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L-09-116

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

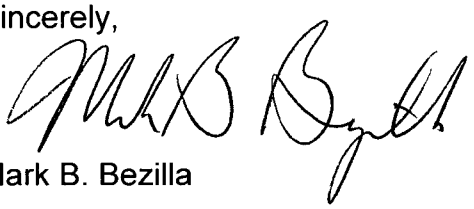
SUBJECT:
Perry Nuclear Power Plant
Docket No. 50-440; License No. NPF-58
Submission of the Core Operating Limits Report

Enclosed is Revision 17 of the Core Operating Limits Report for the Perry Nuclear Power Plant Unit 1 Cycle 13 (Reload 12). This report is submitted in accordance with Perry Nuclear Power Plant (PNPP) Technical Specification 5.6.5, "Core Operating Limits Report (COLR)."

The COLR for the last operating cycle (Cycle 12) was Revision 15, submitted by letter dated May 9, 2007 (PY-CEI/NRR-3032L). The enclosed Revision 17 supersedes Revision 16 that was prepared for Cycle 13, but was not docketed due to minor editorial errors that were identified and corrected in Revision 17.

There are no regulatory commitments contained in this submittal. If there are any questions or if additional information is required, please contact Mr. Thomas A. Lentz, Manager – Fleet Licensing, at (330) 761-6071.

Sincerely,



Mark B. Bezilla

Enclosure: Core Operating Limits Report for the Perry Nuclear Power Plant Unit 1 Cycle 13 (Reload 12)

cc: NRC Region III
NRC Resident Inspector
NRC Project Manager

A001
NRR

CORE OPERATING LIMITS REPORT FOR THE PERRY NUCLEAR POWER PLANT UNIT 1 CYCLE 13 (RELOAD 12)

Functional Location (J11)

Plant Data Book

Effective Date: 5-1-09

Preparer: Dean A. Thayer / 4-24-09
Date

TABLE OF CONTENTS

1.0 INTRODUCTION

This Core Operating Limits Report for PNPP Unit 1 Cycle 13 is prepared in accordance with the requirements of PNPP Technical Specification Administrative Controls 5.6.5. The core operating limits presented were developed using NRC-approved methods (Reference 2). Results from the reload analysis for the General Electric fuel in PNPP Unit 1 for Cycle 13 are documented in References 3, 4 and 15.

The cycle-specific core operating limits for the following PNPP Unit 1 Technical Specifications are included in this report:

1. Average Planar Linear Heat Generation Rate (APLHGR) Limits for each fuel/lattice type, including the power and flow dependent MAPFAC curves with the single loop MAPLHGR reduction factor. (Technical Specification 3.2.1)

2. Minimum Critical Power Ratio Operating Limit including the power and flow dependent MCPR curves for Two Loop Operation and Single Loop Operation. (Technical Specification 3.2.2)

   Additional power dependent MCPR curves for Two Loop Operation and Single Loop Operation are provided for operation with one pressure regulator out of service.

3. Linear Heat Generation Rate (LHGR) Limits for each fuel/lattice type, including the power and flow dependent MAPFAC curves with the single loop MAPLHGR reduction factor. (Technical Specification 3.2.3)

4. The simulated thermal power time constant. (Technical Specification 3.3.1.1, SR 3.3.1.1.14)

5. Oscillation Power Range Monitor (OPRM) Instrumentation. (Technical Specification 3.3.1.3)

2.0 REFERENCES

2.1 Discretionary

None

2.2 Obligations

1. Perry Nuclear Power Plant Updated Safety Analysis Report, Unit 1, Appendix 15B-Reload Safety Analysis
2. General Electric Standard Application for Reactor Fuel-GESTAR II, NEDE-24011-P-A-16 and NEDE-24011-P-A-16-US (US Supplement), October 2007
3. Supplemental Reload Licensing Report for Perry Nuclear Power Plant Unit 1 Reload 12 Cycle 13, GNF Document 0000-0081-0845-SRLR, Rev 0, November 2008
4. Fuel Bundle Information Report for Perry Nuclear Power Plant Unit 1 Reload 12 Cycle 13, GNF Document 0000-0081-0845-FBIR, Rev 0, November 2008
5. License Amendment No. 61 to Facility Operating License NPF-58, June 2, 1994
6. Generic Letter 88-16, Removal of Cycle-Specific Parameters From Technical Specifications
7. Technical Specification 3.2.1, Average Planar Linear Heat Generation Rate
8. Technical Specification 3.2.2, Minimum Critical Power Ratio
9. Technical Specification 3.2.3, Linear Heat Generation Rate
10. Technical Specification 3.3.1.1, Reactor Protection System Instrumentation
11. Technical Specification 5.6.5, Core Operating Limits Report

12. Technical Specification 2.1.1.2, Safety Limit MCPR

13. License Amendment No. 33 to Facility Operating License NPF-58, September 13, 1990

14. License Amendment 112 to Facility Operating License NPF-58, June 1, 2000

15. Supplemental Reload Licensing Report for Perry Nuclear Power Plant Unit 1 Reload 8 Cycle 9, GNF Document J11-03754SRLR, Rev 1, January 2003

16. CR 03-01377, Equation for OL MCPR(P) in the Core Operating Limits Report is Suspect

17. License Amendment 132, Perry Nuclear Power Plant, Unit 1 – Issuance of Amendment RE: Revision of the Minimum Critical Power Ratio Safety Limit (TAC No. MC 2599), February 3, 2005

18. License Amendment 134, Perry Nuclear Power Plant, Unit 1 – Issuance of Amendment RE: Single Recirculation Loop Operation (TAC No. MC 4224), March 31, 2005

19. Calculation FM-012, OPRM Device Settings and Setpoints, Revision 4.

20. Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications, Licensing Topical Report, NEDO-32465-A, August 1996.

21. Supplemental Reload Licensing Report for PERRY NUCLEAR POWER PLANT UNIT 1 Reload 10 Cycle 11, 0000-0028-4692-SRLR, Revision 1, March 2005.

22. Supplemental Reload Licensing Report for PERRY NUCLEAR POWER PLANT UNIT 1 Reload 11 Cycle 12, 0000-0052-0343-SRLR, Revision 0, December 2006.

Commitments addressed in this document:

None

3.0 AVERAGE PLANAR LINEAR HEAT GENERATION RATE (T.S. 3.2.1)

All AVERAGE PLANAR LINEAR HEAT GENERATION RATES (APLHGRs) shall not exceed the result obtained from multiplying the applicable MAPLHGR limits, {Equation MAPLHGR}, by the smaller of either the flow dependent MAPLHGR factor ($MAPFAC_f$) {Equation MAPLHGR-F} or the power dependent MAPLHGR factor ($MAPFAC_p$) {Equation MAPLHGR-P}. MAPLHGR Limits are defined in Reference 3. $MAPFAC_f$ and $MAPFAC_p$ are defined in Reference 15.

* These applicable MAPLHGR limits are:

1. Those for the respective fuel as a function of the average planar exposure (as described by the NRC approved methodology described in GESTAR-II)

or,

2. When hand calculations are required, the MAPLHGR limit as a function of the average planar exposure as described in equations MAPLHGR, MAPLHGR-F, and MAPLHGR-P.

{Equation MAPLHGR}
Select the equation that applies to the nodal exposure

- For nodal exposure Exp <= 19.13:
  MAPLHGR limit = 12.82
- For nodal exposure 19.13 < Exp <= 57.61
  MAPLHGR limit = 12.82 - [0.12526*(Exp-19.13)]
- For nodal exposure 57.61 < Exp <= 63.5
  MAPLHGR limit = 8.0 – [0.50934*(Exp-57.61)]

Where Exp = Average Planar Exposure GWd/sT

{Equation MAPLHGR-F}
The following equation calculates the Flow Dependent MAPLHGR Factor ($MAPFAC_f$):

$MAPFAC_f = 0.4574+(0.006758*F)$

Where
F = Core Flow (%)

{Equation MAPLHGR-P}
To calculate the Power Dependent MAPLHGR Factor($MAPFAC_p$), select the equation that applies to the Core Thermal Power and Core Flow

- For THERMAL POWER 23.8% <= P <= 38% and Core Flow > 50%:
  $MAPFAC_p = 0.6+0.0021 * (P-38)$
- For THERMAL POWER 23.8% <= P <= 38% and Core Flow <= 50%:
  $MAPFAC_p = 1.0+0.0052 * (P-100)$
- For THERMAL POWER > 38%, regardless of Core Flow
  $MAPFAC_p = 1.0 + 0.0052 * (P-100)$

Where
P = THERMAL POWER (%)

$MAPFAC_f$ and $MAPFAC_p$ shall not exceed 1.0.
For Single Loop Operation, $MAPFAC_f$ and $MAPFAC_p$ shall not exceed 0.8. The Single Loop Operation limits take effect when reset for single loop operation per LCO 3.4.1,"Recirculation Loops Operating". This is consistent with note "(b)" to Table 3.3.1.1-1 of the Technical Specifications. Use FTI-B0012 Single Loop Operation to implement the revised MAPLHGR Limits.

4.0 MINIMUM CRITICAL POWER RATIO (T.S. 3.2.2)

The MINIMUM CRITICAL POWER RATIO (MCPR) shall be equal to or greater than the higher of the flow dependent MCPR ($MCPR_f$) and power dependent MCPR ($MCPR_p$) limits at the indicated core flow and THERMAL POWER.

Use Table 3.2.2-1, MCPR Limit Equation Table, to determine which equations to use for calculating $MCPR_f$ and MCPRp based on equipment operation.
Figure 3.2.2-1, contains a graphical representation of the Power Dependent MCPR Limit (MCPRp), Fuel Type GE14 (Two Loop Operation).

The MCPR Safety Limit for Cycle 13 is 1.08 and the MCPR Safety Limit for Single Loop Operation is 1.10 <TECHNICAL SPECIFICATIONS 2.1.1.2> (Reference 3 and 17). During Single Loop Operation with 3D MONICORE monitor in "2 LOOPS ON" mode, the Maximum Fraction of Limiting Critical Power Ratio (MFLCPR) shall be equal to or less than 0.98. Use FTI-B0012 Single Loop Operation to implement this revised MFLCPR.

Table 3.2.2-1, MCPR Limit Equation Table

	Two Loop Operation	Single Loop Operation
Pressure Regulator in service	MCPR-P1 MCPR-F1	MCPR-P3 MCPR-F2
Pressure Regulator out of service	MCPR-P2 MCPR-F1	MCPR-P4 MCPR-F2

During Two Loop Operation, the resulting limit from $MCPR_f$ and $MCPR_p$ shall not be less than the OLMCPR of 1.33. During Single Loop Operation, the resulting limit from $MCPR_f$ and $MCPR_p$ shall not be less than the OLMCPR of 1.35.

FLOW DEPENDENT MCPR LIMITS

{Equation MCPR-F1}
(Two Loop Operation)
The following equation calculates the Flow Dependent MCPR ($MCPR_f$):

$MCPR_f = [1.8134 – (0.006948*F)]*(1.08/1.07)$

Where
F = Core Flow (%)

{Equation MCPR-F2}
(Single Loop Operation)
The following equation calculates the Flow Dependent MCPR ($MCPR_f$):

$MCPR_f = [1.8134 – (0.006948*F)]*(1.10/1.07)$

Where
F = Core Flow (%)

POWER DEPENDENT MCPR LIMITS

{Equation MCPR-P1}
(Pressure Regulator in service and Two Loop Operation)
Select the equation that applies to the THERMAL POWER and Core Flow

- For THERMAL POWER 23.8% <= P <= 38% and Core Flow > 50%:
  $MCPR_p = 1.98 + 0.0246*(38-P)$
- For THERMAL POWER 23.8% <= P <= 38% and
  Core Flow <= 50%:
  $MCPR_p = 1.95 + 0.0162*(38-P)$
- For THERMAL POWER 38% < P <= 50%, regardless of Core Flow
  $MCPR_p = 1.33 * [1.448 + 0.007 * (50-P)]$
- For THERMAL POWER 50% < P <= 66.7%, regardless of Core Flow $MCPR_p = 1.33 * [1.223 + 0.004 * (66.7-P)]$

- For THERMAL POWER > 66.7%, regardless of Core Flow
  $MCPR_p = 1.33 * [1.0 + 0.005 * (100-P)]$

Where
P = THERMAL POWER (%)

{Equation MCPR-P2}
(Pressure Regulator out of service and Two Loop Operation)
Select the equation that applies to the THERMAL POWER and Core Flow

- For THERMAL POWER 23.8% <= P <= 38% and Core Flow > 50%:
  $MCPR_p = 1.98 + 0.0246 * (38-P)$

- For THERMAL POWER 23.8% <= P <= 38% and
  Core Flow <= 50%:
  $MCPR_p = 1.95 + 0.0162 * (38-P)$

- For THERMAL POWER 38% < P <= 80%, regardless of Core Flow
  $MCPR_p = (1.33) * [1.19 + 0.0087 * (80-P)]$

- For THERMAL POWER > 80%, regardless of Core Flow
  $MCPR_p = 1.33 * [1.0 + 0.005 * (100-P)]$

Where
P = THERMAL POWER (%)

{Equation MCPR-P3}
(Pressure Regulator in service and Single Loop Operation)
Select the equation that applies to the THERMAL POWER and Core Flow

- For THERMAL POWER 23.8% <= P <= 38% and Core Flow > 50%:
  $MCPR_p = [1.98 + 0.0246 * (38-P)] + 0.02$

- For THERMAL POWER 23.8% <= P <= 38% and
  Core Flow <= 50%:
  $MCPR_p = [1.95 + 0.0162 * (38-P)] + 0.02$

- For THERMAL POWER 38% < P <= 50%, regardless of Core Flow
  $MCPR_p = (1.33 + 0.02) * [1.448 + 0.007 * (50-P)]$

- For THERMAL POWER 50% < P <= 66.7%, regardless of Core Flow
  $MCPR_p = (1.33 + 0.02) * [1.223 + 0.004 * (66.7-P)]$

- For THERMAL POWER > 66.7%, regardless of Core Flow
  $MCPR_p = (1.33 + 0.02) * [1.0 + 0.005 * (100-P)]$

Where
P = THERMAL POWER (%)

{Equation MCPR-P4}
(Pressure Regulator out of service and Single Loop Operation)
Select the equation that applies to the THERMAL POWER and Core Flow

- For THERMAL POWER 23.8% <= P <= 38% and Core Flow > 50%:
  $MCPR_p = [1.98 + 0.0246 * (38-P)] + 0.02$

- For THERMAL POWER 23.8% <= P <= 38% and Core Flow <= 50%:
  $MCPR_p = [1.95 + 0.0162 * (38-P)] + 0.02$

- For THERMAL POWER 38% < P <= 80%, regardless of Core Flow
  $MCPR_p = (1.33 + 0.02) * [1.19 + 0.0087 * (80-P)]$

- For THERMAL POWER > 80%, regardless of Core Flow
  $MCPR_p = (1.33 + 0.02) * [1.0 + 0.005 * (100-P)]$

(INTENTIONALLY BLANK)

Where
P = THERMAL POWER (%)

NOTE 1

For Cycle 13 no change to MCPR limits is required for planned reduction of feedwater temperature to as low as 325.5°F. Final feedwater temperature may be reduced to 255.5°F after all control rods are withdrawn at the end of cycle if the OPRMs are OPERABLE.

NOTE 2

Planned reduction of rated feedwater temperature from nominal rated feedwater temperature is not permitted during plant operation with the reactor recirculation system in Single Loop Operation.

NOTE 3

Single Loop Operation and/or Pressure Regulator Out of Service (OOS) may be implemented as either a change to the core monitoring software or appropriate administrative limit.

Figure 3.2.2-2 is used to determine the limit to the Maximum Fraction Limiting Critical Power Ratio (MFLCPR) with One Pressure Regulator Out Of Service. This is intended as an interim measure until such time that the 3D Monicore Data Bank can be updated to reflect the $MCPR_p$ Pressure Regulator Out of Service curve. Once the 3DM Data Bank is updated, the MFLCPR limit would return to 1.00. Figure 3.2.2-2 represents the ratio of $MCPR_p$ to $MCPR_p$ with the Pressure Regulator Out of Service.

In the case where a Pressure Regulator is out of service and the plant is in Single Loop Operations, limit the MFLCPR to the smaller of 0.98 and Figure 3.2.2-2, MFLCPR Limit With one Pressure Regulator Out Of Service.

NOTE 4

There are a total of 19 safety/relief valves, the two lowest setpoint valves are assumed to be out-of-service in the transient analysis.

NOTE 5

The MCPR operating limit is increased 0.02 to account for the increase in the single loop MCPR safety limit with the reactor recirculation system in Single Loop Operation.

NOTE 6

The Single Loop Operation limits take effect when reset for Single Loop Operation per LCO 3.4.1, "Recirculation Loops Operating". This is consistent with note "(b)" to Table 3.3.1.1-1 of the Technical Specifications.

NOTE 7

The standard off-rated limits established as part of the GE14 new fuel introduction from Cycle 9 are applicable for the current Cycle 13 with the appropriate scaling. Therefore, scaling of (1.08/1.07) was applied to the $MCPR_p$ equations and scaling of (1.08/1.07) and (1.10/1.07) applied to $MCPR_f$ coefficients to account for the changes in the SLMCPR (Reference 3).

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Power Dependent MCPR Limit ($MCPR_p$),Fuel Type GE14 (Two Loop Operation)

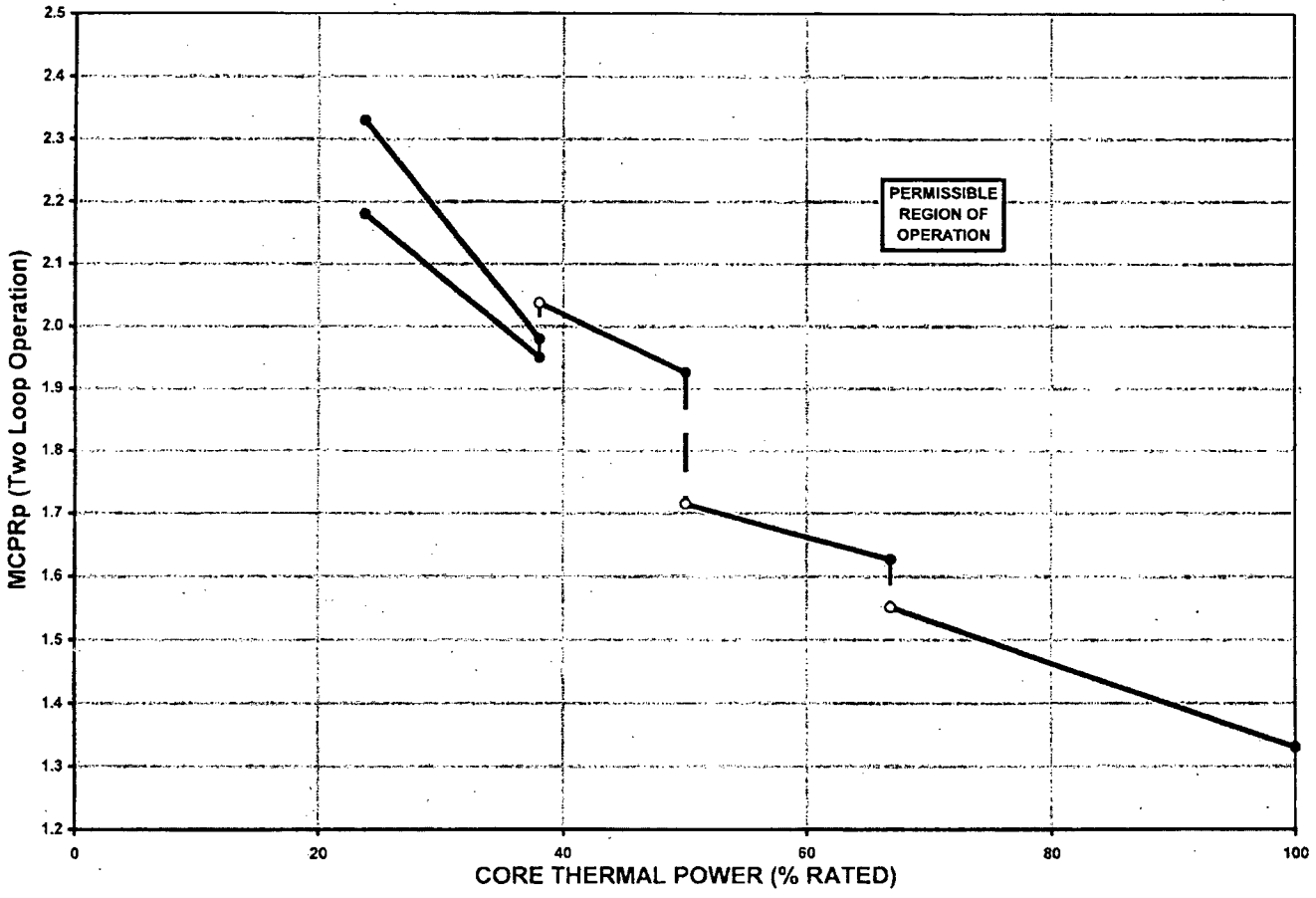

Figure 3.2.2-1

Maximum Fraction Limiting Critical Power Ratio Limit (MFLCPR), Fuel Type GE14
With One Pressure Regulator Out Of Service

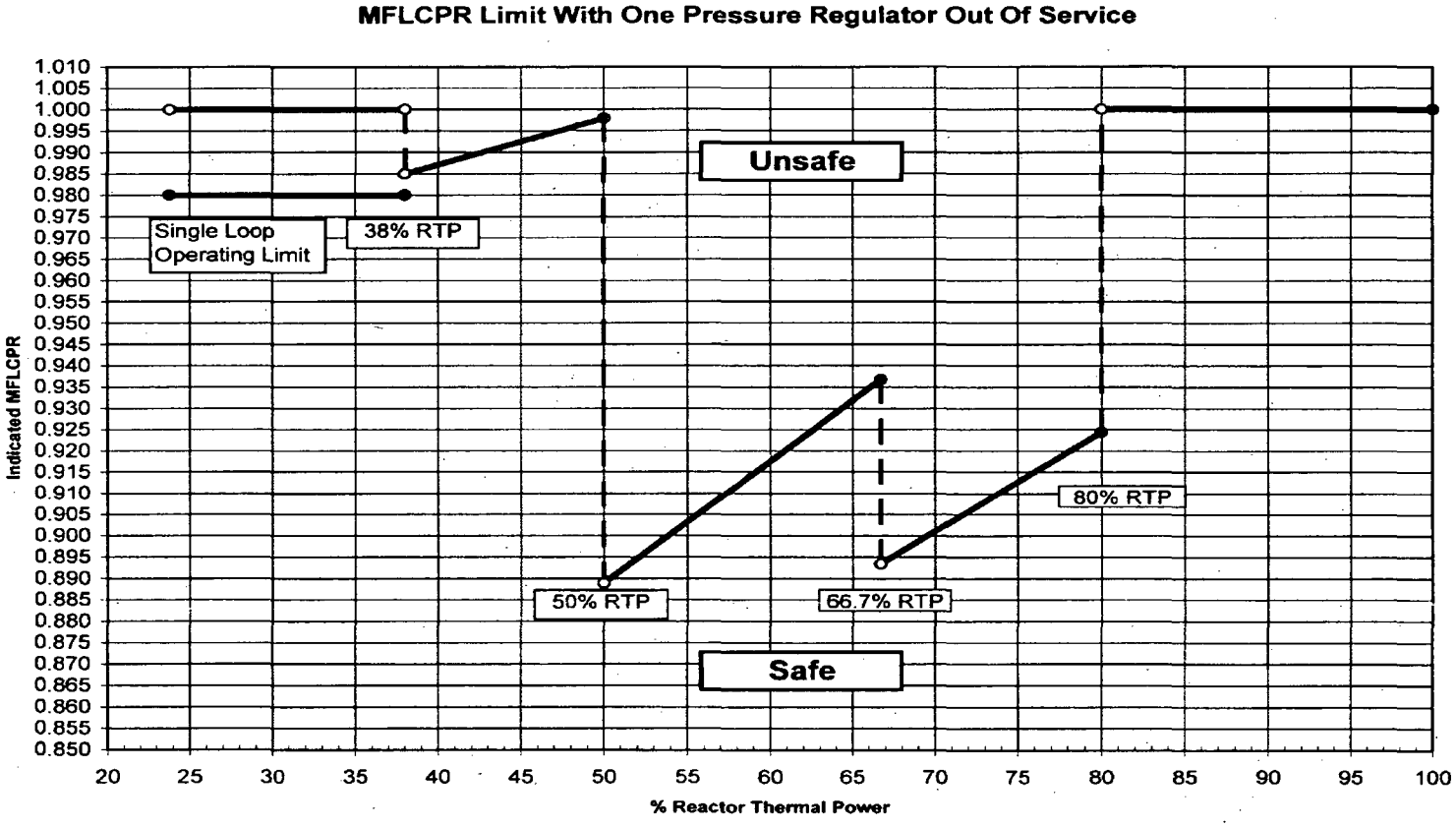

Figure 3.2.2-2

5.0 LINEAR HEAT GENERATION RATE (T.S. 3.2.3)

All LINEAR HEAT GENERATION RATES (LHGRs) shall not exceed the result obtained from multiplying the applicable LHGR values* by the smaller of either the flow dependent MAPLHGR factor ($MAPFAC_f$) {Equation MAPLHGR-F} or the power dependent MAPLHGR factor ($MAPFAC_p$) MAPLHGR-F.

NOTES

- LHGR Limits are defined in Reference 4. $MAPFAC_f$ and $MAPFAC_p$ are defined in Reference 15.
- The Single Loop Operation limits take effect when reset for single loop operation per LCO 3.4.1,"Recirculation Loops Operating". This is consistent with note "(b)" to Table 3.3.1.1-1 of the Technical Specifications. Use FTI-B0012 Single Loop Operation to implement the revised LHGR Limits.

For fuel rods without gadolinium, use equation LHGR-1. For rods that contain gadolinium, equation LHGR-2 bounds all of the gadolinium concentrations.

{Equation LHGR-1}
Select the equation that applies to the nodal exposure

- For nodal exposure Exp <= 14.51:
  LHGR limit = 13.4
- For nodal exposure 14.51 < Exp <= 57.61
  LHGR limit = 13.4 - [0.12529*(Exp-14.51)]
- For nodal exposure 57.61 < Exp <= 63.5
  LHGR limit = 8.0 – [0.50934*(Exp-57.61)]

Where Exp = Nodal Exposure (GWd/sT)

{Equation LHGR-2}

Select the equation that applies to the nodal exposure

- For nodal exposure where Exp <= 12.17:
  LHGR limit = 12.0
- For nodal exposure where 12.17 < Exp <= 54.59
  LHGR limit = 12.0 - [0.11410*(Exp-12.17)]
- For nodal exposure where 54.59 < Exp <= 60.39
  LHGR limit = 7.16 – [0.46207*(Exp-54.59)]

Where Exp = Nodal Exposure (GWd/sT)

* These applicable LHGR values are:

1. Those for the respective fuel type and bounding Gadolinium content as a function of the average planar exposure (as described by the NRC approved methodology described in GESTAR-II) (Reference 2).

6.0 REACTOR PROTECTION SYSTEM INSTRUMENTATION (T.S. 3.3.1.1)

The simulated thermal power time constant shall be 6 +/-0.6 seconds.

7.0 OSCILLATION POWER RANGE MONITOR (OPRM) INSTRUMENTATION (T.S. 3.3.1.3)

These are the Cycle 13 OPRM setpoints for operable OPRMs.

Current Settings:

1. Confirmation Count Setpoint ($N_p = N_2$): 12

2. Amplitude Setpoint (Sp): 1.10

Reference: Calculation: FM-012, Revision 4

8.0 SCOPE OF REVISION

Rev. 17

1. Removed subsection titles from the index.
2. Corrected page numbers in the index.
3. Added numbers to the references so they can be referenced from within the COLR.
4. Corrected revision number for Reference 19.
5. Corrected the MAPLHGR equation.
6. Deleted conditional phrase from Note 2 on page 12 as it was not applicable to Note 2.
7. Corrected Figure numbers on page 12.