May 27, 1986

Docket No. 50-263

Mr. D. M. Musolf
Nuclear Support Services Department
Northern States Power Company
414 Nicollet Mall - 8th Floor
Minneapolis, Minnesota 55401

Dear Mr. Musolf:

SUBJECT:

Re: Monticello Nuclear Generating Plant

The Commission has issued the enclosed Amendment No. 44 to Facility Operating License No. DPR-22 for the Monticello Nuclear Generating Plant. This amendment is in response to your application dated

The amendment revises Technical Specifications to permit operation for Cycle 12. The changes include administrative changes relating to the previously approved ARTS (Average Power Range Monitor/Rod Block Monitor/ Technical Specification) Improvement Program and operation in the expanded power-flow domain. In addition, Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) limits are revised to accommodate a new fuel type (GE-7 barrier fuel) and extended exposure for some existing fuel.

A copy of our related Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's biweekly Federal Register notices.

Sincerely,

ORIGINAL SIGNED BY

Rajender Auluck, Project Manager
BWR Project Directorate #1
Division of BWR Licensing

Enclosures:
1. Amendment No. 44 to License No. DPR-22
2. Safety Evaluation

cc w/enclosures:
See next page

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
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NORTHERN STATES POWER COMPANY

DOCKET NO. 50-263

MONTICELLO NUCLEAR GENERATING PLANT

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 44
License No. DPR-22

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Northern States Power Company (the licensee) dated March 7, 1986 complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.2 of Facility Operating License No. DPR-22 is hereby amended to read as follows:

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2 Technical Specifications

The Technical Specifications contained in Appendix A as revised through Amendment No. 44 , are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of its issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Rajender Auluck

Rajender Auluck, Project Manager
BWR Project Directorate #1
Division of BWR Licensing

Attachment:
Changes to the Technical
Specifications

Date of Issuance: May 27, 1986.

ATTACHMENT TO LICENSE AMENDMENT

PROVISIONAL OPERATING LICENSE NO. DPR-22

DOCKET NO. 50-263

Revise Appendix A Technical Specifications by removing the pages identified below and inserting the attached pages. The revised pages are identified by the captioned amendment number and contain marginal lines indicating the area of changes.

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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 power operation, the APLHGR for all core locations shall not exceed the appropriate APLHGR limit for those core locations. The APLHGR limit, which is a function of average planar exposure and fuel type, is the appropriate value from Table 3.11.1 (based on a 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. If any time during operation it is determined that the limit for APLHGR is being exceeded, action shall be initiated within 15

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 ≥25% rated thermal power.

3.0 LIMITING CONDITIONS FOR OPERATION	4.0 SURVEILLANCE REQUIREMENTS
C. Minimum Critical Power Ratio (MCPR) If thermal power is greater than 45%, the MCPR limit is the greater of: 1) MCPR (100) from Table 3.11.2 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. 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 operations is within the prescribed limits. If the steady state MCPR is not returned to within the prescribed limits within two (2) hours, the reactor shall be brought to the Cold Shutdown condition within 36 hours.	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.

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

Exposure MWD/STU	MAPLHGR FOR EACH FUEL TYPE (kw/ft)					
	8DB262 8DB250 8DB219L	8DRB282 8DRB265L	P8DRB265L BP8DRB265L	P8DRB282 BP8DRB282L	P8DRB284LB BP8DRB284LB	P8DRB299L BP8DRB299L
200	11.1	11.2	11.6	11.2	11.4	11.0
1,000	11.3	11.2	11.6	11.2	11.4	11.0
5,000	11.9	11.6	11.8	11.8	11.8	11.6
10,000	12.0	11.7	11.9	11.9	11.9	11.9
15,000	11.9	11.7	11.9	11.8	11.9	11.9
20,000	11.8	11.5	11.8	11.7	11.7	11.8
25,000	11.3	11.3	11.3	11.3	11.4	11.5
30,000	10.2	10.7	10.7	11.1	10.8	10.9
35,000	9.6	10.2	10.2	10.4	10.2	10.3
40,000	8.9	9.6	9.6	9.8	9.5	9.7
45,000	-	-	-	-	8.9	9.0

TABLE 3.11.2

Rated Minimum Critical Power Ratio [MCPR(100)] vs Fuel Type			
Fuel Type	$MCPR_B$ For $\tau ave \leq \tau_B$	MCPR* For $\tau_B < \tau ave < 0.9$ SEC	$MCPR_A$ For $\tau ave = 0.9$ sec
8X8	1.36	*	1.43
P8X8R BP8X8R	1.39	*	1.46

* A linear interpolation between $MCPR_B$ and $MCPR_A$

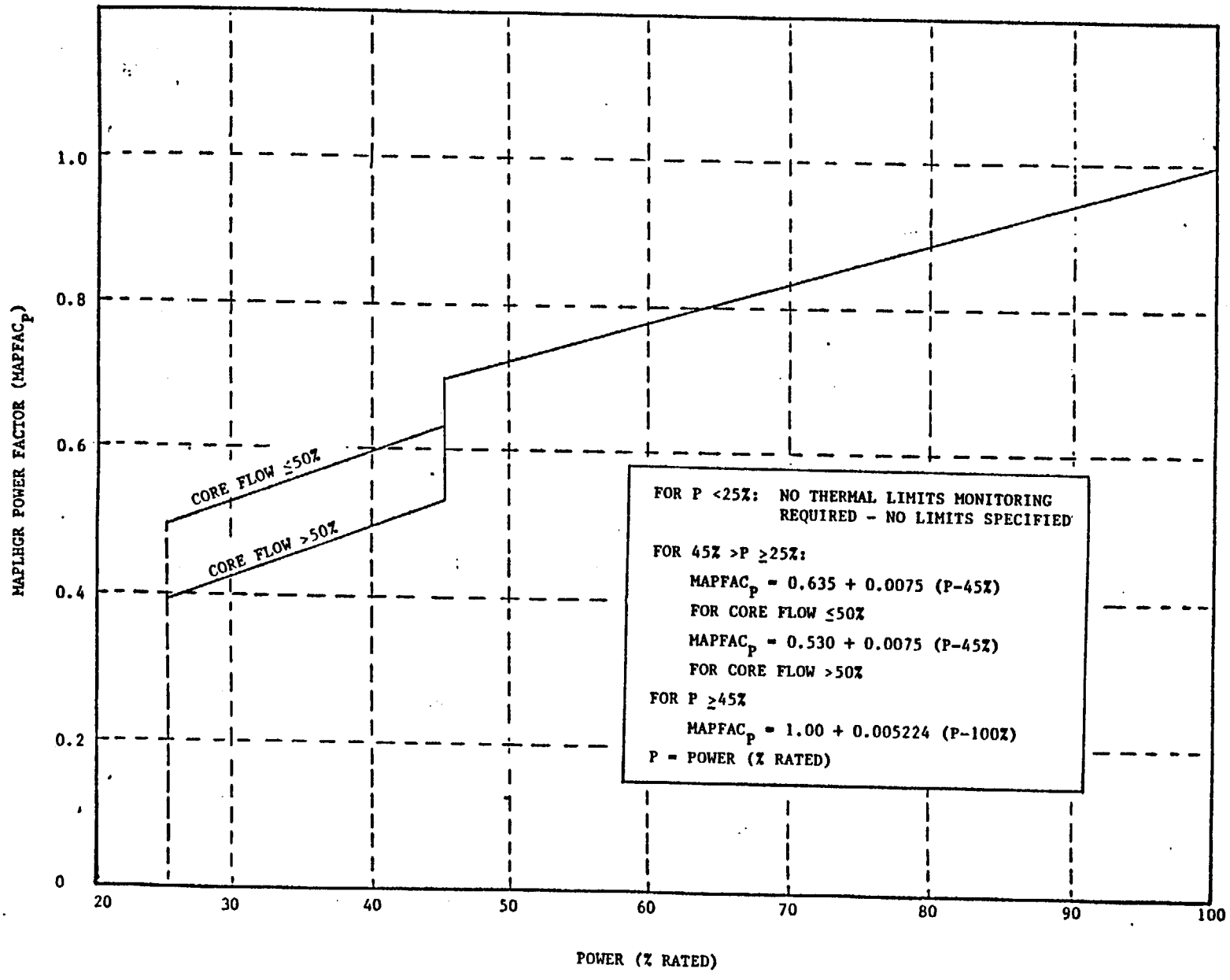

FIGURE 3.11.1 MAPFAC$_P$ LIMITS

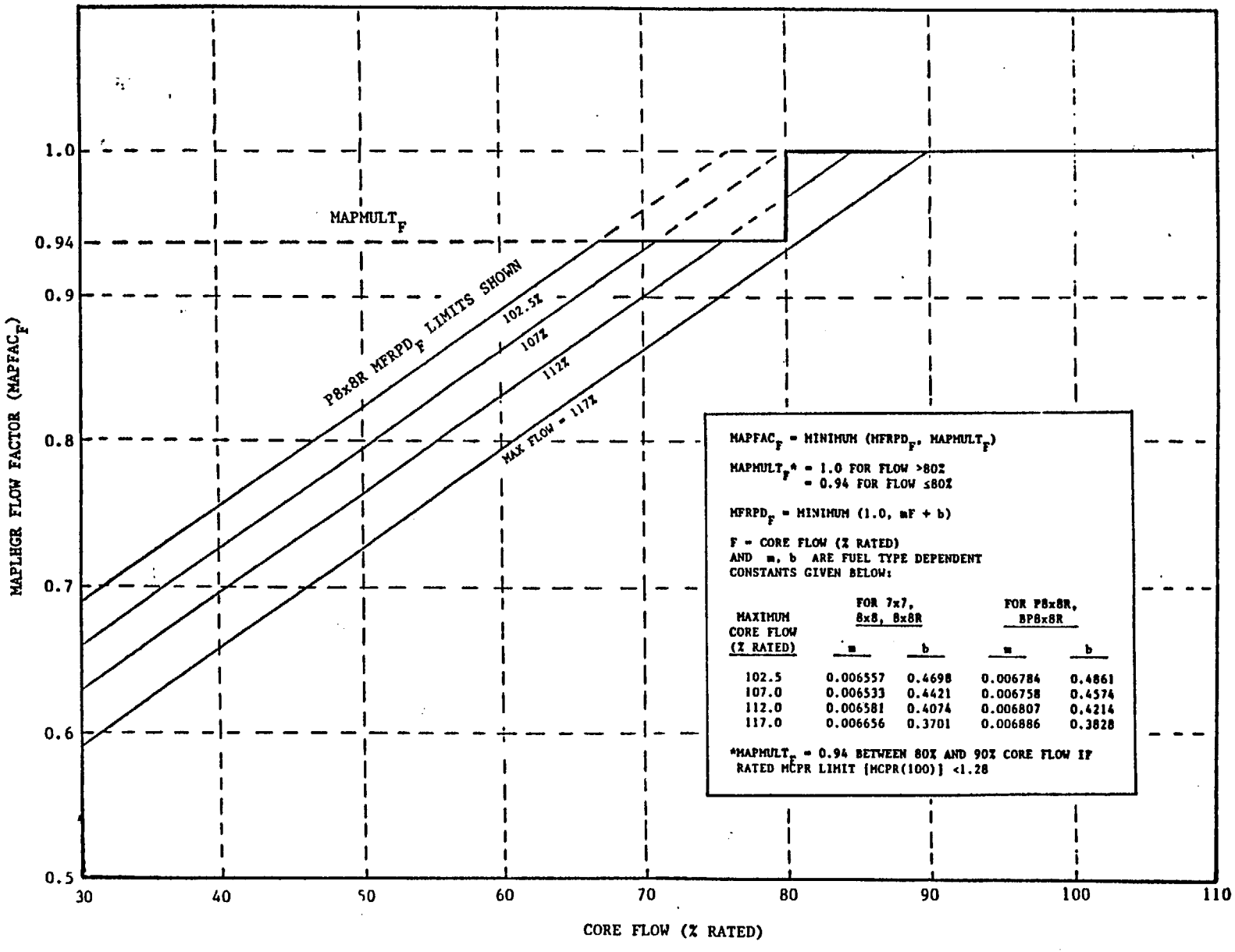

FIGURE 3.11.2 MAPFAC$_F$ LIMITS

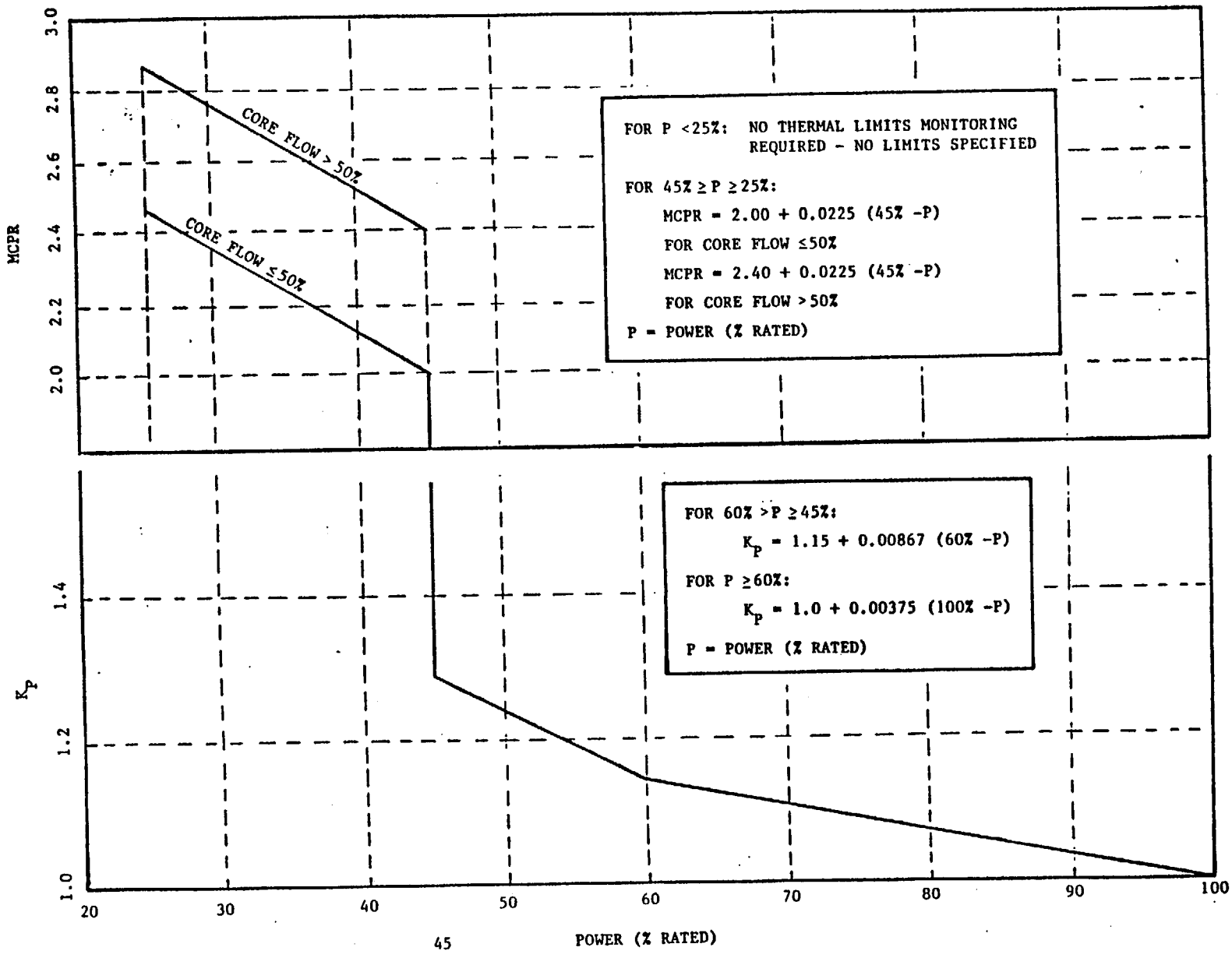

FIGURE 3.11.3 POWER DEPENDENT MCPR LIMITS

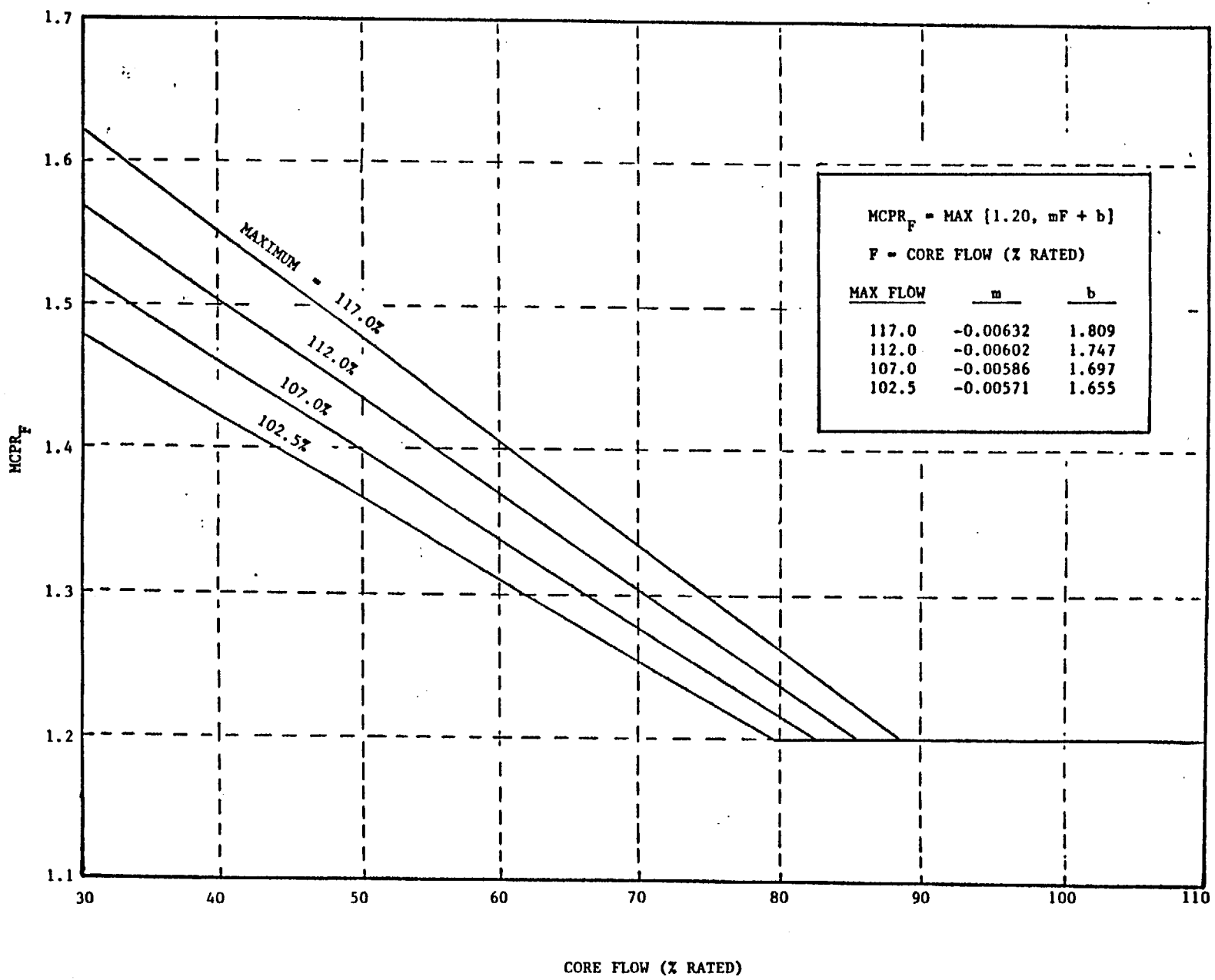

FIGURE 3.11.4 MCPR$_F$ LIMITS

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 $\pm 20^{o}$ 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 $2200^{o}F$ 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 APLHGR limits in such cases need not be reported.

B. LHGR

This specification assures that the linear heat generation rate in any rod is less than 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)

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 1.28 for all fuel types for rated flow. The Rated

Bases Continued

MCPR [MCPR(100)] 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.

Use of GE's new ODYN code Option B will require average scram time to be a factor in determining the MCPR (Reference 7). In order to increase the operating envelope for MCPR below $MCPR_A$ (ODYN code Option A), the cycle average scram time (τave) must be determined (see Bases 3.3.C). If τave is below the adjusted analysis scram time, the $MCPR_B$ Limit can be used. If $\tau ave > \tau_B$ a linear interpolation must be used to determine the appropriate MCPR. For example:

$$MCPR = MCPR_B + \frac{\tau ave - \tau B}{0.9 - \tau B}(MCPR_A - MCPR_B)$$

$MCPR_A$ and $MCPR_B$ have been determined from the most limiting abnormal operational transients analyses.

The evaluation of a given transient begins with the system initial parameters shown in FSAR Section 14.5 that are input to a GE-core dynamic behavior transient computer program described in References 2 and 3.

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 MCPRs 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).

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 44 TO FACILITY OPERATING LICENSE NO. DPR-22

NORTHERN STATES POWER COMPANY

MONTICELLO NUCLEAR GENERATING PLANT

DOCKET NO. 50-263

1.0 INTRODUCTION

By letter dated March 7, 1986 (Reference 1) Northern States Power Company (the licensee) proposed to change the Technical Specifications for the Monticello Nuclear Generating Plant to permit its operation for Cycle 12. The proposed changes include administrative changes relating to the previously approved ARTS (APRM/RBM/Technical Specification) Improvement Program and operation in an expanded power-flow domain (Reference 4 and 5). In addition, revised MAPLHGR limits are proposed to accommodate a new fuel type (GE-7 barrier fuel) and extended exposure for some existing fuel.

In the core-related areas of fuel design, thermal-hydraulic design, nuclear design, and safety analyses of postulated accidents and transients, the licensee has relied on the results presented in the approved General Electric Company (GE) topical report NEDE-24011, "General Electric Standard Application for Reactor Fuel," or GESTAR II (Reference 2). In addition, the licensee submitted a supplemental reload licensing document (Reference 3) which provides results of other analyses necessary to justify Cycle 12 operation but which are not included in GESTAR II.

2.0 EVALUATION

2.1 Fuel Design

Fresh fuel assemblies (BP8DRB299L), which are pressurized 8x8 retrofit barrier fuel assemblies, will be loaded for Cycle 12 operation. Since the pressurized 8x8 retrofit barrier fuel has been reviewed by the staff and found acceptable (Amendment 13 to Reference 2), we conclude that the fuel assemblies are acceptable for Cycle 12 operation. The 124 new assemblies will reside with 360 irradiated 8X8 assemblies of prior GE designs presently in the core. The fuel designs for the earlier designs have all been found acceptable in connection with the staff review of Reference 2.

2.2 Nuclear Design

The nuclear design and analysis of the proposed reload has been performed by the methods described in Reference 2. Reference 2 has been approved for use in the design and analysis of reloads in boiling water reactors (BWR) and its use is acceptable for this reload. We have reviewed the

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results of the nuclear design analysis for Monticello Cycle 12 and have determined that, since the nuclear parameters are within the range of those normally obtained for similar cores and were obtained with acceptable methods, they are acceptable.

2.3 Thermal-Hydraulic Design

The objective of the review of the thermal-hydraulic design of the core for Cycle 12 operation is to confirm that the thermal-hydraulic design has been accomplished using acceptable methods, and to assure an acceptable margin of safety from conditions which could lead to fuel damage during normal operation and anticipated transients, and to assure that the core is not susceptible to thermal-hydraulic instability.

The review included the following areas: (1) rated minimum critical power ratio (MCPR), and the related changes to the Technical Specifications, and (2) thermal-hydraulic stability. Discussion of the review concerning the thermal-hydraulic design for Cycle 12 operation follows:

(1) Rated MCPR and the Related Technical Specification Changes

Power dependent MCPR limits have been imposed to assure that 99.9 percent of the fuel rods in the core will not experience boiling transition during normal operation and anticipated operational transients. As stated in Reference 3 the approved safety limit MCPR for the Monticello reload core is 1.07. The safety limit of 1.07 was used for the Cycle 12 analyses.

In a related matter, the licensee has proposed that four ARTS (Average Power Range Monitor, Rod Block Monitor and Technical Specifications Program) curves be added to the Monticello Technical Specifications to replace a reference to the same curves in a proprietary GE Topical Report (Reference 4). This is an administrative change which we find to be acceptable and appropriate.

To assure that the fuel cladding integrity safety limit MCPR will not be violated during any anticipated transient, the most limiting events have been reanalyzed for this reload (Reference 3) by the licensee, in order to determine which event results in the largest reduction in MCPR. The operating limit MCPR for each fuel type was then established by adding the largest reduction factor in the MCPR to the safety limit MCPR. The operating limit MCPR for Cycle 12 increased by 0.01 over the value for the previous Cycle 11.

We find that, since approved methods (Reference 2) were used and the results show an acceptable margin of safety from conditions which could lead to fuel damage during any anticipated operational transient, the thermal-hydraulic design of the Cycle 12 is acceptable. The corresponding changes to Technical Specification

3.11.C.1. (See Section 2.5) are also acceptable since they are consistent with the Cycle 12 safety analysis.

(2) Thermal-Hydraulic Stability

The results of thermal-hydraulic analyses applicable to previous cycles showed that the maximum core stability decay ratio was 0.63. The licensee has referenced Generic Letter (GL) No. 86-02 as justification for not performing an additional stability analysis for Cycle 12. GL 86-02 informs BWR licensees of the technical resolution of Generic Issue B-19 (Thermal-Hydraulic Stability) and cautions licensees to examine each core reload to assure that an acceptable stability margin exists. Since Monticello is a BWR/3 with a conventional fuel design and operating restrictions which provide a substantial stability margin, the staff concludes that no additional stability analysis is required for Cycle 12. A more recent GL 86-09 addresses thermal-hydraulic instabilities in connection with the single loop operating mode. This will be pursued further for Monticello to evaluate the need for future Technical Specification revisions if permanent single loop operation (SLO) is proposed.

2.4 Transient and Accident Analyses

The licensee reported the results of those events which required a reanalysis to support Cycle 12 operation. All events reanalyzed showed results consistent with the applicable criteria. The reanalyses were done in connection with the implementation of the ARTS (APRM/RBM/Technical Specification) Improvement Program and operation in an expanded power-flow domain. This implementation for Monticello was approved in Amendment No. 29 to Operating License No. DPR-22 (Reference 5).

On the basis that approved methods were used to perform the analyses and to obtain input parameters for them and that the results of the accident analysis are acceptable for Cycle 12, we conclude that the transients and accident analyses are acceptable.

2.5 Technical Specification Changes

There are three Technical Specification changes for Cycle 12 as discussed below:

(1) Addition of ARTS curves

As discussed in Section 2.3 of this SE the incorporation of four previously accepted curves to the Monticello Technical Specifications is an administrative change only and is acceptable.

(2) Addition of New Fuel Type, GE-7 Barrier Fuel

MAPLHGR values for the new fuel type (barrier fuel) were added and

proposed MAPLHGR limits were extended to 45,000 MWD/STU for the barrier fuel and selected fuel from a previous cycle (P8DRB284LB). The limiting values of MAPLHGR for different exposures is determined from the analysis of a postulated design basis loss-of-coolant accident (LOCA). The LOCA analyses were reexamined in connection with the staff review of the ARTS program and it was concluded that acceptable analytical methods were used to assure that the peak cladding temperature would not be exceeded if the ARTS recommendations are followed. Although we find the analytical methods for the LOCA analysis acceptable, the staff has recently reviewed the GE fuel design and analyses process with respect to extended burnup considerations. The staff specifically reviewed a GE Topical Report on extended burnup evaluation methodology (Reference 6). Our SE is enclosed in the approved version of Reference 6. The results of our evaluation indicated that burnups up to 46,000 MWD/MTU (41,000 MWD/ST) are acceptable. At higher burnups, there is an inadequate data base for rod-to-tie plate clearances. Therefore, additional information will be required prior to approval of burnup levels beyond 45,000 MWD/STU.

Table 3.11.1 on Technical Specification page 214 (titled Maximum Average Planar Linear Heat Generation Rate vs. Exposure) was modified to add MAPLHGR values for the new fuel type and also to combine MAPLHGR values for previous fuel types. This latter combination was performed by selecting the most limiting MAPLHGR for each exposure range for the combined fuel types. Since this consolidation retains the limiting MAPLHGR concept, the change is acceptable.

(3) MCPR Limit Changes

The 0.01 change in the MCPR discussed in Section 2.3 of this SE was made in Table 3.11.2 of the proposed Technical Specifications. At the same time, administrative changes were made to simplify the interpretation of Table 3.11.2 and the ARTS curves. The term operating limit MCPR was replaced with the term "Rated Minimum Critical Power Ratio" to distinguish between the value for maximum flow rate (100 percent rated) and values determined from the application of power-flow dependent MCPR limits from the ARTS curves. Since previously approved methodology was used, we find the changes acceptable.

Based on our review we have found that the licensee has used approved methods to analyze the LOCA response of an approved fuel BP8DRB299L and to extend the MAPLHGR limits to higher burnup levels for the new fuel and one existing fuel type (P8DRB284IB). Therefore, this proposed amendment to Section 3.11 and related Figures and Tables of the Technical Specifications to reflect the addition and extension of the MAPLHGR limits for the identified fuel types is acceptable.

3.0 ENVIRONMENTAL CONSIDERATION

This amendment involves a change to a requirement with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that this amendment involves no significant hazards consideration and there has been no public comment on such finding. Accordingly, this amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement nor environmental assessment need be prepared in connection with the issuance of this amendment.

4.0 CONCLUSION

The staff has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (2) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security nor to the health and safety of the public.

5.0 REFERENCES

1. Letter, D. M. Musolf (NSP) to Office of Nuclear Reactor Regulation (USNRC), dated March 7, 1986 (with attachments).

2. "Generic Reload Fuel Application," NEDE-24011-P-A-7-US, August 1985.

3. Supplemental Reload Licensing Submittal for Monticello Nuclear Generating Plant Reload 11 (Cycle 12), 23A4754, February 1986.

4. NEDC-30492 "General Electric BWR Licensing Report: Average Power Range Monitor, Rod Block Monitor and Technical Specification Improvement (ARTS) Program for Monticello Nuclear Generating Plant," April 1984.

5. Letter, V. Rooney (NRC) to D. M. Musolf (NSPCo) dated November 16, 1984 transmitting Amendment No. 29 to License No. DPR-22 (with enclosures).

6. NEDO-22148-A, "Extended Burnup Evaluation Methodology," General Electric Licensing Topical Report, February 1986.

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