

DETROIT EDISON - FERMI 2
AUTOMATED RECORD MANAGEMENT
DISTRIBUTION CONTROL LIST
08/27/01

To: 00935

US NRC
DOCUMENT CNTRL DESK

PAGE 2

WASHINGTON, DC 20555

Media: 8 1/2 X 11

DTC	Doc. Serial Number	Page	Rev	Copies	Number Cnt Lvl	Issue Date	Sec Status
TMTRM	TRM VOL I		48	11	IR	08/27/01	AFC

Please destroy or mark all revised, superseded, or cancelled documents as such. CONTROLLED stamps must be voided by lining through and initialing.

=====
Detroit Edison EF2, C/O Info Mgmt 140 NOC, 6400 North Dixie Highway,
Newport MI 48166. (734) 586-4338 OR (734) 586-4061 for questions or concerns.

Ref: e55202

A001

LICENSING DOCUMENT TRANSMITTAL
FERMI 2 TECHNICAL REQUIREMENTS MANUAL – VOL I
Revision 48 dated 08/27/01

Immediately, upon receipt of the item(s) below, please insert and/or remove the documents indicated. Please destroy the removed documents. Please be sure that Revision 47 dated 08/21/01 has been inserted prior to inserting these pages.

<u>Location</u>	<u>Remove</u>	<u>Insert</u>
In Front of TRM Manual	Title Page Rev 47 08/21/01	Title Page Rev 48 08/27/01
Immediately following Title Page	List of Effective Pages LEP-1 through LEP- 4 Rev 47 08/21/01	List of Effective Pages LEP-1 through LEP- 4 Rev 48 08/27/01
Core Operating Limits Report	Core Operating Limits Report Cycle 8 Revision 0	Core Operating Limits Report Cycle 8 Revision 1

END

Fermi 2

Technical Requirements Manual

Volume I

Detroit
Edison

<i>ARMS - INFORMATION</i>			
DTC: TMTRM	File: 1754	DSN: TRM VOL I	Rev: 48
Date: 08/27/01	Recipient 935		

FERMI 2 - TECHNICAL REQUIREMENTS MANUAL VOL I

LIST OF EFFECTIVE PAGES

<u>Page</u>	<u>Revision</u>	<u>Page</u>	<u>Revision</u>
TRM i	Revision 31	TRM 3.3-32	Revision 31
TRM ii	Revision 31	TRM 3.3-33	Revision 31
TRM iii	Revision 31	TRM 3.3-34	Revision 31
TRM iv	Revision 34	TRM 3.3-35	Revision 31
TRM v	Revision 31	TRM 3.3-36	Revision 41
TRM vi	Revision 31	TRM 3.3-37	Revision 31
TRM 1.0-a	Revision 31	TRM 3.3-38	Revision 31
TRM 1.0-1	Revision 31	TRM 3.3-39	Revision 31
TRM 2.0-1	Revision 31	TRM 3.3-40	Revision 31
TRM 3.0-a	Revision 31	TRM 3.3-41	Revision 31
TRM 3.0-1	Revision 31	TRM 3.3-42	Revision 45
TRM 3.0-2	Revision 31	TRM 3.3-43	Revision 31
TRM 3.0-3	Revision 31	TRM 3.3-44	Revision 31
TRM 3.0-4	Revision 31	TRM 3.3-45	Revision 31
TRM 3.1-a	Revision 31	TRM 3.3-46	Revision 31
TRM 3.1-1	Revision 31	TRM 3.3-47	Revision 31
TRM 3.2-1	Revision 31	TRM 3.3-48	Revision 31
TRM 3.3-a	Revision 31	TRM 3.3-49	Revision 31
TRM 3.3-b	Revision 31	TRM 3.4-a	Revision 31
TRM 3.3-c	Revision 31	TRM 3.4-1	Revision 36
TRM 3.3-d	Revision 31	TRM 3.4-1a	Revision 34
TRM 3.3-1	Revision 34	TRM 3.4-1b	Revision 34
TRM 3.3-2	Revision 39	TRM 3.4-2	Revision 31
TRM 3.3-3	Revision 31	TRM 3.4-3	Revision 31
TRM 3.3-4	Revision 31	TRM 3.4-4	Revision 31
TRM 3.3-5	Revision 31	TRM 3.4-5	Revision 31
TRM 3.3-6	Revision 31	TRM 3.4-6	Revision 31
TRM 3.3-7	Revision 31	TRM 3.4-7	Revision 31
TRM 3.3-8	Revision 31	TRM 3.4-8	Revision 31
TRM 3.3-9	Revision 31	TRM 3.4-9	Revision 31
TRM 3.3-10	Revision 31	TRM 3.4-10	Revision 31
TRM 3.3-11	Revision 31	TRM 3.5-1	Revision 31
TRM 3.3-12	Revision 31	TRM 3.6-a	Revision 31
TRM 3.3-13	Revision 31	TRM 3.6-1	Revision 31
TRM 3.3-14	Revision 31	TRM 3.6-2	Revision 31
TRM 3.3-15	Revision 31	TRM 3.6-3	Revision 31
TRM 3.3-16	Revision 31	TRM 3.6-4	Revision 31
TRM 3.3-17	Revision 31	TRM 3.6-5	Revision 31
TRM 3.3-18	Revision 31	TRM 3.6-6	Revision 33
TRM 3.3-19	Revision 31	TRM 3.6-7	Revision 31
TRM 3.3-20	Revision 31	TRM 3.6-8	Revision 31
TRM 3.3-21	Revision 39	TRM 3.6-9	Revision 31
TRM 3.3-22	Revision 31	TRM 3.6-10	Revision 31
TRM 3.3-23	Revision 31	TRM 3.6-11	Revision 31
TRM 3.3-24	Revision 31	TRM 3.6-12	Revision 31
TRM 3.3-25	Revision 31	TRM 3.6-13	Revision 31
TRM 3.3-26	Revision 31	TRM 3.6-14	Revision 31
TRM 3.3-27	Revision 31	TRM 3.6-15	Revision 31
TRM 3.3-28	Revision 31	TRM 3.6-16	Revision 31
TRM 3.3-29	Revision 31	TRM 3.6-17	Revision 31
TRM 3.3-30	Revision 31	TRM 3.6-18	Revision 31
TRM 3.3-31	Revision 31	TRM 3.6-19	Revision 31

FERMI 2 - TECHNICAL REQUIREMENTS MANUAL VOL I

LIST OF EFFECTIVE PAGES

<u>Page</u>	<u>Revision</u>	<u>Page</u>	<u>Revision</u>
TRM 3.6-20	Revision 31	TRM 3.8-14	Revision 46
TRM 3.6-21	Revision 31	TRM 3.8-15	Revision 31
TRM 3.6-22	Revision 31	TRM 3.8-16	Revision 31
TRM 3.6-23	Revision 31	TRM 3.8-17	Revision 43
TRM 3.6-24	Revision 47	TRM 3.8-18	Revision 33
TRM 3.6-25	Revision 31	TRM 3.9-a	Revision 31
TRM 3.6-26	Revision 31	TRM 3.9-1	Revision 31
TRM 3.6-27	Revision 31	TRM 3.9-2	Revision 31
TRM 3.6-28	Revision 31	TRM 3.9-3	Revision 31
TRM 3.6-29	Revision 31	TRM 3.9-4	Revision 31
TRM 3.6-30	Revision 31	TRM 3.9-5	Revision 31
TRM 3.6-31	Revision 31	TRM 3.10-1	Revision 31
TRM 3.6-32	Revision 31	TRM 3.11-a	Revision 31
TRM 3.6-33	Revision 31	TRM 3.11-1	Revision 31
TRM 3.6-34	Revision 31	TRM 3.12-a	Revision 31
TRM 3.6-35	Revision 31	TRM 3.12-1	Revision 31
TRM 3.7-a	Revision 31	TRM 3.12-2	Revision 31
TRM 3.7-b	Revision 31	TRM 3.12-3	Revision 31
TRM 3.7-1	Revision 31	TRM 3.12-4	Revision 31
TRM 3.7-2	Revision 31	TRM 3.12-5	Revision 38
TRM 3.7-3	Revision 31	TRM 3.12-6	Revision 31
TRM 3.7-4	Revision 31	TRM 3.12-7	Revision 31
TRM 3.7-5	Revision 31	TRM 3.12-8	Revision 40
TRM 3.7-6	Revision 31	TRM 3.12-9	Revision 40
TRM 3.7-7	Revision 31	TRM 3.12-10	Revision 31
TRM 3.7-8	Revision 31	TRM 3.12-11	Revision 44
TRM 3.7-9	Revision 31	TRM 3.12-12	Revision 31
TRM 3.7-10	Revision 44	TRM 3.12-13	Revision 31
TRM 3.7-11	Revision 31	TRM 3.12-14	Revision 31
TRM 3.7-12	Revision 31	TRM 3.12-15	Revision 31
TRM 3.7-13	Revision 31	TRM 3.12-16	Revision 31
TRM 3.7-14	Revision 31	TRM 3.12-17	Revision 31
TRM 3.7-15	Revision 31	TRM 3.12-18	Revision 31
TRM 3.7-16	Revision 31	TRM 3.12-19	Revision 31
TRM 3.7-17	Revision 31	TRM 3.12-20	Revision 31
TRM 3.7-18	Revision 31	TRM 3.12-21	Revision 31
TRM 3.7-19	Revision 31	TRM 3.12-22	Revision 31
TRM 3.7-20	Revision 31	TRM 3.12-23	Revision 31
TRM 3.8-a	Revision 31	TRM 3.12-24	Revision 31
TRM 3.8-1	Revision 31	TRM 3.12-25	Revision 31
TRM 3.8-2	Revision 31	TRM 3.12-26	Revision 31
TRM 3.8-3	Revision 31	TRM 3.12-27	Revision 31
TRM 3.8-4	Revision 31	TRM 3.12-28	Revision 31
TRM 3.8-5	Revision 31	TRM 3.12-29	Revision 31
TRM 3.8-6	Revision 31	TRM 3.12-30	Revision 31
TRM 3.8-7	Revision 31	TRM 4.0-1	Revision 31
TRM 3.8-8	Revision 31	TRM 5.0-a	Revision 31
TRM 3.8-9	Revision 31	TRM 5.0-1	Revision 31
TRM 3.8-10	Revision 31	TRM 5.0-2	Revision 31
TRM 3.8-11	Revision 39	TRM 5.0-3	Revision 31
TRM 3.8-12	Revision 31	TRM 5.0-4	Revision 31
TRM 3.8-13	Revision 31	TRM 5.0-5	Revision 31

FERMI 2 - TECHNICAL REQUIREMENTS MANUAL VOL I

LIST OF EFFECTIVE PAGES

<u>Page</u>	<u>Revision</u>	<u>Page</u>	<u>Revision</u>
TRM 5.0-6	Revision 31	TRM B3.6.3-1	Revision 31
TRM 5.0-7	Revision 31	TRM B3.6.4-1	Revision 31
TRM 5.0-8	Revision 31	TRM B3.6.5-1	Revision 31
TRM 5.0-9	Revision 31	TRM B3.6.6-1	Revision 31
TRM B1.0-1	Revision 31	TRM B3.6.7-1	Revision 31
TRM B2.0-1	Revision 31	TRM B3.6.8-1	Revision 31
TRM B3.0-1	Revision 31	TRM B3.7.1-1	Revision 31
TRM B3.0-2	Revision 31	TRM B3.7.2-1	Revision 31
TRM B3.0-3	Revision 31	TRM B3.7.3-1	Revision 31
TRM B3.0-4	Revision 31	TRM B3.7.4-1	Revision 31
TRM B3.0-5	Revision 31	TRM B3.7.4-2	Revision 31
TRM B3.0-6	Revision 31	TRM B3.7.5-1	Revision 31
TRM B3.0-7	Revision 31	TRM B3.7.6-1	Revision 31
TRM B3.1-1	Revision 31	TRM B3.7.7-1	Revision 31
TRM B3.2-1	Revision 31	TRM B3.7.8-1	Revision 31
TRM B3.3.1-1	Revision 31	TRM B3.7.9-1	Revision 31
TRM B3.3.1-2	Revision 31	TRM B3.7.9-2	Revision 31
TRM B3.3.2-1	Revision 31	TRM B3.8.1-1	Revision 31
TRM B3.3.2-2	Revision 31	TRM B3.8.2-1	Revision 31
TRM B3.3.3-1	Revision 31	TRM B3.8.3-1	Revision 31
TRM B3.3.4-1	Revision 31	TRM B3.8.4-1	Revision 31
TRM B3.3.4-2	Revision 31	TRM B3.8.5-1	Revision 31
TRM B3.3.5-1	Revision 31	TRM B3.8.6-1	Revision 43
TRM B3.3.5-2	Revision 31	TRM B3.9.1-1	Revision 31
TRM B3.3.6-1	Revision 31	TRM B3.9.2-1	Revision 31
TRM B3.3.6-2	Revision 31	TRM B3.9.3-1	Revision 31
TRM B3.3.6-3	Revision 31	TRM B3.9.4-1	Revision 31
TRM B3.3.6-4	Revision 31	TRM B3.10-1	Revision 31
TRM B3.3.6-5	Revision 31	TRM B3.11.1-1	Revision 31
TRM B3.3.7-1	Revision 31	TRM B3.12.1-1	Revision 31
TRM B3.3.7-2	Revision 31	TRM B3.12.2-1	Revision 44
TRM B3.3.8-1	Revision 31	TRM B3.12.3-1	Revision 31
TRM B3.3.9-1	Revision 31	TRM B3.12.4-1	Revision 31
TRM B3.3.10-1	Revision 31	TRM B3.12.5-1	Revision 31
TRM B3.3.11-1	Revision 45	TRM B3.12.6-1	Revision 31
TRM B3.3.12-1	Revision 31	TRM B3.12.7-1	Revision 31
TRM B3.3.13-1	Revision 31	TRM B3.12.8-1	Revision 31
TRM B3.3.14-1	Revision 31		
TRM B3.4.1-1	Revision 31		
TRM B3.4.1-2	Revision 34		
TRM B3.4.1-3	Revision 34		
TRM B3.4.1-4	Revision 34		
TRM B3.4.1-5	Revision 34		
TRM B3.4.2-1	Revision 31		
TRM B3.4.3-1	Revision 31		
TRM B3.4.4-1	Revision 31		
TRM B3.4.5-1	Revision 31		
TRM B3.4.6-1	Revision 31		
TRM B3.4.7-1	Revision 31		
TRM B3.5-1	Revision 31		
TRM B3.6.1-1	Revision 31		
TRM B3.6.2-1	Revision 31		

FERMI 2 - TECHNICAL REQUIREMENTS MANUAL VOL I

LIST OF EFFECTIVE PAGES

CORE OPERATING LIMITS REPORT

COLR 8, Revision 1

Page Revision

Notation Page

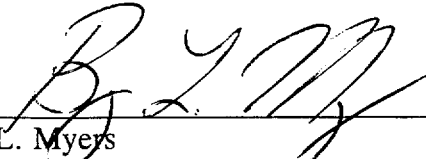
1	1
2	1
3	1
4	1
5	1
6	1
7	1
8	1
9	1
10	1
11	1
12	1
13	1
14	1
15	1
16	1
17	1


FERMI 2

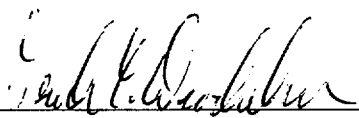
CORE OPERATING LIMITS REPORT


CYCLE 8

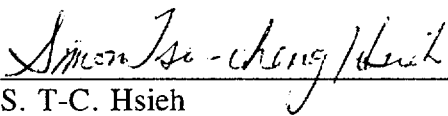
REVISION 1

Prepared by:  8/23/01
B. L. Myers
Principal Engineer - Nuclear Fuel
Date

Reviewed by:  8/24/01
P. R. Kiel
Principal Engineer - Nuclear Fuel
Date

 8/24/01
D. C. Drockelman
Supervisor, Reactor Engineering
Date

 8/24/01
P. R. Kiel
COLR Checklist Reviewer
Date

Approved by:  8-24-01
S. T-C. Hsieh
Supervisor - Nuclear Fuel
Date

AUGUST 2001

TABLE OF CONTENTS

1.0 INTRODUCTION AND SUMMARY	4
2.0 AVERAGE PLANAR LINEAR HEAT GENERATION RATE	5
2.1 Definition	5
2.2 Determination of MAPLHGR Limit	5
2.2.1 Calculation of MAPFAC(P)	7
2.2.2 Calculation of MAPFAC(F)	8
3.0 MINIMUM CRITICAL POWER RATIO	9
3.1 Definition	9
3.2 Determination of Operating Limit MCPR	9
3.3 Calculation of MCPR(P)	10
3.3.1 Calculation of K_p	11
3.3.2 Calculation of τ	12
3.4 Calculation of MCPR(F)	13
4.0 LINEAR HEAT GENERATION RATE	14
4.1 Definition	14
4.2 Determination of LHGR Limit	14
5.0 CONTROL ROD BLOCK INSTRUMENTATION	15
5.1 Definition	15
6.0 REFERENCES	16

LIST OF TABLES

TABLE 1	FUEL TYPE-DEPENDENT STANDARD MAPLHGR LIMITS.....	6
TABLE 2	FLOW-DEPENDENT MAPLHGR LIMIT COEFFICIENTS	8
TABLE 3	OLMCPR _{100/105} AS A FUNCTION OF EXPOSURE AND τ	10
TABLE 4	FLOW-DEPENDENT MCPR LIMIT COEFFICIENTS.....	13
TABLE 5	LHGR LIMITS FOR VARIOUS FUEL TYPES.....	14
TABLE 6	CONTROL ROD BLOCK INSTRUMENTATION SETPOINTS WITH FILTER	15

1.0 INTRODUCTION AND SUMMARY

This report provides the cycle specific plant operating limits, which are listed below, for Fermi 2, Cycle 8, as required by Technical Specifications 5.6.5. The analytical methods used to determine these core operating limits are those previously reviewed and approved by the Nuclear Regulatory Commission in GESTAR II.

The cycle specific limits contained within this report are valid for the full range of the licensed operating domain.

<u>OPERATING LIMIT</u>	<u>TECHNICAL SPECIFICATION</u>
APLHGR	3.2.1
MCPR	3.2.2
LHGR	3.2.3
RBM	3.3.2.1

APLHGR	=	AVERAGE PLANAR LINEAR HEAT GENERATION RATE
MCPR	=	MINIMUM CRITICAL POWER RATIO
LHGR	=	LINEAR HEAT GENERATION RATE
RBM	=	ROD BLOCK MONITOR SETPOINTS

2.0 AVERAGE PLANAR LINEAR HEAT GENERATION RATE

TECH SPEC IDENT	OPERATING LIMIT
3.2.1	APLHGR

2.1 Definition

The AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR) shall be applicable to a specific planar height and is equal to the sum of the LINEAR HEAT GENERATION RATE's (LHGR) for all the fuel rods in the specified bundle at the specified height divided by the number of fuel rods in the fuel bundle at the height.

2.2 Determination of MAPLHGR Limit

The maximum APLHGR (MAPLHGR) limit is a function of reactor power, core flow, fuel and lattice type, and average planar exposure. The limit is developed, using NRC approved methodology described in References 1 and 2, to ensure gross cladding failure will not occur following a loss of coolant accident (LOCA) and that fuel thermal-mechanical design criteria will not be violated during any postulated transient events. The MAPLHGR limit ensures that the peak clad temperature during a LOCA will not exceed the limits as specified in 10CFR50.46(b)(1) and that the fuel design analysis criteria defined in References 1 and 2 will be met.

The MAPLHGR limit during dual loop operation is calculated by the following equation:

$$MAPLHGR_{LIMIT} = \text{MIN} (MAPLHGR (P), MAPLHGR (F))$$

where:

$$MAPLHGR (P) = MAPFAC (P) \times MAPLHGR_{STD}$$

$$MAPLHGR (F) = MAPFAC (F) \times MAPLHGR_{STD}$$

Within four hours after entering single loop operation, the MAPLHGR limit is calculated by the following equation:

$$MAPLHGR_{LIMIT} = \text{MIN} (MAPLHGR (P), MAPLHGR (F), MAPLHGR (SLO))$$

where:

$$MAPLHGR (SLO) = 0.73 \times MAPLHGR_{STD}$$

MAPLHGR_{STD}, the standard MAPLHGR limit, is defined at a power of 3430 MWt and flow of 105 Mlbs/hr for each fuel type as a function of average planar exposure and is presented in Table 1. Since fuel types may contain more than one lattice type (axially), Table 1 represents the most limiting lattice type at each exposure point for that fuel type. When hand calculations are required, MAPLHGR_{STD} shall be determined by interpolation from Table 1.

MAPFAC(P), the core power-dependent MAPLHGR limit adjustment factor, shall be calculated by using Section 2.2.1.

MAPFAC(F), the core flow-dependent MAPLHGR limit adjustment factor, shall be calculated by using Section 2.2.2.

TABLE 1 FUEL TYPE-DEPENDENT STANDARD MAPLHGR LIMITS

Standard MAPLHGR Limit (KW/FT)						
Exposure GWD/ST	Fuel Type					
	10	12	14	15	16	
0.0	11.51	10.75	11.01	10.65	10.48	
0.2	11.54	10.79	11.07	10.70	10.56	
1.0	11.62	10.90	11.18	10.81	10.70	
2.0	11.71	11.11	11.33	10.97	10.87	
3.0	11.79	11.36	11.48	11.14	11.08	
4.0	11.87	11.54	11.64	11.32	11.30	
5.0	11.96	11.67	11.80	11.51	11.45	
6.0	12.04	11.81	11.96	11.69	11.59	
7.0	12.13	11.95	12.13	11.87	11.72	
8.0	12.23	12.09	12.29	12.06	11.85	
9.0	12.34	12.23	12.45	12.23	11.98	
10.0	12.48	12.39	12.61	12.39	12.09	
12.5	12.50	12.46	12.70	12.47	12.07	
15.0	12.19	12.18	12.48	12.34	11.91	
17.5	11.82	11.88	12.18	12.10	11.63	
20.0	11.45	11.57	11.87	11.81	11.32	
25.0	10.71	10.91	11.25	11.20	10.71	
30.0	9.99	10.47	10.64	10.59	10.10	
35.0	9.28	10.05	10.01	9.97	9.50	
40.0	8.59	9.64	9.28	9.23	8.88	
45.0	7.91	9.26	8.59	8.53	8.24	
50.0	7.24	8.88	7.93	7.87	7.57	
55.0	6.56	8.51	7.25	7.20	6.87	
56.37	6.37					
56.89					6.59	
57.12		8.35				
57.24		8.34				
58.58				6.66		
58.84			6.67			

Fuel Types	
10 = GE11-P9CUB353-10GZ-100M-146-T	15 = GE11-P9CUB378-4G6/8G5-100T-146-T
12 = GE11-P9CUB366-15GZ-100T-146-T	16 = GE11-P9CUB396-13GZ-100T-146-T
14 = GE11-P9CUB380-12GZ-100T-146-T	

2.2.1 Calculation of MAPFAC(P)

The core power-dependent MAPLHGR limit adjustment factor, MAPFAC(P), shall be calculated by one of the following equations:

For $0 \leq P < 25$:

No thermal limits monitoring is required.

For $25 \leq P < 30$:

With turbine bypass OPERABLE,

For core flow ≤ 50 Mlbs/hr,

$$MAPFAC(P) = 0.606 + 0.0038(P - 30)$$

For core flow > 50 Mlbs/hr,

$$MAPFAC(P) = 0.586 + 0.0038(P - 30)$$

With turbine bypass INOPERABLE,

For core flow ≤ 50 Mlbs/hr,

$$MAPFAC(P) = 0.490 + 0.0050(P - 30)$$

For core flow > 50 Mlbs/hr,

$$MAPFAC(P) = 0.438 + 0.0050(P - 30)$$

For $30 \leq P \leq 100$:

$$MAPFAC(P) = 1.0 + 0.005224(P - 100)$$

where: P = Core power (fraction of rated power times 100).

2.2.2 Calculation of MAPFAC(F)

The core flow-dependent MAPLHGR limit adjustment factor, MAPFAC(F), shall be calculated by the following equation:

$$MAPFAC(F) = \text{MIN}(1.0, A_F \times \frac{WT}{100} + B_F)$$

where:

- WT = Core flow (Mlbs/hr).
- A_F = Given in Table 2.
- B_F = Given in Table 2.

TABLE 2 FLOW-DEPENDENT MAPLHGR LIMIT COEFFICIENTS

Maximum Core Flow* (Mlbs/hr)	A _F	B _F
110	0.67874	0.4358

*As limited by the Recirculation System MG Set mechanical scoop tube stop setting.

3.0 MINIMUM CRITICAL POWER RATIO

TECH SPEC IDENT	OPERATING LIMIT
3.2.2	MCPR

3.1 Definition

The MINIMUM CRITICAL POWER RATIO (MCPR) shall be the smallest Critical Power Ratio (CPR) that exists in the core for each type of fuel. The CPR is that power in the assembly that is calculated by application of the appropriate correlation(s) to cause some point in the assembly to experience boiling transition, divided by the actual assembly operating power.

3.2 Determination of Operating Limit MCPR

The required Operating Limit MCPR (OLMCPR) at steady-state rated power and flow operating conditions is derived from the established fuel cladding integrity Safety Limit MCPR of 1.07 and an analysis of abnormal operational transients. To ensure that the Safety Limit MCPR is not exceeded during any anticipated abnormal operational transient, the most limiting transients have been analyzed to determine which event will cause the largest reduction in CPR. Three different core average exposure conditions are evaluated. The result is an Operating Limit MCPR which is a function of exposure and τ . τ is a measure of scram speed, and is defined in Section 3.3.2.

The OLMCPR shall be calculated by the following equation:

$$OLMCPR = \text{MAX}(MCPR(P), MCPR(F))$$

MCPR(P), the core power-dependent MCPR operating limit, shall be calculated using Section 3.3.

MCPR(F), the core flow-dependent MCPR operating limit, shall be calculated using Section 3.4.

In case of **Single Loop Operation**, the Safety Limit MCPR is increased by 0.02 to 1.09, but OLMCPR does not change.

3.3 Calculation of MCPR(P)

MCPR(P), the core power-dependent MCPR operating limit, shall be calculated by the following equation:

$$MCPR(P) = K_p \times OLMCPR_{100/105}$$

K_p , the core power-dependent MCPR Operating Limit adjustment factor, shall be calculated by using Section 3.3.1.

$OLMCPR_{100/105}$ shall be determined by interpolation from Table 3, and τ shall be calculated by using Section 3.3.2.

TABLE 3 OLMCPR_{100/105} AS A FUNCTION OF EXPOSURE AND τ

<u>CONDITION</u>	<u>EXPOSURE (MWD/ST)</u>		<u>OLMCPR_{100/105}</u>
Both Turbine Bypass and Moisture Separator Reheater OPERABLE	BOC to 7500	$\tau = 0$	1.26
		$\tau = 1$	1.31
	7500 to 9500	$\tau = 0$	1.29
		$\tau = 1$	1.34
	9500 to EOC	$\tau = 0$	1.30
		$\tau = 1$	1.38
Either Turbine Bypass or Moisture Separator Reheater INOPERABLE	BOC to EOC	$\tau = 0$	1.35
		$\tau = 1$	1.43
Both Turbine Bypass and Moisture Separator Reheater INOPERABLE	BOC to EOC	$\tau = 0$	1.37
		$\tau = 1$	1.45

3.3.1 Calculation of K_p

The core power-dependent MCPR operating limit adjustment factor, K_p , shall be calculated by using one of the following equations:

For $0 \leq P < 25$:

No thermal limits monitoring is required.

For $25 \leq P < 30$:

When turbine bypass is **OPERABLE**,

$$K_p = \frac{(K_{BYP} + (0.026 \times (30 - P)))}{OLMCPR_{100/105}}$$

where: $K_{BYP} = 1.90$ for core flow ≤ 50 Mlbs/hr
 $= 2.23$ for core flow > 50 Mlbs/hr

When turbine bypass is **INOPERABLE**,

$$K_p = \frac{(K_{BYP} + (0.054 \times (30 - P)))}{OLMCPR_{100/105}}$$

where: $K_{BYP} = 2.26$ for core flow ≤ 50 Mlbs/hr
 $= 3.03$ for core flow > 50 Mlbs/hr

For $30 \leq P < 45$:

$$K_p = 1.28 + (0.0134 \times (45 - P))$$

For $45 \leq P < 60$:

$$K_p = 1.15 + (0.00867 \times (60 - P))$$

For $60 \leq P \leq 100$:

$$K_p = 1.0 + (0.00375 \times (100 - P))$$

where: $P =$ Core power (fraction of rated power times 100).

3.3.2 Calculation of τ

The value of τ , which is a measure of the conformance of the actual control rod scram times to the assumed average control rod scram time in the reload licensing analysis, shall be calculated by using the following equation:

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

where: $\tau_A = 1.096$ seconds,

$$\tau_B = 0.830 + 0.019 \times 1.65 \sqrt{\frac{N_1}{\sum_{i=1}^n N_i}}$$

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

n = number of surveillance tests performed to date in cycle,

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

τ_i = average scram time to notch 36 of all rods measured in the i^{th} surveillance test, and

N_1 = total number of active rods measured in the initial control rod scram time test for the cycle (Technical Specification Surveillance Requirement 3.1.4.4).

The value of τ shall be calculated and used to determine the applicable $OLMCPR_{100/105}$ value from Table 3 within 72 hours of the conclusion of each control rod scram time surveillance test required by Technical Specification Surveillance Requirements 3.1.4.1, 3.1.4.2, and 3.1.4.4. Prior to performance of the initial scram time measurements for the cycle, a τ value of 1.0 shall be used to determine the applicable $OLMCPR_{100/105}$ value from Table 3.

3.4 Calculation of MCPR(F)

MCPR(F), the core flow-dependent MCPR operating limit, shall be calculated by using the following equation:

$$MCPR(F) = \text{MAX}(1.20, (A_F \times \frac{WT}{100} + B_F))$$

where:

- WT = Core flow (Mlbs/hr).
- A_F = Given in Table 4.
- B_F = Given in Table 4.

TABLE 4 FLOW-DEPENDENT MCPR LIMIT COEFFICIENTS

Maximum Core Flow* (Mlbs/hr)	A _F	B _F
110	-0.5956	1.727

*As limited by the Recirculation System MG Set mechanical scoop tube stop setting.

4.0 LINEAR HEAT GENERATION RATE

TECH SPEC IDENT	OPERATING LIMIT
3.2.3	LHGR

4.1 Definition

The LINEAR HEAT GENERATION RATE (LHGR) shall be the heat generation per unit length of fuel rod. It is the integral of the heat flux over the heat transfer area associated with the unit length. By maintaining the operating LHGR below the applicable LHGR limit, it is assured that all thermal-mechanical design bases and licensing limits for the fuel will be satisfied.

4.2 Determination of LHGR Limit

The LHGR limit is defined as a function of lattice type and average planar exposure and is presented in Table 5. Since fuel types may contain more than one lattice type (axially), Table 5 represents the most limiting lattice type at each exposure point for that fuel type. When hand calculations are required, the LHGR limit shall be determined by interpolation from Table 5.

TABLE 5 LHGR LIMITS FOR VARIOUS FUEL TYPES					
LHGR Limit (KW/FT)					
Exposure GWD/ST	Fuel Type				
	10	12	14	15	16
0.0	14.40	14.40	14.40	14.40	14.40
9.81	14.40				
10.43					14.40
10.57				14.40	
10.70		14.40			
10.82			14.40		
23.26		12.29			
56.20	6.80				
56.89					6.80
57.13		8.90			
58.58				6.80	
58.85			6.80		

Fuel Types	
10 = GE11-P9CUB353-10GZ-100M-146-T	15 = GE11-P9CUB378-4G6/8G5-100T-146-T
12 = GE11-P9CUB366-15GZ-100T-146-T	16 = GE11-P9CUB396-13GZ-100T-146-T
14 = GE11-P9CUB380-12GZ-100T-146-T	

5.0 CONTROL ROD BLOCK INSTRUMENTATION

TECH SPEC IDENT	SETPOINT
3.3.2.1	RBM

5.1 Definition

The nominal trip setpoints and allowable values of the control rod withdrawal block instrumentation are shown in Table 6. These values are consistent with the bases of the APRM Rod Block Technical Specification Improvement Program (ARTS) and the MCPR operating limits.

TABLE 6 CONTROL ROD BLOCK INSTRUMENTATION SETPOINTS WITH FILTER

Setpoint	Trip Setpoint	Allowable Value
LPSP	27.0	28.4
IPSP	62.0	63.4
HPSP	82.0	83.4
LTSP	117.0	118.9
ITSP	112.2	114.1
HTSP	107.2	109.1
DTSP	94.0	92.3

where:

- LPSP Low power setpoint; Rod Block Monitor (RBM) System trip automatically bypassed below this level
- IPSP Intermediate power setpoint
- HPSP High power setpoint
- LTSP Low trip setpoint
- ITSP Intermediate trip setpoint
- HTSP High trip setpoint
- DTSP Downscale trip setpoint

6.0 REFERENCES

1. "General Electric Standard Application for Reactor Fuel (GESTAR II)," NEDE-24011-P-A, Revision 13 as amended by Amendment 25
2. "The GESTR-LOCA and SAFER Models for the Evaluation of the Loss-of-Coolant Accident - SAFER/GESTR Application Methodology," NEDE 23785-1-PA, Revision 1, October 1984
3. "Fermi-2 SAFER/GESTR-LOCA, Loss-of-Coolant Accident Analysis," NEDC-31982P, July 1991, and Errata and Addenda No. 1, April 1992
4. "Lattice-Dependent MAPLHGR Report for Fermi Power Plant Unit 2 Reload 7 Cycle 8," Global Nuclear Fuel, J11-03648-10AA, Revision 0, March 2000
5. "Supplemental Reload Licensing Report for Fermi Power Plant Unit 2 Reload 7, Cycle 8," Global Nuclear Fuel, J11-03648-10, Revision 1, March 2000
6. Letter from T. G. Colburn to W. S. Orser, "Fermi-2 - Amendment No. 87 to Facility Operating License No. NPF-43 (TAC NO. M82102)," September 9, 1992
7. Letter from J. F. Stang to W. S. Orser, "Amendment No. 53 to Facility Operating License No. NPF-43: (TAC No. 69074)," July 27, 1990
8. "Maximum Extended Operating Domain Analysis for Detroit Edison Company Enrico Fermi Energy Center Unit 2," GE Nuclear Energy, NEDC-31843P, July 1990
9. Letter from D. P. Stier, GENE N&SA, to A. Alzaben, GNF, "Fermi 2 Cycle 8 ARTS 110% Flow Dependent Curves" April 5, 2000
10. "Power Range Neutron Monitoring System," DC-4608, Vol. XI DCD, Rev. B and DC-4608 Vol. I Rev. D.
11. Letter from Andrew J. Kugler (USNRC) to Douglas R. Gipson (Detroit Edison), "Fermi-2 - Issuance of Amendment RE: Safety Limit Minimum Critical Power Ratio Limits for Cycle 8 (TAC NO. MA7372)," dated March 30, 2000
12. Letter from Greg Porter to B. L. Myers, "Scram Times for Improved Tech Specs." GP-99014, October 22, 1999 containing DRF A12-00038-3, Vol. 4 information from G. A. Watford, GE, to Distribution, Subject: Scram Times versus Notch Position.

6.0 REFERENCES

13. Methodology and Uncertainties for Safety Limit MCPR Evaluations, NEDC-32601P-A, August 1999
14. Power Distribution Uncertainties for Safety Limit MCPR Evaluation, NEDC-32694P-A, August 1999
15. R-Factor Calculation Method for GE11, GE12, and GE13 Fuel, NEDC-32505P-A, Revision 1, July 1999
16. Letter from Les Conner to Simon Hsieh, Implementation of Relaxed Thermal Mechanical Limits for Fermi-2 Cycle 8, LRC01.033, dated August 24, 2001