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TS 5.6.5.d

October 3, 2003

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

Peach Bottom Atomic Power Station, Unit 3
Facility Operating License No. DPR- 56
NRC Docket No. 50-278

Subject: Issuance of the Core Operating Limits Report for Reload 14, Cycle 15, Revision 0

Dear Sir/Madam:

Enclosed is a copy of the Core Operating Limits Report (COLR) for Peach Bottom Atomic Power Station (PBAPS), Unit 3, Reload 14, Cycle 15, Revision 0. Revision 0 of this report incorporates the revised cycle specific parameters resulting from the new core configuration implemented during the PBAPS, Unit 3 outage.

This COLR is being submitted to the NRC in accordance with PBAPS, Unit 3 Technical Specifications (TS) Section 5.6.5.d.

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

Very truly yours,

MP Gallagher for

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

Enclosure

cc: H. J. Miller, Administrator, Region I, USNRC (w/enc)
C. Smith, USNRC Senior Resident Inspector, PBAPS (w/enc)
G. F. Wunder, Project Manager, USNRC (w/enc)

A001

# CORE OPERATING LIMITS REPORT FOR

# PEACH BOTTOM ATOMIC POWER STATION UNIT 3

# RELOAD 14, CYCLE 15

# REVISION 0

Prepared By: _____ Date: 9/8/03

Reviewed By: _____ Date: 9/9/03

Approved By: _____ Date: 9/11/03

## LIST OF EFFECTIVE PAGES

| Page(s) | Revision |
|---|---|
| 1 - 33 | 0 |

## INTRODUCTION AND SUMMARY

This report provides the following cycle-specific parameter limits for Peach Bottom Atomic Power Station Unit 3 Cycle 15 (Reload 14):

- Maximum Average Planar Linear Heat Generation Rate (MAPLHGR)
- ARTS MAPLHGR thermal limit multipliers
- Single Loop Operation (SLO) MAPLHGR multipliers
- Minimum Critical Power Ratio (MCPR)
- ARTS MCPR thermal limit adjustments and multipliers
- Single Loop Operation (SLO) MCPR adjustment
- Rod Block Monitor (RBM) Analytical Limits, Allowable Values and MCPR Limits
- Linear Heat Generation Rate (LHGR)
- Turbine Bypass Valve Parameters
- EOC Recirculation Pump Trip (EOC-RPT) Parameters

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

This report provides the means for calculating the Operating Limit MCPR and MAPLHGR thermal limits for the following conditions:

- All points in the operating region of the power/flow map including Maximum Extended Load Line Limit (MELLL) down to 82.9% of rated core flow during full power (3514 MWt) operation
- Increased Core Flow (ICF), up to 110% of rated core flow
- End-of-Cycle Power Coastdown to a minimum power level of 40%
- Feedwater Heaters Out of Service (FWHOOS) to 55° F temperature reduction
- Final Feedwater Temperature Reduction (FWTR) between End-of-Rated (EOR) and End-of-Cycle (EOC) to 90° F temperature reduction
- Asymmetric Feedwater Temperature Operation (AFTO) – Appendix A

The Allowable Values, documented in Reference (9), for feedwater temperature as a function of thermal power for both FWHOOS and FWTR are specified in the appropriate Peach Bottom procedures.

Note that 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) based on the EOR point as documented in the current revision of the Cycle Management Report.

Also note that the following description of MAPLHGR and MCPR limits pertain to NON - AFTO. A separate description of AFTO limits and their associated ARTS figures are located in Appendix A.

Preparation of this report was performed in accordance with Exelon Nuclear procedures. This report is submitted in accordance with Technical Specification 5.6.5 of Reference (1) and contains all thermal limit parameters related to the implementation of the ARTS Improvement Program and Maximum Extended Load Line Limit Analyses (ARTS/MELLLA) for Peach Bottom Unit 3 Cycle 15.

## MAPLHGR LIMITS

The bounding MAPLHGR limits (kW/ft) for each fuel type are provided in Figures 1 through 6. The bounding MAPLHGR limits are the lowest kW/ft limits of the fuel lattices (excluding natural uranium) which comprise a given fuel type as a function of average planar exposure. The MAPLHGR figures are used when hand calculations are required as specified in Reference (4). All MAPLHGR values for each fuel type as a function of axial location and average planar exposure shall be less than or equal to the applicable MAPLHGR limits for the respective fuel and lattice types to be in compliance with Technical Specification 3.2.1. These MAPLHGR limits are specified in References (2), (3), (18), and (19) and the process computer databank. The ARTS-based MAPLHGR power-dependent multipliers (MAPFAC(P)) are provided in Figures 7 and 8. Figure 7 is valid for seven or more (of nine) Turbine Bypass Valves (TBVs) In-Service and Recirculation Pump Trip (RPT) In-Service with a maximum temperature reduction of 90° F for FWTR operation. Figure 8 is valid for three or more (of nine) TBVs Out-of-Service (OOS) or RPTOOS with a maximum FWTR of 90° F. The flow-dependent multipliers (MAPFAC(F)) are provided in Figures 9 and 10 as a function of the number of recirculation loops in operation only. The SLO MAPLHGR multiplier (0.73) is applied through MAPFAC(F) as shown in Figure 10. This value is based on the GE14 fuel product line. MAPFAC(F) is clamped at 0.73 starting at 33.6% of rated core flow to ensure peak clad temperatures are maintained within the limits of the cycle-specific LOCA analysis for single recirculation loop operation. The power- and flow-dependent MAPLHGR multipliers were obtained from References (5), (10) and (12). AFTO parameters are addressed in Appendix A.

## MCPR LIMITS

The Operating Limit MCPR (OLMCPR) for use in Technical Specification 3.2.2 for each fuel type is provided in Table 1. These values are determined by the cycle-specific fuel reload analyses in Reference (2). The Safety Limit MCPRs are documented in Section 2.1.1.2 of Reference (1).

Control rod scram time verification is required as per Technical Specification 3.1.4, "Control Rod Scram Times". Tau, a measure of scram time performance to notch position 36 throughout the cycle, is determined based on the cumulative scram time test results. The calculation of Tau shall be performed in accordance with site procedures. Linear interpolation shall be used to calculate the OLMCPR value if Tau is between 0.0 (Tau Option B) and 1.0 (Tau Option A).

Separate OLMCPR values are presented herein (Table 1) for the following domains:

- TBVs In-Service (seven or more in-service) and RPT In-Service, maximum FWTR of 90 °F
- TBVs Out-of-Service (three or more out-of-service) and RPT In-Service, maximum FWTR of 90 °F
- TBVs In-Service (seven or more in-service) and RPT Out-of-Service, maximum FWTR of 90 °F

The OLMCPR values are documented in Reference (2) for the GE13 and GE14 fuel designs.

The ARTS-based power-dependent MCPR limits, OLMCPR(P), for use in Technical Specification 3.2.2 are provided in Figures 11 and 12. Figure 11 is valid for seven or more (of nine) Turbine Bypass Valves (TBVs) In-Service and Recirculation Pump Trip (RPT) In-Service and a maximum temperature reduction of 90 °F for FWTR operation. Figure 12 is valid for three or more (of nine) TBVs Out-of-Service (OOS) or RPTOOS with a maximum FWTR of 90 °F. The flow-dependent

MCPR limits, OLMCPR(F), are provided in Figure 13. Figure 13 is valid for all operating conditions with symmetric feedwater temperature operation. OLMCPR(P, F) curves were obtained from References (5), (10) and (12). AFTO parameters are addressed in Appendix A.

## OVERALL GOVERNING MCPR AND MAPLHGR LIMITS

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. At any given power/flow (P/F) state, all four limits are to be determined: MAPFAC(P), MAPFAC(F), OLMCPR(P), and OLMCPR(F) from Figures 7 through 21, inclusive. The most limiting MCPR and the most limiting MAPLHGR [maximum of OLMCPR(P) and OLMCPR(F) and minimum of MAPLHGR(P) and MAPLHGR(F)] for a given (P,F) condition will be the governing limits. The OLMCPR for each fuel type is determined by the cycle-specific fuel reload analyses in Reference (2). Rated MAPLHGR values are a composite of results obtained from bundle-specific thermal-mechanical and emergency core cooling system analyses. Supporting documentation for the ARTS-based limits is provided in References (5), (10), (12) and (14).

## ROD BLOCK MONITOR SETPOINTS

The RBM power-biased Analytical Limits, Allowable Values and MCPR Limits for use in Technical Specification 3.3.2.1 are provided in Table 2 per Reference (5) with supporting documentation in References (2) and (13).

## LINEAR HEAT GENERATION RATES

The beginning of life (maximum) LHGR values for each fuel type for use in Technical Specification 3.2.3 are provided in Table 3. The LHGR values as a function of fuel exposure are provided in References (3), (18), and (19). The bases for the LHGR values are documented in Reference (4).

## STEAM BYPASS SYSTEM OPERABILITY

The operability requirements for the steam bypass system are governed by Technical Specification 3.7.6. If the requirements cannot be met, the appropriate power dependent limits for Turbine Bypass Valves Out-of-Service (TBVOOS) must be used (Table 1 with Figures 8 and 12 or Figures 15 and 19). The minimum number of bypass valves to maintain system operability is seven as per References (2), (6) and (7) and Table 4. Table 4 also includes other Turbine Bypass Valve parameters.

## EOC RECIRCULATION PUMP TRIP (EOC-RPT) OPERABILITY

If the EOC-RPT is inoperable, then the OLMCPR (Table 1), MAPFAC(P) (Figure 8), and OLMCPR(P) (Figure 12) values for EOC Recirculation Pump Trip Out-of-Service (RPTOOS), must be used. Appendix A contains MAPFAC(P) and OLMCPR(P) for RPTOOS and AFTO.

The measured EOC-RPT Response Times as referenced in Technical Specifications Section 3.3.4.2 and as defined in Technical Specifications Section 1.1 are:

$\leq$ 0.145 seconds for TCV Fast Closure Trip ( i.e. Generator Load Rejection)

$\leq$ 0.155 seconds for TSV Fast Closure Trip ( i.e. Turbine Trip )

A total RPT response time of 0.175 seconds is assumed in the safety analysis for both trips and is defined as the time from the turbine valves (TCV or TSV) start to close until complete arc suppression of the EOC-RPT circuit breakers. Reference (11) provides the basis for the RPT response time.

## CONCURRENT TBVOOS AND RPTOOS

Cycle 15 is not licensed for TBVOOS and RPTOOS to occur concurrently. Therefore, concurrent TBVOOS and RPTOOS is an unanalyzed condition.

## REFERENCES

1) "Technical Specifications for Peach Bottom Atomic Power Station Unit 3", Docket No. 50-278, Appendix A to License No. DPR-56.

2) "Supplemental Reload Licensing Report for Peach Bottom Atomic Power Station Unit 3, Reload 14, Cycle 15", GNF Document No. 0000-0019-2633-SRLR, Revision 0, August 2003.

3) "Lattice Dependent MAPLHGR Report for Peach Bottom 3 Reload 14 Cycle 15", 0000-0019-2633-MAPLHR, Revision 0, August 2003.

4) "General Electric Standard Application for Reactor Fuel", NEDE-24011-P-A-14, June 2000; and NEDE-24011-P-A-14-US, June 2000.

5) "Maximum Extended Load Line Limit and ARTS Improvement Program Analyses for Peach Bottom Atomic Power Station Unit 2 and 3", NEDC-32162P, Revision 2, March 1995.

6) "Letter from R. M. Butrovich to H. J. Diamond, "Peach Bottom-2 Cycle 11 Turbine Bypass Valve Capacity Variation from Design Basis", January 9, 1995.

7) Letter from G. V. Kumar to G. C. Storey, "PBAPS Evaluation of Turbine Bypass Surveillance Requirements", January 19, 1995.

8) PECO Energy Calc. PM-0875, "GE NSSS Setpoints Required to Support Power Rerate."

9) "Peach Bottom Atomic Power Station Evaluation for Extended Final Feedwater Temperature Reduction of 90° F", NEDC-32707P, Supplement 1, May 1998.

10) "ARTS Flow-Dependent Limits with TBVOOS for Peach Bottom Atomic Power Station and Limerick Generating Station", NEDC-32847P, June 1998.

11) PECO Calculation PE-0173, "Determination of Total Time Required to Initiate the Trip Signal to the EOC-RPT Circuit Breaker".

12) "Peach Bottom Atomic Power Station Units 2 and 3 Plant and Cycle Independent ARTS Thermal Limits Analysis", NEDC – 32162P, Supplement 1, Revision 0, August 2001.

13) PECO Calculation PE-0251, Revision 1, "Power Range Neutron Monitoring System Setpoint Calculations, Peach Bottom Atomic Power Station Units 2 and 3".

14) "Safety Review for Peach Bottom Atomic Power Station Units 2 and 3 Asymmetric Feedwater Temperature Operation", NEDC-32691P, Revision 0, May 1997.

15) ECR 02-00478, "Asymmetric Feedwater Operation Implementation"

16) "GE14 Fuel Design Cycle-Independent Analyses for Peach Bottom Atomic Power Station Units 2 & 3," GENE L12-00880-00-01P, September 2000

17) "Fuel Bundle Information Report for Peach Bottom 3 Reload 14 Cycle 15", GNF Document No. 0000-0019-2633-FIBR, Revision 0, August 2003

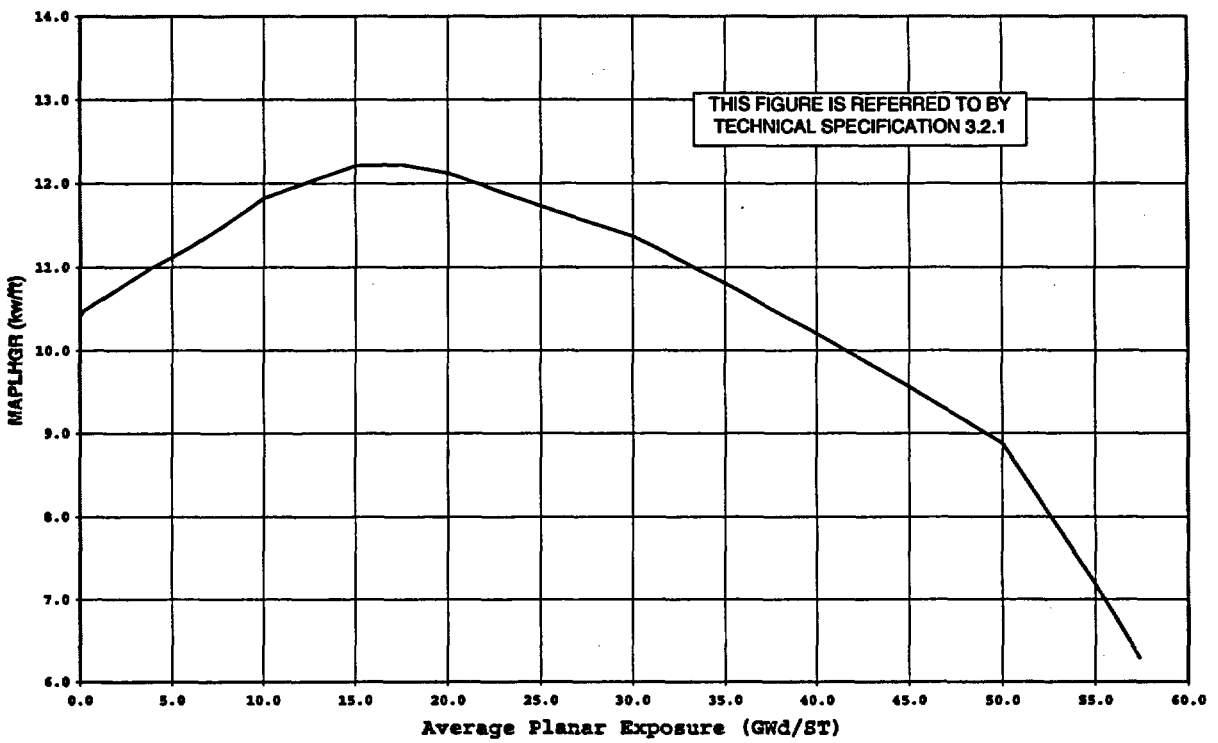
18) "Lattice Dependent MAPLHGR Report for Peach Bottom 3 Reload 13 Cycle 14", GNF Document No. J11-03913MAPL, Revision 0, August 2001

19) "Lattice Dependent MAPLHGR Report for Peach Bottom Atomic Power Station Unit 3 Reload 12 Cycle 13", GNF Document No. J11-03549MAPL, Revision 1, December 2000

20) CR 00171805, AFTO ARTS thermal limit penalties not applied above 100% CTP

FIGURE 1

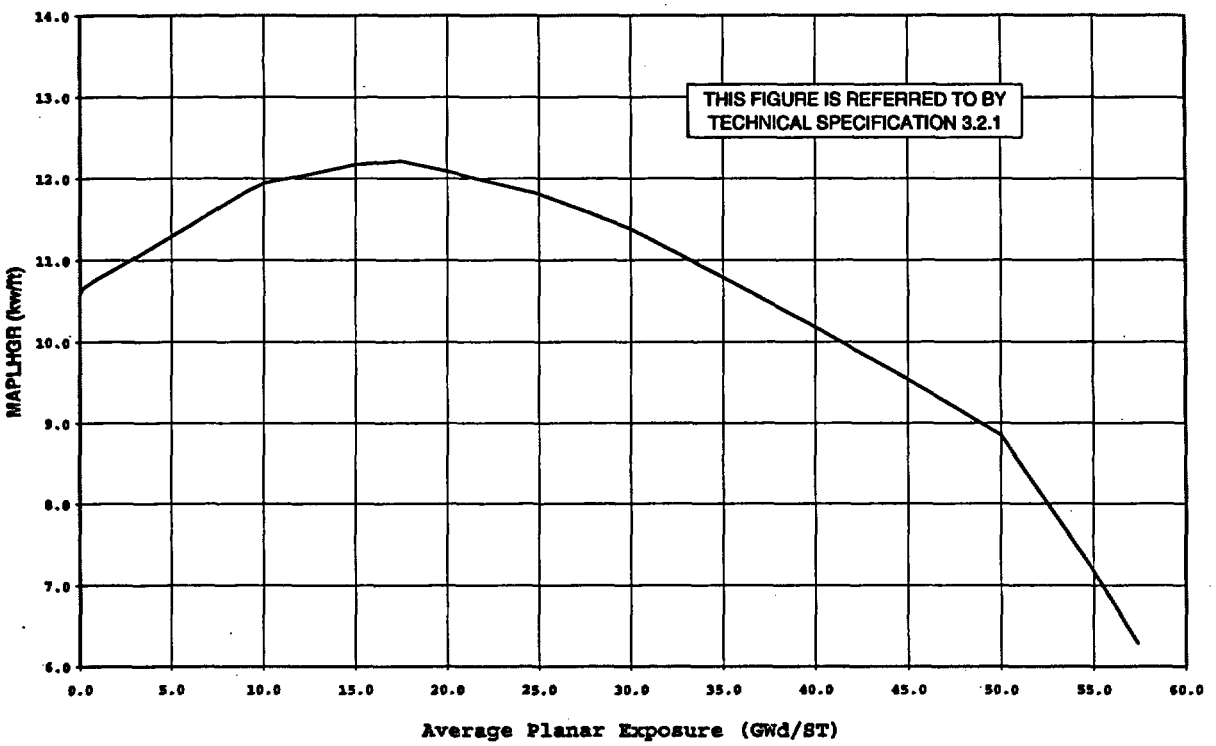
## MAXIMUM AVERAGE PLANAR LINEAR HEAT GENERATION RATE (MAPLHGR) VERSUS AVERAGE PLANAR EXPOSURE FUEL TYPE GE13-P9DTB407-14GZ-100T-146-T




| 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 | 10.41 | 8.0 | 11.52 | 30.0 | 11.37 |
| 0.2 | 10.48 | 9.0 | 11.67 | 32.66 | 11.07 |
| 1.0 | 10.59 | 10.0 | 11.82 | 35.0 | 10.81 |
| 2.0 | 10.73 | 12.5 | 12.02 | 40.0 | 10.20 |
| 3.0 | 10.87 | 15.0 | 12.21 | 45.0 | 9.56 |
| 4.0 | 11.01 | 17.5 | 12.22 | 50.0 | 8.88 |
| 5.0 | 11.12 | 20.0 | 12.12 | 55.0 | 7.19 |
| 6.0 | 11.24 | 24.38 | 11.78 | 56.7 | 6.56 |
| 7.0 | 11.38 | 25.0 | 11.73 | 57.4 | 6.29 |

## FIGURE 2

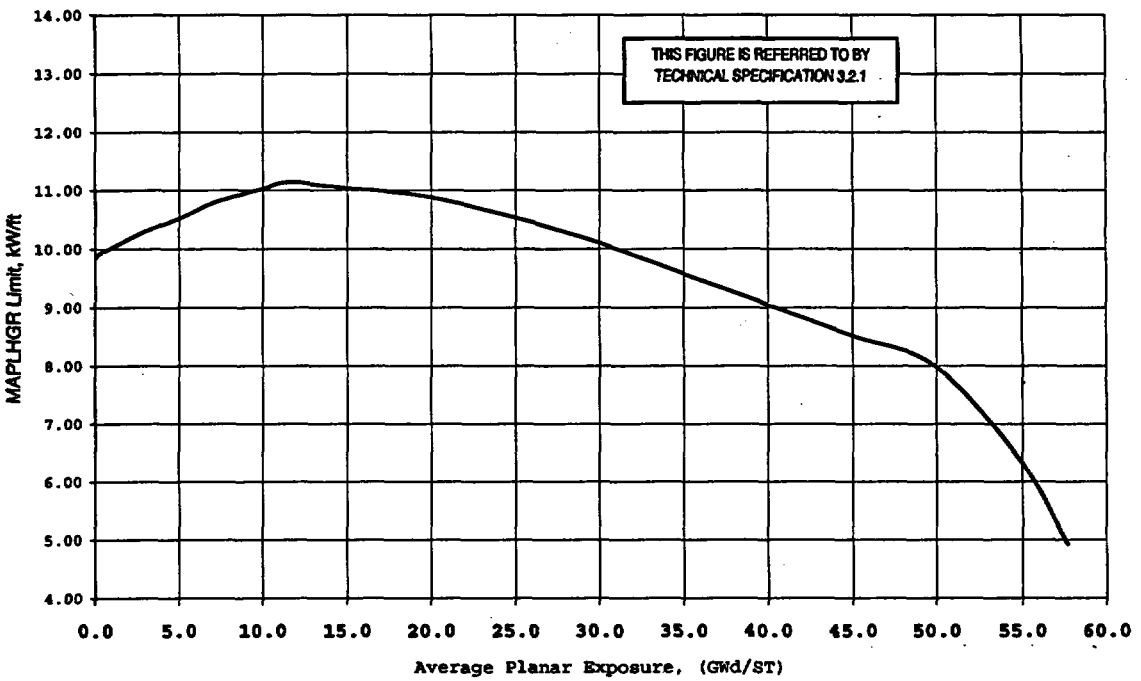
## MAXIMUM AVERAGE PLANAR LINEAR HEAT GENERATION RATE (MAPLHGR) VERSUS AVERAGE PLANAR EXPOSURE FUEL TYPE GE13-P9DTB404-13GZ-100T-146-T




| 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 | 10.61 | 8.0 | 11.70 | 30.0 | 11.38 |
| 0.2 | 10.67 | 9.0 | 11.83 | 32.66 | 11.07 |
| 1.0 | 10.78 | 10.0 | 11.94 | 35.0 | 10.79 |
| 2.0 | 10.90 | 12.5 | 12.05 | 40.0 | 10.18 |
| 3.0 | 11.03 | 15.0 | 12.17 | 45.0 | 9.54 |
| 4.0 | 11.16 | 17.5 | 12.21 | 50.0 | 8.85 |
| 5.0 | 11.29 | 20.0 | 12.09 | 55.0 | 7.18 |
| 6.0 | 11.42 | 24.38 | 11.84 | 56.7 | 6.54 |
| 7.0 | 11.56 | 25.0 | 11.81 | 57.4 | 6.28 |

## FIGURE 3

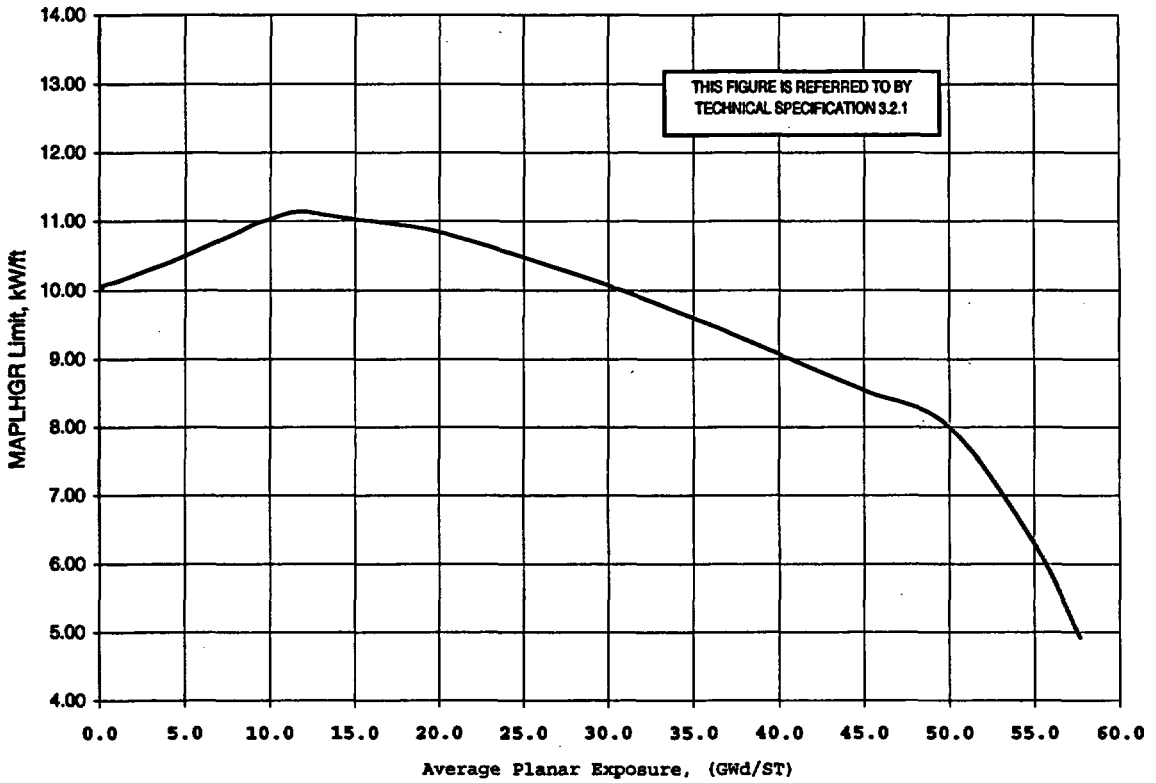
## MAXIMUM AVERAGE PLANAR LINEAR HEAT GENERATION RATE (MAPLHGR) VERSUS AVERAGE PLANAR EXPOSURE FUEL TYPE GE14-P10DNAB410-14GZ-100T-150-T-2468




| 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 | 9.84 | 8.0 | 10.87 | 20.0 | 10.88 |
| 0.2 | 9.91 | 9.0 | 10.95 | 25.0 | 10.53 |
| 1.0 | 10.02 | 10.0 | 11.03 | 30.0 | 10.10 |
| 2.0 | 10.17 | 11.0 | 11.12 | 35.0 | 9.57 |
| 3.0 | 10.30 | 12.0 | 11.14 | 40.0 | 9.05 |
| 4.0 | 10.41 | 13.0 | 11.10 | 45.0 | 8.52 |
| 5.0 | 10.52 | 14.0 | 11.07 | 50.0 | 7.98 |
| 6.0 | 10.65 | 15.0 | 11.04 | 55.0 | 6.32 |
| 7.0 | 10.78 | 17.0 | 10.99 | 57.92 | 4.87 |

## FIGURE 4

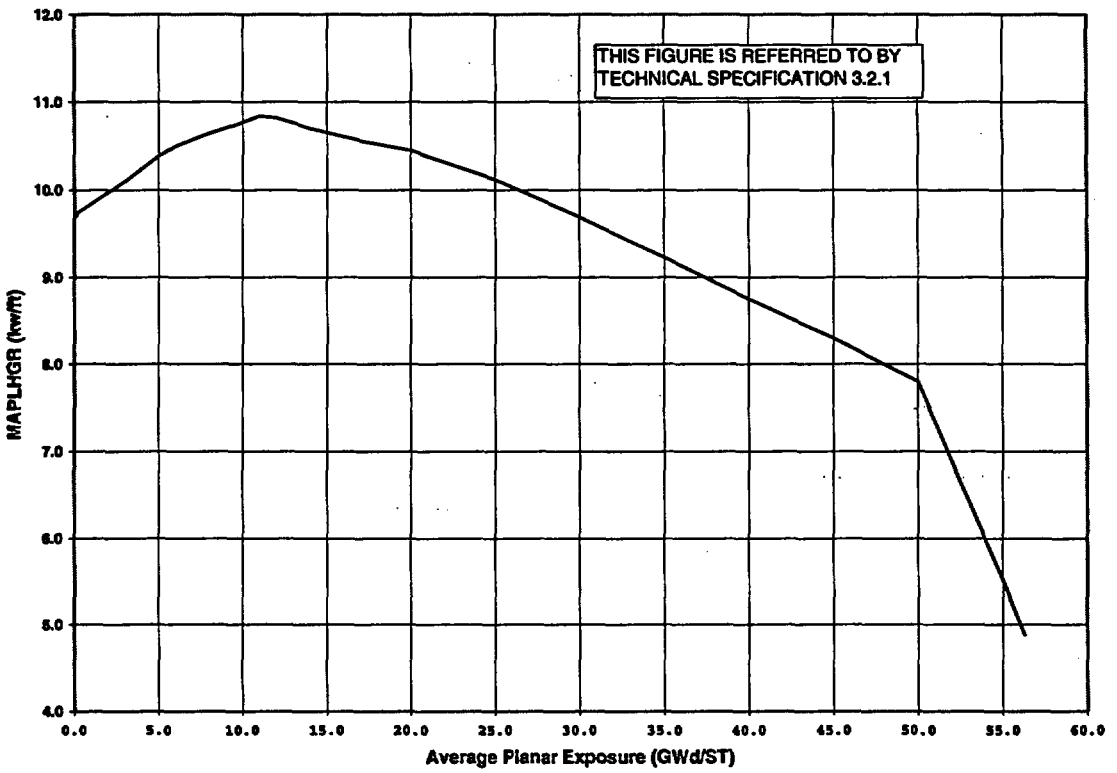
## MAXIMUM AVERAGE PLANAR LINEAR HEAT GENERATION RATE (MAPLHGR) VERSUS AVERAGE PLANAR EXPOSURE FUEL TYPE GE14-P10DNAB411-14GZ-100T-150-T-2466




| 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 | 10.83 | 20.0 | 10.84 |
| 0.2 | 10.07 | 9.0 | 10.95 | 25.0 | 10.48 |
| 1.0 | 10.13 | 10.0 | 11.03 | 30.0 | 10.07 |
| 2.0 | 10.22 | 11.0 | 11.11 | 35.0 | 9.60 |
| 3.0 | 10.31 | 12.0 | 11.14 | 40.0 | 9.07 |
| 4.0 | 10.40 | 13.0 | 11.10 | 45.0 | 8.54 |
| 5.0 | 10.50 | 14.0 | 11.06 | 50.0 | 8.00 |
| 6.0 | 10.61 | 15.0 | 11.03 | 55.0 | 6.29 |
| 7.0 | 10.72 | 17.0 | 10.97 | 57.77 | 4.90 |

## FIGURE 5

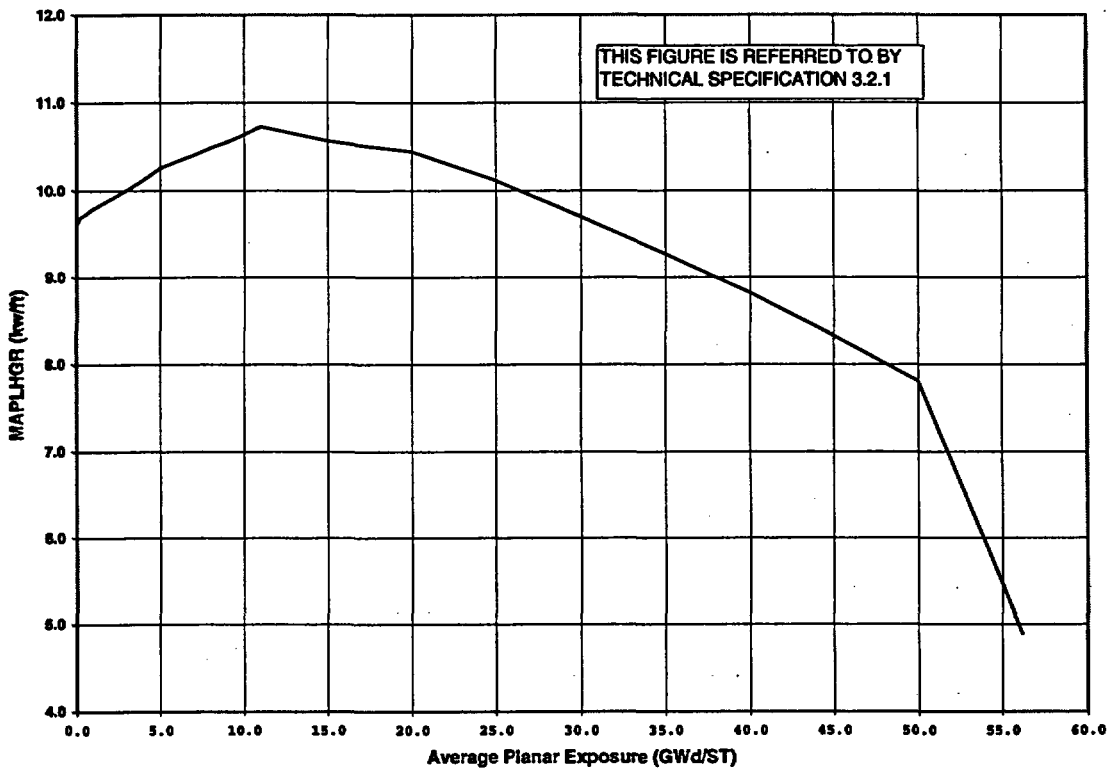
## MAXIMUM AVERAGE PLANAR LINEAR HEAT GENERATION RATE (MAPLHGR) VERSUS AVERAGE PLANAR EXPOSURE FUEL TYPE GE14-P10DNAB415-15GZ-100T-150-T-2668




| 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 | 9.67 | 8.0 | 10.64 | 20.0 | 10.45 |
| 0.2 | 9.74 | 9.0 | 10.70 | 25.0 | 10.12 |
| 1.0 | 9.84 | 10.0 | 10.77 | 30.0 | 9.69 |
| 2.0 | 9.97 | 11.0 | 10.84 | 35.0 | 9.23 |
| 3.0 | 10.10 | 12.0 | 10.82 | 40.0 | 8.75 |
| 4.0 | 10.24 | 13.0 | 10.76 | 45.0 | 8.30 |
| 5.0 | 10.38 | 14.0 | 10.70 | 50.0 | 7.80 |
| 6.0 | 10.50 | 15.0 | 10.65 | 55.0 | 5.52 |
| 7.0 | 10.57 | 17.0 | 10.56 | 56.29 | 4.88 |

## FIGURE 6

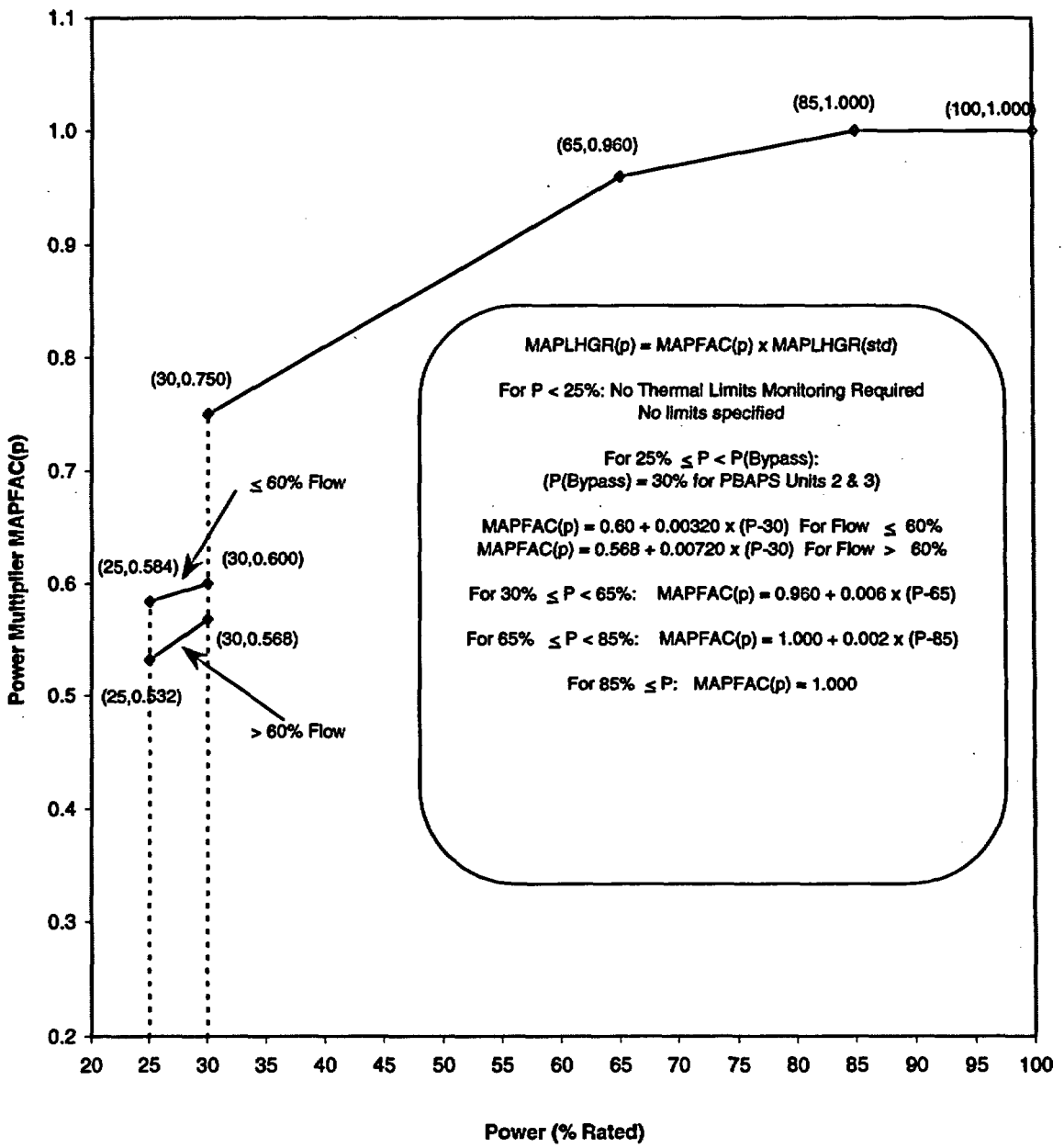
## MAXIMUM AVERAGE PLANAR LINEAR HEAT GENERATION RATE (MAPLHGR) VERSUS AVERAGE PLANAR EXPOSURE FUEL TYPE GE14-P10DNAB416-15GZ-100T-150-T-2669




| 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 | 9.61 | 8.0 | 10.49 | 20.0 | 10.45 |
| 0.2 | 9.69 | 9.0 | 10.56 | 25.0 | 10.12 |
| 1.0 | 9.79 | 10.0 | 10.64 | 30.0 | 9.70 |
| 2.0 | 9.90 | 11.0 | 10.73 | 35.0 | 9.27 |
| 3.0 | 10.01 | 12.0 | 10.69 | 40.0 | 8.82 |
| 4.0 | 10.13 | 13.0 | 10.65 | 45.0 | 8.33 |
| 5.0 | 10.26 | 14.0 | 10.61 | 50.0 | 7.81 |
| 6.0 | 10.34 | 15.0 | 10.57 | 55.0 | 5.47 |
| 7.0 | 10.41 | 17.0 | 10.52 | 56.17 | 4.89 |

# FIGURE 7
# POWER-DEPENDENT MAPLHGR MULTIPLIER, MAPFAC(P)
# THIS FIGURE IS REFERRED TO BY TECHNICAL SPECIFICATION 3.2.1

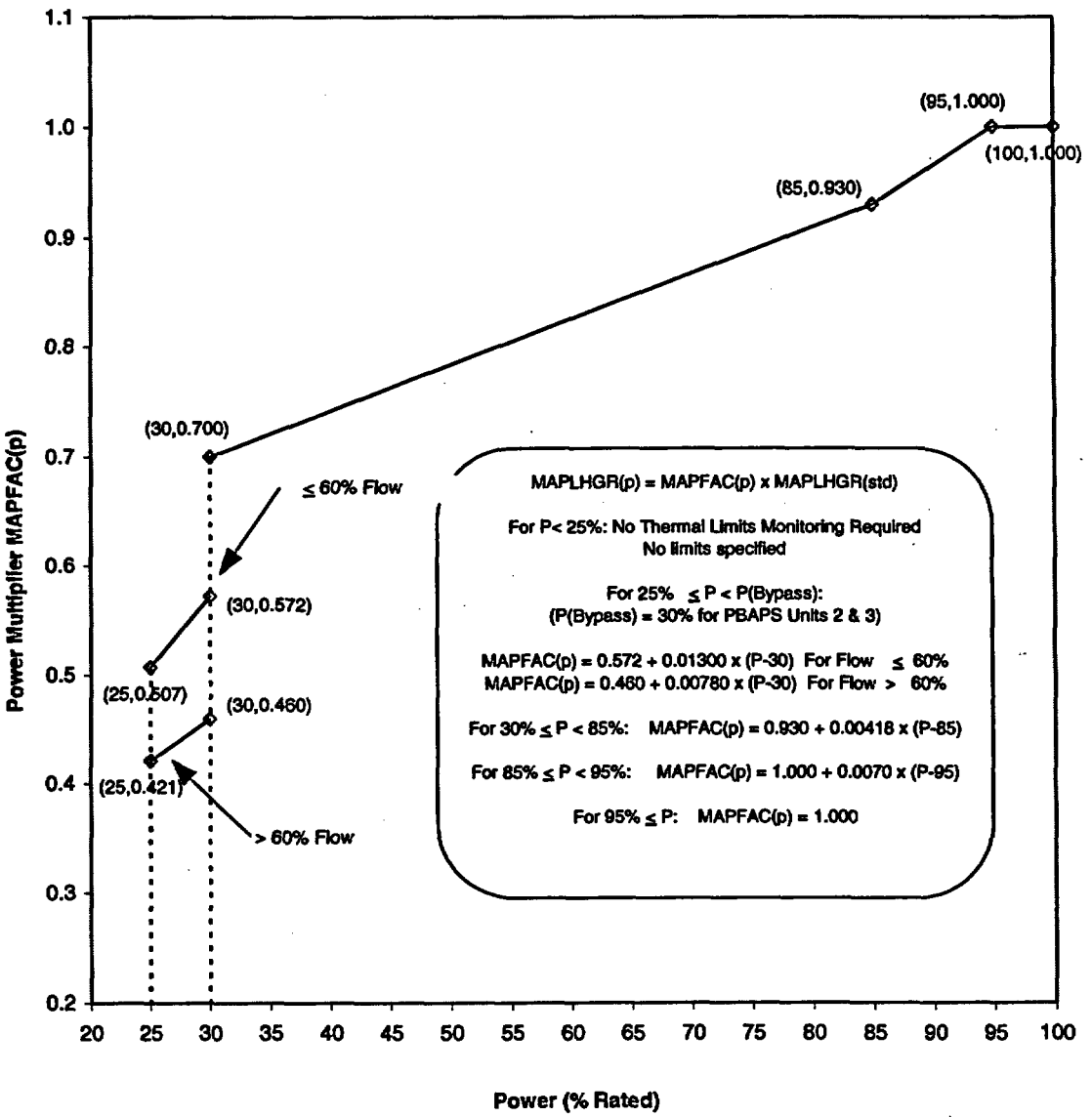
**VALID FOR 7 OR MORE TBVs IN-SERVICE, RPT IN-SERVICE AND MAX 90 °F FWTR (Symmetric Feedwater Heating)**



## FIGURE 8

## POWER-DEPENDENT MAPLHGR MULTIPLIER, MAPFAC(P)
## THIS FIGURE IS REFERRED TO BY TECHNICAL SPECIFICATION 3.2.1, 3.3.4.2 and 3.7.6

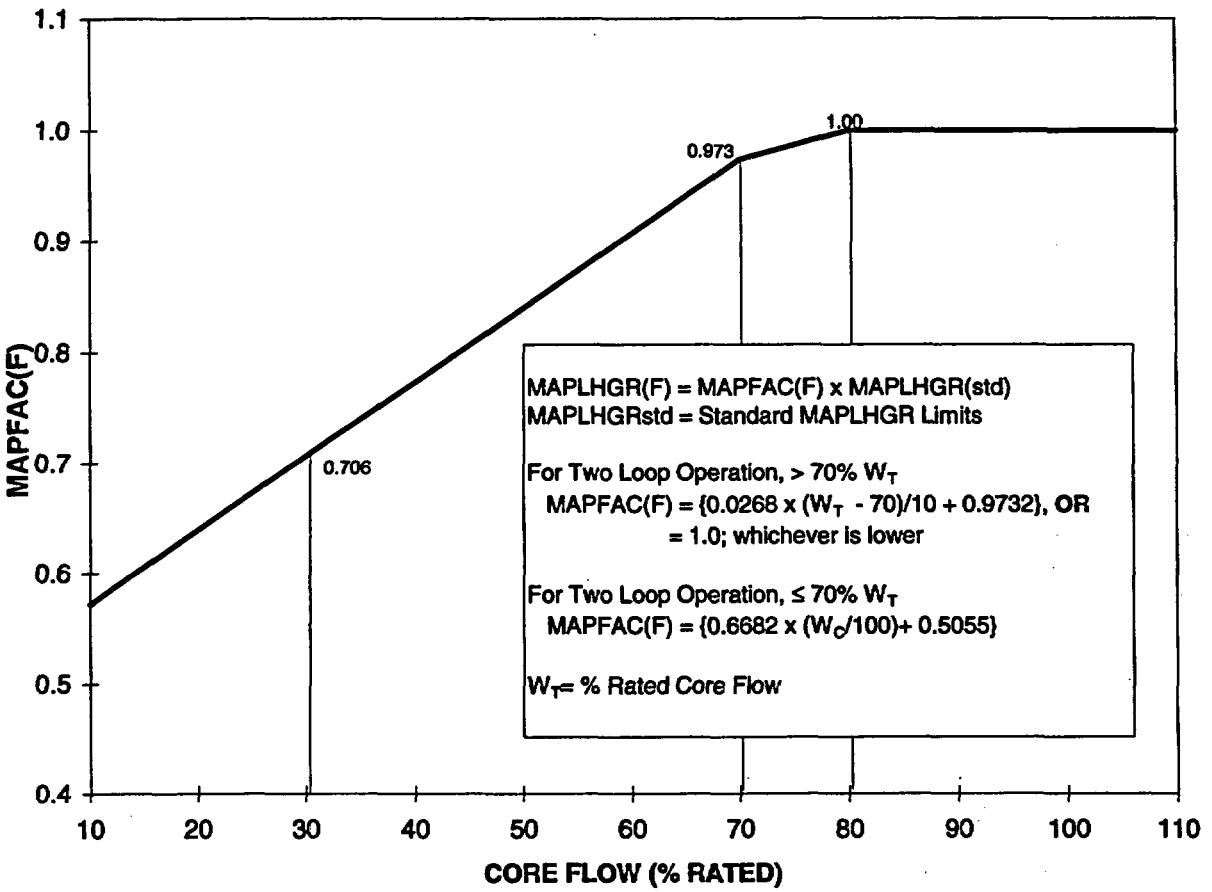
### VALID FOR 3 OR MORE TBVOOS OR RPTOOS AND MAX 90 °F FWTR
### (Symmetric Feedwater Heating)



## FIGURE 9

## FLOW DEPENDENT MAPLHGR MULTIPLIER MAPFAC(F)
## THIS FIGURE IS REFERRED TO BY TECHNICAL SPECIFICATION 3.2.1

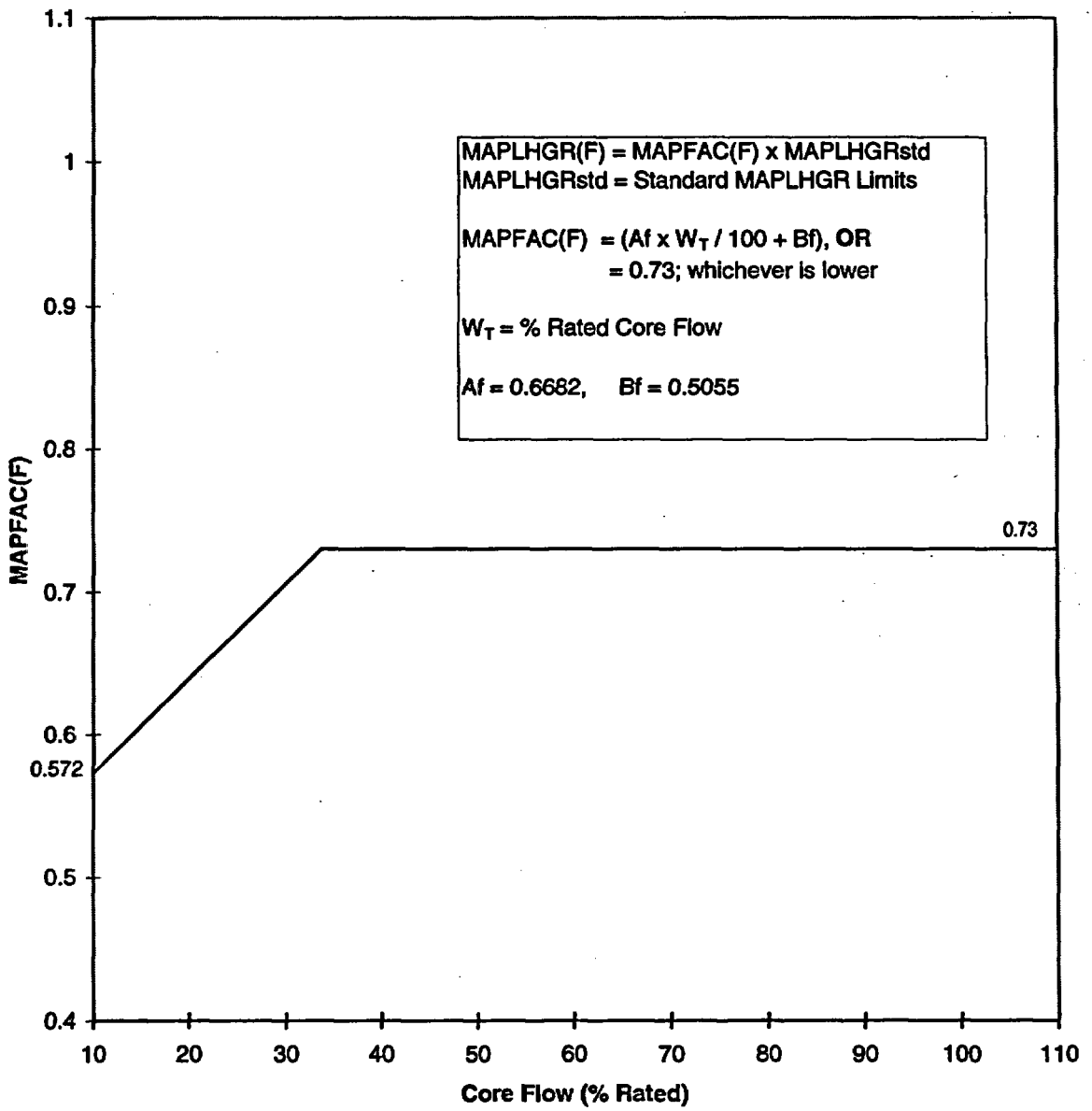
## VALID FOR TWO LOOP RECIRC FLOW (Symmetric Feedwater Heating)



## FIGURE 10

## FLOW DEPENDENT MAPLHGR MULTIPLIER MAPFAC(F)
## THIS FIGURE IS REFERRED TO BY TECHNICAL SPECIFICATION 3.2.1 AND 3.4.1

## VALID FOR SINGLE LOOP RECIRC FLOW (Symmetric Feedwater Heating)



# TABLE 1

## OPERATING LIMIT MINIMUM CRITICAL POWER RATIO (OLMCPR)

Applicable to all fuel types

Use in conjunction with Figures 11, 12, 13, 18, 19, 20, and 21

These Tables are referred to by Technical Specification 3.2.2, 3.4.1 and 3.7.6

| | | TBV in Service and RPT in Service | | TBV out of Service (3 or more TBVOOS) | | RPT OOS | |
|---|---|---|---|---|---|---|---|
| | | Option B $\tau = 0$ [1] | Option A $\tau = 1$ [1] | Option B $\tau = 0$ [1] | Option A $\tau = 1$ [1] | Option B $\tau = 0$ [1] | Option A $\tau = 1$ [1] |
| Two Loop Operation | BOC to EOR –2000 MWd/ST | 1.32 | 1.35 | 1.36 | 1.39 | 1.39 | 1.50 |
| | EOR - 2000 MWd/ST to EOC | 1.37 | 1.40 | 1.42 | 1.45 | 1.45 | 1.62 |
| Single Loop Operation [2] | BOC to EOR -2000 MWd/ST | 1.38[3] | 1.38[3] | 1.38 | 1.41 | 1.41 | 1.52 |
| | EOR - 2000 MWd/ST to EOC | 1.39 | 1.42 | 1.44 | 1.47 | 1.47 | 1.64 |

NOTES:

1) When Tau does not equal 0 or 1, use linear interpolation.

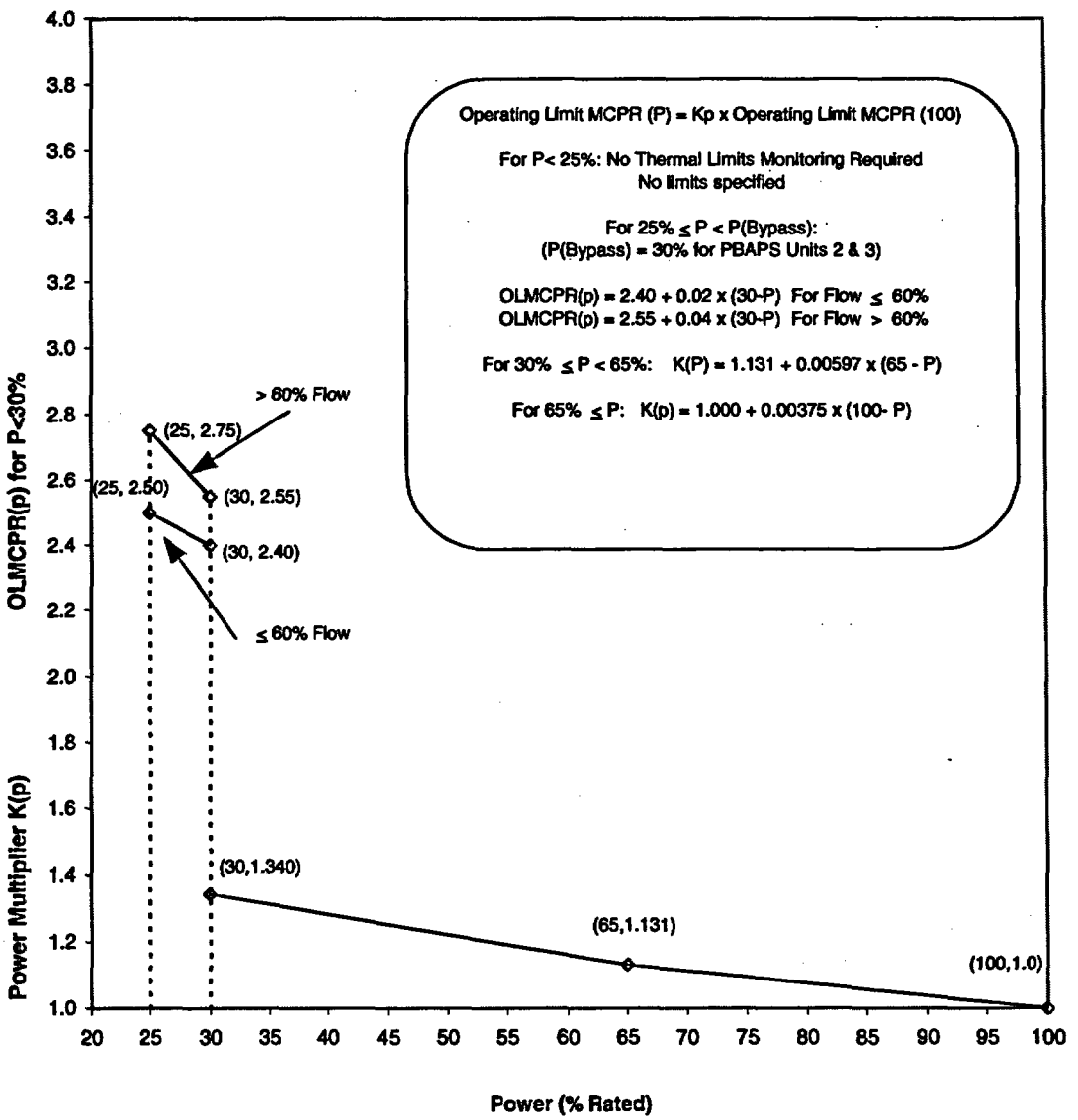
2) For single-loop operation, the MCPR operating limit is 0.02 greater than the two loop value except when the Two Loop Operation MCPR operating limit is less than 1.36 (consistent with Reference 16).

3) OLMCPR limit set by the Single Loop Operation (SLO) - Recirculation Pump Seizure Analysis. (Reference 16)

## FIGURE 11

## POWER-DEPENDENT MCPR LIMIT, OLMCPR(p), AND MULTIPLIERS
## THIS FIGURE IS REFERRED TO BY TECHNICAL SPECIFICATION 3.2.2

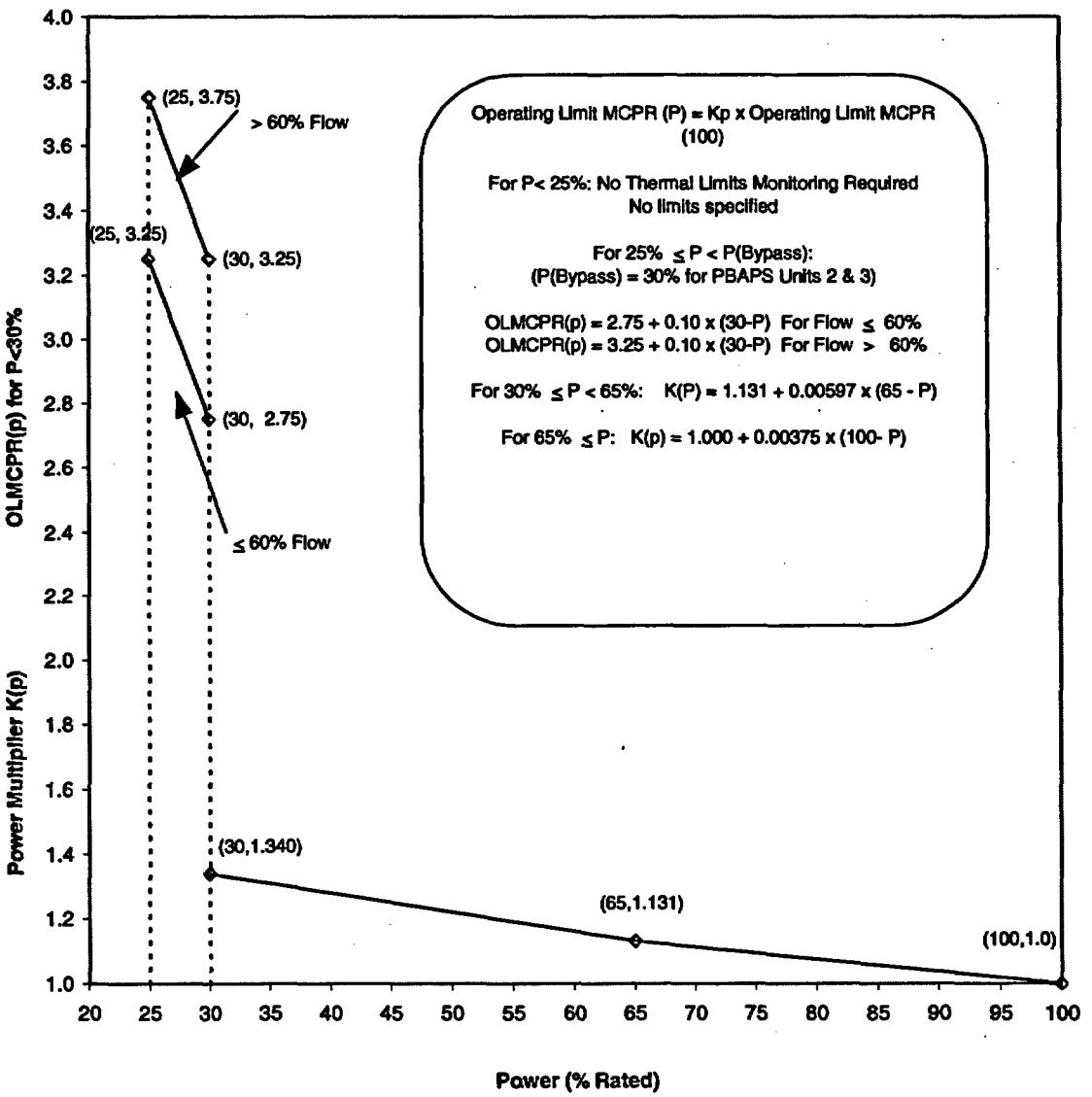
## VALID FOR 7 OR MORE TBVs IN-SERVICE, RPT IN-SERVICE AND MAX 90 °F FWTR
## (Symmetric Feedwater Heating)



## FIGURE 12

## POWER-DEPENDENT MCPR LIMIT, OLMCPR(p), AND MULTIPLIERS
## THIS FIGURE IS REFERRED TO BY TECHNICAL SPECIFICATION 3.2.2, 3.3.4.2 and 3.7.6

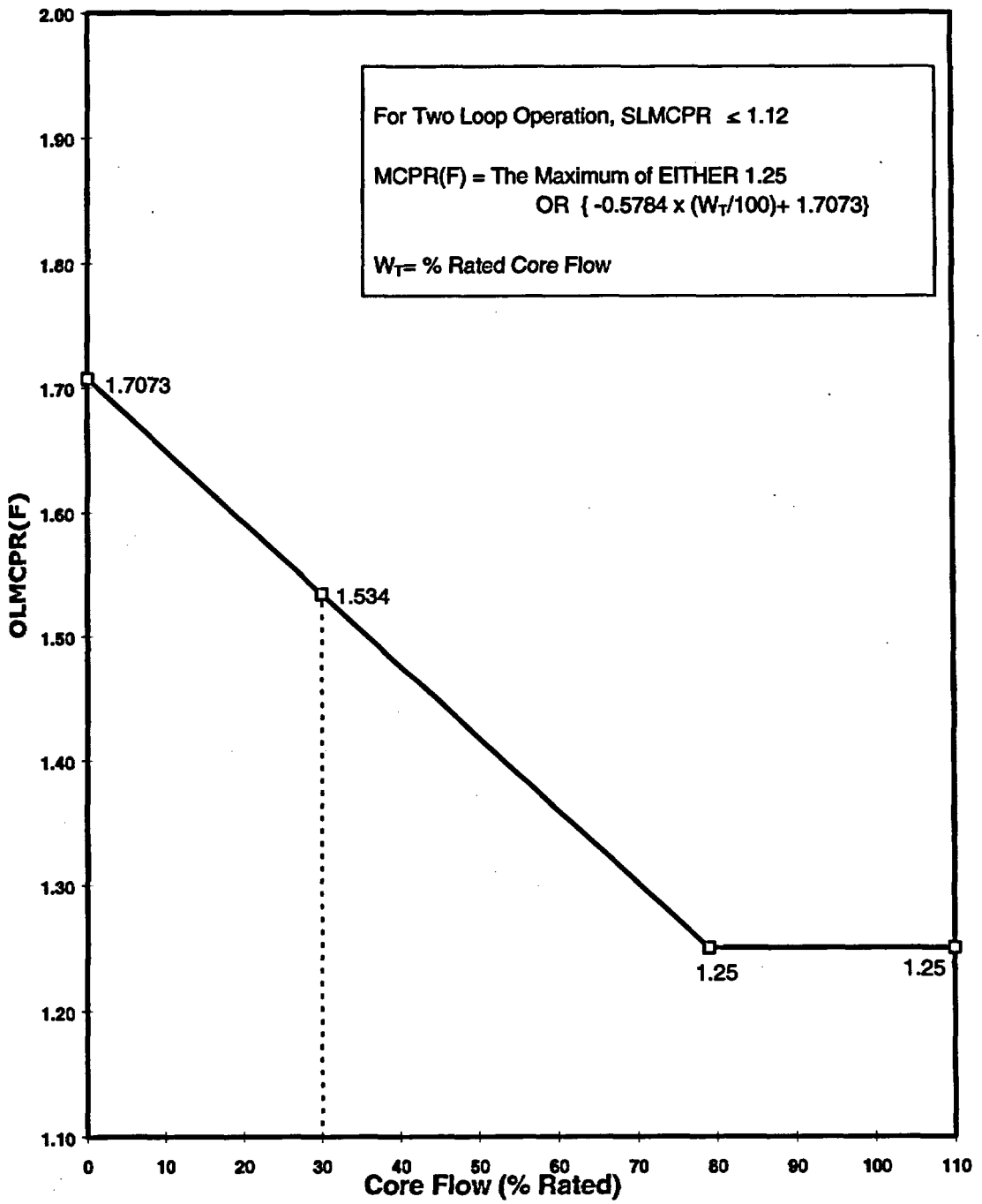
## VALID FOR 3 OR MORE TBVOOS OR RPTOOS AND MAX 90 °F FWTR
## (Symmetric Feedwater Heating)



## FIGURE 13

## FLOW DEPENDENT MCPR LIMITS, OLMCPR(F)
## THIS FIGURE IS REFERRED TO BY TECHNICAL SPECIFICATION 3.2.2

## VALID FOR ALL CONDITIONS (Symmetric Feedwater Heating)



## TABLE 2

## ROD BLOCK MONITOR ANALYTICAL LIMITS, ALLOWABLE VALUES, AND MCPR LIMITS THIS TABLE IS REFERRED TO BY TECHNICAL SPECIFICATION 3.3.2.1

***Applicability:*** **BOC to EOC**

| FUNCTION | ANALYTICAL LIMIT(1) | ALLOWABLE VALUE(1) | MCPR LIMIT |
|---|---|---|---|
| Low Power Range - Upscale (Low Trip Setpoint) | ≤ 123.0% | ≤ 121.2% | < 1.70 (2)<br>< 1.40 (3) |
| Intermediate Power Range - Upscale (Intermediate Trip Setpoint) | ≤ 118.0% | ≤ 116.2% | < 1.70 (2)<br>< 1.40 (3) |
| High Power Range - Upscale (High Trip Setpoint) | ≤ 113.2% | ≤ 111.4% | < 1.70 (2)<br>< 1.40 (3) |
| Inop | N/A | N/A | < 1.70 (2)<br>< 1.40 (3) |

---

(1) These setpoints (with RBM filter time constant between 0.1 seconds and 0.55 seconds) are based on a cycle-specific rated RWE MCPR limit which is less than or equal to the minimum cycle OLMCPR (see COLR references 2, 5 and 13).

(2) This is the MCPR limit (given THERMAL POWER ≥ 28.4% and < 90% RTP) below which the RBM is required to be OPERABLE (see COLR references 2 and 5 and TS Table 3.3.2.1-1).

(3) This is the MCPR limit (given THERMAL POWER ≥ 90% RTP) below which the RBM is required to be OPERABLE (see COLR references 2 and 5 and TS Table 3.3.2.1-1).

## TABLE 3

## DESIGN LINEAR HEAT GENERATION RATE (LHGR) LIMITS[1]

| FUEL TYPE | LHGR LIMIT |
|---|---|
| GE13 | 14.4 kW/ft |
| GE14 | 13.4 kW/ft |

[1] The LHGR limits provided above are the beginning of life (maximum) values. The LHGR limits as a function of fuel exposure are provided in Reference (3).

# TABLE 4

## TURBINE BYPASS VALVE PARAMETERS

### TURBINE BYPASS SYSTEM RESPONSE TIMES

| | |
|---|---|
| Maximum delay time before start of bypass valve opening following generation of the turbine bypass valve flow signal | 0.10 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) | 0.30 sec. |
| Minimum required number of bypass valves to maintain system operability | 7 |

# APPENDIX A

## ASYMMETRIC FEEDWATER TEMPERATURE OPERATION

Asymmetric feedwater heating (resulting from removing a heater string, or individual feedwater heaters, from operation) is the result of the specific configuration of the feedwater lines at Peach Bottom. A reduction in heating either the 'A' or the 'C' heater strings will result in a temperature mismatch between the feedwater flows entering the opposite sides of the reactor vessel. Asymmetric feedwater temperature operation (AFTO) is defined as operation in a feedwater heater/string configuration which results in a specified threshold difference difference. This threshold is a function of power and flow. The curve of the threshold values is incorporated in the station procedures that govern AFTO (Reference 15).

As a result of analyses documented in Reference (14), a 4% penalty has been applied to the MCPR ARTS curves and a 7% penalty has been applied to the MAPLHGR ARTS curves to ensure that sufficient thermal margin exists during anticipated operational occurrences while in AFTO.

### MAPLHGR LIMITS

The ARTS-based MAPLHGR power-dependent multipliers (MAPFAC(P)) for asymmetric feedwater temperature operation are provided in Appendix A, Figures 14 and 15. Figure 14 is valid for seven or more (of nine) Turbine Bypass Valves (TBVs) In-Service and Recirculation Pump Trip (RPT) In-Service, maximum 90 °F FWTR, with a maximum temperature differential of 55° F between the two feedwater sparger lines. Figure 15 is valid for three or more (of nine) TBVs Out-of-Service (OOS) or RPTOOS, maximum 90 °F FWTR, with a maximum temperature differential of 55° F between the two feedwater sparger lines. The flow-dependent multipliers (MAPFAC(F)) for AFTO are provided in Appendix A, Figures 16 and 17 as a function of the number of recirculation loops in operation only. The SLO MAPLHGR multiplier (0.73) is provided in Table 3 and applied, with a 7% penalty, through MAPFAC(F) as shown in Figure 17. MAPFAC(F) is clamped at 0.679 starting at 33.6% of rated core flow to ensure peak clad temperatures are maintained within the limits of the cycle-specific LOCA analysis for single recirculation loop and asymmetric feedwater temperature operation. The power- and flow-dependent MAPLHGR multipliers were obtained from References (10) and (12) and were adjusted with a 7% penalty as per Reference (14).

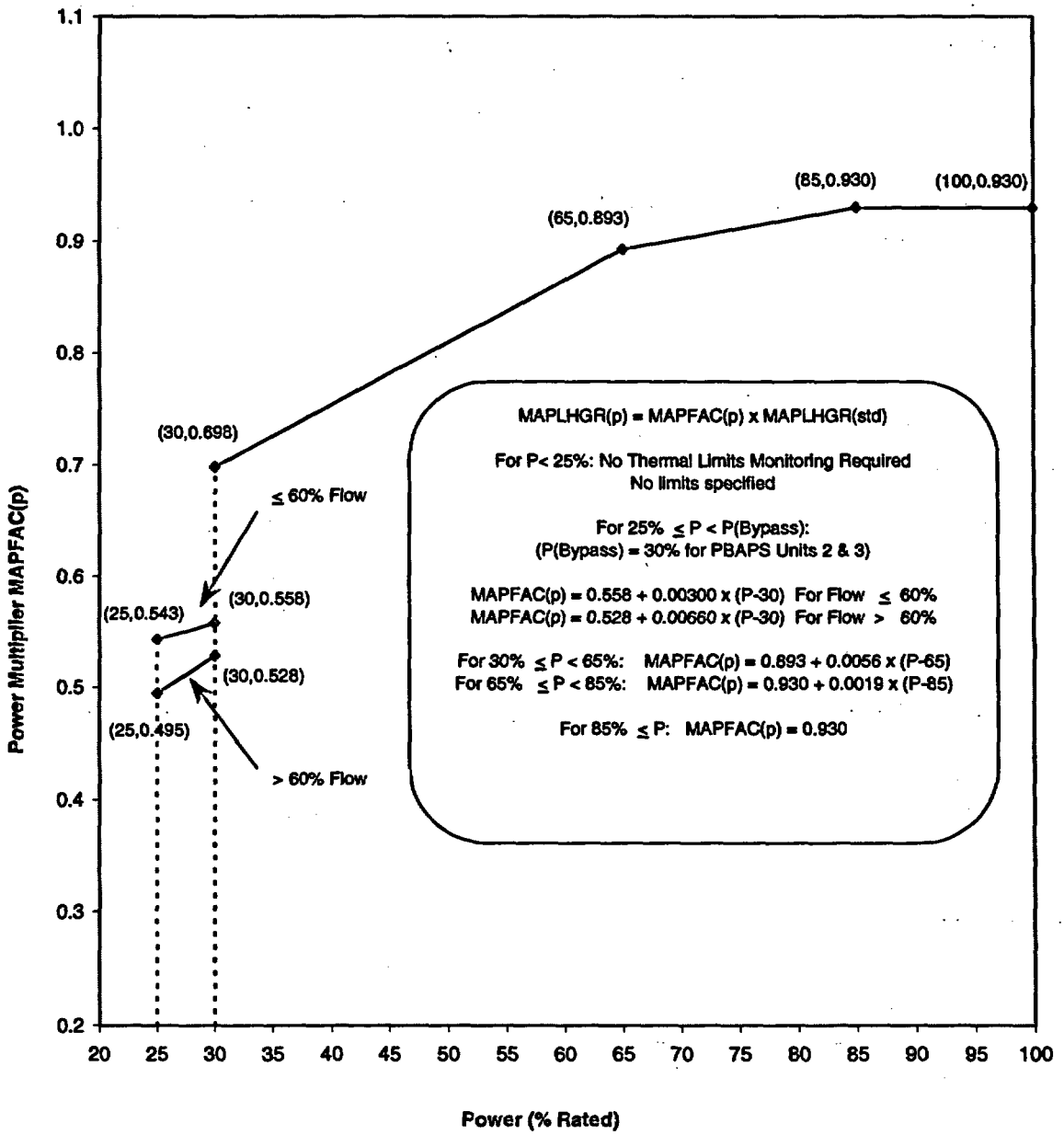
### MCPR LIMITS

The ARTS-based power-dependent MCPR limits, OLMCPR(P), for use in Technical Specification 3.2.2 during asymmetric feedwater temperature operation are provided in Appendix A, Figures 18 and 19. Figure 18 is valid for seven or more (of nine) Turbine Bypass Valves (TBVs) In-Service and Recirculation Pump Trip (RPT) In-Service, maximum 90 °F FWTR, with a maximum temperature differential of 55° F between the two feedwater sparger lines. Figure 19 is valid for three or more (of nine) TBVs Out-of-Service (OOS) or RPTOOS, maximum 90 °F FWTR, with a maximum temperature differential of 55° F between the two feedwater sparger lines. The flow-dependent MCPR limits, OLMCPR(F), for AFTO are provided in Appendix A, Figures 20 and 21. Figure 20 is valid for all operating conditions with AFTO during the exposure period of BOC to EOR-2000 MWd/ST. Figure 21 is valid for all operating conditions with AFTO during the exposure period of EOR-2000 MWd/ST to EOC. The power- and flow-dependent OLMCPR curves were obtained from References (10) and (12) and were adjusted with a 4% penalty as per Reference (14) and (20).

## FIGURE 14

## POWER-DEPENDENT MAPLHGR MULTIPLIER, MAPFAC(P)
## THIS FIGURE IS REFERRED TO BY TECHNICAL SPECIFICATION 3.2.1

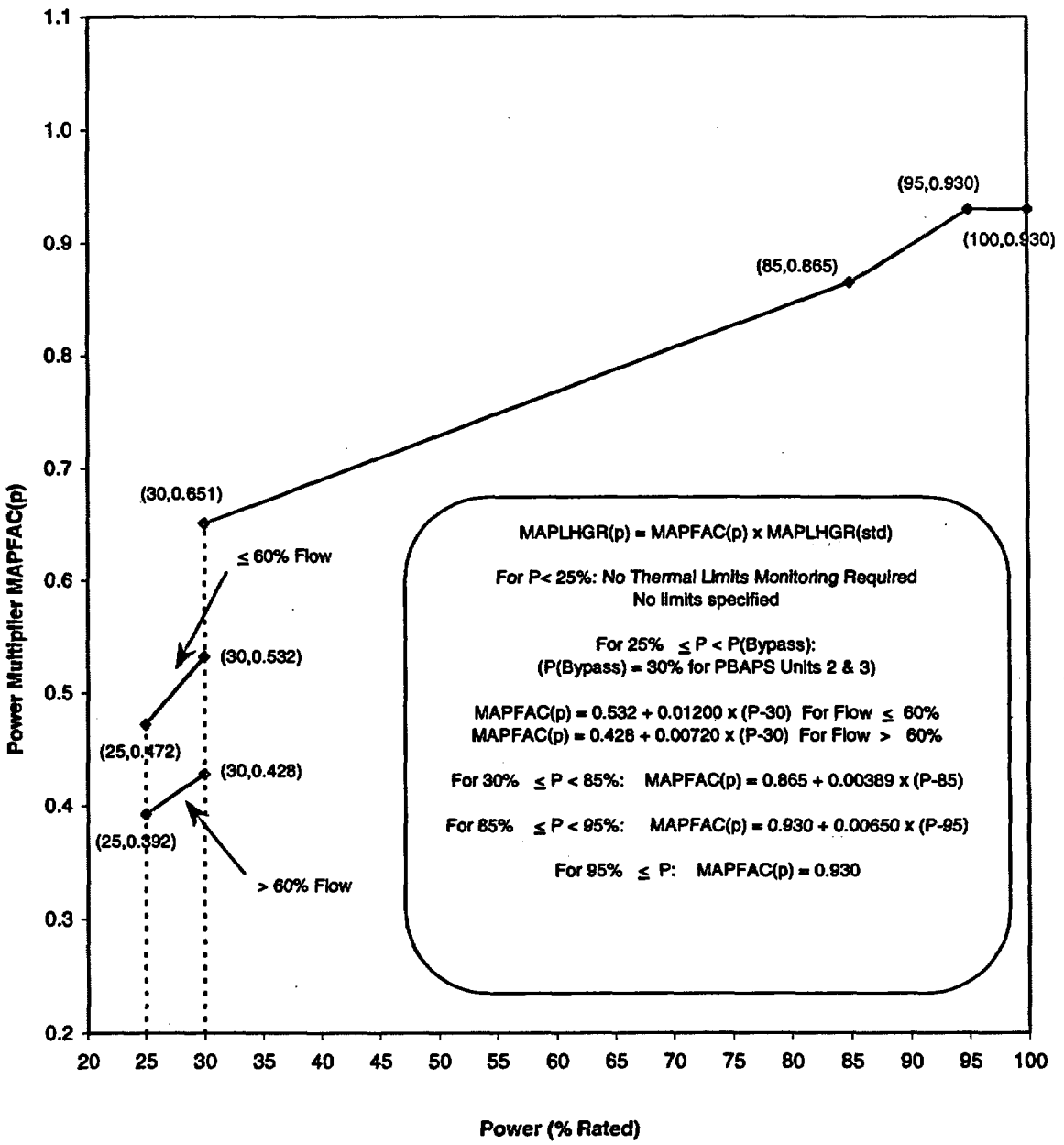
### VALID FOR 7 OR MORE TBVs IN-SERVICE, RPT IN-SERVICE, MAX 90 °F FWTR, WITH MAX 55 °F TEMPERATURE DIFFERENTIAL BETWEEN FEEDWATER SPARGER LINES (AFTO)



## FIGURE 15

## POWER-DEPENDENT MAPLHGR MULTIPLIER, MAPFAC(P)
## THIS FIGURE IS REFERRED TO BY TECHNICAL SPECIFICATION 3.2.1, 3.3.4.2, and 3.7.6

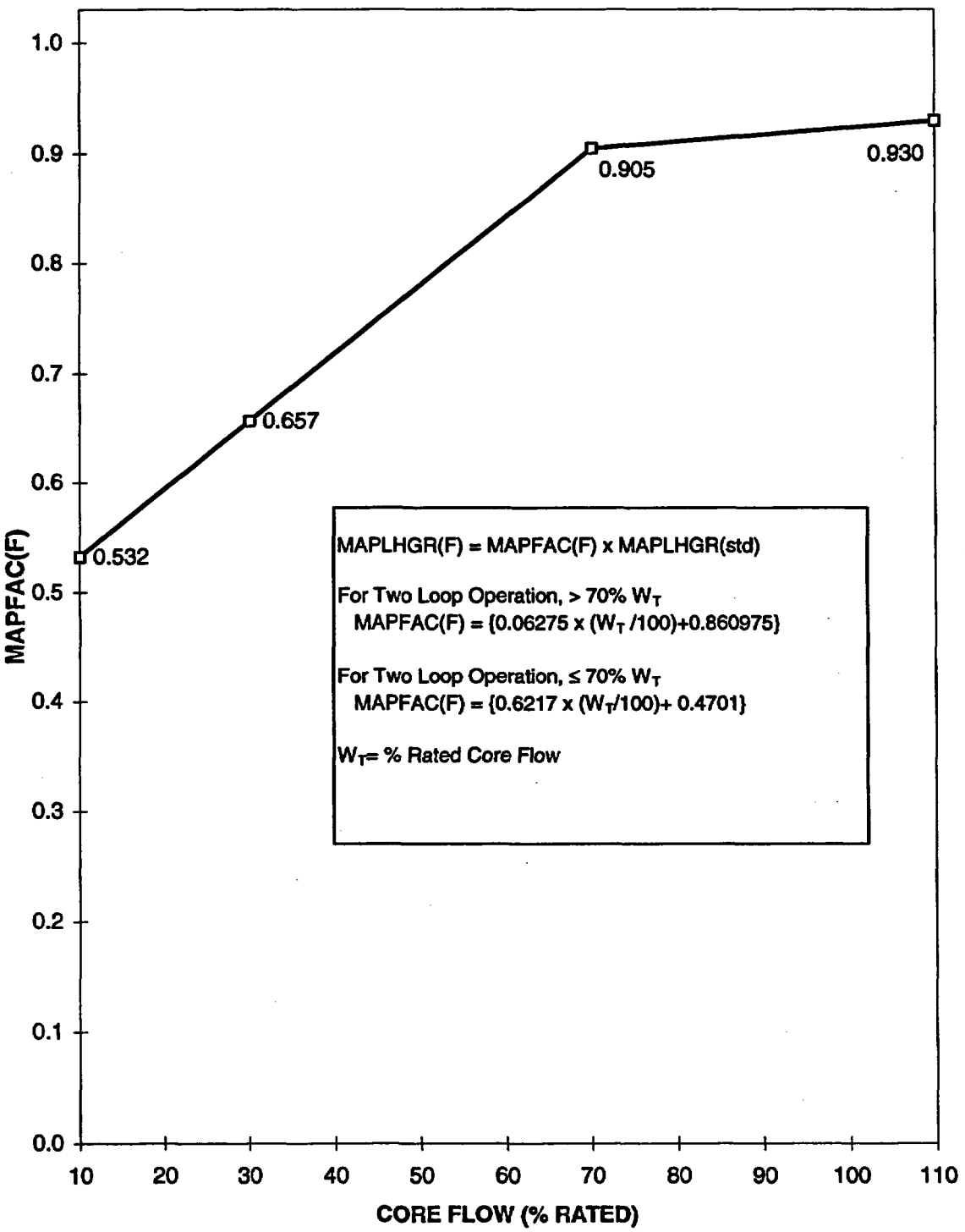
### VALID FOR 3 OR MORE TBVOOS OR RPTOOS, MAX 90 °F FWTR, WITH MAX 55 °F TEMPERATURE DIFFERENTIAL BETWEEN FEEDWATER SPARGER LINES (AFTO)



## FIGURE 16

## FLOW-DEPENDENT MAPLHGR MULTIPLIER, MAPFAC(F)
## THIS FIGURE IS REFERRED TO BY TECHNICAL SPECIFICATION 3.2.1

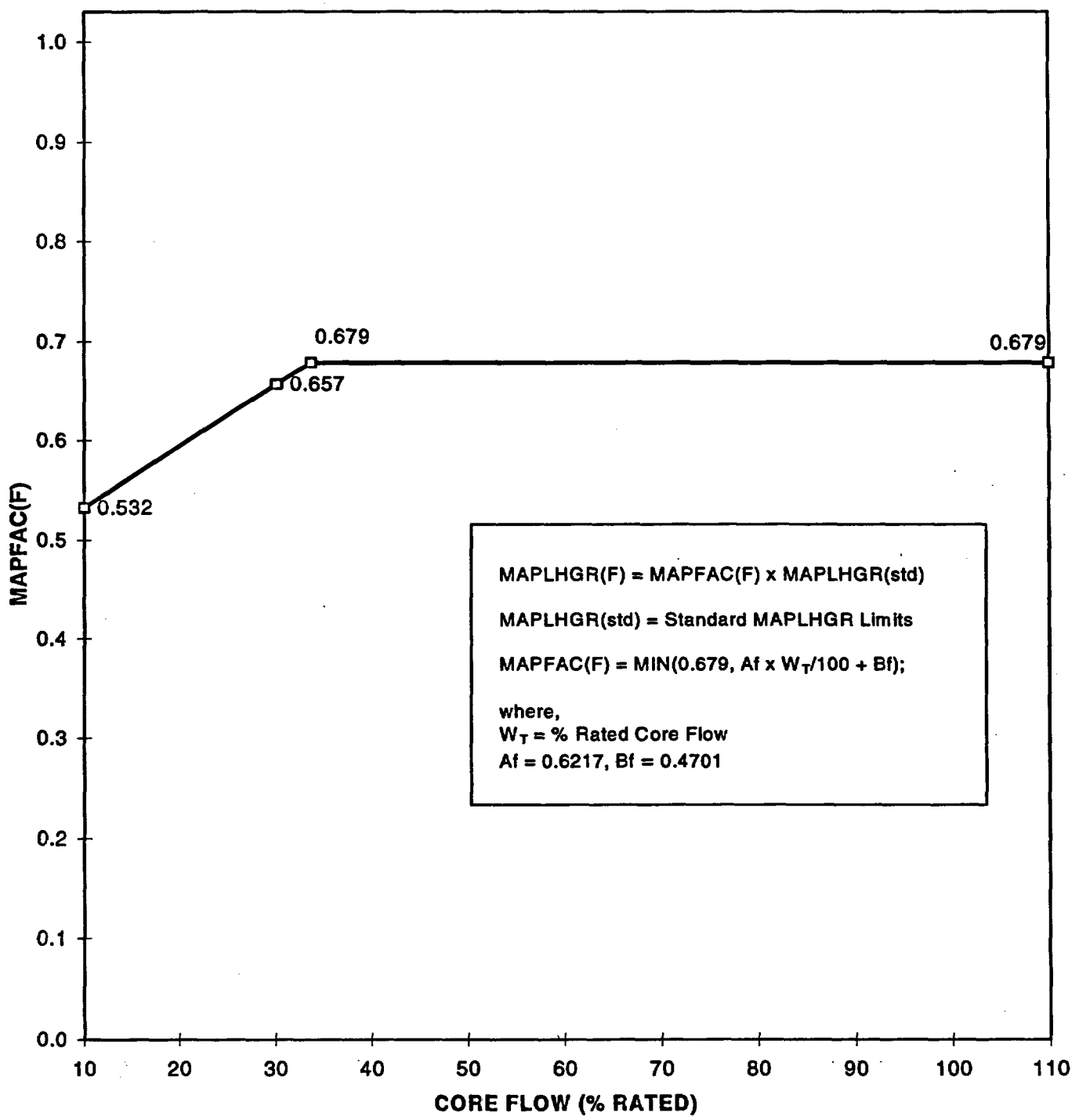
### VALID FOR 2 LOOP RECIRC FLOW WITH MAX 55 °F TEMPERATURE DIFFERENTIAL BETWEEN FEEDWATER SPARGER LINES (AFTO)



## FIGURE 17

## FLOW-DEPENDENT MAPLHGR MULTIPLIER, MAPFAC(F)
## THIS FIGURE IS REFERRED TO BY TECHNICAL SPECIFICATION 3.2.1 AND 3.4.1

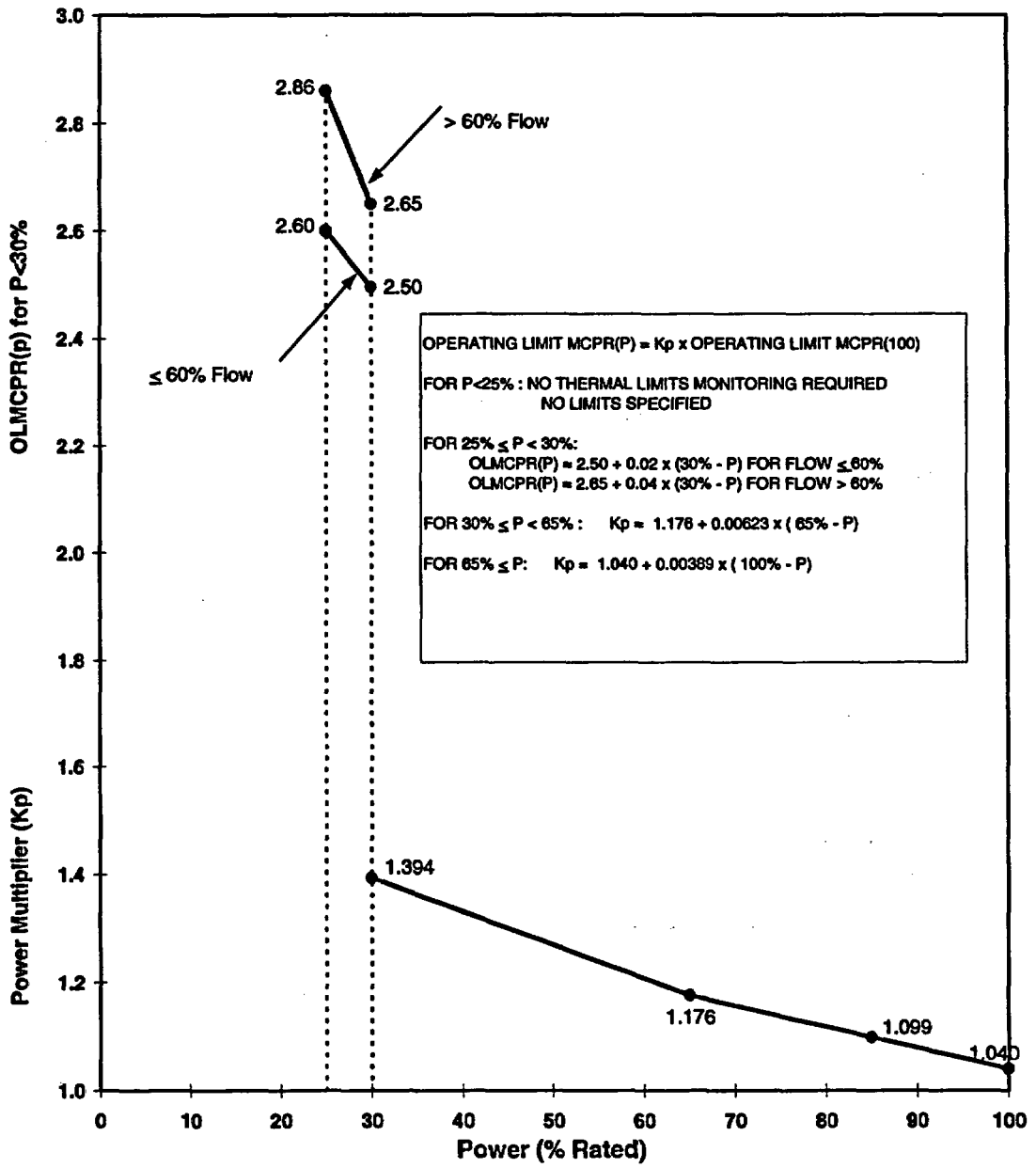
### VALID FOR SINGLE LOOP RECIRC FLOW WITH MAX 55 °F TEMPERATURE DIFFERENTIAL BETWEEN FEEDWATER SPARGER LINES (AFTO)



## FIGURE 18

## POWER-DEPENDENT MCPR LIMIT, OLMCPR(p), AND MULTIPLIERS
## THIS FIGURE IS REFERRED TO BY TECHNICAL SPECIFICATION 3.2.2

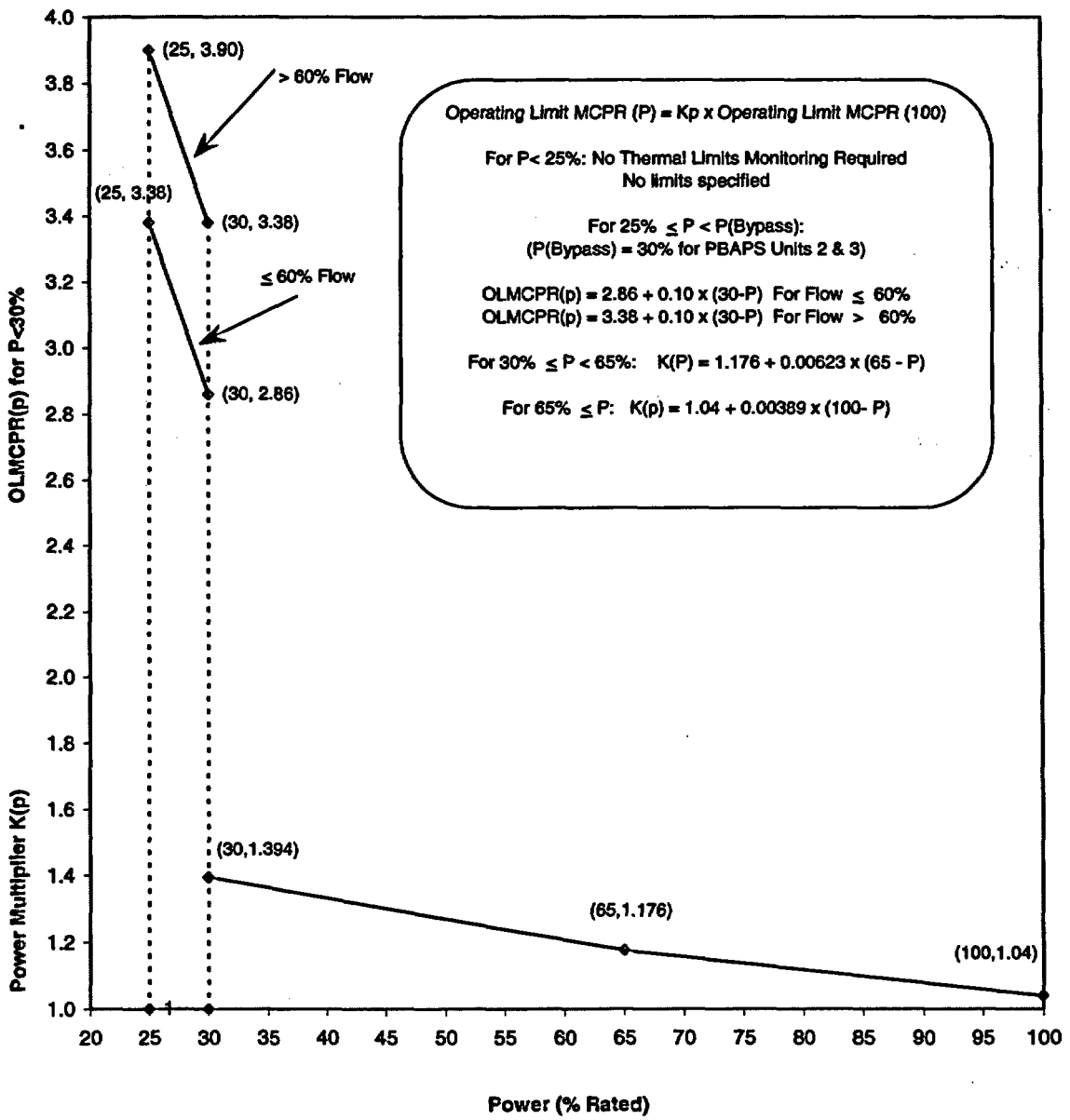
### VALID FOR 7 OR MORE TBVs IN-SERVICE, RPT IN-SERVICE, MAX 90 °F FWTR, WITH MAX 55 °F TEMPERATURE DIFFERENTIAL BETWEEN FEEDWATER SPARGER LINES (AFTO)



## FIGURE 19

## POWER-DEPENDENT MCPR LIMIT, OLMCPR(p), AND MULTIPLIERS
## THIS FIGURE IS REFERRED TO BY TECHNICAL SPECIFICATION 3.2.2, 3.3.4.2, and 3.7.6

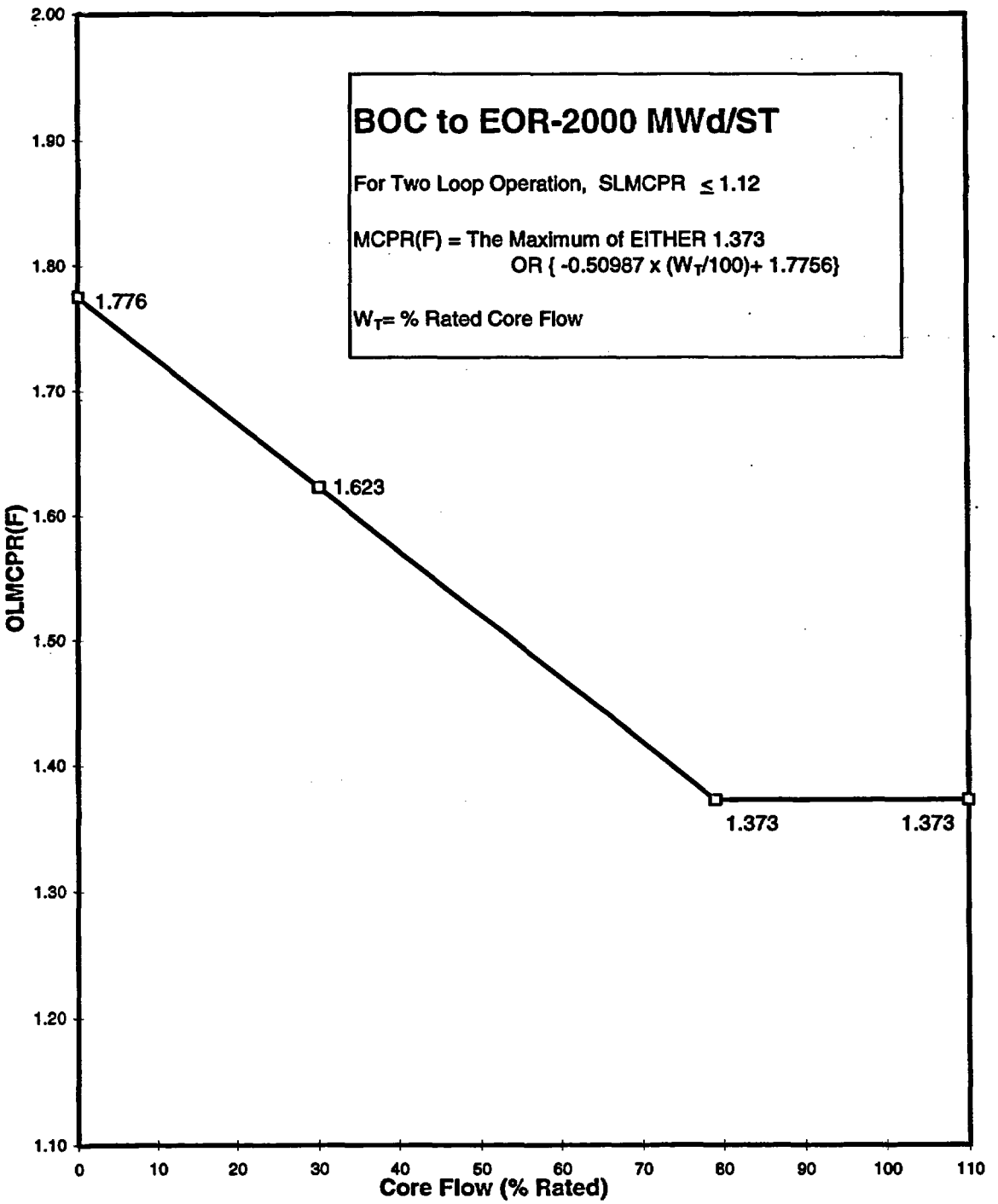
### VALID FOR 3 OR MORE TBVOOS OR RPTOOS, MAX 90 °F FWTR, WITH MAXIMUM 55 °F TEMPERATURE DIFFERENTIAL BETWEEN FEEDWATER SPARGER LINES (AFTO)



## FIGURE 20

## FLOW-DEPENDENT MCPR LIMITS, OLMCPR(F)
## THIS FIGURE IS REFERRED TO BY TECHNICAL SPECIFICATION 3.2.2 AND 3.4.1

### VALID FOR ALL CONDITIONS WITH MAXIMUM 55 °F TEMPERATURE DIFFERENTIAL BETWEEN FEEDWATER SPARGER LINES (AFTO) [BOC to EOR-2000 MWd/ST]



## FIGURE 21

## FLOW-DEPENDENT MCPR LIMITS, OLMCPR(F)
## THIS FIGURE IS REFERRED TO BY TECHNICAL SPECIFICATION 3.2.2 AND 3.4.1

### VALID FOR ALL CONDITIONS WITH MAXIMUM 55 °F TEMPERATURE DIFFERENTIAL BETWEEN FEEDWATER SPARGER LINES (AFTO) [EOR-2000 MWd/ST to EOC]