Entergy

Entergy Nuclear Operations, Inc.
Pilgrim Nuclear Power Station
600 Rocky Hill Road
Plymouth, MA 02360

August 28, 2017

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

SUBJECT: Pilgrim Fuel Cycle 21, Core Operating Limits Report, Revision 35

Pilgrim Nuclear Power Station
Docket No. 50-293
Renewed License No. DPR-35

LETTER NUMBER 2.17.060

Dear Sir or Madam:

In accordance with Pilgrim Nuclear Power Station (PNPS) Technical Specification 5.6.5, Entergy Nuclear Operations, Inc. submits the attached Fuel Cycle 21, Core Operating Limits Report, Revision 35, which provides cycle-specific limits for operating PNPS during Cycle 21.

PNPS requests that Attachment 2 to this letter, which contains Trade Secret Information, be withheld from public disclosure in accordance with 10 CFR 2.390(b)(1).

If you have any questions or require additional information, please contact me at (508) 830-8323.

There are no regulatory commitments contained in this letter.

Sincerely,

Everett P. Perkins, Jr.
Manager, Regulatory Assurance

EPP/mp

A001
NRR

This letter contains Proprietary Information – Attachment 2 is withheld from public disclosure per 10 CFR 2.390

Attachments:

1. GNF letter,KGO-ENO-HK1-17-081, Kimberly O'Connor (GNF) to Nela Szwarc (Entergy), entitled "Pilgrim Nuclear Power Station Cycle 20 Core Operating Limits Report (COLR) Revision 33 and Cycle 21 COLR Revision 34, 35, and 36 – Proprietary and Non-Proprietary Versions," July 28, 2017.
2. Enclosure 7, KGO-ENO-HK1-17-081, Pilgrim Nuclear Power Station Cycle 21 Core Operating Limits Report, Revision 35, GNF Proprietary Information – Class II (Internal)
3. Enclosure 8, KGO-ENO-HK1-17-081, Pilgrim Nuclear Power Station Cycle 21 Core Operating Limits Report, Revision 35, Non-Proprietary Information – Class I (Public)
4. Enclosure 9, KGO-ENO-HK1-17-081, Affidavit for Enclosure 7, Pilgrim Nuclear Power Station Cycle 21 Core Operating Limits Report, Revision 35, GNF Proprietary Information – Class II (Internal)

cc: Mr. Daniel H. Dorman
Regional Administrator, Region I
U.S. Nuclear Regulatory Commission
2100 Renaissance Boulevard, Suite 100
King of Prussia, PA 19406-2713

Mr. John Lamb, Senior Project Manager
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Mail Stop 8 B1A
Washington, DC 20555

NRC Senior Resident Inspector
Pilgrim Nuclear Power Station

Mr. John Giarrusso Jr.
Planning, Preparedness & Nuclear Section Chief
Mass. Emergency Management Agency
400 Worcester Road
Framingham, MA 01702

This letter contains Proprietary Information – Attachment 2 is withheld from public disclosure per 10 CFR 2.390

Attachment 1

Letter Number 2.17.060

GNF letter,KGO-ENO-HK1-17-081, Kimberly O'Connor (GNF) to Nela Szwarc (Entergy), entitled "Pilgrim Nuclear Power Station Cycle 20 Core Operating Limits Report (COLR) Revision 33 and Cycle 21 COLR Revision 34, 35, and 36 – Proprietary and Non-Proprietary Versions," July 28, 2017

Proprietary Notice

This letter transmits proprietary information in accordance with 10 CFR 2.390. Upon the removal of Enclosures 1, 4, 7, and 10, the balance of the letter may be considered non-proprietary.

Global Nuclear Fuel

A Joint Venture of GE, Toshiba & Hitachi

Global Nuclear Fuel – Americas, LLC
Castle Hayne Road, Wilmington, NC 28401

Kimberly O'Connor
GNF Customer Project Manager

KGO-ENO-HK1-17-081

July 28, 2017

Ms. Nela Szwarc
Entergy Nuclear Northeast
440 Hamilton Road
White Plains, NY 10601

cc: Lynn Leatherwood
Gary James

SUBJECT: Pilgrim Nuclear Power Station Cycle 20 Core Operating Limits Report (COLR) Revision 33 and Cycle 21 COLR Revision 34, 35, and 36 – Proprietary and Non-Proprietary Versions

REFERENCES:
1. Email from Szwarc, Kornelia (Entergy) to O'Connor, Kimberly (GNF), Subject: FW: COLR Proprietary/Non-Proprietary Versions - Mail 1 of 4, July 25, 2017, 12:52 pm.
2. Entergy Nuclear Operations, Inc. Fixed Services Agreement No. 50014434 for the Supply of Fuel and Fuel Related Work to PNP with Global Nuclear Fuel, as amended ("Fuel Contract").

Ms. Szwarc,

By Reference 1, Global Nuclear Fuel – Americas, LLC (GNF) was requested to review and mark the proprietary content in the Pilgrim Nuclear Power Station (PNPS) Cycle 20 Core Operating Limits Report (COLR), Revision 33 and the PNPS Cycle 21 COLR Revisions 34, 35, and 36, prepare a corresponding non-proprietary version of each COLR, and provide an affidavit supporting the basis for the proprietary determination for each COLR. Enclosed are the COLRs marked to indicate the GNF proprietary information, corresponding non-proprietary versions of the COLRs, and affidavits supporting the basis for the proprietary determination.

GNF's review is limited to a proprietary determination. GNF did not review the content of the COLRs for technical accuracy.

Enclosures 1, 4, 7, and 10 of this transmittal contain GNF proprietary information that should be handled in accordance with the proprietary information provisions contained in the Fuel Contract listed above (Reference 2). GNF customarily maintains this information in confidence and withholds it from public disclosure. The affidavits provided in Enclosures 3, 6, 9, and 12 identify that the designated information in Enclosures 1, 4, 7, and 10 have been handled and classified as proprietary to GNF. The designated information is suitable for submittal to the NRC when accompanied by the attached affidavits. GNF hereby requests that the designated information be withheld from public disclosure in accordance with the provisions of 10 CFR 2.390 and 9.17. Non-proprietary versions of the GNF information is provided in Enclosures 2, 5, 8, and 11, respectively.

GNF requests that any transmittal of this proprietary information to the NRC be accompanied by the enclosed affidavit and proprietary notice. In order to maintain the applicability of the affidavit and to meet the requirements of 10 CFR 2.390, the transmittal to the NRC should:

1) faithfully reproduce the proprietary information,
2) preserve the proprietary annotations, and
3) include, at the top of the transmittal letter or in the subject line, the words similar to "Proprietary Information." If a cover sheet for enclosures is used, then the cover sheet for the enclosure containing the proprietary information should also state "Proprietary Information."

Based on past discussions with the NRC, GNF has been encouraged to request its customers to provide a paragraph similar to the following paragraph in the customer letter transmitting proprietary information to the NRC in order to clearly indicate the proprietary nature of the information and to document the source of the proprietary information as indicated in the GNF affidavit.

> "The enclosed documentation contains proprietary information as defined by 10 CFR 2.390. GNF, as the owner of the proprietary information, has executed the enclosed affidavit, which identifies that the enclosed proprietary information has been handled and classified as proprietary, is customarily held in confidence, and has been withheld from public disclosure. The proprietary information was provided to Entergy in a GNF transmittal that is referenced by the affidavit. The proprietary information has been faithfully reproduced in the enclosed documentation such that the affidavit remains applicable. GNF hereby requests that the enclosed proprietary information be withheld from public disclosure in accordance with the provisions of 10 CFR 2.390 and 9.17. A non-proprietary version of the documentation is also provided."

A signed copy of this letter is included in PLM Specification 004N3963 R0.

All information should be handled in accordance with the proprietary information provisions contained in the Fuel Contract listed above in Reference 2.

Please let me know if you have questions or comments regarding this transmittal.

Sincerely,

Kimberly O'Connor

Kimberly O'Connor
GNF-A Customer Project Manager

Enclosures:

1. Pilgrim Nuclear Power Station Cycle 20- Core Operating Limits Report, Revision 33 – Proprietary
2. Pilgrim Nuclear Power Station Cycle 20 Core Operating Limits Report, Revision 33 – Non-Proprietary

3. Affidavit for Enclosure 1
4. Pilgrim Nuclear Power Station Cycle 21 Core Operating Limits Report, Revision 34 – Proprietary
5. Pilgrim Nuclear Power Station Cycle 21 Core Operating Limits Report, Revision 34 – Non-Proprietary
6. Affidavit for Enclosure 4
7. Pilgrim Nuclear Power Station Cycle 21 Core Operating Limits Report, Revision 35 – Proprietary
8. Pilgrim Nuclear Power Station Cycle 21 Core Operating Limits Report, Revision 35 – Non-Proprietary
9. Affidavit for Enclosure 7
10. Pilgrim Nuclear Power Station Cycle 21 Core Operating Limits Report, Revision 36 – Proprietary
11. Pilgrim Nuclear Power Station Cycle 21 Core Operating Limits Report, Revision 36 – Non-Proprietary
12. Affidavit for Enclosure 10

Attachment 3

Letter Number 2.17.060

Enclosure 8, KGO-ENO-HK1-17-081, Pilgrim Nuclear Power Station Cycle 21 Core Operating Limits Report, Revision 35, Non-Proprietary Information – Class I (Public)

ENCLOSURE 8

KGO-ENO-HK1-17-081

Pilgrim Nuclear Power Station Cycle 21 Core Operating Limits Report, Revision 35

Non-Proprietary Information – Class I (Public)

INFORMATION NOTICE

This is a non-proprietary version of Enclosure 7 of KGO-ENO-HK1-17-081, which has the proprietary information removed. Portions of the document that have been removed are indicated by white space inside an open and closed bracket as shown here [[ ]].

(CYCLE 21)

LBDCR2015-010 Documents Approvals

Information Notice

This is a non-proprietary version of the Pilgrim Nuclear Power Station Core Operating Limits Report for Cycle 21, which has GNF proprietary information removed. Portions of the document that have been removed are indicated by white space inside open and closed bracket as shown here [[ ]].

TABLE OF CONTENTS

RECORD OF REVISIONS

Revision	Effective Date	Description
8A	Effective date based on issuance of license amendment by NRC	Applicable for use during Cycle 8 Operation
9A	License amendment by NRC for ARTS and SAFER/GESTR	Applicable for use during Cycle 9 operation
10A	Effective upon final approval	Applicable for use during Cycle 10 Operation
11A	Effective upon final approval	Applicable for use during Cycle 11 Operation
11B	Effective upon final approval	Applicable for use during Cycle 11 Operation
11C	Effective upon final approval	Applicable for use during Cycle 11 Operation
11D	Effective upon final approval	Applicable for use during Cycle 11 Operation
12A	License amendment by NRC for SLMCPR of 1.08	Applicable for use during Cycle 12 Operation
12B	Effective upon final approval	Renumbered Table 3.3-2 to 3.3-1, Sh. 2 of 2 and Table 3.3-1 to 3.3-1, Sh. 1 of 2
12C	Effective upon final approval	Changed Tech Spec section numbers referenced due to Tech Amendment #177. Pages affected: 6, 24
12D	Effective upon final approval	Incorporated stability log-term solution option I-A.
13A	Effective upon final approval	Applicable for use during Cycle 13 Operation
14A	Effective upon final approval	Applicable for use during Cycle 14 Operation
15A	Effective upon final approval	Applicable for use during Cycle 15 Operation
15B	Effective upon final approval	Changed MAPLHGR Limits for GE14 fuel in response to an input error GE corrected. Applicable for use during Cycle 15 Operation
16A	Effective upon final approval	Applicable for use during Cycle 16 Operation
16B	Effective upon final approval	Core Loading Change to replace leaking fuel bundle JLG621. Clarified P-F Map graphic on P. 36. Applicable for use during Cycle 16 Operation
25	Effective upon final approval	Limits for Single Loop Operation were incorporated. Rev number scheme changed to Merlin Convention
26	Effective upon final approval	Applicable for use during Cycle 17 Operation
27	Effective upon final approval	Corrected typographical errors on p. 30, 34,38,39 per CR-PNP-2008-256 and 285
28	Effective upon final approval	Extended Tables 3.1-1 to 63.5 GWD/ST (70 GWD/MT), updated Fig. 3.1-1, section 3.1 & references, addressed CR-PNP-2009-01066
29	Effective upon final approval	Applicable for use during Cycle 18 Operation
30	Effective upon final approval	Applicable for use during Cycle 19 Operation
31	Effective upon final approval	Corrected typographical error on fig.3.4-1
32	Effective upon final approval	MAPLHGR limits were revised to correct errors reported by 2011-02 and 2011-03, CR-PNP-2011-02556
33	Effective upon final approval	Applicable for use during Cycle 20 Operation
34	Effective upon final approval	Applicable for use during Cycle 21 Operation
35	Effective upon final approval	Updated GESTAR Revision Number

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

This report provides the cycle-specific limits for operation of the Pilgrim Nuclear Power Station (PNPS) during Cycle 21. In this report, Cycle 21 will be referred to as the present cycle.

The Technical Specifications refer to this report for the applicable values of the following fuel-related parameters:

	Reference Technical Specification
APRM Flux Scram Trip Setting (Run Mode)	Table 3.1.1
APRM Rod Block Trip Setting (Run Mode)	Table 3.2.C-2
Rod Block Monitor Trip Setting	Table 3.2.C-2
Average Planar Linear Heat Generation Rate	3.11.A
Linear Heat Generation Rate (LHGR)	3.11.B
Minimum Critical Power Ratio (MCPR)	3.11.C
Power/Flow Relationship	3.11.D
Reactor Vessel Core Design	4.2

If any of the core operating limits in this report is exceeded, actions will be taken as defined in the referenced Technical Specification.

The core operating limits in this report have been established for the present cycle using the NRC-approved methodology provided in the documents listed in Technical Specification 5.6.5. These limits are established such that the applicable limits of the plant safety analysis are met.

1.1 Stability Option 1-D Exclusion Region and Buffer Zone

The reactor shall not be intentionally operated within the Exclusion Region given in Figure 3.4-1, for Two Loop Operation (TLO) and Figure 3.4-2 for Single Loop Operation (SLO). Immediate exit is required for inadvertent entry into the exclusion region.

The reactor shall not be intentionally operated within the Buffer Zone given in Figure 3.4-1 for TLO and Figure 3.4-2, for SLO when the on-line Stability Monitor is inoperable.

Allowable values for APRM Scram and Rod Block trip set points are defined in Section 2.

2.0 INSTRUMENTATION TRIP SETTINGS:

2.1 APRM Flux Scram Trip Setting (Run Mode)

Reference Technical Specifications: Table 3.1.1

APRM flux scram Allowable Trip Set points (ATSP) for TLO are shown on Figure 2.1-1. The scram set point curve clamps power at 120% of rated core thermal power. Formulae used to develop Figure 2.1-1 are listed in Table 2.1-1.

APRM flux scram Allowable Trip Set points (ATSP) for SLO are shown on Figure 2.1-2. The scram set point curve clamps power at 120% of rated core thermal power. Formulae used to develop Figure 2.1-2 are listed in Table 2.1-2.

In accordance with Technical Specification Table 3.1.1, Note 15, for no combination of loop recirculation flow rate and core thermal power shall the APRM flux scram trip setting be allowed to exceed 120% of rated thermal power. Flow clamp feature is not used in Cycle 21.

Drive Flow to Core Flow relationship:

APRM Trip settings use Drive flow to determine the power trip setting for both scrams and rod blocks, as the drive flow is a more reliable flow indication than core flow. The transient analysis uses the stability based trip settings based on Core Flow. Therefore, calibration of Drive flow vs. core flow is important to ensure that transient analysis assumptions for trip settings are implemented correctly.

Drive Flow (W_D) normalization with core flow shall be done such that 100% Drive Flow with Two Loops corresponds to 100% Rated Core Flow of 69 M#/hr.

Source: Reference 5.6, sec. 2.1

Table 2.1-1
Formulae for Allowable APRM Flux Scram Trip Settings in Figure 2.1-1

Two Loop Operation

Allowable Trip Set Point (ATSP)		Drive Flow Range
C SLOPE	D INTERCEPT	% Rated
0.20	71.5	$0 \leq W_D \leq 22.5$
0.71	60.0	$22.5 < W_D \leq 55.9$
0.65	70.6	$55.9 < W_D \leq 76$
0	120.0	$76 < W_D \leq 125$

Notes:

1. ATSP = C * % W_D + D, ATSP is in % Power.
2. Figure 2.1-1 shows the plot of ATSP vs. W_D.
3. Reference 5.6, Table 1.a is the basis for the values of constants listed in this Table.

Table 2.1-2
Formulae for Allowable APRM Flux Scram Trip Settings in Figure 2.1-2

Single Loop Operation

Allowable Trip Set Point (ATSP)		Drive Flow Range
C SLOPE	D INTERCEPT	% Rated
0.20	69.5	$0 \leq W_D \leq 32.5$
0.71	52.9	$32.5 < W_D \leq 65.9$
0.65	64.1	$65.9 < W_D \leq 86$
0	120.0	$86 < W_D \leq 125$

Notes:

1. ATSP = C * % W_D + D, ATSP is in % Power.
2. Figure 2.1-2 shows the plot of ATSP vs. W_D.
3. Reference 5.6, Table 1.b is the basis for the values of constants listed in this Table.

Figure 2.1-1 Allowable APRM Flux Scram Trip Settings - TLO (Normal Feedwater Temperature)

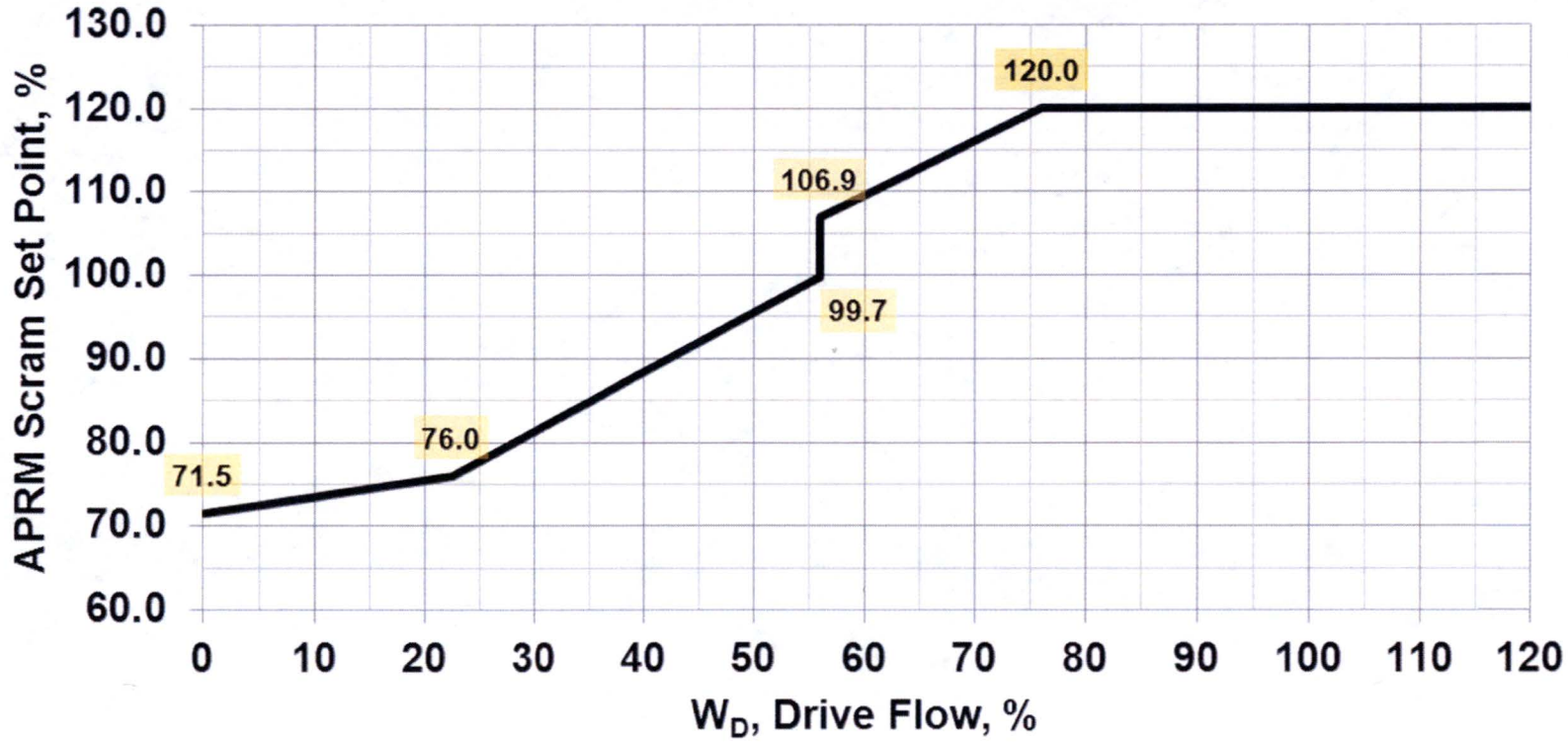
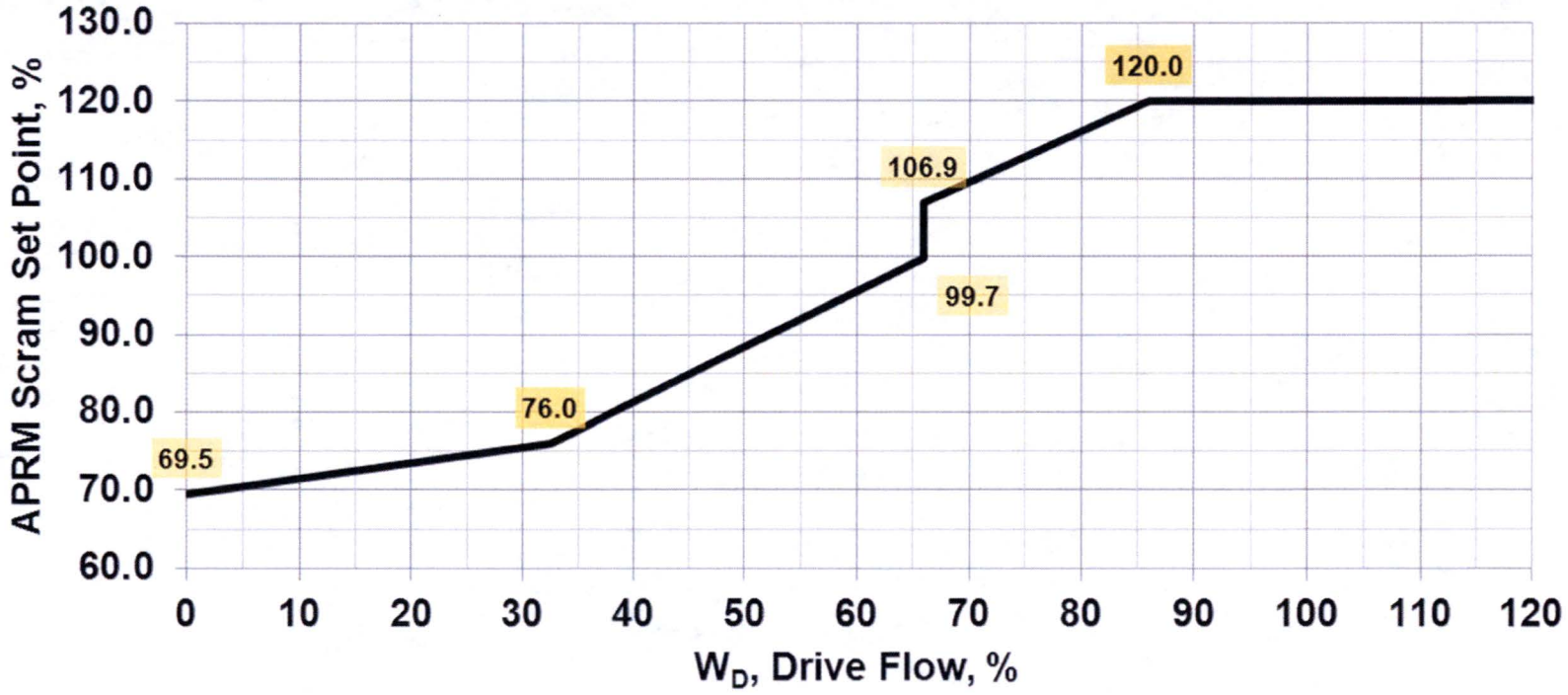


Figure 2.1-2 Allowable APRM Flux Scram Trip Settings - SLO (Normal Feedwater Temperature)



2.2 APRM Rod Block Trip Setting (Run Mode)

Reference Technical Specifications: Table 3.2.C-2, 3.1.B.1

When the mode switch is in the RUN position, the Average Power Range Monitor (APRM) rod block Allowable Trip setting ($ATSP_{RB}$) as a function of drive flow for Two Loop Operation shall be as given by Figure 2.2-1. The $ATSP_{RB}$ is clamped at 115% of rated core thermal power. Formulae that form the basis of the Figure 2.2-1 are listed in Table 2.2-1. The flow clamp feature is not used in Cycle 21.

When the mode switch is in the RUN position, the Average Power Range Monitor (APRM) rod block Allowable Trip setting ($ATSP_{RB}$) as a function of drive flow for Single Loop Operation shall be as given by Figure 2.2-2. The $ATSP_{RB}$ is clamped at 115% of rated core thermal power. Formulae that form the basis of the Figures 2.2-2 are listed in Table 2.2-2. The flow clamp feature is not used in Cycle 21.

2.3 Rod Block Monitor Trip Setting

References:
Technical Specification Table 3.2.C-2, Ref. 5.15, Ref. 5.10 Table 4.5 (b)

Allowable values for the power-dependent Rod Block Monitor trip set points shall be:

Reactor Power, P (% of Rated)	Trip Set point (Allowable Value) (% of Reference Level)
$P \leq 25.9$	Not applicable (All RBM Trips Bypassed)
$25.9 < P \leq 62.0$	125
$62.0 < P \leq 82.0$	125
$82.0 < P$	125

The allowable value for the RBM downscale trip set point shall be $\leq 94.0\%$ of the reference level. The RBM downscale trip is bypassed for reactor power $\leq 25.9\%$ of rated (Technical Specification Table 3.2.C-1, Note 5). The most limiting Analytical Value of Rod Block set point of 125% is justified as the Rod Withdrawal Error is expected to reduce MCPR by 0.29 if this set point is used. Since the minimum OLMCPR value is always greater than 1.51, a reduction of 0.29 in MCPR, starting with operation at OLMCPR, is expected to lower MCPR to 1.22. This is substantially above the Safety Limit MCPR of 1.10. The HTSP can be set at 125 % as unblocked rod withdrawal is non-limiting, as justified in the SRLR.

Table 2.2-1
Formulae for Allowable APRM Rod Block Settings in Figure 2.2-1

Two Loop Operation

APRM Rod Block Allowable Trip Set Point ($ATSP_{RB}$)		Drive Flow Range
C SLOPE	D INTERCEPT	% Rated
0.20	66.5	$0 \leq W_D \leq 22.5$
0.71	55.0	$22.5 < W_D \leq 55.9$
0.65	63.6	$55.9 < W_D \leq 79.1$
0	115.0	$79.1 < W_D \leq 125$

Notes:

1. $ATSP_{RB} = C * \% W_D + D$, $ATSP_{RB}$ is in % Power.
2. Figure 2.2-1 shows the plot of $ATSP_{RB}$ vs. W_D.
3. Reference 5.6, Table 1.a is the basis for the values of constants listed in this Table.

Table 2.2-2
Formulae for Allowable APRM Rod Block Settings in Figure 2.2-2

Single Loop Operation

APRM Rod Block Allowable Trip Set Point ($ATSP_{RB}$)		Drive Flow Range
C SLOPE	D INTERCEPT	% Rated
0.20	64.5	$0 \leq W_D \leq 32.5$
0.71	47.9	$32.5 < W_D \leq 65.9$
0.65	57.1	$65.9 < W_D \leq 89.1$
0	115.0	$89.1 < W_D \leq 125$

Notes:

1. $ATSP_{RB} = C * \% W_D + D$, $ATSP_{RB}$ is in % Power.
2. Figure 2.2-2 shows the plot of $ATSP_{RB}$ vs. W_D.
3. Reference 5.6, Table 1.b is the basis for the values of constants listed in this Table.

Figure 2.2-1 Allowable APRM Flux Rod Block Trip Settings - TLO (Normal Feedwater Temperature)

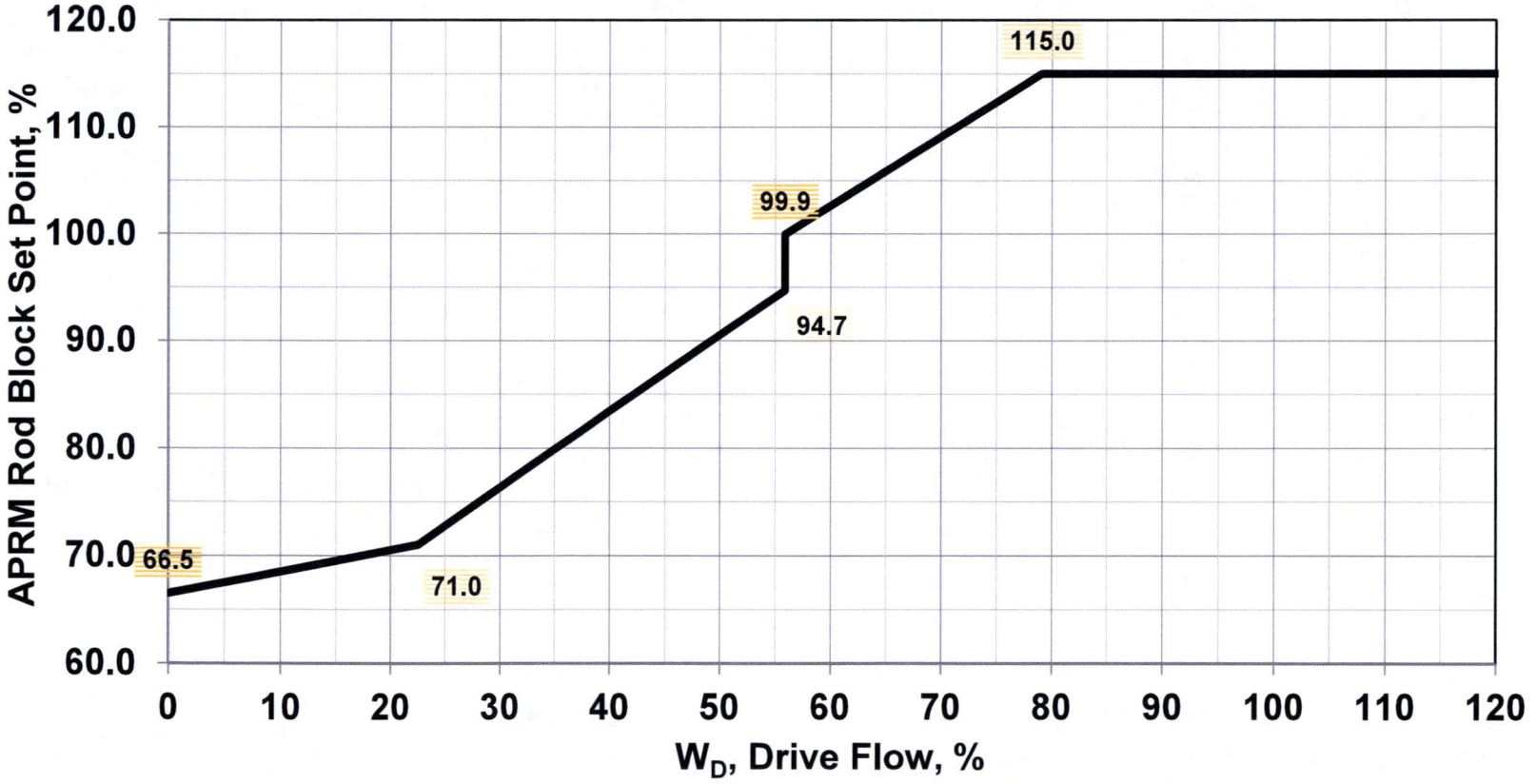
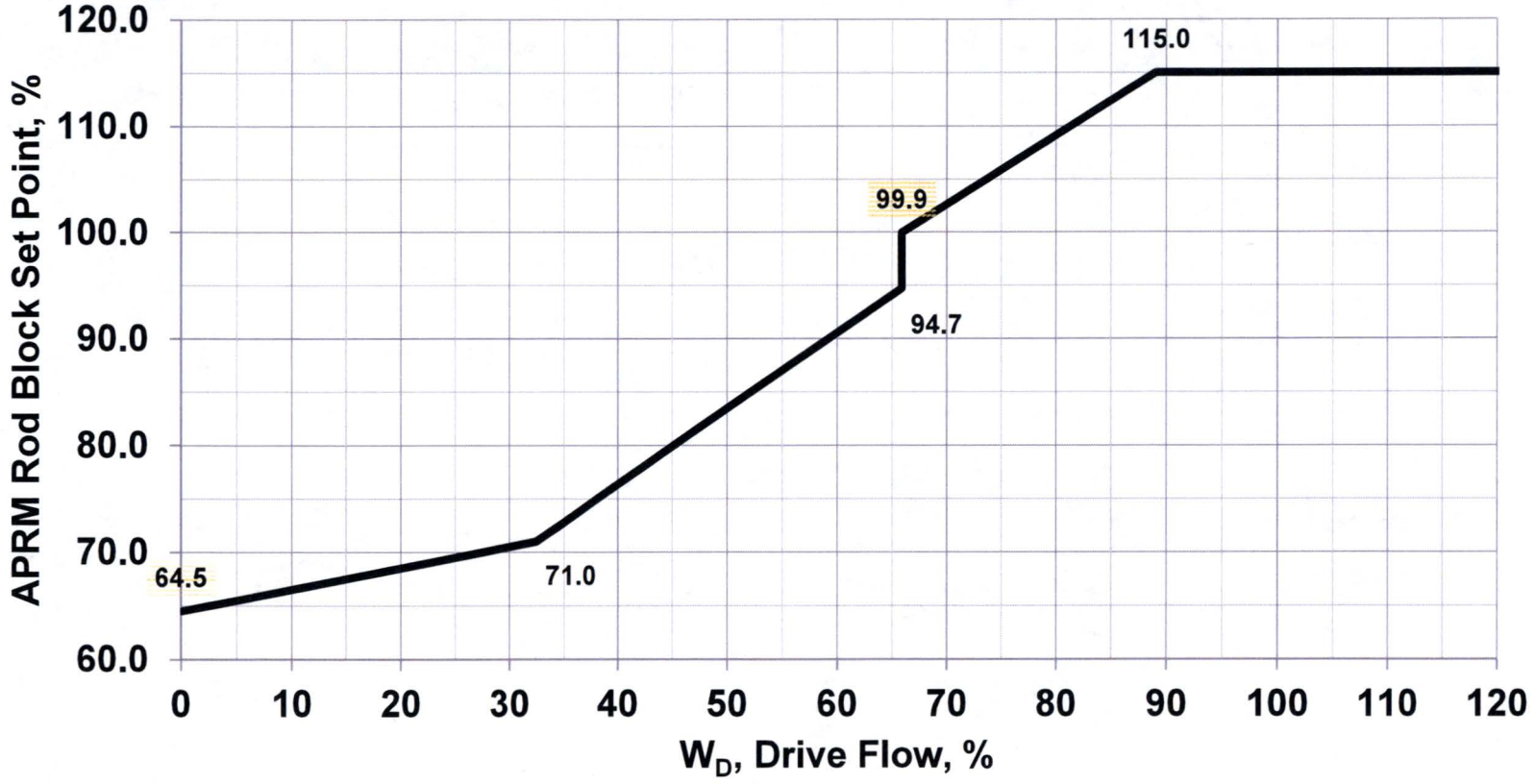


Figure 2.2-2 Allowable APRM Flux Rod Block Trip Settings - SLO (Normal Feedwater Temperature)



3.0 CORE OPERATING LIMITS

3.1 Maximum Average Planar Linear Heat Generation Rate (MAPLHGR)

Reference Technical Specification: 3.11.A

During power operation, MAPLHGR as a function of axial location and average planar exposure shall not exceed the applicable limiting value. MAPLHGR limits for rated power and flow conditions are given in Tables 3.1-1. Flow and power dependent multipliers used to be necessary only as a result of applying pin based limit using lattice local peaking factors. Beginning with Cycle 20, the peak pin LHGR setdown is applied to the pin based LHGR limit. Therefore, there is no need for power and flow dependent multipliers on the MAPLHGR limit (Reference 5.10). Peak pin LHGR limits based on LOCA analysis are listed in Table 3.1-3.

MAPLHGR limits for rated power and flow conditions for GNF2 are presented in Figure 3.1-1. MAPLHGR limits are based on ECCS-LOCA considerations. The MAPLHGR values for rated power and flow conditions are listed in Tables 3.1-1 for GNF2, which are obtained from the Supplemental Reload Licensing Report, Rev.0 (Ref. 5.15). Licensing basis PCT based on the MAPLHGR Limits in this report for GNF2 is 2150 °F (Ref. 5.15). All PCT determination errors reported under 10CFR50.46 up to 12/31/2014 have been accounted for.

Since the thermal-mechanical LHGR is no longer composited with MAPLHGR limits, there is no power or flow dependent aspect to MAPLHGR limits. The pLHGR limit is applied to LHGR which makes MAPLHGR fuel type dependent, rather than lattice dependent. Therefore the power & flow dependent multipliers only apply to LHGR limits.

When in Single Loop Operation, an SLO Multiplier of 0.89 (Table 3.1-2) applies to the Rated MAPLHGR limit.

Table 3.1-1, MAPLHGR Limits for Rated Power and Rated Flow for GNF2 Fuel

Bundle Type(s):

GNF2-P10DG2B388-6G6.0/7G5.0-100T2-145-T6-3143 (GNF2)
GNF2-P10DG2B395-6G6.0/9G5.0-100T2-145-T6-3422 (GNF2)
GNF2-P10DG2B401-6G6.0/8G5.0/1G4.0-100T2-145-T6-3421 (GNF2)
GNF2-P10DG2B389-6G6.0/8G5.0-100T2-145-T6-3141 (GNF2)
GNF2-P10DG2B407-6G6.0/2G5.0/6G4.0-100T2-145-T6-3642 (GNF2)
GNF2-P10DG2B406-6G6.0/6G5.0/2G4.0-100T2-145-T6-3641 (GNF2)
GNF2-P10DG2B401-6G6.0/2G5.0/6G4.0-100T2-145-T6-3640 (GNF2)
GNF2-P10DG2B389-6G6.0/2G5.0/6G4.0-100T2-145-T6-3142 (GNF2)
GNF2-P10DG2B375-6G6.0/7G5.0-100T2-145-T6-3434 (GNF2)
GNF2-P10DG2B406-6G6.0/2G5.0/6G4.0-100T2-145-T6-4171 (GNF2)
GNF2-P10DG2B398-5G6.0/8G5.0-100T2-145-T6-4172 (GNF2)
GNF2-P10DG2B389-15G5.0-100T2-145-T6-4173 (GNF2)
GNF2-P10DG2B375-7G6.0/6G5.0-100T2-145-T6-4174 (GNF2)
GNF2-P10DG2B387-15G6.0-100T2-145-T6-4308 (GNF2)
GNF2-P10DG2B387-12G6.0/4G5.0-100T2-145-T6-4309 (GNF2)
GNF2-P10DG2B398-14G5.0-100T2-145-T6-4310 (GNF2)
GNF2-P10DG2B387-13G6.0-100T2-145-T6-4311 (GNF2)

Average Planar Exposure		MAPLHGR Limit
GWd/MT	GWd/ST	kW/ft
0	0	10.63
40.85	37.06	10.63
67	60.78	6.87
70	63.5	5.5

Table 3.1-2
MAPLHGR and LHGR Multipliers for Single Loop Operation

The single loop operation multipliers on LHGR and MAPLHGR and the ECCS-LOCA analytical initial MCPR values applicable to each fuel type in the new cycle core are shown in the following table.

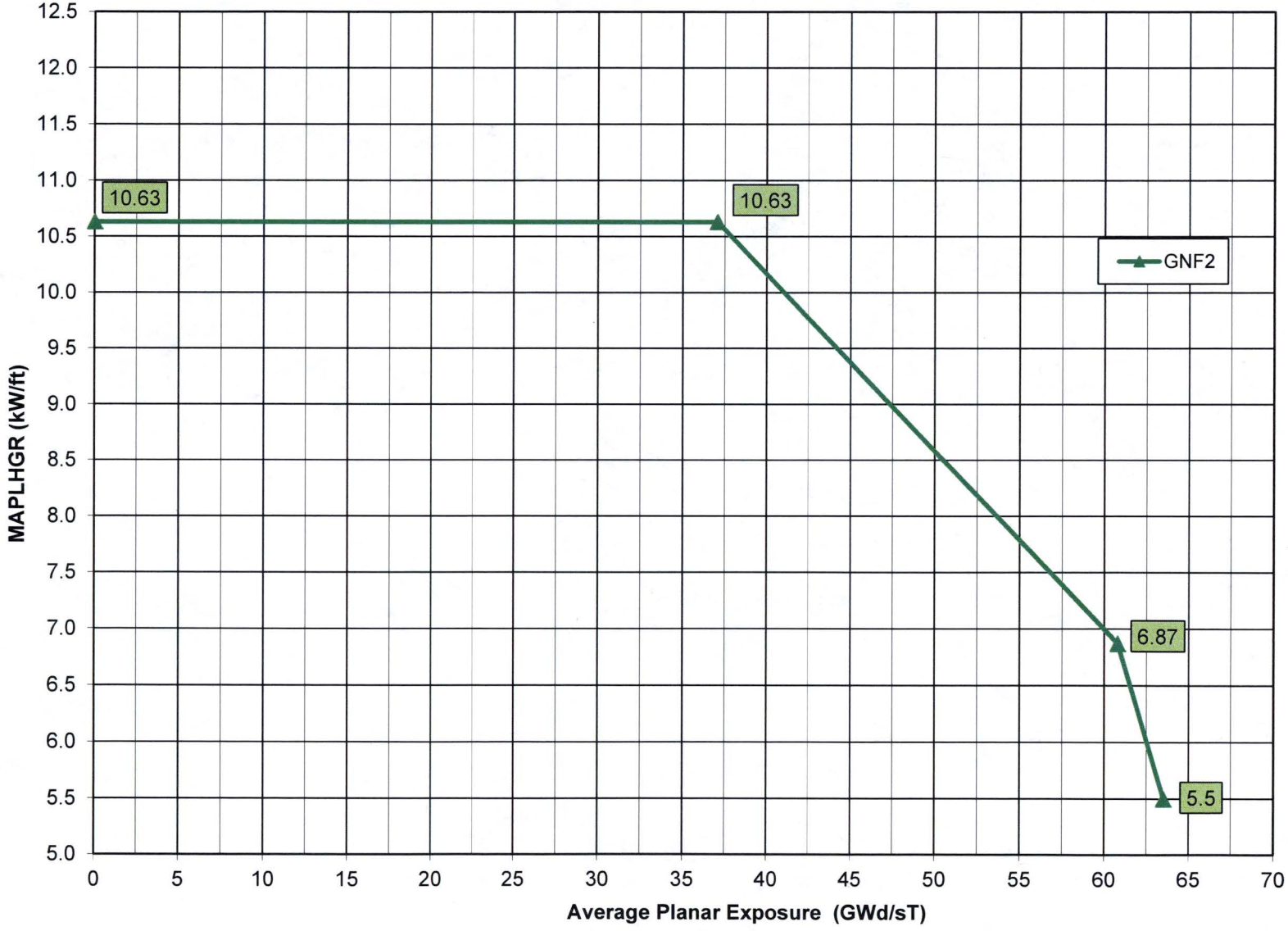
Fuel Type	Single Loop Operation Multiplier on LHGR and MAPLHGR
GNF2	0.89

Table 3.1-3
Peak Pin LHGR Set Down from LOCA Analysis

Pilgrim has an ECCS-LOCA set down on Peak Pin LHGR as shown in the Table below. This limit is therefore applied to LHGR which is a pin based limit.

Fuel Type	Peak Pin LHGR, kW/ft
GNF2	11.81

Figure 3.1-1, MAPLHGR Limit



3.2 Linear Heat Generation Rate (LHGR)

Reference Technical Specification: 3.11.B

When reactor power is greater than 25%, the LHGR of any rod in any fuel assembly at any axial location shall not exceed the rated power and rated core flow limits presented in Reference 5.17. Figure 3.2-1 represents LHGR curves for GNF2 fuel. Proprietary detailed values are in Reference 5.17. At other than rated power and rated flow conditions, the applicable limiting LHGR value for each fuel type is the smaller of the flow- and power-dependent LHGR limits, $LHGR_F$ and $LHGR_P$. The flow-dependent LHGR limit, $LHGR_F$, is the product of the LHGR flow factor, $LHGRFAC_F$, shown in Figure 3.2-2 and the LHGR for rated power and flow conditions in Reference 5.17. The power-dependent LHGR limit, $LHGR_P$, is the product of the LHGR power factor, $LHGRFAC_P$, shown in Figure 3.2-3 and the LHGR for rated power and flow conditions in Reference 5.17.

LHGR Curves in Figure 3.2-1 are representative curves for UO2 fuel rods and Gd containing rods. References 5.17 and 5.26 document the most limiting LHGR limits for Gd containing fuel rods. Reference 5.23 documents the GESTAR II compliance of GNF2 fuel, as amended, GESTAR II, Rev. 20 (Reference 5.1) incorporated Prime T-M methods. Cycle 21 LHGR limits are based on using PRIME for UO2 fuel rods and Gd rods.

Pbypass is the power level below which more restrictive thermal limits are applied, as Turbine Stop Valve closure and Turbine Control Valve Fast Closure scrams are assumed to be bypassed. Pbypass can be set anywhere in the range 25 to 45% core thermal power. Pbypass is set at 32.5% power in 3D Monicore by default. However, the applicable less restrictive LHGRFACp limits in the upper curve in Figure 3.2-3 can be used whenever the Turbine Stop Valve closure and the Turbine Control Valve Fast Closure scrams are enabled.

In modeling the Feedwater Level Control Failure with maximum demand Transient, an automatic Reactor Feed pump trip is not assumed because the trip may not occur during the transient. The trip is also not credited in the event of a system malfunction and therefore the results of the integrated plant response assume that the feed pump trip does not occur on high level. For example of a low reactor water level indication on one of the feed water level sensing channels may be present that could be the cause of the maximum Feedwater demand. This becomes important for lower power levels where the Turbine Stop Valve closure and the Turbine Control Valve Fast Closure scrams are bypassed. The off-rated limits in this COLR revision reflect this consideration (Ref. 5.25).

[[

]]

Figure 3.2-2, Flow Dependent LHGR Factor ($LHGRFAC_F$)

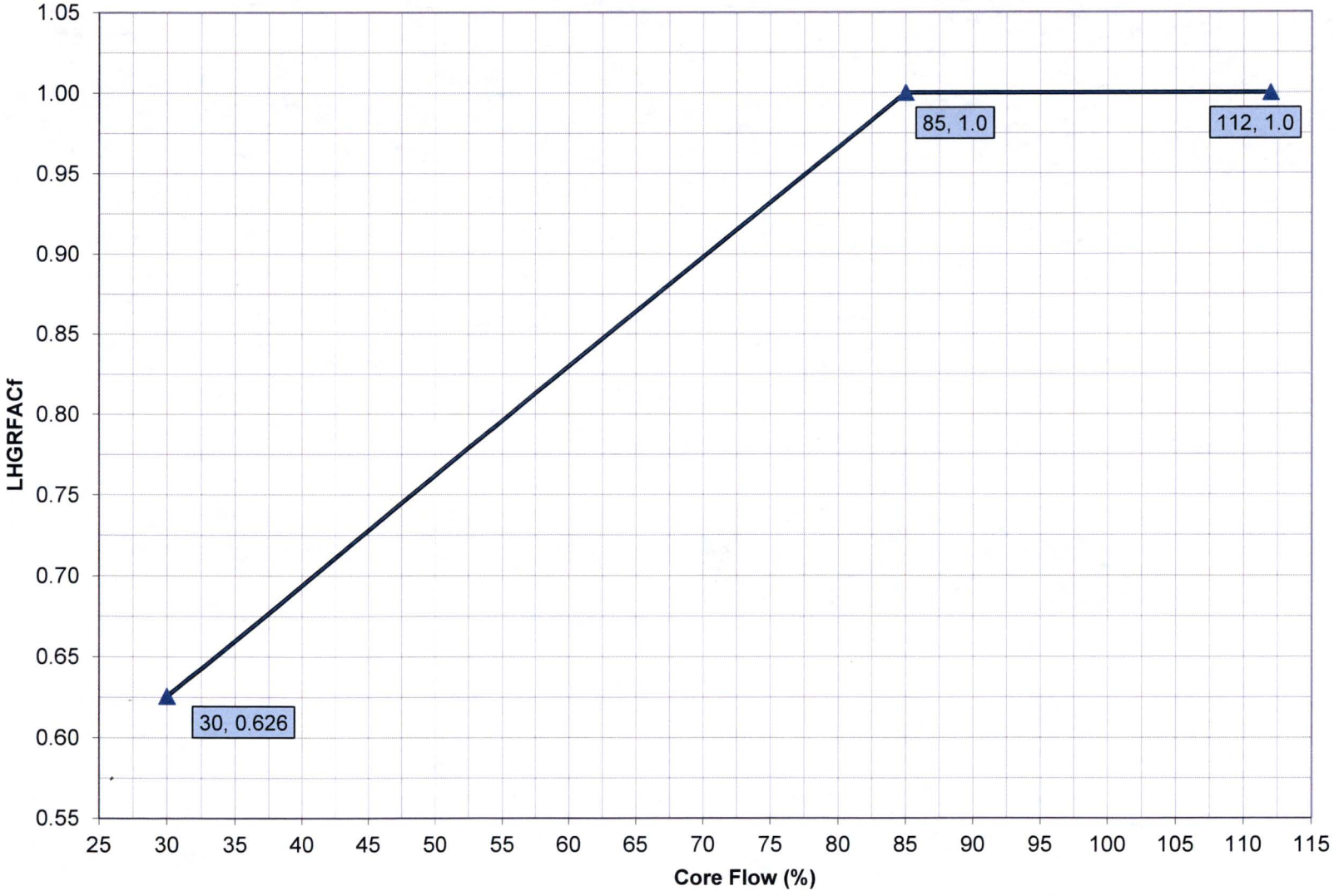
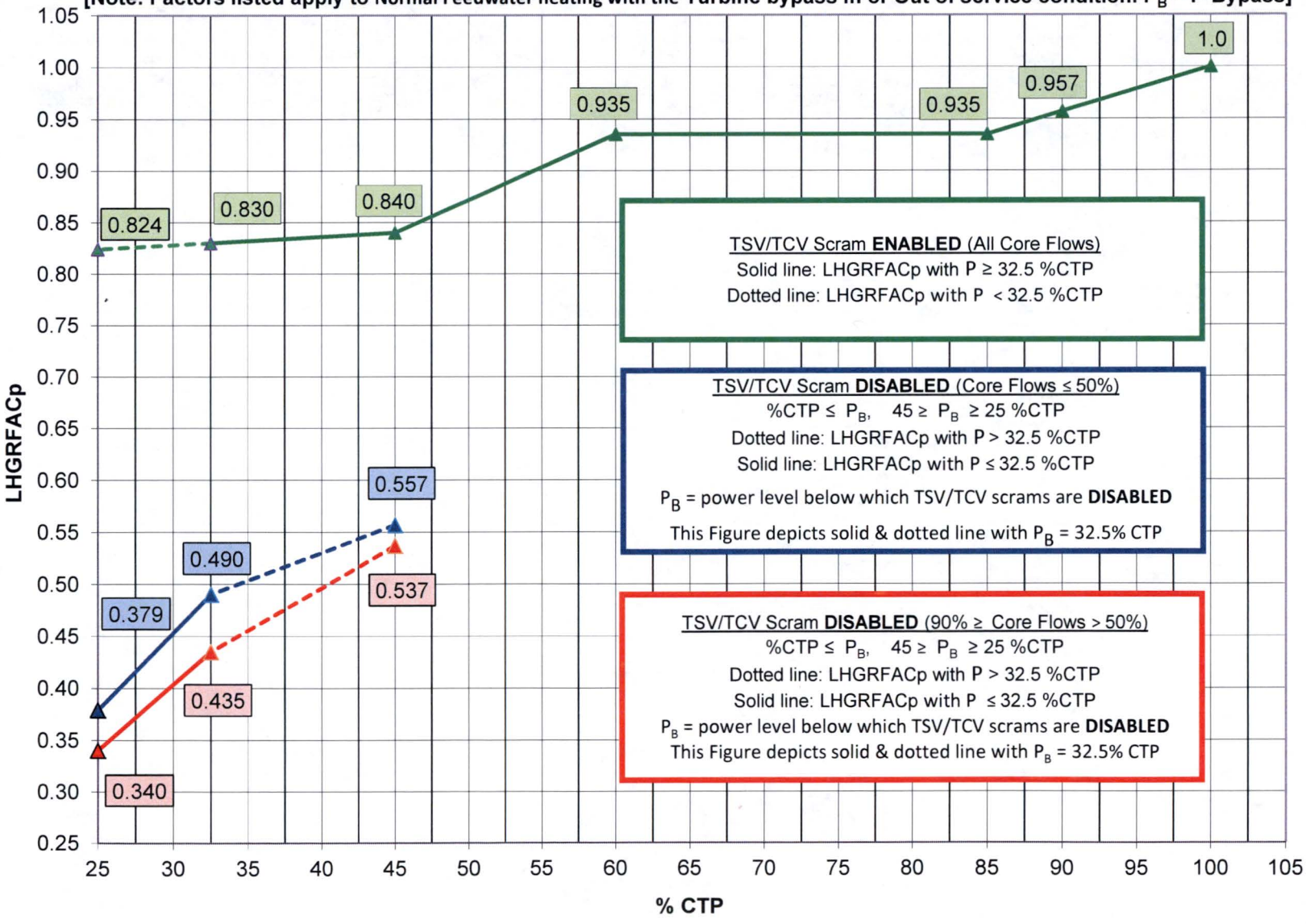


Figure 3.2-3, Power Dependent LHGR Factors ($LHGRFAC_P$)

[Note: Factors listed apply to Normal Feedwater heating with the Turbine bypass In or Out of service condition. P_B = P-Bypass]



3.3 Minimum Critical Power Ratio (MCPR)

Reference Technical Specification: 3.11.C

During power operation, the MCPR shall be greater than or equal to the Operating Limit MCPR (OLMCPR). The operating limit MCPR is the greater of the flow- and power-dependent MCPR operating limits, $MCPR_F$ and $MCPR_P$. The flow-dependent MCPR operating limit, $MCPR_F$, is provided in Figure 3.3-1. For power level less than P_{bypass}, the MCPRp is independent of the fuel type and can be directly read from Figure 3.3-2, when Turbine Bypass is operable and from Figure 3.3-3, when Turbine Bypass is out of service.

Above P_{Bypass}, $MCPR_P$ is the product of the rated power and flow MCPR operating limit presented in Table 3.3-1, and the K_P factor presented in Figure 3.3-2, when Turbine Bypass is in service and from Figure 3.3-3, when Turbine Bypass is out of service. The rated power and flow MCPR operating limits presented in Tables 3.3-1 are functions of τ.

Both Figures 3.3-2 and 3.3-3 include normal and reduced feed water temperature operating modes. For SLO MCPRp and $MCPR_F$ are raised by 0.02 compared to TLO values shown in Figures 3.3-2 and 3.3-3.

The value of τ in Table 3.3-1 shall be equal to 1.0, unless it is calculated from the results of the surveillance testing of Technical Specification 4.3.C. TS 4.11.C defines τ.

Pbypass is the power level below which 3D Monicore applies more restrictive thermal limits, as Turbine Stop Valve Closure and Turbine Control Valve Fast Closure scrams are assumed to be bypassed. Pbypass can be set anywhere in the range 25% to 45% core thermal power. In 3D Monicore, Pbypass is set at 32.5% by default in 3D Monicore. However, the less restrictive MCPRp limits (the lower curve) in Figures 3.3-2 & 3.3-3 can be applied whenever the Turbine Stop Valve closure and the Turbine Control Valve Fast Closure scrams are enabled.

Transient Analysis assumes that the transient initiates from operation within the Feedwater temperature vs. Reactor Power band (Figure 3.3-4). Transient Analysis also assumes that the transient initiates from operation at a Reactor Pressure within the upper & lower limit curves defined by Figure 3.3-5. If operating at or above 95% power and Reactor pressure between 1015 psig and 1025 psig corresponding to the lower pressure band in Figure 3.3-5, an OLMCPR penalty of 0.01 must be applied (Reference 5.22). To operate above the lower pressure bound curve at any power level (not including the flat portion of the curve at 1015 psig above 95% power) in Figure 3.3-5, there is no OLMCPR penalty.

In modeling the Feedwater Level Control Failure with maximum demand Transient, an automatic Reactor Feed pump trip is not assumed because the trip may not occur during the transient. The trip is also not credited in the event of a system malfunction and therefore the results of the integrated plant response assume that the feed pump trip does not occur on high level. For example of a low reactor water level indication on one of the feed water level sensing channels may be present that could be the cause of the maximum Feedwater demand. This becomes important for lower power levels where the Turbine Stop Valve closure and the Turbine Control Valve Fast Closure scrams are bypassed. The off-rated limits in this COLR revision reflect this consideration (Ref. 5.25).

Table 3.3-1

MCPR Operating Limits At Rated Power and Rated Flow

The MCPR Operating Limit for Two Loop Operation ($OLMCPR_{TLO}$) is a function of fuel type, exposure, and τ, which is derived from scram timing measurements.

Tau		OLMCPR For GNF2 Fuel Two Loop Operation	
From	To	BOC to MOC	MOC to EOC
0.0		1.51	1.57
0.0	0.1	1.52	1.58
0.1	0.2	1.53	1.59
0.2	0.3	1.54	1.60
0.3	0.4	1.55	1.61
0.4	0.5	1.56	1.62
0.5	0.6	1.57	1.63
0.6	0.7	1.58	1.64
0.7	0.8	1.59	1.65
0.8	0.9	1.60	1.66
0.9	1.0	1.61	1.67

BOC = Beginning Of Cycle
MOC = Middle of Cycle = End Of Rated Power Operation at Rated Flow (EOR) – 1.935 GWd/ST
EOC = End Of Cycle

Note: The rated OLMCPR Limits given above apply to both normal and reduced Feedwater Temperature as well as Turbine Bypass Valve OOS and Turbine bypass Valves in service. Off rated MCPR limits are given in Figures 3.3-1, 3.3-2 and 3.3-3 as taken from the Supplemental Reload Licensing Report (Reference 5.15).

Single Loop Operation

$OLMCPR_{SLO} = 0.02 + OLMCPR_{TLO}$, where $OLMCPR_{TLO}$ is selected from the Table above.

Figure 3.3-1, Flow Dependent MCPR Limits ($MCPR_F$)

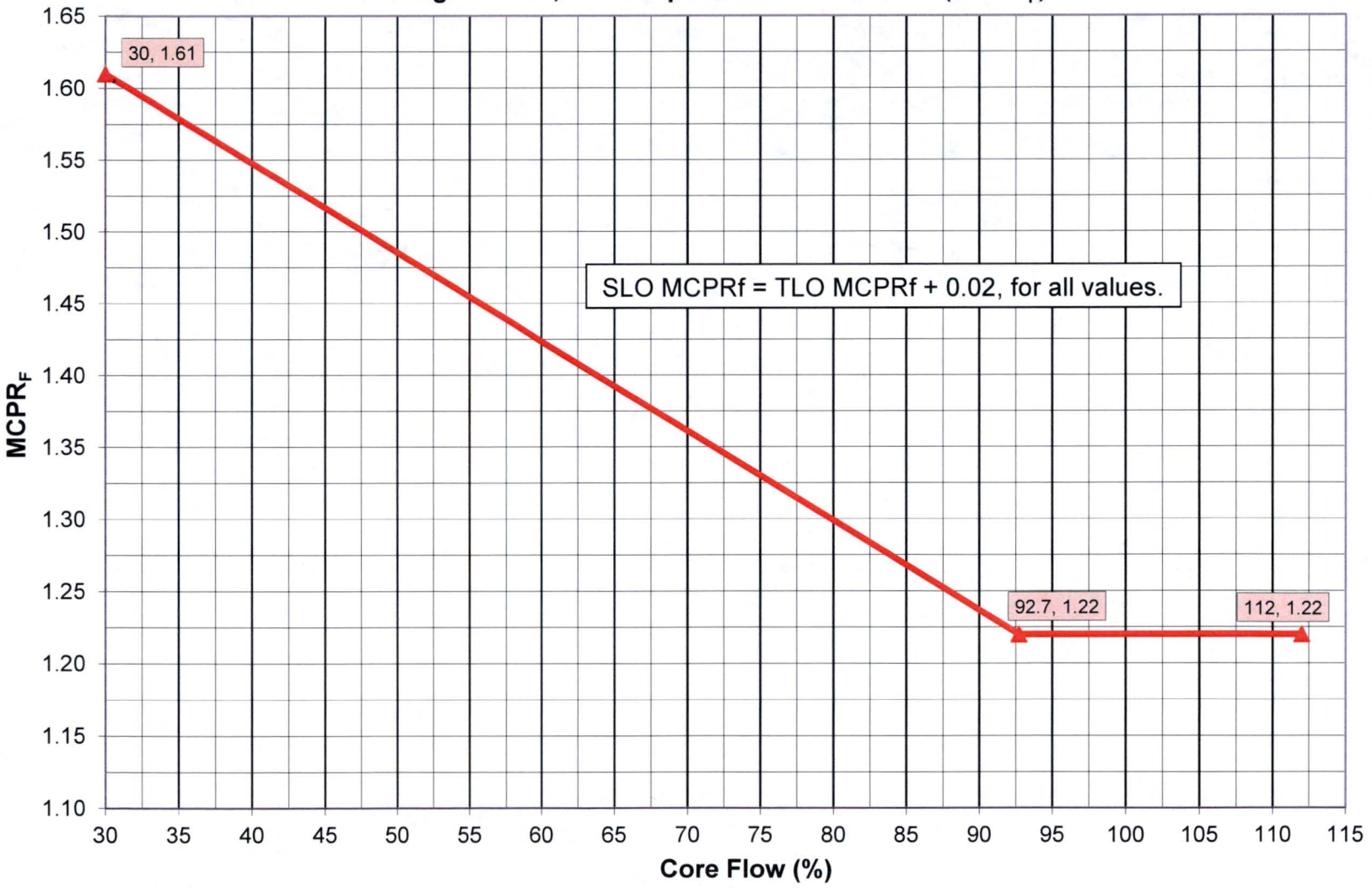
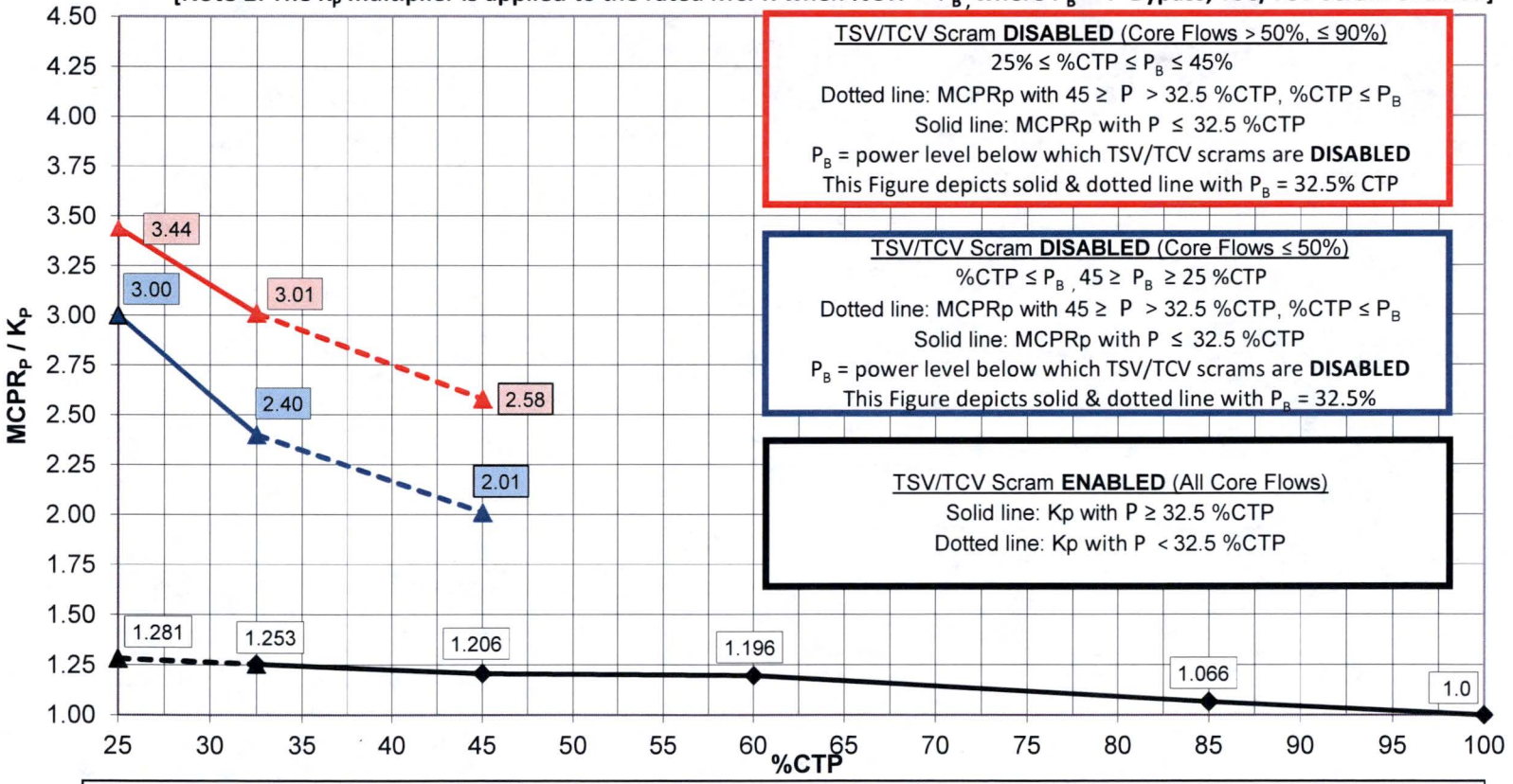


Figure 3.3-2
Power Dependent MCPR Limits ($MCPR_P$ / K_P)

[Note 1: Turbine Bypass is Assumed Operable for both Normal and Reduced Feedwater Temperature]

[Note 2: The K_P multiplier is applied to the rated MCPR when %CTP > P_B, where P_B = P-Bypass, TSC/TCV Scram enabled]

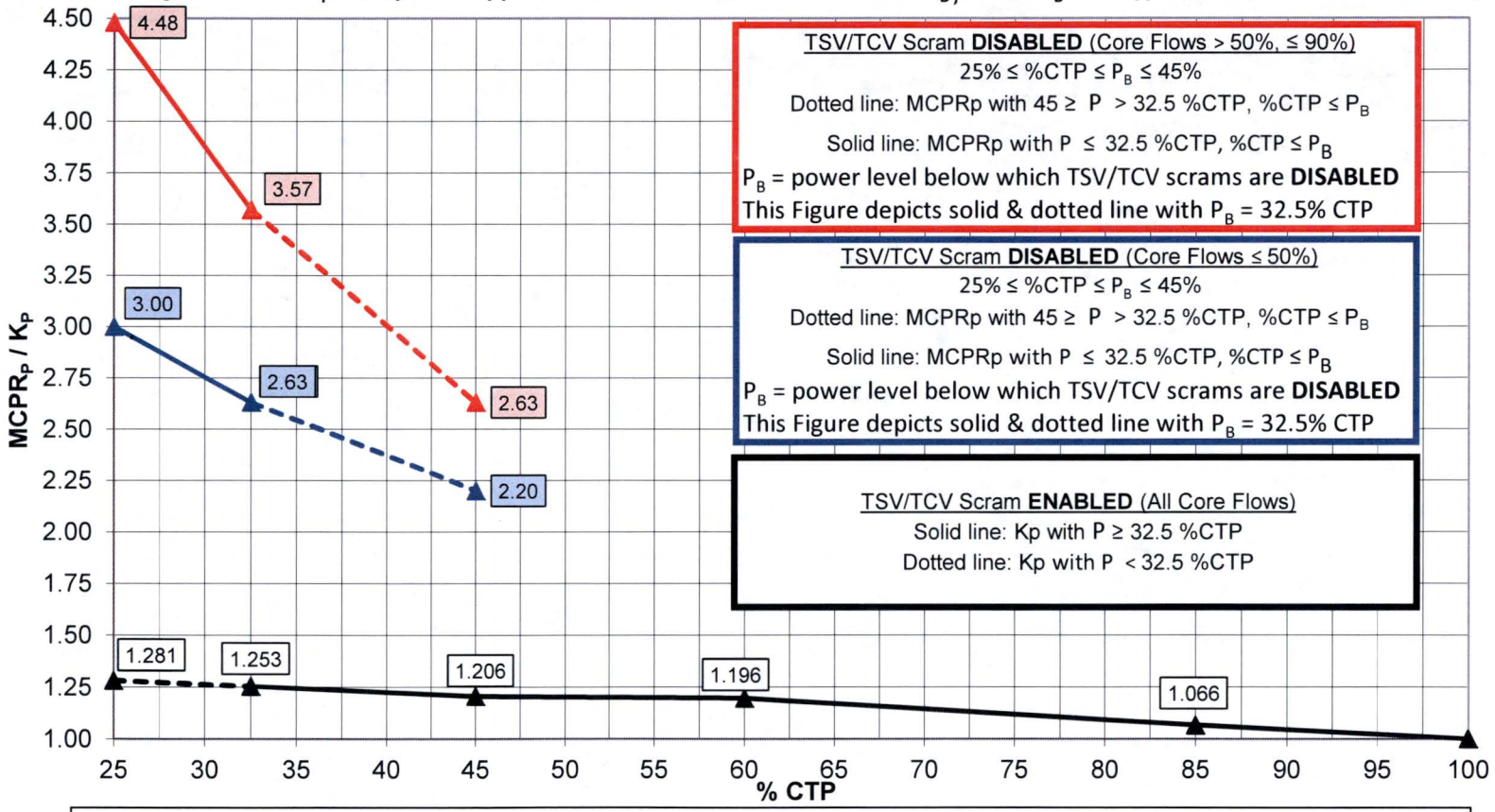


WHEN IN Single Loop Operation (SLO):
For P ≤ Pbypass MCPRp is raised by 0.02 compared to TLO values.
For P > Pbypass , the rated OLMCPR is raised by 0.02 before multiplying by Kp to calculate MCPRp.

Figure 3.3-3
Power Dependent MCPR Limits ($MCPR_P$ / K_P)

[Note 1: Turbine Bypass is Assumed Out of Service for both Normal and Reduced Feedwater Temperature]

[Note 2: The K_P multiplier is applied to the rated MCPR when %CTP > P_B, where P_B = P-Bypass, TSC/TCV Scram enabled]



WHEN IN Single Loop Operation (SLO):
For P ≤ Pbypass MCPRp is raised by 0.02 compared to TLO values.
For P > Pbypass , the rated OLMCPR is raised by 0.02 before multiplying by Kp to calculate MCPRp.

Figure 3.3-4, Feedwater Temperature Analytical Bands

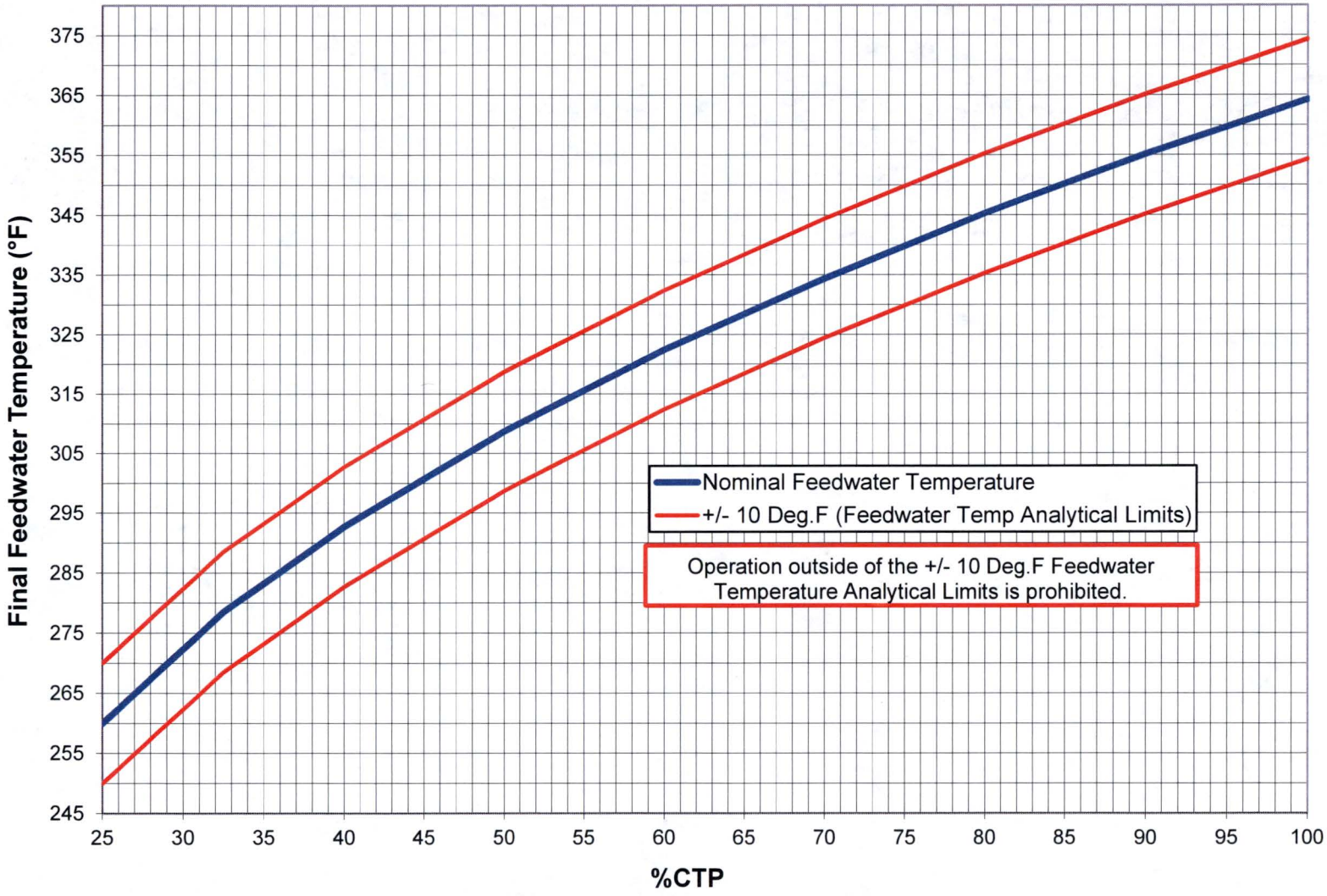
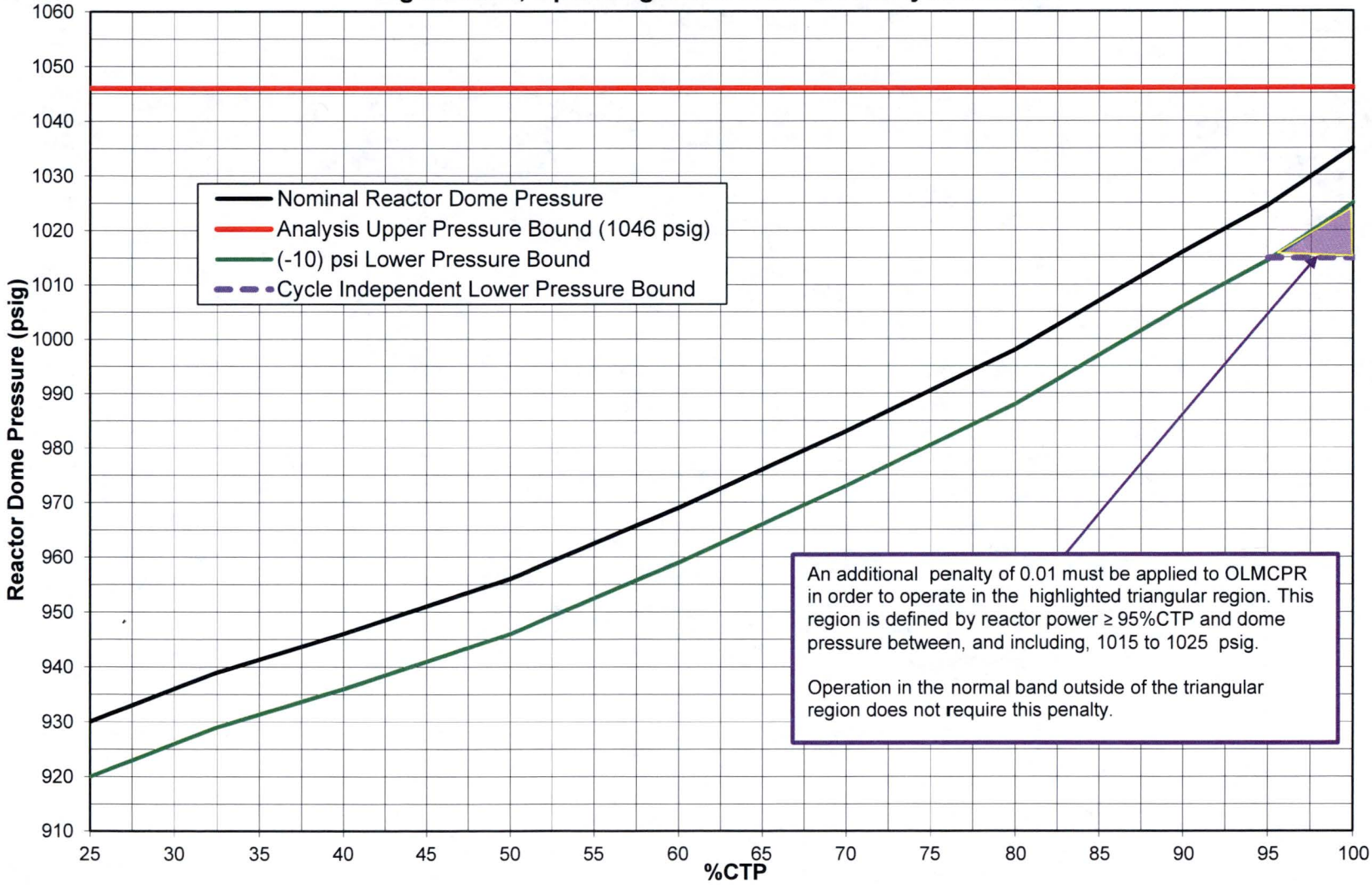


Figure 3.3-5, Operating Dome Pressure Analytical Bands



3.4 Power/Flow Relationship During Power Operation

Reference Technical Specification: 3.11.D

The Cycle 21 stability analysis does not credit the flow clamp feature of the FCTR cards. The dominance of Core Wide Oscillations was demonstrated without the use of the flow clamp. APRM Flux scram and Rod Block curves without the flow clamp are therefore applicable to Cycle 21.

The power/flow relationship shall not exceed the limiting values shown on the Power/Flow Operating Maps in Figures 3.4-1 when in Two Loop Operation and 3.4-2 when in Single Loop Operation.

Cycle 21 operation is **not** fully analyzed for reduced feedwater temperature for issues other than thermal limits. The SRLR (Reference 5.15) contains only the thermal limit analysis results for reduced feed water temperature mode.

The exclusion and the buffer regions shown in Figures 3.4-1 and 3.4-2 are based on Stability Solution I-D (references 5.4, 5.12, 5.15 and 5.20). Cycle 21 Stability Analysis summarized in the SRLR (Reference 5.15, Section 15) utilizes ODYSY LTR (Reference 5.24) that removed the decay ratio adder of 0.15.Figures 3.4-1 and 3.4-2 show APRM Scram and Rod Block lines using Allowable values as a function of Core Flow. Exclusion and Buffer Region boundaries specified in the SRLR are slightly smaller than those in the P-F Map Reference 5.14. The current P-F Map is therefore conservative for buffer and exclusion regions and was not revised for Cycle 21, other than the core flow restriction to 90% core flow for power below Pbypass of 32.5%.

Single Loop Analysis limits maximum Core Flow to 52% of Rated Core Flow and maximum Power to 65% of Rated due to SLO vessel internal vibration (Ref. 5.7, p. 1-2).

Various lines on the Power to flow map are described in Ref. 5.14.

FIGURE 3.4-1
PILGRIM POWER / FLOW MAP - Two Loop Operation
Scram and Rod Block Data based on Allowable Values

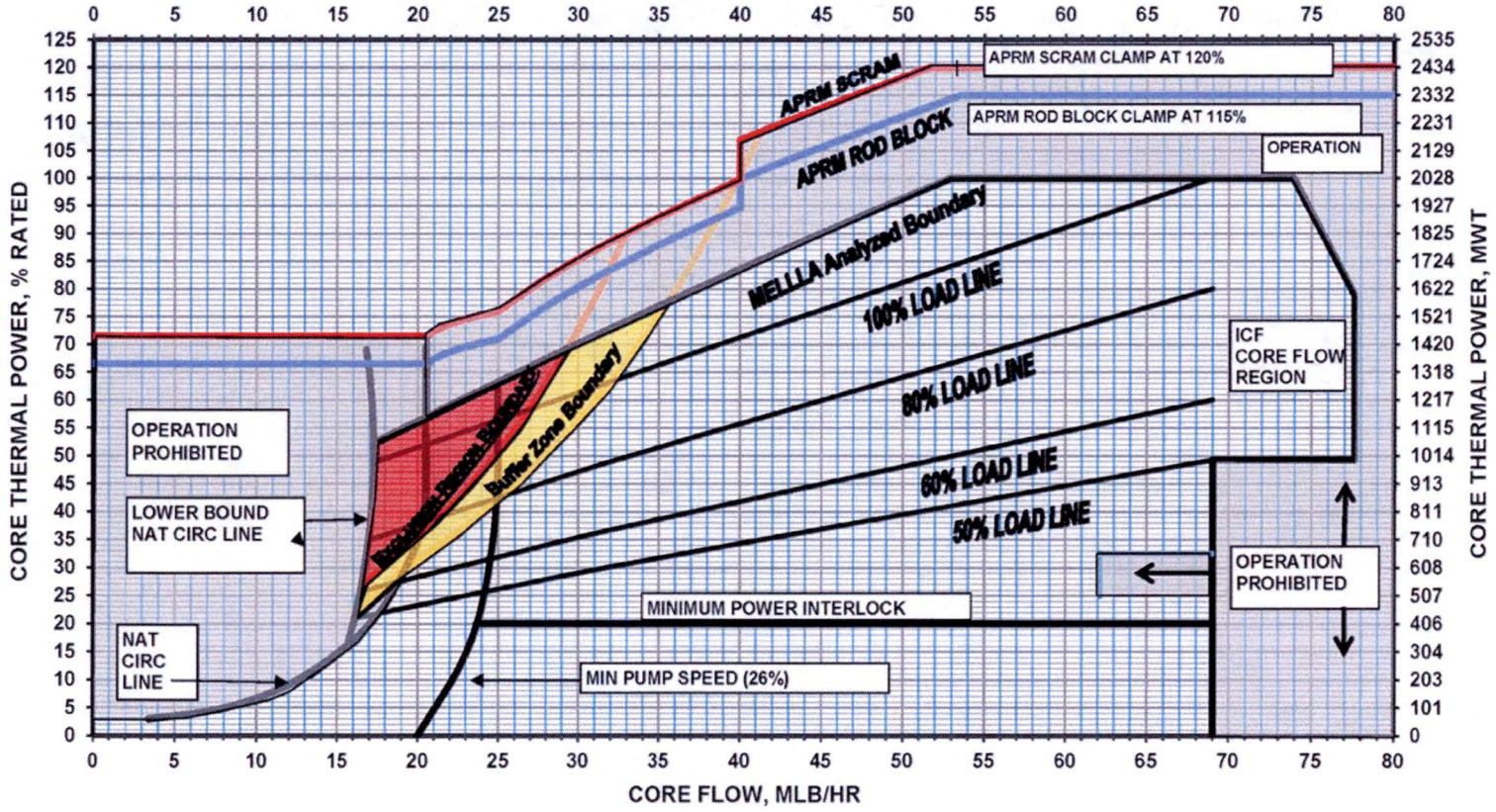
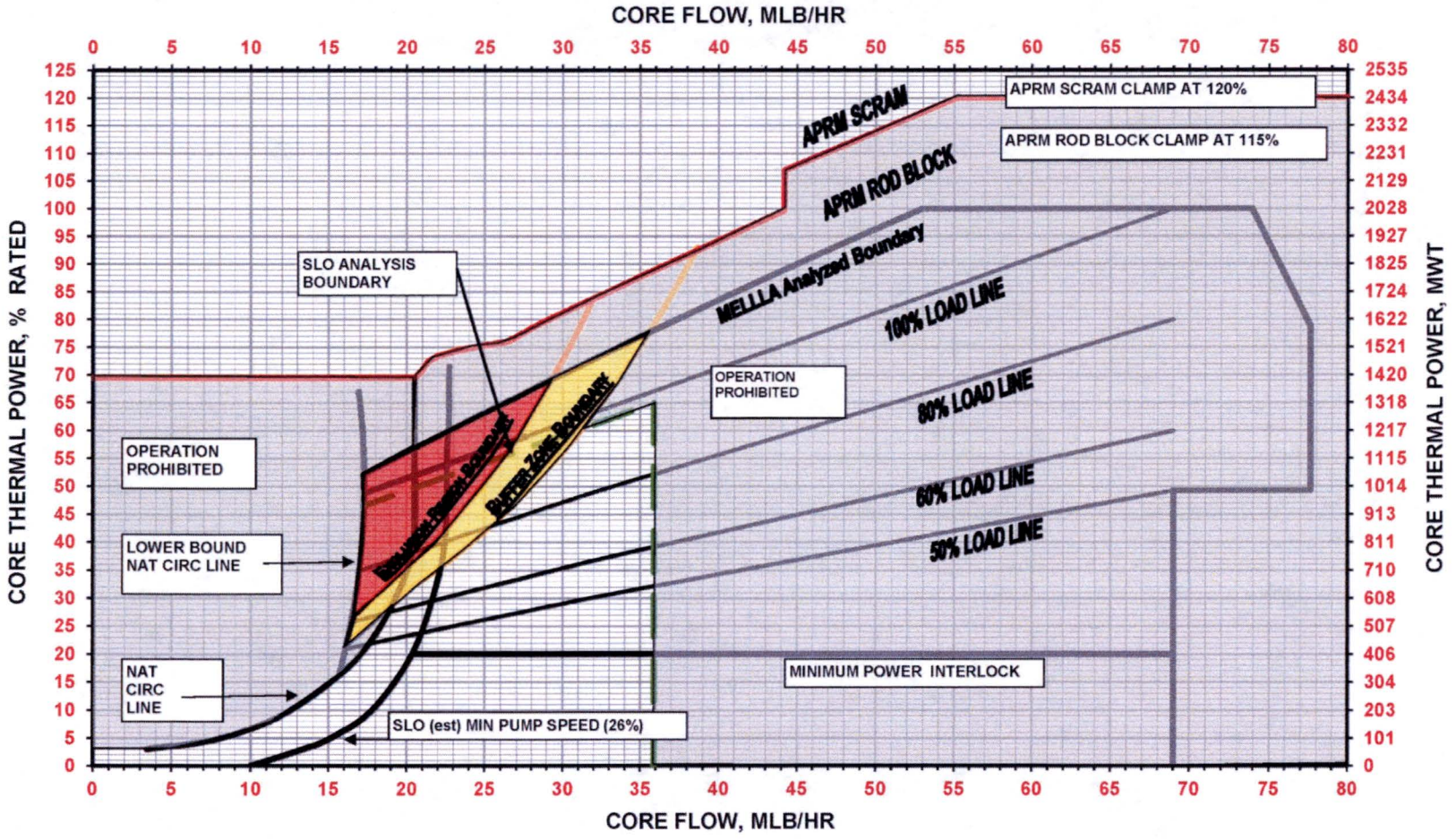


FIGURE 3.4-2
PILGRIM POWER / FLOW MAP - Single Loop Operation
Scram and Rod Block Data based on Allowable Value Setpoint



4.0 REACTOR VESSEL CORE DESIGN

Reference Technical Specification: 4.2

The reactor vessel core for the present cycle consists of 580 fuel assemblies of the types listed below. The core loading pattern (Ref. 5.15) for each type of fuel is shown for the present cycle in Figure 4.0-1.

Irradiated Bundles	# of Bundles	Cycle Loaded
GNF2-P10DG2B388-6G6.0/7G5.0-100T2-145-T6-3143	21	18
GNF2-P10DG2B388-6G6.0/7G5.0-100T2-145-T6-3143	5	18
GNF2-P10DG2B395-6G6.0/9G5.0-100T2-145-T6-3422	16	19
GNF2-P10DG2B401-6G6.0/8G5.0/1G4.0-100T2-145-T6-3421	24	19
GNF2-P10DG2B389-6G6.0/8G5.0-100T2-145-T6-3141	14	18
GNF2-P10DG2B407-6G6.0/2G5.0/6G4.0-100T2-145-T6-3642	44	19
GNF2-P10DG2B401-6G6.0/2G5.0/6G4.0-100T2-145-T6-3640	28	19
GNF2-P10DG2B406-6G6.0/6G5.0/2G4.0-100T2-145-T6-3641	16	19
GNF2-P10DG2B401-6G6.0/2G5.0/6G4.0-100T2-145-T6-3640	8	19
GNF2-P10DG2B389-6G6.0/2G5.0/6G4.0-100T2-145-T6-3142	92	18
GNF2-P10DG2B375-6G6.0/7G5.0-100T2-145-T6-3434	16	19
GNF2-P10DG2B406-6G6.0/2G5.0/6G4.0-100T2-145-T6-4171	56	20
GNF2-P10DG2B398-5G6.0/8G5.0-100T2-145-T6-4172	24	20
GNF2-P10DG2B389-15G5.0-100T2-145-T6-4173	40	20
GNF2-P10DG2B375-7G6.0/6G5.0-100T2-145-T6-4174	32	20
New Bundles for Cycle 21		
GNF2-P10DG2B387-15G6.0-100T2-145-T6-4308	24	21
GNF2-P10DG2B387-12G6.0/4G5.0-100T2-145-T6-4309	30	21
GNF2-P10DG2B398-14G5.0-100T2-145-T6-4310	28	21
GNF2-P10DG2B387-13G6.0-100T2-145-T6-4311	16	21
GNF2-P10DG2B387-15G6.0-100T2-145-T6-4308	8	21
GNF2-P10DG2B387-12G6.0/4G5.0-100T2-145-T6-4309	10	21
GNF2-P10DG2B398-14G5.0-100T2-145-T6-4310	20	21
GNF2-P10DG2B387-13G6.0-100T2-145-T6-4311	8	21
Total	580	

FIGURE 4.0-1, Reactor Vessel Core Loading Pattern

Site		1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51		Site
	GNF	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	GNF	
52	1							19	19	11	19	5	19	5	19	5	19	5	11	19	19							1	52
50	2							19	19	19	19	7	12	8	8	12	7	19	19	19	19							2	50
48	3					19	19	11	20	21	23	21	15	22	22	15	21	23	21	20	11	19	19					3	48
46	4					19	19	21	21	27	27	31	31	27	27	31	31	27	27	21	21	5	19					4	46
44	5			6	11	5	7	13	31	12	23	13	23	8	8	23	13	23	12	31	13	7	19	6	19			5	44
42	6			19	19	7	12	21	26	21	12	23	25	24	24	25	23	12	21	26	21	12	7	5	19			6	42
40	7	11	19	19	21	13	21	30	21	30	24	29	24	26	26	24	29	24	30	21	26	21	13	21	19	19	19	7	40
38	8	19	5	20	21	31	26	21	26	23	26	24	25	8	8	25	24	26	23	26	21	26	31	21	20	19	19	8	38
36	9	19	19	21	27	12	21	30	23	16	12	25	20	13	13	20	25	12	16	23	30	21	12	27	21	5	19	9	36
34	10	19	19	23	27	23	12	24	26	12	16	22	32	22	22	32	22	16	12	26	24	12	23	27	23	19	11	10	34
32	11	5	7	21	31	13	23	29	24	25	22	28	15	28	28	15	28	22	25	24	29	23	13	31	21	7	5	11	32
30	12	19	12	15	27	23	25	24	25	20	32	15	28	12	12	28	15	32	20	25	24	25	23	27	15	12	19	12	30
28	13	19	8	22	27	8	24	26	8	13	22	28	13	12	12	13	28	22	13	8	26	24	8	27	22	8	5	13	28
26	14	5	8	22	27	8	24	26	8	13	22	28	20	12	12	20	28	22	13	8	26	24	8	27	22	8	19	14	26
24	15	19	12	15	27	23	25	24	25	13	32	15	28	12	12	28	15	32	20	25	24	25	23	27	15	12	19	15	24
22	16	19	7	21	31	13	23	29	24	25	22	28	15	28	28	15	28	22	25	24	29	23	13	31	21	7	5	16	22
20	17	19	19	23	27	23	12	24	26	12	16	22	32	22	22	32	22	16	12	26	24	12	23	27	23	6	11	17	20
18	18	19	19	21	27	12	21	30	23	16	12	25	13	13	13	20	25	12	16	23	30	21	12	27	21	5	19	18	18
16	19	6	19	20	21	31	26	21	26	23	26	24	25	8	8	25	24	26	23	26	21	26	31	21	20	19	19	19	16
14	20	19	6	19	21	13	21	30	21	30	24	29	24	26	26	24	29	24	30	21	26	21	13	21	5	19	19	20	14
12	21			11	19	7	12	21	26	21	12	23	25	24	24	25	23	12	21	26	21	12	7	19	19			21	12
10	22			19	19	11	7	13	31	12	23	13	23	8	8	23	13	23	12	31	13	7	19	19	5			22	10
8	23					19	19	21	21	27	27	31	31	27	27	31	31	27	27	21	21	19	19					23	8
6	24					19	19	19	20	21	23	21	15	22	22	15	21	23	21	20	11	19	19					24	6
4	25							19	19	19	19	7	12	8	8	12	7	19	19	19	19							25	4
2	26							19	19	11	19	5	5	19	19	5	5	19	11	11	19							26	2
	GNF	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	GNF	
Site		1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51		Site

IAT	Bundle Description	# of Bundles	Cycle Loaded
5	GNF2-P10DG2B388-6G6.0/7G5.0-100T2-145-T6-3143	21	18
6	GNF2-P10DG2B388-6G6.0/7G5.0-100T2-145-T6-3143	5	18
7	GNF2-P10DG2B395-6G6.0/9G5.0-100T2-145-T6-3422	16	19
8	GNF2-P10DG2B401-6G6.0/8G5.0/1G4.0-100T2-145-T6-3421	24	19
11	GNF2-P10DG2B389-6G6.0/8G5.0-100T2-145-T6-3141	14	18
12	GNF2-P10DG2B407-6G6.0/2G5.0/6G4.0-100T2-145-T6-3642	44	19
13	GNF2-P10DG2B401-6G6.0/2G5.0/6G4.0-100T2-145-T6-3640	28	19
15	GNF2-P10DG2B406-6G6.0/6G5.0/2G4.0-100T2-145-T6-3641	16	19
16	GNF2-P10DG2B401-6G6.0/2G5.0/6G4.0-100T2-145-T6-3640	8	19
19	GNF2-P10DG2B389-6G6.0/2G5.0/6G4.0-100T2-145-T6-3142	92	18
20	GNF2-P10DG2B375-6G6.0/7G5.0-100T2-145-T6-3434	16	19
21	GNF2-P10DG2B406-6G6.0/2G5.0/6G4.0-100T2-145-T6-4171	56	20
22	GNF2-P10DG2B398-5G6.0/8G5.0-100T2-145-T6-4172	24	20
23	GNF2-P10DG2B389-15G5.0-100T2-145-T6-4173	40	20
24	GNF2-P10DG2B375-7G6.0/6G5.0-100T2-145-T6-4174	32	20
25	GNF2-P10DG2B387-15G6.0-100T2-145-T6-4308	24	21
26	GNF2-P10DG2B387-12G6.0/4G5.0-100T2-145-T6-4309	30	21
27	GNF2-P10DG2B398-14G5.0-100T2-145-T6-4310	28	21
28	GNF2-P10DG2B387-13G6.0-100T2-145-T6-4311	16	21
29	GNF2-P10DG2B387-15G6.0-100T2-145-T6-4308	8	21
30	GNF2-P10DG2B387-12G6.0/4G5.0-100T2-145-T6-4309	10	21
31	GNF2-P10DG2B398-14G5.0-100T2-145-T6-4310	20	21
32	GNF2-P10DG2B387-13G6.0-100T2-145-T6-4311	8	21
	Total	580	

5.0 REFERENCES

5.1 NEDE-24011-P-A-21 and NEDE-24011-P-A-21-US, "General Electric Standard Application for Reactor Fuel", May, 2015, eB record: KGO-ENO-GEN-15-085.

5.2. EC47669, Cycle 21 Reload Core Design.

5.3. NEDC-31852-P, rev. 4, "Pilgrim Nuclear Power Station SAFER/GESTR-LOCA Loss-of-Coolant Accident Analysis for PNPS", January 2008.

5.4. NEDC-33155P, Rev.0, Application of Stability Long-Term Solution Option I-D To Pilgrim Nuclear Power Station, October 2004.

5.5. Letter 2.14.076, License Amendment Request for Cycle 21 SLMCPR.

5.6. GE-NE-GENE-0000-0033-6871-01, Rev. 0, Pilgrim Option I-D APRM Flow Biased Set points, October 2004.

5.7. GE-NE-0000-0027-5301, Rev 2, Pilgrim Nuclear Power Station Single Loop Operation, April 2006.

5.8. S&SA-186, % ΔW_D for use with Stability Option I-D for Pilgrim (applicable to SLO).

5.9. SUDDS/RF 94-42, NEDC-32306P, "Maximum Extended Load Line Limit Analyses", March 1994.

5.10. SUDDS/RF 88-160, NEDC-31312-P, "ARTS Improvement Program Analysis for Pilgrim Nuclear Power Station", September 4, 1987.

5.11. A22-00109-00 MAPLHGR set down process explanation for Pilgrim, November 2001.

5.12. ECH-NE-09-00019, R2, GNF2NFI, GEH-0000-0085-9069-R2, GNF2 Fuel Design Cycle Independent Analyses for Entergy PNPS, March 2011.

5.13. ER 03110960, Stability I-D implementation.

5.14. PNPS-RPT-03-00001, Rev. 7, "Pilgrim Power To Flow Map Report."(EC56046)

5.15. ECH-NE-15-00008, "Supplemental Reload Licensing Report, Reload 20, Cycle 21, February 2015", 000N9841-SRLR Rev.0 (EC56046).

5.16. ECH-NE-15-00006, EC55561, PNPS Cycle 21 OPL-3 Form.

5.17. ECH-NE-15-00009, 000N9842-FBIR Rev.0, January 2015, "PNPS Cycle 21 Fuel Bundle Information Report (FBIR)" (EC56046).

5.18. SUDDS/RF 02-86, GNF SER issued by NRC approving elimination of Upper Bound PCT limit requirement.

5.19. EC7933 documents OPL-4 & 5 LOCA Inputs.

5.20. NEDO-32465A, Licensing Topical report "Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Application, August 1996.

5.21. ECH-NE-09-00018, PNPS GNF2 ECCS-LOCA Evaluation.

5.22. ECH-NE-2013-00026, "Increased Operating Dome Pressure Band For Pilgrim".

5.23. NEDE-33270P, GNF2 Advantage Generic Compliance with GESTAR II), Revision 5, May 2013 (This reference is also known as Amendment 22 report for GNF2). (record in eB: KGO-ENO-JB1-13-085)

5.24. NEDE-33213, ODYSY Application for Stability Licensing Calculations Including Option I-D and II Long Term Solutions, April 2009

5.25. CR-PNP-2014-5904, Inappropriate Use of Reactor Feed Pump Trip in transient analysis

5.26. EC47669-7.010, 002N3765-00, GNF2-B36-P3-HK1-18PDN Limits Tables

5.27. GNF Letter KGO-ENO-HK1-15-094, dated June 16, 2015.

Attachment 4

Letter Number 2.17.060

Enclosure 9, KGO-ENO-HK1-17-081, Affidavit for Enclosure 7, Pilgrim Nuclear Power Station Cycle 21 Core Operating Limits Report, Revision 35, GNF Proprietary Information – Class II (Internal)

ENCLOSURE 9

KGO-ENO-HK1-17-081

Affidavit for Enclosure 7

Global Nuclear Fuel – Americas

AFFIDAVIT

I, **Brian R. Moore**, state as follows:

(1) I am General Manager, Core & Fuel Engineering, Global Nuclear Fuel – Americas, LLC (GNF-A), and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in Enclosure 7 of GNF's letter, KGO-ENO-HK1-17-081, Kimberly O'Connor (GNF) to Nela Szwarc (Entergy), entitled "Pilgrim Nuclear Power Station Cycle 20 Core Operating Limits Report (COLR) Revision 33 and Cycle 21 COLR Revision 34, 35, and 36 – Proprietary and Non-Proprietary Versions," July 28, 2017. GNF proprietary information in Enclosure 7, which is entitled "Pilgrim Nuclear Power Station Cycle 21 Core Operating Limits Report, Revision 35," is identified by a dotted underline inside double square brackets. [[This sentence is an example.{3}]] A "[[" marking at the beginning of a table, figure, or paragraph closed with a "]]" marking at the end of the table, figure or paragraph is used to indicate that the entire content between the double brackets is proprietary. In each case, the superscript notation {3} refers to Paragraph (3) of this affidavit, which provides the basis for the proprietary determination.

(3) In making this application for withholding of proprietary information of which it is the owner or licensee, GNF-A relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), and 2.390(a)(4) for "trade secrets" (Exemption 4). The material for which exemption from disclosure is here sought also qualify under the narrower definition of "trade secret", within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).

(4) Some examples of categories of information which fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by GNF-A's competitors without license from GNF-A constitutes a competitive economic advantage over other companies;

b. Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;

c. Information which reveals aspects of past, present, or future GNF-A customer-funded development plans and programs, resulting in potential products to GNF-A;

d. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a. and (4)b. above.

(5) To address 10 CFR 2.390 (b) (4), the information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GNF-A, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GNF-A, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge, or subject to the terms under which it was licensed to GNF-A.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist or other equivalent authority, by the manager of the cognizant marketing function (or his delegate), and by the Legal Operation, for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GNF-A are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.

(8) The information identified in paragraph (2) is classified as proprietary because it contains details of GNF-A's fuel design and licensing methodology. The development of this methodology, along with the testing, development and approval was achieved at a significant cost to GNF-A.

The development of the fuel design and licensing methodology along with the interpretation and application of the analytical results is derived from an extensive experience database that constitutes a major GNF-A asset.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GNF-A's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GNF-A's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and

analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

The research, development, engineering, analytical, and NRC review costs comprise a substantial investment of time and money by GNF-A.

The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

GNF-A's competitive advantage will be lost if its competitors are able to use the results of the GNF-A experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GNF-A would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GNF-A of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing and obtaining these very valuable analytical tools.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on this 28th day of July 2017.

Brian R. Moore
General Manager, Core & Fuel Engineering
Global Nuclear Fuel – Americas, LLC
3901 Castle Hayne Road
Wilmington, NC 28401
Brian.Moore@ge.com