Exhibit B

Monticello Nuclear Generating Plant

License Amendment Request Dated July 26, 1989

Proposed Changes Marked Up on Existing
Technical Specification Pages

Exhibit B consists of the existing Technical Specification pages with the proposed changes marked up on those pages. Existing pages affected by this change are listed below:

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LIST OF FIGURES

List of Tables (continued)

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F. Instrument Calibration - An instrument calibration means the adjustment of an instrument signal output so that it corresponds, within acceptable range, accuracy, and response time to a known value(s) of the parameter which the instrument monitors. Calibration shall encompass the entire instrument including actuation, alarm or trip. Response time is not part of the routine instrument calibration but will be checked once per cycle.

G. Limiting Conditions for Operation (LCO) - The limiting conditions for operation specify the minimum acceptable levels of system performance necessary to assure safe startup and operation of the facility. When these conditions are met, the plant can be operated safely and abnormal situations can be safety controlled.

H. ~~Limiting Control Rod Pattern (LCRP) - A limiting control rod pattern for rod withdrawal error (RWE) exists when: a) Thermal power is below 90% of rated and the MCPR is less than 1.70 or b) Thermal power is 90% of rated or above and the MCPR is less than 1.40.~~

I. Limiting Safety System Setting (LSSS) - The limiting safety system settings are settings on instrumentation which initiate the automatic protective action at a level such that the safety limits will not be exceeded. The region between the safety limit and these settings represents margin with normal operation lying below these settings. The margin has been established so that with proper operation of the instrumentation, the safety limits will never be exceeded.

J. Minimum Critical Power Ratio (MCPR) - The minimum critical power ratio is the value of critical power ratio associated with the most limiting assembly in the reactor core. Critical power ratio (CPR) is the ratio of that power in a fuel assembly which is calculated by the GEXL correlation to cause some point in the assembly to experience boiling transition to the actual assembly operating power.

K. Mode - The reactor mode is that which is established by the mode-selector switch.

L. Operable - A system, subsystem, train, component or device shall be Operable or have Operability when it is capable of performing its specified function(s). Implicit in this definition shall be the assumption that all necessary attendant instrumentation, controls, normal and emergency electrical power sources, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component or device to perform its function(s) are also capable of performing their related support function(s).

AQ. <u>Core Operating Limits Report</u> The Core Operating Limits Report is the unit specific document that provides core operating limits for the current operating reload cycle. These cycle-specific operating limits shall be determined for each reload cycle in accordance with Specification 6.7.A.7. Plant operation within these operating limits is addressed in individual specifications.

NEW PAGE

BASES:

2.3 The abnormal operational transients applicable to operation of the Monticello Unit have been analyzed throughout the spectrum of planned operating conditions up to the thermal power level of 1670 MWt. The analyses were based upon plant operation in accordance with the operating map ~~given in Figure 3-1 of Reference 2.~~ The licensed maximum power level 1670 MWt represents the maximum steady-state power which shall not knowingly be exceeded.

Conservatism is incorporated in the transient analyses in estimating the controlling factors, such as void reactivity coefficient, control rod scram worth, scram delay time, peaking factors, and axial power shapes. These factors are selected conservatively with respect to their effect on the applicable tranisent results as determined by the current analysis model. Conservatism incorporated into the transient analysis is documented in Reference 1.

Bases Continued:

that the reactor mode switch be in the startup position where protection of the fuel cladding integrity safety limit is provided by the IRM high neutron flux scram. Thus, the combination of main steam line low pressure isolation and isolation valve closure scram assures the availability of the neutron scram protection over the entire range of applicability of the fuel cladding integrity safety limit.

The operator will set this pressure trip at greater than or equal to 825 psig. However, the actual trip setting can be as much as 10 psi lower due to the deviations discussed on page 39.

~~References~~

~~1. "General Electric Standard Application for Reactor Fuel", NEDE-24011-P-A (as amended).~~

~~2. "Average Power Range Monitor, Rod Block Monitor and Technical Specifications Improvement (ARTS) Program for Monticello Nuclear Generating Plant", NEDG-30492-P, April, 1984.~~

~~3. "Monticello Nuclear Generating Plant Single Loop Operation", NEDO-24271, June, 1980.~~

3.0 LIMITING CONDITIONS FOR OPERATION	4.0 SURVEILLANCE REQUIREMENTS

B. Emergency Core Cooling Subsystems Actuation

When irradiated fuel is in the reactor vessel and the reactor water temperature is above 212°F, the limiting conditions for operation for the instrumentation which initiates the emergency core cooling subsystems are given in Table 3.2.2.

C. Control Rod Block Actuation

1. SRM, IRM, APRM and Scram Discharge Volume Rod Blocks

   The limiting conditions of operation for the instrumentation that initiates control rod block are given in Table 3.2.3.

2. Rod Block Monitor (RBM)

   a. When core thermal power is greater than or equal to 30% of rated and ~~a Limiting Control Rod Pattern exists~~ MCPR is below the limits specified in the Core Operating Limits Report, either:

      (1) Both RBM channels shall be operable, or

      (2) With one RBM channel inoperable, control rod withdrawal shall be blocked within 24 hours, or

      (3) With both RBM channels inoperable, control rod withdrawal shall be blocked immediately.

C. Control Rod Block Actuation.

During operation requiring RBM operability when only one channel is operable, an instrument functional test of the operable RBM shall be performed within 24 hours prior to withdrawal of control rod(s).

TABLE 3.2.3 - Continued
Instrumentation That Initiates Rod Block

Function	Trip Settings	Reactor Modes in Which Function Must be Operable or Operating and Allowable Bypass Conditions** Refuel	Startup	Run	Total No. of Instrument Channels per per System	Min. No. of Operable or Operating Instrument Channels per Trip System	Required Conditions*
4. RBM							
a. Upscale (power referenced). (Note 8)		See Section 3.2.C.2			1	See Section 3.2.C.2 (note 5)	See Section 3.2.C.2
~~1. Low Trip Setpoint (LSTP)~~	~~<120/125 of full scale~~						
~~2. Intermediate Setpoint (ISTP)~~	~~<115/125 of full scale~~						
~~3. High Trip Setpoint (HTSP)~~	~~<110/125 of full scale~~						
b. Downscale	>94/125 of full scale	See Section 3.2.C.2			1	See Section 3.2.C.2 (note 5)	See Section 3.2.C.2
5. Scram Discharge Volume							
Water Level - High							
a. East	<40 gal		X	X	1	1 (note 6)	B and D, or A
b. West	≤40 gal		X	X	1	1 (note 6)	B and D, or A

Table 3.2.3 - Continued
Instrumentation That Initiates Rod Block

Notes:

(1) There shall be two operable or operating trip systems for each function. If the minimum number of operable or operating instrument channels cannot be met for one of the two trip systems, this condition may exist up to seven days provided that during this time the operable system is functionally tested immediately and daily thereafter.

(2) "W" is the reactor recirculation driving flow in percent, dw = 0 for two recirculation loop operation, dw = 5.4 for single recirculation loop operation.

(3) Only one of the four SRM channels may be bypassed.

(4) There must be at least one operable or operating IRM channel monitoring each core quadrant.

(5) An RBM channel will be considered inoperable if there are less than half the total number of normal inputs.

(6) Upon discovery that minimum requirements for the number of operable or operating trip systems or instrument channels are not satisfied actions shall be initiated to:

(a) Satisfy the requirements by placing appropriate channels or systems in the tripped condition or

(b) Place the plant under the specified required conditions using normal operating procedures.

(7) There must be a total of at least 4 operable or operating APRM channels

(8) There are 3 upscale trip levels. Only one is applied over a specified operating core thermal power range. All RBM trips are automatically bypassed below 30% thermal power.

Trip settings are provided in the Core Operating Limits Report.

Bases Continued:

3.2 The HPCI and/or RCIC high flow and temperature instrumentation is provided to detect a break in the HPCI and/or RCIC piping. Tripping of this instrumentation results in actuation of HPCI and/or RCIC isolation valves; i.e., Group 4 and/or Group 5 valves. The trip settings of 200°F and 150% of HPCI and 300% of RCIC design flows and valve closure times are such that the core will not be uncovered and fission product release will not exceed 10 CFR 100 guidelines.

The instrumentation which initiates ECCS action is arranged in a dual bus system. As for other vital instrumentation arranged in this fashion tbe Specification preserves the effectiveness of the system even during periods when maintenance or testing is being performed.

The control rod block functions are provided to prevent excessive control rod withdrawal so that MCPR remains above the Safety Limit (T.S.2.1.A). The trip logic for this function is 1 out of n; e.g., any trip on one of the six APRM's, eight IRM's, or four SRM's will result in a rod block. The minimum instrument channel requirements for the IRM and RBM may be reduced by one for a short period of time to allow for maintenance, testing, or calibration. See Section 7.3 FSAR.

The APRM rod block trip is referenced to flow and prevents operation significantly above the licensing basis power level especially during operation at reduced flow. The APRM provides gross core protection; i.e., limits the gross core power increase from withdrawal of control rods in the normal witbdrawal sequence. The operator will set the APRM rod block trip settings no greater than that stated in Table 3.2.3. However, the actual setpoint can be as much as 3% greater than that stated in Table 3.2.3 for recirculation driving flows less than 50% of design and 2% greater than that shown for recirculation driving flows greater than 50% of design due to the deviations discussed on page 39.

The RBM provides local protection of the core; i.e., the prevention of critical power in a local region of the core, for a single rod withdrawal error from a limiting control rod pattern. The trip point is referenced to power. This power signal is provided by the APRMs. A statistical analysis of many single control rod withdrawal errors has been performed and at the 95/95 level the results show that with the specified trip settings, rod withdrawal is blocked at MCPRs greater than the Safety Limit, thus allowing adequate margin. This analysis assumes a steady state MCPR ~~of 1.30~~ prior to the postulated rod withdrawal error. The RBM functions are required when core thermal power is greater than 30% and a Limiting Control Rod Pattern exists. When both RBM channels are operating either channel will assure required withdrawal blocks occur even assuming a single failure of one channel. With one RBM channel inoperable for no more than 24 hours, testing of the RBM prior to withdrawal of control rods assures that improper control rod withdrawal will be blocked ~~(Reference 1)~~. Requiring at least half of the normal LPRM inputs to be operable assures that the RBM response will be adequate to protect against rod withdrawal errors, as shown by a statistical failure analysis.

Bases Continued:

open and instrumentation drift has caused the nominal 80-psi blowdown range to be reduced to 60 psi. Maximum water leg clearing time has been calculated to be less than 6 seconds for the Monticello design. Inhibit timers are provided for each valve to prevent the valve from being manually opened less than 10 seconds following valve closure. Valve opening is sensed by pressure switches in the valve discharge line. Each valve is provided with two trip, or actuation, systems. Each system is provided with two channels of instrumentation for each of the above described functions. A two-out-of-two-once logic scheme ensures that no single failure will defeat the low-low set function and no single failure will cause spurious operation of a safety/relief valve. Allowable deviations are provided for each specified instrument setpoint. Setpoints within the specified allowable deviations provide assurance that subsequent safety/relief valve actuations are sufficiently spaced to allow for discharge line water leg clearing.

Control room habitability protection assures that the control room operators will be adequately protected against the effects of accidental releases of toxic substances and of radioactive leakage which may bypass secondary containment following a loss of coolant accident or radioactive releases from a steam line break accident, thus assuring that the Monticello Nuclear Generating Plant can be operated or shutdown down safely. A study conducted by Bechtel Power Corporation concluded that of the onsite and offsite potential toxic chemical hazards, only chlorine required automatic detection and isolation to prevent incapacitation of control room operators. All other chemicals were determined to have at least two minutes between detection and possible incapacitation. Protection for there toxic chemicals is provided through operator training.

Although the operator will set the setpoints within the trip settings specified in Tables 3.2.1 through 3.2.9, the actual values of the various set points can differ appreciably from the value the operator is attempting to set. The deviations could be caused by inherent instrument error, operator setting error, drift of the set point, etc. Therefore, these deviations have been accounted for in the various transient analyses and the actual trip settings may vary by the following amounts:

~~References:~~

~~1. "Average Power Range Monitor, Rod Block Monitor and Technical Specifications Improvement (ARTS) Program for Monticello Nuclear Generating Plant", NEDG-30492-P, April, 1984.~~

3.0 LIMITING CONDITIONS FOR OPERATION

3.11 REACTOR FUEL ASSEMBLIES

Applicability

The Limiting Conditions for Operation associated with the fuel rods apply to those parameters which monitor the fuel rod operating conditions.

Objective

The objective of the Limiting Conditions for Operation is to assure the performance of the fuel rods.

Specifications

A. Average Planar Linear Heat Generation Rate (APLHGR)

During two recirculation loop power operation, the APLHGR limiting condition for operation for each type of fuel as a function of axial location and average planar exposure shall not exceed limits based on applicable APLHGR limit values which have been approved for the respective fuel and lattice types as determined by the approved methodology described in NEDE-24011-P-A (GESTAR II). This approval is based on and limited to GESTAR II methodology. When hand calculations are required, the APLHGR for each type of fuel as a function of average planar exposure shall not exceed the limiting value for the most limiting lattice (excluding natural uranium) ~~shown in Table 3.11.1 (based on straight line interpolation between data points) multiplied by the smaller of the two MAPFAC factors determined from Figures 3.11.1 and 3.11.2.~~ provided in the Core Operating Limits Report.

During one recirculation loop power operation, the APLHGR limiting condition for operation for each type of fuel shall not exceed the above values multiplied by 0.85.

If at any time during power operation, it is determined that the APLHGR limiting condition for operation is being exceeded, action shall be initiated within 15 minutes to restore operation to within the prescribed limits. Surveillance and corresponding action shall continue until reactor operation is within the prescribed limits. If the APLHGR is not returned to within the prescribed limits within two hours, reduce thermal power to less than 25% within the next four hours.

4.0 SURVEILLANCE REQUIREMENTS

4.11 REACTOR FUEL ASSEMBLIES

Applicability

The Surveillance Requirements apply to the parameters which monitor the fuel rod operating conditions.

Objective

The objective of the Surveillance Requirements is to specify the type and frequency of surveillance to be applied to the fuel rods.

Specifications

A. Average Planar Linear Heat Generation Rate (APLHGR)

The APLHGR for each type of fuel as a function of average planar exposure shall be determined daily during reactor operation at $\geq$25% rated thermal power.

3.0 LIMITING CONDITIONS FOR OPERATION

B. Linear Heat Generation Rate (LHGR)

During power operation, the LHGR shall be less than or equal to ~~13.4 Kw/ft for all fuel types except GE8x8EB(GE8) fuel, and less than or equal to 14.4 Kw/ft for GE8x8EB fuel.~~ the limits specified in the Core Operating Limits Report

If at any time during operation it is determined that the limiting value for LHGR is being exceeded, action shall be initiated within 15 minutes to restore operation to within the prescribed limits. Surveillance and corresponding action shall continue until reactor operation is within the prescribed limits. If the LHGR is not returned to within the prescribed limits within 2 hours, reduce thermal power to less than 25% within the next 4 hours.

4.0 SURVEILLANCE REQUIREMENTS

B. Linear Heat Generation Rate (LHGR)

The LHGR shall be checked daily during reactor operation at ≥25% of rated thermal power.

C. Minimum Critical Power Ratio (MCPR)

~~If thermal~~ power is greater than 45%, the MCPR limit is the greater of:

1) 1.30 multiplied by K_P from Figure 3.11.3. or,

2) $MCPR_F$ from Figure 3.11.4.

If thermal power is less than or equal to 45%, the MCPR limit is obtained from ~~Figure 3.11.3.~~

The OLMCPR limit for one recirculation loop operation is 0.01 higher than the comparable two loop value.

If at any time during operation it is determined that the limiting value for MCPR is being exceeded, action shall be initiated within 15 minutes to restore operation to within the prescribed limits. Surveillance and corresponding action shall continue until reactor operation is within the prescribed limits. If the steady state MCPR is not returned to within the prescribed limits within two hours, reduce thermal power to less than 25% within the next four hours.

The MCPR shall be greater than or equal to the limits provided in the Core Operating Limits Report.

C. Minimum Critical Power Ratio (MCPR)

MCPR shall be determined daily during reactor power operation at ≥25% rated thermal power and following any change in power level or distribution which has the potential of bringing the core to its operating MCPR Limit.

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Move to Core Operating Limits Report

TABLE 3.11.1 MAXIMUM AVERAGE PLANAR LINEAR HEAT GENERATION RATE vs. EXPOSURE

Exposure MWD/STU	MAPLHGR FOR EACH FUEL TYPE (kw/ft)					
	P8DRB265L BP8DRB265L	P8DRB282 BP8DRB282L	P8DRB284LB BP8DRB284LB	P8DRB299L BP8DRB299L	BD 319B	Other GE 8 Fuel
200	11.6	11.2	11.4	11.0	11.19	10.7
1,000	11.6	11.2	11.4	11.0	11.31	10.8
5,000	11.8	11.8	11.8	11.6	11.99	11.5
10,000	11.9	11.9	11.9	11.9	12.60	12.1
15,000	11.9	11.8	11.9	11.9	12.34	11.8
20,000	11.8	11.7	11.7	11.8	11.95	11.4
25,000	11.3	11.3	11.4	11.5	11.56	11.0
30,000	10.7	11.1	10.8	10.9	10.54	10.0
35,000	10.2	10.4	10.2	10.3	9.53	9.0
40,000	9.6	9.8	9.5	9.7	-	-
45,000	-	-	8.9	9.0	-	-
50,000	-	-	-	-	6.28	5.8

Note: For two recirculation loop operation. For single loop operation multiply these values by 0.85.

Move to the Core Operating Limit Report

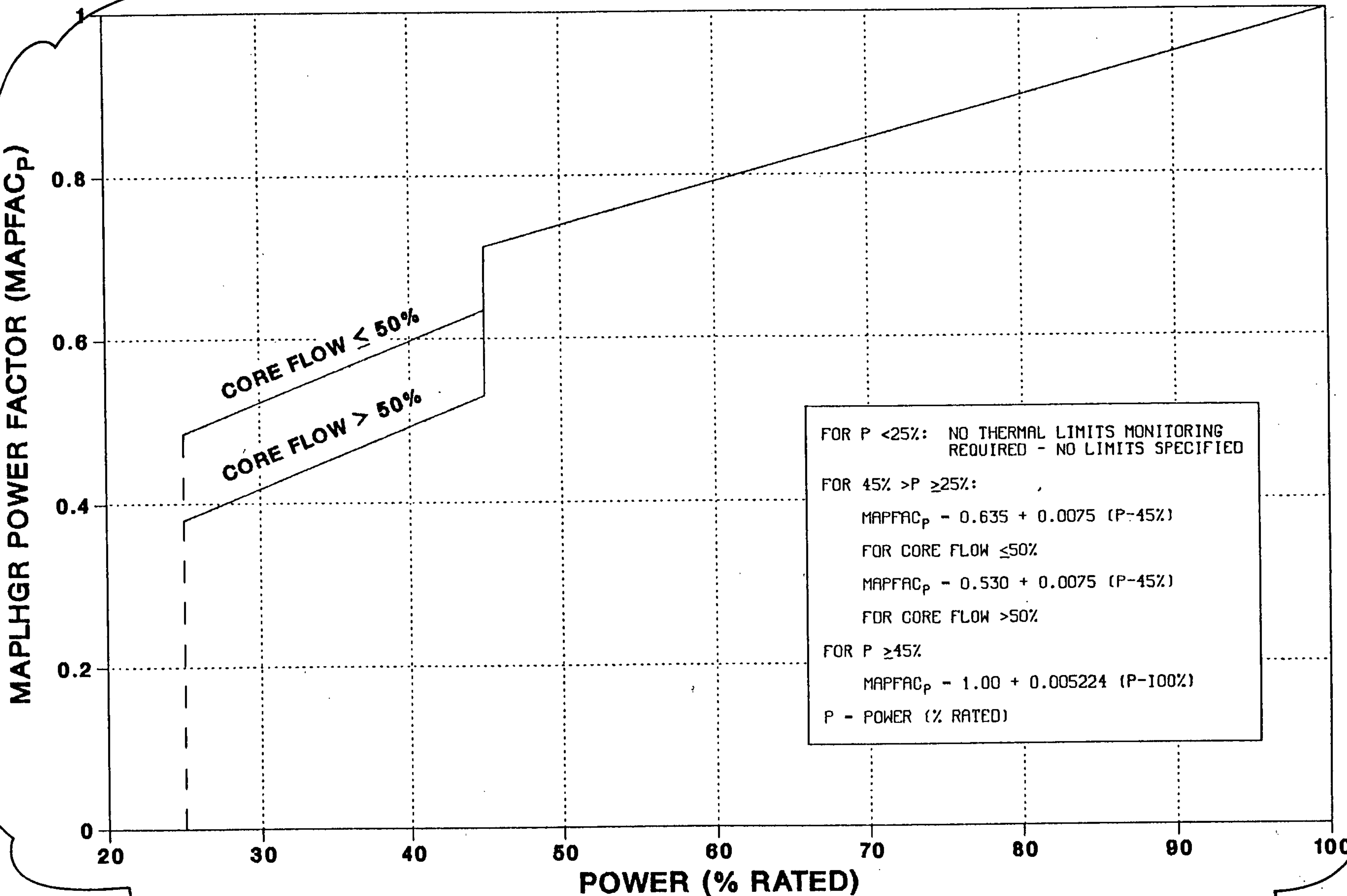
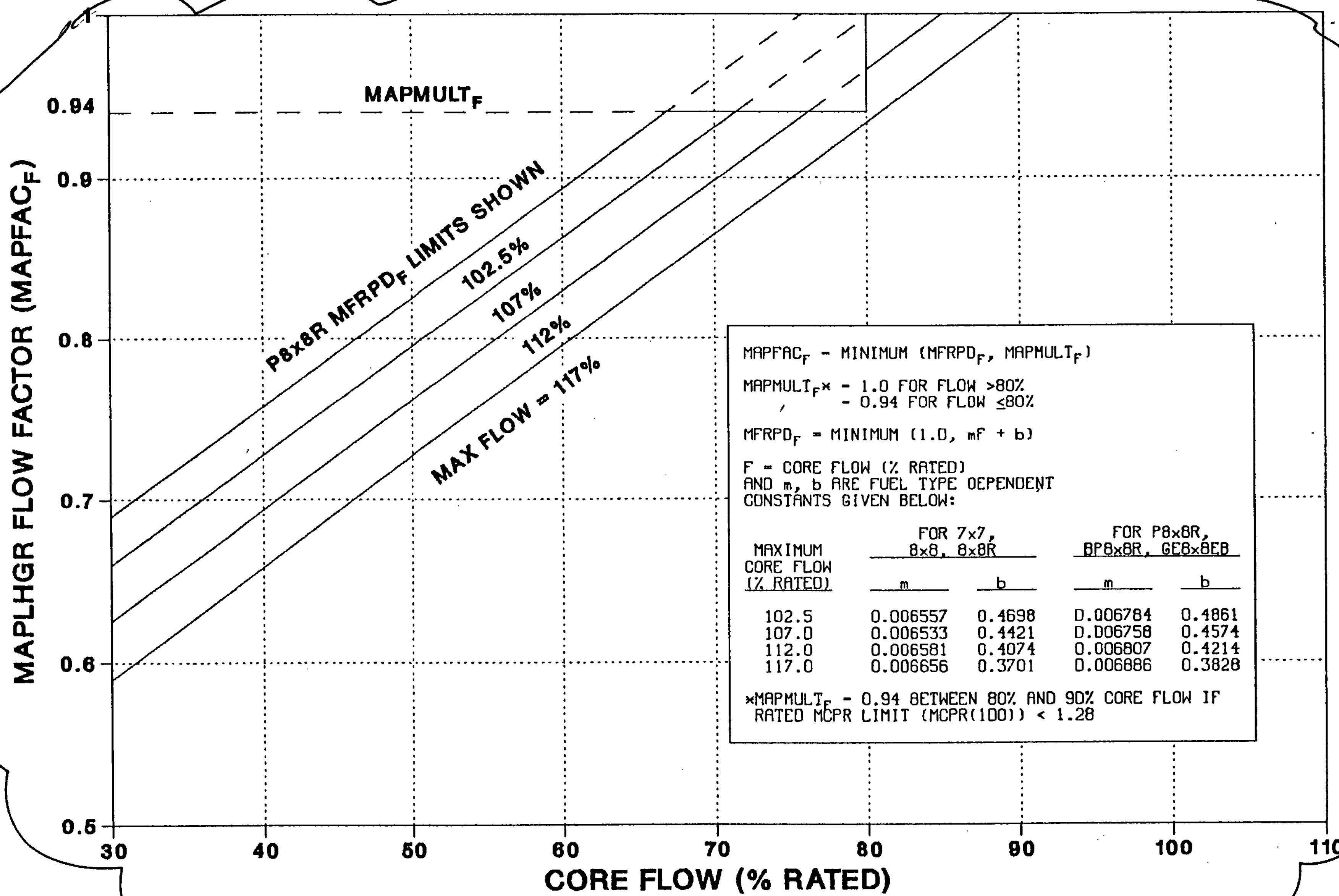


FIGURE 3.11.1 MAPFAC$_P$ LIMITS

Move to the Core Operating Limits Report



MAPFAC$_F$ = MINIMUM (MFRPD$_F$, MAPMULT$_F$)

MAPMULT$_F$* = 1.0 FOR FLOW >80%
= 0.94 FOR FLOW ≤80%

MFRPD$_F$ = MINIMUM (1.0, mF + b)

F = CORE FLOW (% RATED)
AND m, b ARE FUEL TYPE DEPENDENT CONSTANTS GIVEN BELOW:

MAXIMUM CORE FLOW (% RATED)	FOR 7x7, 8x8, 8x8R m	FOR 7x7, 8x8, 8x8R b	FOR P8x8R, BP8x8R, GE8x8EB m	FOR P8x8R, BP8x8R, GE8x8EB b
102.5	0.006557	0.4698	0.006784	0.4861
107.0	0.006533	0.4421	0.006758	0.4574
112.0	0.006581	0.4074	0.006807	0.4214
117.0	0.006656	0.3701	0.006886	0.3828

*MAPMULT$_F$ = 0.94 BETWEEN 80% AND 90% CORE FLOW IF RATED MCPR LIMIT (MCPR(100)) < 1.28

FIGURE 3.11.2 MAPFAC$_F$ LIMITS

Move to the Core Operating Limit Report

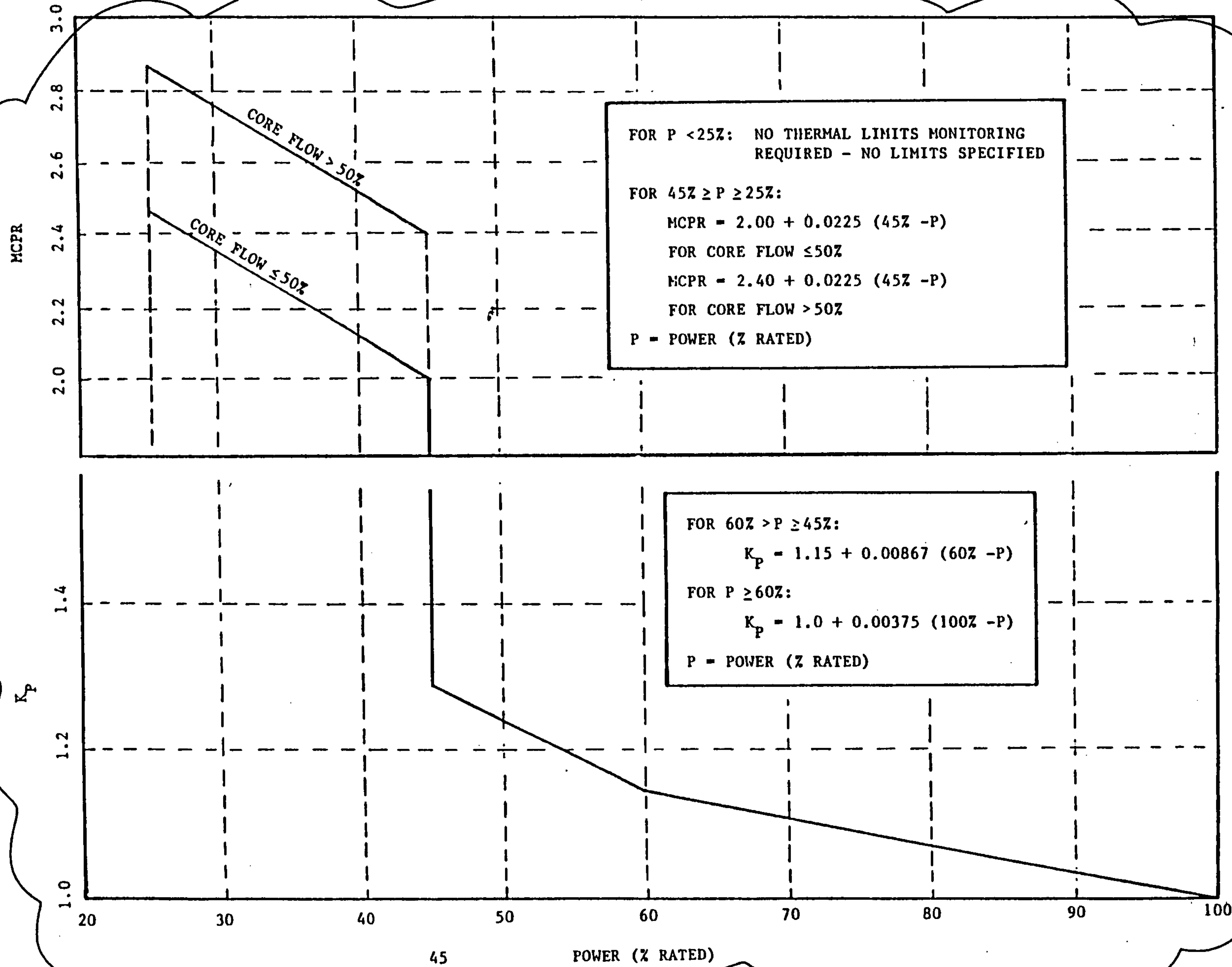


FIGURE 3.11.3 POWER DEPENDENT MCPR LIMITS

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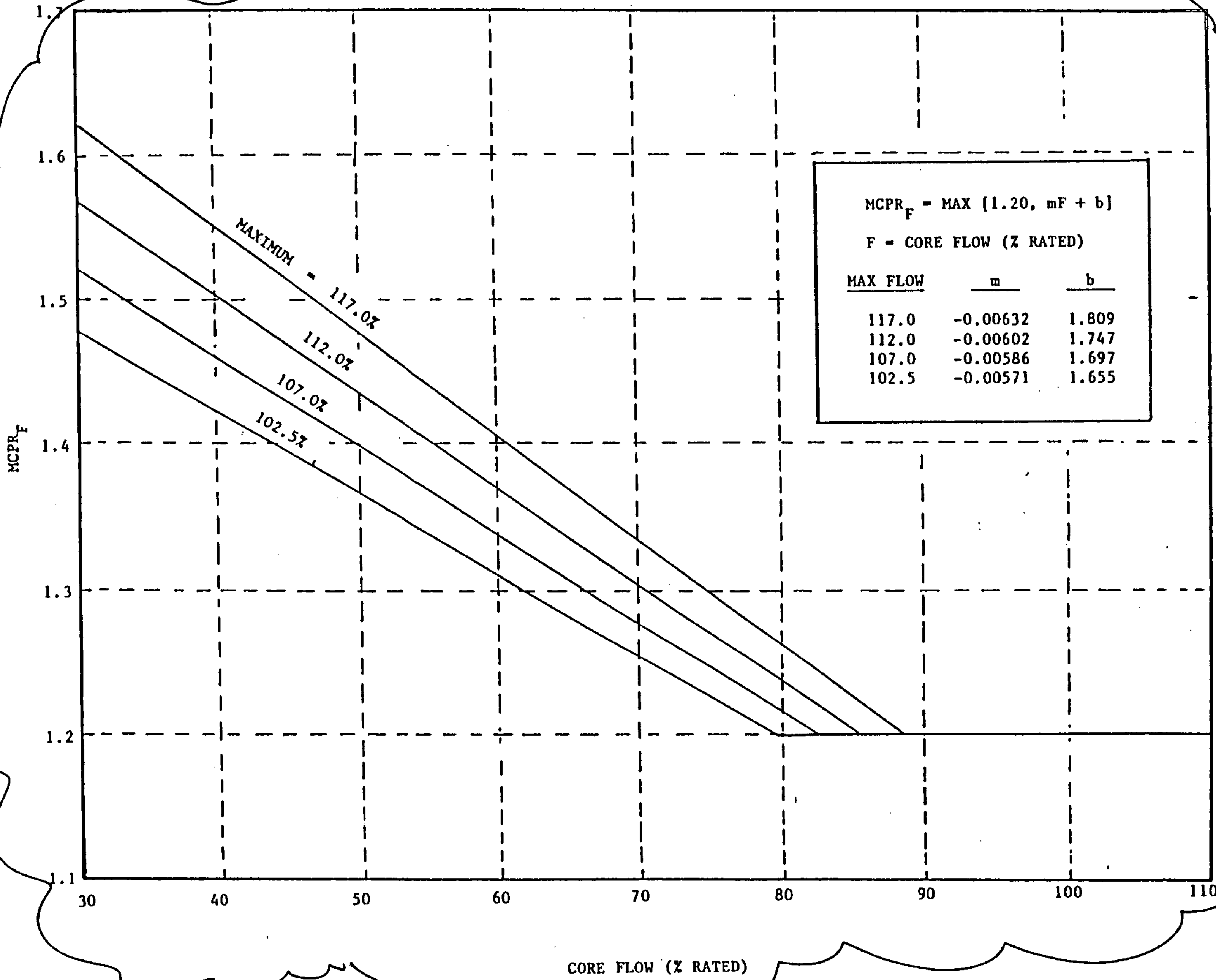

$MCPR_F$ = MAX [1.20, mF + b]

F = CORE FLOW (% RATED)

MAX FLOW	m	b
117.0	-0.00632	1.809
112.0	-0.00602	1.747
107.0	-0.00586	1.697
102.5	-0.00571	1.655

FIGURE 3.11.4 $MCPR_F$ LIMITS

provided in the Core Operating Limits Report

Bases 3.11:

A. Average Planar Linear Heat Generation Rate (APLHGR)

This specification assures tbat the peak cladding temperature following the postulated design bases loss-of-coolant accident will not exceed the limit specified in the 10CFR50, Appendix K.

The peak cladding temperature following a postulated loss-of-coolant accident is primarily a function of the average heat generation rate of all the rods of a fuel assembly at any axial location and is only dependent secondarily on the rod to rod power distribution within an assembly. Since expected local variations in power distribution within a fuel assembly affect the calculated peak cladding temperature by less than ±20° relative to the peak temperature for a typical fuel design, the limit on the average linear heat generation rate is sufficient to assure that calculated temperatures at rated conditions conform to 10CFR50.46. The limiting value for APLHGR is given by this specification.

The flow dependent correction factor (~~Figure 3.11.2~~) applied to the rated condition's APLHGR limits assures that 1) the 2200°F PCT limit would not be exceeded during a LOCA initiated from less than rated core flow conditions and 2) the fuel thermal-mechanical design criteria would be met during abnormal transients initiated from less than rated core flow conditions. The power dependent correction factor (~~Figure 3.11.1~~) applied to the rated conditions APLHGR limits assures that the fuel thermal-mechanical design criteria would be met during abnormal transients initiated from all conditions (~~Reference 1~~).

Those abnormal operational transients, analyzed in FSAR Section 14.5 which result in an automatic reactor scram are not considered a violation of LCO. Exceeding APHLGR limits in such cases need not be reported.

B. LHGR

This specification assures that the linear heat generation rate in any rod is less that the design linear heat generation.

Those abnormal operational transients, analyzed in FSAR Section 14.5, which result in an automatic reactor scram are not considered a violation of LCO. Exceeding LHGR limits in such cases need not be reported.

C. Minimum Critical Power Ratio (MCPR)

1 and 2

The ECCS evaluation presented in Reference ~~4 and Reference 6~~ assumed the steady state MCPR prior to the postulated loss-of-coolant accident ~~to be 1.24~~ for all fuel types for rated flow. The Rated

Bases Continued:

MCPR Limit is determined from the analysis of transients discussed in Bases Sections 2.1 and 2.3. By maintaining an operating MCPR above these limits, the Safety Limit (T.S. 2.1.A) is maintained in the event of the most limiting abnormal operational transient.

At less than 100% of rated flow and power the required MCPR is the larger value of the $MCPR_F$ and $MCPR_P$ at the existing core flow and power state. The required MCPR is a function of flow in order to protect the core from inadvertent core flow increases such that the 99.9% MCPR limit requirement can be assured.

The MPCRs were calculated such that for the maximum core flow rate and the corresponding thermal power along the 105% of rated power/flow control line, the limiting bundle's relative power was adjusted until the MCPR was slightly above the Safety Limit. Using this relative bundle power, the MCPRs were calculated at different points along the 105% of rated power flow control line corresponding to different core flows. The calculated MCPR at a given point of core flow ($MCPR_F$) is ~~defined in Figure 3.11.4 (Reference 1)~~.

For operation above 45% of rated thermal power, the core power dependent MCPR operating limit is the rated MCPR limit, MCPR(100), multiplied by the factor, ~~K_P given in Figure 3.11.3~~. For operation below 45% of rated thermal power (turbine control valve fast closure and turbine stop valve closure scrams can be bypassed) MCPR limits are ~~established directly from Figure 3.11.3~~. This protects the core from plant transients other than core flow increase, including a localized event such as rod withdrawal error ~~(Reference 1)~~.

provided in the Core Operating Limits Report

Bases Continued:

This limit was determined based upon bounding analyses for the limiting transient at the given core power level. ~~Further information on MCPR operating limits for off-rated conditions is presented in NEDC-30492-P. (1)~~

At thermal power levels less than or equal to 25% of rated thermal power, operating plant experience indicates that the resulting MCPR value is in excess of requirements by a considerable margin. MCPR evalution below this power level is therefore unnecessary. The daily requirement for calculating MCPR above 25% of rated thermal power is sufficient since power distribution shifts are very slow when there have not been significant power or control rod changes.

Those abnormal operational transients, analyzed in FSAR Section 14.5, which result in an automatic reactor scram are not considered a violation of the LCO. Exceeding MCPR limits in such cases need not be reported.

References

~~1. "Average Power Range Monitor, Rod Block Monitor and Technical Specification Improvement (ARTS) Program for Monticello Nuclear Generating Plant", NEDC-30492-P, April, 1984.~~

~~2. -Deleted-~~

~~3. -Deleted-~~

(1) → ~~4.~~ "General Electric Company Analytical Model for Loss-of-Coolant Analysis in Accordance with 10CFR50, Appendix K", NEDE-20566, November, 1975.

~~5. "Revision of Low Core Flow Effects on LOCA Analysis for Operating BWRs", R L Gridley (GE) to D G Eisenhut (USNRC), September 28, 1977.~~

(2) → ~~6.~~ "Loss-of-Coolant Accident Analysis Report for the Monticello Nuclear Generating Plant", NEDO-24050-1, December, 1980, L O Mayer (NSP) to Director of Nuclear Reactor Regulation (USNRC), February 6, 1981.

~~7. "Monticello Nuclear Generating Plant Single-Loop Operation", NEDO-24271, July, 1980.~~

Bases 4.11

The APLHGR, LHGR and MCPR shall be checked daily to determine if fuel burnup, or control rod movement have caused changes in power distribution. Since changes due to burnup are slow, and only a few control rods are removed daily, a daily check of power distribution is adequate. For a limiting value to occur below 25% of rated thermal power, an unreasonably large peaking factor would be required, which is not the case for operating control rod sequences. In addition, the MCPR is checked whenever changes in the core power level or distribution are made which have the potential of bringing the fuel rods to their thermal-hydraulic limits.

7. Core Operating Limits Report

a. Core operating limits shall be established and documented in the Core Operating Limits Report before each reload cycle or any remaining part of a reload cycle for the following:

Rod Block Monitor Operability Requirements
(Specification 3.2.C.2a)

Rod Block Monitor Upscale Trip Settings
(Table 3.2.3, Item 4.a)

Maximum Average Planar Linear Heat Generation Rate Limits
(Specification 3.11.A)

Linear Heat Generation Ratio Limits
(Specification 3.11.B)

Minimum Critical Power Ratio Limits
(Specification 3.11.C)

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel" (latest approved version)

NSPNAD-8608-A, "Reload Safety Evaluation Methods for Application to the Monticello Nuclear Generating Plant" (latest approved version)

NSPNAD-8609-A, "Qualification of Reactor Physics Methods for Application to Monticello" (latest approved version)

c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal-mechanical limits, core thermal-hydraulic limits, ECCS limits, nuclear limits such as shutdown margin, transient analysis limits and accident analysis limits) of the safety analysis are met.

d. The Core Operating Limits Report, including any mid-cycle revisions or supplements, shall be supplied upon issuance, for each reload cycle, to the NRC Document Control Desk with copies to the Regional Administrator and Resident Inspector.

Exhibit C

Monticello Nuclear Generating Plant

License Amendment Request Dated July 26, 1989

REVISED TECHNICAL SPECIFICATION PAGES

Exhibit C consists of revised pages for the Monticello Nuclear Generating Plant Technical Specifications with the proposed changes incorporated as listed below:

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LIST OF FIGURES

LIST OF TABLES (continued)

F. Instrument Calibration - An instrument calibration means the adjustment of an instrument signal output so that it corresponds, within acceptable range, accuracy, and response time to a known value(s) of the parameter which the instrument monitors. Calibration shall encompass the entire instrument including actuation, alarm or trip. Response time is not part of the routine instrument calibration but will be checked once per cycle.

G. Limiting Conditions for Operation (LCO) - The limiting conditions for operation specify the minimum acceptable levels of system performance necessary to assure safe startup and operation of the facility. When these conditions are met, the plant can be operated safely and abnormal situations can be safety controlled.

H. -Deleted-

I. Limiting Safety System Setting (LSSS) - The limiting safety system settings are settings on instrumentation which initiate the automatic protective action at a level such that the safety limits will not be exceeded. The region between the safety limit and these settings represents margin with normal operation lying below these settings. The margin has been established so that with proper operation of the instrumentation, the safety limits will never be exceeded.

J. Minimum Critical Power Ratio (MCPR) - The minimum critical power ratio is the value of critical power ratio associated with the most limiting assembly in the reactor core. Critical power ratio (CPR) is the ratio of that power in a fuel assembly which is calculated by the GEXL correlation to cause some point in the assembly to experience boiling transition to the actual assembly operating power.

K. Mode - The reactor mode is that which is established by the mode-selector switch.

L. Operable - A system, subsystem, train, component or device shall be Operable or have Operability when it is capable of performing its specified function(s). Implicit in this definition shall be the assumption that all necessary attendant instrumentation, controls, normal and emergency electrical power sources, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component or device to perform its function(s) are also capable of performing their related support function(s).

AQ. <u>Core Operating Limits Report</u> The Core Operating Limits Report is the unit specific document that provides core operating limits for the current operating reload cycle. These cycle-specific operating limits shall be determined for each reload cycle in accordance with Specification 6.7.A.7. Plant operation within these operating limits is addressed in individual specifications.

BASES:

2.3 The abnormal operational transients applicable to operation of the Monticello Unit have been analyzed throughout the spectrum of planned operating conditions up to the thermal power level of 1670 MWt. The analyses were based upon plant operation in accordance with the operating map. The licensed maximum power level 1670 MWt represents the maximum steady-state power which shall not knowingly be exceeded.

Conservatism is incorporated in the transient analyses in estimating the controlling factors, such as void reactivity coefficient, control rod scram worth, scram delay time, peaking factors, and axial power shapes. These factors are selected conservatively with respect to their effect on the applicable tranisent results as determined by the current analysis model. Conservatism incorporated into the transient analysis is documented in Reference 1.

Bases Continued:

that the reactor mode switch be in the startup position where protection of the fuel cladding integrity safety limit is provided by the IRM high neutron flux scram. Thus, the combination of main steam line low pressure isolation and isolation valve closure scram assures the availability of the neutron scram protection over the entire range of applicability of the fuel cladding integrity safety limit.

The operator will set this pressure trip at greater than or equal to 825 psig. However, the actual trip setting can be as much as 10 psi lower due to the deviations discussed on page 39.

3.0 LIMITING CONDITIONS FOR OPERATION	4.0 SURVEILLANCE REQUIREMENTS

B. Emergency Core Cooling Subsystems Actuation

When irradiated fuel is in the reactor vessel and the reactor water temperature is above 212°F, the limiting conditions for operation for the instrumentation which initiates the emergency core cooling subsystems are given in Table 3.2.2.

C. Control Rod Block Actuation

1. SRM, IRM, APRM and Scram Discharge Volume Rod Blocks

   The limiting conditions of operation for the instrumentation that initiates control rod block are given in Table 3.2.3.

2. Rod Block Monitor (RBM)

   a. When core thermal power is greater than or equal to 30% of rated and MCPR is below the limits specified in the Core Operating Limits Report, either:

      (1) Both RBM channels shall be operable, or

      (2) With one RBM channel inoperable, control rod withdrawal shall be blocked within 24 hours, or

      (3) With both RBM channels inoperable, control rod withdrawal shall be blocked immediately.

C. Control Rod Block Actuation.

During operation requiring RBM operability when only one channel is operable, an instrument functional test of the operable RBM shall be performed within 24 hours prior to withdrawal of control rod(s).

TABLE 3.2.3 - Continued
Instrumentation That Initiates Rod Block

Function	Trip Settings	Reactor Modes in Which Function Must be Operable or Operating and Allowable Bypass Conditions** Refuel	Startup	Run	Total No. of Instrument Channels per per System	Min. No. of Operable or Operating Instrument Channels per Trip System	Required Conditions*
4. RBM							
a. Upscale (power referenced).	(Note 8)	See Section 3.2.C.2			1	See Section 3.2.C.2 (note 5)	See Section 3.2.C.2
b. Downscale	≥94/125 of full scale	See Section 3.2.C.2			1	See Section 3.2.C.2 (note 5)	See Section 3.2.C.2
5. Scram Discharge Volume							
Water Level - High							
a. East	≤40 gal		X	X	1	1 (note 6)	B and D, or A
b. West	≤40 gal		X	X	1	1 (note 6)	B and D, or A

Table 3.2.3 - Continued
Instrumentation That Initiates Rod Block

Notes:

(1) There shall be two operable or operating trip systems for each function. If the minimum number of operable or operating instrument channels cannot be met for one of the two trip systems, this condition may exist up to seven days provided that during this time the operable system is functionally tested immediately and daily thereafter.

(2) "W" is the reactor recirculation driving flow in percent, dw = 0 for two recirculation loop operation, dw = 5.4 for single recirculation loop operation.

(3) Only one of the four SRM channels may be bypassed.

(4) There must be at least one operable or operating IRM channel monitoring each core quadrant.

(5) An RBM channel will be considered inoperable if there are less than half the total number of normal inputs.

(6) Upon discovery that minimum requirements for the number of operable or operating trip systems or instrument channels are not satisfied actions shall be initiated to:

(a) Satisfy the requirements by placing appropriate channels or systems in the tripped condition or

(b) Place the plant under the specified required conditions using normal operating procedures.

(7) There must be a total of at least 4 operable or operating APRM channels

(8) There are 3 upscale trip levels. Only one is applied over a specified operating core thermal power range. All RBM trips are automatically bypassed below 30% thermal power. Trip settings are provided in the Core Operating Limits Report.

3.2 The HPCI and/or RCIC high flow and temperature instrumentation is provided to detect a break in the HPCI and/or RCIC piping. Tripping of this instrumentation results in actuation of HPCI and/or RCIC isolation valves; i.e., Group 4 and/or Group 5 valves. The trip settings of 200°F and 150% of HPCI and 300% of RCIC design flows and valve closure times are such that the core will not be uncovered and fission product release will not exceed 10 CFR 100 guidelines.

The instrumentation which initiates ECCS action is arranged in a dual bus system. As for other vital instrumentation arranged in this fashion the Specification preserves the effectiveness of the system even during periods when maintenance or testing is being performed.

The control rod block functions are provided to prevent excessive control rod withdrawal so that MCPR remains above the Safety Limit (T.S.2.1.A). The trip logic for this function is 1 out of n; e.g., any trip on one of the six APRM's, eight IRM's, or four SRM's will result in a rod block. The minimum instrument channel requirements for the IRM and RBM may be reduced by one for a short period of time to allow for maintenance, testing, or calibration. See Section 7.3 FSAR.

The APRM rod block trip is referenced to flow and prevents operation significantly above the licensing basis power level especially during operation at reduced flow. The APRM provides gross core protection; i.e., limits the gross core power increase from withdrawal of control rods in the normal withdrawal sequence. The operator will set the APRM rod block trip settings no greater than that stated in Table 3.2.3. However, the actual setpoint can be as much as 3% greater than that stated in Table 3.2.3 for recirculation driving flows less than 50% of design and 2% greater than that shown for recirculation driving flows greater than 50% of design due to the deviations discussed on page 39.

The RBM provides local protection of the core; i.e., the prevention of critical power in a local region of the core, for a single rod withdrawal error from a limiting control rod pattern. The trip point is referenced to power. This power signal is provided by the APRMs. A statistical analysis of many single control rod withdrawal errors has been performed and at the 95/95 level the results show that with the specified trip settings, rod withdrawal is blocked at MCPRs greater than the Safety Limit, thus allowing adequate margin. This analysis assumes a steady state MCPR prior to the postulated rod withdrawal error. The RBM functions are required when core thermal power is greater than 30% and a Limiting Control Rod Pattern exists. When both RBM channels are operating either channel will assure required withdrawal blocks occur even assuming a single failure of one channel. With one RBM channel inoperable for no more than 24 hours, testing of the RBM prior to withdrawal of control rods assures that improper control rod withdrawal will be blocked. Requiring at least half of the normal LPRM inputs to be operable assures that the RBM response will be adequate to protect against rod withdrawal errors, as shown by a statistical failure analysis.

Bases Continued:

open and instrumentation drift has caused the nominal 80-psi blowdown range to be reduced to 60 psi. Maximum water leg clearing time has been calculated to be less than 6 seconds for the Monticello design. Inhibit timers are provided for each valve to prevent the valve from being manually opened less than 10 seconds following valve closure. Valve opening is sensed by pressure switches in the valve discharge line. Each valve is provided with two trip, or actuation, systems. Each system is provided with two channels of instrumentation for each of the above described functions. A two-out-of-two-once logic scheme ensures that no single failure will defeat the low-low set function and no single failure will cause spurious operation of a safety/relief valve. Allowable deviations are provided for each specified instrument setpoint. Setpoints within the specified allowable deviations provide assurance that subsequent safety/relief valve actuations are sufficiently spaced to allow for discharge line water leg clearing.

Control room habitability protection assures that the control room operators will be adequately protected against the effects of accidental releases of toxic substances and of radioactive leakage which may bypass secondary containment following a loss of coolant accident or radioactive releases from a steam line break accident, thus assuring that the Monticello Nuclear Generating Plant can be operated or shutdown down safely. A study conducted by Bechtel Power Corporation concluded that of the onsite and offsite potential toxic chemical hazards, only chlorine required automatic detection and isolation to prevent incapacitation of control room operators. All other chemicals were determined to have at least two minutes between detection and possible incapacitation. Protection for there toxic chemicals is provided through operator training.

Although the operator will set the setpoints within the trip settings specified in Tables 3.2.1 through 3.2.9, the actual values of the various set points can differ appreciably from the value the operator is attempting to set. The deviations could be caused by inherent instrument error, operator setting error, drift of the set point, etc. Therefore, these deviations have been accounted for in the various transient analyses and the actual trip settings may vary by the following amounts:

3.11 REACTOR FUEL ASSEMBLIES

Applicability

The Limiting Conditions for Operation associated with the fuel rods apply to those parameters which monitor the fuel rod operating conditions.

Objective

The objective of the Limiting Conditions for Operation is to assure the performance of the fuel rods.

Specifications

A. Average Planar Linear Heat Generation Rate (APLHGR)

During two recirculation loop power operation, the APLHGR limiting condition for operation for each type of fuel as a function of axial location and average planar exposure shall not exceed limits based on applicable APLHGR limit values which have been approved for the respective fuel and lattice types as determined by the approved methodology described in NEDE-24011-P-A (GESTAR II). This approval is based on and limited to GESTAR II methodology. When hand calculations are required, the APLHGR for each type of fuel as a function of average planar exposure shall not exceed the limiting value for the most limiting lattice (excluding natural uranium) provided in the Core Operating Limits Report.

During one recirculation loop power operation, the APLHGR limiting condition for operation for each type of fuel shall not exceed the above values multiplied by 0.85.

If at any time during power operation, it is determined that the APLHGR limiting condition for operation is being exceeded, action shall be initiated within 15 minutes to restore operation to within the prescribed limits. Surveillance and corresponding action shall continue until reactor operation is within the prescribed limits. If the APLHGR is not returned to within the prescribed limits within two hours, reduce thermal power to less than 25% within the next four hours.

4.11 REACTOR FUEL ASSEMBLIES

Applicability

The Surveillance Requirements apply to the parameters which monitor the fuel rod operating conditions.

Objective

The objective of the Surveillance Requirements is to specify the type and frequency of surveillance to be applied to the fuel rods.

Specifications

A. Average Planar Linear Heat Generation Rate (APLHGR)

The APLHGR for each type of fuel as a function of average planar exposure shall be determined daily during reactor operation at $\geq$25% rated thermal power.

3.0 LIMITING CONDITIONS FOR OPERATION	4.0 SURVEILLANCE REQUIREMENTS
B. <u>Linear Heat Generation Rate (LHGR)</u> During power operation, the LHGR shall be less than or equal to the limits specified in the Core Operating Limits Report. If at any time during operation it is determined that the limiting value for LHGR is being exceeded, action shall be initiated within 15 minutes to restore operation to within the prescribed limits. Surveillance and corresponding action shall continue until reactor operation is within the prescribed limits. If the LHGR is not returned to within the prescribed limits within 2 hours, reduce thermal power to less than 25% within the next 4 hours.	B. <u>Linear Heat Generation Rate (LHGR)</u> The LHGR shall be checked daily during reactor operation at $\geq$25% of rated thermal power.

C. Minimum Critical Power Ratio (MCPR)

The MCPR shall be greater than or equal to the limits provided in the Core Operating Limits Report.

The OLMCPR limit for one recirculation loop operation is 0.01 higher than the comparable two loop value.

If at any time during operation it is determined at any time during operation it is determined that the limiting value for MCPR is being exceeded, action shall be initiated within 15 minutes to restore operation to within the prescribed limits. Surveillance and corresponding action shall continue until reactor operation is within the prescribed limits. If the steady state MCPR is not returned to within the prescribed limits within two hours, reduce thermal power to less than 25% within the next four hours.

G. Minimum Critical Power Ratio (MCPR)

MCPR shall be determined daily during reactor power operation at $\geq$25% rated thermal power and following any change in power level or distribution which has the potential of bringing the core to its operating MCPR Limit.

The next page is 216

Bases 3.11:

A. Average Planar Linear Heat Generation Rate (APLHGR)

This specification assures that the peak cladding temperature following the postulated design bases loss-of-coolant accident will not exceed the limit specified in the 10CFR50, Appendix K.

The peak cladding temperature following a postulated loss-of-coolant accident is primarily a function of the average heat generation rate of all the rods of a fuel assembly at any axial location and is only dependent secondarily on the rod to rod power distribution within an assembly. Since expected local variations in power distribution within a fuel assembly affect the calculated peak cladding temperature by less than ±20° relative to the peak temperature for a typical fuel design, the limit on the average linear heat generation rate is sufficient to assure that calculated temperatures at rated conditions conform to 10CFR50.46. The limiting value for APLHGR is given by this specification.

The flow dependent correction factor provided in the Core Operating Limits Report applied to the rated condition's APLHGR limits assures that 1) the 2200°F PCT limit would not be exceeded during a LOCA initiated from less than rated core flow conditions and 2) the fuel thermal-mechanical design criteria would be met during abnormal transients initiated from less than rated core flow conditions. The power dependent correction factor provided in the Core Operating Limits Report applied to the rated conditions APLHGR limits assures that the fuel thermal-mechanical design criteria would be met during abnormal transients initiated from all conditions provided in the Core Operating Limits Report.

Those abnormal operational transients, analyzed in FSAR Section 14.5 which result in an automatic reactor scram are not considered a violation of LCO. Exceeding APHLGR limits in such cases need not be reported.

B. LHGR

This specification assures that the linear heat generation rate in any rod is less that the design linear heat generation.

Those abnormal operational transients, analyzed in FSAR Section 14.5, which result in a automatic reactor scram are not considered a violation of LCO. Exceeding LHGR limits in such cases need not be reported.

C. Minimum Critical Power Ratio (MCPR)

The ECCS evaluation presented in References 1 and 2 assumed the steady state MCPR prior to the postulated loss-of-coolant accident for all fuel types for rated flow. The Rated

Bases Continued:

MCPR Limit is determined from the analysis of transients discussed in Bases Sections 2.1 and 2.3. By maintaining an operating MCPR above these limits, the Safety Limit (T.S. 2.1.A) is maintained in the event of the most limiting abnormal operational transient.

At less than 100% of rated flow and power the required MCPR is the larger value of the $MCPR_F$ and $MCPR_P$ at the existing core flow and power state. The required MCPR is a function of flow in order to protect the core from inadvertent core flow increases such that the 99.9% MCPR limit requirement can be assured.

The MPCRs were calculated such that for the maximum core flow rate and the corresponding thermal power along the 105% of rated power/flow control line, the limiting bundle's relative power was adjusted until the MCPR was slightly above the Safety Limit. Using this relative bundle power, the MCPRs were calculated at different points along the 105% of rated power flow control line corresponding to different core flows. The calculated MCPR at a given point of core flow ($MCPR_F$) is provided in the Core Operating Limits Report.

For operation above 45% of rated thermal power, the core power dependent MCPR operating limit is the rated MCPR limit, MCPR(100), multiplied by the factor, provided in the Core Operating Limits Report. For operation below 45% of rated thermal power (turbine control valve fast closure and turbine stop valve closure scrams can be bypassed) MCPR limits are provided in the Core Operating Limits Report. This protects the core from plant transients other than core flow increase, including a localized event such as rod withdrawal error.

Bases Continued:

This limit was determined based upon bounding analyses for the limiting transient at the given core power level.

At thermal power levels less than or equal to 25% of rated thermal power, operating plant experience indicates that the resulting MCPR value is in excess of requirements by a considerable margin. MCPR evaluation below this power level is therefore unnecessary. The daily requirement for calculating MCPR above 25% of rated thermal power is sufficient since power distribution shifts are very slow when there have not been significant power or control rod changes.

Those abnormal operational transients, analyzed in FSAR Section 14.5, which result in an automatic reactor scram are not considered a violation of the LCO. Exceeding MCPR limits in such cases need not be reported.

References

1. "General Electric Company Analytical Model for Loss-of-Coolant Analysis in Accordance with 10CFR50, Appendix K", NEDE-20566, November, 1975.

2. "Loss-of-Coolant Accident Analysis Report for the Monticello Nuclear Generating Plant", NEDO-24050-1, December, 1980, L O Mayer (NSP) to Director of Nuclear Reactor Regulation (USNRC), February 6, 1981.

Bases 4.11

The APLHGR, LHGR and MCPR shall be checked daily to determine if fuel burnup, or control rod movement have caused changes in power distribution. Since changes due to burnup are slow, and only a few control rods are removed daily, a daily check of power distribution is adequate. For a limiting value to occur below 25% of rated thermal power, an unreasonably large peaking factor would be required, which is not the case for operating control rod sequences. In addition, the MCPR is checked whenever changes in the core power level or distribution are made which have the potential of bringing the fuel rods to their thermal-hydraulic limits.

7. Core Operating Limits Report

a. Core operating limits shall be established and documented in the Core Operating Limits Report before each reload cycle or any remaining part of a reload cycle for the following:

Rod Block Monitor Operability Requirements
(Specification 3.2.C.2a)

Rod Block Monitor Upscale Trip Settings
(Table 3.2.3, Item 4.a)

Maximum Average Planar Linear Heat Generation Rate Limits
(Specification 3.11.A)

Linear Heat Generation Ratio Limits
(Specification 3.11.B)

Minimum Critical Power Ratio Limits
(Specification 3.11.C)

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel" (latest approved version)

NSPNAD-8608-A, "Reload Safety Evaluation Methods for Application to the Monticello Nuclear Generating Plant" (latest approved version)

NSPNAD-8609-A, "Qualification of Reactor Physics Methods for Application to Monticello" (latest approved version)

c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal-mechanical limits, core thermal-hydraulic limits, ECCS limits, nuclear limits such as shutdown margin, transient analysis limits and accident analysis limits) of the safety analysis are met.

d. The Core Operating Limits Report, including any mid-cycle revisions or supplements, shall be supplied upon issuance, for each reload cycle, to the NRC Document Control Desk with copies to the Regional Administrator and Resident Inspector.

Exhibit D

Monticello Nuclear Generating Plant

License Amendment Request Dated July 26, 1989

SAMPLE CORE OPERATING LIMITS REPORT FOR CYCLE 14

MONTICELLO NUCLEAR GENERATING PLANT

CORE OPERATING LIMITS REPORT

For Cycle 14

Revision 0

This report provides the values of the limits for Cycle 14 as required by Technical Specification Section 6.7.A.7. These values have been established using NRC approved methodology and are established such that all applicable limits of the plant safety analysis are met.

Rod Block Monitor Operability Requirements

The MCPR limit associated with the Rod Block Monitor operability is:

if thermal power < 90% of rated and MCPR < 1.70 or

if thermal power ≥ 90% of rated and MCPR < 1.40.

Reference Technical Specification Sections: 3.2.C.2.a

Rod Block Monitor Upscale Trip Settings

Low Trip Setpoint (LSTP)	≤	120/125 of full scale
Intermediate Setpoint(ISTP)	≤	115/125 of full scale
High Trip Setpoint (HSTP)	≤	110/125 of full scale

Reference Technical Specification Sections: Table 3.2.3 Item 4.a, Table 3.2.3 Note 8.

Maximum Average Planar Linear Heat Generation Rate as a function of Exposure

When hand calculations are required, the Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) for each type of fuel as a function of average planar exposure shall not exceed the limiting lattice (excluding natural uranium) provided in Table 1 (based on straight line interpolation between data points) multiplied by the smaller of the two MAPFAC factors determined from Figures 1 and 2.

Reference Technical Specification Section: 3.11.A

Linear Heat Generation Rate

The Linear Heat Generation Rate limits are:

LHGR FOR EACH FUEL TYPE (kw/ft)				
P8DRB284LB	BP8DRB299L	BD319B	NBD312A	NBD313A
13.4	13.4	14.4	14.4	14.4

Reference Technical Specification Section 3.11.B.

Minimum Critical Power Ratio

The Minimum Critical Power Ratio (MCPR) limit shall be determined as follows:

If thermal power > 45%, then the MCPR limit is the greater of:

$1.30 \times K_p$ (K_p from Figure 3) or the $MCPR_F$ from Figure 4.

If thermal power ≤ 45%, then the MCPR limit is obtained from Figure 3.

Reference Technical Specification Section 3.11.C.

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Thomas M Parker Date

Reviewed By: ______________________ ______________
Daniel Wegener Date
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Reviewed By: ______________________ ______________
Roger Anderson Date
Manager
Nuclear Analysis

Approved By: ______________________ ______________
Thomas M Parker Date
Manager
Nuclear Support Services

TABLE 1
MAXIMUM AVERAGE PLANAR LINEAR HEAT GENERATION RATE vs. EXPOSURE

Exposure	MAPLHGR FOR EACH FUEL TYPE (kw/ft)				
MWD/STU	P8DRB284LB	BP8DRB299L	BD319B	NBD312A	NBD313A
200	11.4	11.0	11.19	11.1	11.3
1,000	11.4	11.0	11.31	11.2	11.4
5,000	11.8	11.6	11.99	12.0	11.9
10,000	11.9	11.9	12.60	12.6	12.5
15,000	11.9	11.9	12.34	12.6	12.6
20,000	11.7	11.8	11.95	12.3	12.2
25,000	11.4	11.5	11.56	11.6	11.6
30,000	10.8	10.9	10.54	-	-
35,000	10.2	10.3	9.53	-	-
40,000	9.5	9.7	-	-	-
45,000	8.9	9.0	-	8.8	8.9
50,000	-	-	6.28	6.3	6.3

Note: For two recirculation loop operation. For single loop operation multiply these values by 0.85.

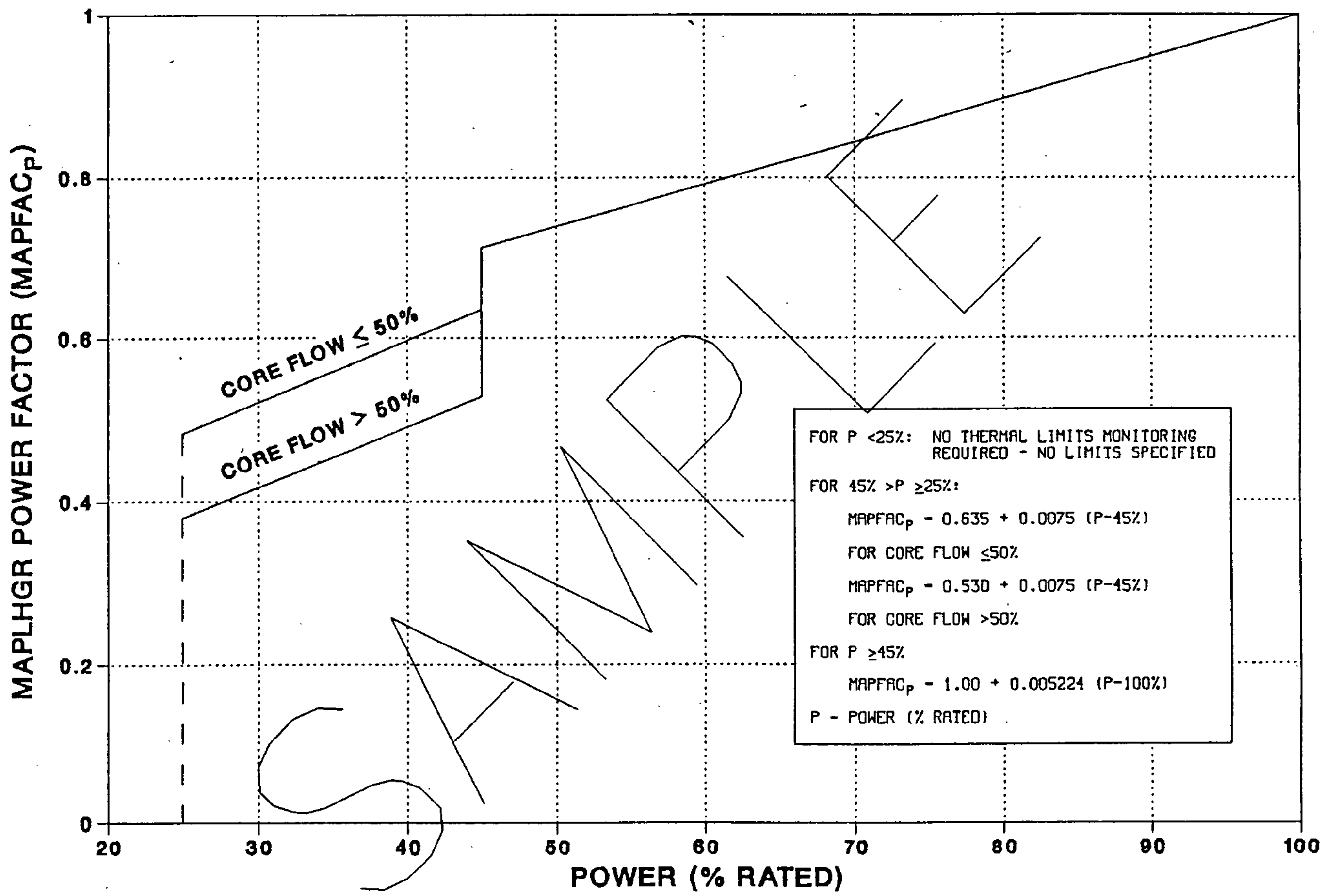

FIGURE 1 $MAPFAC_p$ LIMITS

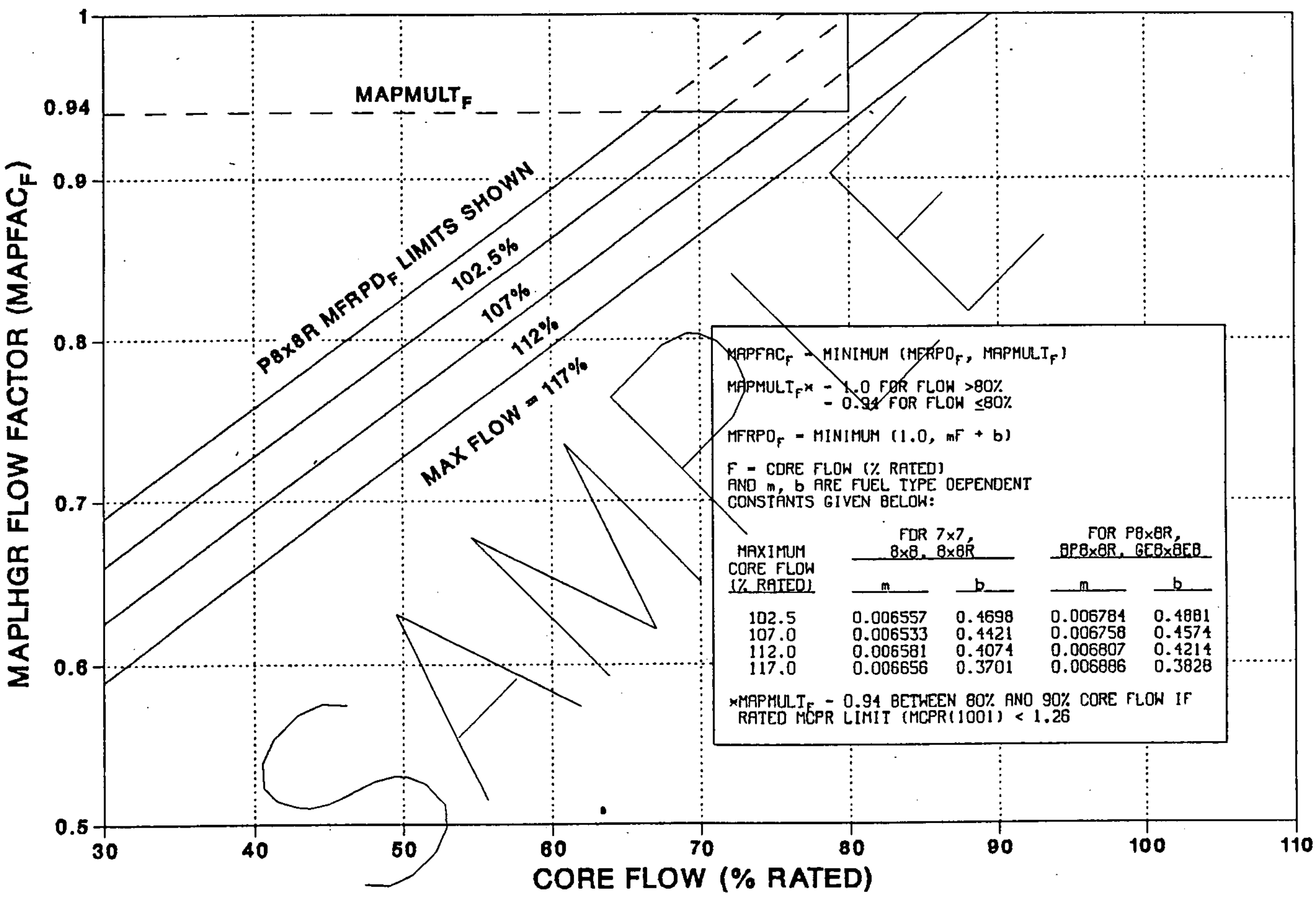

FIGURE 2 MAPFAC$_F$ LIMITS

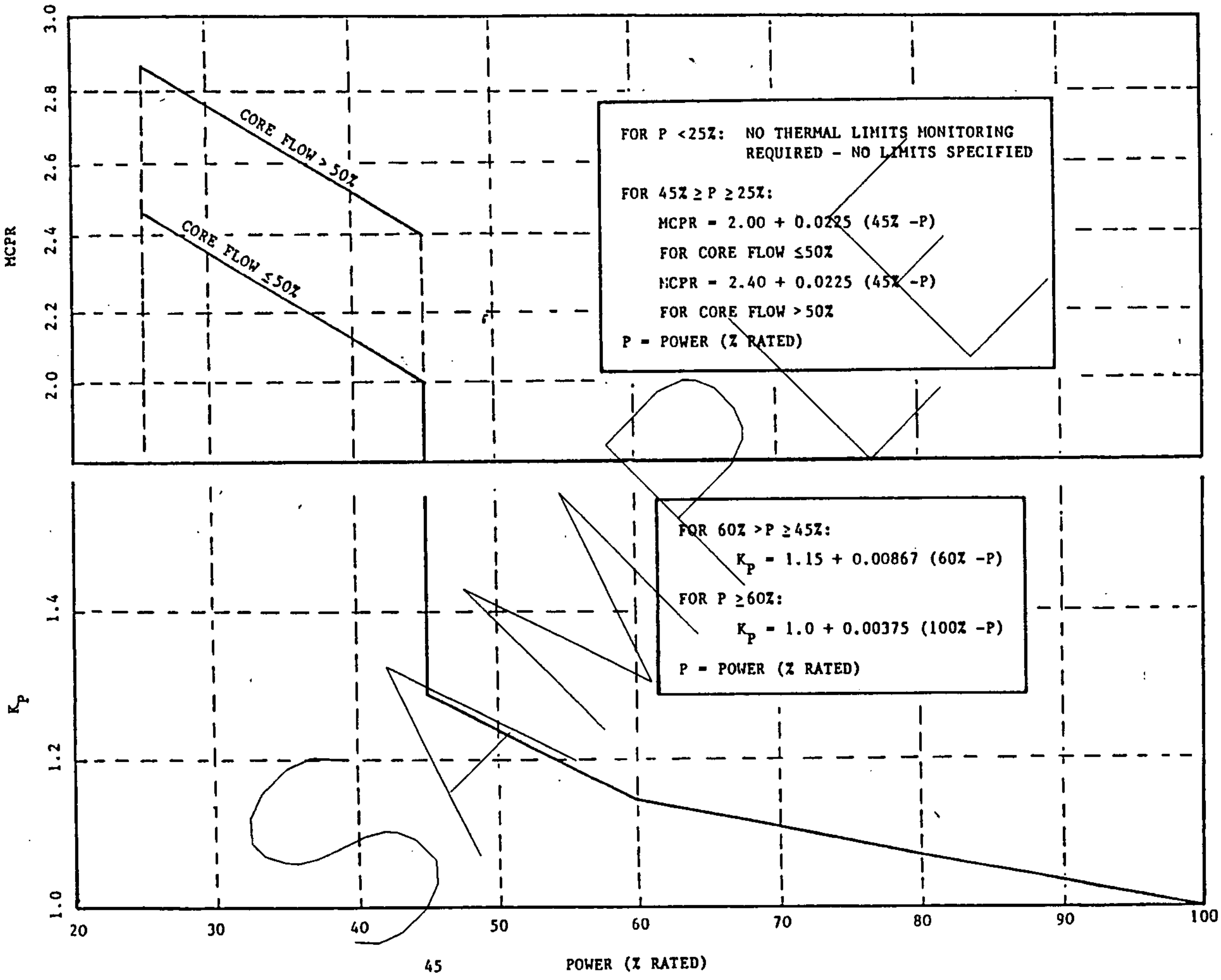

FIGURE 3 POWER DEPENDENT MCPR LIMITS

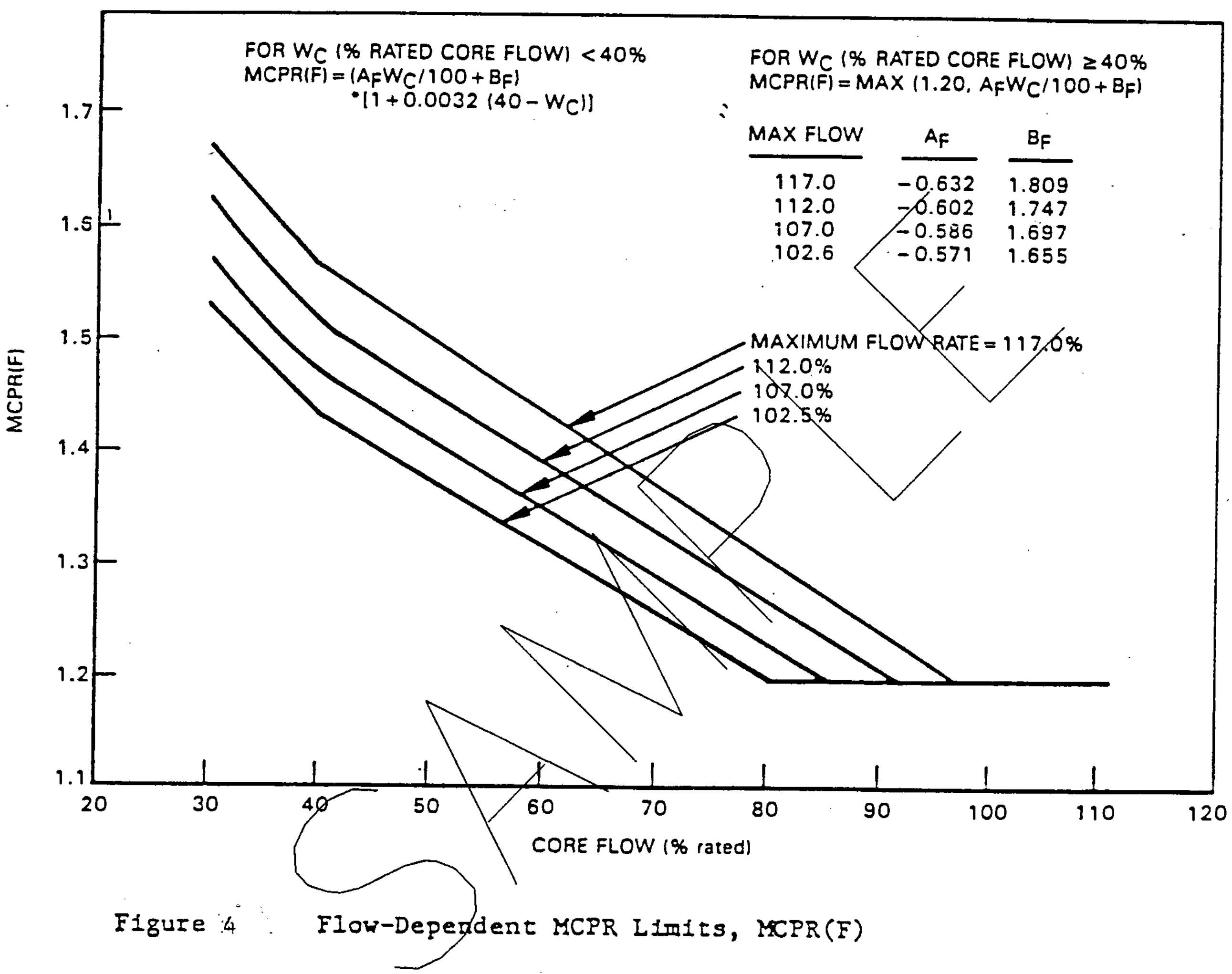

Figure 4 Flow-Dependent MCPR Limits, MCPR(F)