



**Constellation Energy®**

• Nine Mile Point Nuclear Station

P.O. Box 63  
Lycoming, NY 13093

May 1, 2007

U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555-0001

**ATTENTION:** Document Control Desk

**SUBJECT:** Nine Mile Point Nuclear Station  
Unit No. 1; Docket No. 50-220  
Core Operating Limits Report, COLR1-18 Revision 0

Attached is a copy of the Core Operating Limits Report, COLR1-18 Revision 0, for Nine Mile Point Unit 1 (NMP1). This report is being submitted pursuant to NMP1 Technical Specification 6.6.5.d.

Should you have any questions regarding the information in this submittal, please contact M. H. Miller, Director Licensing, at (315) 349-5219.

Very truly yours,

Mark A. Schimmel  
Plant General Manager

MAS/MHS/

Attachment: (1) Core Operating Limits Report, COLR1-18 Revision 0

cc: S. J. Collins, NRC Regional Administrator, Region I  
L. M. Cline, NRC Senior Resident Inspector  
M. J. David, NRR Project Manager

A001

**ATTACHMENT (1)**

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**NINE MILE POINT UNIT 1**  
**CORE OPERATING LIMITS REPORT**  
**COLR1-18**  
**REVISION 0**

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**Nine Mile Point Nuclear Station, LLC**  
**May 1, 2007**

# NINE MILE POINT UNIT 1

## CORE OPERATING LIMITS REPORT

Document No.: COLR1-18

Revision 0

Controlled Document Copy  
For Latest Information  
Check CDS

**ORIGINAL**

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This Controlled Document provides cycle specific core operating limits for use in conjunction with the Nine Mile Point Unit 1 Technical Specifications. Document pages may only be changed through a reissue of the entire document.

## TERMS AND DEFINITIONS

### Average Planar Linear Heat Generation Rate (APLHGR)

The Average Planar Linear Heat Generation Rate (APLHGR) shall be applicable to a specific planar height and is equal to the sum of the heat generation rate per unit length of fuel rod for all fuel rods in the specified bundle at the specified height, divided by the number of fuel rods in the fuel bundle at that height.

### BOC

Beginning of Cycle

### Core Maximum Fraction of Limiting Power Density (CMFLPD)

The highest value of the fraction of limiting power density which exists in the core.

### Critical Power Ratio (CPR)

The ratio of critical power to the bundle power at the reactor condition of interest.

### EOC

End of Cycle

### EOR

End of Rated Conditions (i.e. cycle exposure at 100% power, 100% flow, all rods-out, all feedwater heaters in service and equilibrium xenon)

### Fraction of Limiting Power Density (FLPD)

The linear heat generation rate (LHGR) existing at a given location divided by the specified LHGR limit for that bundle type.

### F RTP

Fraction of Rated Thermal Power where Rated Thermal Power equals 1850 MW

### K(f)

MCPR flow dependent multiplier

### Linear Heat Generation Rate (LHGR)

The heat generation per unit length of fuel rod. It is the integral of the heat flux over the heat transfer area associated with the fuel length.

### MAPLHGR

Maximum Average Planar Linear Heat Generation Rate

### Minimum Critical Power Ratio (MCPR)

The minimum in-core critical power ratio.

### RSLD

Reload Specific Lattice Data Document

**CORE OPERATING LIMITS REPORT****1.0 AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)****1.1 Limits for Technical Specification 3.1.7.a**

During power operation, the APLHGR for each type of fuel as function of axial location and average planar exposure shall not exceed the limiting values shown in Table 1a, 1b, 1c, and 1d.

**1.2 Limits for Technical Specification 3.1.7.e**

During partial loop operation with four recirculation loops in operation, the APLHGR as a function of axial location and average planar exposure shall not exceed 98 percent of the limiting values shown in Table 1a, 1b, 1c, and 1d.

During partial loop operation with three recirculation loops in operation, the APLHGR as a function of axial location and average planar exposure shall not exceed 98 percent of the limiting values shown in Table 1a, 1b, 1c, and 1d.

## 2.0 MINIMUM CRITICAL POWER RATIO (MCPR)

### 2.1 Limits for Technical Specification 3.1.7.c

During power operation, the operating MCPR shall be greater than or equal to the Operating Limit MCPR<sup>(1)</sup> from the appropriate<sup>(2)</sup> Figure (2a thru 2d) with tau (or "τ") defined as follows:

$$\tau = (\tau_{ave} - \tau_B) / (\tau_A - \tau_B)$$

where:

$\tau_A = 0.868$  seconds, control rod average scram insertion time limit to notch 39

$$\tau_B = .672 + 1.65 * [ N_1 / \sum_{i=1}^n N_i ]^{1/2} * .016$$

$$\tau_{ave} = \frac{\sum_{i=1}^n N_i \tau_i}{\sum_{i=1}^n N_i}$$

$n$  = number of surveillance tests performed in cycle

$N_i$  = number of active control rods measured in the  $i^{th}$  surveillance test

$\tau_i$  = average scram time to notch 39 of all rods measured in the  $i^{th}$  surveillance test

$N_1$  = total number of active rods measured in the first test at BOC

For core flows other than rated the MCPR limit shall be the Operating Limit MCPR identified above times  $K(f)$  where  $K(f)$  is as shown in Figure 2e.

Additional limits for operation between 45% and 90% RTP<sup>(3)(4)</sup> are required for operations without a backup pressure regulator. These limits are shown in Figure 2f.

### 2.2 Limits for Technical Specification 3.1.7.e

During 3 loop operation, the Operating Limit MCPR shall be increased by 0.02. No adjustment is needed during 4 loop operation.

#### NOTES:

1. Based on a 1.07 MCPR Safety Limit (SLCPR).
2. If the feedwater pump configuration, as defined by Nuclear Engineering Report No. NER-1M-022, is such that a feedwater controller failure could result in maximum feedwater flow greater than that for two feedwater pumps (i.e., the shaft-driven pump plus one motor-driven pump), then the Operating Limit MCPR shall be as shown in Figures 2c or 2d, depending on exposure.
3. Below 45% and above 90% RTP no additional limits are required for operation without a backup pressure regulator.
4. These limits are valid for 3, 4, and 5 loop operation. (Note that for the MCPR Limit for  $70\% \leq P < 90\%$ , i.e. MCPR Limit = (Rated OLMCPR) / FRTP, the Rated OLMCPR is as determined by 2.1 and 2.2 above.)
5. EOR on Figures 2a through 2d is the end of rated exposure as defined in the Cycle Management report.

### 3.0 LINEAR HEAT GENERATION RATE (LHGR)

#### 3.1 Limits for Technical Specification 3.1.7.b

During power operation, the Linear Heat Generation Rate (LHGR) of any rod in any fuel assembly at any axial location shall not exceed the limiting values shown in RSLD-19, Revision 0, "Nine Mile Point Unit 1 Reload 19, Reload Specific Lattice Data". This document contains the LHGR limits for both UO<sub>2</sub> rods (which contain no gadolinium) and the most limiting gadolinium-bearing rods. Other gadolinium-bearing rods have LHGR limits which lie between these two curves. Compliance with these limits will be monitored by the plant's 3D-Monicores computer.

Additional limits for operation between 45% and 90% RTP<sup>(1)</sup> are required for operations without a backup pressure regulator. These limits are shown in Figure 3.

**NOTE:**

- (1) Below 45% and above 90% RTP no additional limits are required for operation without a backup pressure regulator.

#### **4.0 POWER/FLOW RELATIONSHIP DURING OPERATION**

##### **4.1 Limits for Technical Specification 3.1.7.d and e**

The power/flow relationship shall not exceed the limiting values shown in Figure 4.



**6.0 SOURCE DOCUMENTS**

The Core Operating Limits contained in this report were obtained from the following documents:

**CORE OPERATING LIMITS****REFERENCE**

APLHGR Limits (Section 1.0)  
Table 1  
and corresponding three and four  
loop multipliers

0000-0053-5239-SRLR, Revision 1, March 2007,  
Supplemental Reload Licensing Report for  
Nine Mile Point Nuclear Station Unit 1,  
Reload 19 Cycle 18

Lattice Descriptions

RSLD-19 Nine Mile Point Unit 1 Reload 19 Specific  
Lattice Data

MCPR Limits (Section 2)

0000-0053-5239-SRLR, Revision 1, March 2007,  
Supplemental Reload Licensing Report for  
Nine Mile Point Nuclear Station Unit 1,  
Reload 19 Cycle 18

0000-0053-5247-ER, Revision 1, March 2007,  
Engineering Report for Nine Mile Point Nuclear  
Station Unit 1, Reload 19

Pressure Regulator Out-of-Service  
Restriction

GE-NE-J11-03433-16-01-R1, "Pressure Regulator  
Out of Service Calculations for Nine Mile Point  
Unit 1", January 2005

EOR Definition

NMP1CMR Nine Mile Point Unit 1 Cycle 18 Cycle  
Management Report

LHGR Limits (Section 3)

0000-0053-5247-ER, Revision 1, March 2007,  
Engineering Report for Nine Mile Point Nuclear  
Station Unit 1, Reload 19

Pressure Regulator Out-of-Service  
Restriction

GE-NE-J11-03433-16-01-R1, "Pressure Regulator  
Out of Service Calculations for Nine Mile Point  
Unit 1", January 2005

Power/Flow Relationship (Section 4)

NMP1 Technical Specification Amendment 92, Figure  
3.1.7.aa

Table 1a

MAPLHGR VERSUS AVERAGE PLANAR EXPOSURE<sup>(1) (2)</sup>

Average Planar Exposure GwD/ST	MAPLHGR Limits (kw/ft)			
	Bundle GE11-C15	Bundle GE11-C16A	Bundle GE11-C16B	Bundle GE11-C17
0.00	8.82	9.93	9.93	9.81
0.20	8.82	9.93	9.93	9.81
1.00	8.89	9.89	9.90	9.78
5.00	9.22	9.78	9.70	9.64
10.00	9.56	9.61	9.67	9.49
15.00	9.50	9.53	9.53	9.36
17.50	9.49	9.53	9.53	--
20.00	9.44	9.08	9.08	8.87
25.00	8.76	8.83	8.83	8.55
30.00	8.32	8.63	8.63	--
35.00	8.43	8.60	8.60	8.47
45.00	8.51	8.62	8.62	8.48
50.00	--	8.65	8.65	--
55.00	8.58	8.66	8.66	8.54
65.00	8.65	6.38	6.38	8.63

## NOTE:

(1) A "--" indicates that there is no entry for this box and the limit can be determined by linearly interpolating between the previous and next point in each column.

MAPLHGRs are interpolated between exposure points for which explicit values are given.

(2) These MAPLHGR are not lattice dependent, therefore the values shown also correspond to the limiting value for the most limiting lattice for use when hand calculations are required.

Fuel Type  
 GE11-P9DUB362-13GZ-100T-145-T6-3899  
 GE11-P9DUB376-12GZ-100T-145-T6-2585  
 GE11-P9DUB376-12GZ-100T-145-T6-2586  
 GE11-P9DUB382-13GZ-100T-145-T6-2831

ID  
 GE11-C15  
 GE11-C16A  
 GE11-C16B  
 GE11-C17

Table 1b

**MAPLHGR VERSUS AVERAGE PLANAR EXPOSURE**  
**Bundle Type: GE11-P9DUB381-13GZ-100T-145-T6-2945 (GE11)**

Average Planar Exposure GWd/ST	MAPLHGR Limits <sup>(1)</sup> (kw/ft)						Most Limiting
	Lattice 7433	Lattice 7434	Lattice 7435	Lattice 7436	Lattice 7437	Lattice 7438	
0.00	9.91	9.91	9.87	9.87	9.87	9.87	9.87
0.20	9.91	9.91	9.87	9.87	9.87	9.87	9.87
1.00	9.87	9.87	9.86	9.86	9.86	9.86	9.86
5.00	9.72	9.72	9.76	9.76	9.76	9.76	9.72
10.00	9.67	9.67	9.63	9.63	9.63	9.63	9.63
15.00	9.51	9.51	9.52	9.52	9.52	9.52	9.51
20.00	9.47	9.47	9.48	9.48	9.48	9.48	9.47
25.00	8.77	8.77	8.74	8.74	8.74	8.74	8.74
35.00	8.45	8.45	8.54	8.54	8.54	8.54	8.45
45.00	8.53	8.53	8.53	8.53	8.53	8.53	8.53
55.00	8.57	8.57	8.57	8.57	8.57	8.57	8.57
65.00	8.64	8.64	8.64	8.64	8.64	8.64	8.64

(1) These MAPLHGR are lattice dependent. The values shown in the Most Limiting Column correspond to the limiting value for the most limiting lattice for use when hand calculations are required. Lattice descriptions are contained in the RSLD.

Table 1c

**MAPLHGR VERSUS AVERAGE PLANAR EXPOSURE**  
**Bundle Type: GE11-P9DUB381-14GZ-100T-145-T6-2946 (GE11)**

Average Planar Exposure GWd/ST	MAPLHGR Limits <sup>(1)</sup> (kw/ft)						Most Limiting
	Lattice 7433	Lattice 7439	Lattice 7440	Lattice 7441	Lattice 7442	Lattice 7443	
0.00	10.56	10.56	10.51	10.51	10.51	10.51	10.51
0.20	10.56	10.56	10.51	10.51	10.51	10.51	10.51
1.00	10.52	10.52	10.51	10.51	10.51	10.51	10.51
5.00	10.22	10.22	10.16	10.16	10.16	10.16	10.16
10.00	9.72	9.72	9.63	9.63	9.63	9.63	9.63
15.00	9.51	9.51	9.48	9.48	9.48	9.48	9.48
20.00	9.48	9.48	9.49	9.49	9.49	9.49	9.48
25.00	9.00	9.00	8.97	8.97	8.97	8.97	8.97
35.00	8.50	8.50	8.48	8.48	8.48	8.48	8.48
45.00	8.56	8.56	8.54	8.54	8.54	8.54	8.54
55.00	8.62	8.62	8.60	8.60	8.60	8.60	8.60
65.00	8.70	8.70	8.69	8.69	8.69	8.69	8.69

(1) These MAPLHGR are lattice dependent. The values shown in the Most Limiting Column correspond to the limiting value for the most limiting lattice for use when hand calculations are required. Lattice descriptions are contained in the RSLD.

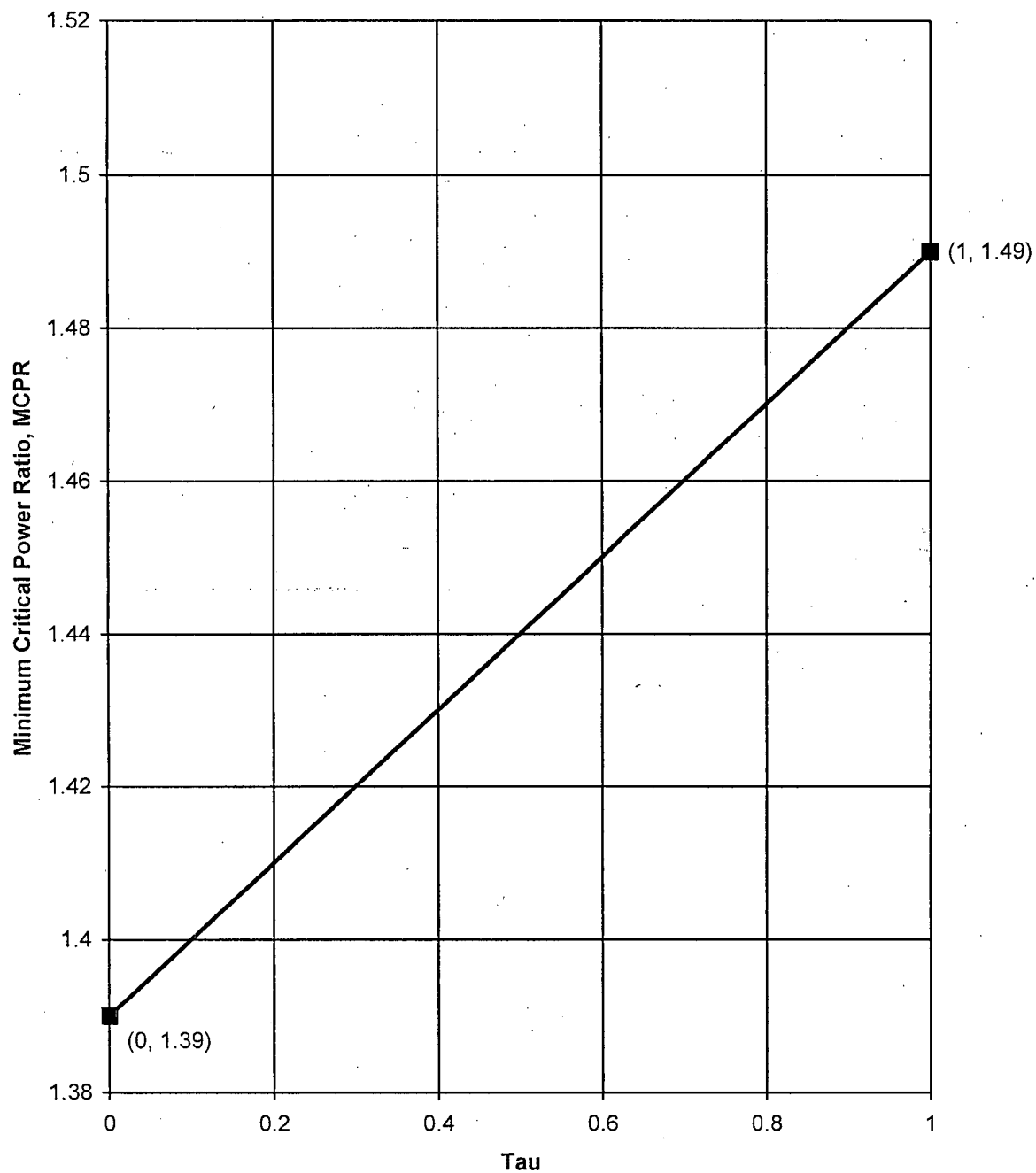
Table 1d

**MAPLHGR VERSUS AVERAGE PLANAR EXPOSURE**  
**Bundle Type: GE11-P9DUB380-13GZ-100T-145-T6-2948 (GE11)**

Average Planar Exposure GWd/ST	MAPLHGR Limits <sup>(1)</sup> (kw/ft)						Most Limiting
	Lattice 7433	Lattice 7449	Lattice 7450	Lattice 7451	Lattice 7447	Lattice 7448	
0.00	10.02	10.02	10.00	10.00	10.00	10.00	10.00
0.20	10.02	10.02	10.00	10.00	10.00	10.00	10.00
1.00	9.99	9.99	9.97	9.97	9.97	9.97	9.97
5.00	9.86	9.86	9.80	9.80	9.80	9.80	9.80
10.00	9.68	9.68	9.61	9.61	9.61	9.61	9.61
15.00	9.52	9.52	9.53	9.53	9.53	9.53	9.52
20.00	9.67	9.67	9.70	9.70	9.70	9.70	9.67
25.00	8.85	8.85	8.84	8.84	8.84	8.84	8.84
35.00	8.51	8.51	8.51	8.51	8.51	8.51	8.51
45.00	8.53	8.53	8.55	8.55	8.55	8.55	8.53
55.00	8.57	8.57	8.59	8.59	8.59	8.59	8.57
65.00	8.66	8.66	8.65	8.65	8.65	8.65	8.65

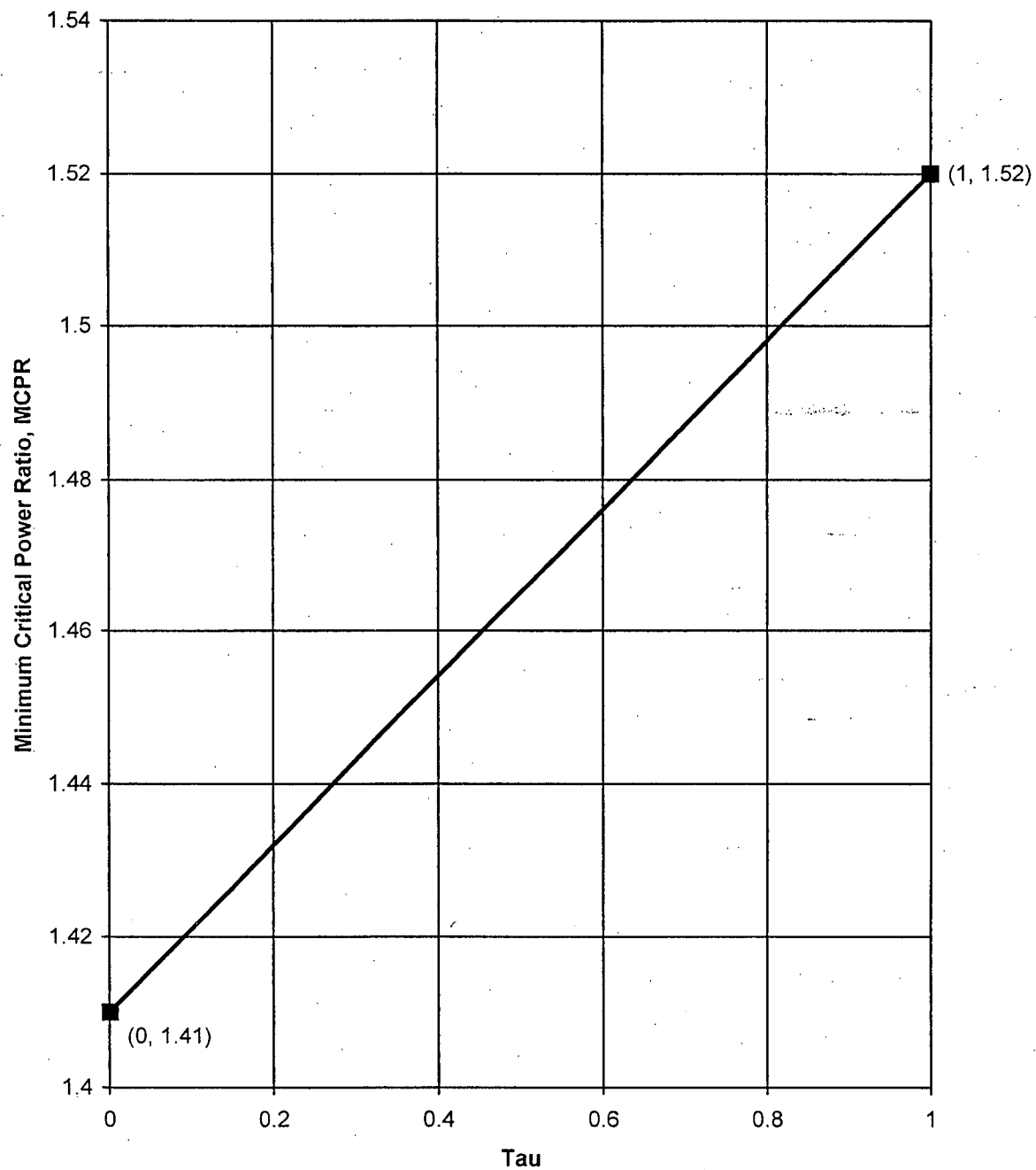
(1) These MAPLHGR are lattice dependent. The values shown in the Most Limiting Column correspond to the limiting value for the most limiting lattice for use when hand calculations are required. Lattice descriptions are contained in the RSLD.

**Figure 2a**  
**MCPR Operating Limits**  
**for Two Feedwater Pump Maximum Flow <sup>(1)</sup>**  
**(Beginning Of Cycle to EOR-2010 MWd/ST)**



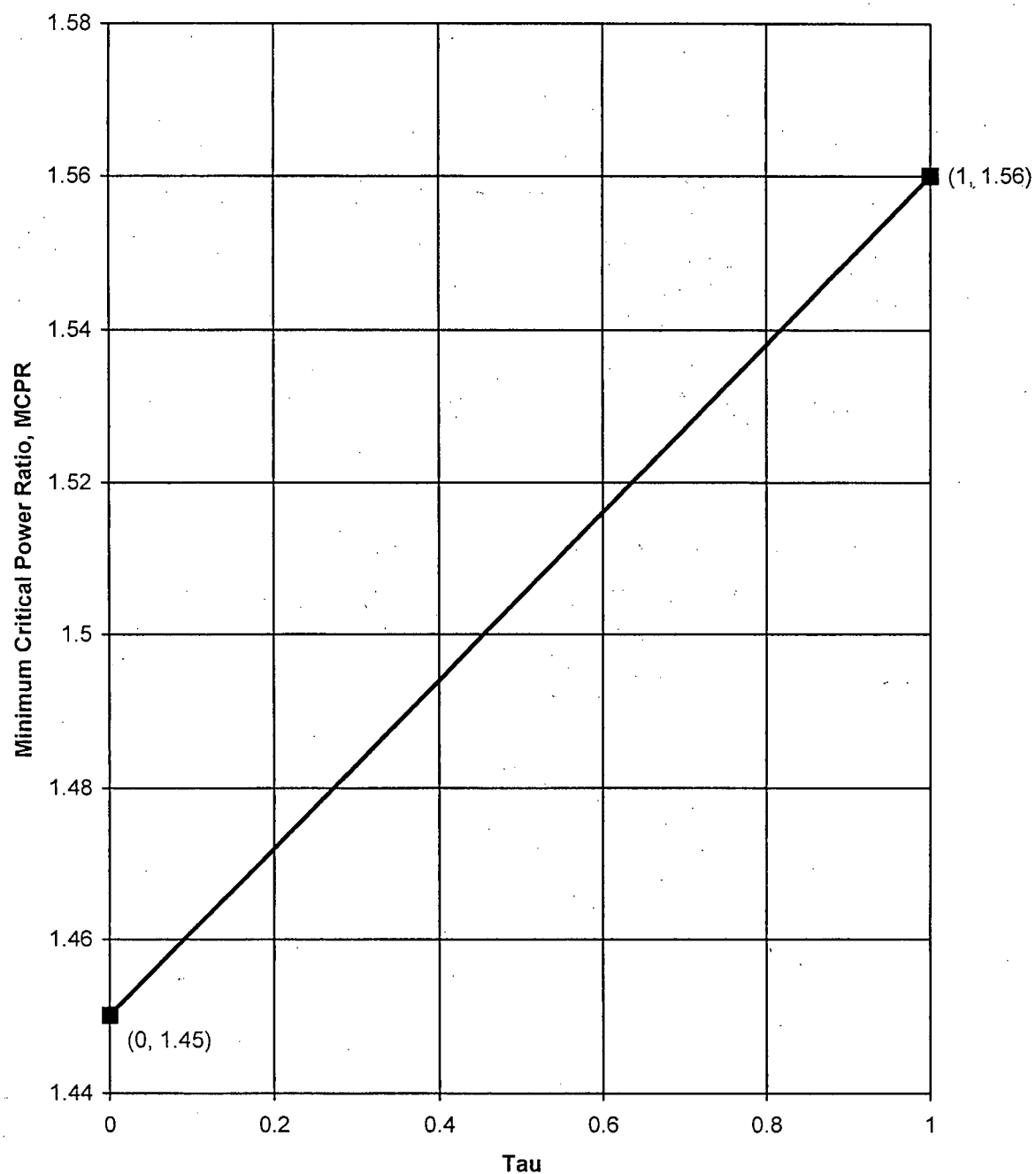
(1) as defined by Nuclear Engineering Report No. NER-1M-022

**Figure 2b**  
**M CPR Operating Limits**  
**for Two Feedwater Pump Maximum Flow <sup>(1)</sup>**  
**(EOR-2010 MWd/ST to End Of Cycle)**



(1) as defined by Nuclear Engineering Report No. NER-1M-022

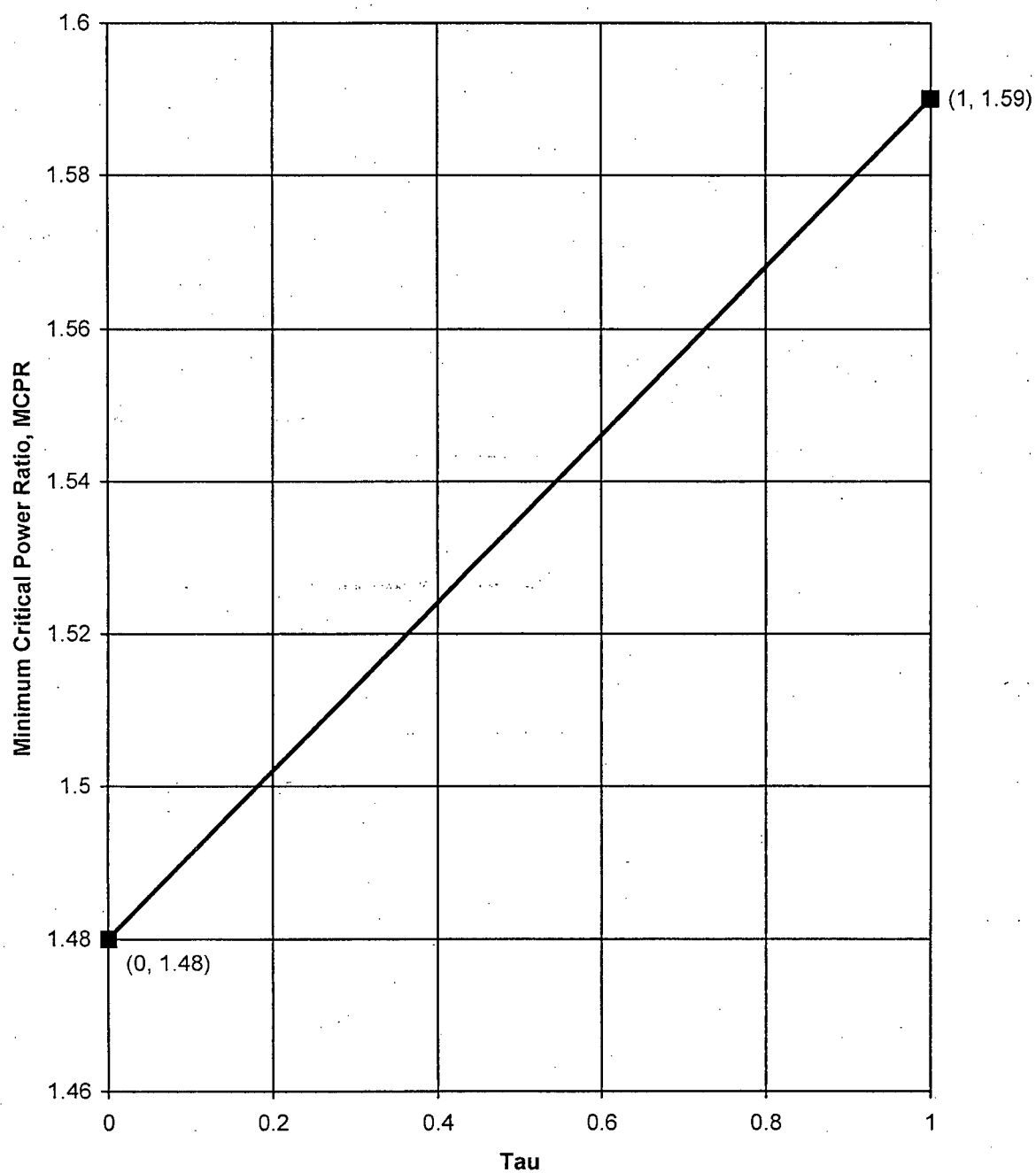
**Figure 2c**  
**MCPR Operating Limits**  
**for Greater Than Two Feedwater Pump Maximum Flow <sup>(1)</sup>**  
**(Beginning Of Cycle to EOR-2010 MWd/ST)**



(1) as defined by Nuclear Engineering Report No. NER-1M-022



**Figure 2d**  
**MCPR Operating Limits**  
**for Greater Than Two Feedwater Pump Maximum Flow <sup>(1)</sup>**  
**(EOR-2010 MWd/ST to End Of Cycle)**



(1) as defined by Nuclear Engineering Report No. NER-1M-022

Figure 2e NMP-1 K(f) Curve for MCPR

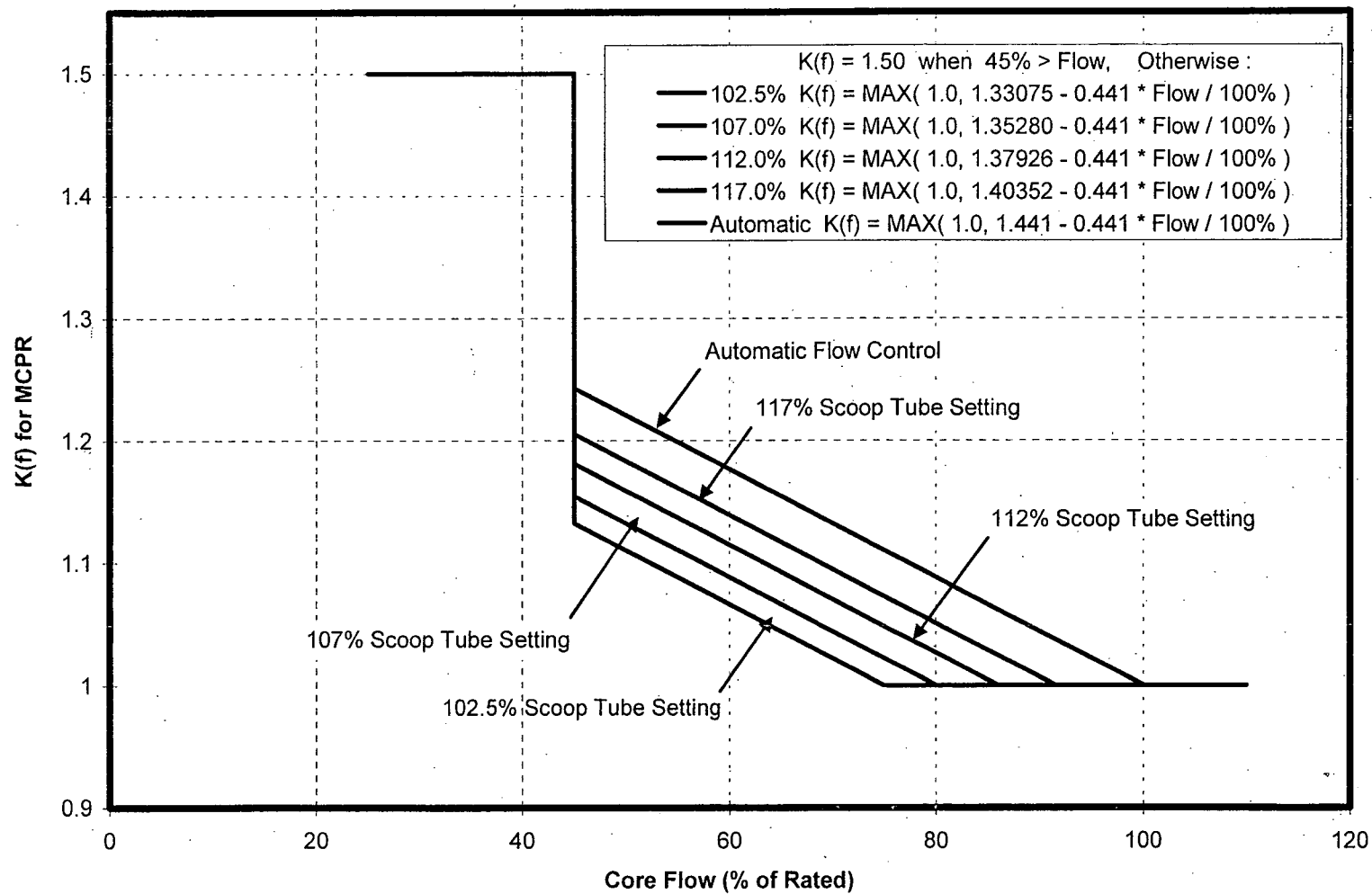


Figure 2f: MCPR Limits for Operation Between 45% and 90% RTP  
Without a Backup Pressure Regulator

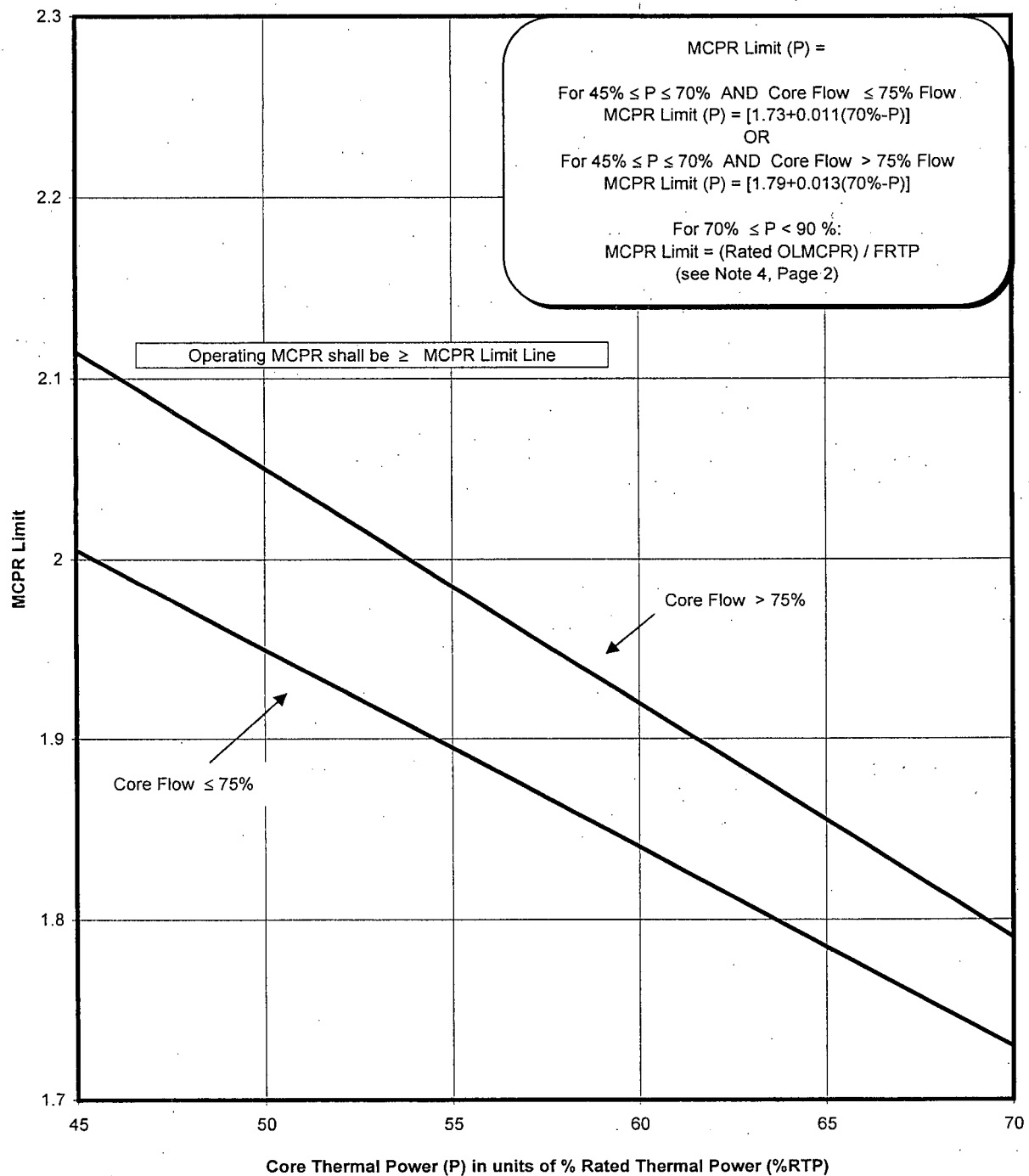


Figure 3: LHGR Limits for Operation Between 45% and 90% RTP  
Without a Backup Pressure Regulator

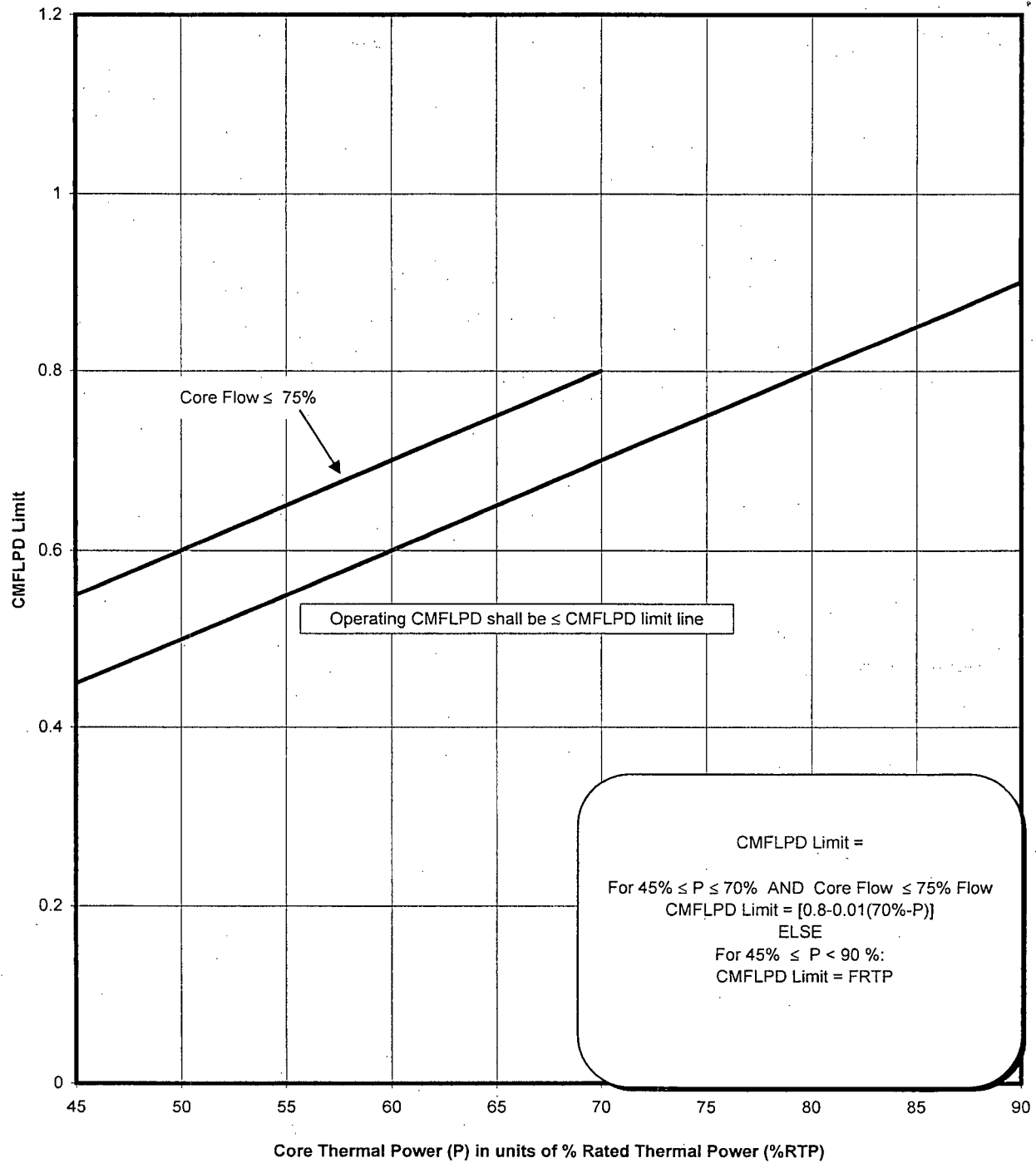


Figure4 Limiting Power / Flow Line

