Entergy

Entergy Nuclear Generation Company
Pilgrim Nuclear Power Station
600 Rocky Hill Road
Plymouth, MA 02360

J. F. Alexander
Director
Nuclear Assessment

10CFR50.36

ENGC Ltr. 2.01.062
May 17, 2001

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

Docket No. 50-293
License No. DPR-35

Core Operating Limits Reports

The attached revision of Pilgrim's Core Operating Limits Report (COLR) is submitted in accordance with the requirements of Pilgrim's Technical Specification 5.6.5.

Revision 14A provides cycle-specific limits for operating Pilgrim during cycle 14. The core operating limits in COLR, Revision 14A, have been established using the NRC-approved methodology provided in the references listed in COLR, Section 5.0, and in Technical Specification 5.6.5.

Should you require further information concerning COLR, Revision 14A, please contact P.M. Kahler at (508) 830-7939.

J.F. Alexander
Regulatory Relations
Group Manager

PMK/201062
Attachment: Pilgrim Nuclear Power Station Core Operating Limits Report, Revision 14A

cc: Mr. Steven Bloom, Project Manager
Project Directorate I-3
Office of Nuclear Reactor Regulation
Mail Stop: 0-7A-3
1 White Flint North
11855 Rockville Pike
Rockville, MD 20852

U.S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406

Senior Resident Inspector

A001

(CYCLE 14)

APPROVED: _____ 5/12/01
Operations Support Superintendent Date

APPROVED: _____ 5/12/01
Nuclear Engineering Director Date

APPROVED: _____ 5/12/01
Operations Review Committee Date

ORC Meeting #: 01-05

APPROVED: _____ 5/12/01
Operations Director Date

APPROVED: _____ 5/12/01
Station Director Date

TABLE OF CONTENTS

RECORD OF REVISIONS

Revision	Effective Date	Description
8A	Effective date based on issuance of license amendment by NRC	Applicable for use during Cycle 8 Operation
9A	Effective date based on issuance of license amendment by NRC for ARTS and SAFER/GESTR	Applicable for use during Cycle 9 operation
10A	Effective date based on initial startup of Cycle 10	Applicable for use during Cycle 10 Operation
11A	Effective date based on initial startup of Cycle 11	Applicable for use during Cycle 11 Operation
11B	Effective upon final approval	Applicable for use during Cycle 11 Operation
11C	Effective upon final approval	Applicable for use during Cycle 11 Operation
11D	Effective upon final approval	Applicable for use during Cycle 11 Operation
12A	Effective date based on issuance of license amendment by NRC for SLMCPR of 1.08	Applicable for use during Cycle 12 Operation
12B	Effective upon final approval	Renumbered Table 3.3-2 to 3.3-1, Sh. 2 of 2 and Table 3.3-1 to 3.3-1, Sh. 1 of 2
12C	Effective upon final approval	Changed Tech Spec section numbers referenced due to Tech Amendment #177. Pages affected: 6, 24
12D	Effective upon final approval	Incorporated stability log-term solution option I-A.
13A	Effective upon final approval	Applicable for use during Cycle 13 Operation
14A	Effective upon final approval	Applicable for use during Cycle 14 Operation

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

This report provides the cycle-specific limits for operation of the Pilgrim Nuclear Power Station (PNPS) during Cycle 14. In this report, Cycle 14 will be referred to as the present cycle.

Although this report is not a part of the PNPS Technical Specifications, the Technical Specifications refer to this report for the applicable values of the following fuel-related parameters:

	Reference Technical Specification
APRM Flux Scram Trip Setting (Run Mode)	Table 3.1.1
APRM Rod Block Trip Setting (Run Mode)	Table 3.2.C-2
Rod Block Monitor Trip Setting	Table 3.2.C-2
Average Planar Linear Heat Generation Rate	3.11.A
Linear Heat Generation Rate (LHGR)	3.11.B
Minimum Critical Power Ratio (MCPR)	3.11.C
Power/Flow Relationship	3.11.D
Reactor Vessel Core Design	4.2

If any of the core operating limits in this report is exceeded, actions will be taken as defined in the referenced Technical Specification.

The core operating limits in this report have been established for the present cycle using the NRC-approved methodology provided in the documents listed in Technical Specification 5.6.5. These limits are established such that the applicable limits of the plant safety analysis are met.

2.0 INSTRUMENTATION TRIP SETTINGS:

2.1 APRM Flux Scram Trip Setting (Run Mode)

Ref. Technical Specifications: Table 3.1.1

a. Normal Feedwater Heating or Low Thermal Reactor Power:

$T_{FW} \geq T_{FW}(rated)-50°F$ **OR** $P < 30\%$,
Where T_{FW} = rated equivalent Feedwater Temperature in °F; P= Core Power, % of rated.

When the mode switch is in the RUN position, the average power range monitor (APRM) flux scram trip setting (S_S), in percent of rated thermal power, as a function of aligned drive flow shall be as given by Figure 2.1-1. S_S is clamped at 120% of rated core thermal power. Formulae used to develop Figure 2.1-1 are listed in Table 2.1-1.

The aligned drive flow to the input drive flow relationship is as follows :

$$W_D = \frac{W_D100*(\Delta D40) - W_D40*(\Delta D100) + DW_D*W_{D1}}{DW_D - \Delta D100 + \Delta D40}$$

Where:

W_D100 =	100.43 (Ref: 5.10 Table 16)
W_D40 =	32.135 (Ref: 5.10 Table 16)
ΔW_D=	$W_D100 - W_D40$
$\Delta D40$ =	Low flow drive flow alignment setting
$\Delta D100$ =	High flow drive flow alignment setting
W_{D1}=	FCTR card input drive flow in percent of rated
W_D=	Aligned drive flow in percent of rated

The APRM flux scram trip setting is valid only for operation using two recirculation loops. Operation with one recirculation loop out of service is restricted by License Condition 3.E.

In accordance with Technical Specification Table 3.1.1, Note 15, for no combination of loop recirculation flow rate and core thermal power shall the APRM flux scram trip setting be allowed to exceed 120% of rated thermal power. The 50 °F Feedwater Temperature reduction limit only applied to the APRM FCTR Card Settings, based on the validity range of Stability Analysis.

b. Reduced Feedwater Heating :

$T_{FW} < T_{FW}(rated) - 50°F$ AND $P > 30\%$,

Cycle 14 operations are not analyzed for reduced feedwater temperature. Core stability has been analyzed for feedwater temperature reduction. Use of this analysis requires implementation of the appropriate settings on the Flow Control Trip Reference (FCTR) cards.

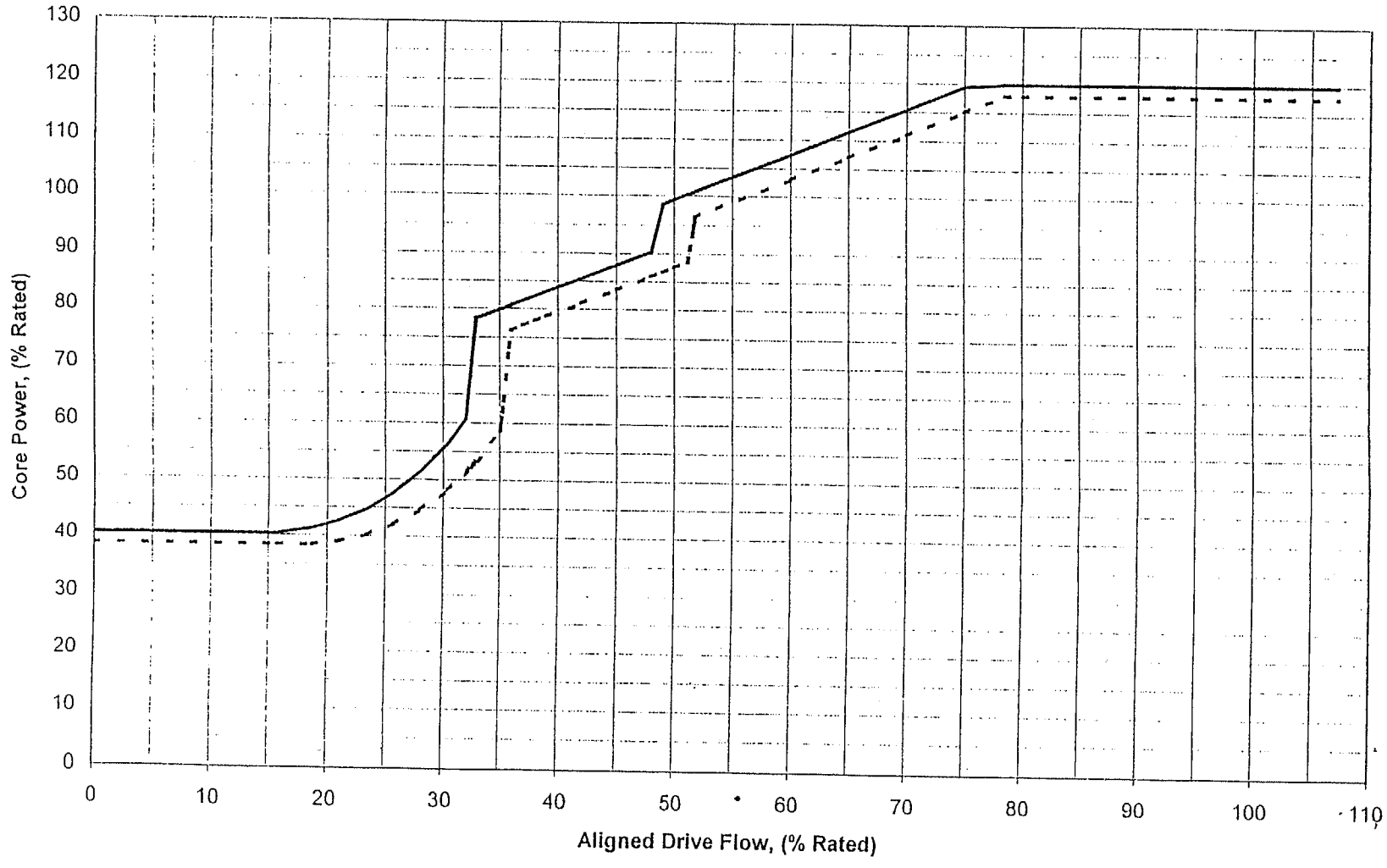
Table 2.1-1
Formulae For Nominal and Allowable APRM Flux Scram Settings
(Normal Feedwater Temperature)

Expression S_S = P,% power, where	A	B	C	D	E	Drive Flow Range % Rated
P=A	38.4980					0 ≤Wd ≤18.727
$P = A \times B^{\left[C + D\left(\frac{W_D}{100}\right) + E\left(\frac{W_D}{100}\right)^2\right]}$	41.0000	1.6849	0.6791	-9.2164	26.4087	18.727 <Wd ≤35.024
P=A + B x W_D	-597.1193	18.7275				35.024 <W_D ≤35.961
P=A + B x W_D	47.3412	0.8063				35.961 ≤W_D ≤51.110
P=A + B x W_D	-513.5415	11.7804				51.110 <W_D ≤51.784
P=A + B x W_D	54.7848	0.8054				51.784 <W_D ≤78.492
P=A	118					78.492 <W_D ≤107.221

Notes:

1. S_S is the Scram Trip Setting in % Core Power and W_D is the % Aligned Drive Flow as stated in section 2.1
2. Figure 2.1-1 shows the plot of S_S vs. W_D.
3. Allowable setting = 2 + Nominal S_S calculated at (W_D + 3)
4. Reference 5.10, Table 12.C lists the values of constants listed in this Table.

Figure 2.1-1 Nominal and allowable APRM Flux Scram Trip Settings



2.2 APRM Rod Block Trip Setting (Run Mode)

Reference Technical Specifications: Table 3.2.C-2, 3.1.B.1

a. Normal Feedwater Heating or Low Thermal Reactor Power :

$T_{FW} \geq T_{FW}(rated)-50°F$ OR $P < 30\%$
Where T_{FW} = rated equivalent Feedwater Temperature. °F & P=Core Power, % of rated

When the mode switch is in the run position, the average power range monitor (APRM) rod block trip setting (S_{RB}) as a function of aligned drive flow shall be as given by Figure 2.2-1. S_{RB} is clamped at 115% of rated core thermal power. Formulae that form the basis of the Figure 2.2-1 are listed in Table 2.2-1.

The aligned drive flow is calculated from the input drive flow using the relationship given in section 2.1.

The APRM rod block trip setting is valid only for operation using two recirculation loops. Operation with one recirculation loop out of service is restricted by License Condition 3.E.

2.2 APRM Rod Block Trip Setting (Run Mode)

b. Reduced Feedwater Heating :

$T_{FW} < T_{FW}(rated) - 50°F$ AND $P > 30\%$

Cycle 14 operations are not analyzed for reduced feedwater temperature. Core stability has been analyzed for feedwater temperature reduction. Use of this analysis requires implementation of the appropriate settings on the Flow Control Trip Reference (FCTR) cards.

2.3 Rod Block Monitor Trip Setting

Reference Technical Specification: Table 3.2.C-2

Allowable values for the power-dependent Rod Block Monitor trip setpoints shall be:

Reactor Power, P (% of Rated)	Trip Setpoint (% of Reference Level)
$P \leq 25.9$	Not applicable (All RBM Trips Bypassed)
$25.9 < P \leq 62.0$	120
$62.0 < P \leq 82.0$	115
$82.0 < P$	110

The allowable value for the RBM downscale trip setpoint shall be $\leq 94.0\%$ of the reference level. The RBM downscale trip is bypassed for reactor power $\leq 25.9\%$ of rated.

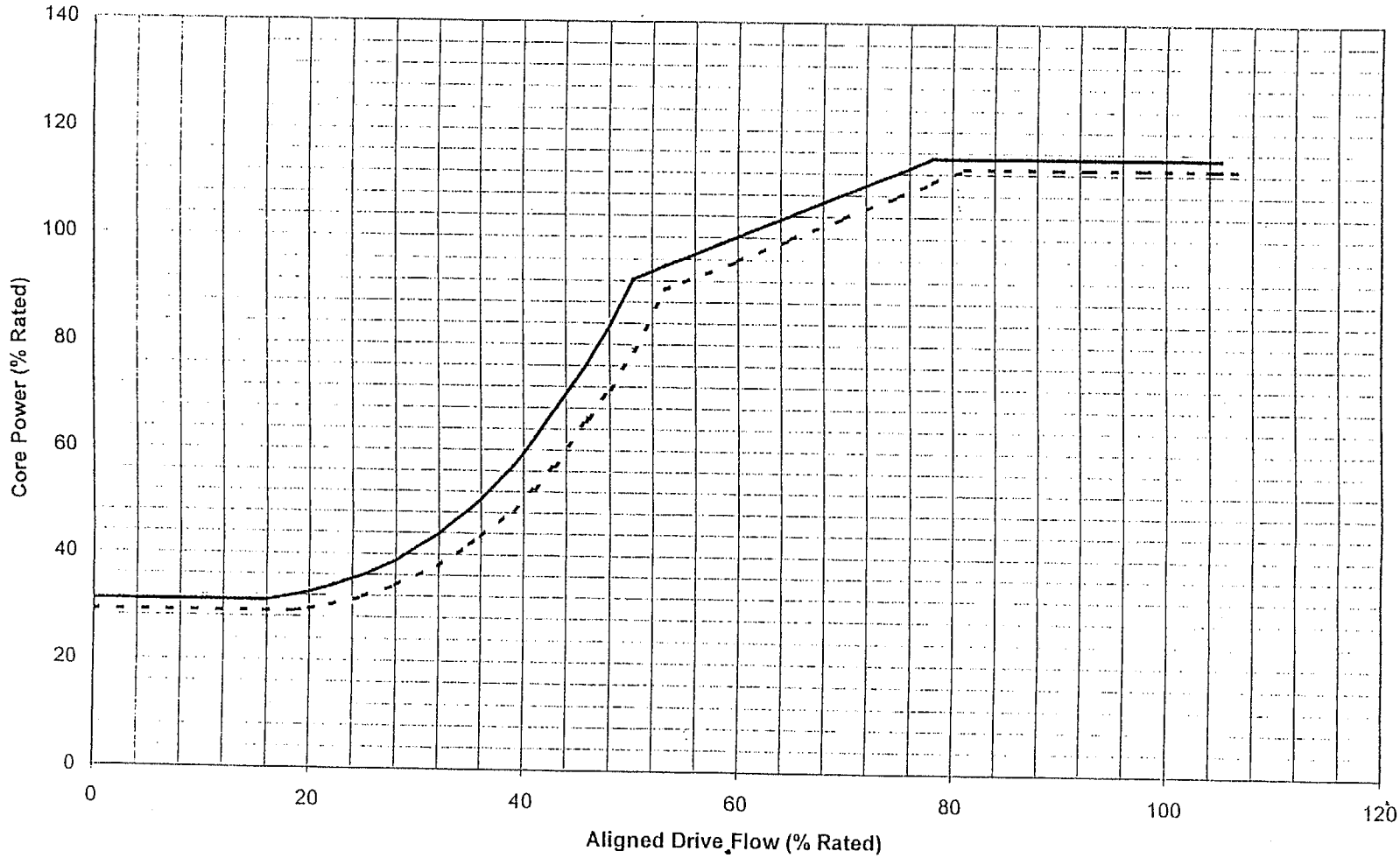
Table 2.2-1
Formulae For Nominal & Allowable APRM Rod Block Settings
(Normal Feedwater Temperature)

Expression S_{RB} = P,% power , where	A	B	C	D	E	Drive Flow Range % Rated
P = A	29.0998	N/A	N/A	N/A	N/A	$0 \le W_D \le 18.727$
$P = A \times B^{\left[C + D\left(\frac{W_D}{100}\right) + E\left(\frac{W_D}{100}\right)^2\right]}$	31.7059	2.4664	0.0272	-2.3474	9.0496	$18.727 < W_D \le 34.942$
	31.7059	2.4664	-0.0247	-1.7727	7.8297	$34.942 < W_D \le 45.813$
	31.7059	2.4664	-0.1193	-0.3416	5.1571	$45.813 \le W_D \le 53.254$
$P = A + B \times W_D$	47.4896	0.8069	N/A	N/A	N/A	$53.254 < W_D \le 81.192$
P = A	113.000	N/A	N/A	N/A	N/A	$81.192 < W_D \le 106.775$

Notes:

1. S_{RB} is the APRM Rod Block Trip Setting in % Core Power and W_D is the % Aligned Drive Flow as stated in section 2.2
2. Figure 2.2-1 shows the plot of S_{RB} vs. W_D.
3. Allowable setting = 2 + Nominal S_{RB} calculated at (W_D + 3)
4. Reference 5.10, Table 12.C lists the values of constants listed in this Table.

Figure 2.2-1 Nominal & Allowable APRM Rod Block Trip Settings



3.0 CORE OPERATING LIMITS

3.1 Maximum Average Planar Linear Heat Generation Rate (MAPLHGR)

Reference Technical Specification: 3.11.A

During power operation, MAPLHGR for each fuel type as a function of axial location and average planar exposure shall not exceed the applicable limiting value. The applicable limiting value for each fuel type is the smaller of the flow-dependent and power-dependent MAPLHGR limits, $MAPLHGR_F$ and $MAPLHGR_P$. The flow-dependent MAPLHGR limit, $MAPLHGR_F$, is the product of the MAPLHGR flow factor, $MAPFAC_F$, shown in Figure 3.1-6 and the MAPLHGR for rated power and flow conditions, given in Tables 3.1-1 for GE11 fuel or Table 3.1-2 for GE14 fuel. The power-dependent MAPLHGR limit, $MAPLHGR_P$, is the product of the MAPLHGR power factor, $MAPFAC_P$, (shown in Figure 3.1-4 for both GE11 and GE14 fuels) and the MAPLHGR for rated power and flow conditions, (given in Tables 3.1-1 for GE11 fuel or Table 3.1-2 for GE14 fuel). For GE11 fuel, a MAPLHGR penalty is applied to compensate for an an increase in Upperbound PCT to 1640 °F, due to errors in the GE11 LOCA analysis reported by GE, by reducing the MAPFACp by 1% for each 13 °F rise beyond the 1600 °F upperbound PCT limit. The application of this penalty is equivalent to reducing the upperbound PCT to less than 1600 °F. The penalty factor at 100% power is 0.968. This penalty is not applicable to GE14 fuel (Reference 5.15)

The MAPLHGR for rated power and flow conditions for each fuel type as a function of axial location and average planar exposure are based on the approved methodology referenced in Section 5.0 and programmed in the plant process computer. The MAPLHGR for rated power and flow conditions for the most limiting lattice in each fuel type (excluding natural uranium lattices) are presented in Figures 3.1-1 and 3.1-2. For each lattice type, the MAPLHGR values for rated power and flow conditions are listed in Tables 3.1-1 and 3.1-2. The MAPLHGR limits for off-rated conditions are based on the approved methodology in reference 5.3. MAPLHGR limits are based on ECCS-LOCA considerations.

Pbypass is the power level below which more restrictive thermal limits are applied, as Turbine Control Valve fast closure scram is assumed to be bypassed. Pbypass is currently set at 33% power; however, it may be set higher up to 45% power, if the limits corresponding to 33% power are applied at power levels between 33% and Pbypass, as shown in Figure 3.1-4.

Table 3.1-1
GE11 MAPLHGR Limits at Rated Power and Rated Core Flow

Bundle Type: GE11 ALL Lattices In Cycle 14 Core		
Average Planar Exposure		MAPLHGR
(GWd/ST)	(GWd/MT)	(kW/ft)
0.0	0.0	12.16
36.2	39.9	12.16
56.7	62.5	9.0
63.5	70.0	6.4

Table 3.1-2

GE14 MAPLHGR Limits at Rated Power and Rated Core Flow

Bundle Type: GE14-P10DNAB412-16GZ-100T-145-T6-3901

Average Planar Exposure	MAPLHGR						
GWd/MT (GWd/ST)	Lattice 4820	Lattice 4827	Lattice 4828	Lattice 4829	Lattice 4830	Lattice 4825	Lattice 4831
0.00 (0.00)	9.22	8.26	8.07	8.21	8.12	9.61	10.14
0.22 (0.20)	9.14	8.29	8.10	8.24	8.19	9.56	10.14
1.10 (1.00)	8.94	8.35	8.17	8.33	8.28	9.42	10.14
2.20 (2.00)	8.88	8.45	8.28	8.45	8.40	9.39	10.14
3.31 (3.00)	8.90	8.55	8.40	8.59	8.53	9.42	10.14
4.41 (4.00)	8.93	8.66	8.52	8.70	8.65	9.46	10.14
5.51 (5.00)	8.97	8.77	8.63	8.81	8.76	9.51	10.14
6.61 (6.00)	9.01	8.87	8.74	8.92	8.89	9.55	10.14
7.72 (7.00)	9.04	8.96	8.84	9.04	9.01	9.58	10.14
8.82 (8.00)	9.07	9.05	8.95	9.16	9.15	9.61	10.14
9.92 (9.00)	9.09	9.15	9.06	9.29	9.29	9.64	10.14
11.02 (10.00)	9.11	9.24	9.17	9.43	9.44	9.65	10.14
12.13 (11.00)	9.12	9.34	9.28	9.56	9.58	9.66	10.14
13.23 (12.00)	9.13	9.43	9.39	9.68	9.70	9.67	10.14
14.33 (13.00)	9.13	9.52	9.49	9.78	9.80	9.67	10.14
15.43 (14.00)	9.13	9.59	9.57	9.85	9.87	9.67	10.14
16.53 (15.00)	9.13	9.64	9.64	9.90	9.91	9.66	10.14
18.74 (17.00)	9.12	9.73	9.74	9.97	9.97	9.65	10.14
22.05 (20.00)	9.11	9.83	9.85	10.06	9.98	9.64	10.14
27.56 (25.00)	8.95	10.01	10.00	10.14	10.03	9.61	10.14
33.07 (30.00)	8.30	9.58	9.58	9.85	9.87	9.01	9.95
38.58 (35.00)	7.65	9.15	9.15	9.42	9.40	8.36	9.31
44.09 (40.00)	7.02	8.70	8.70	8.97	8.92	7.73	8.68
49.60 (45.00)	6.38	8.22	8.21	8.49	8.46	7.09	8.05
54.78 (49.70)	3.98						
55.12 (50.00)		7.68	7.63	7.95	7.98	5.63	7.42
58.15 (52.75)						4.21	
60.63 (55.00)		5.21	5.16	5.89	5.96		5.46
61.32 (55.63)			4.84				
61.44 (55.74)		4.84					
62.68 (56.86)							4.51
62.81 (56.98)				4.90			
62.91 (57.07)					4.92		

Figure 3.1-1 MAPLHGR For Fuel Type GE11

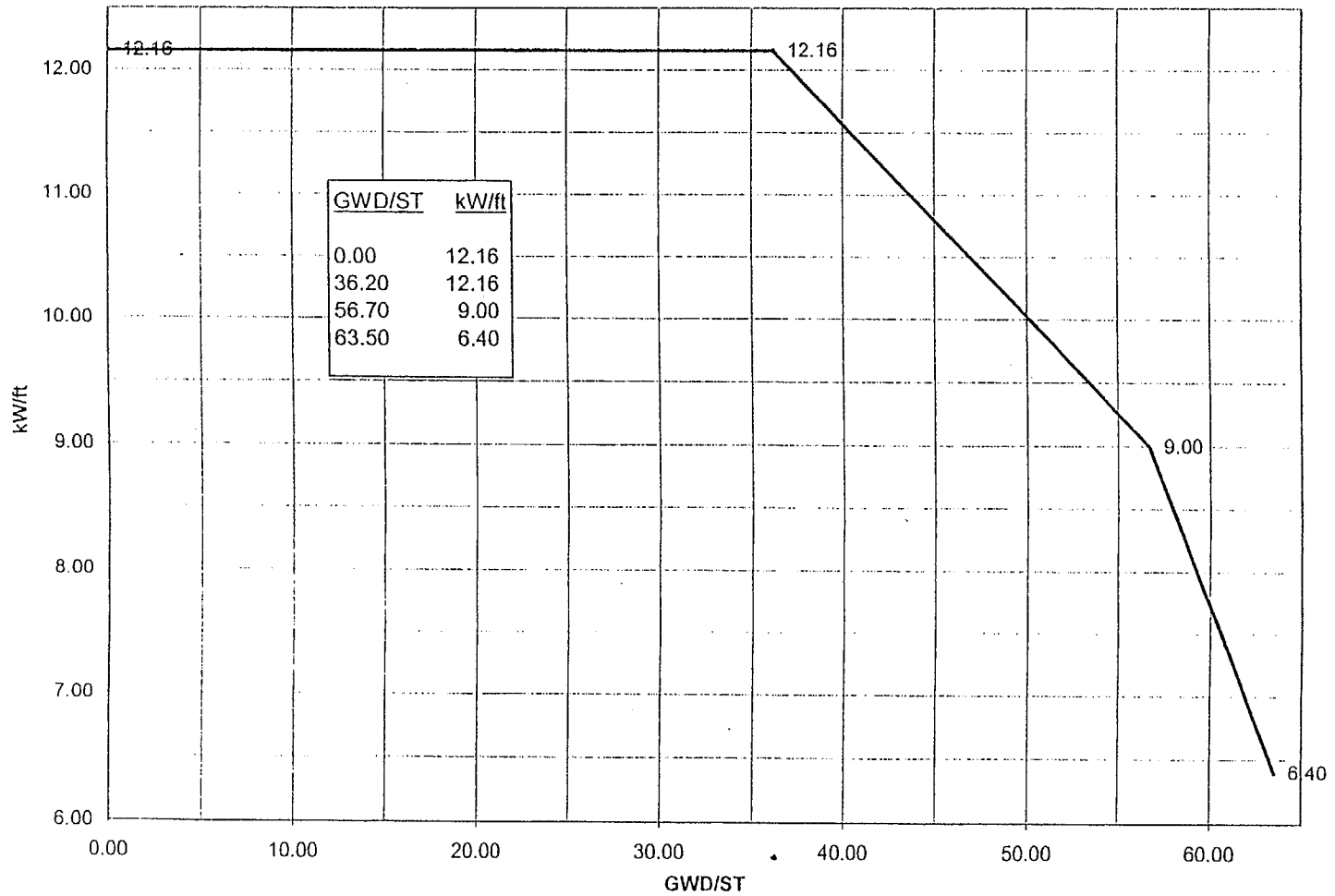
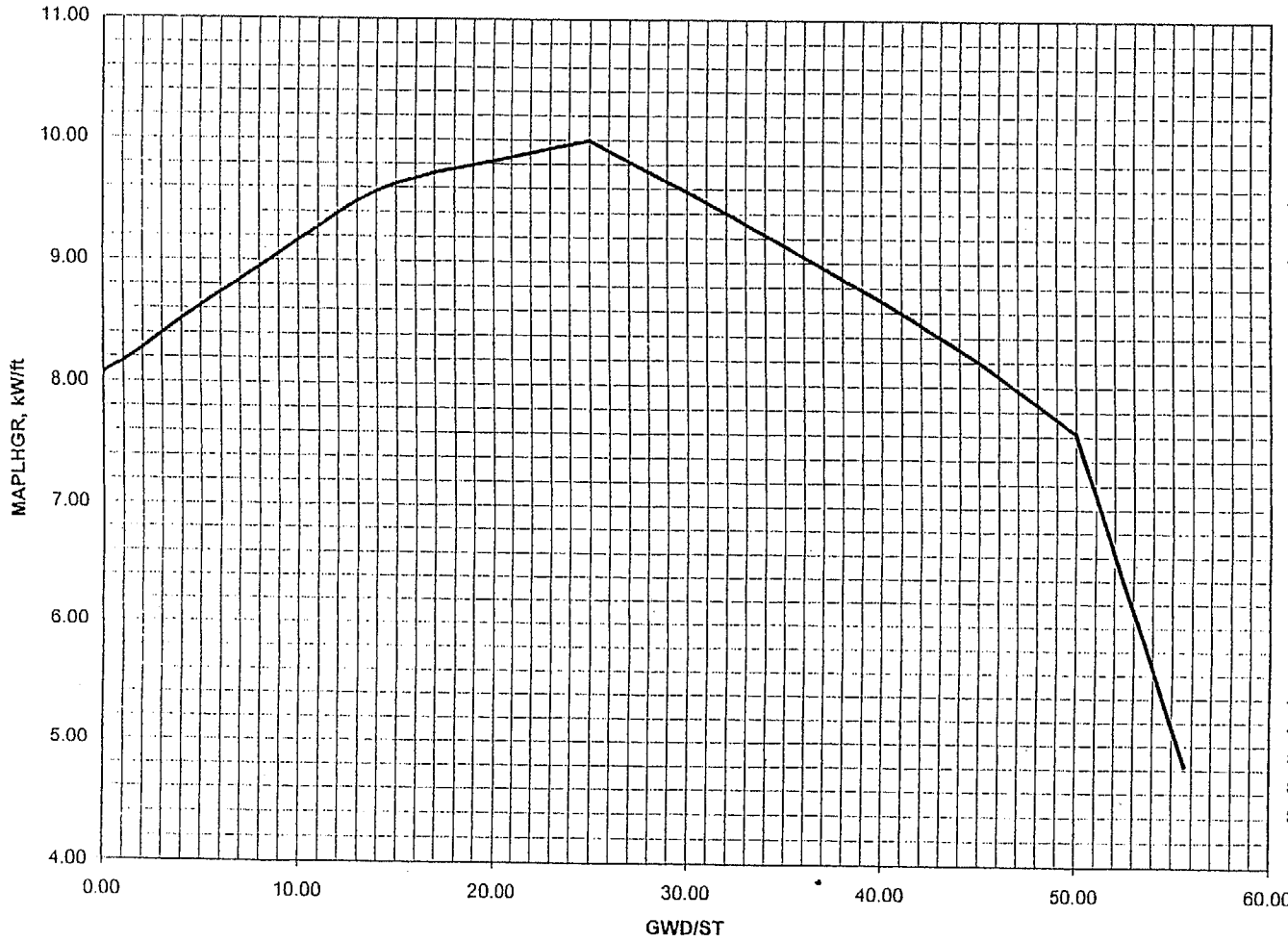


Figure 3.1-2 MAPLHGR For Fuel Bundle Type GE14-P10DNAB412-16GZ-100T-145-T6-3901



GWD/ST	kW/ft
0.00	8.07
0.20	8.10
1.00	8.17
2.00	8.28
3.00	8.40
4.00	8.52
5.00	8.63
6.00	8.74
7.00	8.84
8.00	8.95
9.00	9.06
10.00	9.17
11.00	9.28
12.00	9.39
13.00	9.49
14.00	9.57
15.00	9.64
17.00	9.73
20.00	9.83
25.00	10.00
30.00	9.58
35.00	9.15
40.00	8.70
45.00	8.21
50.00	7.63
55.00	5.16
55.63	4.84

Figure 3.1-3 Flow Dependent MAPLHGR Factor ($MAPFAC_F$) for both GE11 and GE14 fuels

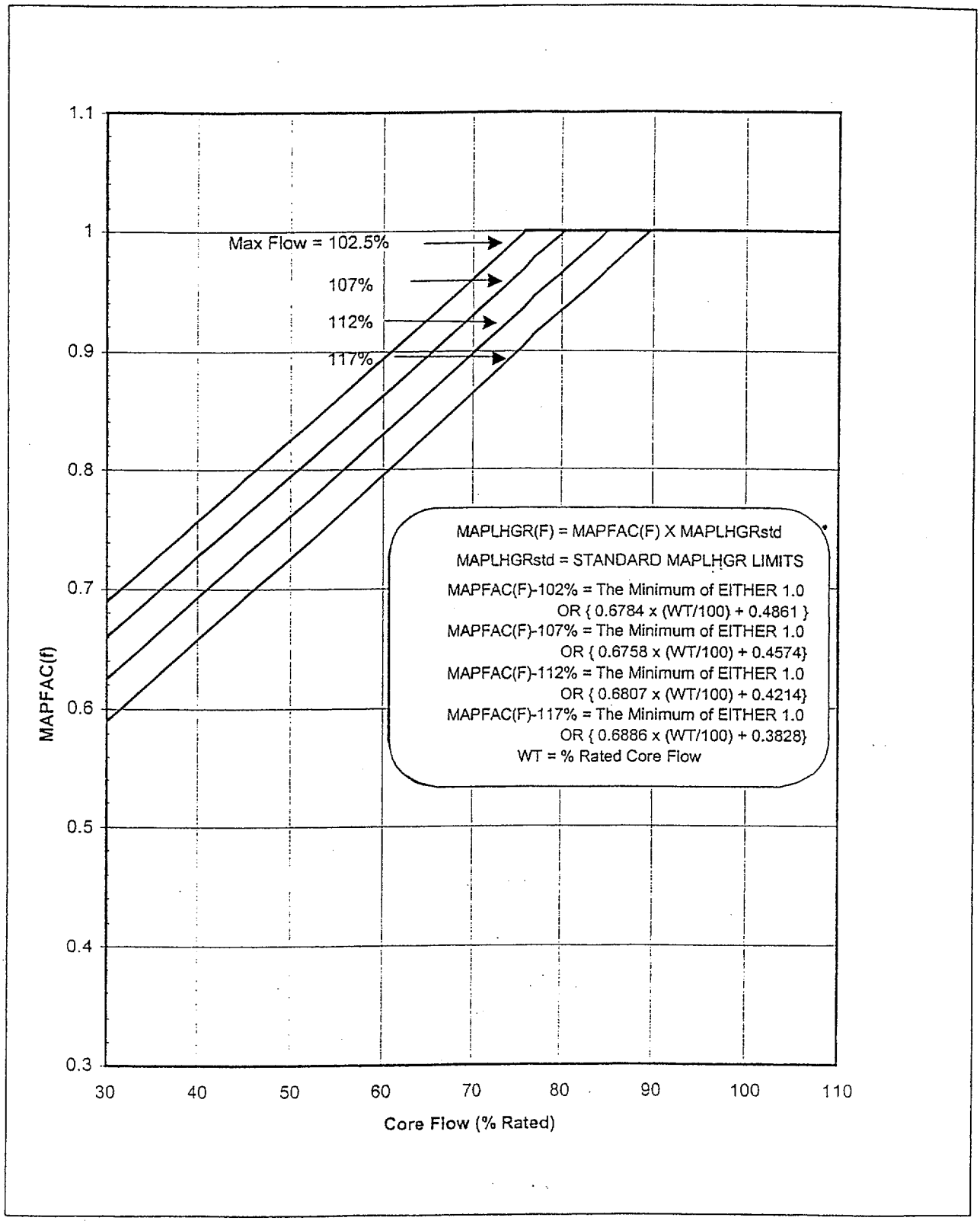


Figure 3.1-4 Power Dependent MAPLHGR Factors for GE11 Fuel

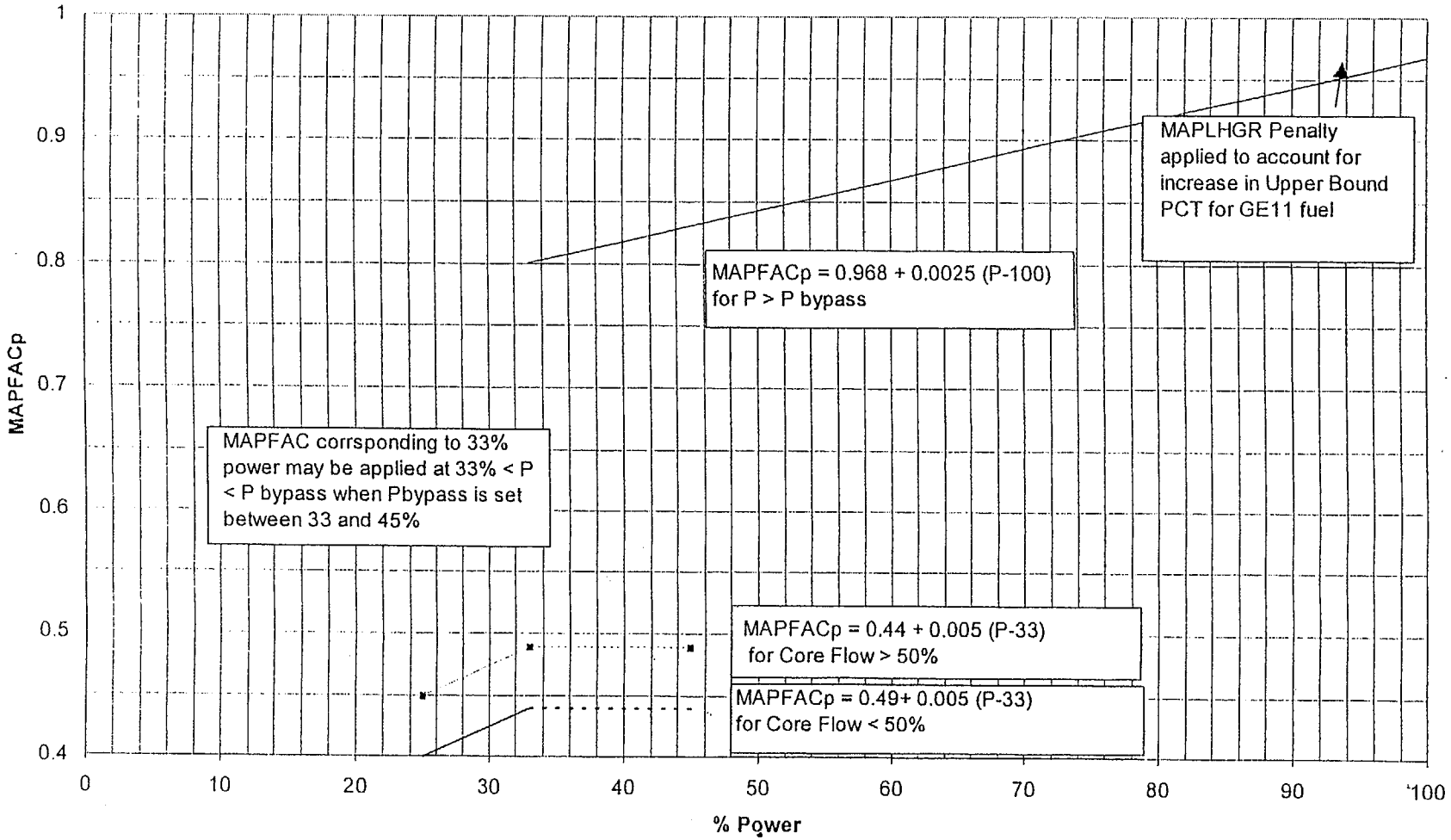
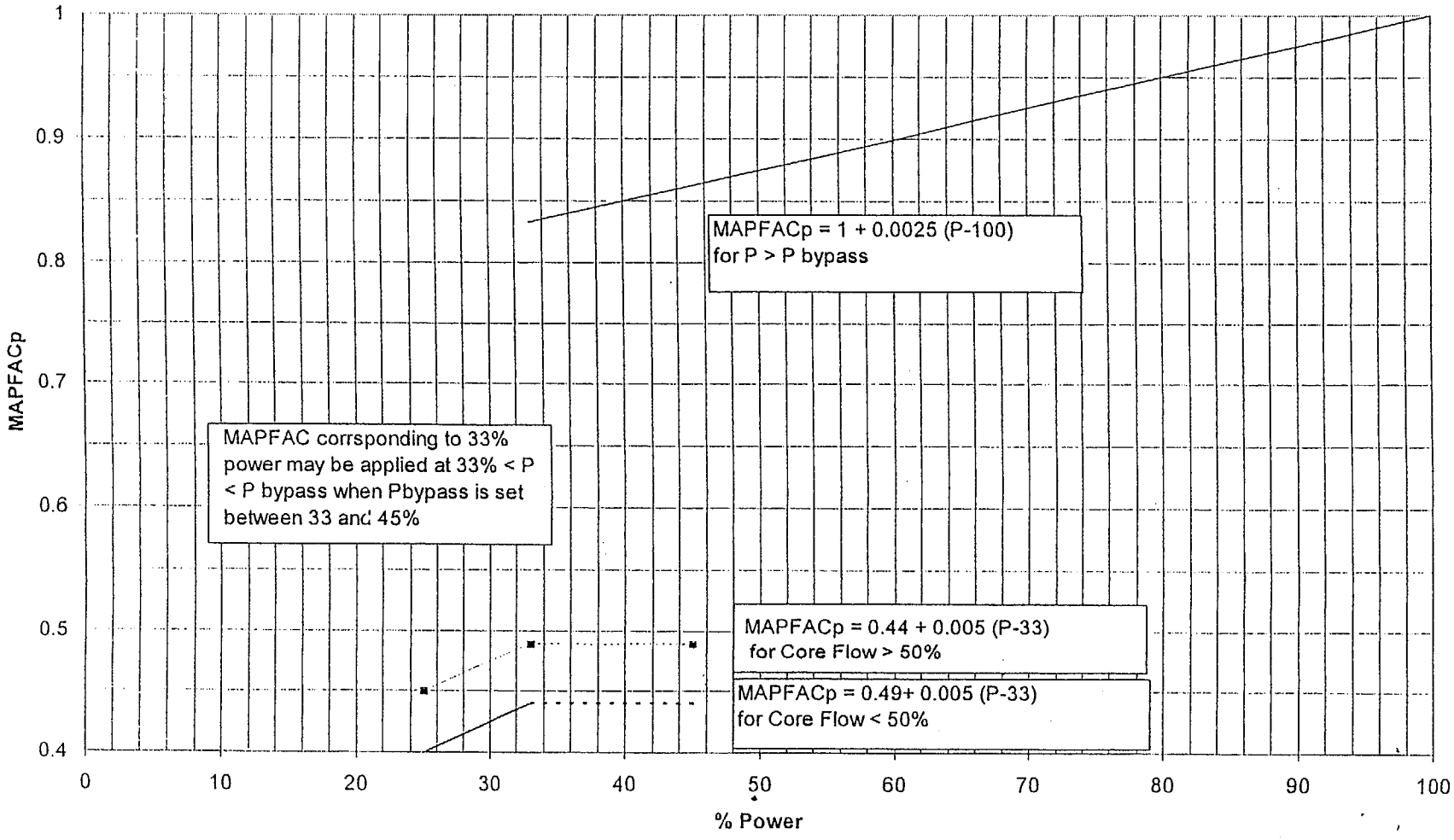


Figure 3.1-5 Power Dependent MAPLHGR Factors for GE14 Fuel



3.2 Linear Heat Generation Rage (LHGR)

Reference Technical Specification: 3.11.B

During reactor power operation, the LHGR of any rod in any fuel assembly at any axial location shall not exceed the rated power and rated core flow limits represented by Figures 3.2-1 and 3.2-2, with the detailed values presented in Reference 5.16. At other than rated power and rated flow conditions, the applicable limiting LHGR value for each fuel type is the smaller of the flow- and power-dependent LHGR limits, $LHGR_F$ and $LHGR_P$. The flow-dependent LHGR limit, $LHGR_F$, is the product of the LHGR flow factor, $LHGRFAC_F$, shown in Figure 3.2-3 and the LHGR for rated power and flow conditions in Reference 5.16. The power-dependent LHGR limit, $LHGR_P$, is the product of the LHGR power factor, $LHGRFAC_P$, shown in Figure 3.2-3 and the LHGR for rated power and flow conditions in Reference 5.16. For GE11 fuel, a LHGR penalty is applied to compensate for an an increase in Upperbound PCT to 1640 °F, due to errors in the GE11 LOCA analysis reported by GE, by reducing the LHGRFACp by 1% for each 13 °F rise beyond the 1600 °F upperbound PCT limit. The application of this penalty is equivalent to reducing the upperbound PCT to less than 1600 °F. The penalty factor at 100% power is 0.968 This penalty is not applicable to GE14 fuel (Reference 5.15). Penaty applied to LHGRFACp for GE11 ensures that the peak pin LHGR is also reduced to ensure that upperbound PCT will be less than 1600 °F.

The LHGR limits for each fuel type as a function of axial location, rod power and exposure are based on the approved methodology referenced in Section 5.0 and programmed in the plant process computer. LHGR limits are based on thermal-mechanical design limits in reference 5.1. LHGR Curves in Figures 3.2-1 and 3.2-2 are representative curves for UO2 fuel rods in GE11 and GE14 fuel bundles. Gd containing fuel rods have different LHGR limits which are also exposure dependent. The detailed proprietary curves and values are documented by Reference 5.16. Limits specified in Reference 5.16 are programmed into the 3D Monicore Process Computer.

Pbypass is the power level below which more restrictive thermal limits are applied, as Turbine Control Valve fast closure scram is assumed to be bypassed. Pbypass is currently set at 33% power; however, it may be set higher up to 45% power, if the limits corresponding to 33% power are applied at power levels between 33% and Pbypass, as shown in Figure 3.2-4.

Figure 3.2-1 LHGR Limit for GE11 Fuel (UO2 Rods) At Rated Power and rated Core Flow

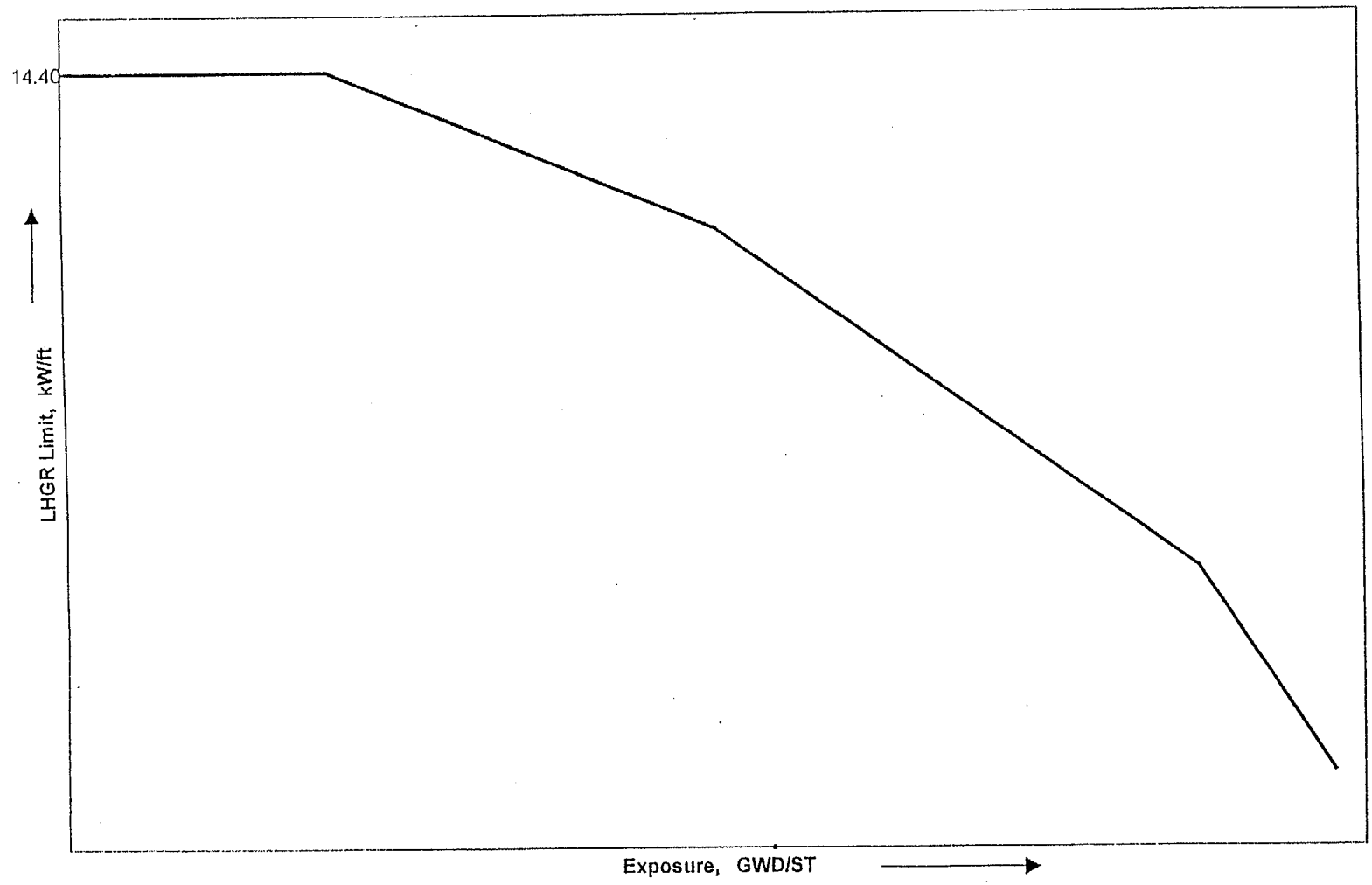


Figure 3.2-2 LHGR for GE14 Fuel (UO2 Rods) At Rated Power and rated Core Flow

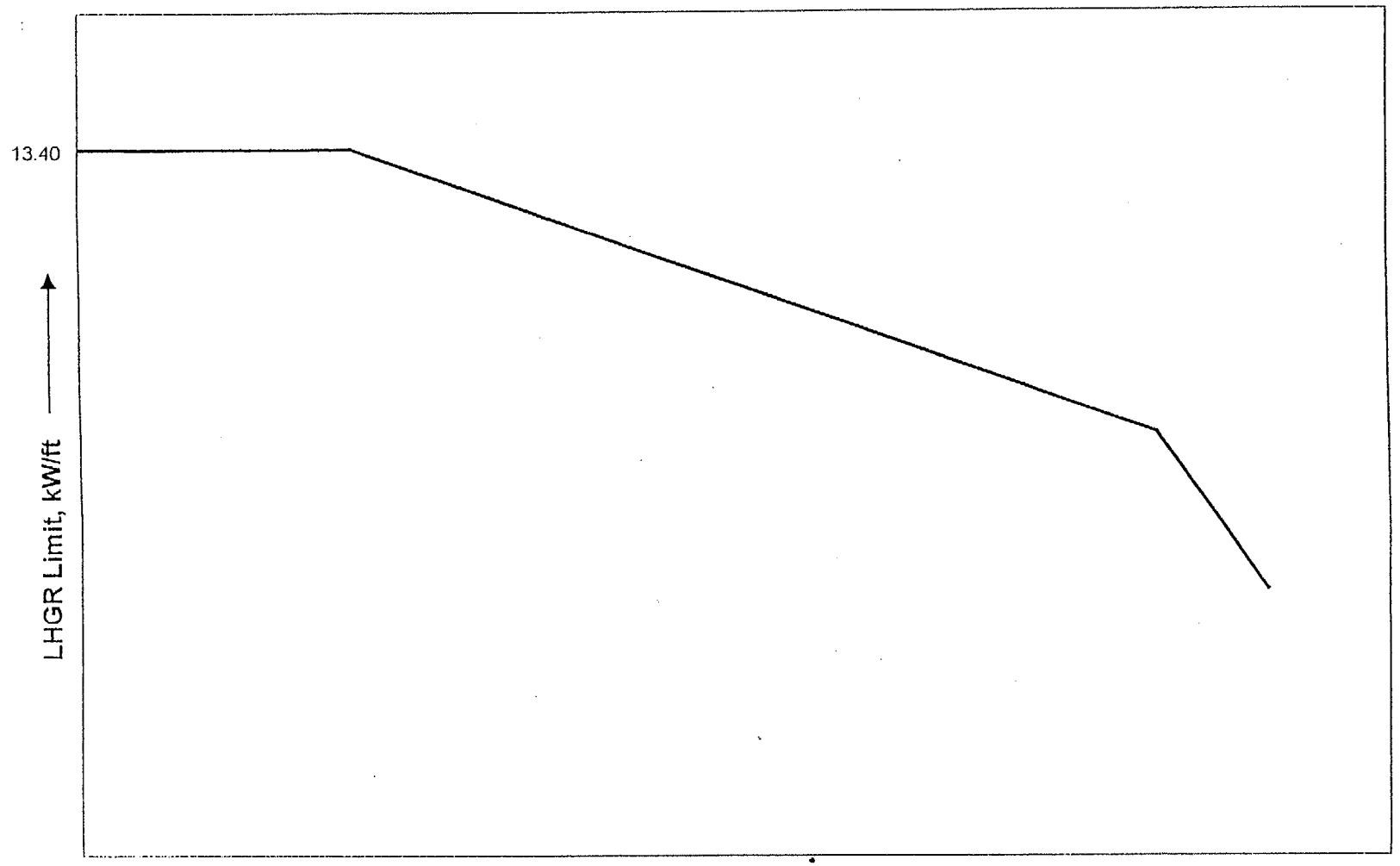


Figure 3.2-3 Flow Dependent LHGR Factor ($LHGRFAC_F$) for both GE11 and GE14 fuels

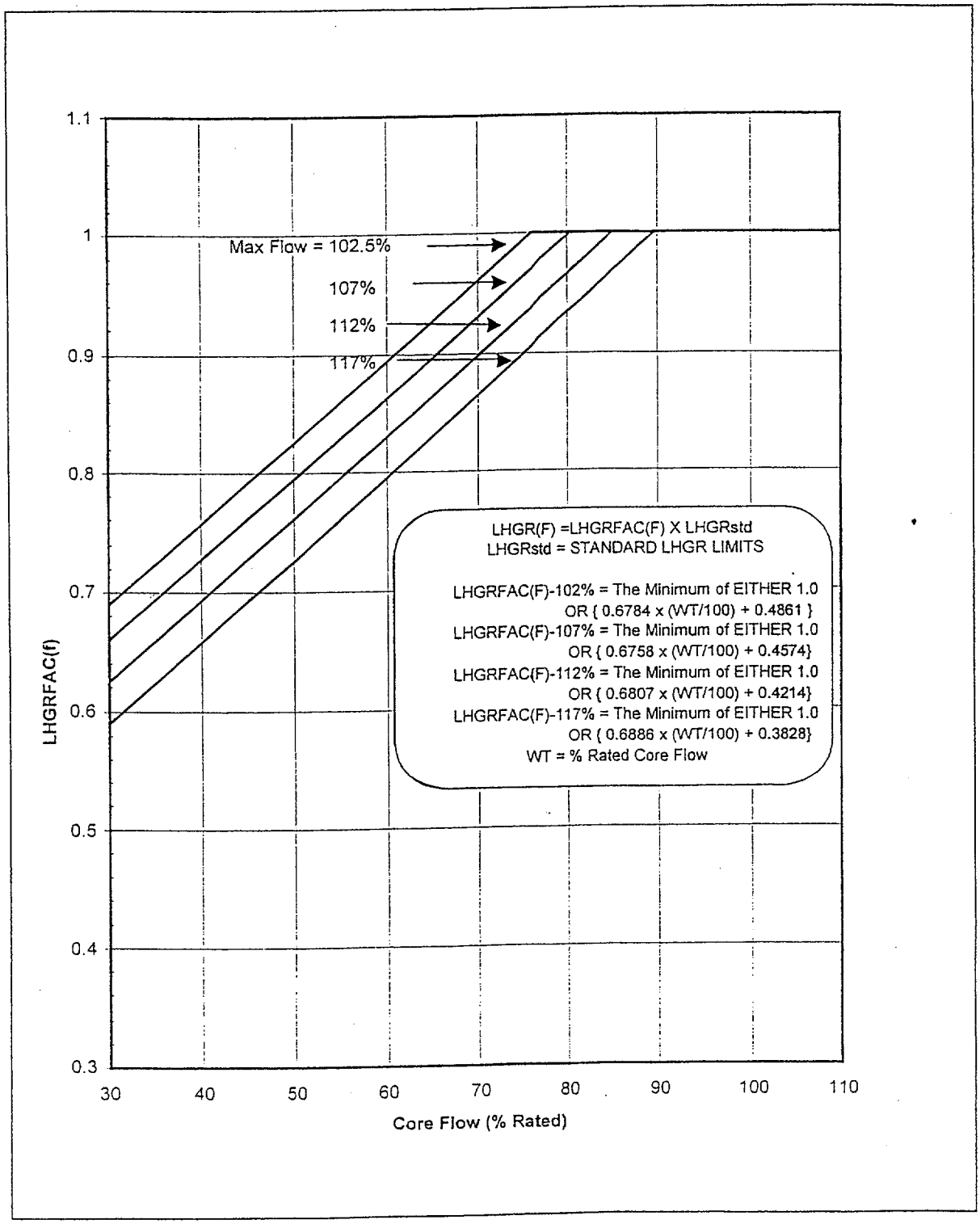


Figure 3.2-4 Power Dependent LHGR Factors for GE11 Fuel

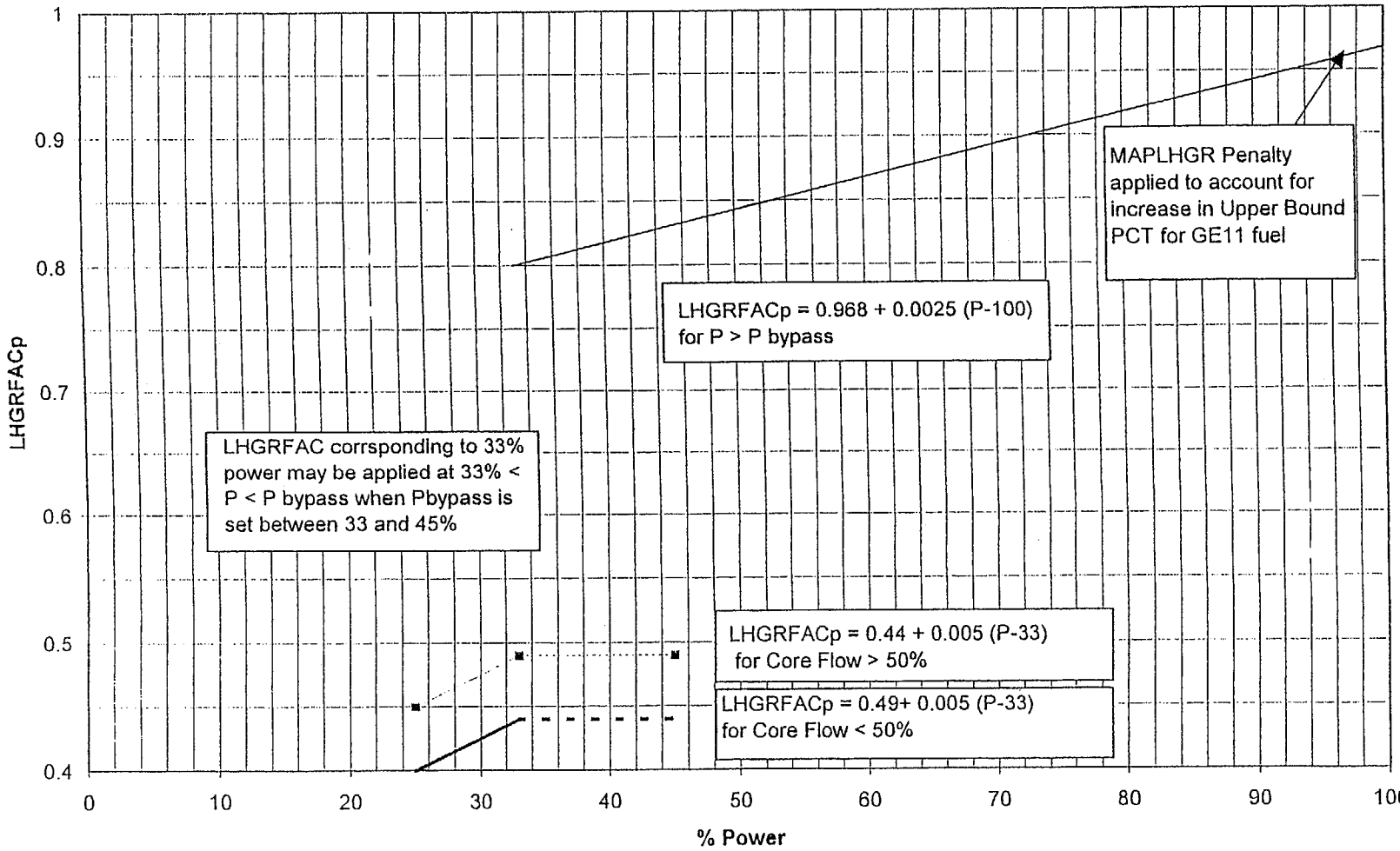
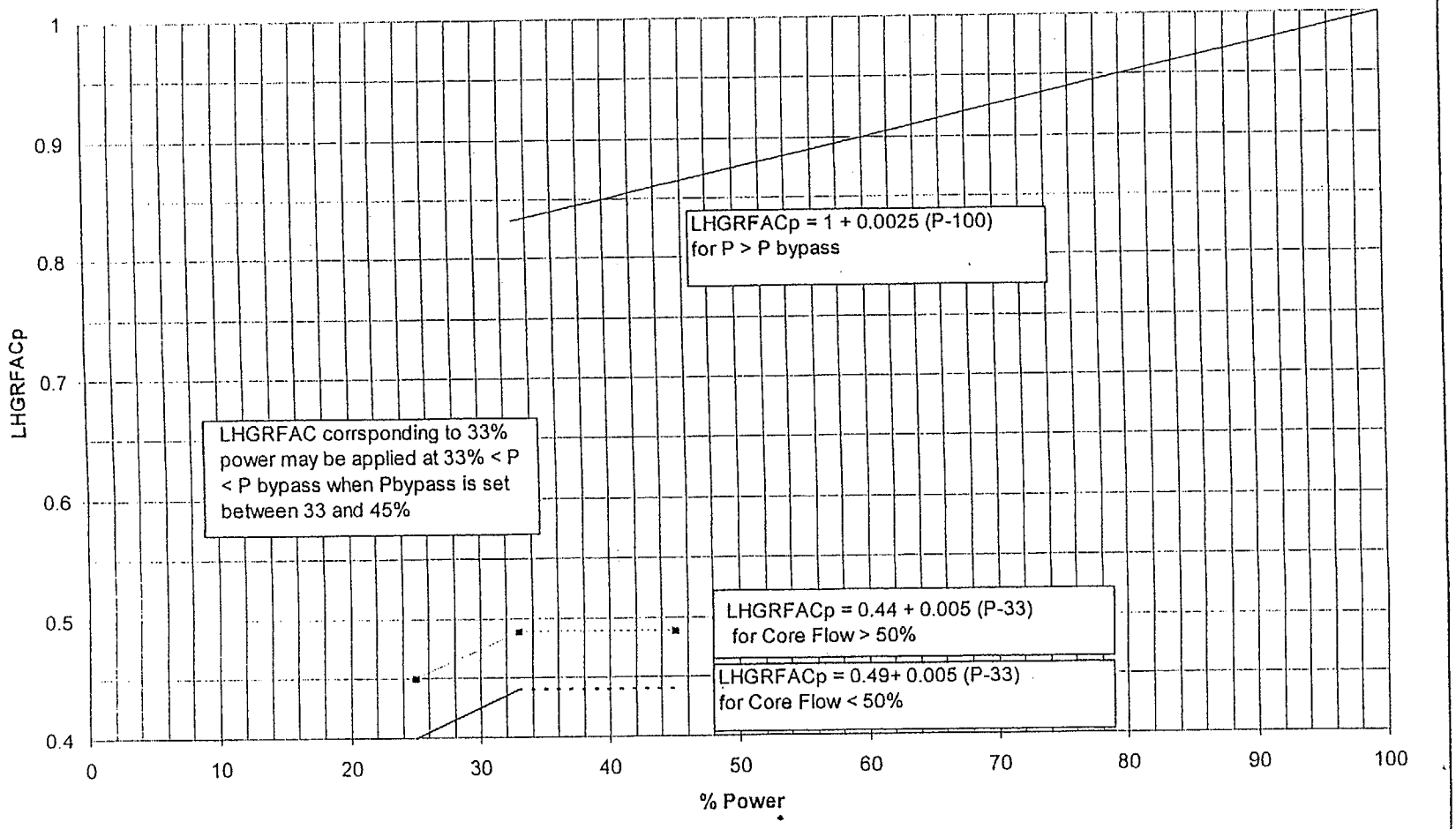


Figure 3.2-5 Power Dependent LHGR Factors for GE14 Fuel



3.3 Minimum Critical Power Ratio (MCPR)

Reference Technical Specification: 3.11.C

During power operation, the MCPR shall be greater than or equal to the Operating Limit MCPR (OLMCPR). The operating limit MCPR is the greater of the flow- and power-dependent MCPR operating limits, $MCPR_F$ and $MCPR_P$. The flow-dependent MCPR operating limit, $MCPR_F$, is provided in Figure 3.3-1. For core thermal powers less than or equal to P_{Bypass}, the power-dependent MCPR operating limit, $MCPR_P$, is provided in Figure 3.3-2. Above P_{Bypass}, $MCPR_P$ is the product of the rated power and flow MCPR operating limit presented in Table 3.3-1, and the K_P factor presented in Figure 3.3-2, when Turbine Bypass is in service and 3.3-3 when Turbine Bypass is NOT in service. Figure 3.3-2 and Figure 3.3-3 indicate MCPRp up to 45% power, which is the maximum analyzed value for P_{bypass} . The rated power and flow MCPR operating limits presented in Tables 3.3-1 are functions of τ for both GE11 and GE14 fuels. In arriving at the MCPRp for off-rated power conditions, Kp from Figure 3.3-2 or Figure 3.3.-3 is multiplied by the rated OLMCPR from Table 3.3-1 for the appropriate fuel type, GE11 or GE14, when power is above P_{bypass}. For power level less than P_{bypass}, the MCPRp is independent of the fuel type and can be directly read from Figures 3.3-2 and 3.3-3.

The value of τ in Table 3.3-1 shall be equal to 1.0, unless it is calculated from the results of the surveillance testing of Technical Specification 4.3.C, as follows:

$$\tau = \frac{\tau_{ave} - \tau_B}{1.252 - \tau_B}$$

Where:

τ_{ave} = Average scram time to drop out of Notch 34 $= \dfrac{\sum_{i=1}^{n} N_i \tau_i}{\sum_{i=1}^{n} N_i}$

τ_B = Adjusted analysis mean scram time $= \mu + 1.65\sigma \sqrt{\dfrac{N_1}{\sum_{i=1}^{n} N_i}}$

n = Number of surveillance tests performed to date in the present cycle
N_1 = Total number of active control rods
N_i = Number of active control rods measured in the i^{th} surveillance test
τ_i = Average scram time to drop out of Notch 34 position of all rods measured in the i^{th} surveillance test
μ = Mean of the distribution for average scram insertion time to drop out of Notch 34
= 0.937 sec
σ = Standard deviation of the distribution for average scram insertion time to dropout of Notch 34
= 0.021 sec

Pbypass is the power level below which more restrictive thermal limits are applied, as Turbine Control Valve fast closure scram is assumed to be bypassed. Pbypass is currently set at 33% power; however, it may be set higher up to 45% power, if the limits corresponding to 33% power are applied at power levels between 33% and Pbypass, as shown in Figure 3.3-2 when Turbine Bypass System is in service and Figure 3.3-3 when Turbine Bypass System is inoperable.

Table 3.3-1

MCPR Operating Limits At Rated Power and Rated Flow

The MCPR Operating Limit (OLMCPR) is a function of fuel type, exposure and τ, derived from scram timing measurements

τ		GE11 Fuel		GE14 Fuel	
from	to	BOC to (EOR-3) GWD/ST	(EOR-3) to EOC GWD/ST	BOC to (EOR-3) GWD/ST	(EOR-3) to EOC GWD/ST
	≤0.0	1.37	1.38	1.41	1.47
0.0	≤0.1	1.38	1.39	1.42	1.49
0.1	≤0.2	1.39	1.40	1.43	1.50
0.2	≤0.3	1.40	1.41	1.44	1.52
0.3	≤0.4	1.41	1.42	1.45	1.54
0.4	≤0.5	1.43	1.44	1.47	1.56
0.5	≤0.6	1.44	1.45	1.48	1.57
0.6	≤0.7	1.45	1.46	1.49	1.59
0.7	≤0.8	1.46	1.47	1.50	1.61
0.8	≤0.9	1.47	1.48	1.51	1.62
0.9	≤1.0	1.48	1.49	1.52	1.64

BOC = Beginning Of Cycle 14
EOC = End Of Cycle 14
EOR = End Of Rated Power Operation At Rated Flow

Figure 3.3-1 Flow Dependent MCPR Limits ($MCPR_F$) for both GE11 and GE14 fuels

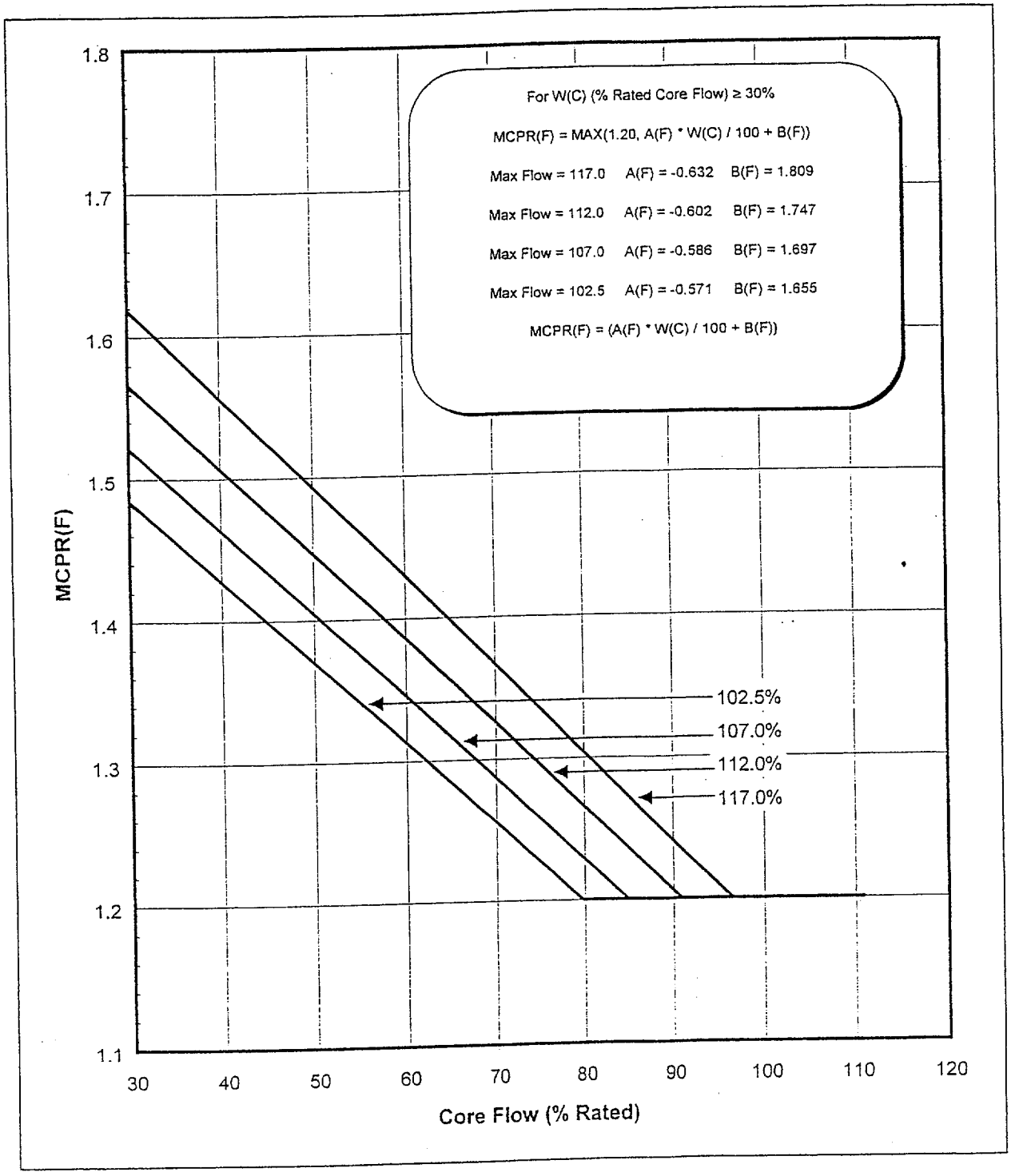


Figure 3.3-2
Power Dependent MCPR Limits (MCPRp) for both GE11 and GE14 fuels
Turbine Bypass Is Assumed To Be Operable

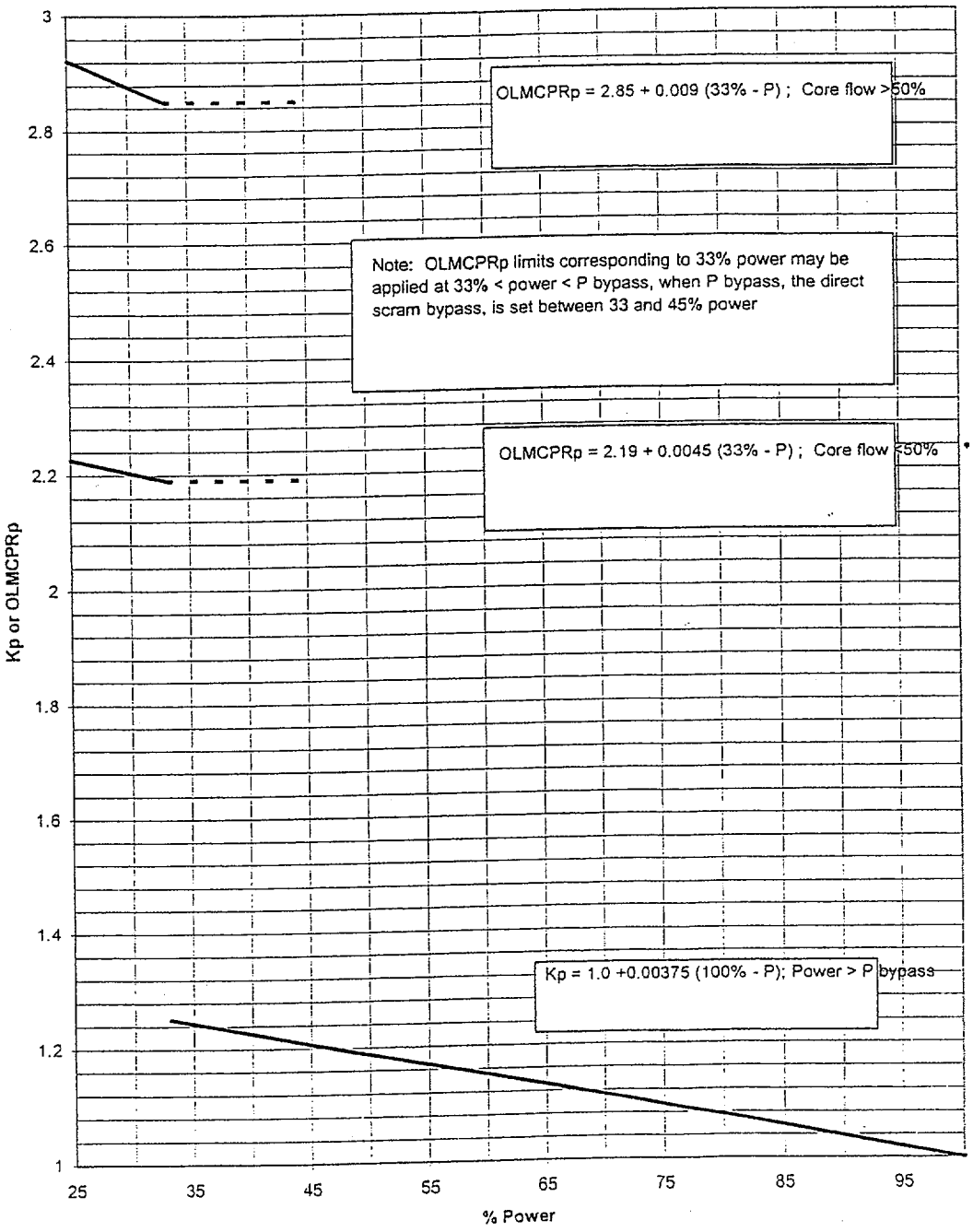
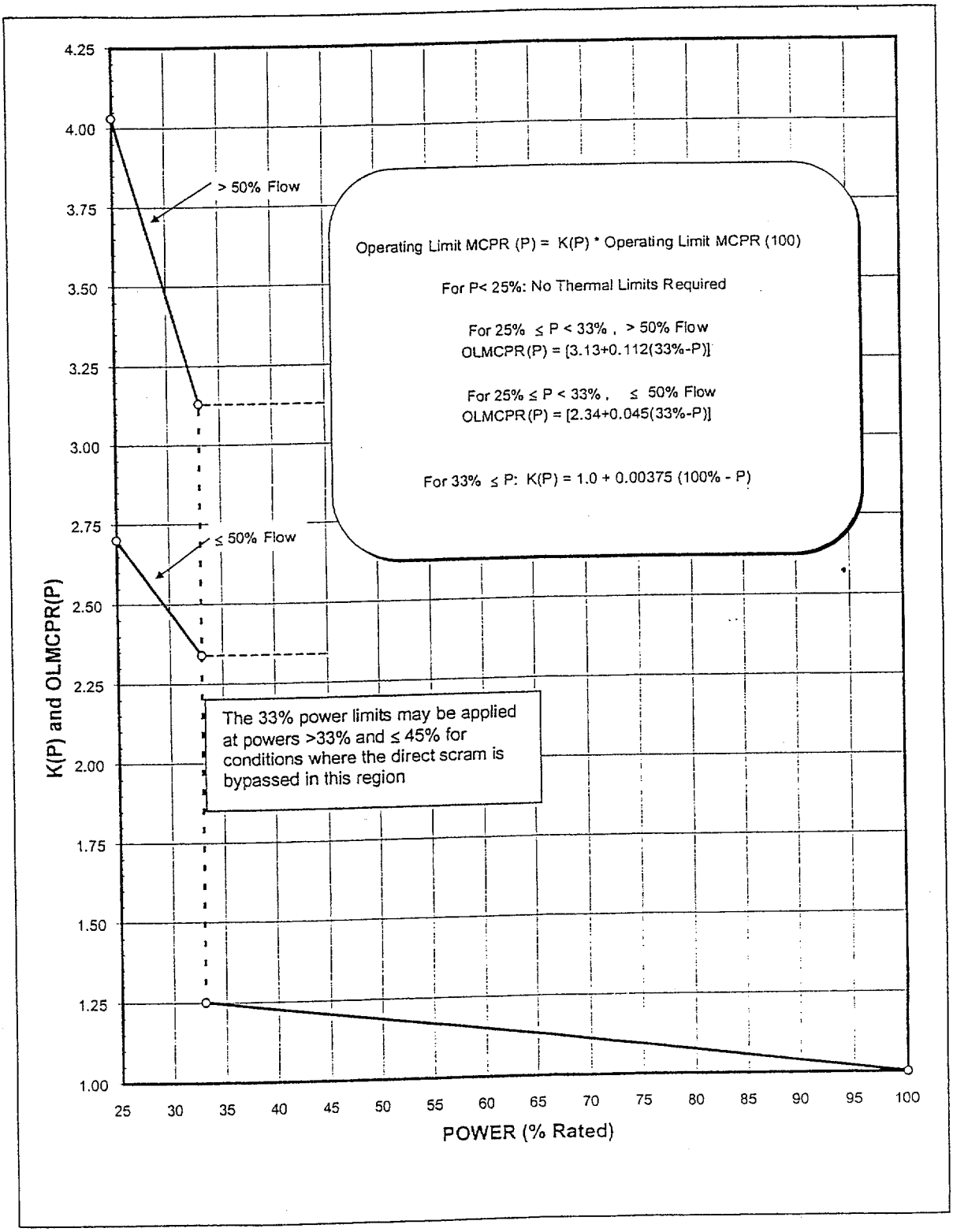


Figure 3.3-3 Power Dependent MCPR Limits for both GE11 and GE14 fuels
Turbine Bypass is Assumed to be Inoperable



3.4 Power/Flow Relationship During Power Operation

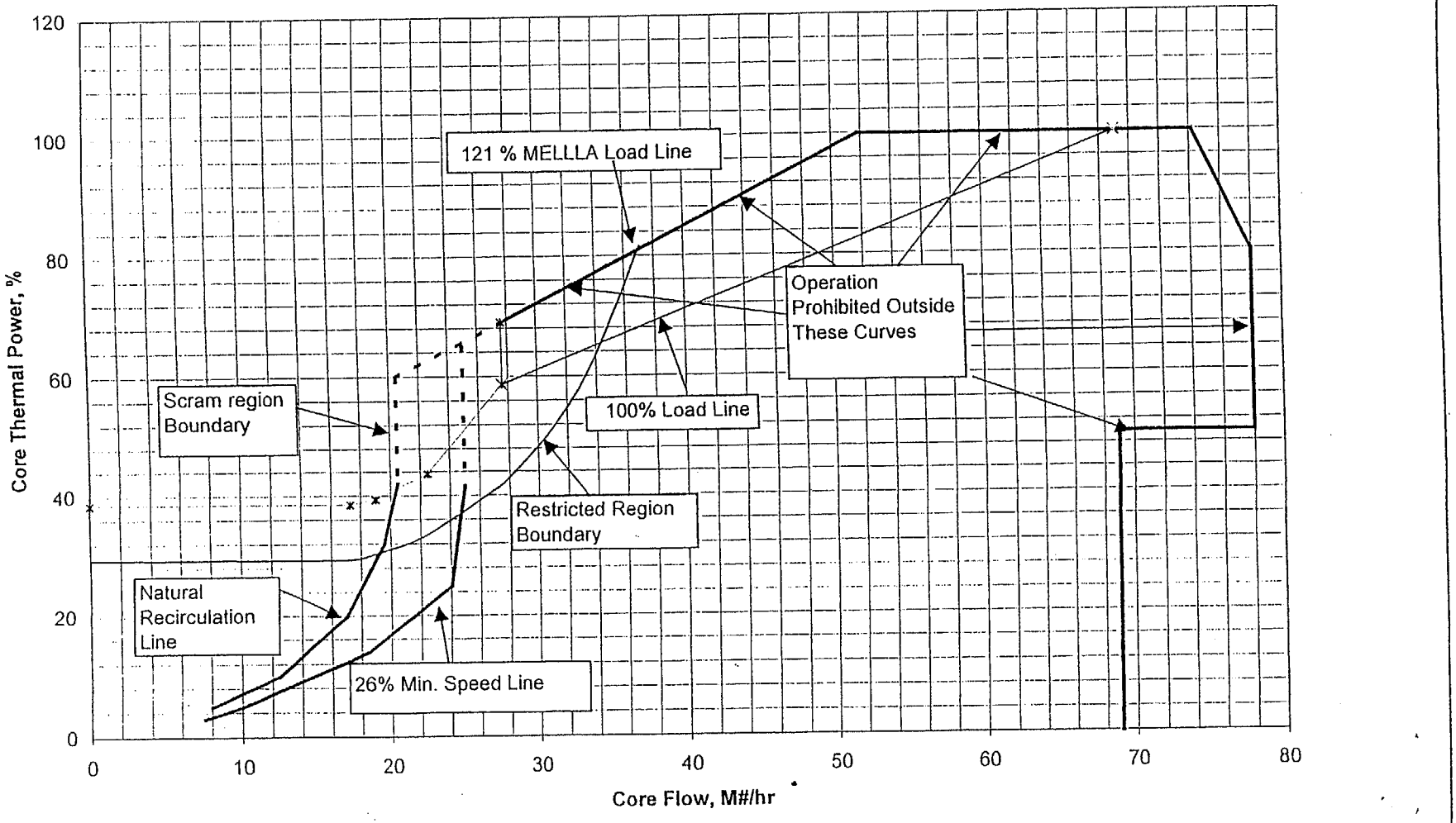
Reference Technical Specification: 3.11.D

The power/flow relationship shall not exceed the limiting values shown on the Power/Flow Operating Map in Figure 3.4-1. The Power/Flow Map, Figure 3.4-1 is applicable to operation with Normal feedwater heating. Cycle 14 operations are not analyzed for reduced feedwater temperature.

Intentional operation within the Restricted Region is prohibited. The Restricted Region boundary as a function of aligned drive flow is as given in Figure 2.2 -1.

Note: The boundary of the Restricted Region is established by analysis in terms of thermal power and core flow as shown in Figure 3.4 - 1. The Restricted Region boundary is defined by the APRM Rod Block setpoints, which are a function of reactor recirculation flow as shown by Figure 2.2-1.

Figure 3.4-1 Power/Flow Operating Map



4.0 REACTOR VESSEL CORE DESIGN

Reference Technical Specification: 4.2

The reactor vessel core for the present cycle consists of 580 fuel assemblies of the types listed below. The core loading pattern for each type of fuel is shown for the present cycle in Figure 4.0-1.

Fuel Type	Cycle Loaded	Number
Irradiated		
GE11-P9HUB378	11	68
GE11-P9DUB408-6G5.0/7G4.0	12	64
GE11-P9DUB408-16GZ1	12	144
GE11-P9DUB407-14GZ-100T-141-T	13	120
GE11-P9DUB408-6G5.0/7G4.0-100T-141-T	13	40
New		
GE14-P10DNAB412-16GZ-100T	14	144
Total		580

The reactor vessel core contains 145 cruciform-shaped control rods. The control materials used are either boron carbide powder (B_4C) compacted to approximately 70% of the theoretical density or a combination of boron carbide powder and solid hafnium.

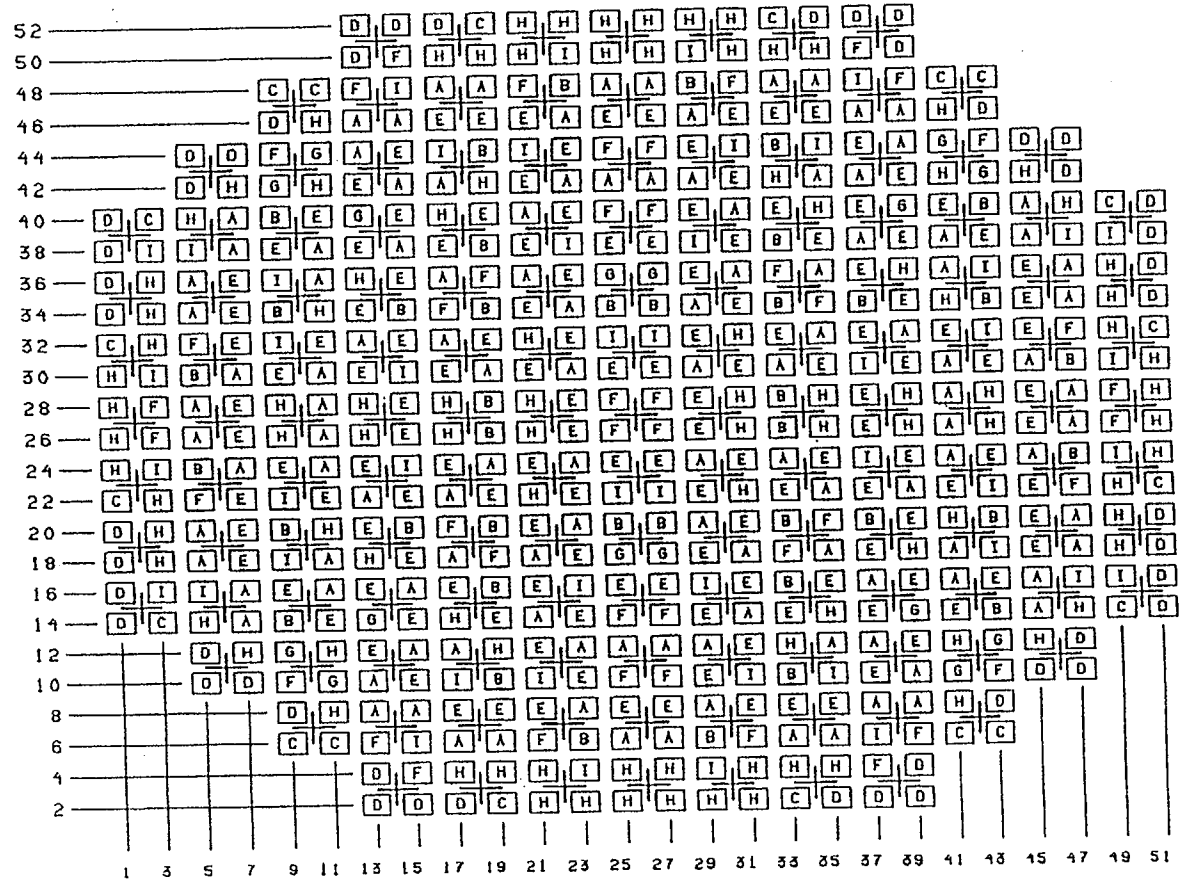


FIGURE 4.0-1 Reactor Vessel Core Loading Pattern

Fuel Type	
A=GE11-P9DUB407-14GZ-100T-141-T6 (Cycle 13)	F=GE11-P9DUB408-16GZ-100T-141-T6 (Cycle 12)
B=GE11-P9DUB408-6G5.0/7G4.0-100T-141-T6 (Cycle 13)	G=GE11-P9DUB408-6G5.0/7G4.0-100T-141-T6 (Cycle 12)
C=GE11-P9HUB378-15GZ-100T-141-T6 (Cycle 11)	H=GE11-P9DUB408-16GZ-100T-141-T6 (Cycle 12)
D=GE11-P9HUB378-15GZ-100T-141-T6 (Cycle 11)	I=GE11-P9DUB408-6G5.0/7G4.0-100T-141-T6 (Cycle 12)
E=GE14-P10DNAB412-16GZ-100T-145-T6-3901 (Cycle 14)	

5.0 REFERENCES

5.1. SUDDS/RF 00-73, NEDE-24011-P-A-14 and NEDE-24011-P-A-14-US, "General Electric Standard Application for Reactor Fuel", June 2000 (includes Amendments through #26)

5.2. PDC 01-03, Cycle 14 Reload Core Design .

5.3. SUDDS/RF 93-44, NEDC-31852-P, rev. 1, "Pilgrim Nuclear Power Station SAFER/GESTR-LOCA Loss-of-Coolant Accident Analysis", April 1992

5.4. SUDDS/RF 00-123, PNPS GE11 SAFER/GESTR-LOCA Loss-of-Coolant Accident Analysis For Cycle 11, January 1995

5.5. SUDDS/RF 00-124, GE-NE-J1103808-08-01-01P, PNPS ECCS-LOCA Evaluation For Cycle 14, March 2001

5.6. SUDDS/RF 00-124, GE-NE-J1103808-08-02P, PNPS ECCS-LOCA Evaluation For GE 14, March 2001

5.7. SUDDS/RF 00-122, ECCS/LOCA Evaluation Of PNPS Revised LHGR limits, NSA 00-394, November 6, 2000

5.8. SUDDS/RF 94-42, NEDC-32306P, "Maximum Extended Load Line Limit Analyses", March 1994.

5.9. SUDDS/RF 88-160, NEDC-31312-P, "ARTS Improvement Program Analysis for Pilgrim Nuclear Power Station", September 4, 1987.

5.10. SUDDS/RF 97-06, GENE-A13-00367-54, " Pilgrim Nuclear Power Station Reactor Stability Long-Term Solution Enhanced Option I-A Flow Mapping Application Output Cycle 11 Normal Feedwater Temperature Operating Range", January 1997, and Suplement 1, "Pilgrim Nuclear Power Station Reactor Stability Long-Term Solution Enhanced Option I-A Flow Mapping Application Output Cycle 11 Reduced Feedwater Temperature Operating Range."

5.11. SUDDS/RF 98-031, NEDO-32339-A, Revision 1, "Reactor Stability Long- Term Solution: Enhanced Option I-A," GENE, April 1998.

5.12. SUDDS/RF 00-115, Cycle14 Stability Validation

5.13. SE-3358, Safety Evaluation for Cycle 14 Reload Core Design.

5.14. SUDDS/RF 00-112, J11-03808-10SRLR Rev.0, March 2001, "Supplemental Reload Licensing Report, Reload 13, Cycle 14." (as revised)

5.15. SUDDS/RF 01- 59 , 50.46 Error Reports on Upperbound PCT errors for GE11 fuel

5.16. SUDDS/RF 00-116, rev. 1 Fuel Bundle Information Report, Cycle 14

5.17. SUDDS/RF 01-60, N&SA 01-198, and REK 01-061, revised MAPFACp and LHGRFACp for Pilgrim, May 2001