Attachment 1

Core Operating Limits Report for Cycle 6

Perry Nuclear Power Plant

PLANT DATA BOOK ENTRY SUBMITTAL SHEET

TITLE: CORE OPERATING LIMITS REPORT FOR THE PERRY NUCLEAR POWER PLANT, UNIT 1 CYCLE 6 (RELOAD 5)

PDB - F0001 /Rev. 3 EFFECTIVE DATE: 3-22-96

MPL: J11

INFORMATION ONLY

SCOPE OF CHANGE: Incorporate new fuel type information for Cycle 6 including MCPR limits which are fuel type dependent and delta T dependent.

REFERENCE: PY-CEI-NRR-1104 L
PY-CEI-NRR-1157 L
PY-NRR/CEI-0529 L

PREPARED BY: D. A. Thayer Dean A Thayer 2-16-96 Date

REVIEWED BY: Jannie M. Rinckel 2-24-96 Date

APPROVED BY: N/A Manager - Sponsoring Group Date

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TAB E, F, AND G USE ONLY

PORC MEETING NUMBER: 96-030 3/7/96 Date

APPROVED BY: [signature] General Manager, PNPPD 3/7/96 Date

UNIT 1 CORE OPERATING LIMITS REPORT

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UNIT 1 CORE OPERATING LIMITS REPORT

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INTRODUCTION AND REFERENCES

INTRODUCTION

This Core Operating Limits Report for PNPP Unit 1 Cycle 6 is prepared in accordance with the requirements of PNPP Technical Specification 6.9.1.9 {TS Administrative Controls 5.6.5}. The core operating limits presented were developed using NRC-approved methods (Reference 2). Results from the reload analyses for the General Electric fuel in PNPP Unit 1 for Cycle 6 are documented in References 3, 4, 5 and 6.

The cycle-specific core operating limits for the following PNPP Unit 1 Technical Specifications are included in this report:

1. Average Planar Linear Heat Generation Rate (APLHGR) Limits for each fuel/lattice type, including the power and flow dependent MAPFAC curves with the single loop MAPLHGR reduction factor. (Technical Specification 3/4.2.1 {TS 3.2.1})

2. Minimum Critical Power Ratio Operating Limit including the power and flow dependent MCPR curves. (Technical Specification 3/4.2.2 {TS 3.2.2}) No changes are required to MCPR operating limits during Single Loop Operation.

3. Linear Heat Generation Rate (LHGR) Limit for each fuel type. (Technical Specification 3/4.2.3 {TS 3.2.3})

4. The simulated thermal power time constant. (Technical Specification 3/4.3.1 {TS 3.3.1.1} {SR 3.3.1.1.14})

REFERENCES

1. J. R. Hall (USNRC) to M. D. Lyster (CEI), Amendment No. 33 to Facility Operating License No. NPF-58, September 13, 1990.

2. "General Electric Standard Application for Reactor Fuel-GESTAR II," NEDE-24011-P-A-11 and NEDE-24011-P-A-11-US (US Supplement), November 1995.

3. "Supplemental Reload Licensing Report for the Perry Nuclear Power Plant Unit 1, Reload 5, Cycle 6," GE Document J11-02581SRLR Rev. 0 (January 1996).

4. "Lattice Dependent MAPLHGR Report for the Perry Nuclear Power Plant Unit 1, Reload 5, Cycle 6," GE Document J11-02581MAP Rev. 0 (January 1996).

5. "Supplement 1 to the Supplemental Reload Licensing Submittal for the Perry Nuclear Power Plant Unit 1, Reload 2, Cycle 3," GE Document 23A6492AA Rev. 0 (September 1990).

6. "Supplement 1 to the Supplemental Reload Licensing Submittal for the Perry Nuclear Power Plant Unit 1, Reload 3, Cycle 4," GE Document 23A7147AA, Rev. 0 (January 1992).

7. Perry Nuclear Power Plant Updated Safety Analysis Report, Unit 1, Appendix 15B-Reload Safety Analysis.

8. R. J. Stransky (USNRC) to R. A. Stratman (CEI), Amendment No. 48 to Facility Operating License NPF-58, May 28, 1993.

9. J. B. Hopkins (USNRC) to R. A. Stratman (Centerior), Amendment No. 61 to Facility Operating License NPF - 58, June 2, 1994.

AVERAGE PLANAR LINEAR HEAT GENERATION RATE (TS 3.2.1 (TS 3.2.1))

All AVERAGE PLANAR LINEAR HEAT GENERATION RATES (APLHGRs) shall not exceed, the result obtained from multiplying the applicable MAPLHGR values* by the smaller of either the flow dependent MAPLHGR factor ($MAPFAC_f$) Figures 3.2.1-1 and 3.2.1-2, or the power dependent MAPLHGR factor ($MAPFAC_p$) Figures 3.2.1-3 and 3.2.1-4.

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* These applicable MAPLHGR values are:

1. Those for the respective fuel and lattice type as a function of the average planar exposure (as described by the NRC approved methodology described in GESTAR-II)

   or,

2. When hand calculations are required, the MAPLHGR as a function of the average planar exposure for the most limiting lattice shown in Figures 3.2.1-5 through Figure 3.2.1-10 for the applicable type of fuel.

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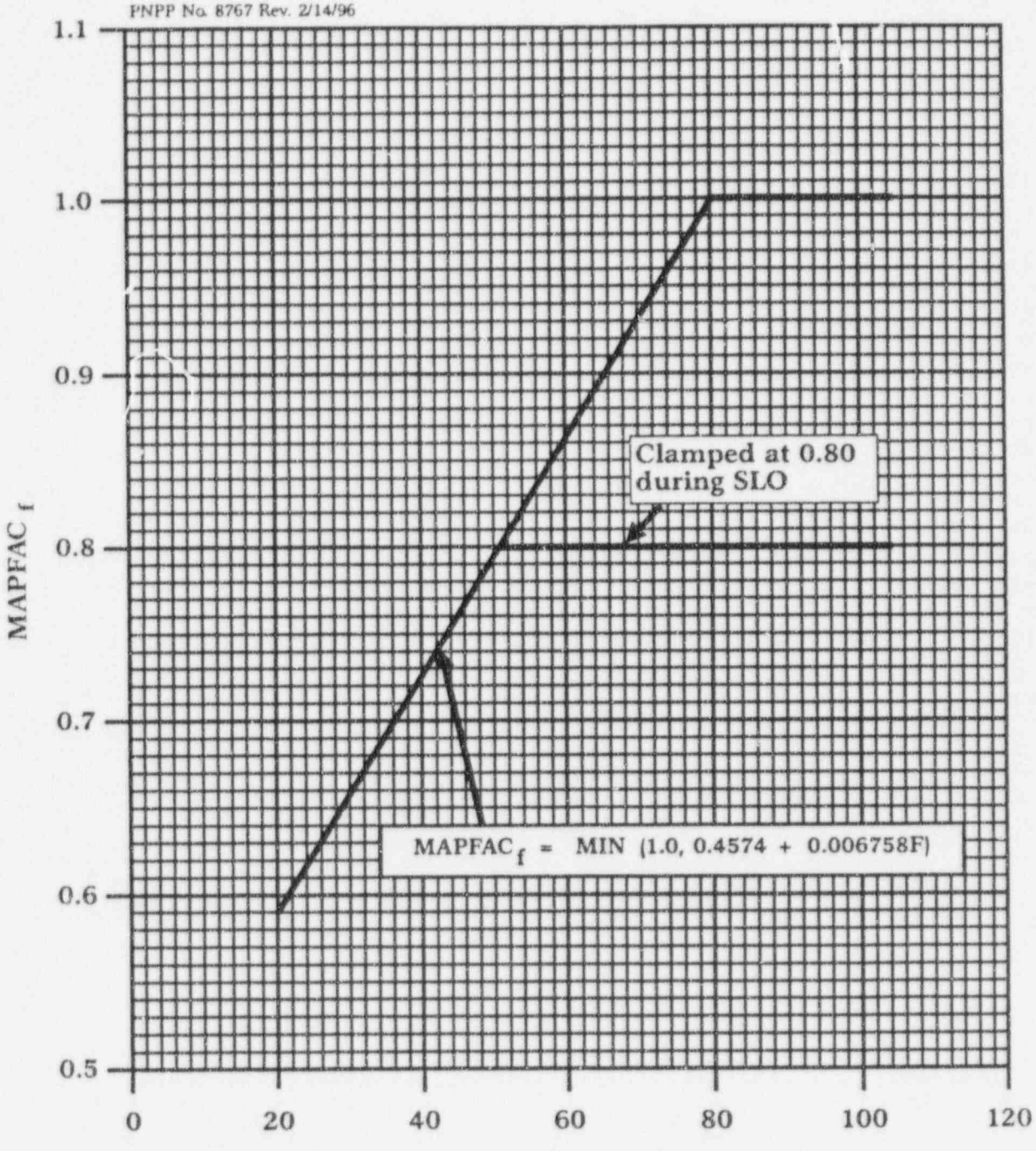
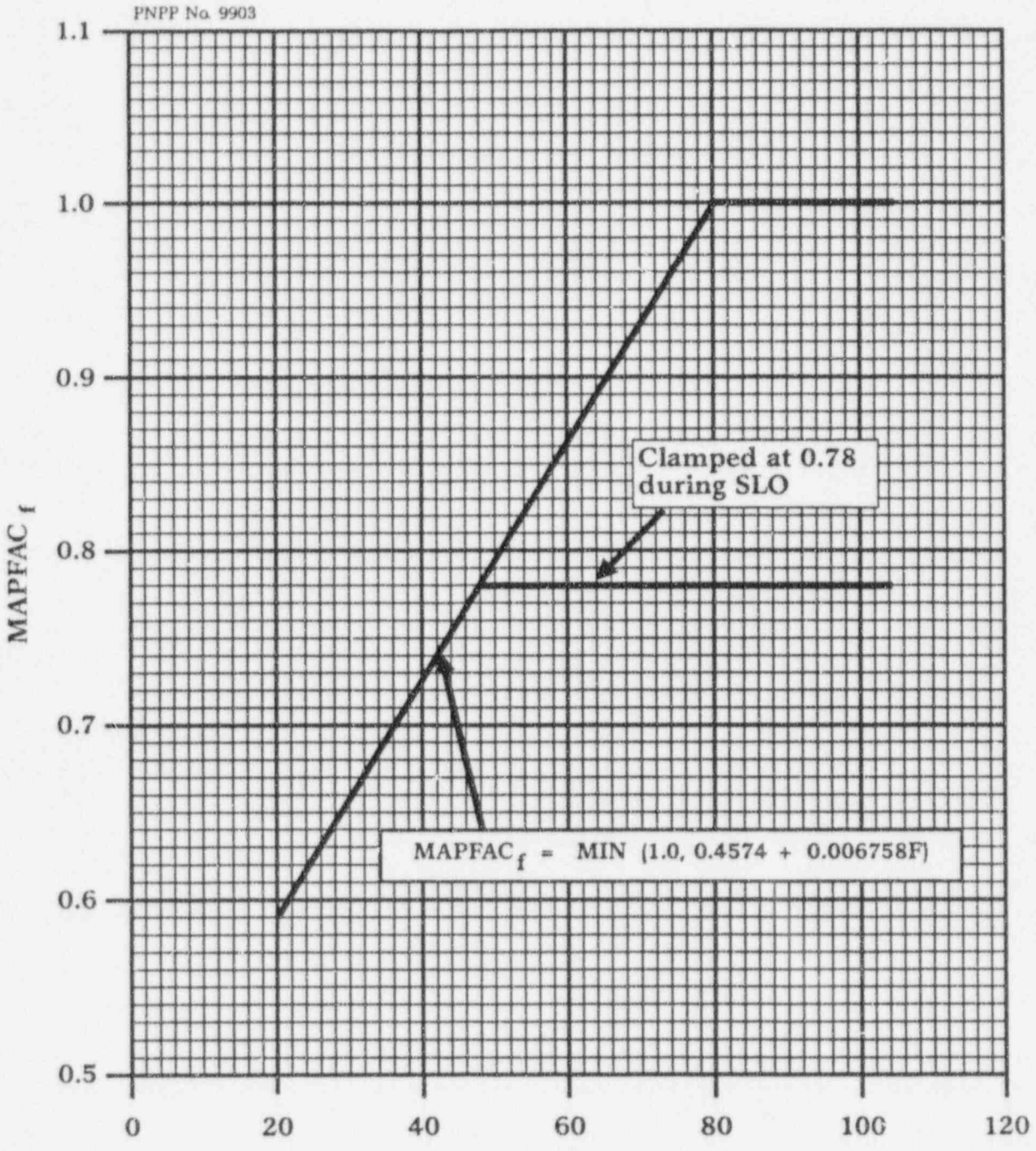


FLOW DEPENDENT MAPLHGR FACTOR
(MAPFAC $_f$)

FUEL TYPES: GE8X8EB and GE8X8NB-1

Figure 3.2.1-1

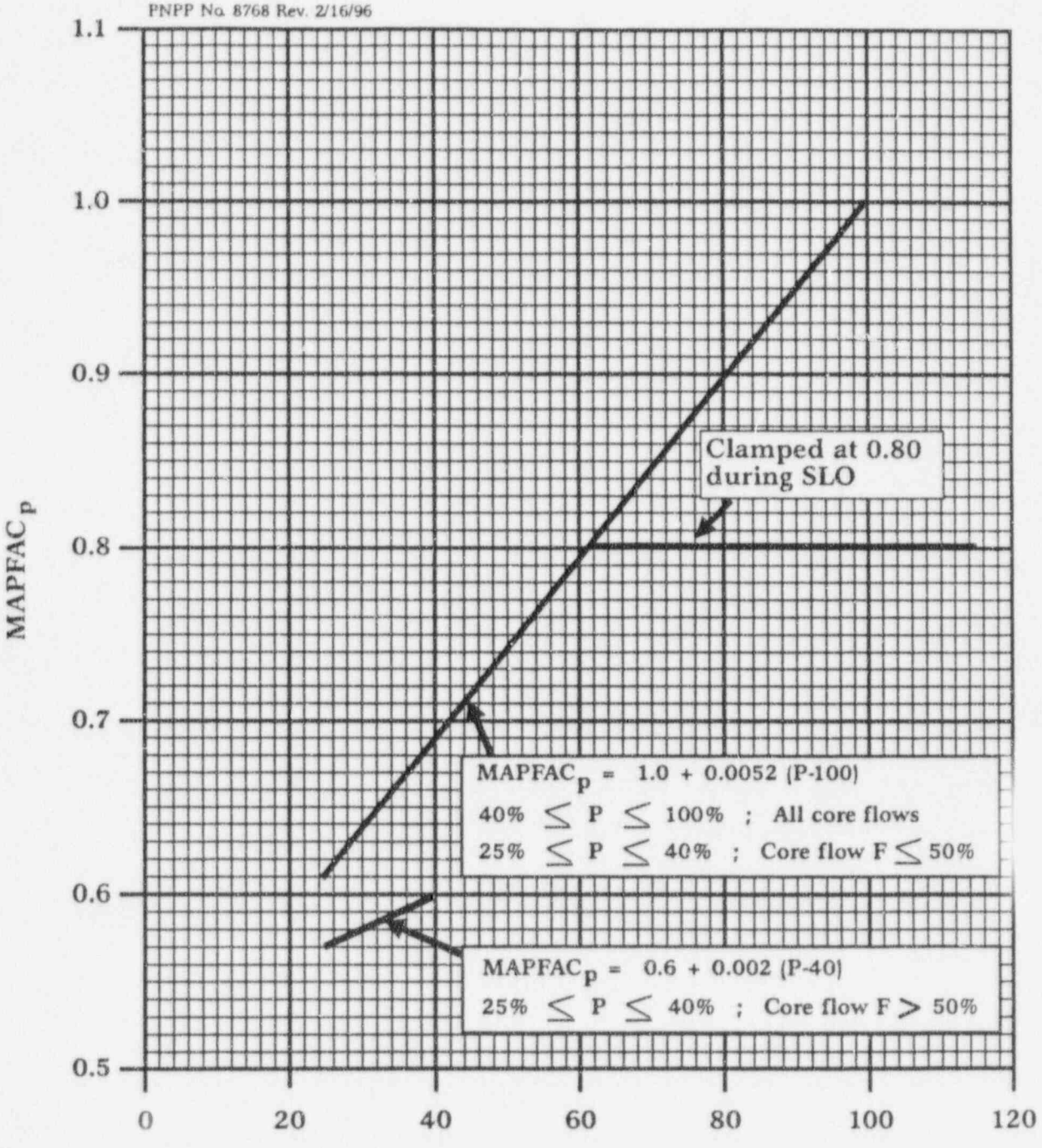


FLOW DEPENDENT MAPLHGR FACTOR
(MAPFAC $_f$)

FUEL TYPES: GE11

Figure 3.2.1-2

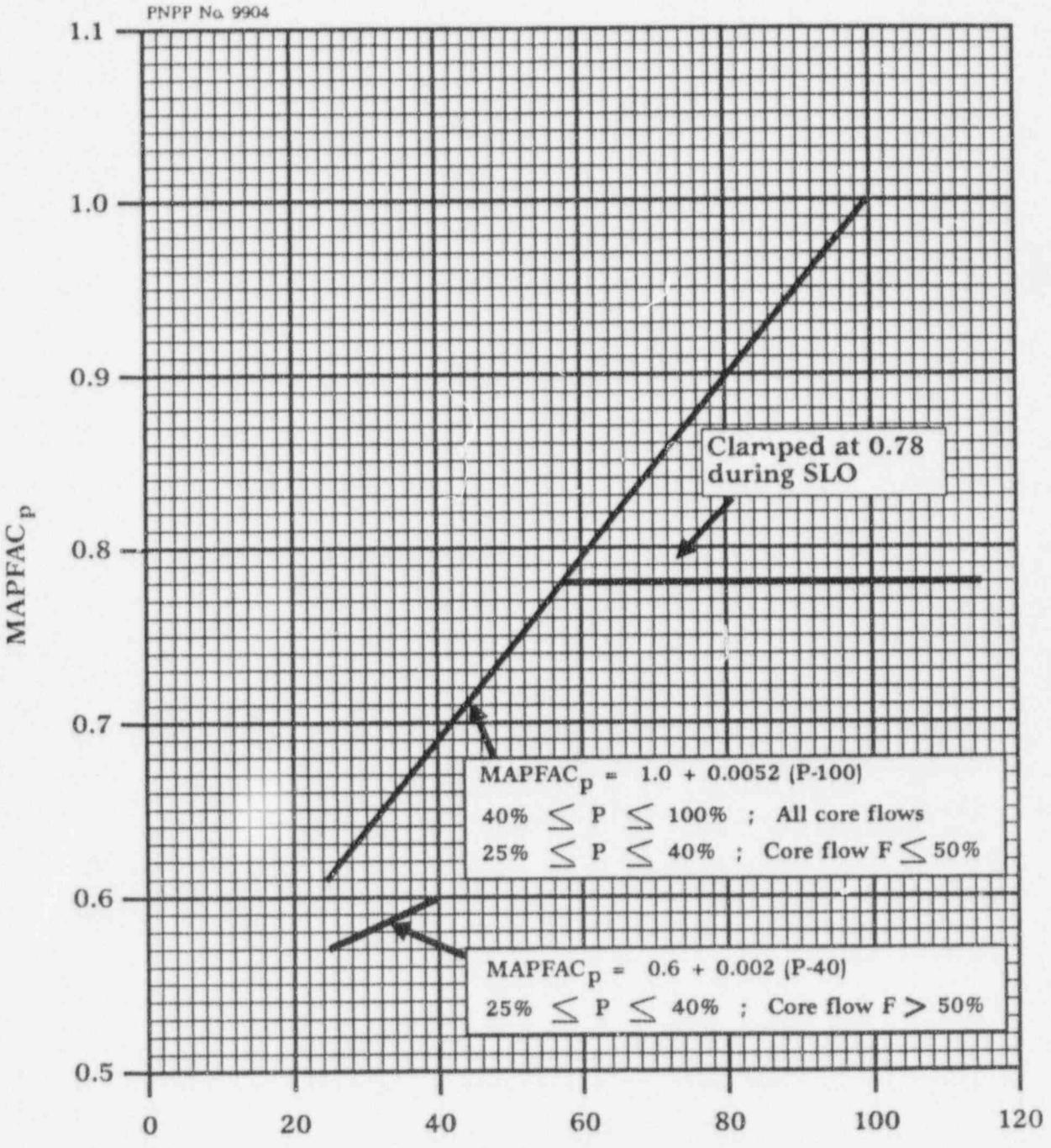
PNPP No. 8768 Rev. 2/16/96



POWER DEPENDENT MAPLHGR FACTOR
(MAPFAC $_p$)

FUEL TYPES: GE8X8EB and GE8X8NB-1

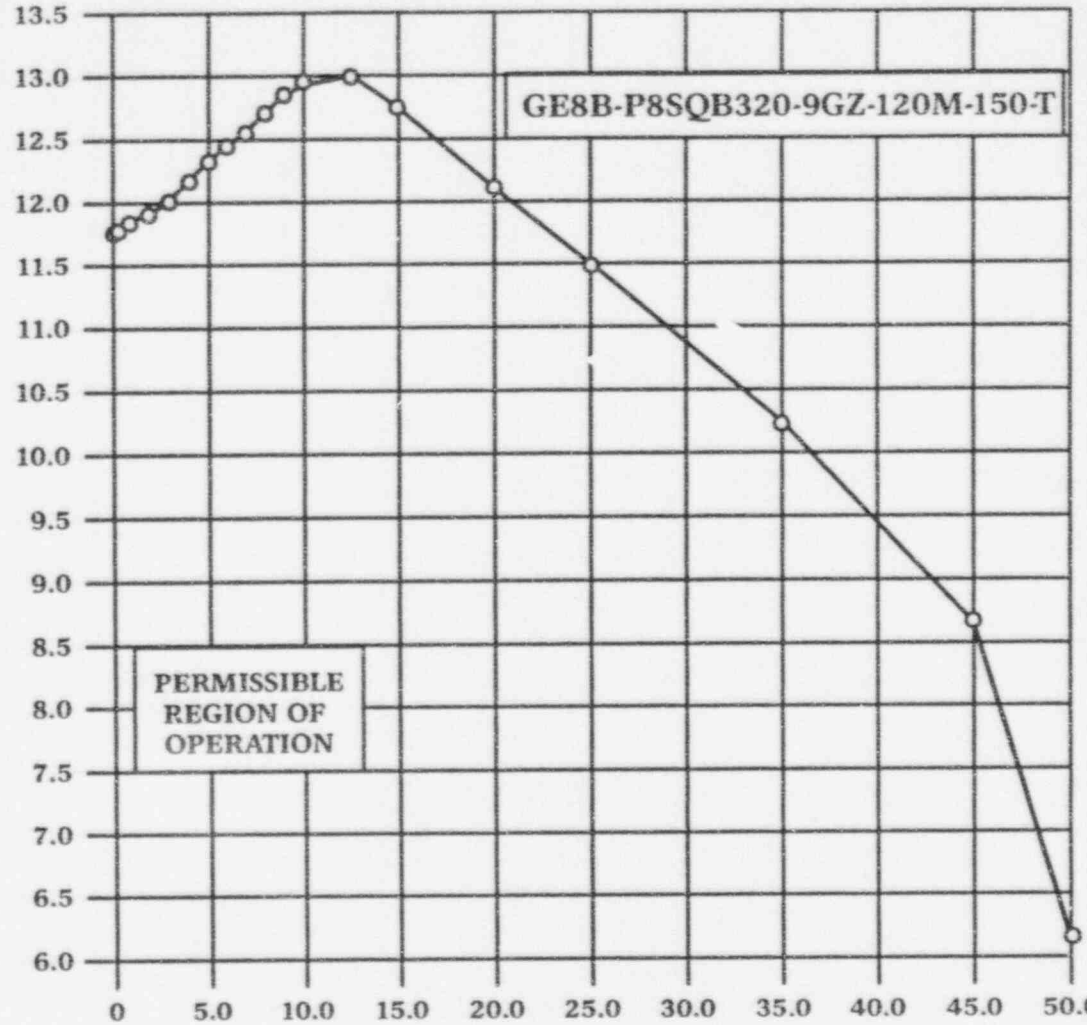
Figure 3.2.1-3



POWER DEPENDENT MAPLHGR FACTOR
(MAPFAC $_p$)

FUEL TYPES: GE11

Figure 3.2.1-4



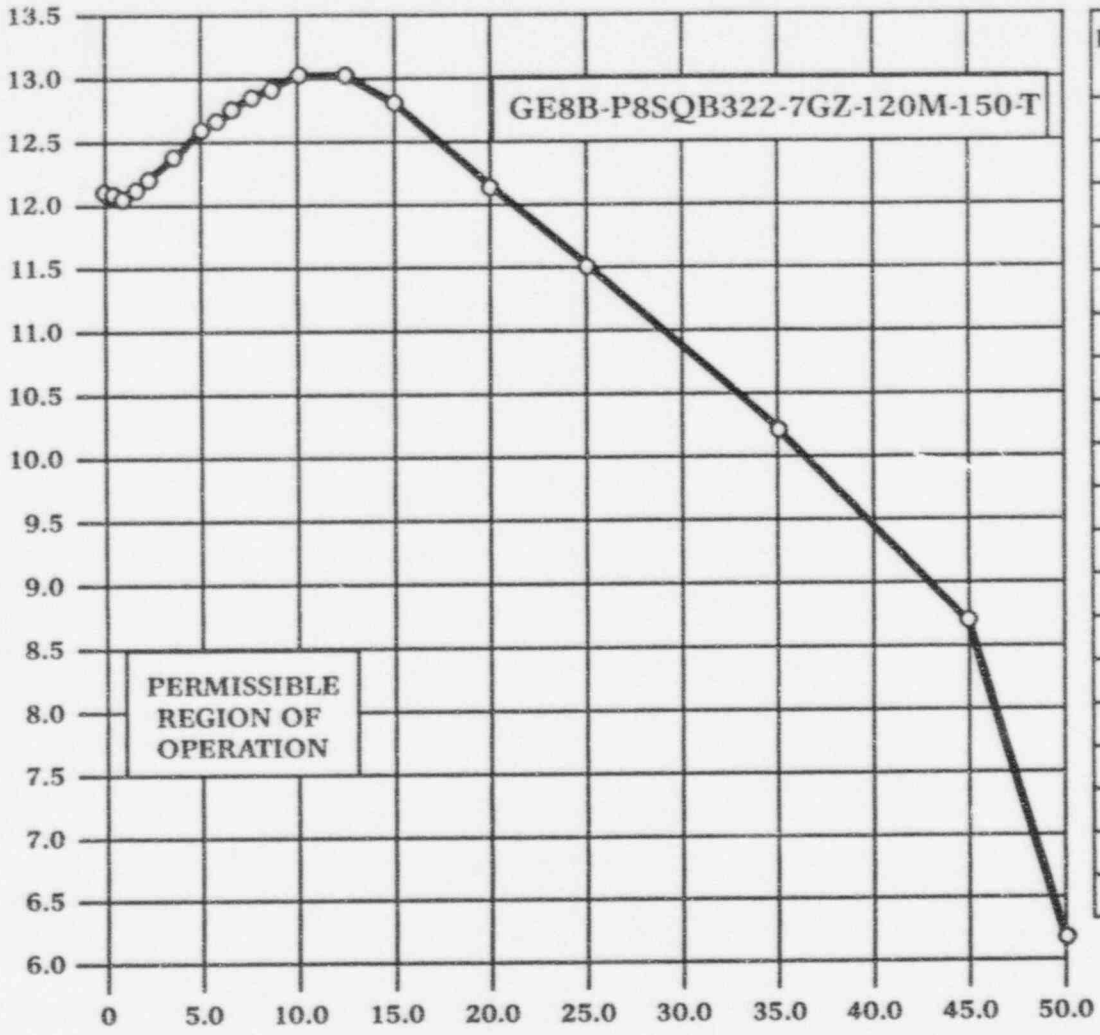
EXPOSURE (GWd/t)	MAPLHGR (kW/ft)
0.0	11.75
0.2	11.78
1.0	11.83
2.0	11.91
3.0	12.02
4.0	12.17
5.0	12.32
6.0	12.44
7.0	12.56
8.0	12.70
9.0	12.84
10.0	12.97
12.5	13.00
15.0	12.73
20.0	12.10
25.0	11.48
35.0	10.23
45.0	8.66
50.0	6.16

MAXIMUM AVERAGE PLANAR LINEAR HEAT GENERATION RATE (MAPLHGR) VERSUS AVERAGE PLANAR EXPOSURE, GE8x8EB

FUEL TYPE GE8B-P8SQB320-9GZ-120M-150-T

Notes:
1. Intermediate MAPLHGR values are obtained by linear interpolation between adjacent points.
2. This curve is a composite of the most limiting enriched fuel lattices. For lattice specific values consult Reference 5.

PNPP No 8879 Rev. 2/14/96



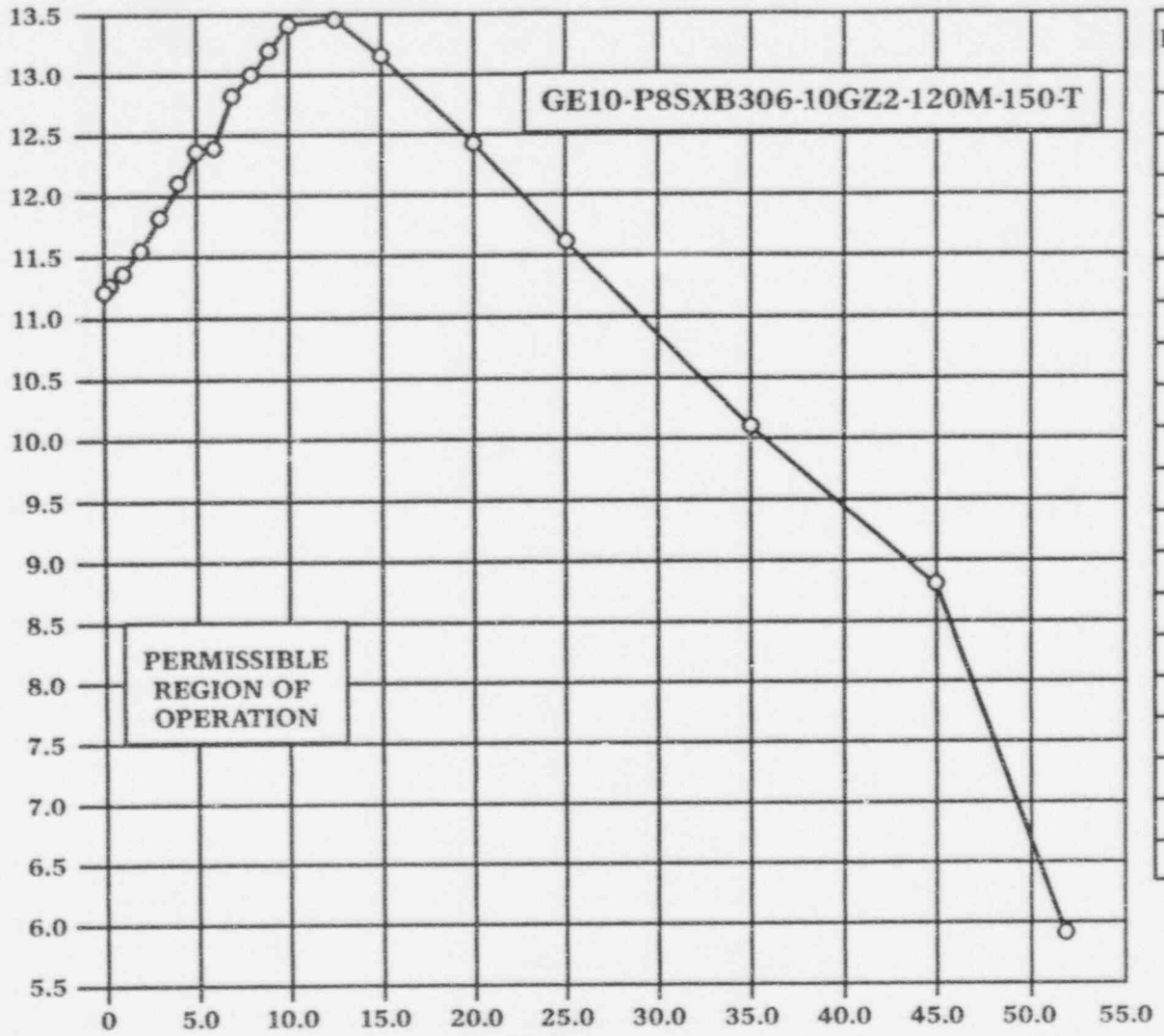
EXPOSURE (GWd/t)	MAPLHGR (kW/ft)
0.0	12.11
0.2	12.10
1.0	12.09
2.0	12.16
3.0	12.28
4.0	12.42
5.0	12.58
6.0	12.67
7.0	12.75
8.0	12.83
9.0	12.92
10.0	13.02
12.5	13.07
15.0	12.79
20.0	12.19
25.0	11.56
35.0	10.29
45.0	8.77
50.0	6.27

Figure 3.2.1-6

MAXIMUM AVERAGE PLANAR LINEAR HEAT GENERATION RATE (MAPLHGR) VERSUS AVERAGE PLANAR EXPOSURE, GE8x8EB

FUEL TYPE GE8B-P8SQB322-7GZ-120M-150-T

Notes:
1. Intermediate MAPLHGR values are obtained by linear interpolation between adjacent points.
2. This curve is a composite of the most limiting enriched fuel lattices. For lattice specific values consult Reference 5.

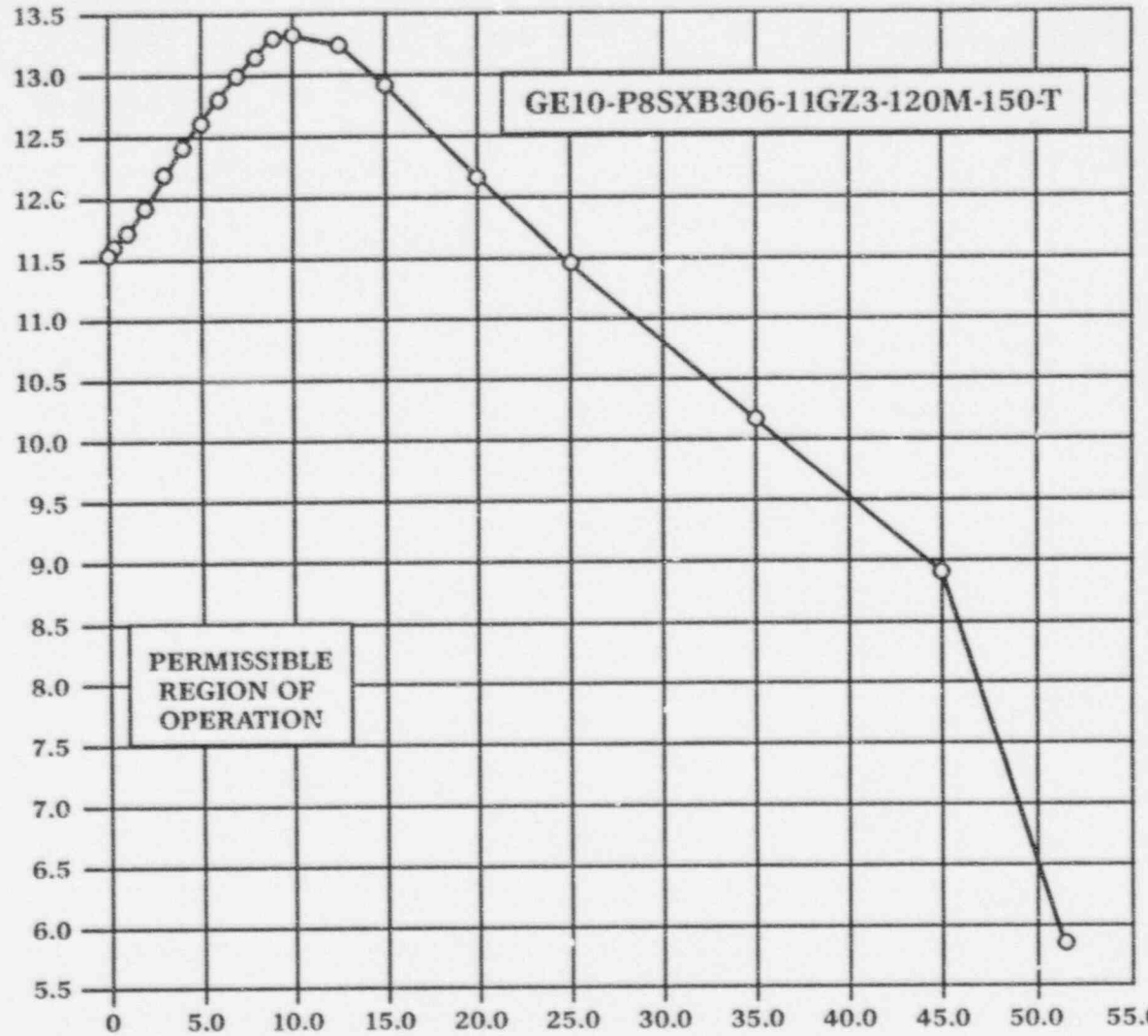


EXPOSURE (GWd/ST)	MAPLHGR (kW/ft)
0.0	11.21
0.2	11.26
1.0	11.36
2.0	11.56
3.0	11.81
4.0	12.08
5.0	12.35
6.0	12.57
7.0	12.80
8.0	13.00
9.0	13.20
10.0	13.37
12.5	13.45
15.0	13.14
20.0	12.40
25.0	11.61
35.0	10.12
45.0	8.83
52.1	5.87

MAXIMUM AVERAGE PLANAR LINEAR HEAT GENERATION RATE (MAPLHGR) VERSUS AVERAGE PLANAR EXPOSURE, GE8x8NB-1

FUEL TYPE GE10-P8SXB306-10GZ2-120M-150T

Notes:
1. Intermediate MAPLHGR values are obtained by linear interpolation between adjacent points.
2. This curve is a composite of the most limiting enriched fuel lattices. For lattice specific values consult Reference 6.

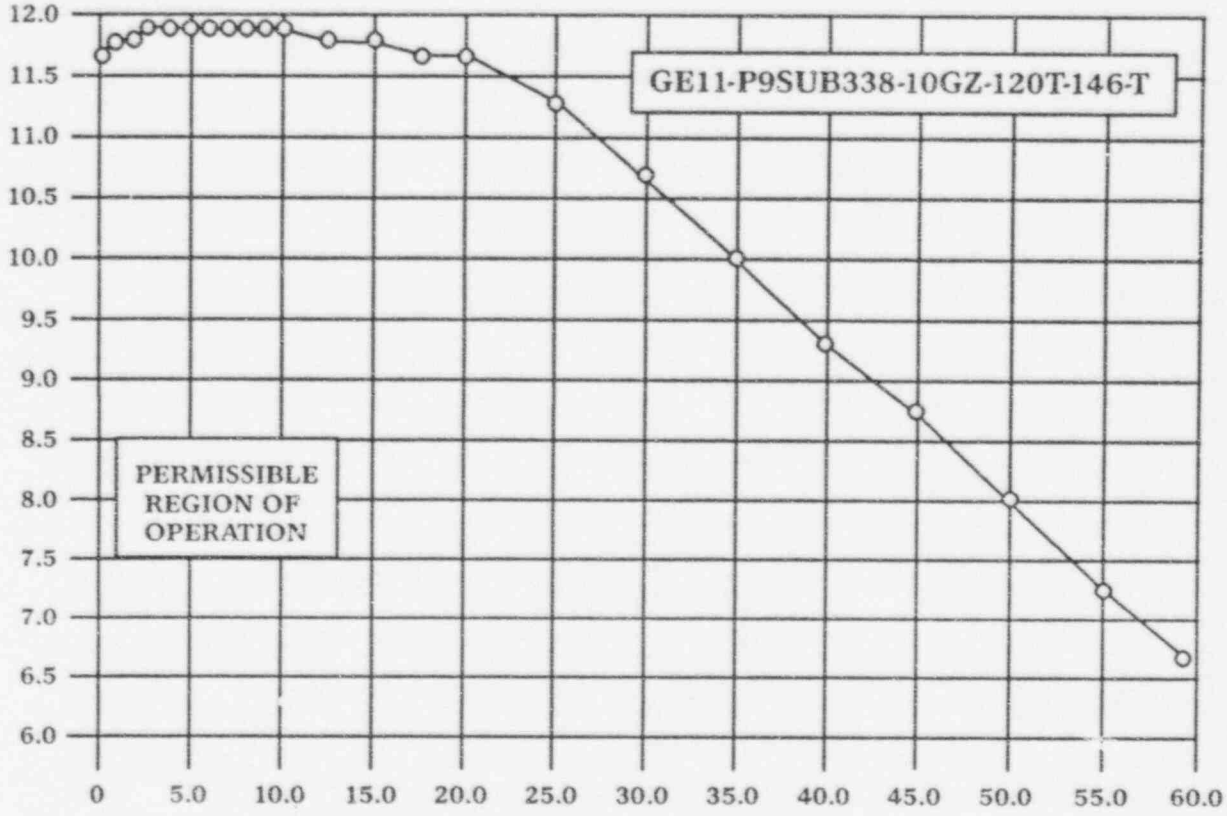


EXPOSURE (GWd/ST)	MAPLHGR (kW/ft)
0.0	11.55
0.2	11.61
1.0	11.71
2.0	11.92
3.0	12.17
4.0	12.41
5.0	12.61
6.0	12.81
7.0	12.99
8.0	13.16
9.0	13.31
10.0	13.34
12.5	13.23
15.0	12.92
20.0	12.16
25.0	11.44
35.0	10.14
45.0	8.90
51.7	5.87

MAXIMUM AVERAGE PLANAR LINEAR HEAT GENERATION RATE (MAPLHGR) VERSUS AVERAGE PLANAR EXPOSURE, GE8x8NB-1

FUEL TYPE GE10-P8SXB306-11GZ3-120M-150T

Notes:
1. Intermediate MAPLHGR values are obtained by linear interpolation between adjacent points.
2. This curve is a composite of the most limiting enriched fuel lattices. For lattice specific values consult Reference 6.

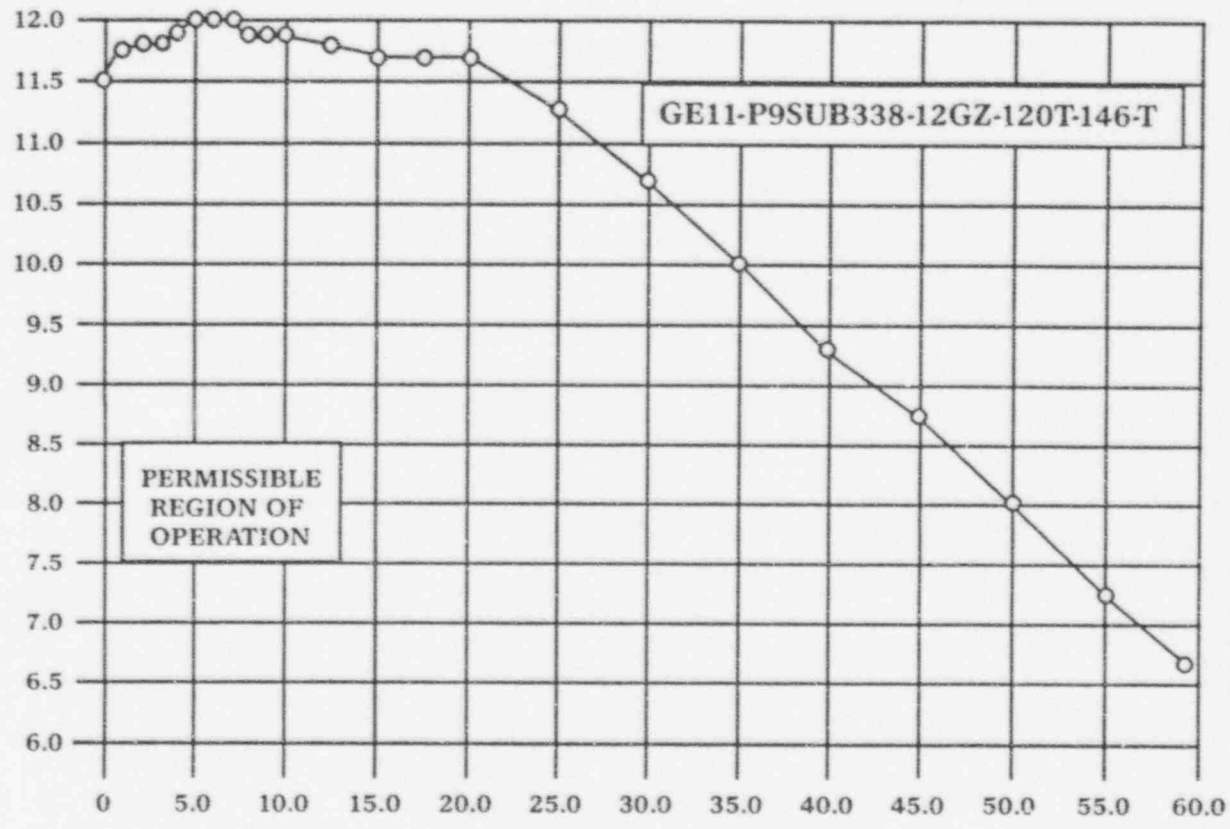


EXPOSURE (GWd/t)	MAPLHGR (kW/ft)
0.0	11.7
1.0	11.8
2.0	11.8
3.0	11.9
4.0	11.9
5.0	11.9
6.0	11.9
7.0	11.9
8.0	11.9
9.0	11.9
10.0	11.9
12.5	11.8
15.0	11.8
17.5	11.7
20.0	11.7
25.0	11.3
30.0	10.7
35.0	10.0
40.0	9.3
45.0	8.7
50.0	8.0
55.0	7.3
59.2	6.6

MAXIMUM AVERAGE PLANAR LINEAR HEAT GENERATION RATE (MAPLHGR) VERSUS AVERAGE PLANAR EXPOSURE, GE11

FUEL TYPE GE11-P9SUB338-10GZ-120T-146T

Notes:
1. Intermediate MAPLHGR values are obtained by linear interpolation between adjacent points.
2. This curve is a composite of the most limiting enriched fuel lattices. For lattice specific values consult Reference 4.



EXPOSURE (GWd/t)	MAPLHGR (kW/ft)
0.0	11.5
1.0	11.7
2.0	11.8
3.0	11.8
4.0	11.9
5.0	12.0
6.0	12.0
7.0	12.0
8.0	11.9
9.0	11.9
10.0	11.9
12.5	11.8
15.0	11.7
17.5	11.7
20.0	11.7
25.0	11.3
30.0	10.7
35.0	10.0
40.0	9.3
45.0	8.7
50.0	8.0
55.0	7.3
59.2	6.6

MAXIMUM AVERAGE PLANAR LINEAR HEAT GENERATION RATE (MAPLHGR) VERSUS AVERAGE PLANAR EXPOSURE, GE11

FUEL TYPE GE11-P9SUB338-12GZ-120T-146T

Notes:
1. Intermediate MAPLHGR values are obtained by linear interpolation between adjacent points.
2. This curve is a composite of the most limiting enriched fuel lattices. For lattice specific values consult Reference 4.

MINIMUM CRITICAL POWER RATIO (TS 3.2.2 (TS 3.2.2))

The MINIMUM CRITICAL POWER RATIO (MCPR) shall be equal to or greater than the higher of the $MCPR_f$ and $MCPR_p$ limits at the indicated core flow, THERMAL POWER, delta T^* and core average exposure compared to the End of Cycle Exposure (EOCE)** as specified in Figures 3.2.2-1 through 3.2.2-7.

For cycle 6 no change to MCPR limits is required for planned reduction of feedwater temperature to as low as 320°F. Final feedwater temperature may be reduced to 250°F after all control rods withdrawn at end of cycle.

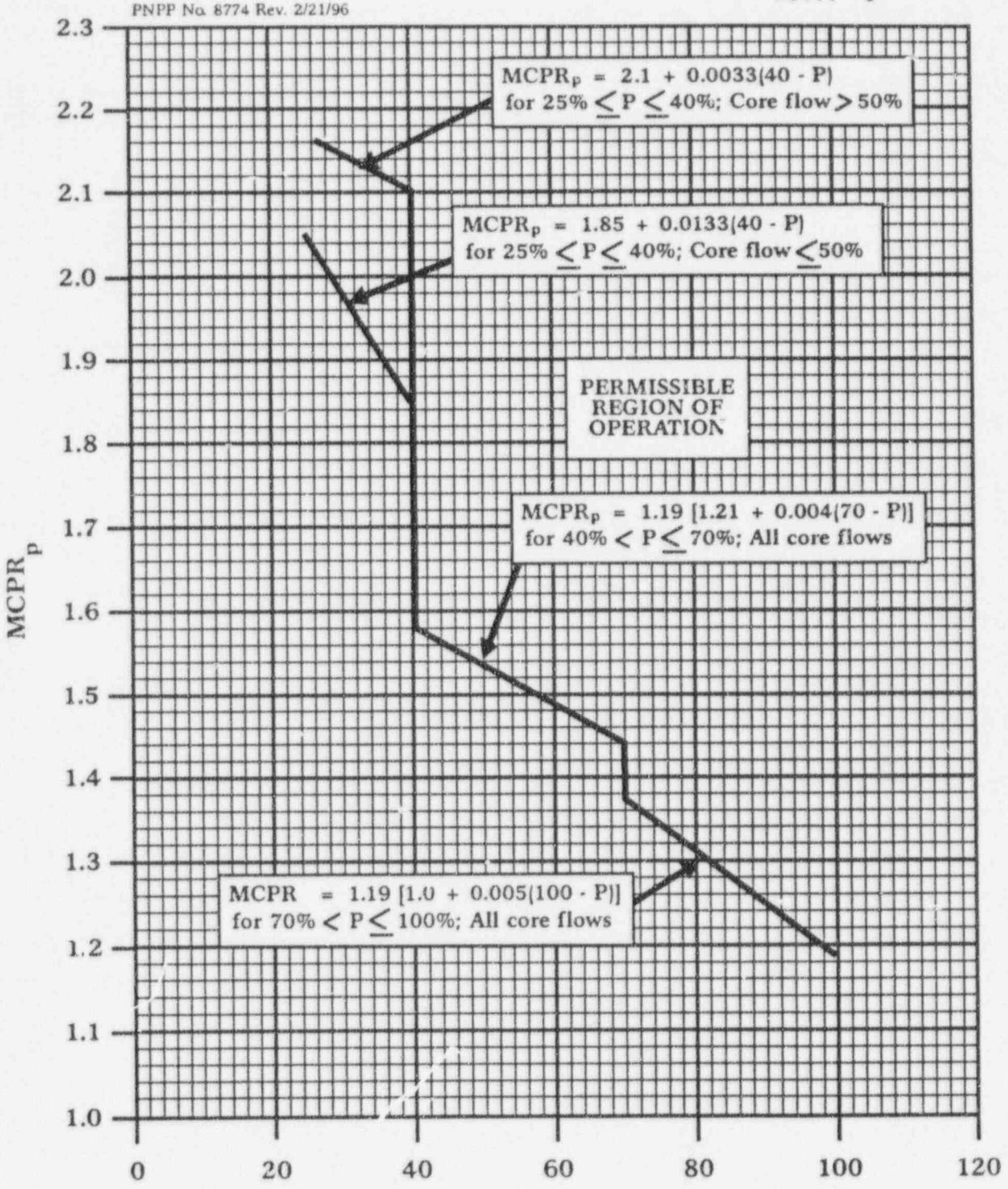
NOTE: Planned reduction of rated feedwater temperature from nominal rated feedwater temperature is not permitted during plant operation with the reactor recirculation system in single loop operation.

There are a total of 19 safety/relief valves, the two lowest setpoint valves are assumed to be out-of-service in the transient analyses.

* This delta T refers to the planned reduction of rated feedwater temperature from nominal rated feedwater temperature (420°F), such as prolonged removal of feedwater heater(s) from service.

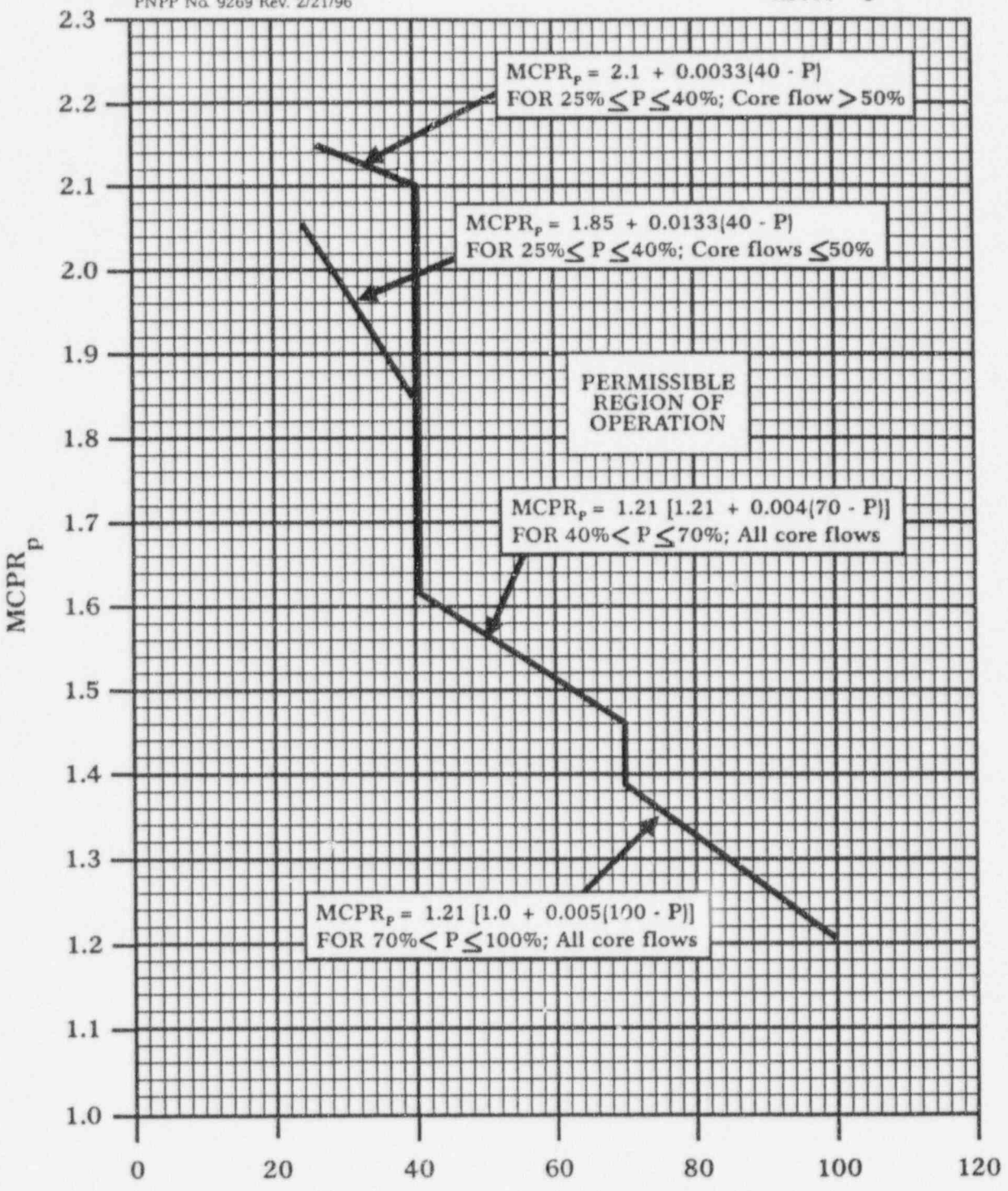
** End of Cycle Exposure (EOCE) is defined as 1) the core average exposures at which there is no longer sufficient reactivity to achieve RATED THERMAL POWER with rated core flow, all control rods withdrawn, all feedwater heaters in service and equilibrium Xenon, or 2) as specified by the fuel vendor.

PNPP No. 8774 Rev. 2/21/96



POWER DEPENDENT MCPR LIMIT
($MCPR_p$)
FUEL TYPE GE8X8EB

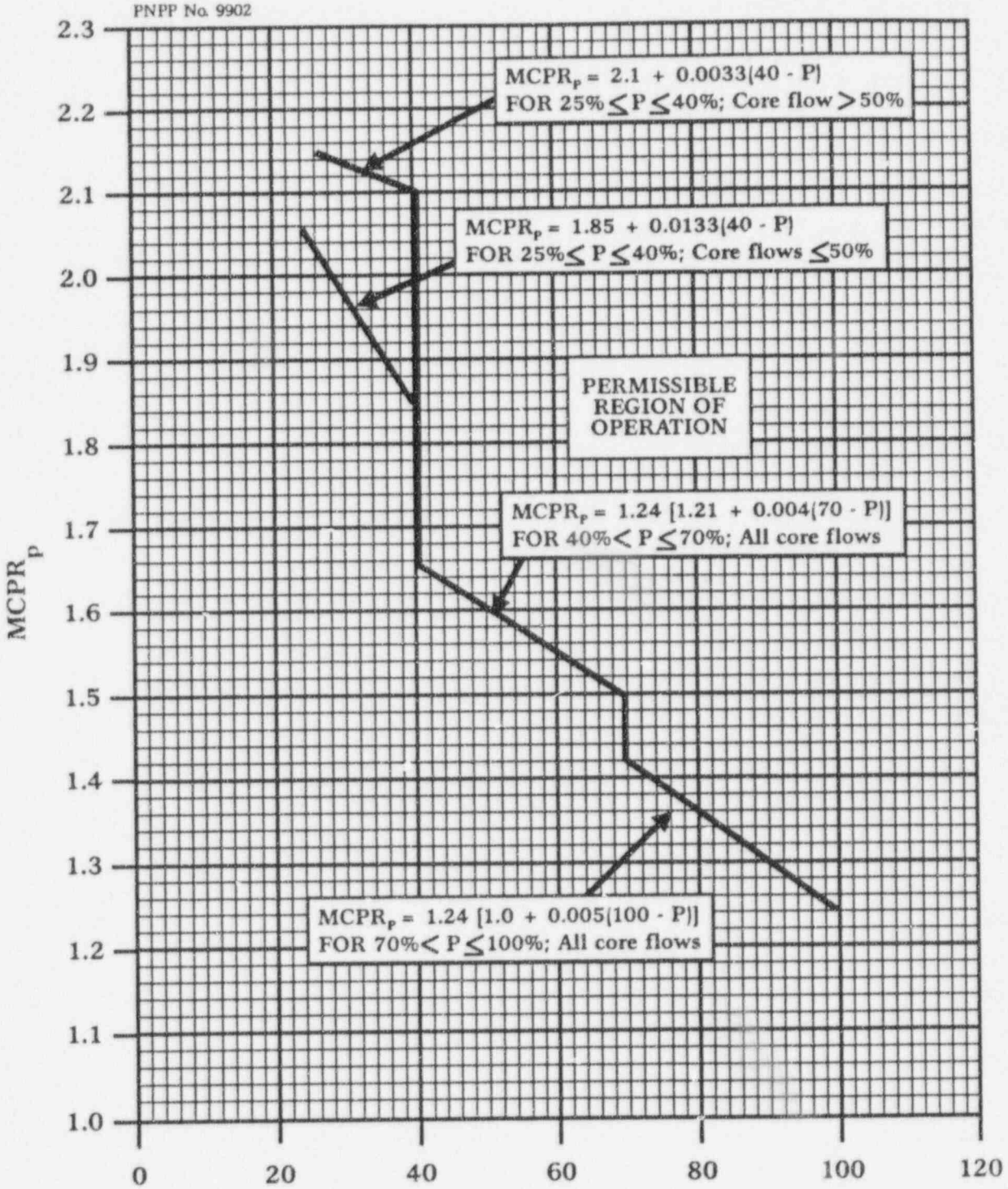
Figure 3.2.2-1



POWER DEPENDENT MCPR LIMIT
(MCPR$_p$)
FUEL TYPE: GE8 x 8NB - 1

Figure 3.2.2-2

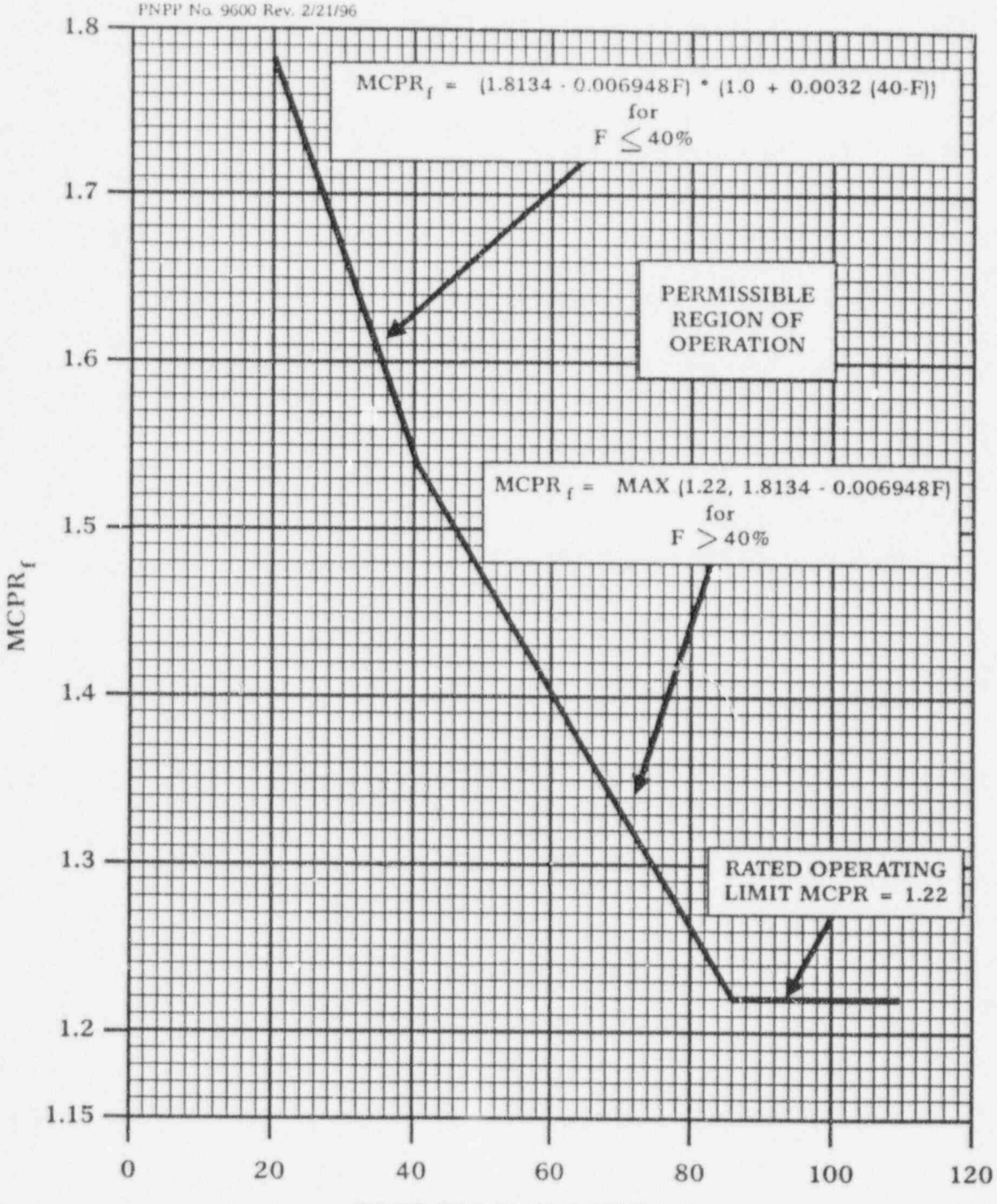
PNPP No. 9902



POWER DEPENDENT MCPR LIMIT
(MCPR$_p$)
FUEL TYPE: GE11

Figure 3.2.2-3

PNPP No. 9600 Rev. 2/21/96



FLOW DEPENDENT MCPR LIMIT
(MCPR$_f$)

FUEL TYPE: GE8X8EB

Figure 3.2.2-4
Includes Fuel Loading Error results.

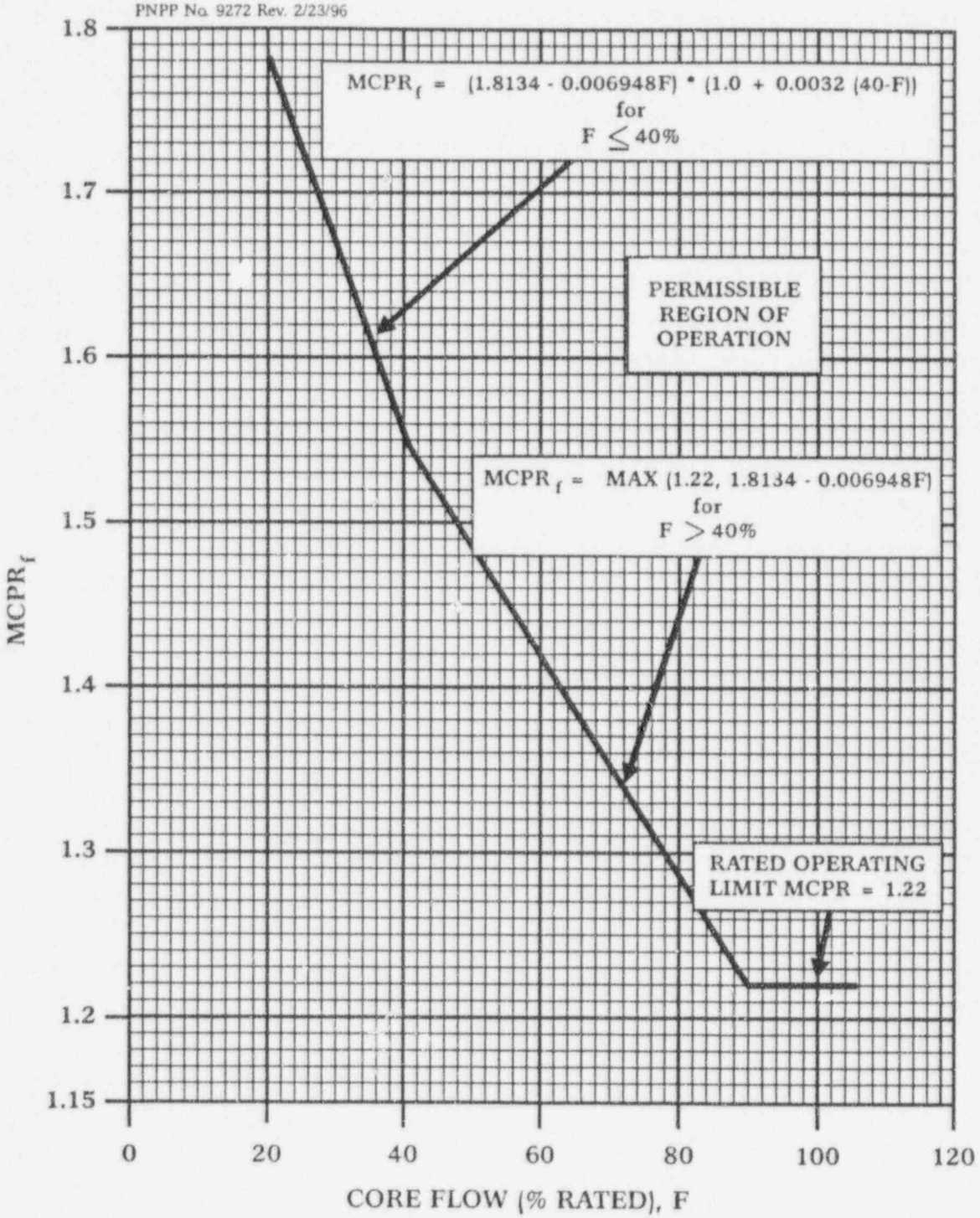
Appendix F
GE8x8NB-1 Rotated Bundle Analysis

The results for each GE8x8NB-1 fuel type are listed in Table F-1. These results do not change from the previous cycle.

Table F-1

	ΔCPR
GE10-P8SXB306-11GZ3-120M-150-T	0.16
GE10-P8SXB306-10GZ2-120M-150-T	0.09

PNPP No. 9272 Rev. 2/23/96



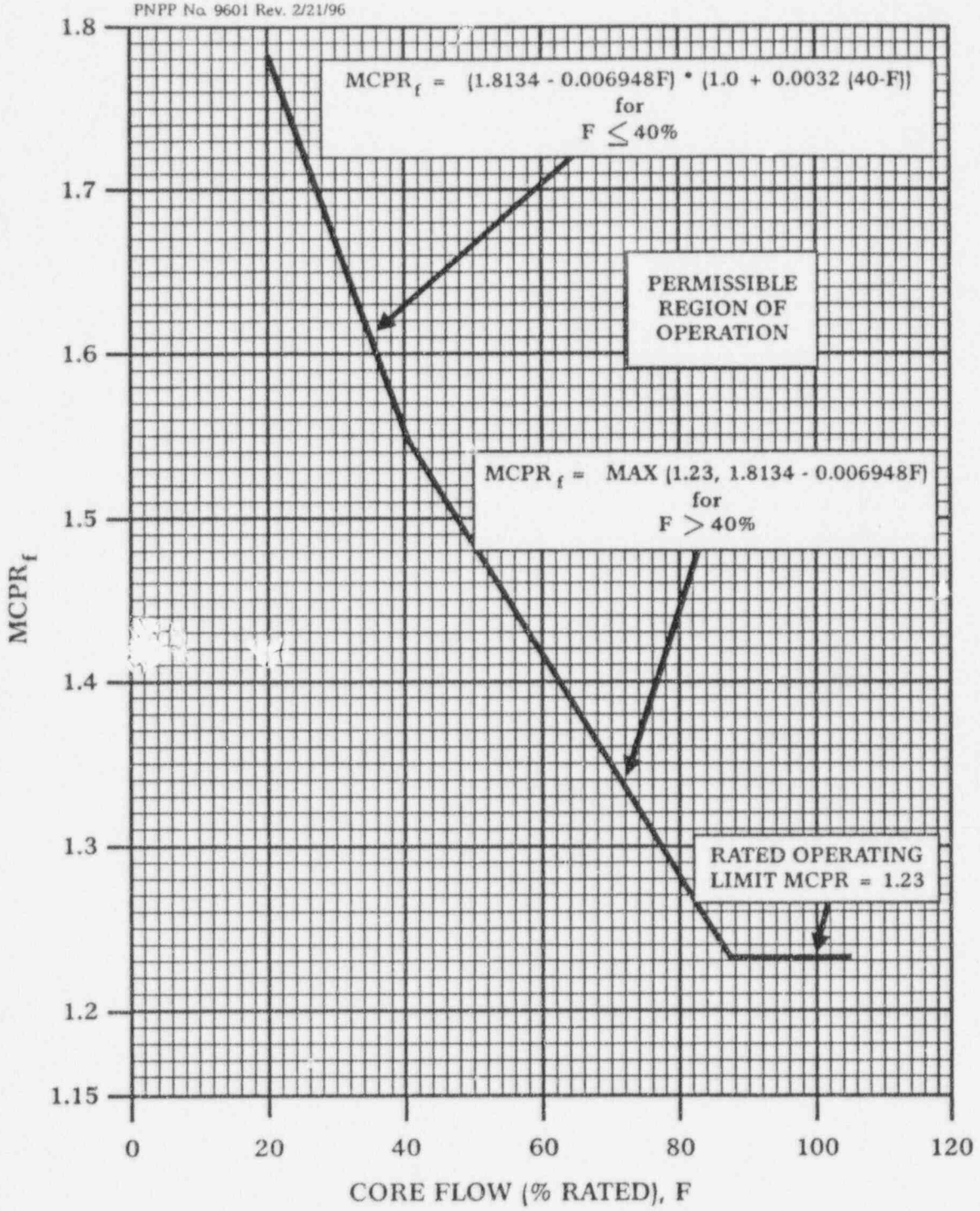
FLOW DEPENDENT MCPR LIMIT
(MCPR$_f$)

FUEL TYPE: GE10-P8SXB306-10GZ2-120M-150T

Figure 3.2.2-5

Includes Fuel Loading Error results.

PNPP No. 9601 Rev. 2/21/96



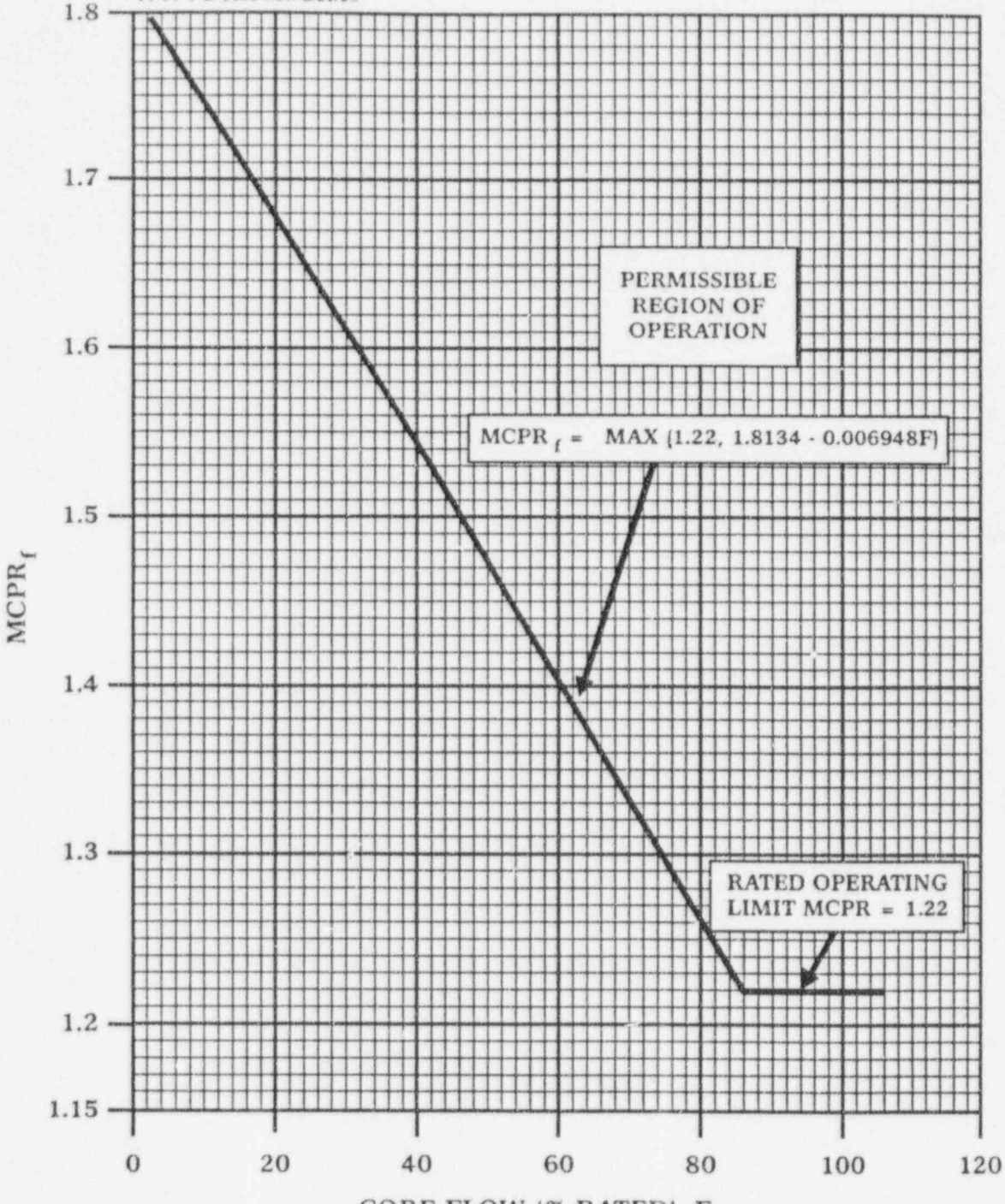
FLOW DEPENDENT MCPR LIMIT
(MCPR$_f$)

FUEL TYPE: GE10-P8SXB306-11GZ3-120M-150T

Figure 3.2.2-6

Includes Fuel Loading Error results.

PNPP No. 9602 Rev. 2/21/96



FLOW DEPENDENT MCPR LIMIT
(MCPR$_f$)

FUEL TYPE: GE11

Figure 3.2.2-7
Includes Fuel Loading Error results.

LINEAR HEAT GENERATION RATE (TS 3.2.3 (TS 3.2.3))

The LINEAR HEAT GENERATION RATE (LHGR) shall not exceed:

a. 14.4 kw/ft. for the following fuel types:

1. GE8B-P8SQB320-9GZ-120M-150-T (GE8X8EB)
2. GE8B-P8SQB322-7GZ-120M-150-T (GE8X8EB)
3. GE10-P8SXB306-10GZ2-120M-150-T (GE8X8NB-1)
4. GE10-P8SXB306-11GZ3-120M-150-T (GE8X8NB-1)
5. GE11-P9SUB338-10GZ-120T-146-T (GE11)
6. GE11-P9SUB338-12GZ-120T-146-T (GE11)

REACTOR PROTECTION SYSTEM INSTRUMENTATION (TS 3.3.1 {TS 3.3.1.1})

The simulated thermal power time constant shall be 6±0.6 seconds.

Attachment 2

Supplemental Reload Licensing Report for the

Perry Nuclear Power Plant Unit 1

Reload 5, Cycle 6 (J11-02581 SRLR, Rev. 0)