon
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Attachment

A001

95-2.

NOV 1 6 2000

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Hope Creek Generating Station

Core Operating Limits Report

Cycle 10/ Reload 9

Effective Date: September 22, 2000

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Reviewed By: Shie-Jeng Peng, Senior Nuclear Engineer — Approved Date: 9/21/2000 September 21, 2000

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1.0 INTRODUCTION

The purpose of this report is to provide the Core Operating Limits for Hope Creek Generation Station Unit 1 Cycle 10/ Reload 9 operation. In addition, this report will provide cycle information on single recirculation loop operation, nominal scram speed and determination of the Core Maximum Fraction of Limiting Power Density. Finally, this report also provides a reference to the most recent revision of the implemented approved methodology. The limits presented here correspond to the core thermal limits for Average Planar Linear Heat Generation Rate (APLHGR), Minimum Critical Power Ratio (MCPR), Power dependent MCPR ($MCPR_p$), Flow dependent MCPR ($MCPR_f$) and Linear Heat Generation Rate (LHGR).

These operating limit values have been determined using NRC approved methods contained in the Reference Safety Report for Boiling Water Reactor Reload Fuel [1], CENPD-300-P-A (Revision 0), and GESTAR-II [5], NEDE-24011-P-A (Revision 13) and are established such that all applicable fuel thermal-mechanical, core thermal-hydraulic, ECCS, and nuclear limits such as shutdown margin, and transient and accident analysis limits are met.

Hope Creek Technical Specifications Section 3.2 references this report as the source for certain LIMITING CONDITIONS FOR OPERATION. These are included in section 2 of this document. Hope Creek Technical Specification 6.9.1.9 also requires that this report, including any mid cycle revisions, shall be provided, upon issuance, to the NRC.

This document is specific to Hope Creek Generating Station Unit 1 Cycle 10 / Reload 9 and shall not be applicable to any other core or cycle design. Revision 2 of this report is applicable for cycle 10 operation from the date of issuance through the end of effective full power capability or a cycle exposure of 11732*MWd/MTU*, whichever occurs first [2] and for coastdown operation at reduced power to a cycle exposure of 12704*MWd/MTU*. End of effective full power capability is reached when 100% rated power can no longer be maintained by increasing core flow (up to 105% of rated core flow), at rated feedwater temperatures, in the all-rods-out configuration.

2.0 TECHNICAL SPECIFICATIONS THAT REFERENCE THE COLR

The TECHNICAL SPECIFICATIONS THAT REFERENCE THE COLR presented in this section are referenced by the Hope Creek Technical Specifications.

Tech. Spec.	Title
2.1	Safety Limit Bases
3/4.2.1	Average Planar Linear Generation Rate
3/4.2.3	Minimum Critical Power Ratio
3/4.2.4	Linear Heat Generation Rate
3/4.4.1	Recirculation System Recirculation Loops
3/4.2b	Power Distribution Bases
3/4.2.1b	Average Planar Linear Heat Generation Rate
6.9.1.9	Administrative Controls

2.1 AVERAGE PLANAR LINEAR HEAT GENERATION RATE

LIMITING CONDITION FOR OPERATION:

All AVERAGE PLANAR LINEAR HEAT GENERATION RATES (APLHGRs) for each type of fuel as a function of AVERAGE PLANAR EXPOSURE shall not exceed the limits specified in Table 2.1-1, Table 2.1-3, Table 2.1-5, Table 2.1-7, Table 2.1-9, Table 2.1-11 and Table 2.1-13.

When the Technical Specification Section 3/4.4.1 ACTION statement a.1.d is entered from that section's LCO, reduce the Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) limit to a value specified in Table 2.1-2, Table 2.1-4, Table 2.1-6, Table 2.1-8, Table 2.1-10, Table 2.1-12 and Table 2.1-14.

When hand calculations are required, all AVERAGE PLANAR LINEAR HEAT GENERATION RATES (APLHGRs) for each type of fuel as a function of AVERAGE EXPOSURE shall not exceed the limits specified in Figures 2.1-2, 2.1-4, 2.1-6, 2.1-8, 2.1-10, 2.1-12 and 2.1-14.

NOTE

Figures 2.1-2, 2.1-4, 2.1-6, 2.1-8, 2.1-10, 2.1-12 and 2.1-14 graphically represent the limiting column of Tables 2.1-1 through 2.1-14.

6 inches	1757 (NATU)	LT23[1]
6 inches	732 (NATU)	LT11
18 inches	1770	LT22
60 inches	1047	LT18
54 inches	1046	LT17
6 inches	732 (NATU)	LT11

NATU = Natural Uranium Lattices, which are not included in the determination of the most limiting lattice APLHGR values.

1. These lattice designators [4] (prefixed with LT) are used in the Core Monitoring System.

Figure 2.1-1: Lattice Definitions for Fuel bundle HC07

Table 2.1-1: APLHGR Data for Fuel Bundle HC07
(Two Recirculation Loop Operation)

Lattice Exposure		Lattice APLHGR Limit (Kw/ft) [1]				
GWD/STU	MWD/MTU	#732 & #1757	#1046	#1047	#1770	Limiting
0.00	0.0	11.80	11.76	11.45	11.79	11.45
0.20	220.5	11.82	11.79	11.45	11.82	11.45
1.00	1102.3	11.92	11.87	11.51	11.91	11.51
2.00	2204.6	12.05	11.97	11.63	12.02	11.63
3.00	3306.9	12.18	12.07	11.79	12.14	11.79
4.00	4409.2	12.31	12.17	11.96	12.26	11.96
5.00	5511.5	12.40	12.28	12.16	12.38	12.16
6.00	6613.8	12.43	12.39	12.33	12.51	12.33
7.00	7716.1	12.46	12.50	12.50	12.63	12.50
8.00	8818.4	12.48	12.60	12.62	12.75	12.60
9.00	9920.7	12.50	12.71	12.73	12.85	12.71
10.00	11023.0	12.51	12.82	12.86	12.94	12.82
12.50	13778.8	12.35	12.84	12.85	12.88	12.84
15.00	16534.5	11.98	12.56	12.57	12.56	12.56
20.00	22046.0	11.20	11.93	11.97	11.93	11.93
25.00	27557.5	10.42	11.31	11.37	11.32	11.31
35.00	38580.5	8.87	10.09	10.17	10.10	10.09
45.00	49603.5	6.00	8.44	8.61	8.45	8.44
46.61	51378.2	5.19	7.64	7.81	7.65	7.64
50.22	55357.5		5.86		5.86	5.86
50.52	55688.2			5.88		

1. See Figure 2.1-1 for the Lattice Definitions for this fuel Assembly.

Table 2.1-2: APLHGR Data for Fuel Bundle HC07
(Single Recirculation Loop Operation)

Lattice Exposure		Lattice APLHGR Limit (Kw/ft) [1]				
GWD/STU	MWD/MTU	#732 & #1757	#1046	#1047	#1770	Limiting
0.00	0.0	10.15	10.11	9.85	10.14	9.85
0.20	220.5	10.17	10.14	9.85	10.17	9.85
1.00	1102.3	10.25	10.21	9.90	10.24	9.90
2.00	2204.6	10.36	10.29	10.00	10.34	10.00
3.00	3306.9	10.47	10.38	10.14	10.44	10.14
4.00	4409.2	10.59	10.47	10.29	10.54	10.29
5.00	5511.5	10.66	10.56	10.46	10.65	10.46
6.00	6613.8	10.69	10.66	10.60	10.76	10.60
7.00	7716.1	10.72	10.75	10.75	10.86	10.75
8.00	8818.4	10.73	10.84	10.85	10.97	10.84
9.00	9920.7	10.75	10.93	10.95	11.05	10.93
10.00	11023.0	10.76	11.03	11.06	11.13	11.03
12.50	13778.8	10.62	11.04	11.05	11.08	11.04
15.00	16534.5	10.30	10.80	10.81	10.80	10.80
20.00	22046.0	9.63	10.26	10.29	10.26	10.26
25.00	27557.5	8.96	9.73	9.78	9.74	9.73
35.00	38580.5	7.63	8.68	8.75	8.69	8.68
45.00	49603.5	5.16	7.26	7.40	7.27	7.26
46.61	51378.2	4.46	6.57	6.72	6.58	6.57
50.22	55357.5		5.04		5.04	5.04
50.52	55688.2			5.06		

1. See Figure 2.1-1 for the Lattice Definitions for this fuel Assembly.

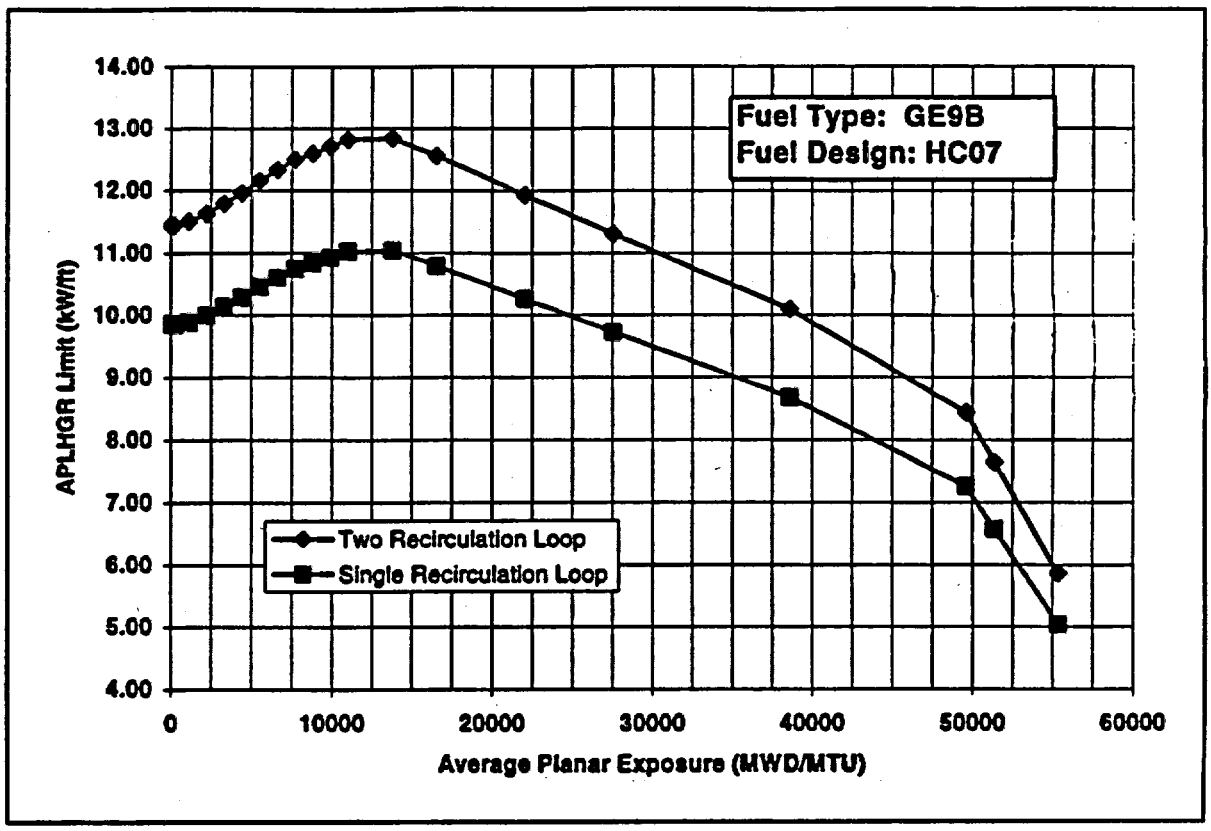


Figure 2.1-2: APLHGR Limit for Fuel Bundle HC07

6 inches	1027 (NATU)	LT16[1]
6 inches	732 (NATU)	LT11
18 inches	1033	LT15
18 inches	1029	LT14
54 inches	1028	LT13
42 inches	1026	LT12
6 inches	732 (NATU)	LT11

NATU = Natural Uranium Lattices, which are not included in the determination of the most limiting lattice APLHGR values.

1. These lattice designators [4] (prefixed with LT) are used in the Core Monitoring System.

Figure 2.1-3: Lattice Definitions for Fuel bundle HB07

Table 2.1-3: APLHGR Data for Fuel Bundle HB07
(Two Recirculation Loop Operation)

Lattice Exposure		Lattice APLHGR Limit (Kw/ft) [1]					
GWD/STU	MWD/MTU	#732 & #1027	#1026	#1028	#1029	#1033	Limiting
0.00	0.0	12.08	12.05	11.57	11.22	12.06	11.22
0.20	220.5	12.10	12.09	11.62	11.29	12.10	11.29
1.00	1102.3	12.20	12.18	11.75	11.40	12.20	11.40
2.00	2204.6	12.34	12.31	11.95	11.56	12.35	11.56
3.00	3306.9	12.34	12.45	12.11	11.71	12.50	11.71
4.00	4409.2	12.37	12.59	12.25	11.88	12.65	11.88
5.00	5511.5	12.40	12.74	12.40	12.05	12.80	12.05
6.00	6613.8	12.43	12.89	12.55	12.23	12.93	12.23
7.00	7716.1	12.46	13.02	12.70	12.43	13.07	12.43
8.00	8818.4	12.48	13.15	12.85	12.61	13.20	12.61
9.00	9920.7	12.50	13.28	12.98	12.78	13.35	12.78
10.00	11023.0	12.51	13.41	13.09	12.94	13.49	12.94
12.50	13778.8	12.35	13.46	13.06	13.01	13.47	13.01
15.00	16534.5	11.98	13.13	12.76	12.75	13.14	12.75
20.00	22046.0	11.20	12.44	12.15	12.14	12.45	12.14
25.00	27557.5	10.42	11.78	11.51	11.50	11.80	11.50
35.00	38580.5	8.87	10.53	10.23	10.21	10.54	10.21
45.00	49603.5	6.00	9.12	8.67	8.56	9.13	8.56
46.61	51378.2	5.19	8.33	7.87	7.75	8.34	7.75
50.36	55511.8		6.48	5.99	5.87	6.51	5.87
50.60	55776.4			5.87			
51.61	56889.7		5.87				
51.69	56977.9					5.86	

1. See Figure 2.1-3 for the Lattice Definitions for this fuel Assembly.

Table 2.1-4: APLHGR Data for Fuel Bundle HB07
(Single Recirculation Loop Operation)

Lattice Exposure		Lattice APLHGR Limit (Kw/ft) [1]					
GWD/STU	MWD/MTU	#732 & #1027	#1026	#1028	#1029	#1033	Limiting
0.00	0.0	10.39	10.36	9.95	9.65	10.37	9.65
0.20	220.5	10.41	10.40	9.99	9.71	10.41	9.71
1.00	1102.3	10.49	10.47	10.11	9.80	10.49	9.80
2.00	2204.6	10.61	10.59	10.28	9.94	10.62	9.94
3.00	3306.9	10.61	10.71	10.41	10.07	10.75	10.07
4.00	4409.2	10.64	10.83	10.54	10.22	10.88	10.22
5.00	5511.5	10.66	10.96	10.66	10.36	11.01	10.36
6.00	6613.8	10.69	11.09	10.79	10.52	11.12	10.52
7.00	7716.1	10.72	11.20	10.92	10.69	11.24	10.69
8.00	8818.4	10.73	11.31	11.05	10.84	11.35	10.84
9.00	9920.7	10.75	11.42	11.16	10.99	11.48	10.99
10.00	11023.0	10.76	11.53	11.26	11.13	11.60	11.13
12.50	13778.8	10.62	11.58	11.23	11.19	11.58	11.19
15.00	16534.5	10.30	11.29	10.97	10.97	11.30	10.97
20.00	22046.0	9.63	10.70	10.45	10.44	10.71	10.44
25.00	27557.5	8.96	10.13	9.90	9.89	10.15	9.89
35.00	38580.5	7.63	9.06	8.80	8.78	9.06	8.78
45.00	49603.5	5.16	7.84	7.46	7.36	7.85	7.36
46.61	51378.2	4.46	7.16	6.76	6.67	7.18	6.67
50.36	55511.8		5.58	5.15	5.05	5.60	5.05
50.60	55776.4			5.05			
51.61	56889.7		5.05				
51.69	56977.9					5.04	

1. See Figure 2.1-3 for the Lattice Definitions for this fuel Assembly.

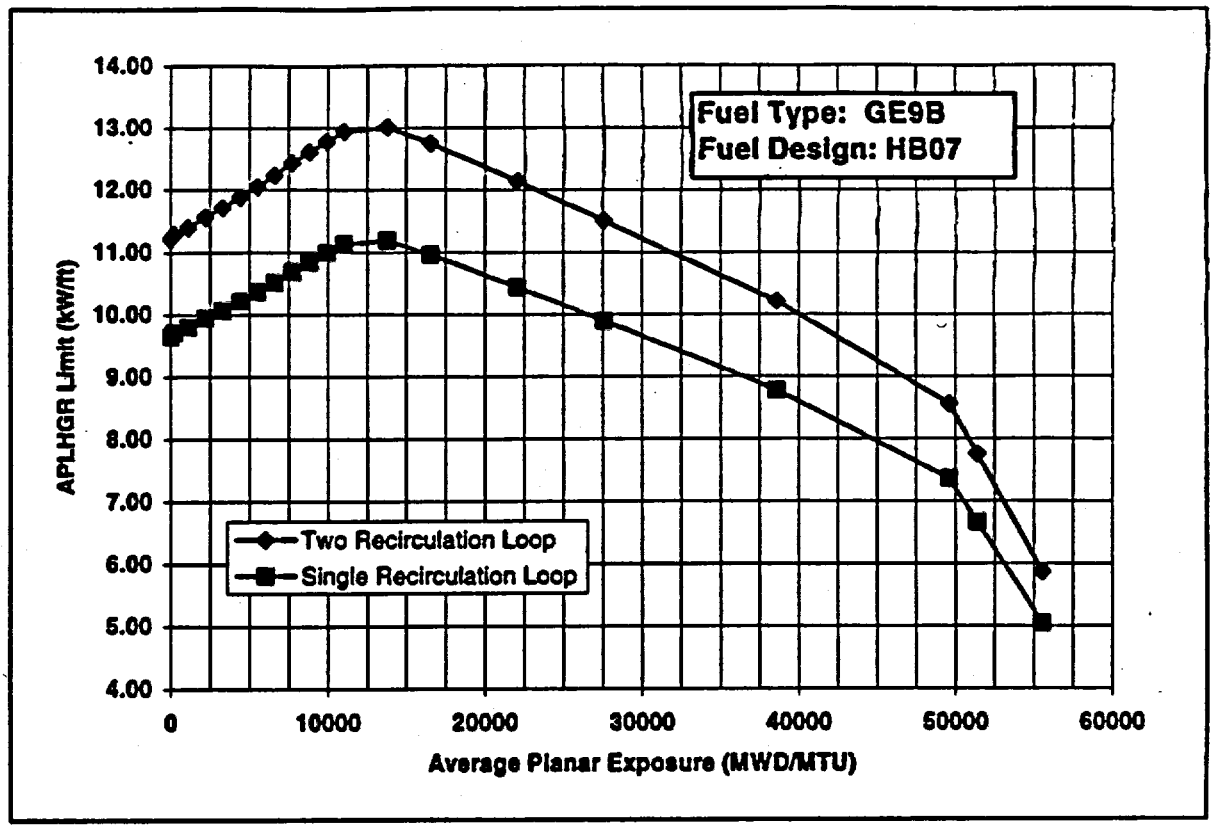


Figure 2.1-4: APLHGR Limit for Fuel Bundle HB07

6 inches	2408 (NATU)	LT31[1]
6 inches	2124 (NATU)	LT11
18 inches	2405	LT28
18 inches	2407	LT30
42 inches	2406	LT29
54 inches	2405	LT28
6 inches	2124 (NATU)	LT11

NATU = Natural Uranium Lattices, which are not included in the determination of the most limiting lattice APLHGR values.

1. These lattice designators [4] (prefixed with LT) are used in the Core Monitoring System.

Figure 2.1-5: Lattice Definitions for Fuel bundle HE08

Table 2.1-5: APLHGR Data for Fuel Bundle HE08
(Two Recirculation Loop Operation)

Lattice Exposure		Lattice APLHGR Limit (Kw/ft) [1]					
GWD/STU	MWD/MTU	#2124	#2405	#2406	#2407	#2408	Limiting
0.00	0.0	12.66	12.68	12.10	11.63	12.72	11.63
0.20	220.5	12.59	12.71	12.14	11.69	12.74	11.69
1.00	1102.3	12.40	12.79	12.24	11.85	12.83	11.85
2.00	2204.6	12.34	12.91	12.40	12.07	12.86	12.07
3.00	3306.9	12.34	13.02	12.57	12.32	12.86	12.32
4.00	4409.2	12.37	13.14	12.76	12.59	12.89	12.59
5.00	5511.5	12.40	13.26	12.95	12.86	12.92	12.86
6.00	6613.8	12.43	13.38	13.15	13.12	12.94	13.12
7.00	7716.1	12.46	13.51	13.36	13.36	12.97	13.36
8.00	8818.4	12.48	13.63	13.54	13.53	12.99	13.53
9.00	9920.7	12.50	13.62	13.62	13.62	13.00	13.62
10.00	11023.0	12.52	13.59	13.59	13.59	13.01	13.59
12.50	13778.8	12.36	13.57	13.57	13.57	12.92	13.57
15.00	16534.5	11.98	13.48	13.49	13.48	12.53	13.48
20.00	22046.0	11.20	12.65	12.87	12.86	11.75	12.65
25.00	27557.5	10.42	11.85	12.13	12.10	10.97	11.85
35.00	38580.5	8.87	10.28	10.49	10.55	9.43	10.28
45.00	49603.5	6.01	8.96	9.10	9.16	7.18	8.96
46.61	51378.2	5.18	8.26	8.39	8.44		8.26
48.53	53494.6		7.43	7.55	7.57	5.38	7.43
52.23	57573.1		5.82				5.82
52.92	58333.7				5.60		
52.98	58399.9			5.59			

1. See Figure 2.1-5 for the Lattice Definitions for this fuel Assembly.

Table 2.1-6: APLHGR Data for Fuel Bundle HE08
(Single Recirculation Loop Operation)

Lattice Exposure		Lattice APLHGR Limit (Kw/ft) [1]					
GWD/STU	MWD/MTU	#2124	#2405	#2406	#2407	#2408	Limiting
0.00	0.0	10.89	10.90	10.41	10.00	10.94	10.00
0.20	220.5	10.83	10.93	10.44	10.05	10.96	10.05
1.00	1102.3	10.66	11.00	10.53	10.19	11.03	10.19
2.00	2204.6	10.61	11.10	10.66	10.38	11.06	10.38
3.00	3306.9	10.61	11.20	10.81	10.60	11.06	10.60
4.00	4409.2	10.64	11.30	10.97	10.83	11.09	10.83
5.00	5511.5	10.66	11.40	11.14	11.06	11.11	11.06
6.00	6613.8	10.69	11.51	11.31	11.28	11.13	11.28
7.00	7716.1	10.72	11.62	11.49	11.49	11.15	11.49
8.00	8818.4	10.73	11.72	11.64	11.64	11.17	11.64
9.00	9920.7	10.75	11.71	11.71	11.71	11.18	11.71
10.00	11023.0	10.77	11.69	11.69	11.69	11.19	11.69
12.50	13778.8	10.63	11.67	11.67	11.67	11.11	11.67
15.00	16534.5	10.30	11.59	11.60	11.59	10.78	11.59
20.00	22046.0	9.63	10.88	11.07	11.06	10.11	10.88
25.00	27557.5	8.96	10.19	10.43	10.41	9.43	10.19
35.00	38580.5	7.63	8.84	9.02	9.07	8.11	8.84
45.00	49603.5	5.17	7.71	7.83	7.88	6.17	7.71
46.61	51378.2	4.45	7.10	7.22	7.26		7.10
48.53	53494.6		6.39	6.49	6.51	4.63	6.39
52.23	57573.1		5.01				5.01
52.92	58333.7				4.82		
52.98	58399.9			4.81			

1. See Figure 2.1-5 for the Lattice Definitions for this fuel Assembly.

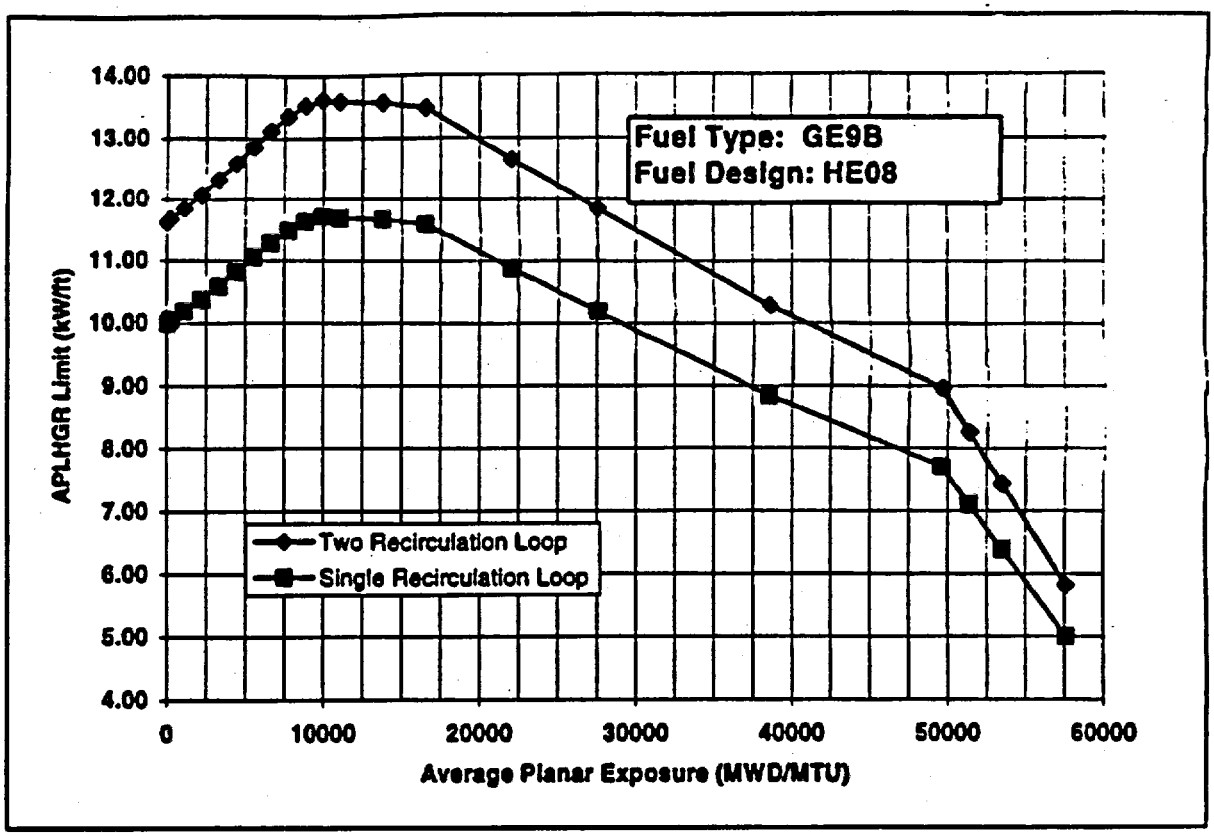
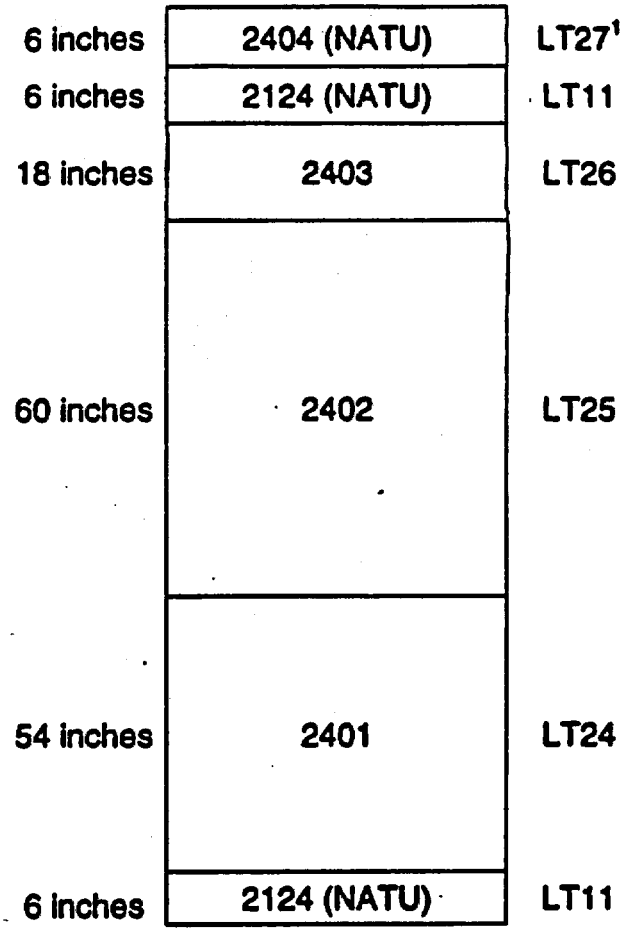


Figure 2.1-6: APLHGR Limit for Fuel Bundle HE08



NATU = Natural Uranium Lattices, which are not included in the determination of the most limiting lattice APLHGR values.

1. These lattice designators [4] (prefixed with LT) are used in the Core Monitoring System.

Figure 2.1-7: Lattice Definitions for Fuel bundle HD08

Table 2.1-7: APLHGR Data for Fuel Bundle HD08
(Two Recirculation Loop Operation)

Lattice Exposure		Lattice APLHGR Limit (Kw/ft) [1]					
GWD/STU	MWD/MTU	#2124	#2401	#2402	#2403	#2404	Limiting
0.00	0.0	12.20	12.05	11.80	12.09	12.20	11.80
0.20	220.5	12.23	12.10	11.83	12.14	12.23	11.83
1.00	1102.3	12.35	12.21	11.93	12.26	12.35	11.93
2.00	2204.6	12.34	12.35	12.08	12.41	12.50	12.08
3.00	3306.9	12.34	12.49	12.23	12.57	12.65	12.23
4.00	4409.2	12.37	12.63	12.39	12.73	12.79	12.39
5.00	5511.5	12.40	12.78	12.55	12.89	12.85	12.55
6.00	6613.8	12.43	12.93	12.66	13.05	12.88	12.66
7.00	7716.1	12.46	13.07	12.77	13.22	12.90	12.77
8.00	8818.4	12.48	13.20	12.88	13.38	12.92	12.88
9.00	9920.7	12.50	13.33	12.99	13.51	12.94	12.99
10.00	11023.0	12.52	13.48	13.10	13.59	12.95	13.10
12.50	13778.8	12.36	13.61	13.16	13.62	12.85	13.16
15.00	16534.5	11.98	13.29	12.87	13.29	12.46	12.87
20.00	22046.0	11.20	12.62	12.26	12.63	11.68	12.26
25.00	27557.5	10.42	11.84	11.66	11.94	10.90	11.66
35.00	38580.5	8.87	10.42	10.36	10.50	9.36	10.36
45.00	49603.5	6.01	9.20	9.00	9.24	7.03	9.00
46.61	51378.2	5.18	8.45	8.20	8.49		8.20
48.28	53219.0		7.68	7.36	7.71	5.36	7.36
51.23	56470.8			5.89			5.89
52.25	57595.2		5.84				
52.27	57617.2				5.84		

1. See Figure 2.1-7 for the Lattice Definitions for this fuel Assembly.

Table 2.1-8: APLHGR Data for Fuel Bundle HD08
(Single Recirculation Loop Operation)

Lattice Exposure		Lattice APLHGR Limit (Kw/ft) [1]					
GWD/STU	MWD/MTU	#2124	#2401	#2402	#2403	#2404	Limiting
0.00	0.0	10.49	10.36	10.15	10.40	10.49	10.15
0.20	220.5	10.52	10.41	10.17	10.44	10.52	10.17
1.00	1102.3	10.62	10.50	10.26	10.54	10.62	10.26
2.00	2204.6	10.61	10.62	10.39	10.67	10.75	10.39
3.00	3306.9	10.61	10.74	10.52	10.81	10.88	10.52
4.00	4409.2	10.64	10.86	10.66	10.95	11.00	10.66
5.00	5511.5	10.66	10.99	10.79	11.09	11.05	10.79
6.00	6613.8	10.69	11.12	10.89	11.22	11.08	10.89
7.00	7716.1	10.72	11.24	10.98	11.37	11.09	10.98
8.00	8818.4	10.73	11.35	11.08	11.51	11.11	11.08
9.00	9920.7	10.75	11.46	11.17	11.62	11.13	11.17
10.00	11023.0	10.77	11.59	11.27	11.69	11.14	11.27
12.50	13778.8	10.63	11.70	11.32	11.71	11.05	11.32
15.00	16534.5	10.30	11.43	11.07	11.43	10.72	11.07
20.00	22046.0	9.63	10.85	10.54	10.86	10.04	10.54
25.00	27557.5	8.96	10.18	10.03	10.27	9.37	10.03
35.00	38580.5	7.63	8.96	8.91	9.03	8.05	8.91
45.00	49603.5	5.17	7.91	7.74	7.95	6.05	7.74
46.61	51378.2	4.45	7.27	7.05	7.30		7.05
48.28	53219.0		6.60	6.33	6.63	4.61	6.33
51.23	56470.8			5.07			5.07
52.25	57595.2		5.02				
52.27	57617.2				5.02		

1. See Figure 2.1-7 for the Lattice Definitions for this fuel Assembly.

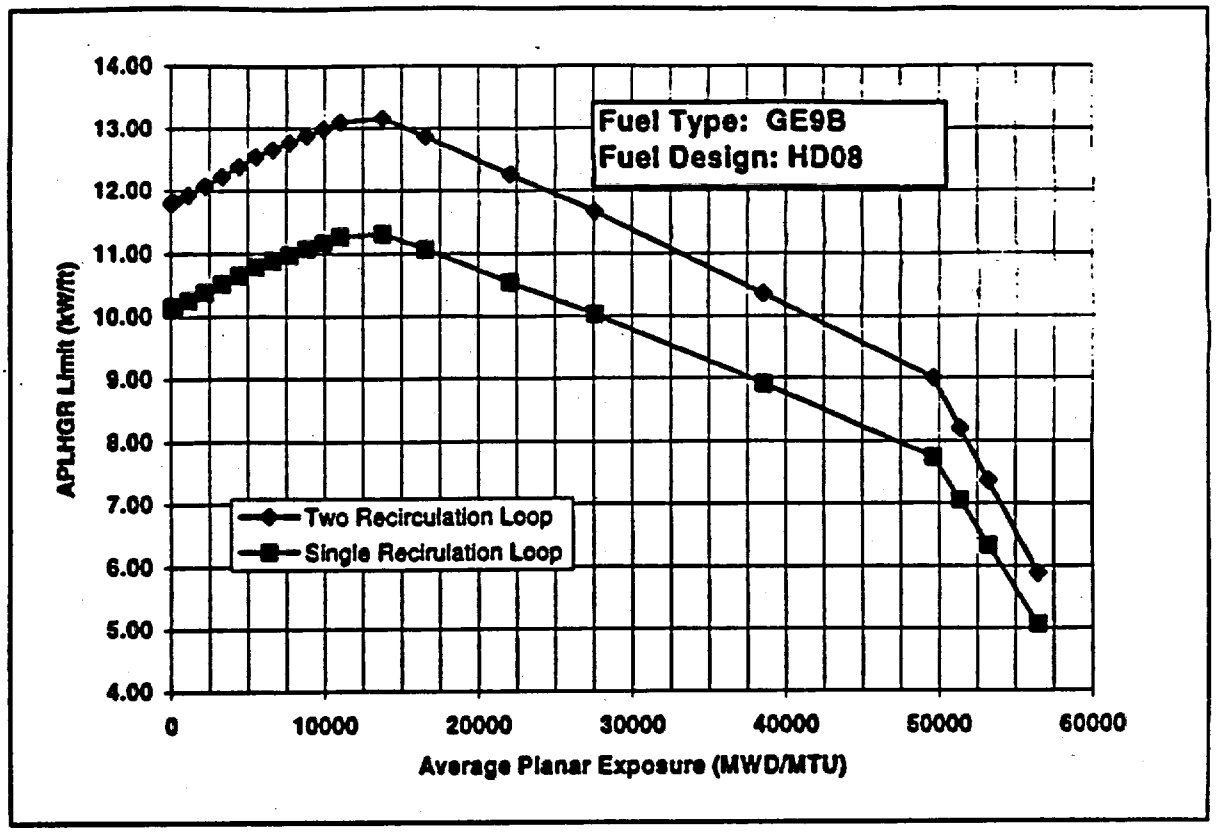
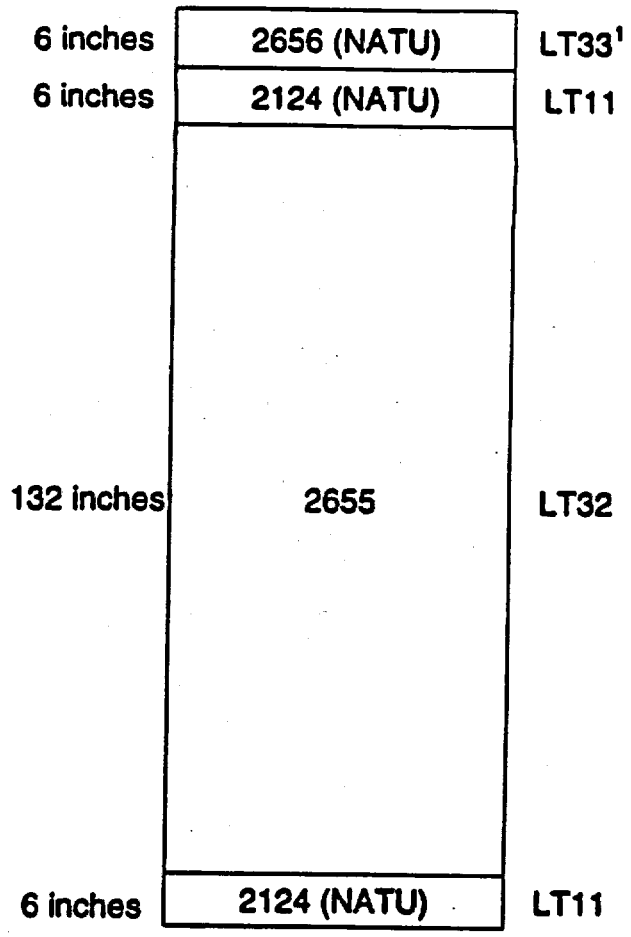


Figure 2.1-8: APLHGR Limit for Fuel Bundle HD08



NATU = Natural Uranium Lattices, which are not included in the determination of the most limiting lattice APLHGR values.

1. These lattice designators [4] (prefixed with LT) are used in the Core Monitoring System.

Figure 2.1-9: Lattice Definitions for Fuel bundle HF09

Table 2.1-9: APLHGR Data for Fuel Bundle HF09
(Two Recirculation Loop Operation)

Lattice Exposure		Lattice APLHGR Limit (Kw/ft) [1]			
GWD/STU	MWD/MTU	#2124	#2655	#2656	Limiting
0.00	0.0	11.89	11.87	11.89	11.87
0.20	220.5	11.92	11.91	11.92	11.91
1.00	1102.3	12.05	12.03	12.05	12.03
2.00	2204.6	12.27	12.21	12.27	12.21
3.00	3306.9	12.34	12.40	12.49	12.40
4.00	4409.2	12.37	12.62	12.69	12.62
5.00	5511.5	12.40	12.85	12.73	12.85
6.00	6613.8	12.43	13.01	12.76	13.01
7.00	7716.1	12.46	13.15	12.79	13.15
8.00	8818.4	12.48	13.30	12.81	13.30
9.00	9920.7	12.50	13.43	12.83	13.43
10.00	11023.0	12.52	13.50	12.85	13.50
12.50	13778.8	12.36	13.49	12.73	13.49
15.00	16534.5	11.98	13.17	12.34	13.17
20.00	22046.0	11.20	12.54	11.56	12.54
25.00	27557.5	10.42	11.75	10.78	11.75
35.00	38580.5	8.87	10.30	9.23	10.30
45.00	49603.5	6.00	9.03	6.76	9.03
46.61	51378.2	5.18	8.29		8.29
47.85	52745.1		7.71	5.31	7.71
52.05	57374.7		5.77		5.77

1. See Figure 2.1-9 for the Lattice Definitions for this fuel Assembly.

Table 2.1-10: APLHGR Data for Fuel Bundle HF09
(Single Recirculation Loop Operation)

Lattice Exposure		Lattice APLHGR Limit (Kw/ft) [1]			
GWD/STU	MWD/MTU	#2124	#2655	#2656	Limiting
0.00	0.0	10.23	10.21	10.23	10.21
0.20	220.5	10.25	10.24	10.25	10.24
1.00	1102.3	10.36	10.35	10.36	10.35
2.00	2204.6	10.55	10.50	10.55	10.50
3.00	3306.9	10.61	10.66	10.74	10.66
4.00	4409.2	10.64	10.85	10.91	10.85
5.00	5511.5	10.66	11.05	10.95	11.05
6.00	6613.8	10.69	11.19	10.97	11.19
7.00	7716.1	10.72	11.31	11.00	11.31
8.00	8818.4	10.73	11.44	11.02	11.44
9.00	9920.7	10.75	11.55	11.03	11.55
10.00	11023.0	10.77	11.61	11.05	11.61
12.50	13778.8	10.63	11.60	10.95	11.60
15.00	16534.5	10.30	11.33	10.61	11.33
20.00	22046.0	9.63	10.78	9.94	10.78
25.00	27557.5	8.96	10.11	9.27	10.11
35.00	38580.5	7.63	8.86	7.94	8.86
45.00	49603.5	5.16	7.77	5.81	7.77
46.61	51378.2	4.45	7.13		7.13
47.85	52745.1		6.63	4.57	6.63
52.05	57374.7		4.96		4.96

1. See Figure 2.1-9 for the Lattice Definitions for this fuel Assembly.

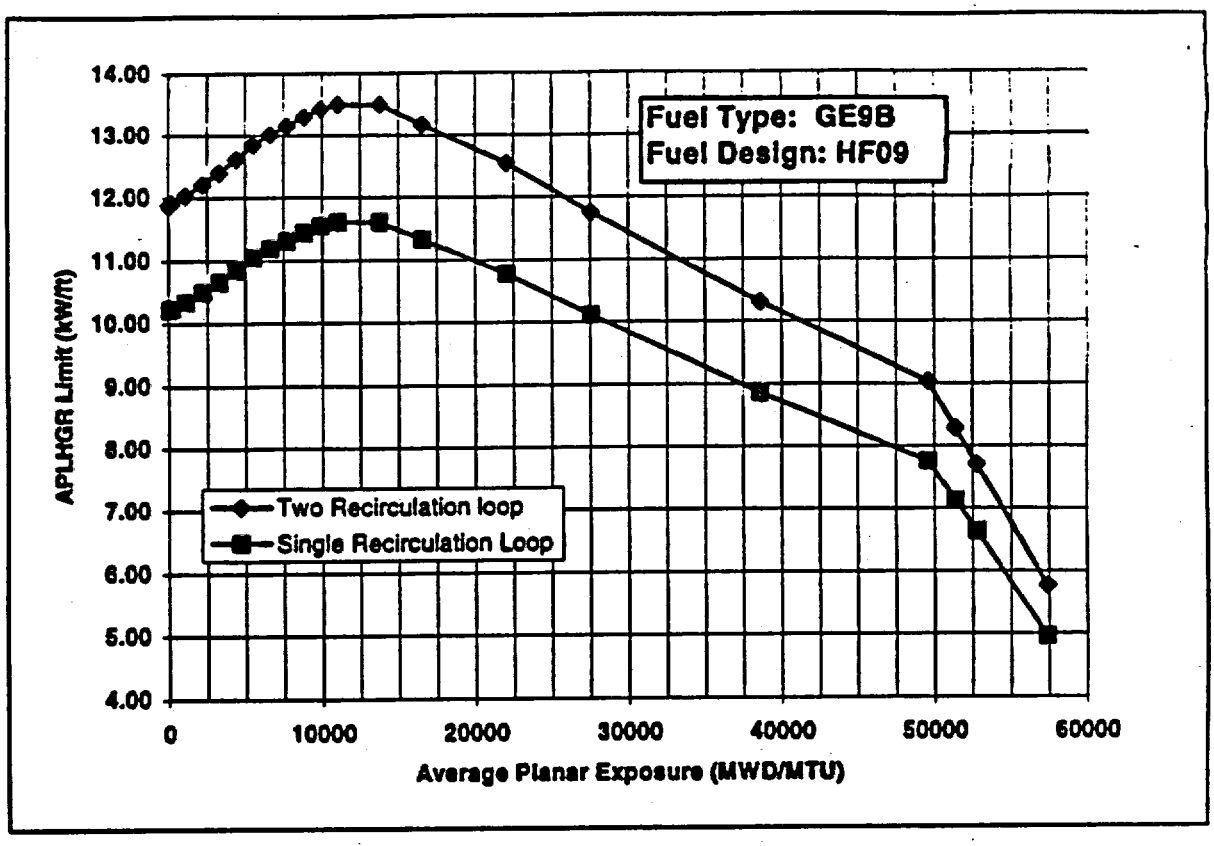
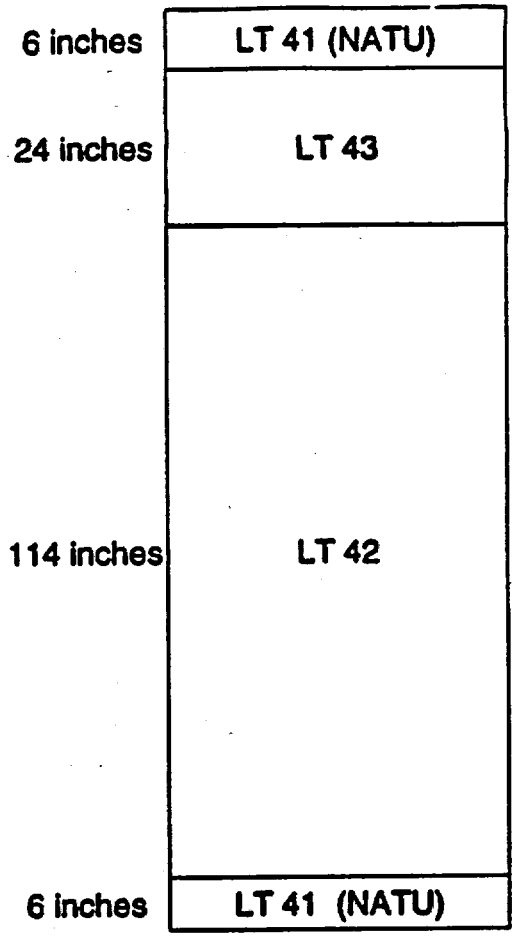


Figure 2.1-10: APLHGR Limit for Fuel Bundle HF09



NATU = Natural Uranium Lattices, which are not included in the determination of the most limiting lattice APLHGR values.

Figure 2.1-11: Lattice Definitions for Fuel bundle PA10

Table 2.1-11: APLHGR Data for Fuel Bundle PA10
(Two Recirculation Loop Operation)

Exposure	Lattice APLHGR Limit (Kw/ft) [1]		
MWD/MTU	LT 41, 42	LT 43	Limiting
0	9.1	9.1	9.1
350	9.1	9.1	9.1
1000	9.2	9.2	9.2
7000	------	9.2	9.2
9500	9.2	8.9	8.9
10000	9.1	------	8.9
14000	8.5	8.5	8.5
18000	8.0	8.0	8.0
22000	7.6	7.6	7.6
24000	7.7	7.7	7.7
26000	8.4	8.4	8.4
28000	8.4	8.4	8.4
34000	8.4	8.4	8.4
42000	8.4	8.4	8.4
52000	8.2	8.2	8.2

1. See Figure 2.1-11 for the Lattice Definitions for this fuel Assembly.

Table 2.1-12: APLHGR Data for Fuel Bundle PA10
(Single Recirculation Loop Operation)

Exposure MWD/MTU	Lattice APLHGR Limit (Kw/ft) [1]		
	LT 41, 42	LT 43	Limiting
0	8.2	8.2	8.2
350	8.2	8.2	8.2
1000	8.3	8.3	8.3
7000	-------	8.3	8.3
9500	8.3	8.0	8.0
10000	8.2	-----	8.0
14000	7.7	7.7	7.7
18000	7.2	7.2	7.2
22000	6.8	6.8	6.8
24000	6.9	6.9	6.9
26000	7.6	7.6	7.6
28000	7.6	7.6	7.6
34000	7.6	7.6	7.6
42000	7.6	7.6	7.6
52000	7.4	7.4	7.4

1. See Figure 2.1-1 for the Lattice Definitions for this fuel Assembly.

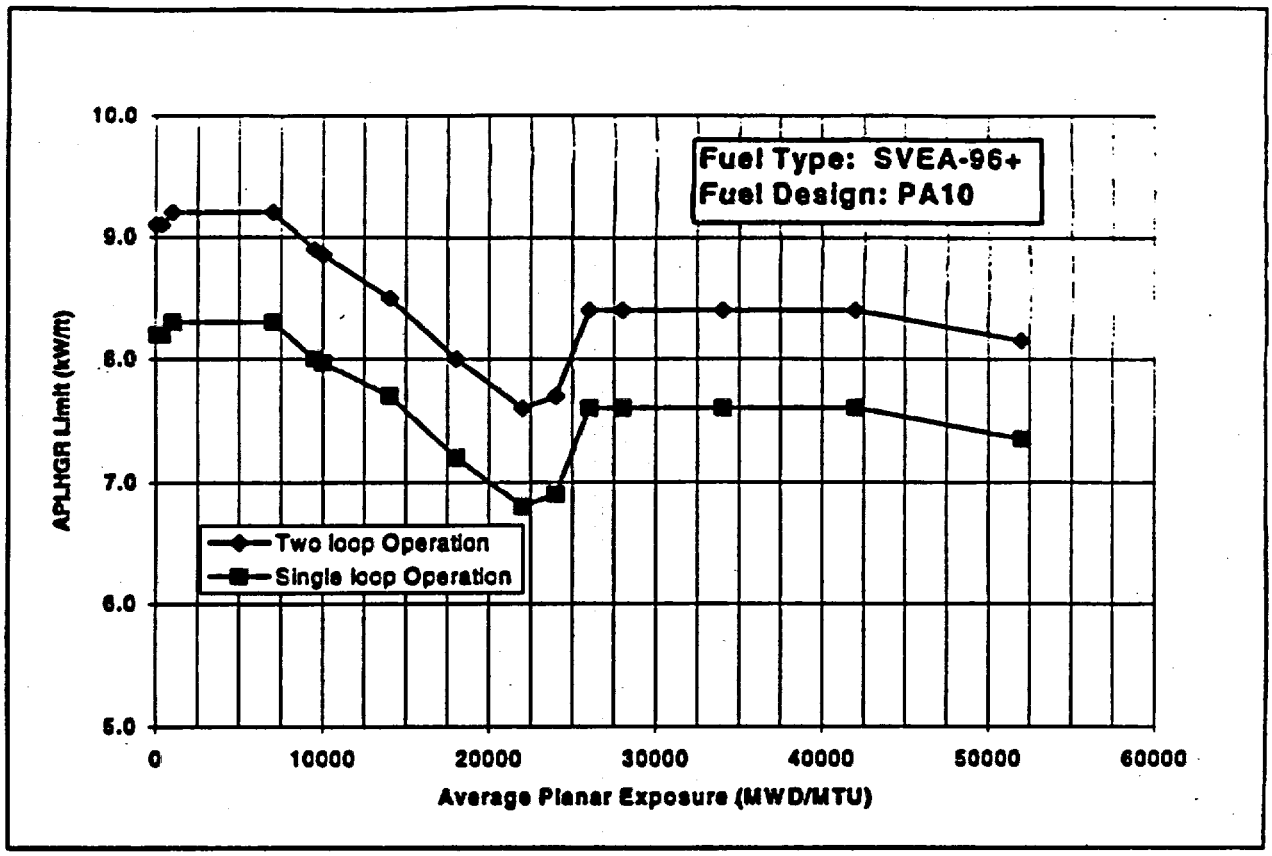
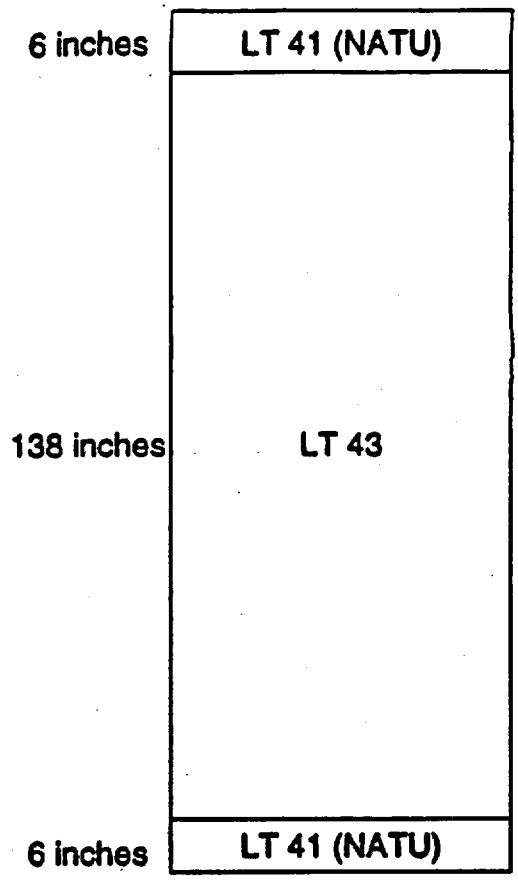


Figure 2.1-12: APLHGR Limit for Fuel Bundle PA10



NATU = Natural Uranium Lattices, which are not included in the determination of the most limiting lattice APLHGR values.

Figure 2.1-13: Lattice Definitions for Fuel bundle PB10

Table 2.1-13: APLHGR Data for Fuel Bundle PB10
(Two Recirculation Loop Operation)

Exposure MWD/MTU	Lattice APLHGR Limit (Kw/ft) [1]		
	LT 41	LT 43	Limiting
0	9.1	9.1	9.1
350	9.1	9.1	9.1
1000	9.2	9.2	9.2
7000	------	9.2	9.2
9500	9.2	8.9	8.9
10000	9.1	-----	8.9
14000	8.5	8.5	8.5
18000	8.0	8.0	8.0
22000	7.6	7.6	7.6
24000	7.7	7.7	7.7
26000	8.4	8.4	8.4
28000	8.4	8.4	8.4
34000	8.4	8.4	8.4
42000	8.4	8.4	8.4
52000	8.2	8.2	8.2

1. See Figure 2.1-13 for the Lattice Definitions for this fuel Assembly.

Table 2.1-14: APLHGR Data for Fuel Bundle PB10
(Single Recirculation Loop Operation)

Exposure MWD/MTU	Lattice APLHGR Limit (Kw/ft) [1]		
	LT 41	LT 43	Limiting
0	8.2	8.2	8.2
350	8.2	8.2	8.2
1000	8.3	8.3	8.3
7000	------	8.3	8.3
9500	8.3	8.0	8.0
10000	8.2	-----	8.0
14000	7.7	7.7	7.7
18000	7.2	7.2	7.2
22000	6.8	6.8	6.8
24000	6.9	6.9	6.9
26000	7.6	7.6	7.6
28000	7.6	7.6	7.6
34000	7.6	7.6	7.6
42000	7.6	7.6	7.6
52000	7.4	7.4	7.4

1. See Figure 2.1-13 for the Lattice Definitions for this fuel Assembly.

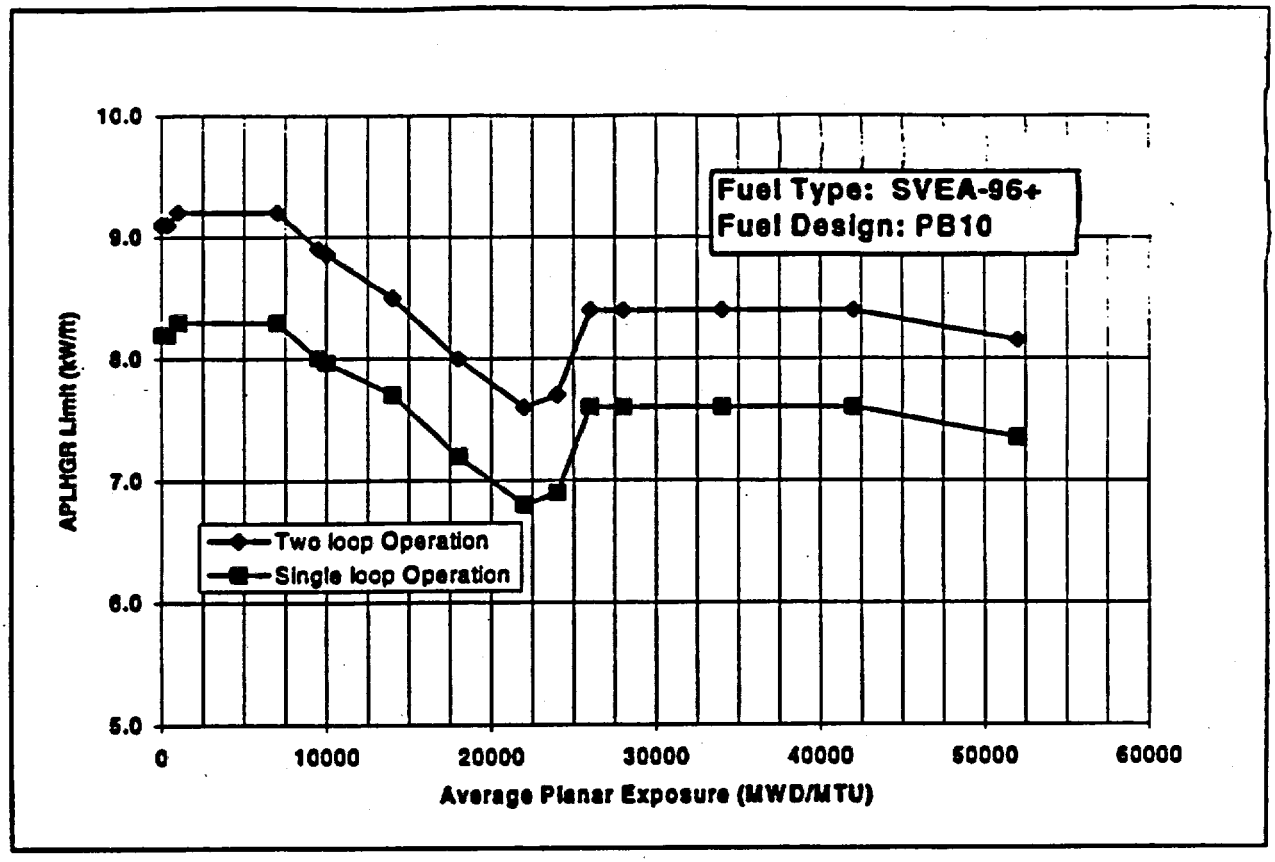


Figure 2.1-14: APLHGR Limit for Fuel Bundle PB10

2.2 MINIMUM CRITICAL POWER RATIO

LIMITING CONDITION FOR OPERATION

The MINIMUM CRITICAL POWER RATIO (MCPR) shall be equal to or greater than the MCPR limit specified in Table 2.2-2 and Table 2.2-3.

The Technical Specification Scram Speed (TSSS) is defined by Hope Creek Technical Specification 3.1.3.3. The Nominal Scram Speed (NSS) is defined in reference [4] and is repeated below in Table 2.2-1.

Table 2.2-1: Nominal Scram Speed

Position Inserted from fully withdrawn	Average Scram Insertion Time (seconds)
Notch 45	0.36
Notch 39	0.65
Notch 25	1.35
Notch 5	2.43

NOTE

The Operating Limit MCPR determined with NSS shall be used when the control rod insertion time is less-than or equal-to that documented in Table 2.2.1. If the control rod insertion time is greater-than that assumed for the NSS then the Operating Limit MCPR shall be determined with the TSSS.

The Operating limit MCPR is the maximum of the 'Full Power,' 'Power Dependent' and 'Flow Dependent' values presented in Tables 2.2.2 and 2.2.3 for the various operating conditions.

The MCPR limit is a function of core average scram speed, Cycle Exposure, EOC-RPT operability and Main Turbine Bypass operability.

EOC-RPT system operability is defined by Hope Creek Technical Specification 3.3.4.2.

Main Turbine Bypass operability is defined by Hope Creek Technical Specification 3.7.7.

Table 2.2-2: Hope Creek Cycle 10 MCPR Operating limits:
Cycle Exposure ≤ 7701*MWd/MTU*

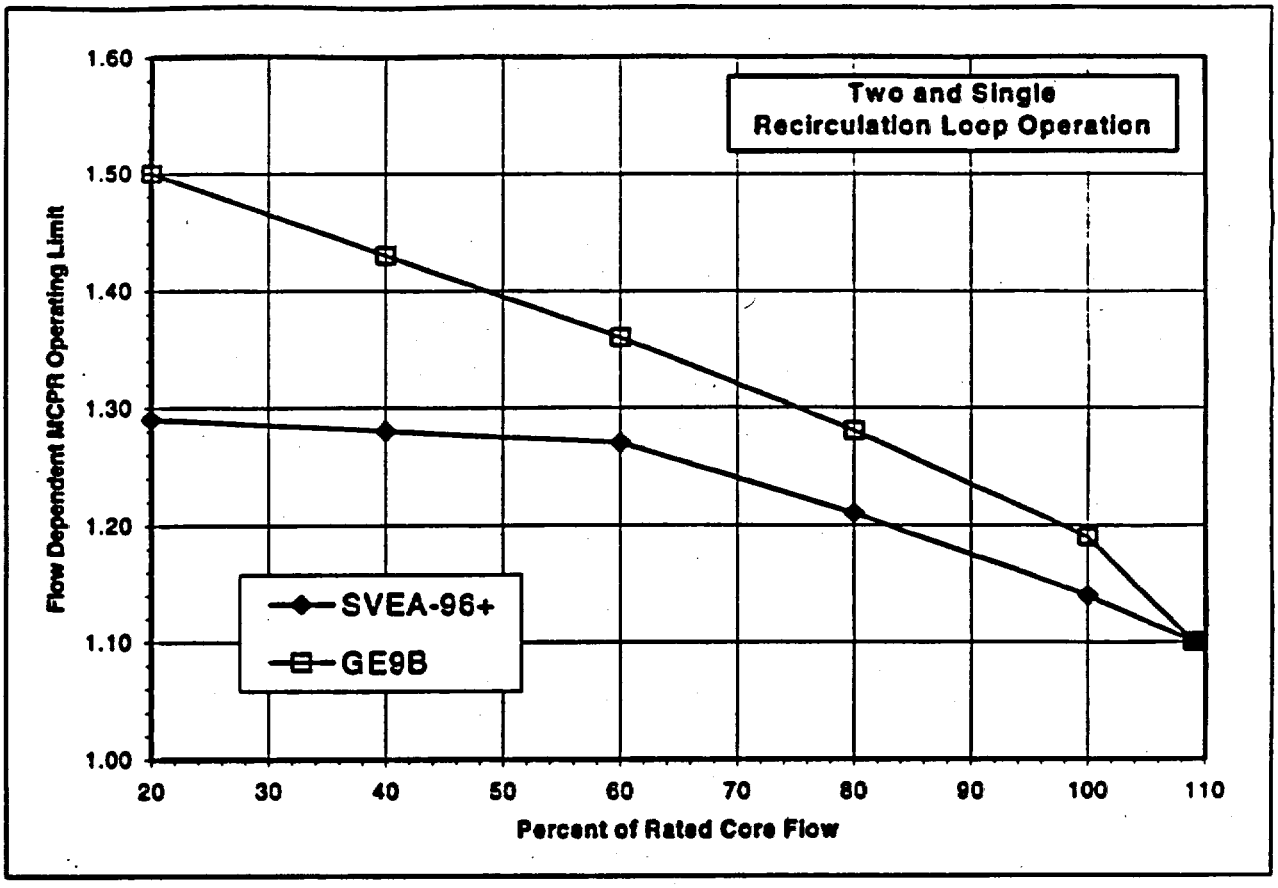
Main Turbine Bypass Operable Cycle Exposure ≤ 7701*MWd/MTU*			
Conditions	**Limit**	**SVEA-96+ (3)**	**GE9B (4)**
NSS(1) EOC-RPT Operable	Full Power	1.29	1.30
	Flow Dependent	Figure 2.2.1	Figure 2.2.1
	Power Dependent(2)	Figure 2.2.2	Figure 2.2.2
TSSS(1) EOC-RPT Operable	Full Power	1.38	1.47
	Flow Dependent	Figure 2.2.1	Figure 2.2.1
	Power Dependent(2)	Figure 2.2.3	Figure 2.2.3
NSS(1) EOC-RPT Inoperable	Full Power	1.29	1.31
	Flow Dependent	Figure 2.2.1	Figure 2.2.1
	Power Dependent(2)	Figure 2.2.4	Figure 2.2.4
TSSS(1) EOC-RPT Inoperable	Full Power	1.42	1.54
	Flow Dependent	Figure 2.2.1	Figure 2.2.1
	Power Dependent(2)	Figure 2.2.5	Figure 2.2.5

1. The TSSS MCPR values are based on the required speed of Technical Specification 3.1.3.3. The NSS MCPR values are based on the ABB transient analysis performed using the control rod insertion times shown in Table 2.2-1. Administrative controls have been established to control the determination of the MCPR operating limit with regard to scram speed.
2. Power dependent MCPR limits are provided for core thermal powers greater than or equal to 25% of rated power at all core flows. A step change in the power dependent MCPR limits occurs at 30% of rated power because direct scram on turbine control valve closure is automatically bypassed below 30% of rated power.
3. Fuel design PA10 and PB10 are SVEA-96+ fuel assemblies.
4. Fuel design HB07, HC07, HD08, HE08 and HF09 are GE9B fuel assemblies.

Table 2.2-3: Hope Creek Cycle 10 MCPR Operating limits:
Cycle Exposure > 7701*MWd/MTU*

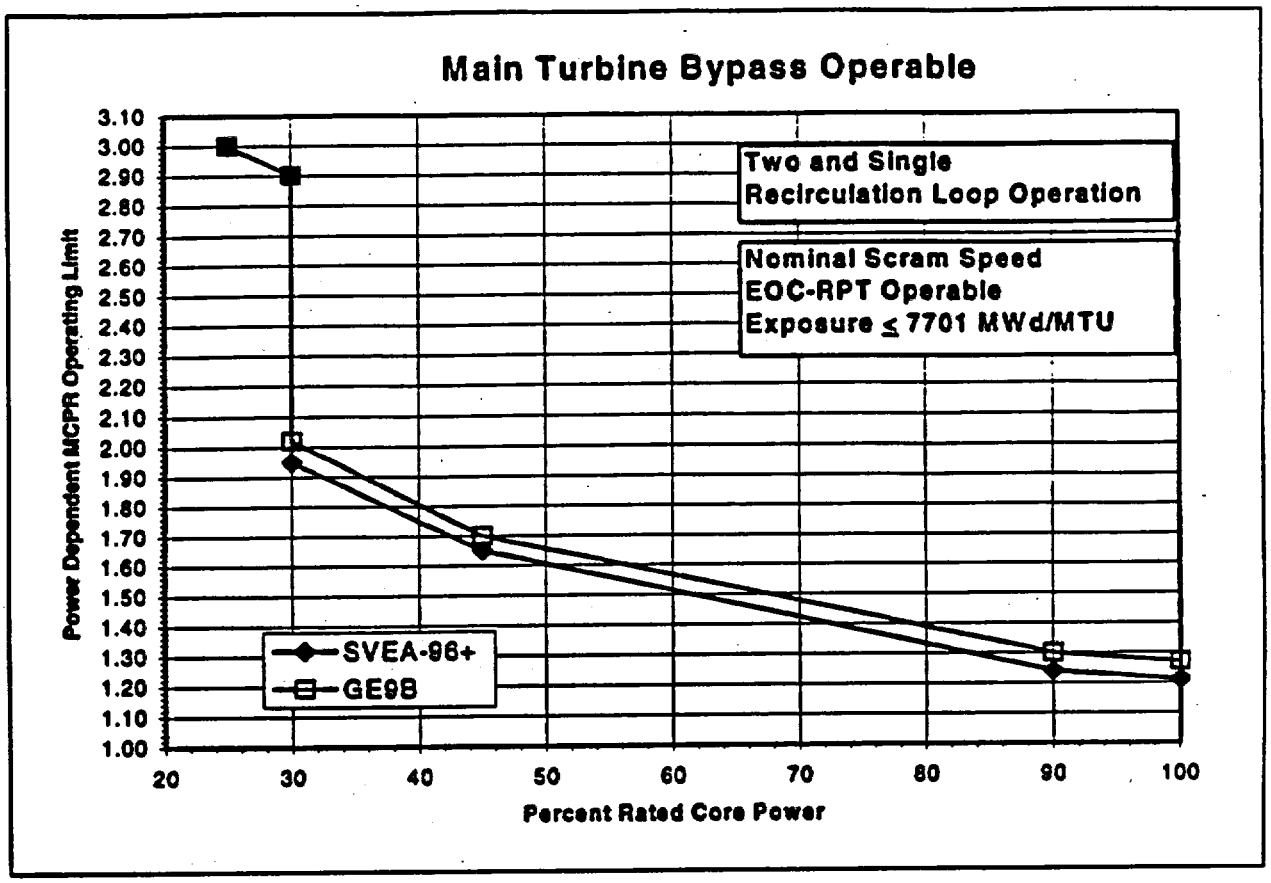
Main Turbine Bypass Operable 7701*MWd/MTU* < Cycle Exposure ≤ 11732*MWd/MTU*			
Conditions	**Limit**	**SVEA-96+ (3)**	**GE9B (4)**
NSS(1) EOC-RPT Operable	Full Power(5) Flow Dependent(5) Power Dependent(2,5)	1.35 Figure 2.2.1 Figure 2.2.6	1.44 Figure 2.2.1 Figure 2.2.6
TSSS(1) EOC-RPT Operable	Full Power(5) Flow Dependent(5) Power Dependent(2,5)	1.46 Figure 2.2.1 Figure 2.2.7	1.60 Figure 2.2.1 Figure 2.2.7
NSS(1) EOC-RPT Inoperable	Full Power(5) Flow Dependent(5) Power Dependent(2,5)	1.38 Figure 2.2.1 Figure 2.2.8	1.49 Figure 2.2.1 Figure 2.2.8
TSSS(1) EOC-RPT Inoperable	Full Power(5) Flow Dependent(5) Power Dependent(2,3)	1.49 Figure 2.2.1 Figure 2.2.9	1.65 Figure 2.2.1 Figure 2.2.9

1. See note 1 in Table 2.2-2
2. See note 2 in Table 2.2-2
3. Fuel design PA10 and PB10 are SVEA-96+ fuel assemblies.
4. Fuel design HB07, HC07, HD08, HE08 and HF09 are GE9B fuel assemblies.
5. All full-power and power-dependent MCPR LCO values shall be increased by 0.03 for coastdown operation at reduced power to a cycle exposure of 12704*MWD/MTU*. The flow-dependent MCPR LCO values remain applicable during coastdown operation.



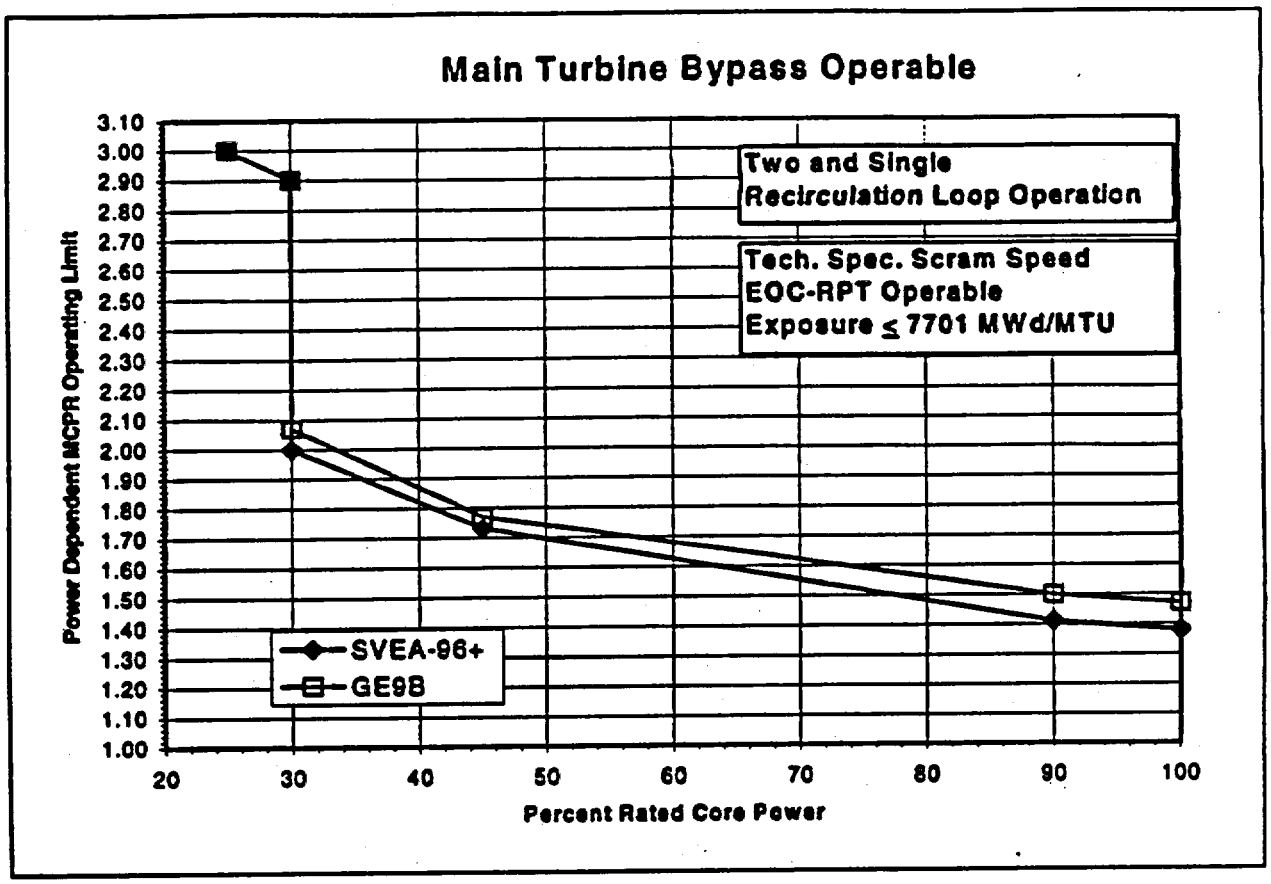
Initial Flow (% Rated Flow)	$MCPR_f$	
	SVEA-96+	GE9B
20	1.29	1.50
40	1.28	1.43
60	1.27	1.36
80	1.21	1.28
100	1.14	1.19
109	1.10	1.10

Figure 2.2-1: Flow Dependent MCPR Limit



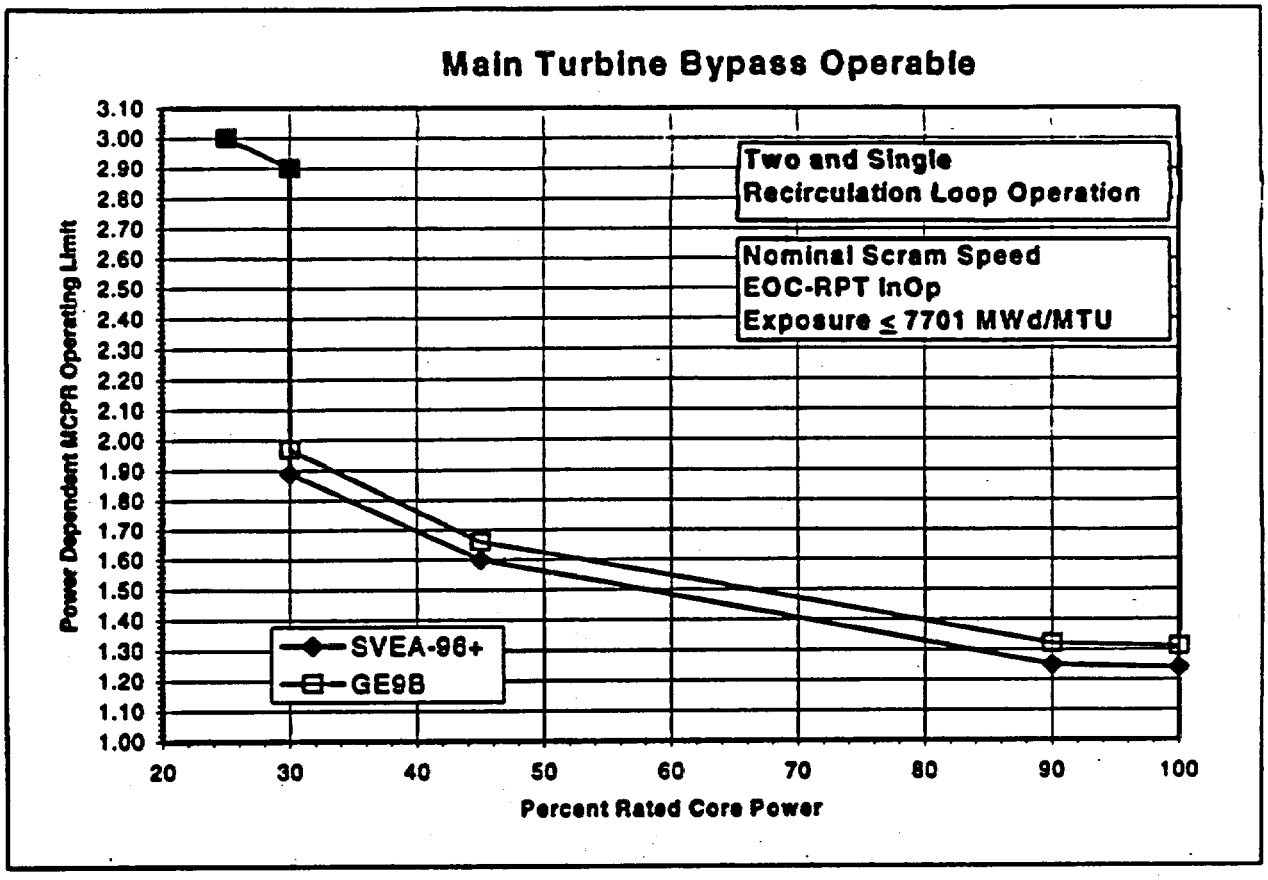
Notes	Initial Power (% of Rated)	$MCPR_p$	
		SVEA-96+	GE9B
All Core Flows, Power ≥ 30%, Credit Direct Scrams	100	1.21	1.27
	90	1.24	1.30
	45	1.65	1.70
	30	1.95	2.02
All Core Flows, Power < 30%, Bypass Direct Scrams	30	2.90	2.90
	25	3.00	3.00

Figure 2.2-2: Power Dependent MCPR Limit:
NSS, Cycle Exposure ≤ 7701*MWd/MTU*, EOC-RPT Operable



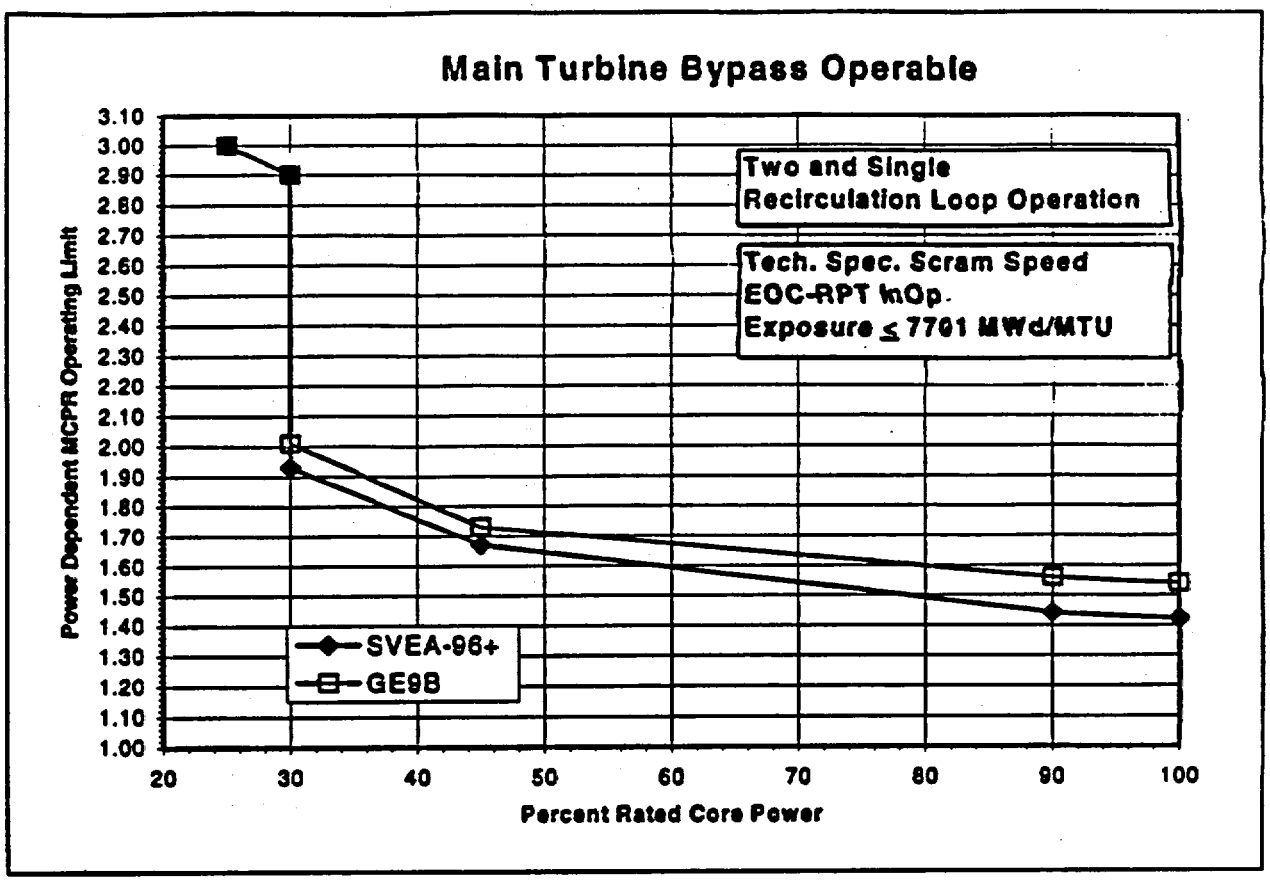
Notes	Initial Power (% of Rated)	$MCPR_p$	
		SVEA-96+	GE9B
All Core Flows, Power ≥ 30%, Credit Direct Scrams	100	1.38	1.47
	90	1.41	1.50
	45	1.73	1.77
	30	2.00	2.07
All Core Flows, Power < 30%, Bypass Direct Scrams	30	2.90	2.90
	25	3.00	3.00

Figure 2.2-3: Power Dependent MCPR Limit:
TSSS, Cycle Exposure ≤ 7701*MWd/MTU*, EOC-RPT Operable



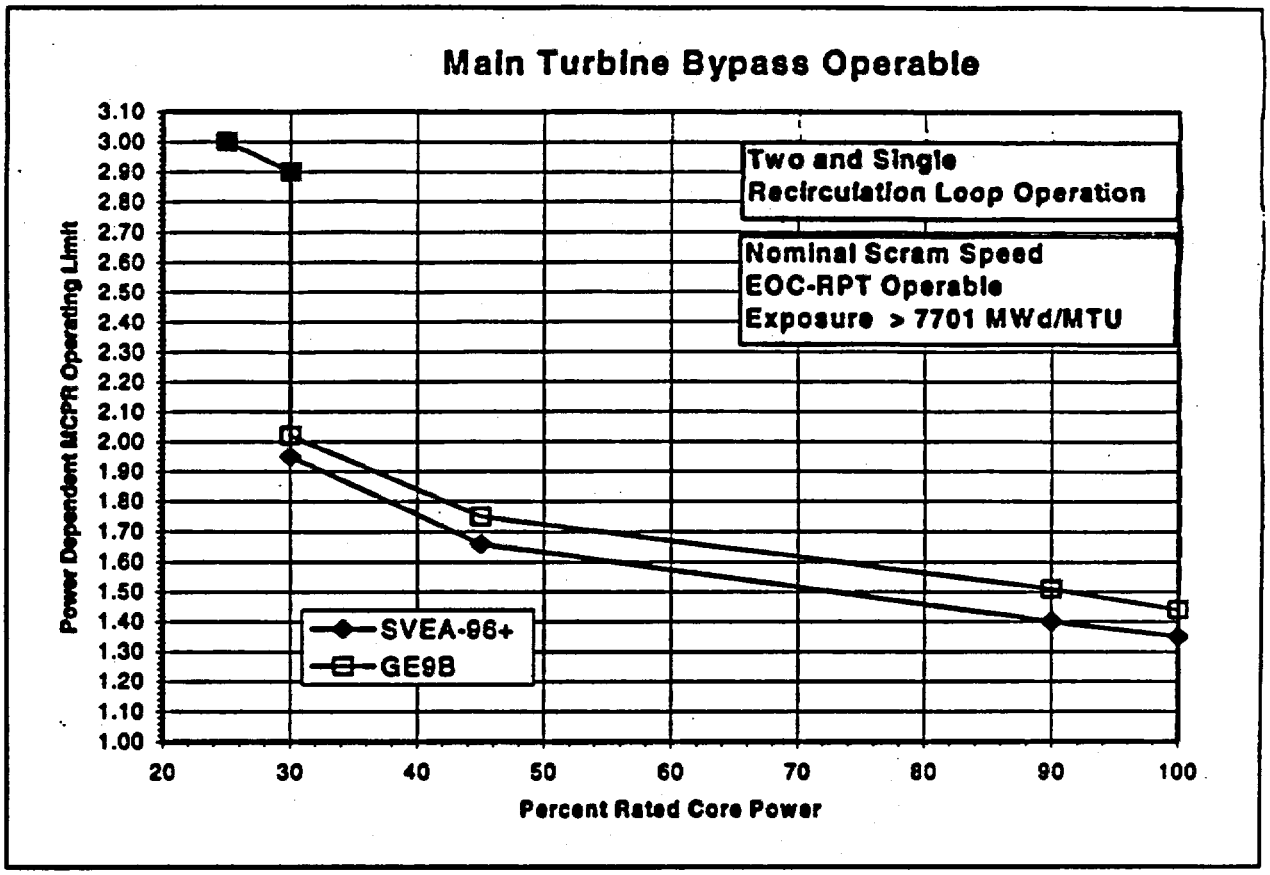
Notes	Initial Power (% of Rated)	$MCPR_p$	
		SVEA-96+	GE9B
All Core Flows, Power ≥ 30%, Credit Direct Scrams	100	1.24	1.31
	90	1.25	1.32
	45	1.60	1.66
	30	1.89	1.97
All Core Flows, Power < 30%, Bypass Direct Scrams	30	2.90	2.90
	25	3.00	3.00

Figure 2.2-4: Power Dependent MCPR Limit:
NSS, Cycle Exposure ≤ 7701*MWd/MTU*, EOC-RPT Inoperable



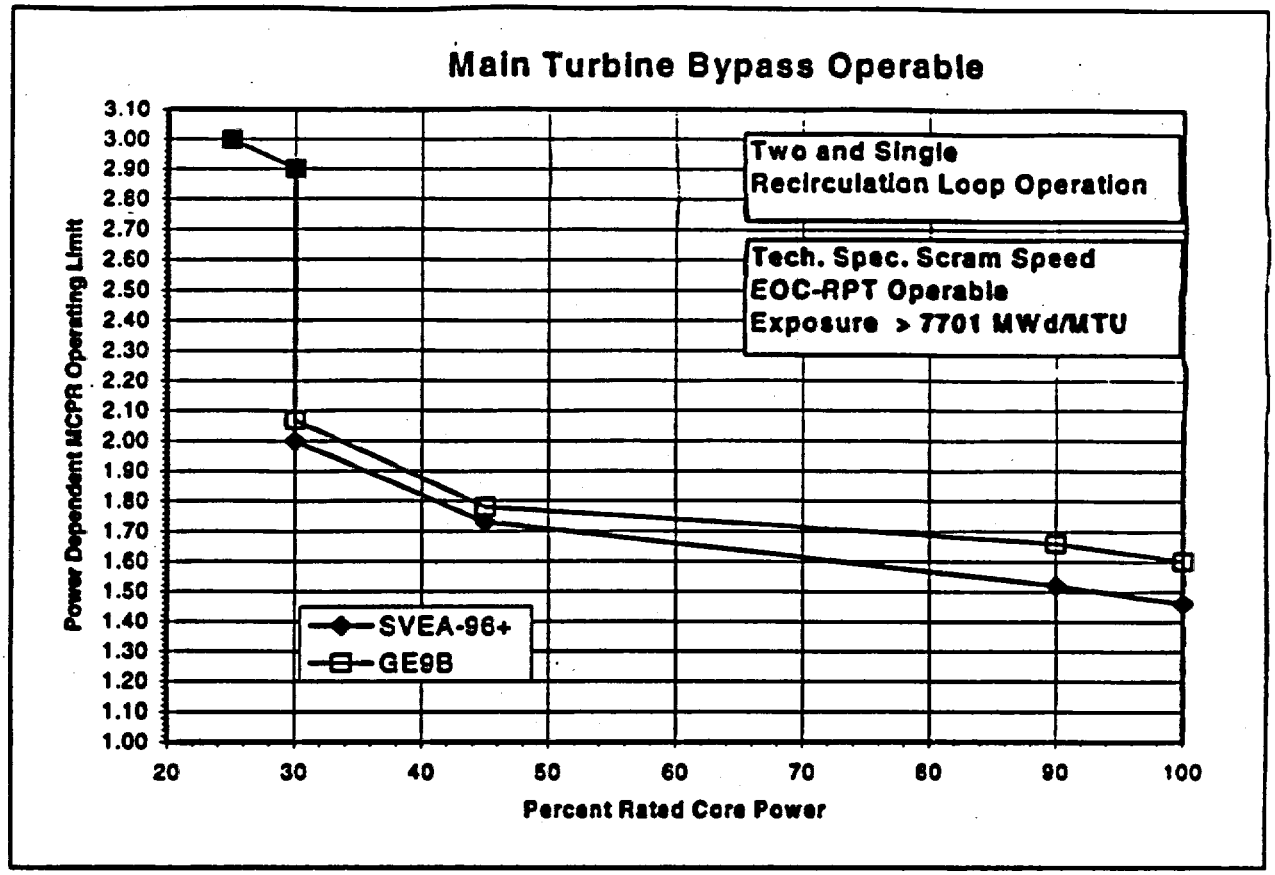
Notes	Initial Power (% of Rated)	$MCPR_p$	
		SVEA-96+	GE9B
All Core Flows, Power ≥ 30%, Credit Direct Scrams	100	1.42	1.54
	90	1.44	1.56
	45	1.67	1.73
	30	1.93	2.01
All Core Flows, Power < 30%, Bypass Direct Scrams	30	2.90	2.90
	25	3.00	3.00

Figure 2.2-5: Power Dependent MCPR Limit:
TSSS, Cycle Exposure ≤ 7701*MWd/MTU*, EOC-RPT Inoperable



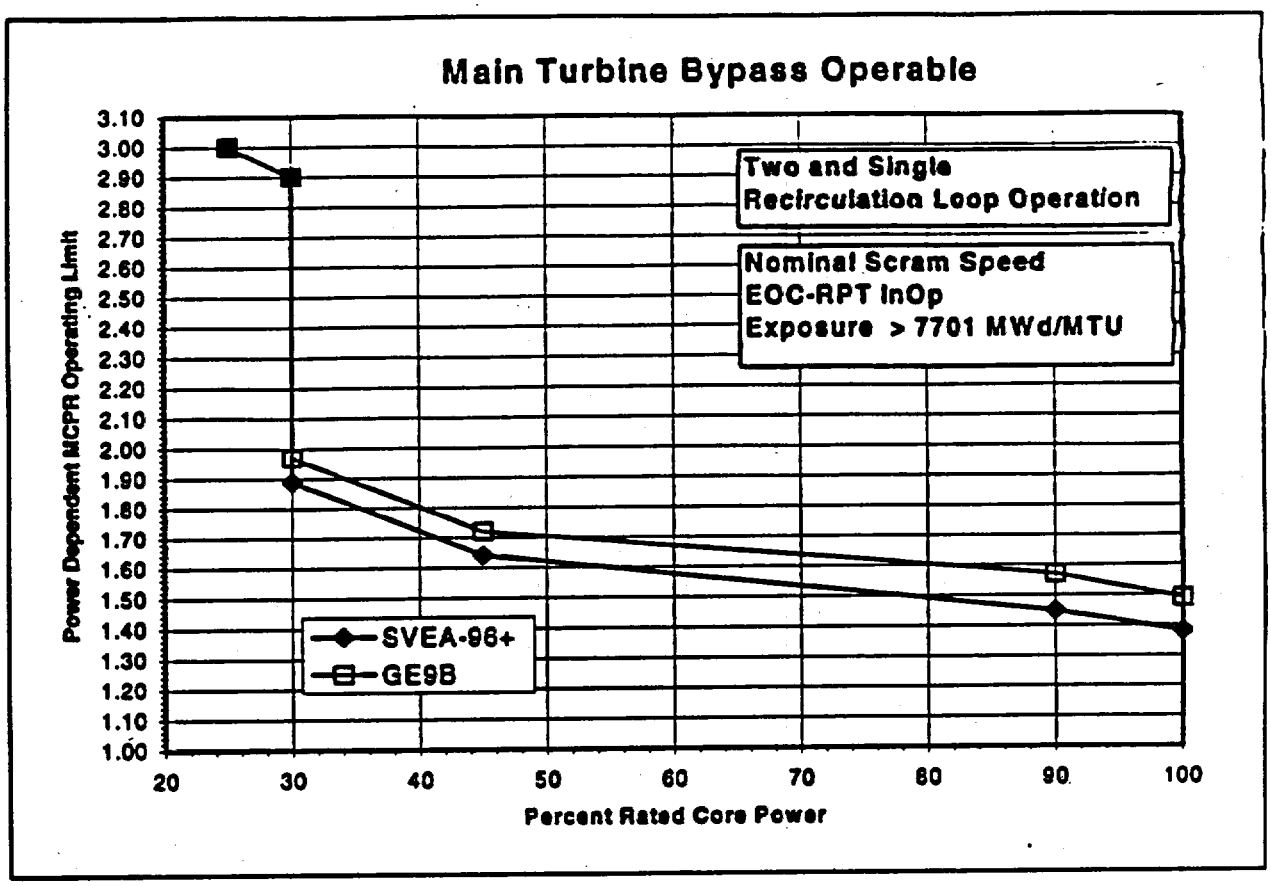
Notes	Initial Power (% of Rated)	$MCPR_p$	
		SVEA-96+	GE9B
All Core Flows, Power ≥ 30%, Credit Direct Scrams	100	1.35	1.44
	90	1.40	1.51
	45	1.66	1.75
	30	1.95	2.02
All Core Flows, Power < 30%, Bypass Direct Scrams	30	2.90	2.90
	25	3.00	3.00

Figure 2.2-6: Power Dependent MCPR Limit:
NSS, Cycle Exposure > 7701*MWd/MTU*, EOC-RPT Operable



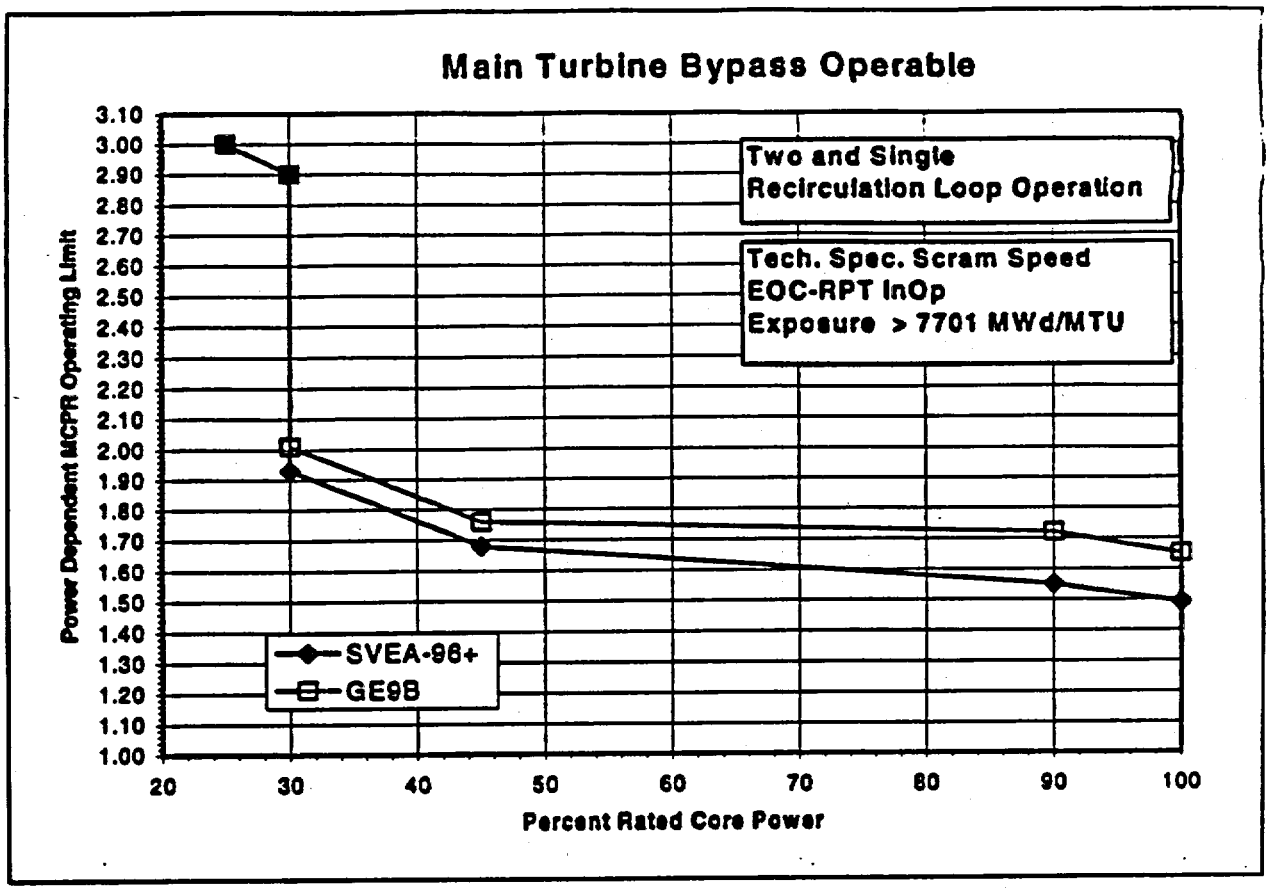
Notes	Initial Power (% of Rated)	$MCPR_p$	
		SVEA-96+	GE9B
All Core Flows, Power ≥ 30%, Credit Direct Scrams	100	1.46	1.60
	90	1.52	1.66
	45	1.73	1.78
	30	2.00	2.07
All Core Flows, Power < 30%, Bypass Direct Scrams	30	2.90	2.90
	25	3.00	3.00

Figure 2.2-7: Power Dependent MCPR Limit:
TSSS, Cycle Exposure > 7701*MWd/MTU*, EOC-RPT Operable



Notes	Initial Power (% of Rated)	$MCPR_p$	
		SVEA-96+	GE9B
All Core Flows, Power ≥ 30%, Credit Direct Scrams	100	1.38	1.49
	90	1.45	1.57
	45	1.64	1.72
	30	1.89	1.97
All Core Flows, Power < 30%, Bypass Direct Scrams	30	2.90	2.90
	25	3.00	3.00

Figure 2.2-8: Power Dependent MCPR Limit:
NSS, Cycle Exposure > 7701*MWd/MTU*, EOC-RPT Inoperable



Notes	Initial Power (% of Rated)	$MCPR_p$	
		SVEA-96+	GE9B
All Core Flows, Power ≥ 30%, Credit Direct Scrams	100	1.49	1.65
	90	1.55	1.72
	45	1.68	1.76
	30	1.93	2.01
All Core Flows, Power < 30%, Bypass Direct Scrams	30	2.90	2.90
	25	3.00	3.00

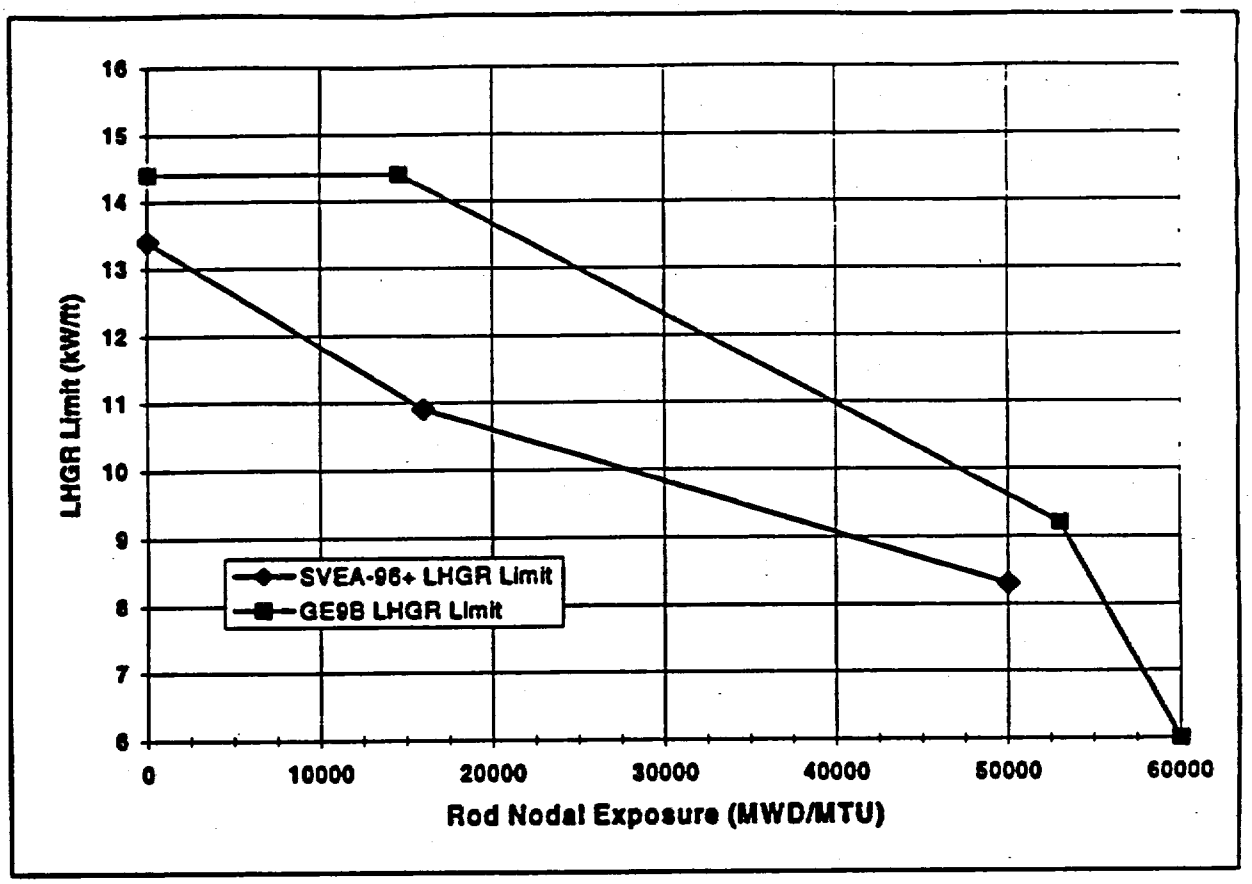
Figure 2.2-9: Power Dependent MCPR Limit:
TSSS, Cycle Exposure > 7701*MWd/MTU*, EOC-RPT Inoperable

2.3 LINEAR HEAT GENERATION RATE

LIMITING CONDITION FOR OPERATION

The LINEAR HEAT GENERATION RATE (LHGR) shall not exceed the limit specified in Figure 2.3-1.

The CORE MAXIMUM FRACTION OF LIMITING POWER DENSITY as implemented in Technical Specification Section 3/4.2.2 shall use a FRACTION OF LIMITING POWER DENSITY that is based on a specified LHGR equal to the exposure dependent LHGR in Figure 2.3-1 for the SVEA-96+ fuel assemblies and a constant LHGR of 14.4*kw/ft* for the GE9B fuel assemblies.



Rod Nodal Exposure (MWD/MTU)	LHGR Limit (kW / ft)	LHGR Limit (kW / ft)
	SVEA-96+	GE9B
0	13.4	14.4
14591	-----	14.4
16000	10.9	-----
50000	8.3	-----
53000	Not Applicable	9.2
60000	Not Applicable	6.0

Figure 2.3-1: Exposure Dependent LHGR Limis

3.0 REFERENCES

1. "Reference Safety Report for Boiling Water Reactor Reload Fuel," ABB Combustion Engineering Nuclear Operations, CENPD-300-P-A, Revision 0, July 1996.

2. Nuclear Fuel Section Vendor Technical Document, NFVD-AB-2000-005-00, "HCGS Cycle 10 Reload Licensing Report," ABB Combustion Engineering Nuclear Operations, CE NPSD-865-P, Rev. 0, March 2000.

3. Nuclear Fuel Section Design Input File, HCA.5-0039, "Cycle 10 GE9B Operating Limit and COLR Related Information."

4. Nuclear Fuel Section Vendor Technical Document, NFVD-AB-2000-006-00, "Conditions for Design: Public Service Electric Gas: Hope Creek: Base Document," ABB Combustion Engineering Nuclear Operations, CE NPSD-865-P, Rev. 0, March 2000.

5. "General Electric Standard Application for Reactor Fuel," General Electric Company, NEDE-24011-P-A, Revision 13, August 1996, and the U.S. Supplement NEDE-24011-P-A-US, Revision 13, August 1996.