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TS 6.9.1.12

March 14, 2003

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

Limerick Generating Station, Unit 2
Facility Operating License No. NPF-85
NRC Docket No. 50-353

Subject: Issuance of the Core Operating Limits Report for Reload 7, Cycle 8, Revision 0

Dear Sir/Madam:

Enclosed is a copy of the Core Operating Limits Report (COLR) for Limerick Generating Station, Unit 2, Reload 7, Cycle 8, Revision 0. Revision 0 of this report incorporates the revised cycle specific parameters resulting from the new core configuration implemented during the LGS, Unit 2 (2R07) refueling outage.

This COLR is being submitted to the NRC in accordance with LGS, Unit 2 Technical Specifications (TS) Section 6.9.1.12.

If you have any questions, please do not hesitate to contact us.

Very truly yours,

D. A. Helker /FOR

Michael P. Gallagher
Director, Licensing and Regulatory Affairs
Exelon Generation Company, LLC

Enclosure

cc: H. J. Miller, Administrator, Region I, USNRC
A. L. Burritt, USNRC Senior Resident Inspector, LGS
S. P. Wall, Project Manager, USNRC

A001

CORE OPERATING LIMITS REPORT

FOR

LIMERICK GENERATING STATION UNIT 2

RELOAD 7, CYCLE 8

Prepared By: S. C. Getz Date: 2/6/03
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Reviewed By: Robert J. Wolfgang Date: FEB 06 2003
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INTRODUCTION AND SUMMARY

This report provides the following cycle-specific parameter limits for Limerick Generating Station Unit 2 Cycle 8:

- Maximum Average Planar Linear Heat Generation Rate (MAPLHGR)
- Minimum Critical Power Ratio (MCPR)
- Single Loop Operation (SLO) MCPR adjustment
- ARTS MCPR thermal limit adjustments and multipliers
- ARTS MAPLHGR thermal limit multipliers
- Rod Block Monitor (RBM) setpoints
- MAPLHGR single loop operation (SLO) reduction factor
- Linear Heat Generation Rate (LHGR)
- Turbine Bypass Valve parameters
- Reactor Coolant System Recirculation Flow Upscale Trips

These values have been determined using NRC-approved methodology, Reference 9, and are established such that all applicable limits of the plant safety analysis are met.

This report is prepared in accordance with Technical Specification 6.9.1.9 of Reference 1. Preparation of this report was performed in accordance with Exelon Nuclear, Nuclear Fuels Procedure NF-AB-120.

The data presented in this report is valid for all points and domains on the operating map, including:

- Maximum Extended Load Line Limit (MELLL) down to 81% of rated core flow during full power operation
- Increased Core Flow (ICF) up to 110% of rated core flow
- Feedwater Temperature Reduction (FWTR) up to 105°F during cycle extension operation
- Feedwater Heater Out of Service (FWHOOS) up to 60°F feedwater temperature reduction at any time during the cycle prior to cycle extension.

Further information on the cycle specific analyses for Limerick 2 Cycle 8 and their associated operating domains is available in Reference 2.

MAPLHGR LIMITS

The limiting MAPLHGR value for the most limiting lattice (excluding natural uranium) of each fuel type as a function of average planar exposure is given in Figures 1 through 6. These figures are used when hand calculations are required as specified in Technical Specification 3.2.1. The MAPLHGR limit curves of Figures 1 through 6 were generated from References 2, 12, and 13.

For single loop operation, a reduction factor is used which is shown in Table 3 (Reference 2).

MCPR LIMITS

The MCPR value for use in Technical Specification 3.2.3 for each fuel type is given in Table 1. This table is derived from the Reference 2 analyses and is valid for all Cycle 8 fuel types and operating domains. Information regarding the treatment of these MCPR limits for SLO is also provided.

Bounding MCPR values are also provided for inoperable Recirculation Pump Trip (RPTOOS) or inoperable Steam Bypass System (TBVOOS). These two options represent the Equipment Out of Service (Equipment OOS) conditions.

Note that in Table 1 the term "EOR" refers to the cycle exposure at which operation at "rated conditions" is no longer possible (i.e., the cycle exposure at which cycle extension begins). The cycle exposure which represents "EOR" is given in the latest verified and approved Cycle Management Report. This value can change during the cycle due to changes in operating strategy.

ARTS THERMAL LIMIT ADMINISTRATION

ARTS provides for power- and flow-dependent thermal limit adjustments and multipliers which allow for a more reliable administration of the MCPR and MAPLHGR thermal limits. The flow-dependent adjustment MCPR(F) is sufficiently generic to apply to all fuel types and operating domains (References 2, 8, and 11). However, there are two sets of flow-dependent MAPFAC(F) multipliers for dual-loop and single-loop operation, References 2 and 8. In addition, there are also two sets of power-dependent MAPLHGR multipliers for use with Equipment in Service and with Equipment OOS conditions, Reference 5. Finally, there are two sets of power-dependent MCPR adjustments and multipliers for use with Equipment in Service and with Equipment OOS conditions, References 2 and 5.

These adjustments and multipliers are shown in Figures 7 through 13. Thermal limit monitoring must be performed with the more limiting MCPR and MAPLHGR limits resulting from the power- and flow-biased calculation.

ROD BLOCK MONITOR SETPOINTS

The ARTS RBM provides for power-dependent RBM trips. The trip setpoints/allowable values and applicable RBM signal filter time constant data are shown in Table 2. These values are for use with Technical Specification 3.3.6. The use of the setpoints specified in Table 2 is documented in References 2 and 10.

LINEAR HEAT GENERATION RATES

The maximum LHGR value for each fuel type for use in Technical Specification 3.2.4 is given in Table 4. The LHGR limit is an exposure dependent value. Due to the proprietary nature of these values only the maximum LHGR for each fuel type is listed in Table 4. The LHGR data is listed in Reference 3 (GNF proprietary).

STEAM BYPASS SYSTEM OPERABILITY

The operability requirements for the steam bypass system for use in Technical Specifications 3.7.8 and 4.7.8.C are found in Table 5 (Reference 6). If these requirements cannot be met, the MCPR, MCPR(P) and MAPFAC(P) limits for inoperable Steam Bypass System, known as Turbine Bypass Valve Out Of Service (TBVOOS), must be used.

RECIRCULATION PUMP TRIP OPERABILITY

If the recirculation pump trip is inoperable, then the MCPR limits for Recirculation Pump Trip Out Of Service (RPTOOS) must be used. The MCPR(P) and MAPFAC(P) curves are independent of recirculation pump trip operability (Reference 5).

CONTROL ROD BLOCK INSTRUMENTATION
REACTOR COOLANT SYSTEM RECIRCULATION FLOW UPSCALE TRIP

Technical Specification Limiting Condition for Operation number 3.3.6 requires that control rod block instrumentation channels shall be OPERABLE with their trip setpoints consistent with the values shown in the Trip Setpoint column of Technical Specification Table 3.3.6-2. The Reactor Coolant System Recirculation Flow Upscale Trip is a cycle-specific value and as such is found in Table 6 of this COLR. Table 6 lists the Nominal Trip Setpoint and Analytical Value. These setpoints are set high enough to allow full utilization of the enhanced ICF domain up to 110% of rated core flow. Reference 10 provides the current basis for the trip setpoint values used.

SAFETY LIMIT MINIMUM CRITICAL POWER RATIO (SLMCPR)

The Safety Limit Minimum Critical Power Ratio (SLMCPR) for Limerick 2 Cycle 8 is 1.07 for Dual Loop Operation and 1.09 for Single Loop Operation. These values are documented in Reference 2.

REFERENCES

1. ``Technical Specifications and Bases for Limerick Generating Station Unit 2'', Docket No. 50-353, License No. NPF-85.

2. ``Supplemental Reload Licensing Report for Limerick Generating Station Unit 2 Reload 7 Cycle 8'', Global Nuclear Fuel Document No. 0000-0006-6569SRLR, Revision 0, January 2003.

3. ``Fuel Bundle Information Report for Limerick 2 Reload 7 Cycle 8'', Global Nuclear Fuel Document No. 0000-000606569FBIR, Revision 0, January 2003.

4. ``GE14 Compliance with Amendment 22 of NEDE-24011-P-A (GESTAR II)'', NEDC-32868P, Revision 0, December 1998.

5. ``GE14 Fuel Design Cycle-Independent Analyses for Limerick Generating Station Units 1 and 2'', GE-NE-L12-00884-00-01P, March 2001.

6. Verified OPL-3 document for Limerick 2 Reload 7 Cycle 8 transmitted by email from Tammy G. Orr, GNF, to Christopher K. Hoffman, Exelon Nuclear, dated September 30, 2002.

7. ``Limerick Generating Station Units 1 and 2 ECCS-LOCA Evaluation for GE14'', GE Nuclear Energy Document No. GE-NE-J11-03793-09-01P, February 2001.

8. ``ARTS Flow-Dependent Limits with TBVOOS for Peach Bottom Atomic Power Station and Limerick Generating Station'', GENE Document NEDC-32847P, June 1998.

9. ``General Electric Standard Application for Reactor Fuel'', NEDE-24011-P-A-14, June 2000 and U.S. Supplement NEDE-24011-P-A-14-US, June 2000.

10. ``Power Range Neutron Monitor System Setpoint Calculation'', Global Nuclear Fuel Calculation LE-0107, Rev. 2(GNF), March 2000.

11. Letter, C.P. Collins to K. Donovan, "Removal of MCPR(f) Low Flow Correction in NEDC-32847P", February 4, 2002.

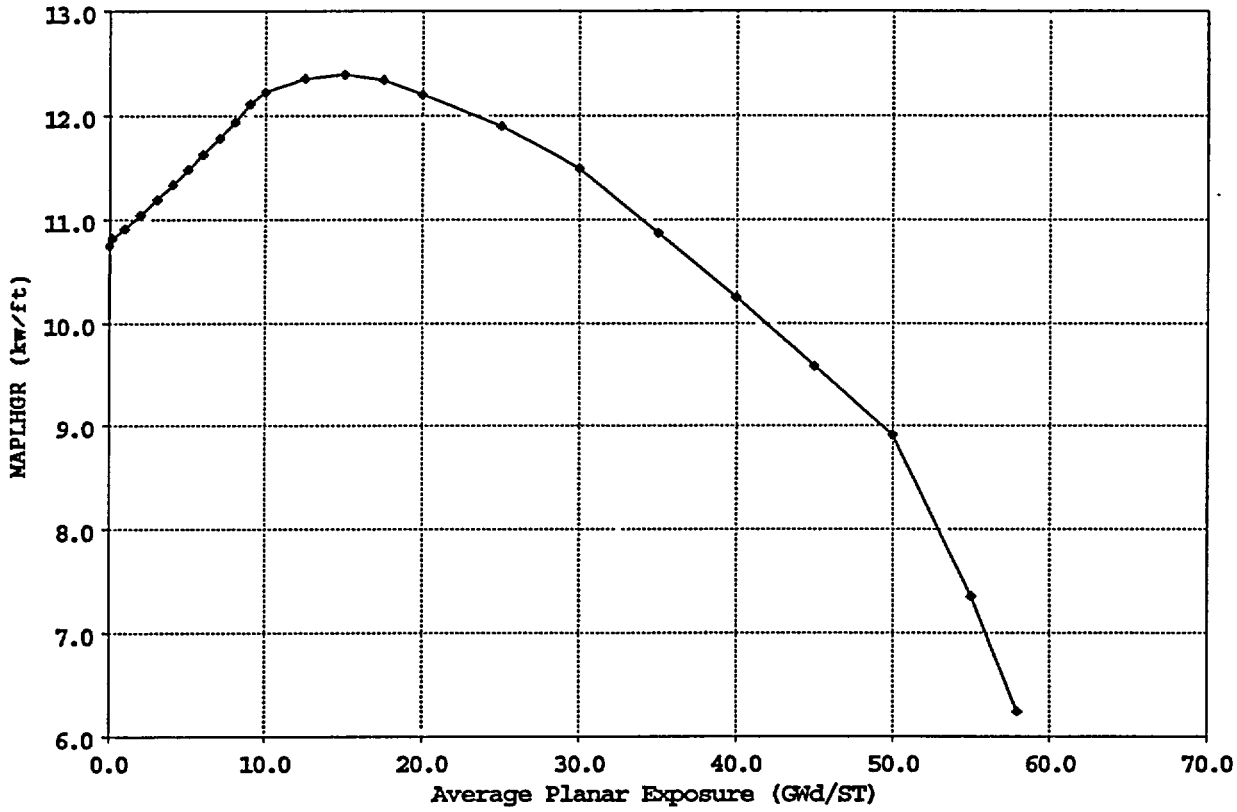
12. "Lattice Dependent MAPLHGR Report for Limerick Generating Station Unit 2 Reload 6 Cycle 7", Global Nuclear Fuel Document No. J11-03793MAPL, Revision 0, March 2001.

13. "Limerick 2 Cycle 8 Fresh Fuel MAPLHGR" email from A. Enica, GNF to S. Getz, Exelon, dated January 28, 2003.

Figure 1

MAXIMUM AVERAGE PLANAR LINEAR HEAT GENERATION RATE (MAPLHGR)
VERSUS AVERAGE PLANAR EXPOSURE
BUNDLE TYPE: GE13-P9CTB412-13GZ1-100T-146-T6 (GE13)
(References 2 and 12)

This Figure is Referred to by Technical Specification 3.2.1

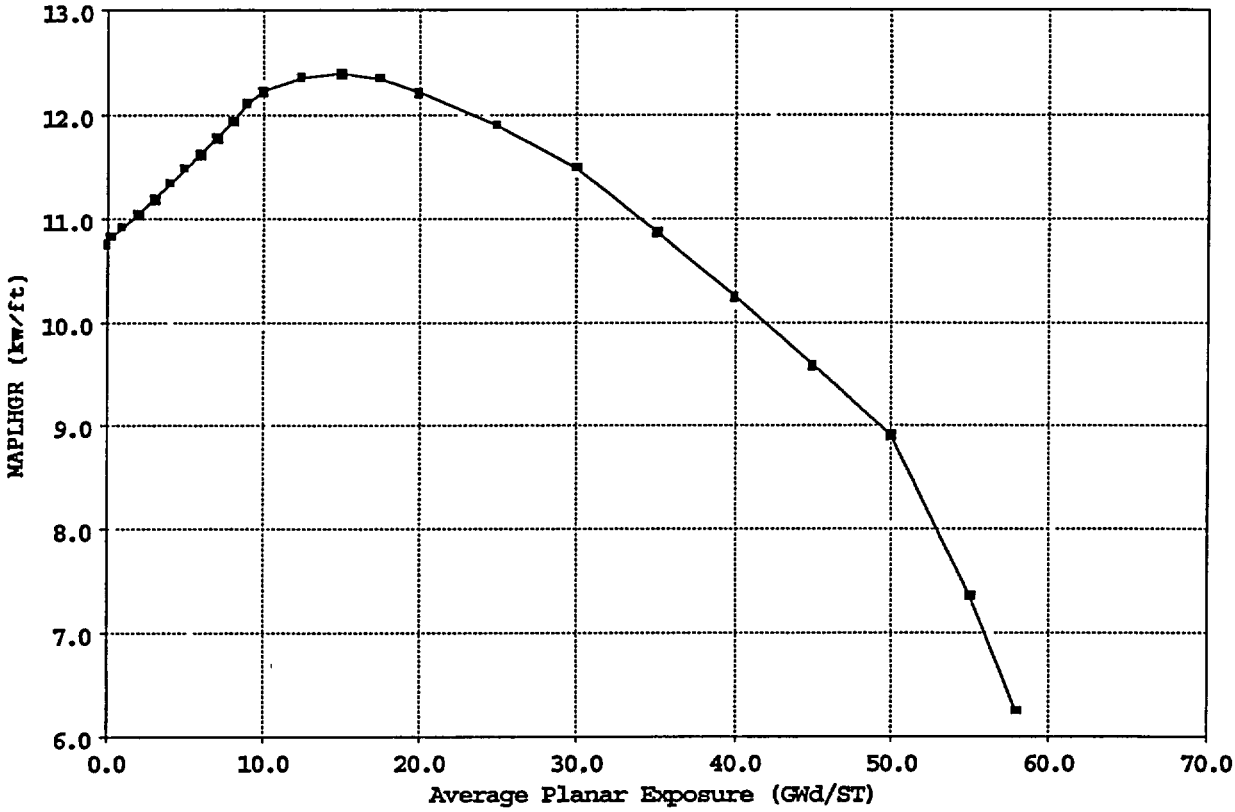


Avg. Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)	Avg. Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)	Avg. Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)
0.0	10.74	7.0	11.77	25.0	11.89
0.2	10.81	8.0	11.93	30.0	11.49
1.0	10.91	9.0	12.10	35.0	10.87
2.0	11.04	10.0	12.22	40.0	10.24
3.0	11.18	12.5	12.36	45.0	9.59
4.0	11.32	15.0	12.40	50.0	8.91
5.0	11.47	17.5	12.34	55.0	7.36
6.0	11.62	20.0	12.20	57.99	6.24

Figure 2

MAXIMUM AVERAGE PLANAR LINEAR HEAT GENERATION RATE (MAPLHGR)
VERSUS AVERAGE PLANAR EXPOSURE
BUNDLE TYPE: GE13-P9CTB412-13GZ2-100T-146-T6 (GE13)
(References 2 and 12)

This Figure is Referred to by Technical Specification 3.2.1

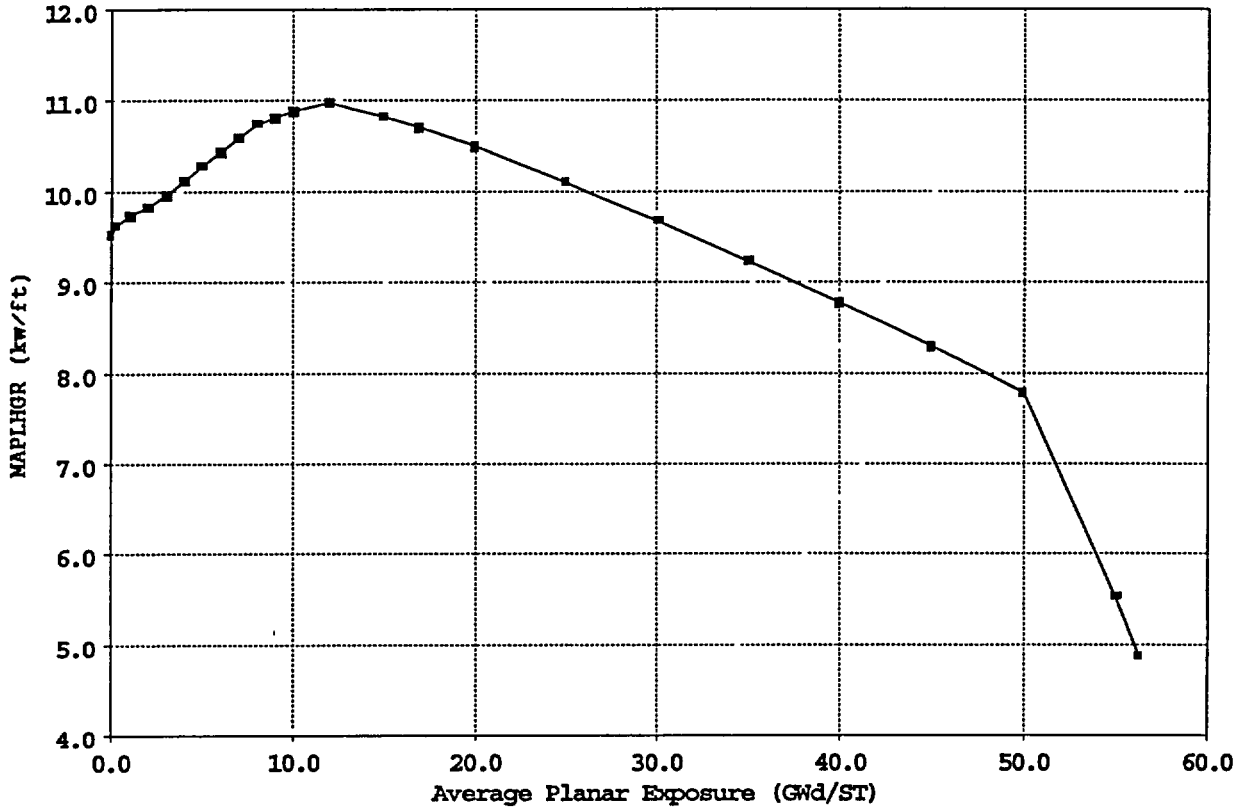


Avg. Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)	Avg. Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)	Avg. Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)
0.0	10.74	7.0	11.77	25.0	11.89
0.2	10.81	8.0	11.93	30.0	11.49
1.0	10.91	9.0	12.10	35.0	10.87
2.0	11.04	10.0	12.22	40.0	10.24
3.0	11.18	12.5	12.36	45.0	9.59
4.0	11.32	15.0	12.40	50.0	8.91
5.0	11.47	17.5	12.34	55.0	7.36
6.0	11.62	20.0	12.21	57.99	6.24

Figure 3

MAXIMUM AVERAGE PLANAR LINEAR HEAT GENERATION RATE (MAPLHGR)
VERSUS AVERAGE PLANAR EXPOSURE
BUNDLE TYPE: GE14-P10CNAB403-16GZ-100T-150-T6-3957 (GE14C)
(References 2, 3, and 12)

This Figure is Referred to by Technical Specification 3.2.1

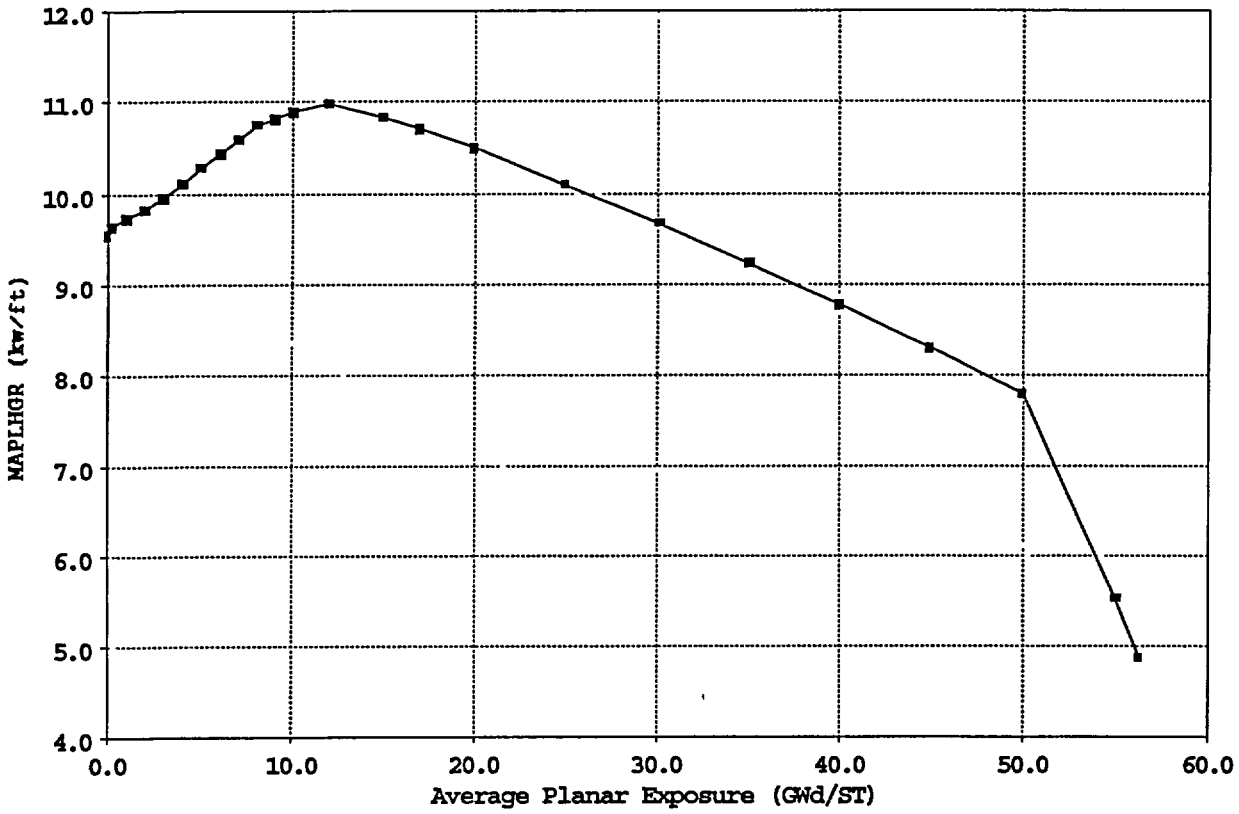


Avg. Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)	Avg. Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)	Avg. Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)
0.0	9.52	7.0	10.58	25.0	10.08
0.2	9.61	8.0	10.73	30.0	9.66
1.0	9.73	9.0	10.81	35.0	9.23
2.0	9.82	10.0	10.89	40.0	8.78
3.0	9.95	12.0	10.97	45.0	8.30
4.0	10.10	15.0	10.82	50.0	7.78
5.0	10.27	17.0	10.70	55.0	5.52
6.0	10.43	20.0	10.50	56.33	4.86

Figure 4

MAXIMUM AVERAGE PLANAR LINEAR HEAT GENERATION RATE (MAPLHGR)
VERSUS AVERAGE PLANAR EXPOSURE
BUNDLE TYPE: GE14-P10CNAB403-16GZ-100T-150-T6-3956 (GE14C)
(References 2, 3, and 12)

This Figure is Referred to by Technical Specification 3.2.1

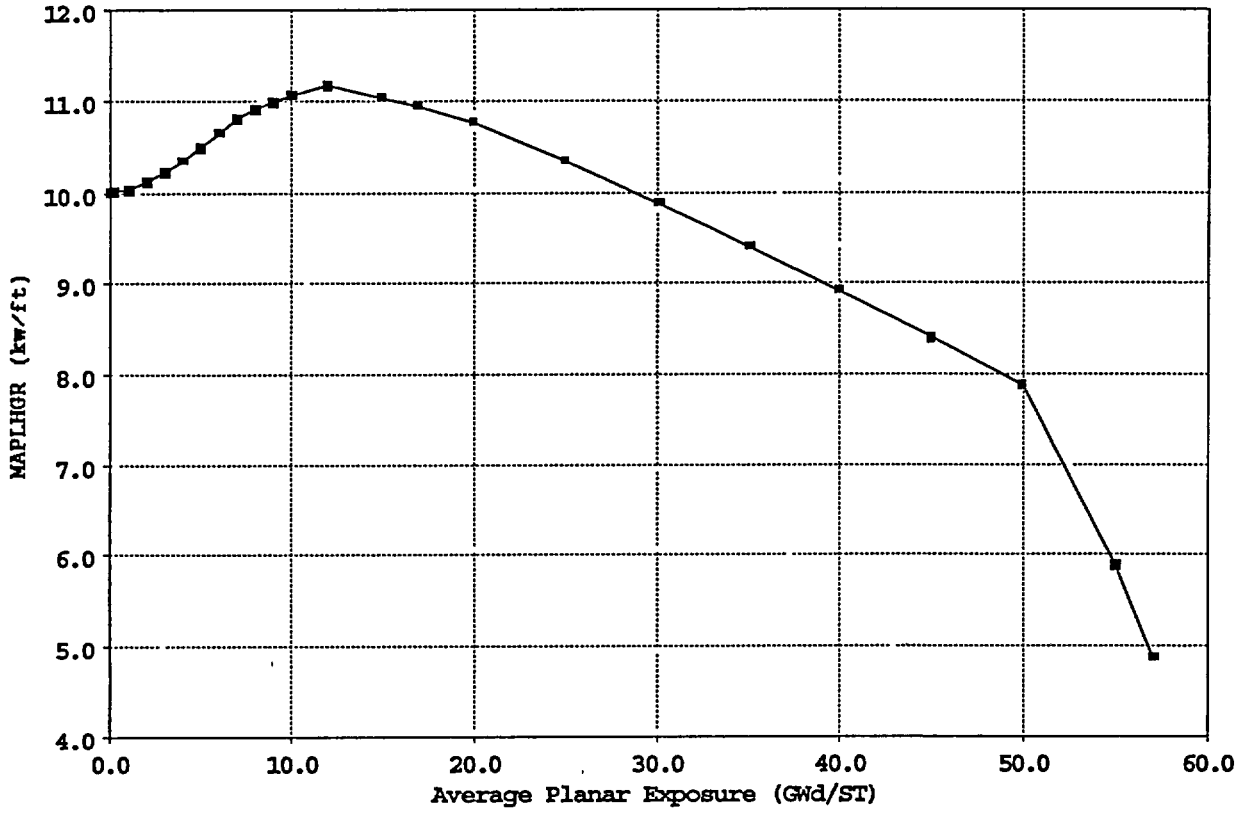


Avg. Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)	Avg. Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)	Avg. Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)
0.0	9.55	8.0	10.73	35.0	9.23
0.2	9.64	9.0	10.81	40.0	8.78
1.0	9.73	10.0	10.89	45.0	8.30
2.0	9.82	12.0	10.97	50.0	7.78
3.0	9.95	15.0	10.82	55.0	5.52
4.0	10.10	17.0	10.70	56.33	4.86
5.0	10.27	20.0	10.50		
6.0	10.43	25.0	10.08		
7.0	10.58	30.0	9.66		

Figure 5

MAXIMUM AVERAGE PLANAR LINEAR HEAT GENERATION RATE (MAPLHGR)
VERSUS AVERAGE PLANAR EXPOSURE
BUNDLE TYPE: GE14-P10CNAB417-15GZ-100T-150-T-2592 (GE14C)
(References 2 and 13)

This Figure is Referred to by Technical Specification 3.2.1

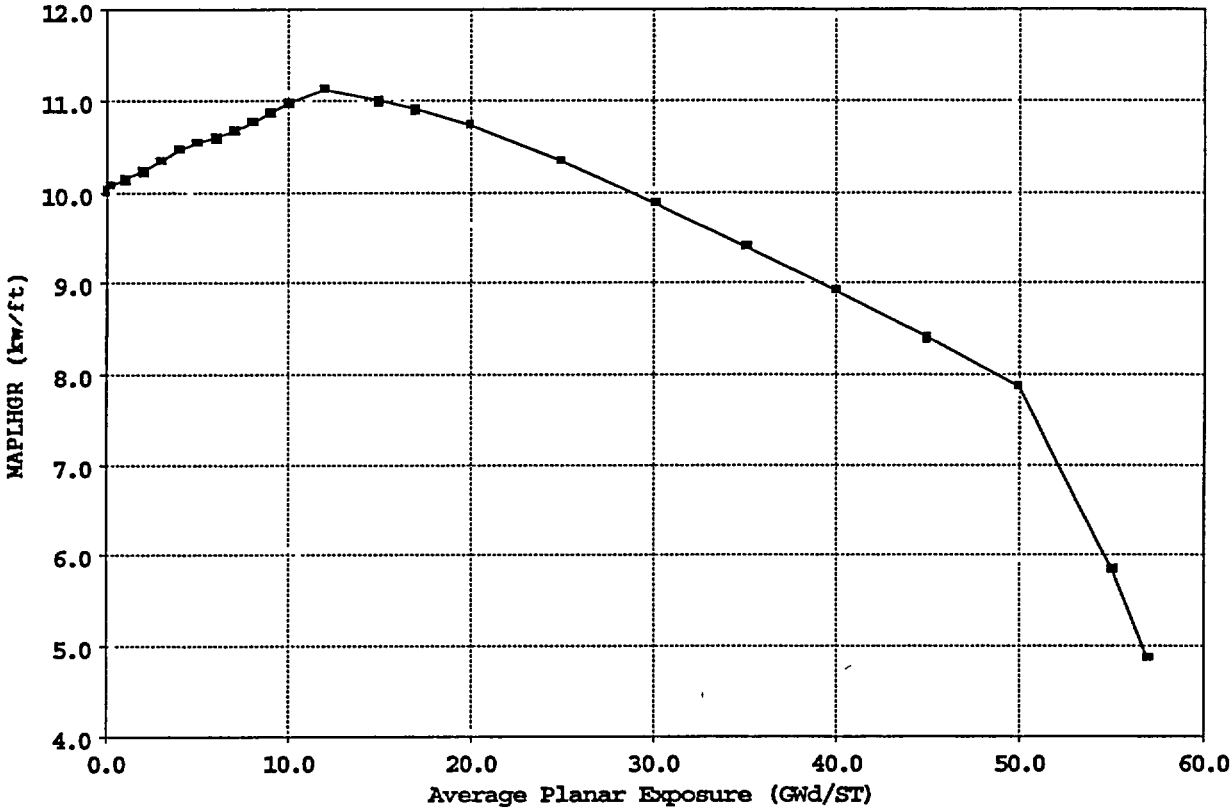


Avg. Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)	Avg. Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)	Avg. Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)
0.0	10.00	8.0	10.91	35.0	9.39
0.2	10.01	9.0	10.99	40.0	8.91
1.0	10.03	10.0	11.07	45.0	8.40
2.0	10.11	12.0	11.17	50.0	7.87
3.0	10.22	15.0	11.04	55.0	5.89
4.0	10.34	17.0	10.95	57.06	4.86
5.0	10.49	20.0	10.76		
6.0	10.64	25.0	10.34		
7.0	10.81	30.0	9.87		

Figure 6

MAXIMUM AVERAGE PLANAR LINEAR HEAT GENERATION RATE (MAPLHGR)
VERSUS AVERAGE PLANAR EXPOSURE
BUNDLE TYPE: GE14-P10CNAB417-14GZ-100T-150-T-2591 (GE14C)
(References 2 and 13)

This Figure is Referred to by Technical Specification 3.2.1



Avg. Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)	Avg. Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)	Avg. Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)
0.0	10.02	8.0	10.77	35.0	9.39
0.2	10.07	9.0	10.87	40.0	8.91
1.0	10.15	10.0	10.98	45.0	8.40
2.0	10.24	12.0	11.13	50.0	7.86
3.0	10.34	15.0	11.01	55.0	5.84
4.0	10.46	17.0	10.91	56.96	4.86
5.0	10.54	20.0	10.74		
6.0	10.60	25.0	10.34		
7.0	10.68	30.0	9.87		

FIGURE 7

POWER DEPENDENT MAPLHGR MULTIPLIER MAPFAC(P)

THIS FIGURE IS VALID FOR THE RCF, ICF, MELLL, FWHOOS AND FWTR OPERATING DOMAINS (RPT IN SERVICE OR RPTOOS) (Reference 5)

This Figure is Referred to by Technical Specification 3.2.1

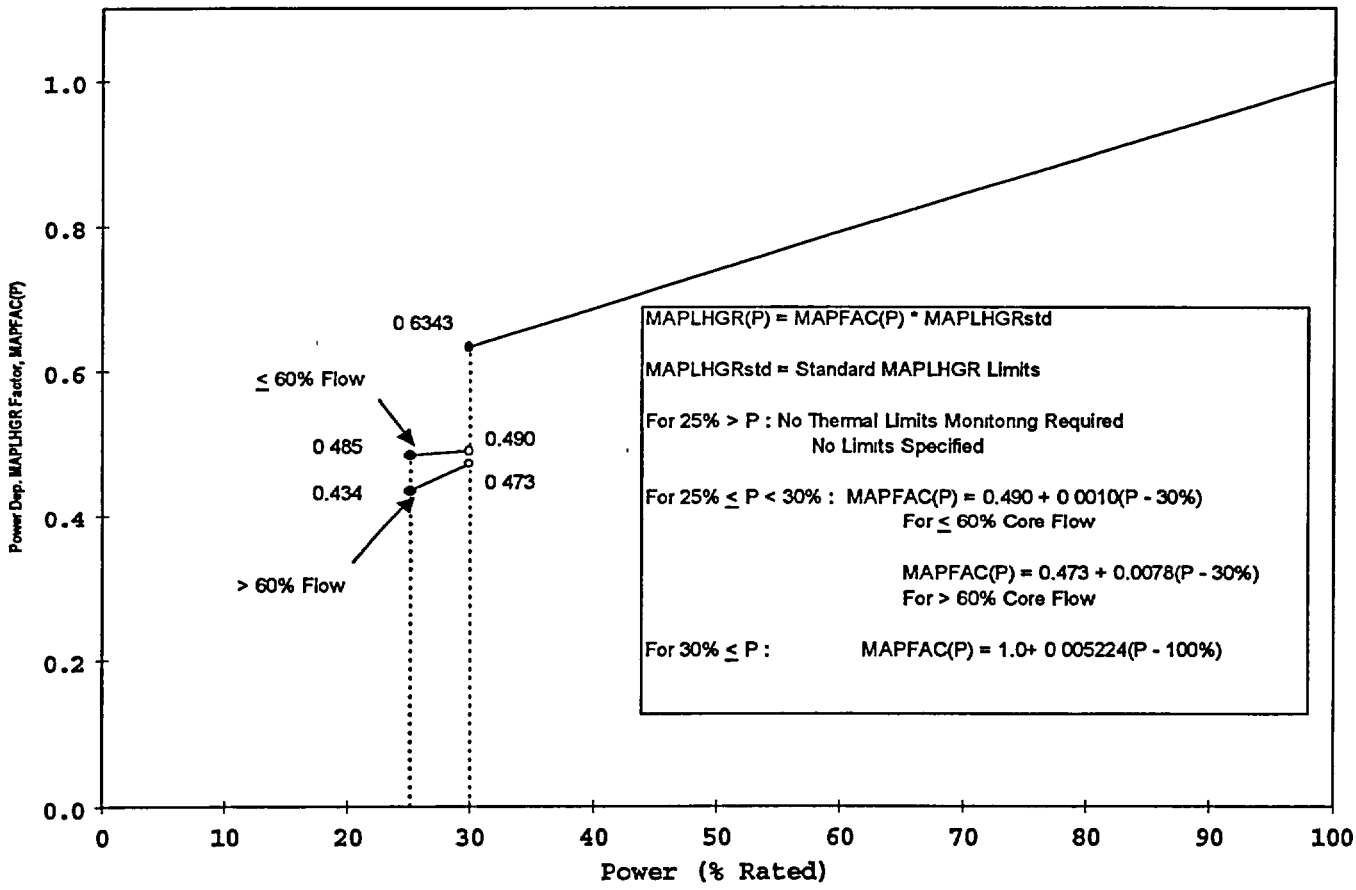


FIGURE 8

POWER DEPENDENT MAPLHGR MULTIPLIER MAPFAC(P)

THIS FIGURE IS VALID FOR THE TBVOOS
OPERATING DOMAIN
(Reference 5)

This Figure is Referred to by Technical Specification 3.2.1

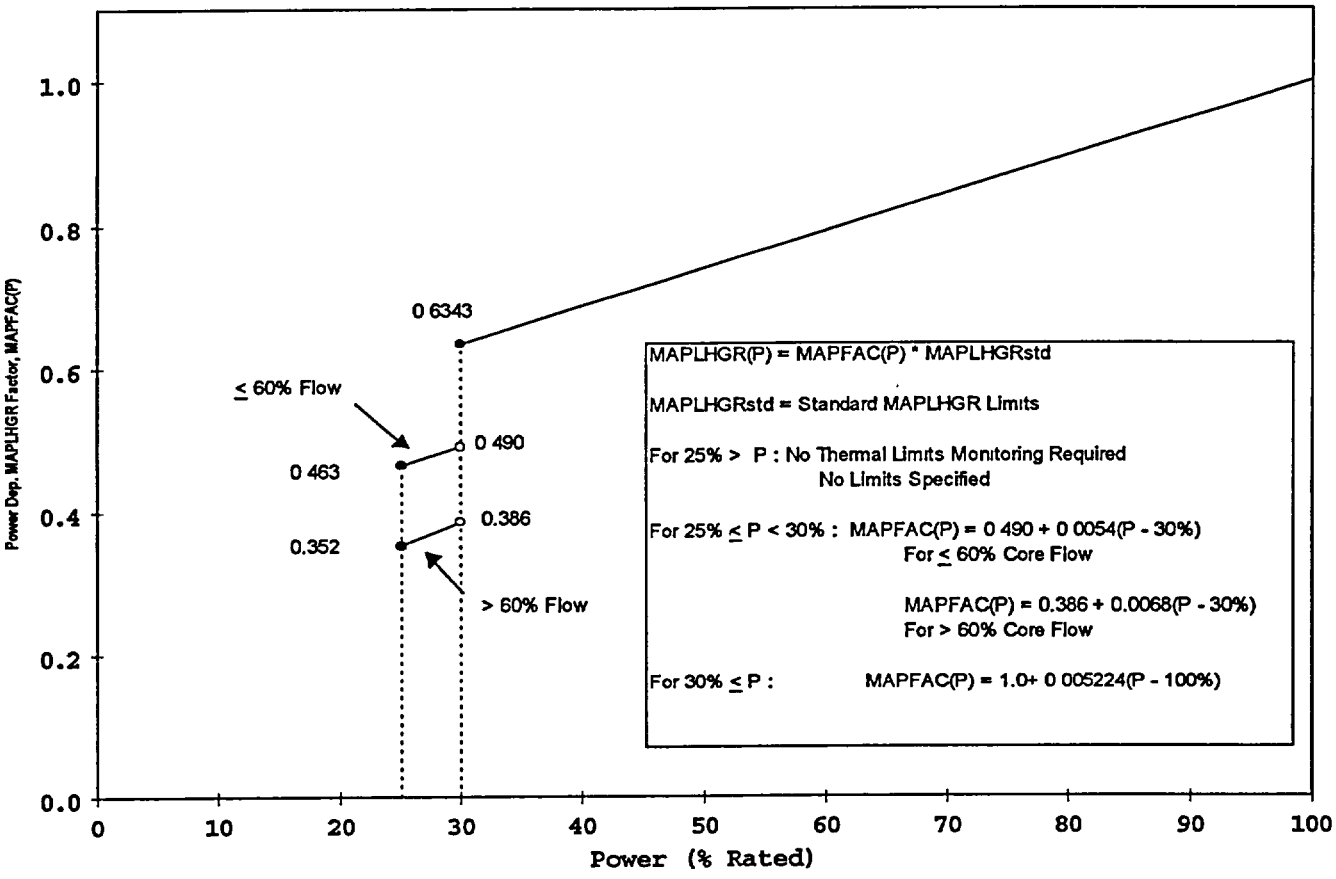


FIGURE 9

FLOW DEPENDENT MAPLHGR MULTIPLIER MAPFAC(F)

THIS FIGURE IS VALID FOR ALL OPERATING DOMAINS
EXCLUDING SINGLE LOOP OPERATION
(References 2 and 8)

This Figure is Referred to by Technical Specification 3.2.1

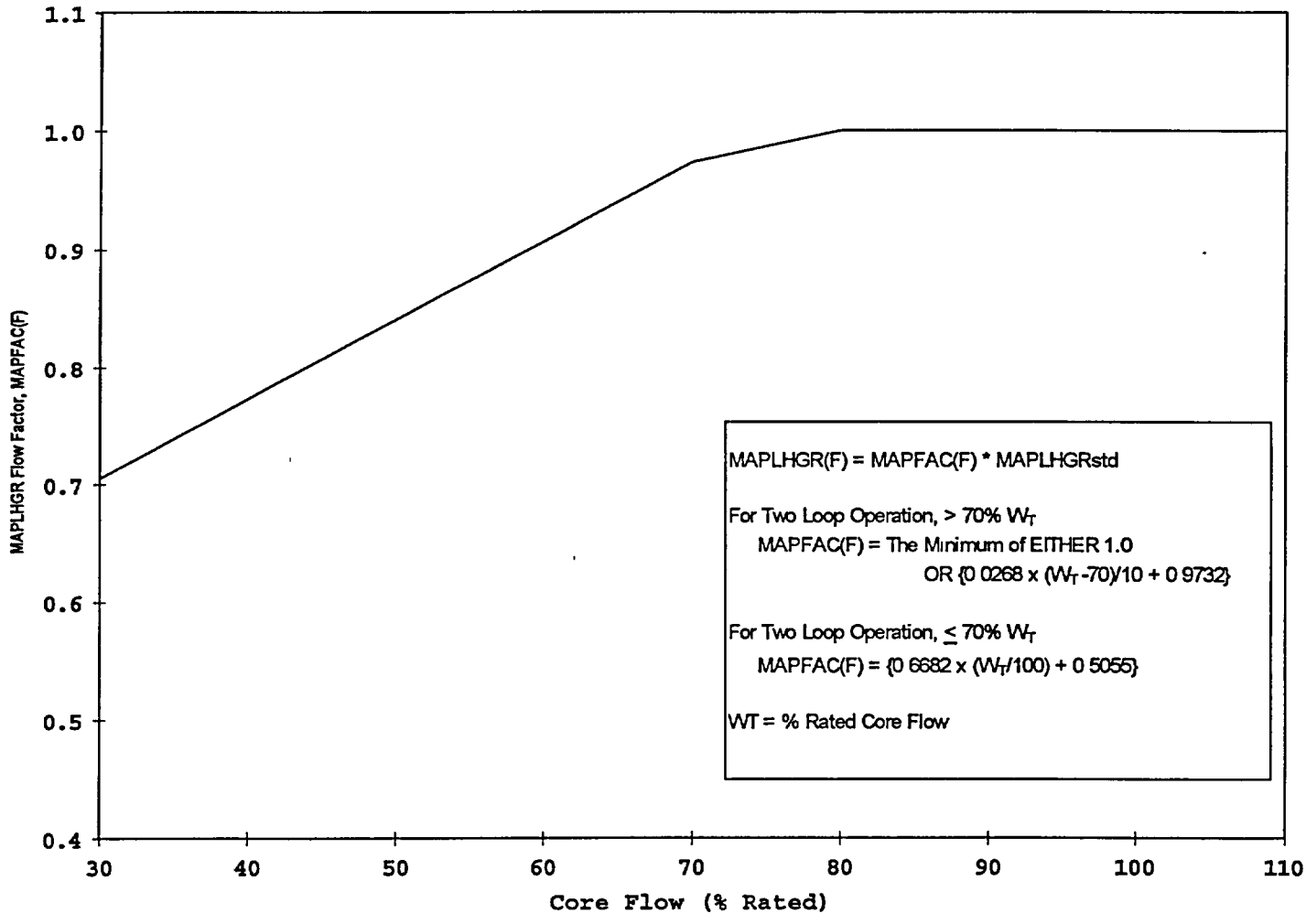
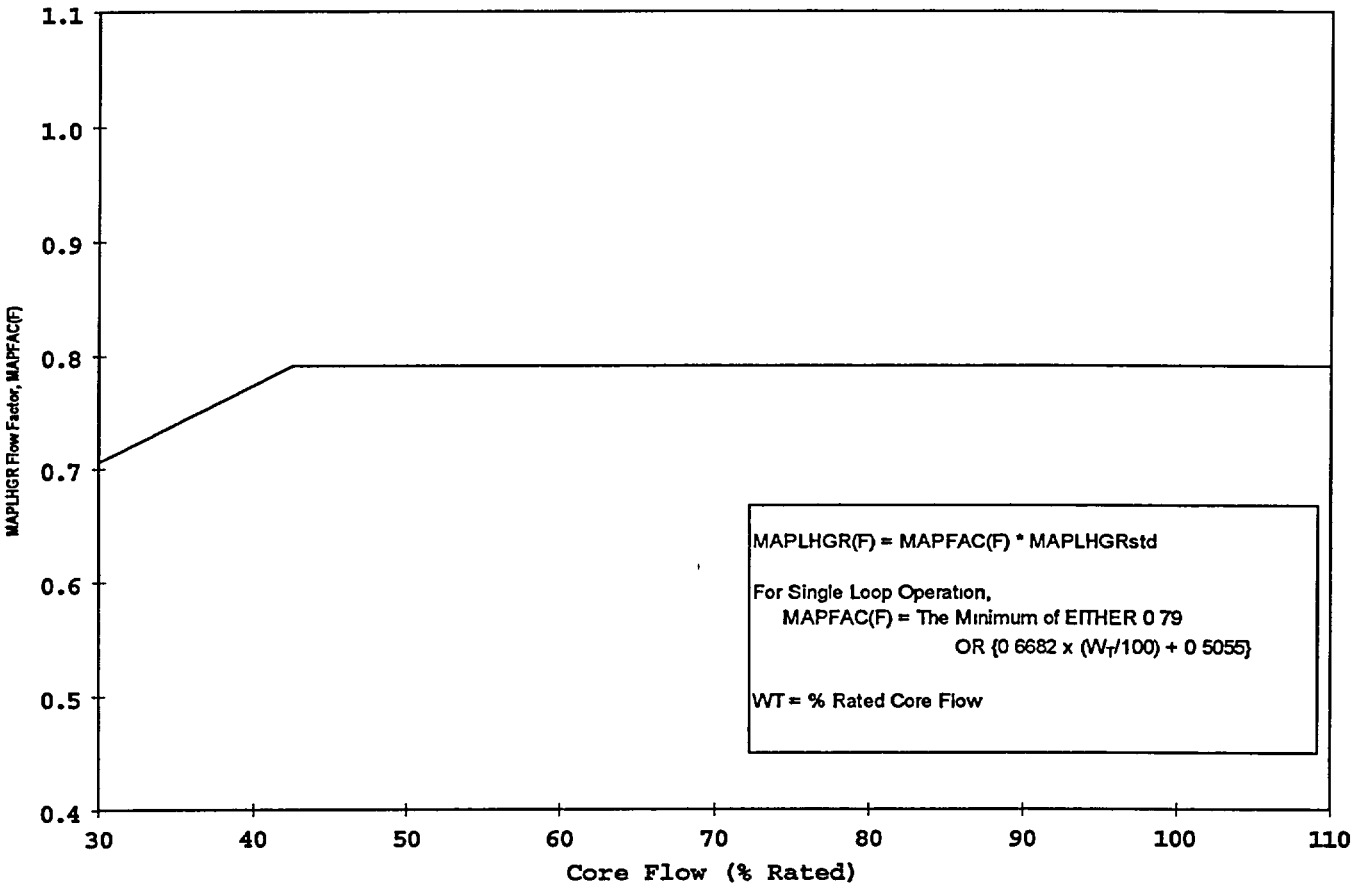


FIGURE 10

FLOW DEPENDENT MAPLHGR MULTIPLIER MAPFAC(F)

THIS FIGURE IS VALID FOR SINGLE LOOP OPERATION
(References 2 and 8)

This Figure is Referred to by Technical Specification 3.2.1



Note: The above multiplier is capped at the SLO Reduction factor provided in Table 3.

TABLE 1

OPERATING LIMIT MINIMUM CRITICAL POWER RATIO (OLMCPR)
Use in conjunction with Figures 11, 12 and 13.
(References 2 and 5)

- This table is valid for all Cycle 8 fuel types.
- This table is referred to by Technical Specification 3.2.3.

		TBV In Service and RPT In Service		TBV out of Service		RPT Out of Service	
		OPT. B (τ=0) (1)	OPT. A (τ=1) (1)	OPT. B (τ=0) (1)	OPT. A (τ=1) (1)	OPT. B (τ=0) (1)	OPT. A (τ=1) (1)
Two Loop Operation	BOC to EOR - 2000 MWd/ST	1.33	1.36	1.37	1.40	1.40	1.51
Two Loop Operation	EOR - 2000 MWd/ST to EOC	1.37	1.40	1.42	1.45	1.46	1.63
Single Loop Operation	BOC to EOR - 2000 MWd/ST	1.44 (2)	1.44 (2)	1.44 (2)	1.44 (2)	1.44 (2)	1.53
Single Loop Operation	EOR - 2000 MWd/ST to EOC	1.44 (2)	1.44 (2)	1.44	1.47	1.48	1.65

Notes:

1. When Tau does not equal 0 or 1, determine OLMCPR via linear interpolation.

2. OLMCPR limit set by the Single Loop Operation (SLO) - Recirculation Pump Seizure Analysis.

FIGURE 11

POWER DEPENDENT MCPR LIMIT ADJUSTMENTS AND MULTIPLIERS

THIS FIGURE IS VALID FOR THE RCF, ICF, MELLL, FWHOOS AND FWTR OPERATING DOMAINS (RPT IN SERVICE OR RPTOOS) (References 2 and 5)

This Figure is Referred to by Technical Specification 3.2.3

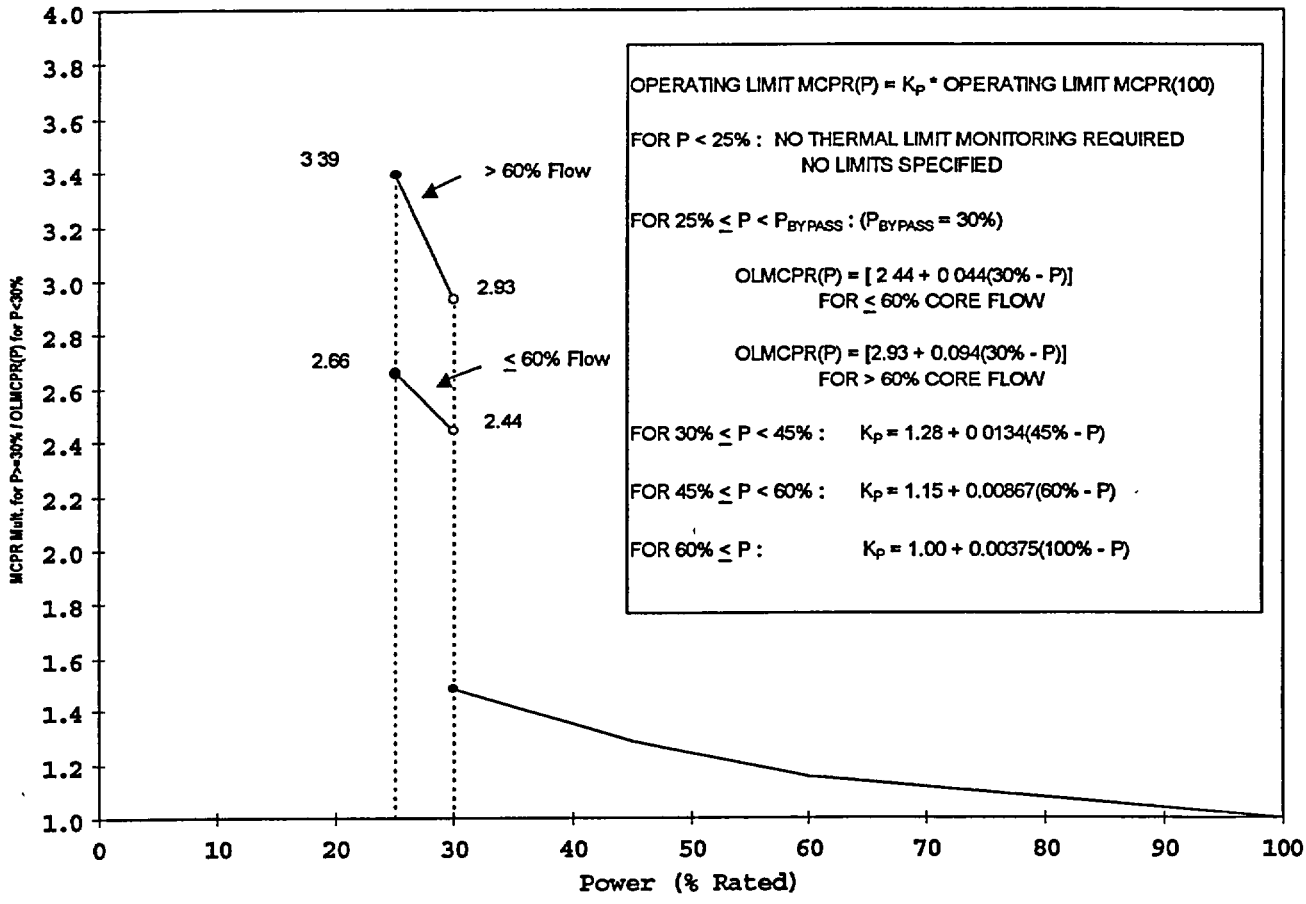


FIGURE 12

POWER DEPENDENT MCPR LIMIT ADJUSTMENTS AND MULTIPLIERS

THIS FIGURE IS VALID FOR THE TBVOOS
OPERATING DOMAIN
(References 2 and 5)

This Figure is Referred to by Technical Specification 3.2.3

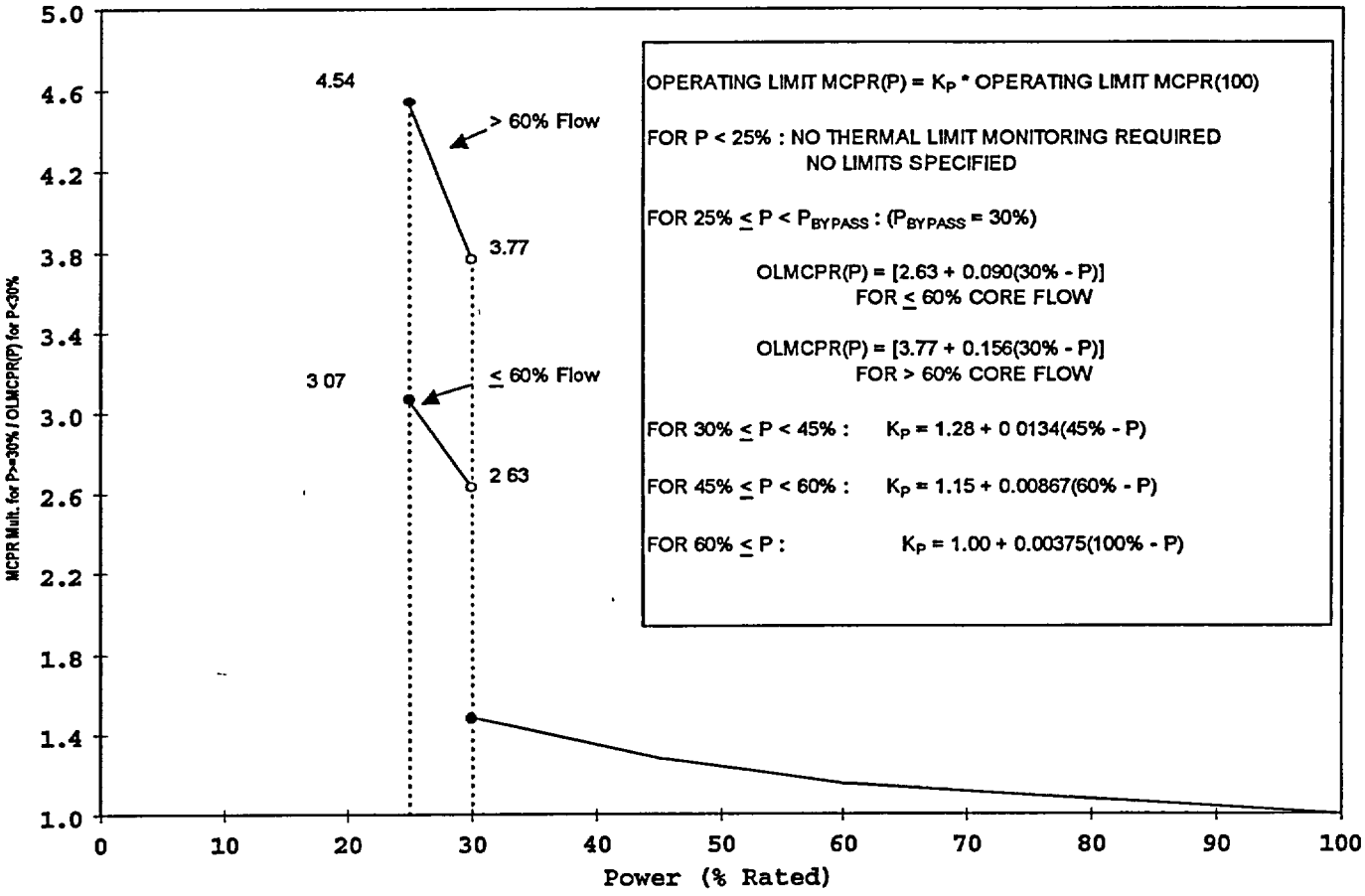


FIGURE 13

FLOW DEPENDENT MCPR LIMITS MCPR(F)

THIS FIGURE IS VALID FOR ALL OPERATING DOMAINS
(References 2, 8, and 11)

This Figure is Referred to by Technical Specification 3.2.3

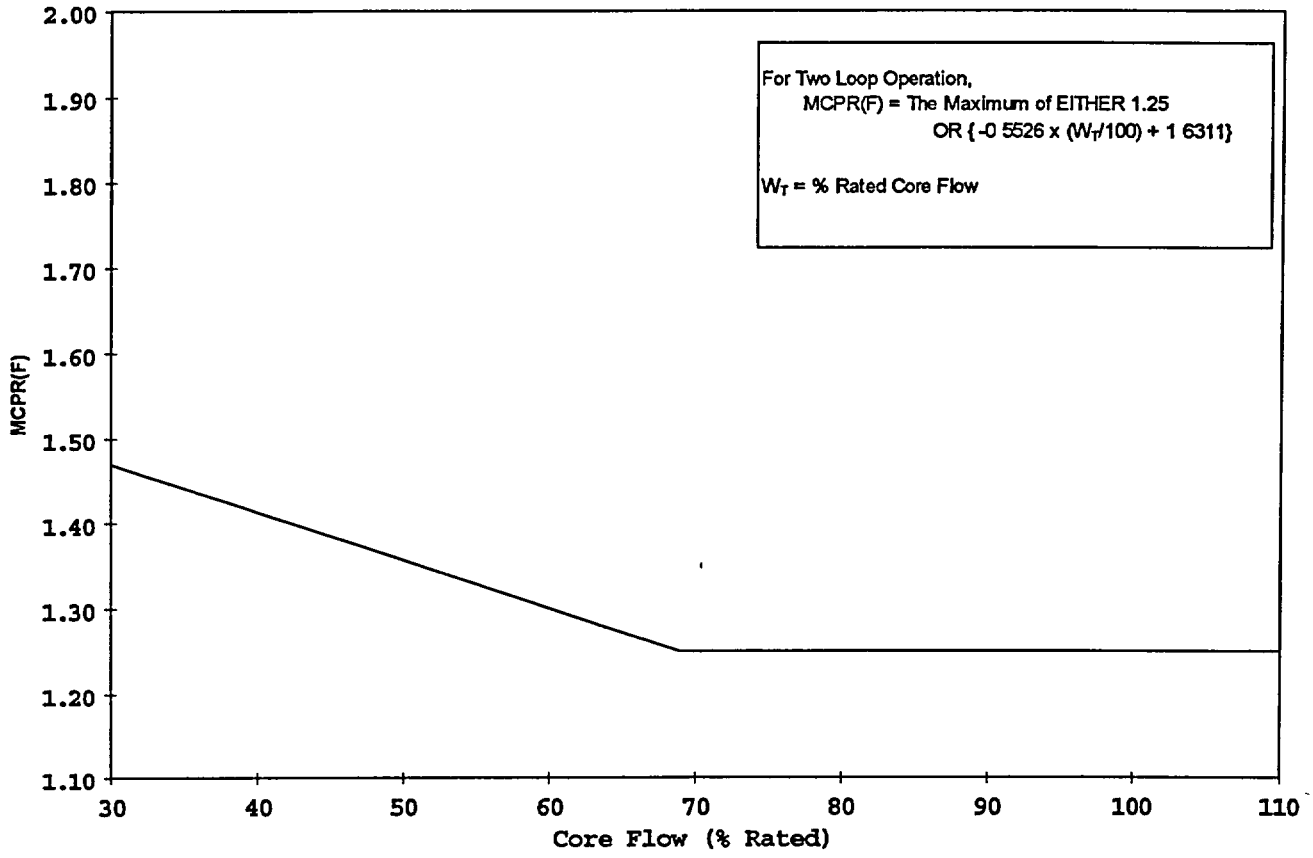


TABLE 2

ROD BLOCK MONITOR SETPOINTS
(References 2 and 10)

This Information is Referred to by Technical Specification 3.3.6

	Nominal Trip Setpoint	Allowable Value
LTSP	121.5%	121.5%
ITSP	116.5%	116.5%
HTSP	111.0%	111.7%
DTSP	92.0%	89.0%

These setpoints are based on a MCPR from Reference 10, limited by an OLMCPR of 1.33 (SLMCPR=1.07), and are consistent with a RBM filter time constant between 0.1 seconds and 0.55 seconds.

LTSP - Low trip setpoint
ITSP - Intermediate trip setpoint
HTSP - High trip setpoint
DTSP - Downscale trip setpoint

TABLE 3

MAPLHGR SINGLE LOOP OPERATION (SLO) REDUCTION FACTOR
(Reference 2)

This Information is Referred to by Technical Specification 3.2.1

SLO reduction factor = **0.79** for the Cycle 8 core.

TABLE 4

LINEAR HEAT GENERATION RATE LIMITS

This Information is Referred to by Technical Specification 3.2.4

FUEL TYPE	MAXIMUM VALUE
GE13	14.4 kW/ft
GE14	13.4 kW/ft

NOTE: The LHGR limit is an exposure dependent value. Due to the proprietary nature of these values only the maximum LHGR for each fuel type is listed in Table 4. The LHGR data is listed in Reference 3 (GNF proprietary).

TABLE 5

TURBINE BYPASS VALVE PARAMETERS
(Reference 6)

This Information is Referred to by Technical Specifications 3.7.8 and 4.7.8.C

TURBINE BYPASS SYSTEM RESPONSE TIME

Maximum delay time before start of bypass valve opening following generation of the turbine bypass valve flow signal	0.11 sec
Maximum time after generation of a turbine bypass valve flow signal for bypass valve position to reach 80% of full flow (includes the above delay time)	0.31 sec

MINIMUM REQUIRED BYPASS VALVES TO MAINTAIN SYSTEM OPERABILITY

Number of valves = 7

TABLE 6

Control Rod Block Instrumentation
Reactor Coolant System Recirculation Flow Upscale Trip
(Reference 10)

This Information is Referred to by Technical Specification 3.3.6

Nominal Trip Setpoint $\leq$ 113.4%
Allowable Value $\leq$ 115.6%