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NINE MILE POINT
NUCLEAR STATION

April 26, 2011

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

Nine Mile Point Unit 1 Core Operating Limits Report, COLR1-20

Enclosed is a copy of the Core Operating Limits Report, COLR1-20, 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 John J. Dosa, Director Licensing, at (315) 349-5219.

Very truly yours,

Alex D. Sterio
Manager Engineering Services (Acting)

ADS/RJC

Enclosure: Nine Mile Point Unit 1 Core Operating Limits Report, COLR1-20, Revision 0

cc: Regional Administrator, Region I, NRC
Project Manager, NRC
Resident Inspector, NRC

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KRR

ENCLOSURE

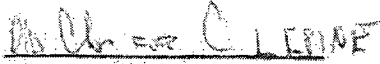
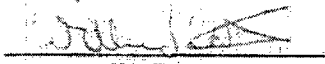
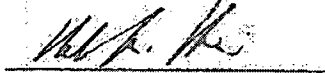

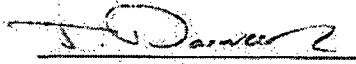

**Nine Mile Point Unit 1
Core Operating Limits Report
COLR1-20, Revision 0**

**Nine Mile Point Nuclear Station, LLC
April 26, 2011**

**NINE MILE POINT UNIT 1
CORE OPERATING LIMITS REPORT**

Document No.: COLR1-20

Revision 0

| | <u>Name</u> | <u>Title</u> | <u>Date</u> |
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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

Maximum Fraction of Limiting Power Density (MFLPD)

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

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)

K(f)

MCPR flow dependent multiplier

K(P)

MCPR power dependent multiplier

LHGRFAC(P)

Power dependent LHGR correction factor

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

MDFWP

Motor driven feedwater pump

TDFWP

Turbine driven feedwater pump

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

During power operations, the APLHGR(s) for each fuel type as a function of AVERAGE PLANAR EXPOSURE shall not exceed the limiting values shown for GE11 in Table 1a, 1b, 1c, and 1d, or the limiting values shown for GNF2 in Table 1e and 1f.

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 average planar exposure shall not exceed 98 percent of the limiting values shown for GE11 in Table 1a, 1b, 1c, and 1d and 99 percent of the limiting values shown for GNF2 in Table 1e and 1f.

During partial loop operation with three recirculation loops in operation, the APLHGR as a function of average planar exposure shall not exceed 98 percent of the limiting values shown for GE11 in Table 1a, 1b, 1c, and 1d and 99 percent of the limiting values shown for GNF2 in Table 1e and 1f.

Table 1a

MAPLHGR VERSUS AVERAGE PLANAR EXPOSURE

| Average Planar Exposure GWd/ST | MAPLHGR Limits (kW/ft) (1) | |
|-----------------------------------|----------------------------|----------------|
| | Bundle 2586 | Bundle 2831 |
| 0.00 | 9.63 | 9.51 |
| 0.20 | 9.63 | 9.51 |
| 1.00 | 9.60 | 9.48 |
| 5.00 | 9.40 | 9.35 |
| 10.00 | 9.37 | 9.20 |
| 15.00 | 9.24 | 9.07 |
| 20.00 | 8.76 | 8.60 |
| 25.00 | 8.34 | 8.15 |
| 35.00 | 8.10 | 8.05 |
| 45.00 | 8.03 | 8.06 |
| 55.00 | 8.02 | 8.11 |
| 65.00 | 6.18 | 8.20 |

(1) These MAPLHGRs 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.

| <u>Bundle Type</u> | <u>ID</u> |
|-------------------------------------|-----------|
| GE11-P9DUB376-12GZ-100T-145-T6-2586 | 2586 |
| GE11-P9DUB382-13GZ-100T-145-T6-2831 | 2831 |

Table 1b

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

| Average Planar Exposure GWd/ST | MAPLHGR Limits ⁽¹⁾ (kw/ft) | | | | | | Most Limiting |
|--------------------------------|---------------------------------------|--------------|--------------|--------------|--------------|--------------|---------------|
| | Lattice 7433 | Lattice 7434 | Lattice 7435 | Lattice 7436 | Lattice 7437 | Lattice 7438 | |
| 0.00 | 9.61 | 9.61 | 9.57 | 9.57 | 9.57 | 9.57 | 9.57 |
| 0.20 | 9.61 | 9.61 | 9.57 | 9.57 | 9.57 | 9.57 | 9.57 |
| 1.00 | 9.57 | 9.57 | 9.56 | 9.56 | 9.56 | 9.56 | 9.56 |
| 5.00 | 9.42 | 9.42 | 9.46 | 9.46 | 9.46 | 9.46 | 9.42 |
| 10.00 | 9.37 | 9.37 | 9.34 | 9.34 | 9.34 | 9.34 | 9.34 |
| 15.00 | 9.22 | 9.22 | 9.23 | 9.23 | 9.23 | 9.23 | 9.22 |
| 20.00 | 9.18 | 9.18 | 9.19 | 9.19 | 9.19 | 9.19 | 9.18 |
| 25.00 | 8.50 | 8.50 | 8.47 | 8.47 | 8.47 | 8.47 | 8.47 |
| 35.00 | 8.19 | 8.19 | 8.28 | 8.28 | 8.28 | 8.28 | 8.19 |
| 45.00 | 8.27 | 8.27 | 8.27 | 8.27 | 8.27 | 8.27 | 8.27 |
| 55.00 | 8.31 | 8.31 | 8.31 | 8.31 | 8.31 | 8.31 | 8.31 |
| 65.00 | 8.38 | 8.38 | 8.38 | 8.38 | 8.38 | 8.38 | 8.38 |

(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 ⁽¹⁾ (kw/ft) | | | | | | Most Limiting |
|--------------------------------|---------------------------------------|--------------|--------------|--------------|--------------|--------------|---------------|
| | Lattice 7433 | Lattice 7439 | Lattice 7440 | Lattice 7441 | Lattice 7442 | Lattice 7443 | |
| 0.00 | 10.24 | 10.24 | 10.19 | 10.19 | 10.19 | 10.19 | 10.19 |
| 0.20 | 10.24 | 10.24 | 10.19 | 10.19 | 10.19 | 10.19 | 10.19 |
| 1.00 | 10.20 | 10.20 | 10.19 | 10.19 | 10.19 | 10.19 | 10.19 |
| 5.00 | 9.91 | 9.91 | 9.85 | 9.85 | 9.85 | 9.85 | 9.85 |
| 10.00 | 9.42 | 9.42 | 9.34 | 9.34 | 9.34 | 9.34 | 9.34 |
| 15.00 | 9.22 | 9.22 | 9.19 | 9.19 | 9.19 | 9.19 | 9.19 |
| 20.00 | 9.18 | 9.18 | 9.19 | 9.19 | 9.19 | 9.19 | 9.18 |
| 25.00 | 8.64 | 8.64 | 8.63 | 8.63 | 8.63 | 8.63 | 8.63 |
| 35.00 | 8.08 | 8.08 | 8.08 | 8.08 | 8.08 | 8.08 | 8.08 |
| 45.00 | 8.02 | 8.02 | 7.99 | 7.99 | 7.99 | 7.99 | 7.99 |
| 55.00 | 8.00 | 8.00 | 7.99 | 7.99 | 7.99 | 7.99 | 7.99 |
| 65.00 | 7.97 | 7.97 | 7.96 | 7.96 | 7.96 | 7.96 | 7.96 |

(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 ⁽¹⁾ (kw/ft) | | | | | | Most Limiting |
|-----------------------------------|---------------------------------------|--------------|--------------|--------------|--------------|--------------|---------------|
| | Lattice 7433 | Lattice 7449 | Lattice 7450 | Lattice 7451 | Lattice 7447 | Lattice 7448 | |
| 0.00 | 9.71 | 9.71 | 9.69 | 9.69 | 9.69 | 9.69 | 9.69 |
| 0.20 | 9.71 | 9.71 | 9.69 | 9.69 | 9.69 | 9.69 | 9.69 |
| 1.00 | 9.68 | 9.68 | 9.67 | 9.67 | 9.67 | 9.67 | 9.67 |
| 5.00 | 9.56 | 9.56 | 9.50 | 9.50 | 9.50 | 9.50 | 9.50 |
| 10.00 | 9.38 | 9.38 | 9.32 | 9.32 | 9.32 | 9.32 | 9.32 |
| 15.00 | 9.23 | 9.23 | 9.24 | 9.24 | 9.24 | 9.24 | 9.23 |
| 20.00 | 9.28 | 9.28 | 9.31 | 9.31 | 9.31 | 9.31 | 9.28 |
| 25.00 | 8.43 | 8.43 | 8.45 | 8.45 | 8.45 | 8.45 | 8.43 |
| 35.00 | 8.09 | 8.09 | 8.09 | 8.09 | 8.09 | 8.09 | 8.09 |
| 45.00 | 7.98 | 7.98 | 8.02 | 8.02 | 8.02 | 8.02 | 7.98 |
| 55.00 | 7.97 | 7.97 | 7.98 | 7.98 | 7.98 | 7.98 | 7.97 |
| 65.00 | 7.91 | 7.91 | 7.93 | 7.93 | 7.93 | 7.93 | 7.91 |

(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.

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Table 1e

MAPLHGR VERSUS AVERAGE PLANAR EXPOSURE
Bundle Type: GNF2-P10DG2B384-16GZ-100T2-145-T6-3351 (GNF2)

| Average Planar Exposure GWd/ST | MAPLHGR Limits (kW/ft).(1) |
|-----------------------------------|----------------------------|
| 0.00 | 7.90 |
| 0.20 | 7.90 |
| 1.00 | 7.90 |
| 5.00 | 7.79 |
| 10.00 | 7.68 |
| 15.00 | 7.60 |
| 20.00 | 7.12 |
| 25.00 | 6.73 |
| 35.00 | 6.57 |
| 45.00 | 6.35 |
| 55.00 | 6.24 |
| 65.00 | 6.15 |

(1) These MAPLHGRs 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.

NINE MILE POINT UNIT 1
CORE OPERATING LIMITS REPORT

Table 1f

MAPLHGR VERSUS AVERAGE PLANAR EXPOSURE
Bundle Type: GNF2-P10DG2B386-13GZ-100T2-145-T6-3352 (GNF2)

| Average Planar Exposure GWd/ST | MAPLHGR Limits (kW/ft) (1) |
|-----------------------------------|----------------------------|
| 0.00 | 7.87 |
| 0.20 | 7.87 |
| 1.00 | 7.85 |
| 5.00 | 7.75 |
| 10.00 | 7.67 |
| 15.00 | 7.63 |
| 20.00 | 7.14 |
| 25.00 | 6.75 |
| 35.00 | 6.57 |
| 45.00 | 6.35 |
| 55.00 | 6.23 |
| 65.00 | 6.15 |

(1) These MAPLHGRs 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.

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 determined as the maximum of either:

A) the appropriate MCPR⁽¹⁾ from Figure (2a thru 2d)^(2,3,5) times the K(f) shown in Figure 2e,

Or,

B) the appropriate MCPR(P)⁽⁴⁾ from Figure 2f.

Additional MCPR(P) limits are required for operations without a backup pressure regulator. These limits are shown in Figure 2g.

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 For Figures 2a thru 2d tau (τ) defined as follows:

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

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

$$\tau_B = .672 + 1.65 \times \left[N_i / \sum_{j=1}^n N_j \right]^{1/2} \times .016$$

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

n = number of surveillance tests performed in cycle

N_i = number of active control rods measured in the ith surveillance test

τ_i = average scram time to notch 39 of all rods measured in the ith surveillance test

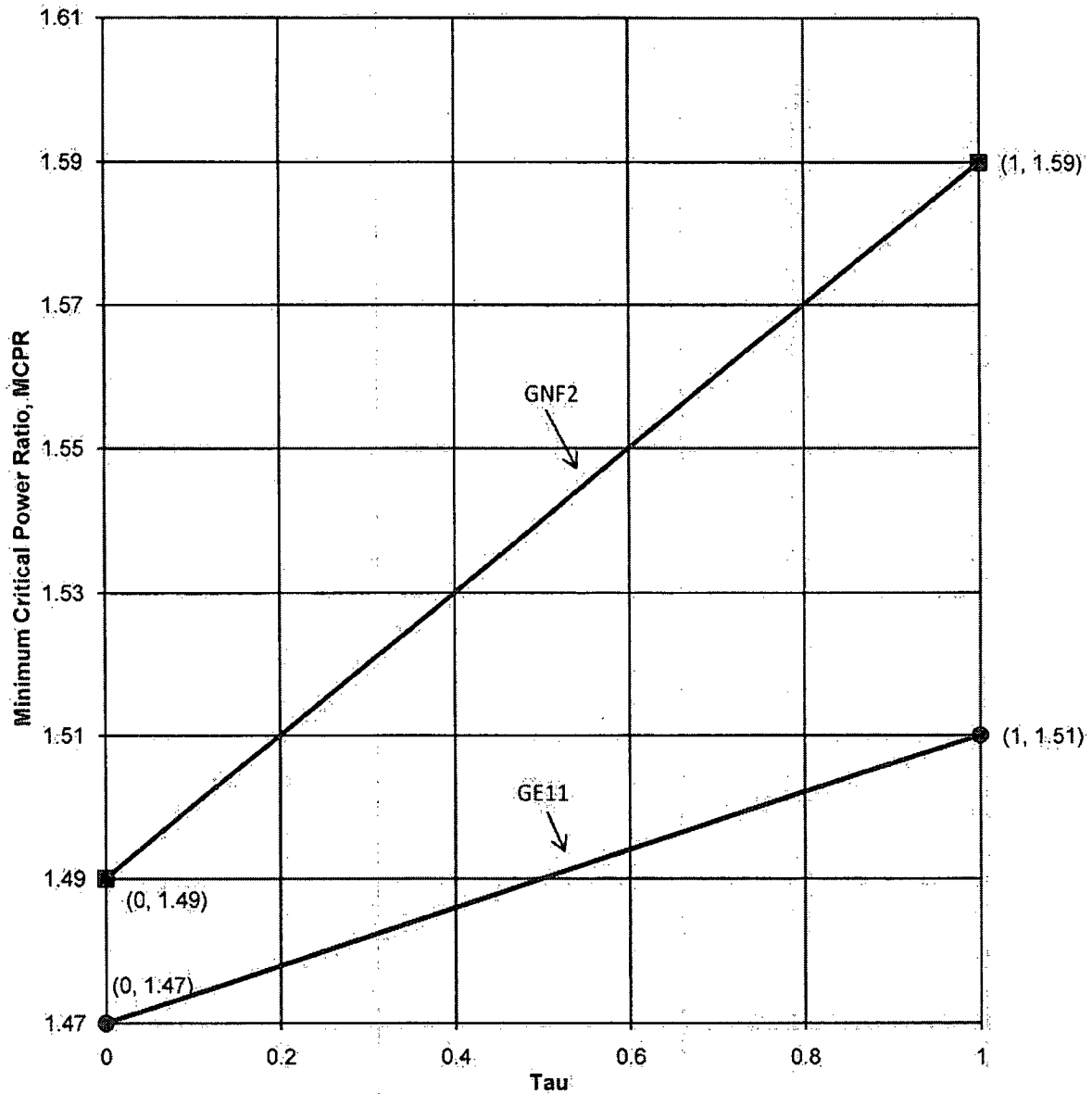
N_i = total number of active rods measured

3 For the current exposure and feedwater pump configuration, "Pump Combinations" are also described in operating procedure NI-OP-16, attachment 13

4 Introduction of the GNF2 fuel type requires use of power dependent MCPR limits for all off-rated conditions, including operations without a backup pressure regulator. When power is greater than 45%, the K(P) multiplier from Figure 2f is applied to the applicable rated condition MCPR limits from Figures 2a thru 2d. At less than or equal to 45% power, the MCPR(P) limits in Figure 2f are applied directly. This discussion also applies to Figure 2g. Figure 2f and 2g are applicable to both GE11 and GNF2 fuel.

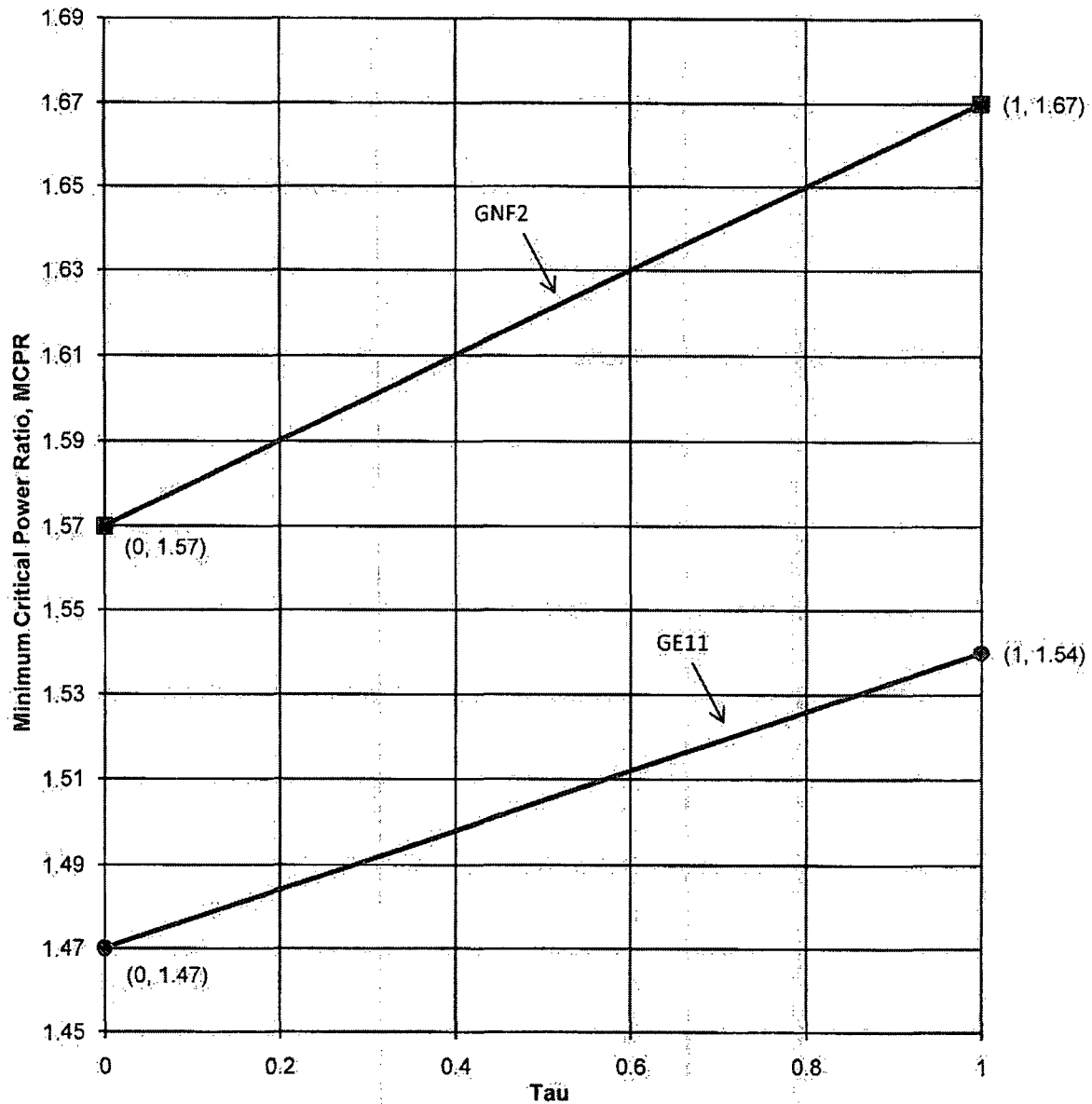
5 Option B OLMCPR limits for GE11 in Figures 2a-2c are set by the Detect and Suppress (Stability) Evaluation for Reload 21.

Figure 2a
MCPR Operating Limits
for Feedwater Pump Combination 1 maximum flows
Beginning Of Cycle to EOR* -1448 MWd/ST
(Bounds TDFWP+MDFWP, TDFWP only, MDFWP only, two MDFWPs)



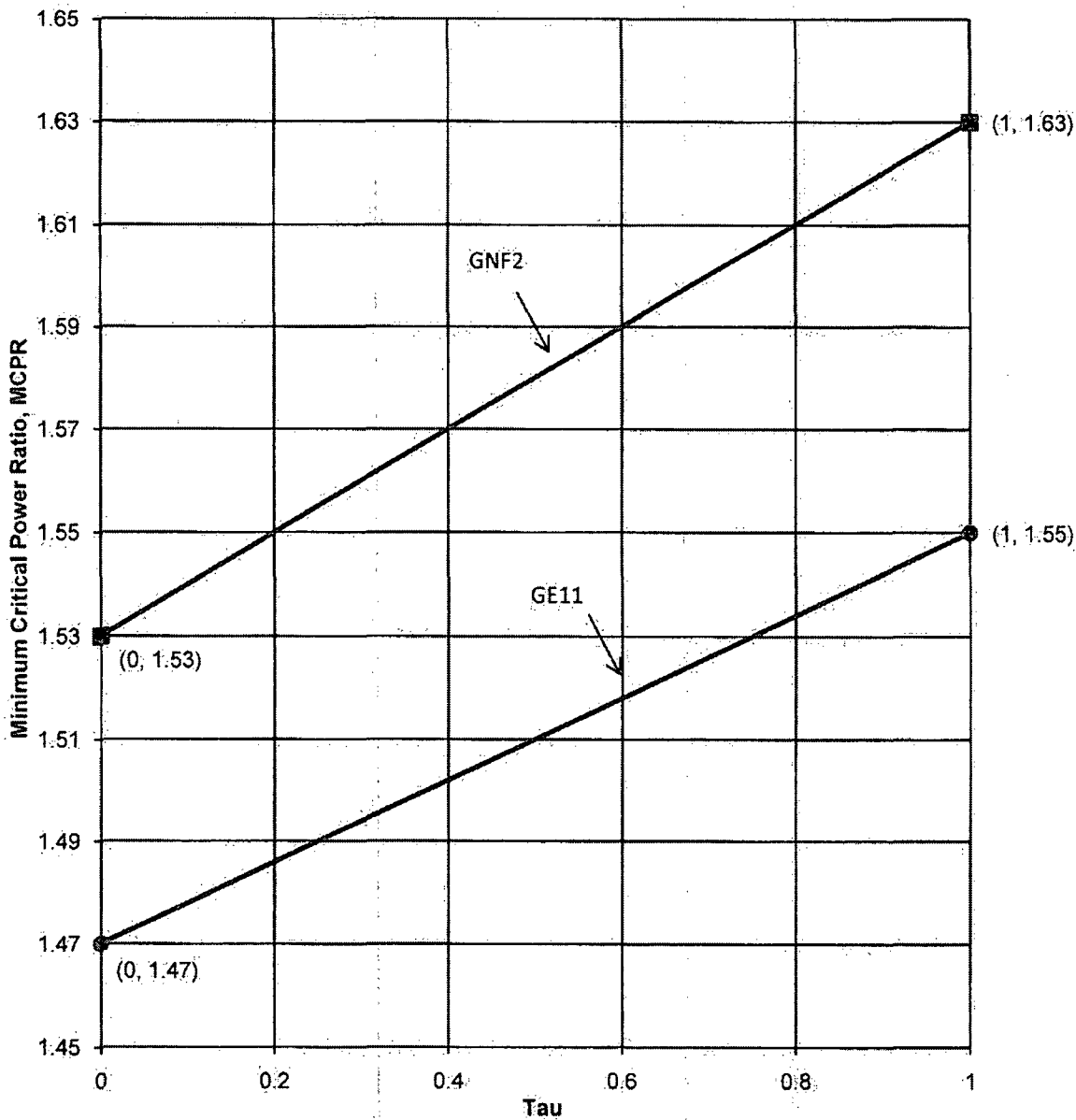
* EOR is the end of rated exposure as defined in the Cycle Management Report

Figure 2b
M CPR Operating Limits
for Feedwater Pump Combination 1 maximum flows
EOR*-1448 MWd/ST to End Of Cycle
(Bounds TDFWP+MDFWP, TDFWP only, MDFWP only, two MDFWPs)



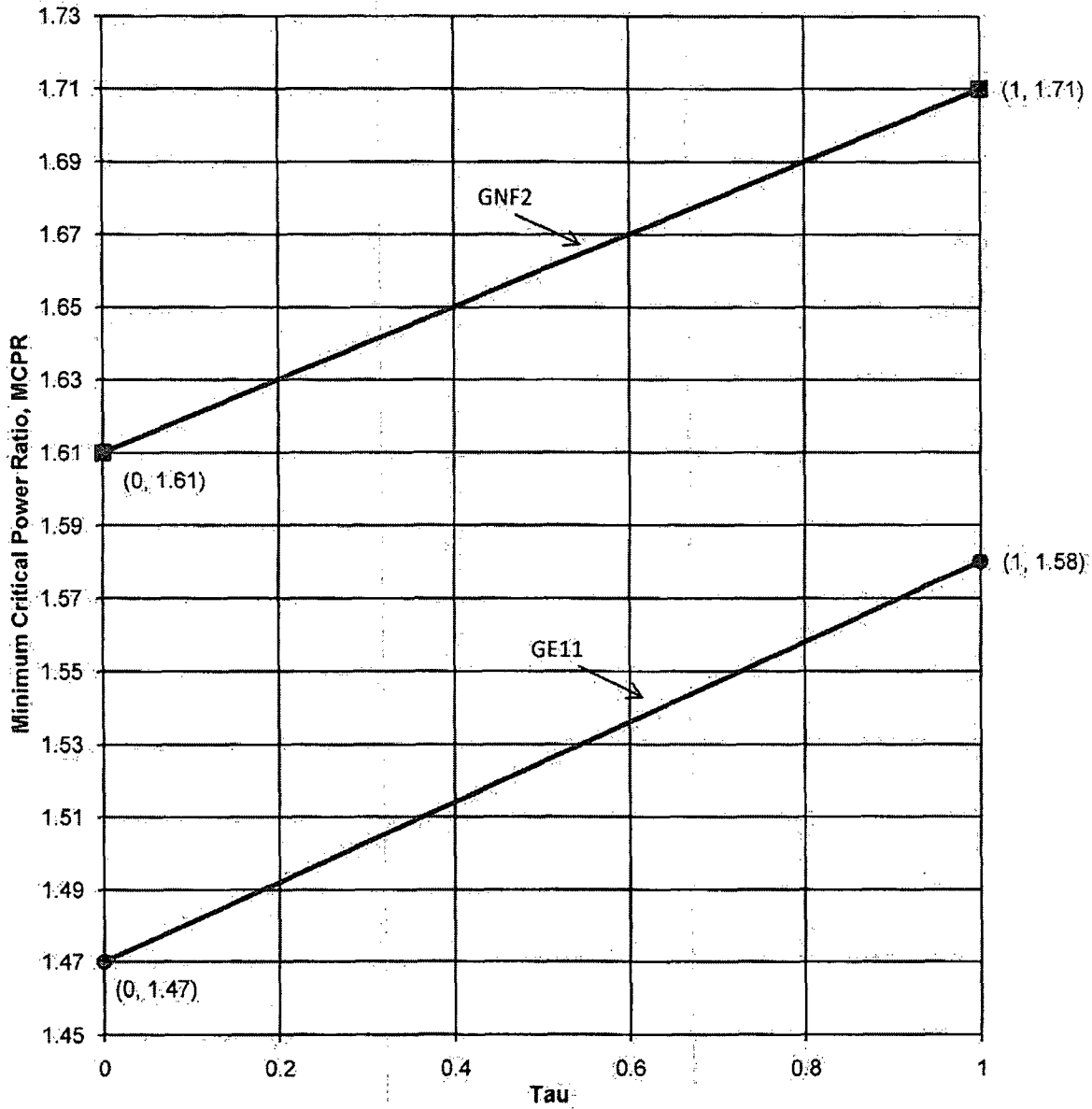
* EOR is the end of rated exposure as defined in the Cycle Management Report

Figure 2c
M CPR Operating Limits
for Feedwater Pump Combination 2 maximum flows
Beginning of Cycle to EOR*-1448 MWd/ST
(Bounds TDFWP+ two MDFWPs)



* EOR is the end of rated exposure as defined in the Cycle Management Report

Figure 2d
MCPR Operating Limits
for Feedwater Pump Combination 2 maximum flows
EOR*-1448 MWd/ST to End Of Cycle
(Bounds TDFWP+ two MDFWPs)



* EOR is the end of rated exposure as defined in the Cycle Management Report

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

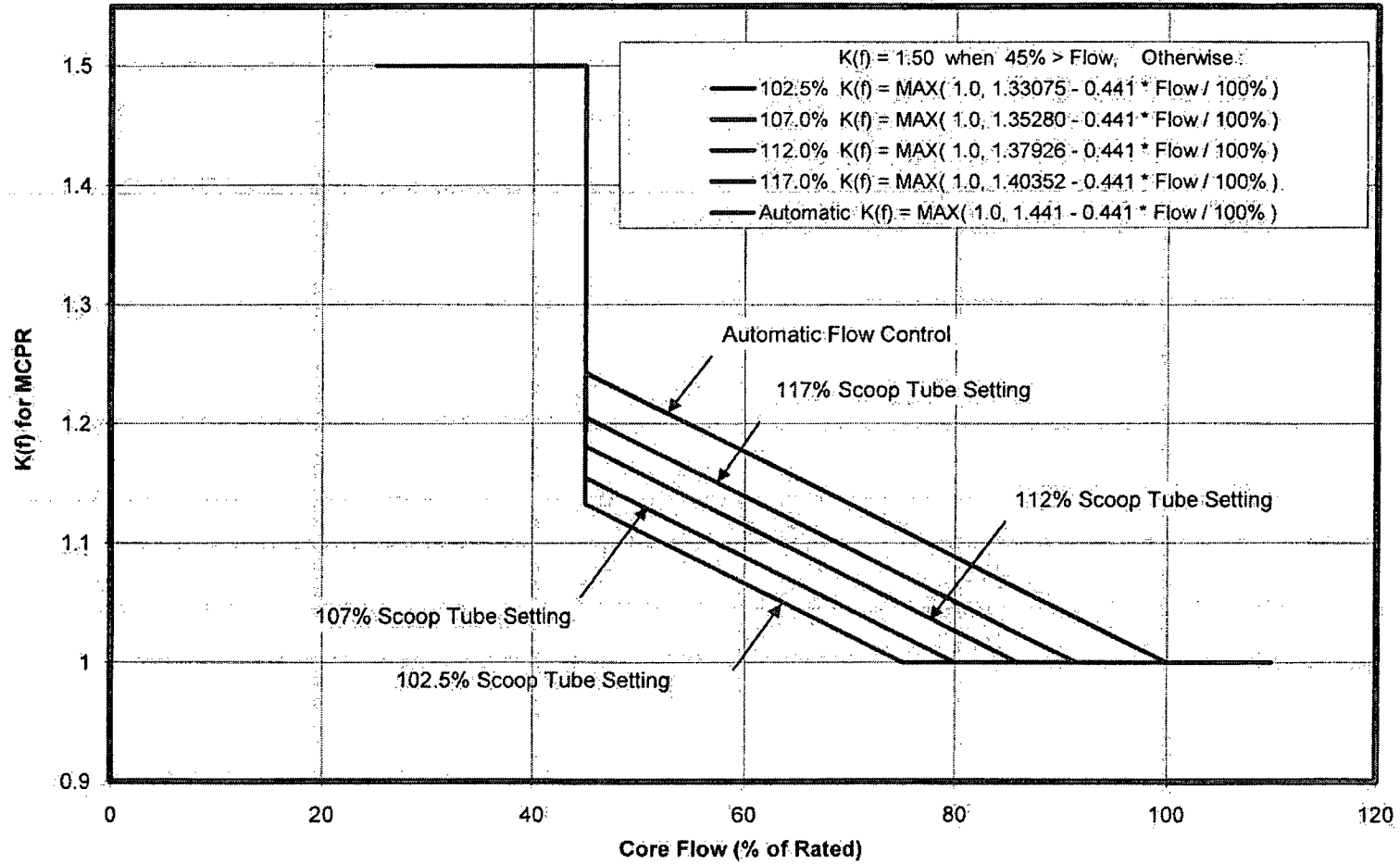


Figure 2f
MCPR(P) Limits for Normal Operation

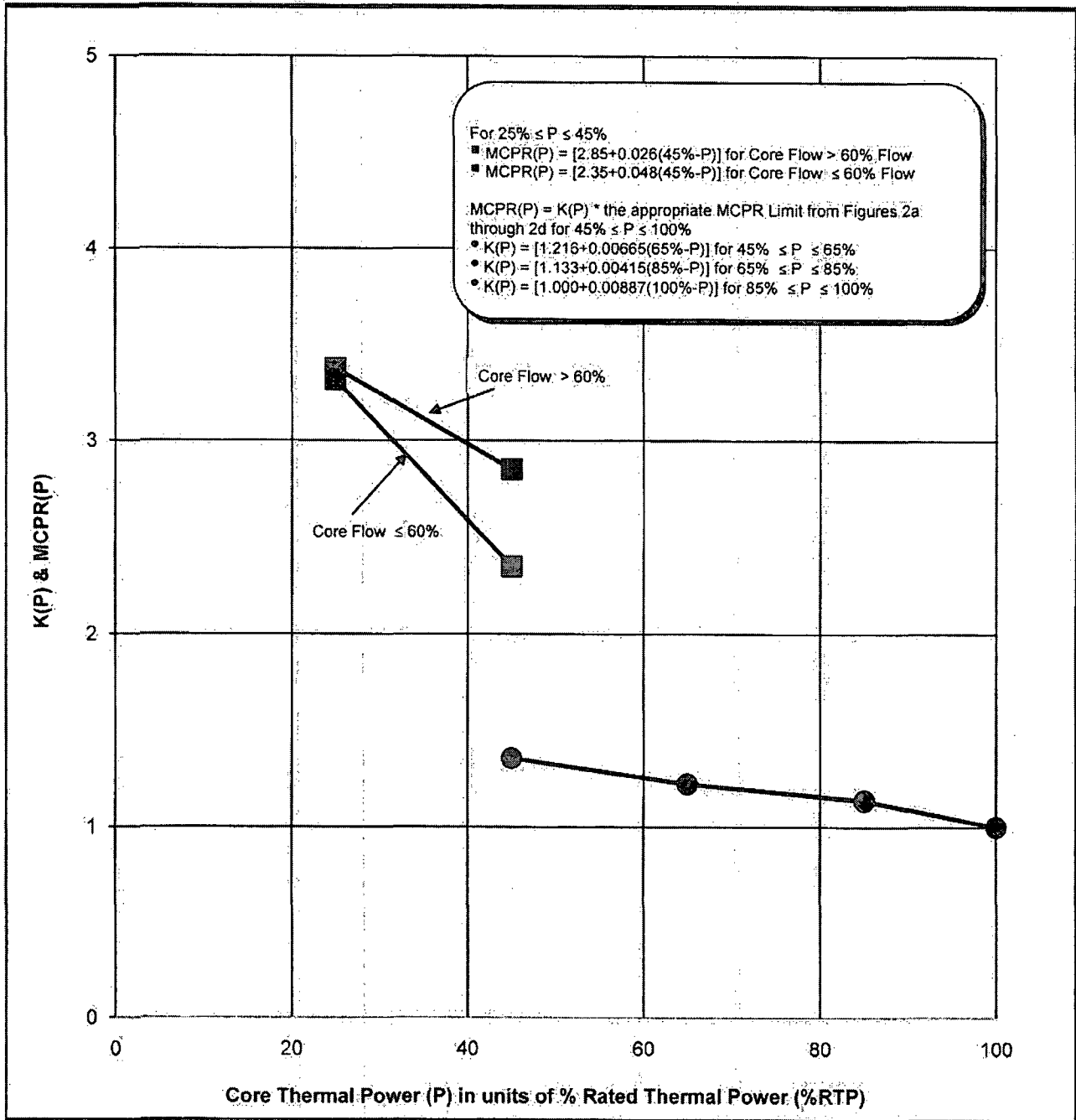
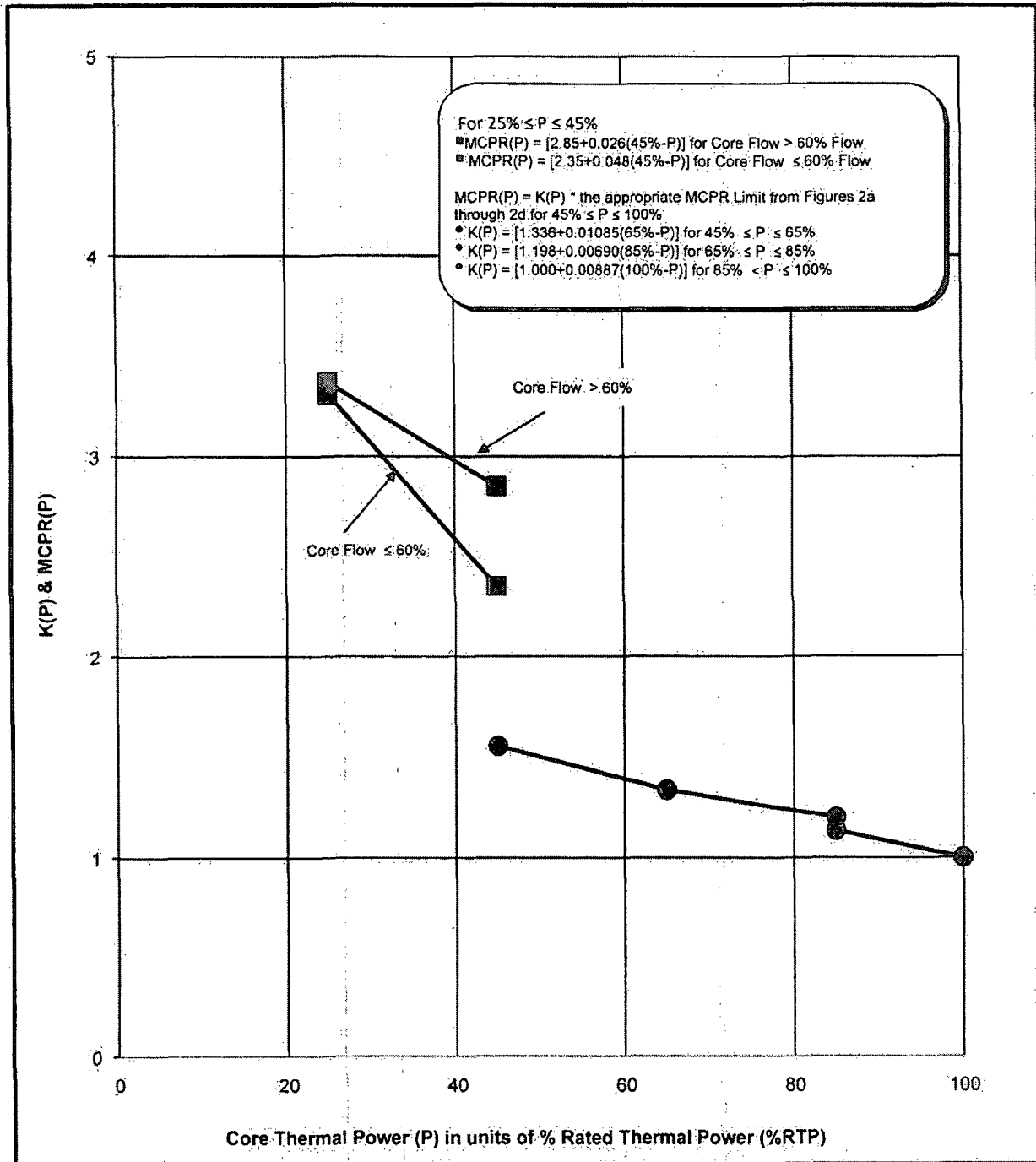


Figure 2g
MCPR(P) Limits for Operation Without Backup Pressure Regulator



3.0 LINEAR HEAT GENERATION RATE (LHGR)

3.1 Limits for Technical Specification 3.1.7.b

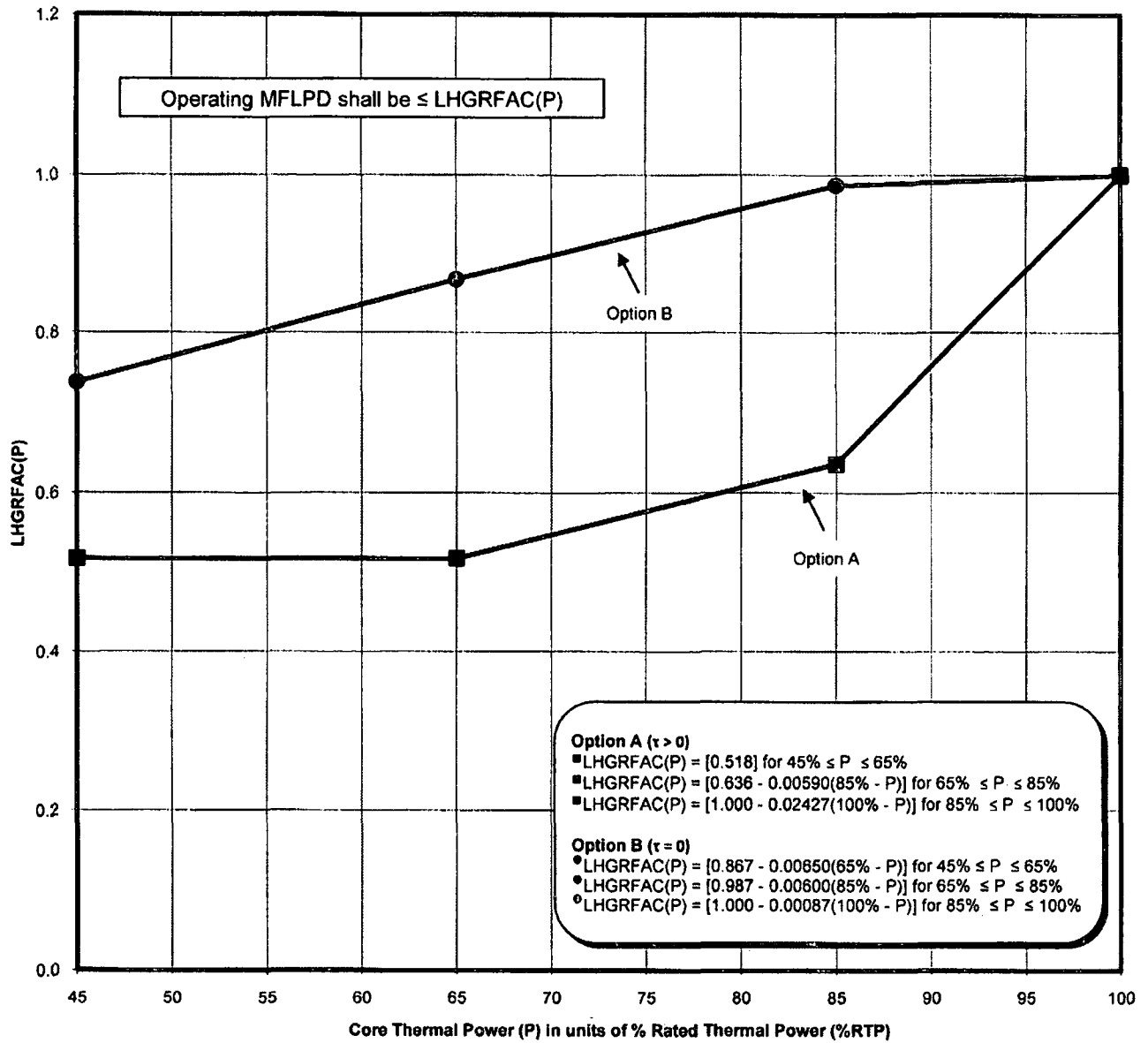
During power operation, the Linear Heat Generation Rate (LHGR) of any rod in any fuel assembly at any axial location shall not exceed the maximum of 11.0 kW/ft⁽¹⁾ or the limiting values shown in RSLD-21, Revision 0, "Nine Mile Point Unit 1 Reload 21, Reload Specific Lattice Data". This document contains the LHGR limits for both UO₂ 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 process computer.

For power operations between 45% and 100% RTP⁽²⁾ without a backup pressure regulator, operating MFLPD shall be \leq LHGRFAC(P)⁽³⁾.

NOTE:

- 1 LHGR shall be maintained below 11.0 kW/ft during plant operating to assure the PCT remains below 1500 F under steam cooling mitigation strategies specified in the EOPs.
- 2 Introduction of the GNF2 fuel type requires use of a power dependent LHGR Correction Factor, or LHGRFAC(P) for power operations without a backup pressure regulator at greater than or equal to 45% RTP. Below 45% RTP, no additional limits are required. Figure 3 is applicable to both GE11 and GNF2 fuel types.
- 3 LHGRFAC(P) limits are provided for option B and option A scram times. If scram times are slower than option B (i.e. $\tau > 0$), then option A limits must be applied.

Figure 3
LHGRFAC(P) Limits for Operation Without Backup Pressure Regulator

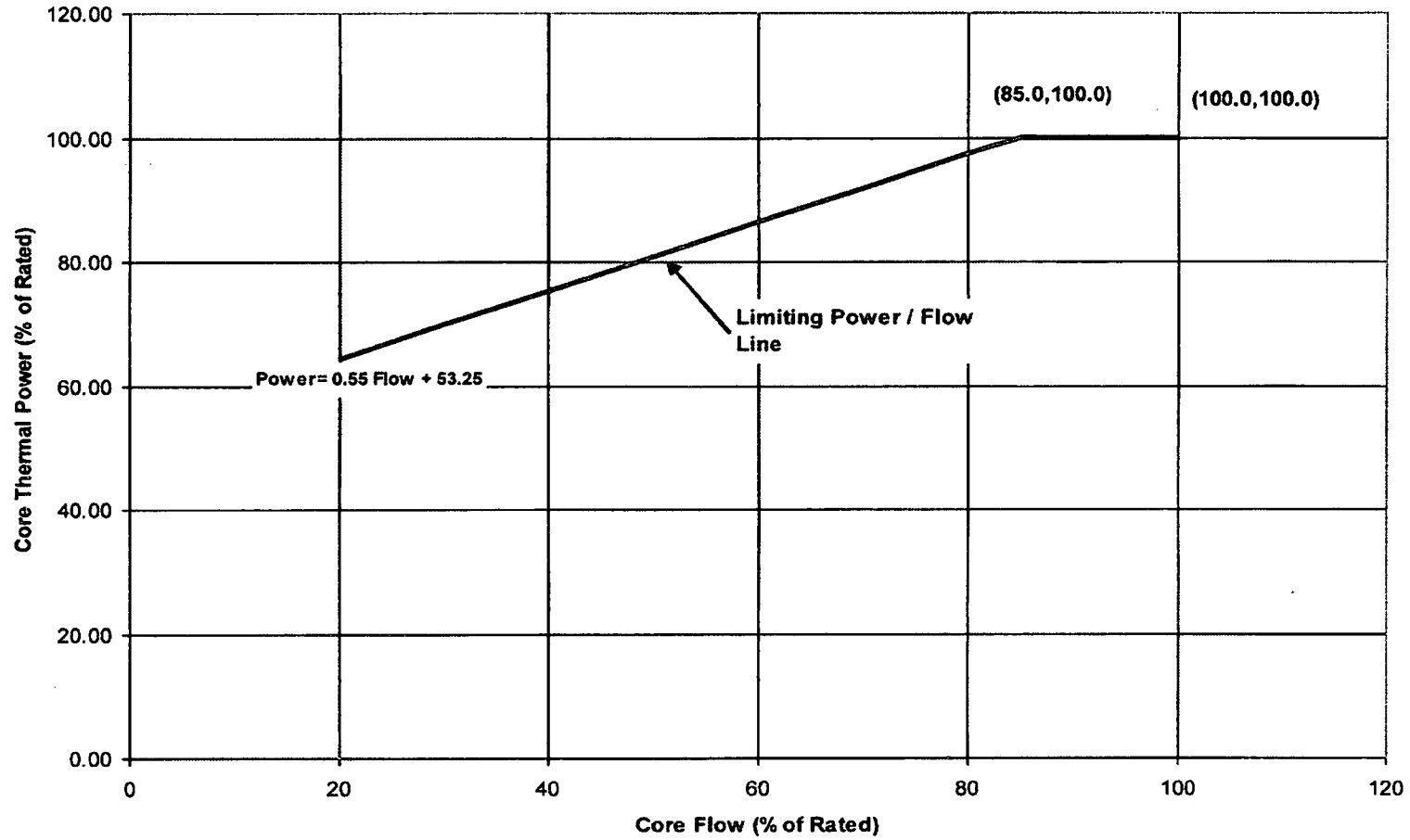


4.0 POWER/FLOW RELATIONSHIP DURING OPERATION

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.

Figure 4 Limiting Power / Flow Line



5.0 REFERENCE FOR TECHNICAL SPECIFICATIONS**Technical Specification 6.6.5b:**

NEDE 24011-P-A-17, "General Electric Standard Application for Reactor Fuel," September 2010 and the U.S. Supplement, NEDE-24011-P-A-17-US, September 2010.

6.0 SOURCE DOCUMENTS

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

| CORE OPERATING LIMITS | REFERENCES |
|---|--|
| <u>APLHGR Limits (Section 1)</u> Table 1 and corresponding 3 and 4 loop multipliers | 0000-0108-3371-SRLR, Revision 0, February 2011, Supplemental Reload Licensing Report for Nine Mile Point 1, Reload 21, Cycle 20 |
| | MEF-NMP-EA11-049, Transmittal of Exposure-dependent GE11 and GNF2 Fuel MAPLHGR Limits for Cycle 22, April 15, 2011 |
| Lattice Descriptions | 0000-0108-3371-FBIR, Revision 0, February 2011 Fuel Bundle Information Report for Nine Mile Point 1, Reload 21, Cycle 20 |
| <u>MCPR Limits (Section 2)</u> | 0000-0108-3371-SRLR, Revision 0, February 2011, Supplemental Reload Licensing Report for Nine Mile Point 1, Reload 21, Cycle 20 |
| | 0000-0130-4605-R1, Nine Mile Point 1 Cycle 22 Revised Operated Power Dependent Limits Below Pbypass with Turbine Bypass, April 5, 2011 |
| | 0000-0131-9552-R0, Nine Mile Point 1 Cycle 22 GNF2 NFI PROOS Off-rated Limits with Option B Scram, April 12, 2011 |
| EOR Definition | NMP1CMR, Revision 20, Nine Mile Point Unit 1, Cycle 20, Cycle Management Report, April 2011 |
| <u>LHGR Limits (Section 3)</u> | 0000-0108-3371-FBIR, Revision 0, February 2011 Fuel Bundle Information Report for Nine Mile Point 1, Reload 21, Cycle 20 |
| | 0000-0108-3371-SRLR, Revision 0, February 2011, Supplemental Reload Licensing Report for Nine Mile Point 1, Reload 21, Cycle 20 |
| | 0000-0131-9552-R0, Nine Mile Point 1 Cycle 22 GNF2 NFI PROOS Off-rated Limits with Option B Scram, April 12, 2011 |
| <u>Power/Flow Relationship (Section 4)</u> | NMP1 Technical Specification Amendment 92, Figure 3.1.7.a |