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GNRO-2020/00027

July 16, 2020

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

SUBJECT: Core Operating Limits Report (COLR) Cycle 23 Revision 1 for Grand Gulf Nuclear Station, Unit 1 (GGNS)

Grand Gulf Nuclear Station, Unit 1
Docket No. 50-416
Renewed License No. NPF-29

REFERENCE: Entergy Letter GNRO-2020/00020, Core Operating Limits Report (COLR) Cycle 23, and Pressure and Temperature Limits Report (PTLR) Update for Grand Gulf Nuclear Station, Unit 1 (GGNS)

Dear Sir or Madam:

On May 5, 2020, In accordance with 10 CFR 50.36 GGNS submitted the Cycle 23 Core Operating Limit Report (COLR) (referenced above). The purpose of this letter is to submit Revision 1 of the Cycle 23 of the COLR to the Nuclear Regulatory Commission (NRC) in accordance with GGNS Technical Specification Sections 5.6.5.d. The revised GGNS Cycle 23 COLR is attached to this letter.

This letter contains no new Regulatory Commitments. Should you have any questions concerning the content of this letter, please contact Jim Shaw, Manager Regulatory Assurance at 601-437-2103.

Sincerely,

A handwritten signature in black ink, appearing to read "E. A. Larson", with a long horizontal flourish extending to the right.

Eric A. Larson
EAL/ram

cc: NRC Senior Resident Inspector
Grand Gulf Nuclear Station
Port Gibson, MS 39150

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Attachment
Core Operating Limits Report (COLR) Cycle 23, Revision 1

Grand Gulf Nuclear Station

Core Operating Limits Report

Cycle 23

Revision 1

CORE OPERATING LIMITS REPORT

REASON FOR REVISION

Revision 1:

The Cycle 23 core operating limits are revised to replace the BSP region boundaries for RFWT (Figure 5) with a corrected figure for Cycle 23. Cycle 23 COLR Revision 0 Figure 5 was still showing Cycle 22's BSP region boundaries for RFWT. Figure 4 was updated to remove A3 and B3 labels which are not provided in Table 2.

Revision 0:

The Cycle 23 core operating limits are updated to provide cycle-specific MCPR and LHGRFAC multiplier values for the GNF2 and GNF3 fuel type. Figure 1-1 and 1-2 provides the APLHGR limits for the GNF2 and GNF3 fuel types, respectively. Figures 2-1 through 2-9 are updated with new MCPR limits and Figures 3-1 through 3-7 are updated with new LHGRFAC limits. No other core operating limits are changed. These limits are based on a core power of 4408 MWt.

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CORE OPERATING LIMITS REPORT

1.0 PURPOSE

The COLR is controlled as a License Basis Document and revised accordingly for each fuel cycle or remaining portion of a fuel cycle. Any revisions to the COLR must be submitted to the NRC for information as required by Tech Spec 5.6.5 and tracked by Licensing Commitment 29132. This COLR reports the Cycle 23 core operating limits and stability setpoint confirmation and regions.

2.0 SCOPE

As defined in Technical Specification 1.1, the COLR is the GGNS document that provides the core operating limits for the current fuel cycle. This document is prepared in accordance with Technical Specification 5.6.5 for each reload cycle using NRC-approved analytical methods.

The Cycle 23 core operating and stability limits included in this report are:

- the Average Planar Linear Heat Generation Rate (APLHGR),
- the Minimum Critical Power Ratio (MCPR) (including EOC-RPT inoperable),
- the Linear Heat Generation Rate (LHGR) limit, and
- the DSS-CD stability setpoint confirmation and regions.

CORE OPERATING LIMITS REPORT

3.0 REFERENCES

This section contains the cycle-specific references used in the safety analysis of Grand Gulf Cycle 23.

Methodology references are documented in Technical Specification 5.6.5b

3.1 Current Cycle References

- 3.1.1 ECH-NE-20-00009 Revision 0, Supplemental Reload Licensing Report for Grand Gulf-1 Reload 22 Cycle 23, dated February 2020.
- 3.1.2 ECH-NE-10-00021 Revision 5, GNF2 Fuel Design Cycle-Independent Analyses for Entergy Grand Gulf Nuclear Station, dated February 2020.
- 3.1.3 ECH-NE-20-00010 Revision 0, Fuel Bundle Information Report for Grand Gulf-1 Reload 22 Cycle 23, dated November 2019.
- 3.1.4 NEDC-32910P, Revision 1, Grand Gulf Nuclear Station SAFER/GESTR-LOCA Accident Analysis With Relaxed ECCS Parameters, dated October 1999.
- 3.1.5 GGNS-NE-12-00022 Revision 0, Grand Gulf Nuclear Station MELLLA+ Task T0407, ECCS-LOCA Performance, dated September 2012.
- 3.1.6 GGNS-SA-09-00002 Revision 1, Grand Gulf Nuclear Station GNF2 ECCS-LOCA Evaluation, dated December 2009.
- 3.1.7 NEDC-33173P-A, Revision 5, Applicability of GE Methods to Expanded Operating Domains (with Supplements 5P-A Rev. 1, and 6P-A Rev. 1), dated October 2019.
- 3.1.8 NEDC-33006P-A, Revision 3, GE BWR Maximum Extended Load Line Limit Analysis Plus, dated June 2009.
- 3.1.9 ECH-NE-20-00012, Revision 1, GGNS Cycle 23 GESTAR Assessment, dated March 2020.
- 3.1.10 ECH-NE-20-00006 Revision 0, GNF3 Fuel Design Cycle-Independent Analyses for Grand Gulf Nuclear Station, dated February 2020.
- 3.1.11 GGNS-SA-19-00002 Revision 0 Grand Gulf Nuclear Station GNF3 ECCS-LOCA Evaluation Revision 1, dated October 2019.
- 3.1.12 GEH-GGNS-AEP-632, GGNS MELLLA+ Final DSS-CD Settings Report, dated October 23, 2013.
- 3.1.13 NEDE-24011-P-A-29, General Electric Standard Application for Reactor Fuel (GESTAR-II), dated October 2019, (KGO-ENO-GEN-19-087).
- 3.1.14 Not Used.
- 3.1.15 NED0-33612-A, Revision 0, Safety Analysis Report for GGNS Maximum Extended Load Line Limit Analysis Plus, September 2013.
- 3.1.16 NEDC-33292P, Revision 3, GEXL17 Correlation for GNF2 Fuel, June 2009 (RA-ENO-GEN-10-034).
- 3.1.17 NEDC-33880P, Revision 1, GEXL21 Correlation for GNF3 Fuel, November 2017 (KGO-ENO-GEN-20-031).

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- 3. 1. 18 NEDC-33840P-A, Revision 1, The PRIME Model for Transient Analysis of Fuel Rod Thermal – Mechanical Performance, August 2017.
- 3. 1. 19 GGNS-NE-10-00076, Revision 0 (GEH 0000-012101122-R0), GGNS EPU Option B Scram Times, dated September 2010.
- 3. 1. 20 NEDC-33270P, Revision 9, GNF2 Advantage Generic Compliance with NEDE-24011-P-A (GESTAR II), Dec 2017. (KGO-ENO-JB1-18-068).
- 3. 1. 21 NEDC-33879P, Revision 2, GNF3 Generic Compliance with NEDE-24011-P-A (GESTAR II), March 2018. (CIN2018-00052).

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4.0 DEFINITIONS

- 4.1 Average Planar Linear Heat Generation Rate (APLHGR) - the APLHGR shall be applicable to a specific planar height and is equal to the sum of the linear heat generation rates 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 specified height.
- 4.2 Average Planar Exposure - the Average Planar Exposure shall be applicable to a specific planar height and is equal to the sum of the exposure of 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 specified height.
- 4.3 Critical Power Ratio (CPR) - the ratio of that power in the assembly, which is calculated by application of the fuel vendor's appropriate boiling correlation, to cause some point in the assembly to experience boiling transition, divided by the actual assembly operating power.
- 4.4 Core Operating Limits Report (COLR) - The Grand Gulf Nuclear Station specific document that provides core operating limits for the current reload cycle in accordance with Technical Specification 5.6.5.
- 4.5 Linear Heat Generation Rate (LHGR) - the 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.
- 4.6 Minimum Critical Power Ratio (MCPR) - the MCPR shall be the smallest CPR which exists in the core.
- 4.7 MCPR Safety Limit - cycle specific SLMCPR, known as $MCPR_{99.9\%}$, is the minimum value of the CPR at which the fuel could be operated to ensure that 99.9% percent of the fuel in the core is not susceptible to the boiling transition.
- 4.8 Oscillation Power Range Monitor (OPRM) - Provides automatic detection and suppression of reactor core thermal-hydraulic instabilities through monitoring neutron flux changes.
- 4.9 Backup Stability Protection (BSP) Scram Region - The area of the core power and flow operating domain where the reactor is susceptible to reactor instabilities under conditions exceeding the licensing basis of the current reactor system. An immediate manual scram is required upon entry.
- 4.10 Backup Stability Protection (BSP) Controlled Entry Region - The area of the core power and flow operating domain where the reactor is susceptible to reactor instabilities. Compliance with at least one alternate stability control is required upon entry.
- 4.11 Automated Backup Stability Protection (ABSP) Scram Region - An automated reactor scram region that bounds the BSP Scram Region and is initiated by the APRM flow-biased scram setpoint upon entry.
- 4.12 End of Rated (EOR) - The Cycle exposure corresponding to all rods out, 100% power, 100% flow, and normal feedwater temperature [3.1.1].
- 4.13 Middle of Cycle (MOC) - The Cycle 23 MOC Core Average Exposure (CAE) is $MOC = EOR - 2,862 \text{ MWd/ST}$ [3.1.1].
- 4.14 End of Cycle (EOC) - The Cycle 23 EOC CAE is $30,594 \text{ MWd/ST}$ [3.1.1].
- 4.15 Maximum Extended Load Line Limit Analysis Plus (MELLLA+) - The GGNS MELLLA+ operating domain is depicted in Figure 4.
- 4.16 Maximum Number of OPRM Cells Along an Instability Symmetry Axis (M_{AX}) - An OPRM configuration constant representing maximum number of OPRM cells along an instability symmetry axis. It is used to calculate the number of unresponsive OPRM cells. Per [3.1.12] the GGNS specific value is five ($M_{AV} = 5$).

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- 4.17 Application Conditions – The combination of equipment out of service conditions for which LHGRFAC and MCPR limits are determined [3.1.1]. The Application Conditions are specified in Table 6.
- 4.18 MCPR_{95/95} Safety Limit - Cycle-independent Technical Specification (TS) 2.1.1 SLMCPR, ensures there is a 95 percent probability at a 95 percent confidence level that no fuel rods will be susceptible to transition boiling.

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5.0 GENERAL REQUIREMENTS

5.1 Average Planar Linear Heat Generation Rates

Consistent with Technical Specification 3.2.1, all APLHGRs shall not exceed the fuel type and exposure-dependent limits reported in Figures 1-1 and 1-2 [3.1.1].

5.2 Minimum Critical Power Ratio

For Cycle 23, the cycle-specific MCPR Safety Limit ($MCPR_{99.9\%}$), is 1.12 for Two Loop Operation (TLO), and 1.12 for Single Loop Operation (SLO) [3.1.1].

Consistent with Technical Specification 3.2.2, the MCPR shall be equal to or greater than the limits reported in Figure(s) 2 as functions of power, flow, exposure, and scram speed. [3.1.1, 3.1.2, 3.1.10, 3.1.19]. For operation at powers $\geq 35.4\%$, the power-dependent MCPR shall be determined based on scram time surveillance data as follows. [3.1.19]

- 1) If the average scram time (t_{AVE}) satisfies the following:

$$t_{AVE} \leq t_B,$$

then the power dependent MCPR shall be equal to or greater than the Option B limits reported in Figure(s) 2 as a function of exposure.

- 2) If the average scram time

$$t_{AVE} > t_B \text{ and } t \leq 0.2,$$

then the power-dependent MCPR shall be equal to or greater than the Tau = 0.2 limits reported in Figure(s) 2 as a function of exposure,

- 3) If the average scram time

$$t_{AVE} > t_B \text{ and } t > 0.2,$$

then the power-dependent MCPR shall be equal to or greater than the Option A limits reported in Figure(s) 2 as a function of exposure.

In the above equations:

t_{AVE} = average scram time to the 20% insertion position as calculated by equation 1 of Reference 3.1.19,

t_B = adjusted analysis mean scram time for 20% insertion as calculated by equation 3 of Reference 3.1.19

and

$$t = \frac{t_{AVE} - t_B}{t_A - t_B},$$

where

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t_A = the technical specification limit on core average scram time to the 20 percent insertion position (0.503 seconds).

The limits determined above support operation with Turbine Bypass Valves Out of Service as described in Technical Specification 3.7.7. Additional MCPR operating limits are provided to support operation with EOC-RPT inoperable as described in Technical Specification 3.3.4.1.

5.3 Linear Heat Generation Rate

Consistent with Technical Specification 3.2.3, the LHGRs for any GNF2 or GNF3 fuel rod at any axial location shall not exceed the nodal exposure-dependent limits reported in Reference 3.1.3 (by reference reported in [3.1.20] for GNF2 and [3.1.21] for GNF3) multiplied by the smaller of either the power-dependent or flow-dependent LHGR factors reported in Figures 3-1 through 3-6 and 3-7, respectively [3.1.1]. The limits determined above support operation with Turbine Bypass Valves Out of Service as described in Technical Specification 3.7.7.

5.4 Stability

The OPRM Upscale Confirmation Density Algorithm (CDA) Amplitude Discriminator setpoint is reported in Table 1.

The Backup Stability Protection (BSP) regions boundaries are reported in Figures 4 and 5 [3.1.1]. BSP measures support operation with the OPRM upscale trip function inoperable as described in Technical Specification 3.3.1.1 Condition J. The endpoints for the BSP region boundaries are provided for normal (NFWT) and reduced (RFWT) feedwater temperature operations in Tables 2 and 3, respectively. Figures 4 and 5 depict the BSP region boundaries for NFWT and RFWT operations. Note that Figures 4 and 5 also depict the MELLLA+ and MELLLA domains, consistent with feedwater temperature operating limitations.

The ABSP APRM Simulated Thermal Power (STP) setpoints associated with the ABSP Scram Region are provided in Table 4. The ABSP setpoints are applicable to TLO and SLO, and to both normal and reduced feedwater temperature operations.

The BSP Boundary and Manual BSP region boundaries for normal feedwater temperature operations are valid for reductions in normal feedwater temperature as much as (and including) -10.0 °F.

5.5 Applicability

The following core operating limits are applicable for operation in the Maximum Extended Operating Domain (MEOD), with Feedwater Heaters Out of Service (FWH00S), Turbine Bypass Out of Service (TBV00S), EOC-RPT inoperable, and Pressure Regulator Out of Service (PRO0S). For operation with one of the previous conditions mentioned, the alternate MCPR limits described in Section 5.2 above must be implemented. Table 6 provides an applicability condition list of events related to the Figures. For SLO, the following additional requirements must be satisfied.

1. THE APLHGRs shall not exceed the exposure-dependent limits determined in accordance with Section 5.1 reduced by a 0.83 SLO multiplier for GNF2 fuel bundles, and reduced by a 0.90 SLO multiplier for GNF3 fuel bundles. [3.1.1].
2. THE LHGRs shall not exceed the smaller of the nodal exposure-dependent limits determined in accordance with Section 5.3 above or the nodal

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exposure-dependent limits reported in Reference 3.1.3. During SLO operation the SLO values will be used from Figures 3-7 [3.1.1].

3. The MCPR shall be equal to or greater than the limits determined in accordance with Section 5.2 above increased by 0.00 to account for the difference between the two-loop and single-loop MCPR safety limits for the allowable range of single-loop operation [3.1.1].

5.6 Limitations and Conditions

As required by Limitation and Condition 9.10/9.11 of Licensing topical report NEDC-33173P-A [3.1.7], the limiting Thermal and Mechanical Overpower results are reported in Table 5. The results are summarized as a percent margin to both of these limits. The results are confirmed to meet the required 10% margin to the design limits [3.1.1].

As required by Limitation and Condition 12.10.b of Licensing topical report NEDC-33006P-A [3.1.8], the off-rated limits assumed in the ECCS-LOCA analyses are confirmed to be consistent with the off-rated LHGR multipliers provided Figures 3-1 through 3-7. These off-rated LHGR multipliers provide adequate protection for MELLLA+ operation.

As required by Limitation and Condition 12.5.c of Licensing topical report NEDC-33006P-A [3.1.8], the plant specific power/flow map specifying the GGNS licensed MELLLA+ operating domain is included as Figure 4.

As required by Limitation and Condition 12.5.b of Licensing topical report NEDC-33006P-A [3.1.8], operation with Feedwater Heaters Out of Service (FWH00S) is prohibited while in the MELLLA+ operating domain [3.1.1]. In addition, as required by Limitation and Condition 12.5.a of Licensing topical report NEDC-33006P-A [3.1.8], and described in GGNS TS 3.4.1 LCO, SLO is prohibited in the MELLLA+ operating domain [3.1.1]. Therefore, operations with RFWT and/or SLO must adhere to the operating domain shown in Figure 5.

Table 1
OPRM Upscale CDA Amplitude Discriminator Setpoint

Amplitude Discriminator Trip
1.10

Table 2
BSP Endpoints for Normal Feedwater Temperature

Endpoint	Power(%)	Flow(%)	Definition
A1	72.3	44.2	Scram Region Boundary, HFCL
B1	34.2	25.2	Scram Region Boundary, NCL
A2	67.3	50.0	Controlled Entry Region Boundary, HFCL
B2	26.4	24.4	Controlled Entry Region Boundary, NCL

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Table 3
BSP Endpoints for Reduced Feedwater Temperature

Endpoint	Power(%)	Flow(%)	Definition
A1'	65.9	48.3	Scram Region Boundary, HFCL
B1'	28.5	24.6	Scram Region Boundary, NCL
A2'	68.8	51.8	Controlled Entry Region Boundary, HFCL
B2'	26.4	24.4	Controlled Entry Region Boundary, NCL

Table 4
ABSP Setpoints for the Scram Region

Parameter	Symbol	Value
Slope of ABSP APRM flow-biased trip linear segment	m_{TRIP}	0.77
ABSP APRM flow-biased trip setpoint power intercept. Constant Power Line for Trip from zero Drive Flow to Flow Breakpoint.	$P_{BSP-TRIP}$	31.0% RTP ¹
ABSP APRM flow-biased trip setpoint drive flow intercept. Constant Flow Line for Trip.	$W_{BSP-TRIP}$	39.0% RDF ²
Flow Breakpoint value	$W_{BSP-BREAK}$	7.5% RDF ²

1. RTP – Rated Thermal Power

2. RDF – Recirculation Drive Flow

Table 5
Margin to Thermal Overpower and Mechanical Overpower Limits

Criteria	GNF3	GNF2
Thermal Overpower Margin	54.74%	51.02%
Mechanical Overpower Margin	55.03%	55.03%

Table 6
Application Conditions

Application Condition	FWH 00S	EOC-RPT	PROOS	TBV00S
1*				X
2*	X			X
3		X		X
4	X	X		X
5			X	X
6*	X		X	X
7		X	X	X
8*	X	X	X	X

* These are the limiting conditions evaluated in [3.1.1] and the only ones monitored.

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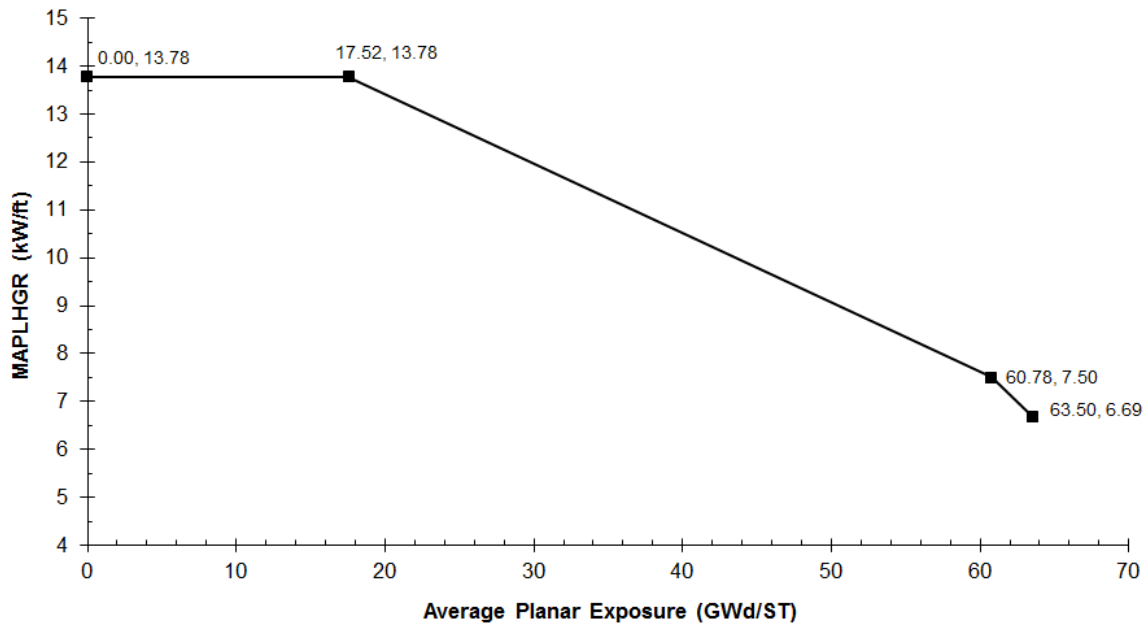


Figure 1-1
GNF2 Maximum Average Planar Linear Heat Generation Rate
Note: Actual Limits described in Sections 5.1 and 5.5

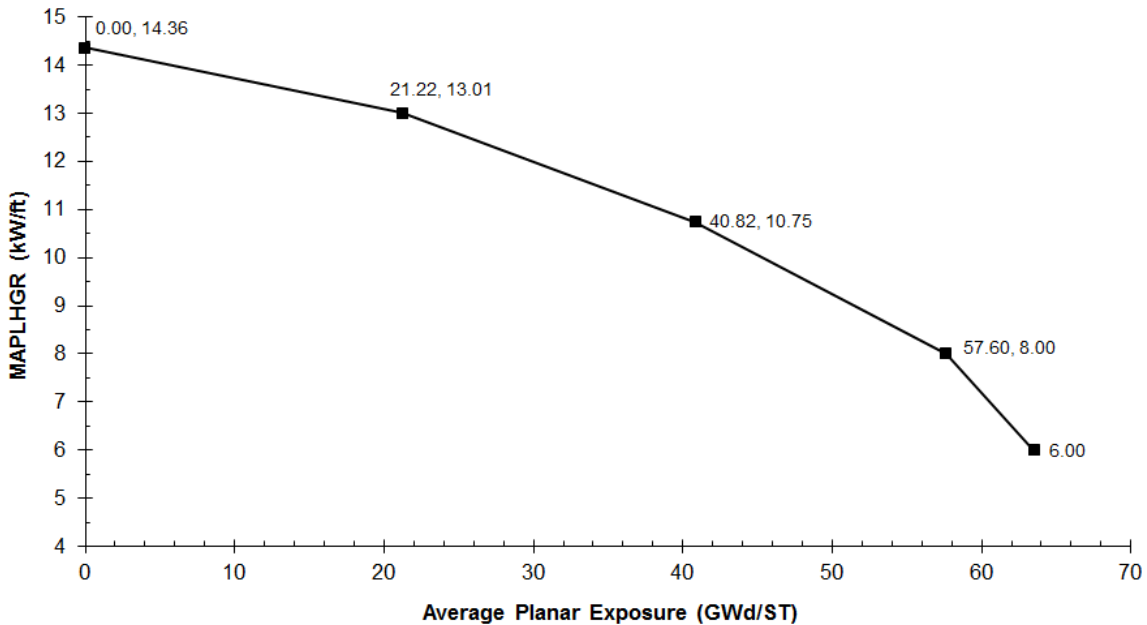


Figure 1-2
GNF3 Maximum Average Planar Linear Heat Generation Rate
Note: Actual Limits described in Sections 5.1 and 5.5

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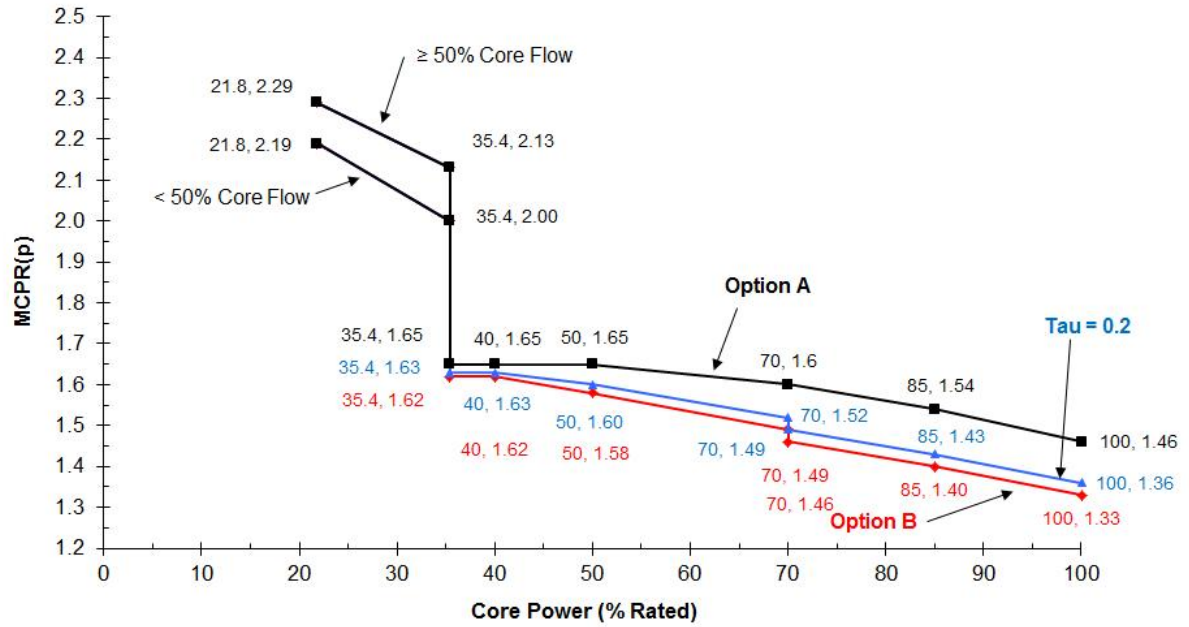


Figure 2-1A
Cycle 23 GNF2 Power-Dependent MCPR Limits, EIS
BOC to MOC

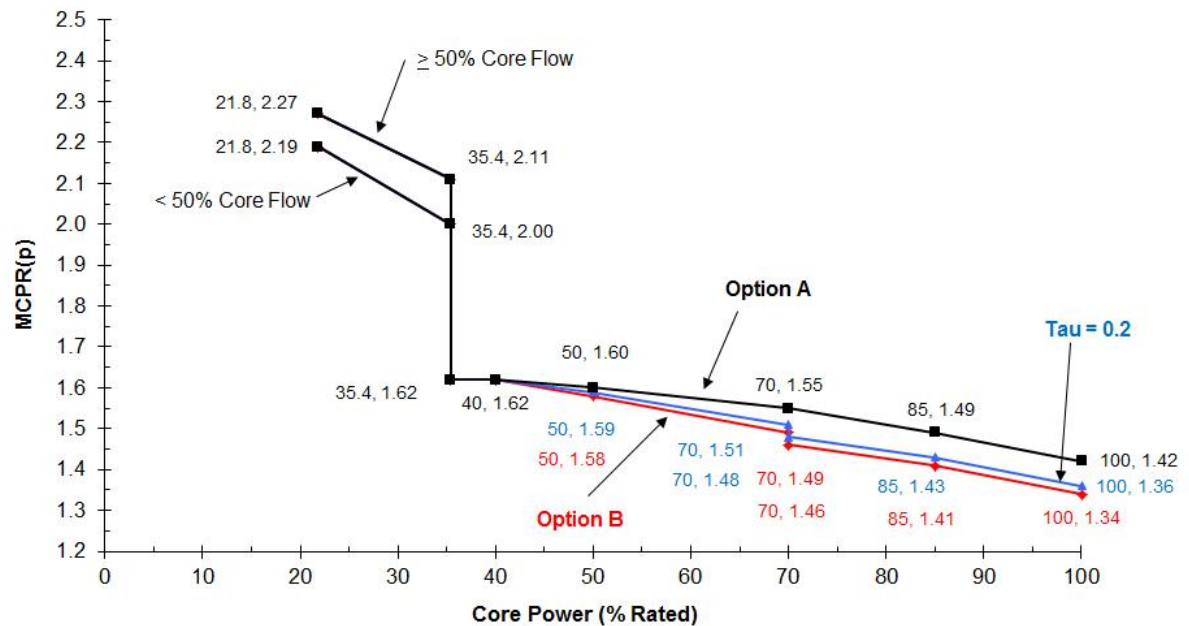


Figure 2-1B
Cycle 23 GNF3 Power-Dependent MCPR Limits, EIS
BOC to MOC

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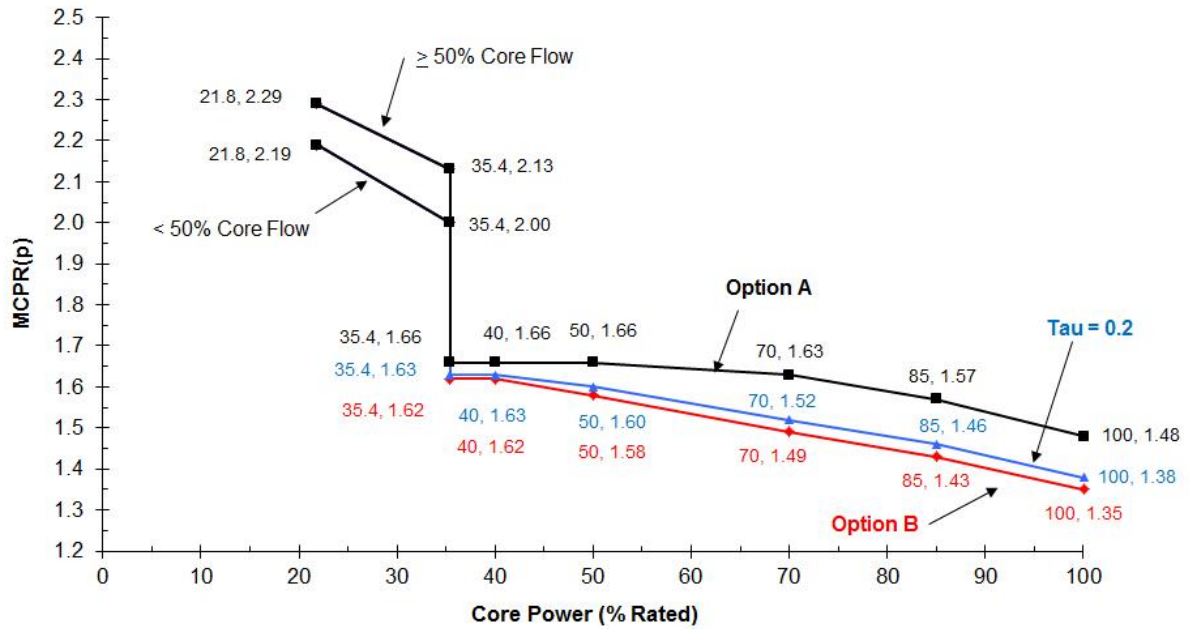


Figure 2-2A
Cycle 23 GNF2 Power-Dependent MCPR Limits with FWH OOS
BOC to MOC

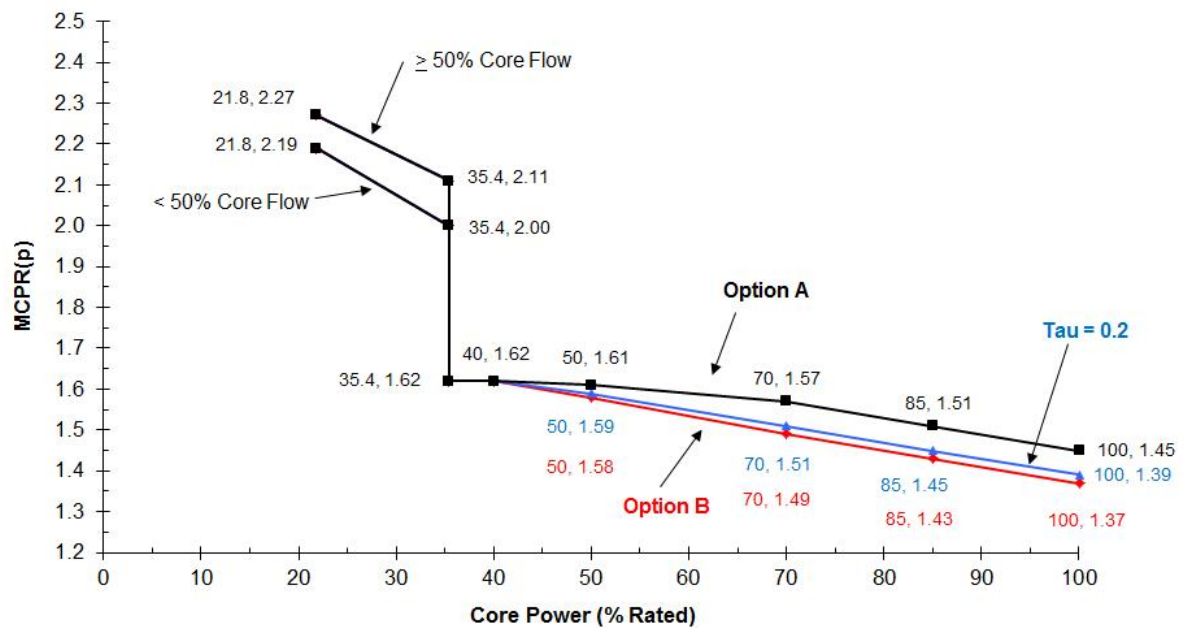


Figure 2-2B
Cycle 23 GNF3 Power-Dependent MCPR Limits with FWH OOS
BOC to MOC

CORE OPERATING LIMITS REPORT

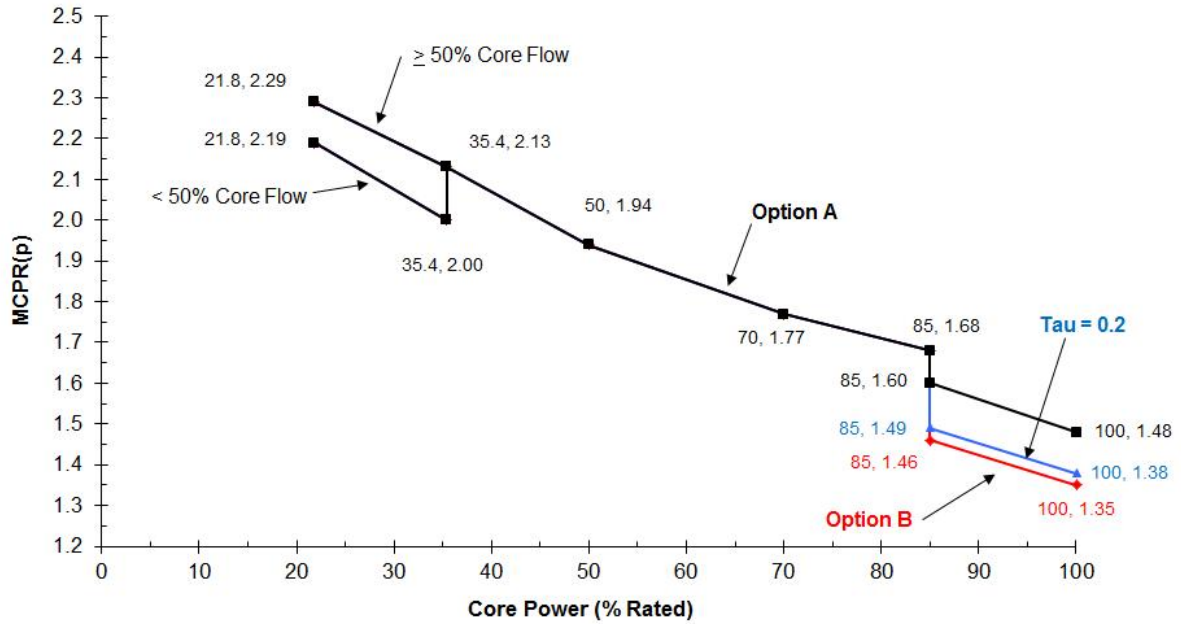


Figure 2-3A
Cycle 23 GNF2 Power-Dependent MCPR Limits with PR+FWH OOS
BOC to MOC

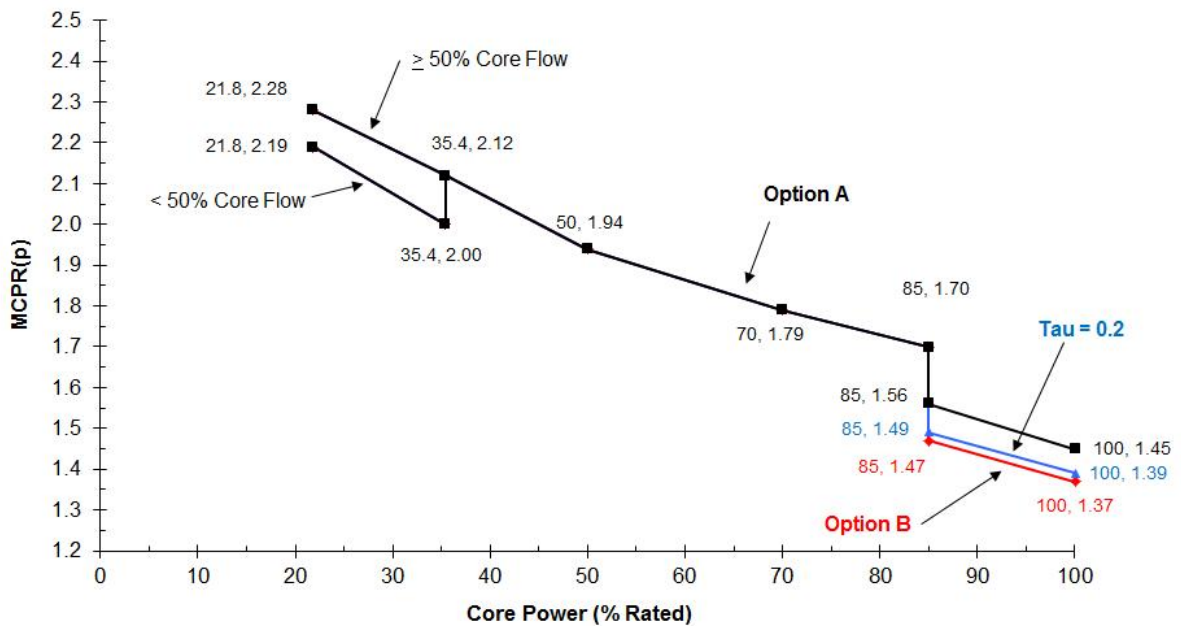


Figure 2-3B
Cycle 23 GNF3 Power-Dependent MCPR Limits with PR+FWH OOS
BOC to MOC

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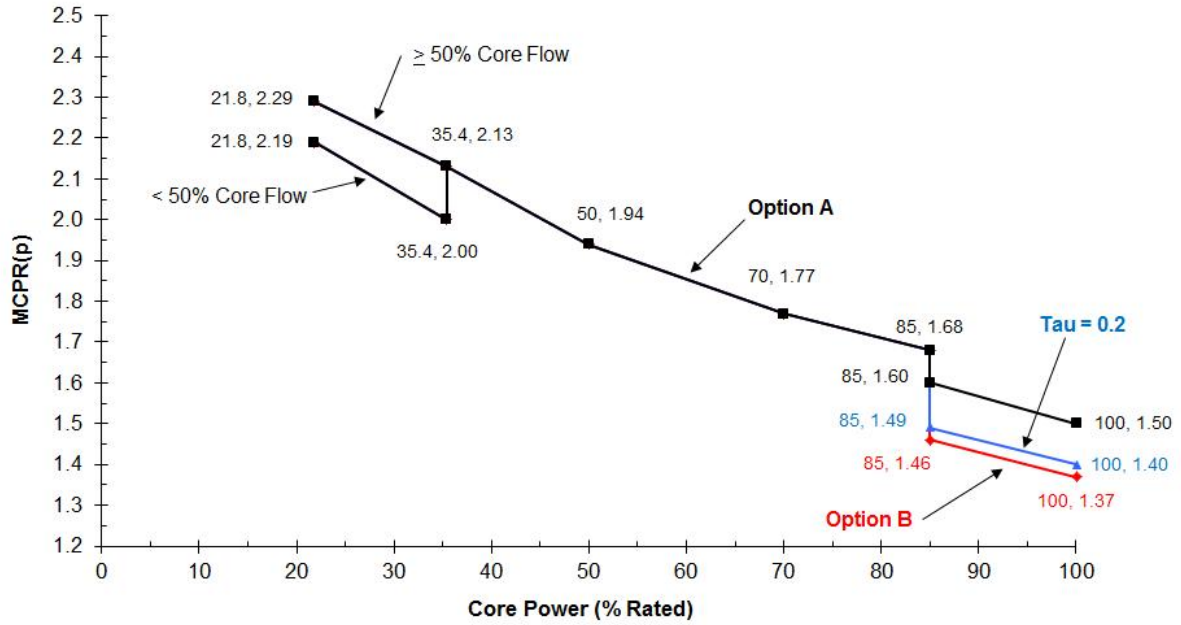


Figure 2-4A
Cycle 23 GNF2 Power-Dependent MCPR Limits with PR+EOC-RPT+FWH OOS
BOC to MOC

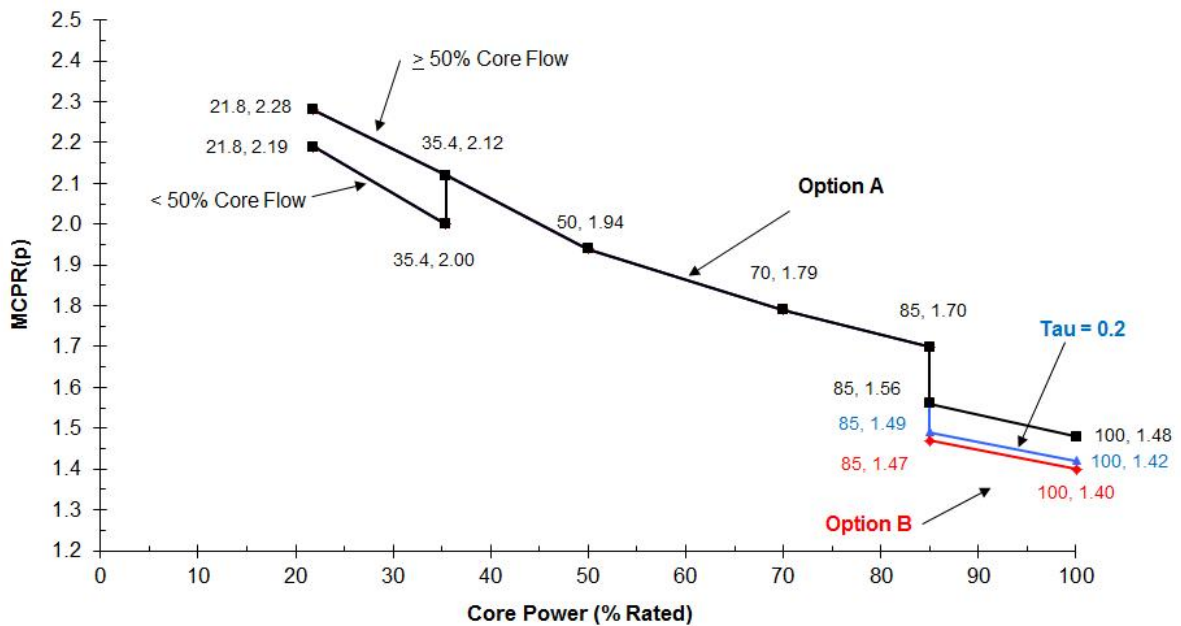


Figure 2-4B
Cycle 23 GNF3 Power-Dependent MCPR Limits with PR+EOC-RPT+FWH OOS
BOC to MOC

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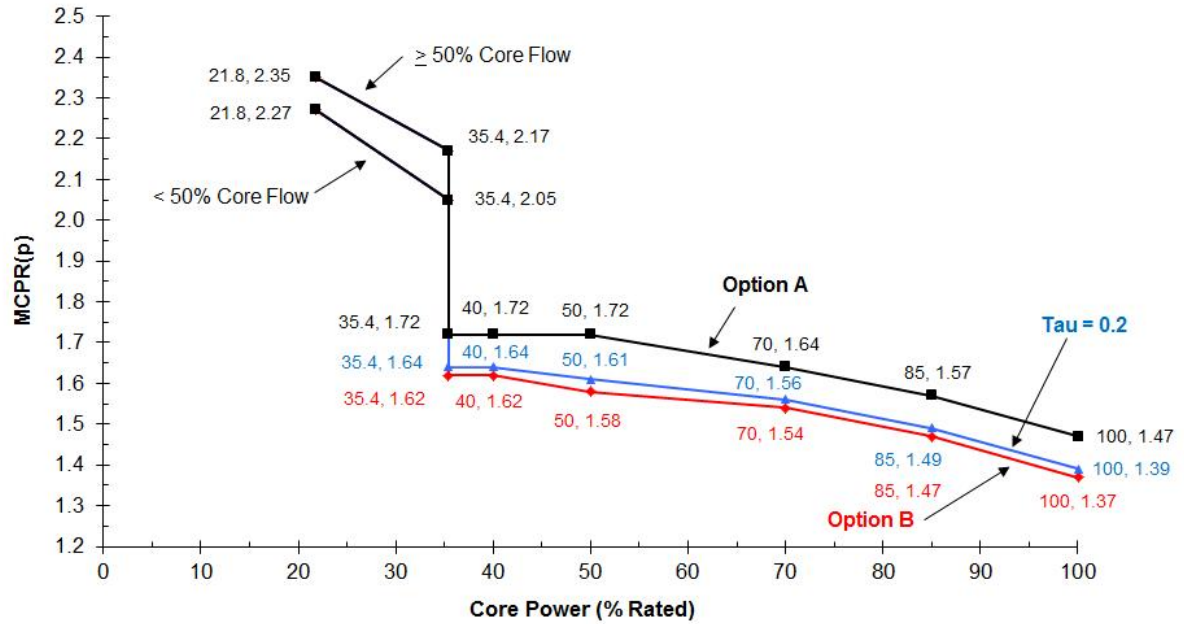


Figure 2-5A
Cycle 23 GNF2 Power-Dependent MCPR Limits, EIS
MOC to EOC

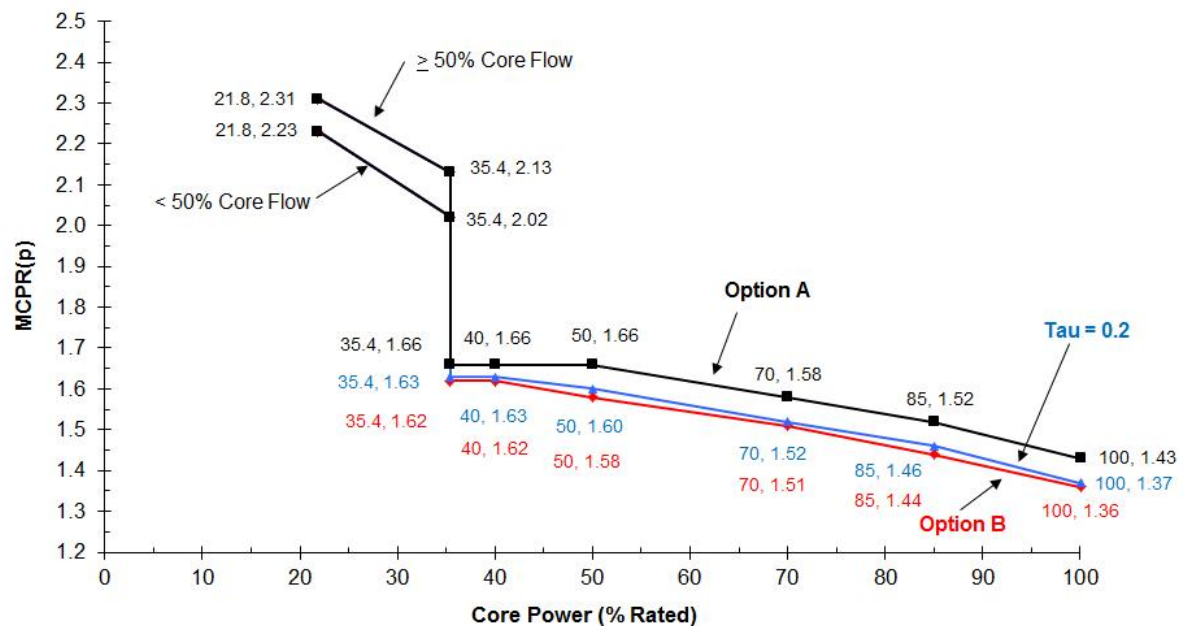


Figure 2-5B
Cycle 23 GNF3 Power-Dependent MCPR Limits, EIS
MOC to EOC

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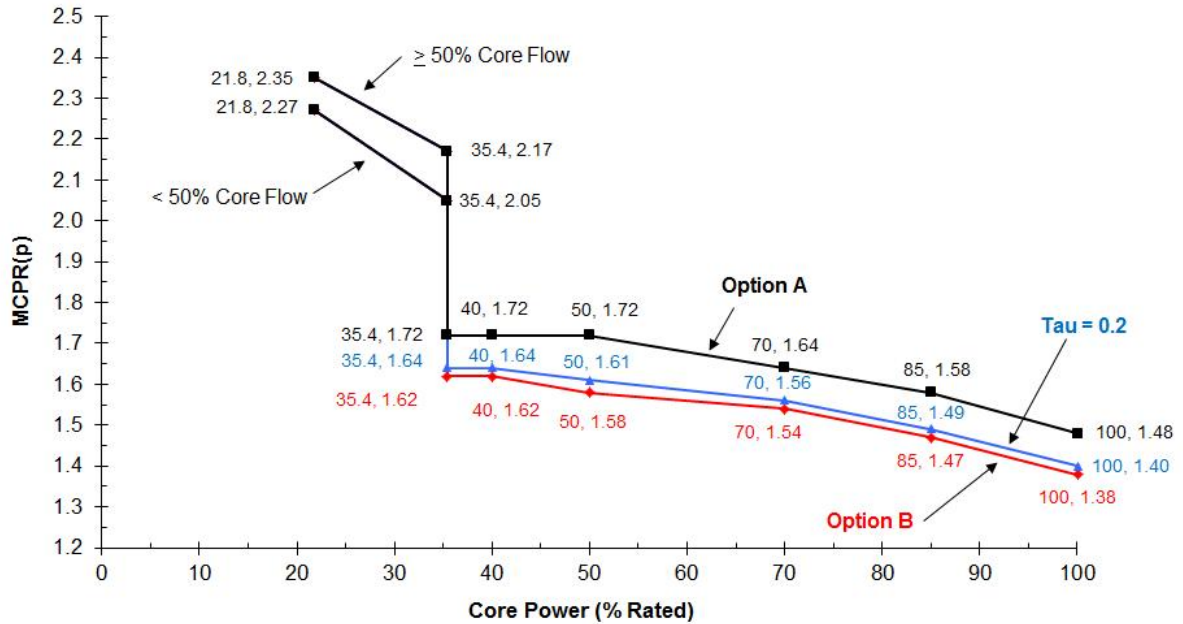


Figure 2-6A
Cycle 23 GNF2 Power-Dependent MCPR Limits with FWH OOS
MOC to EOC

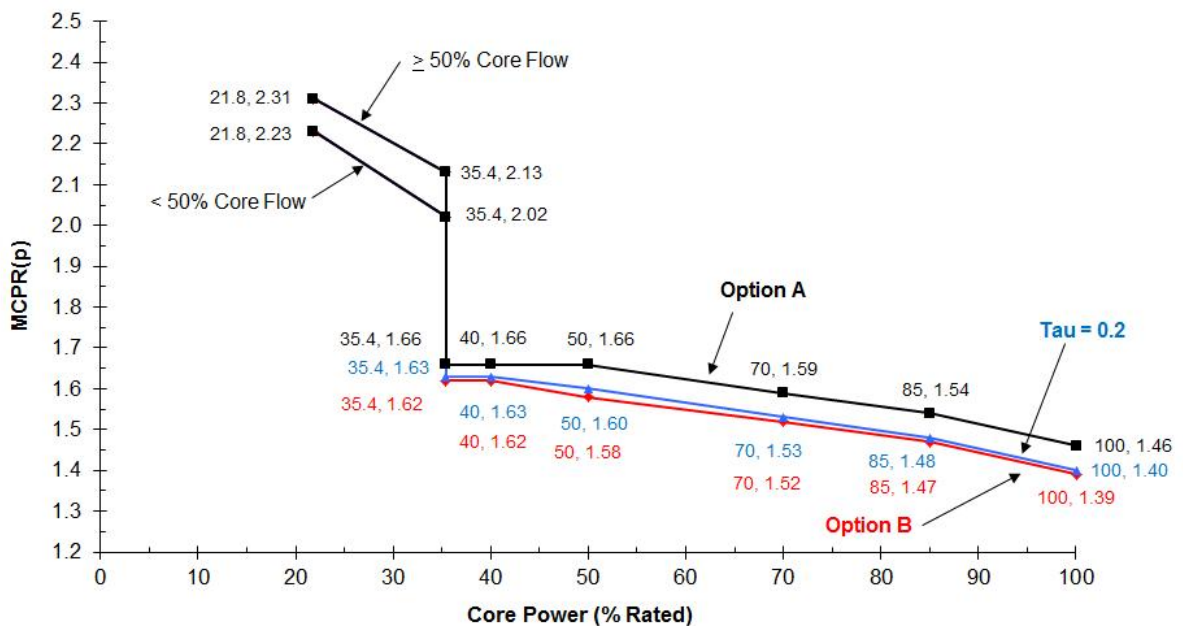


Figure 2-6B
Cycle 23 GNF3 Power-Dependent MCPR Limits with FWH OOS
MOC to EOC

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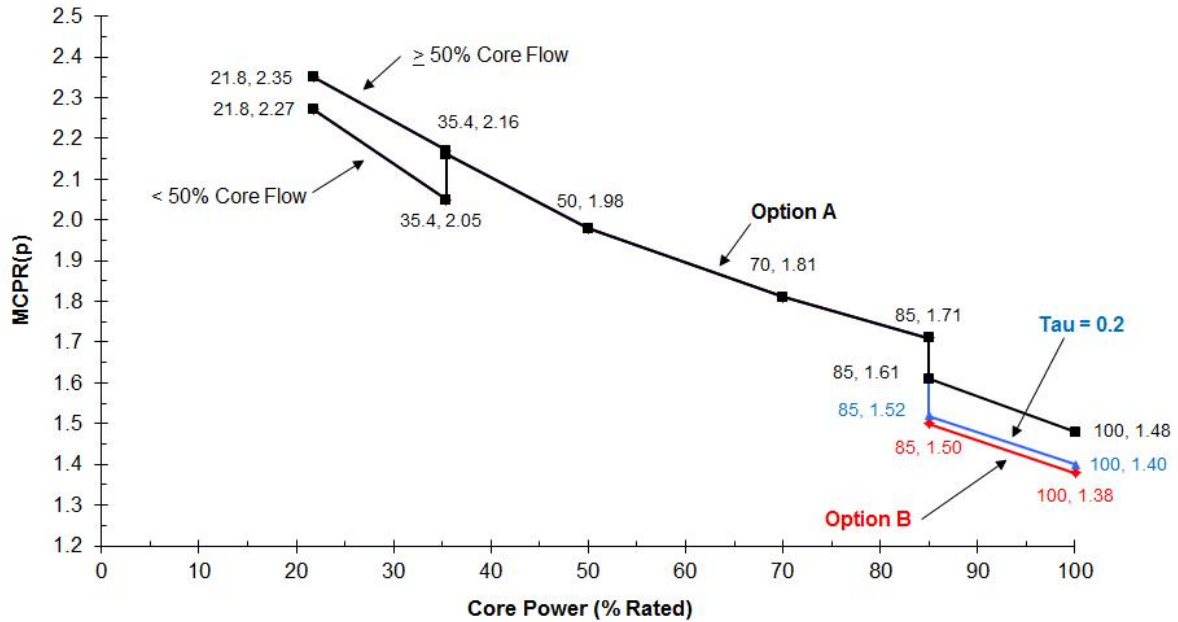


Figure 2-7A
Cycle 23 GNF2 Power-Dependent MCPR Limits with PR+FWH OOS
MOC to EOC

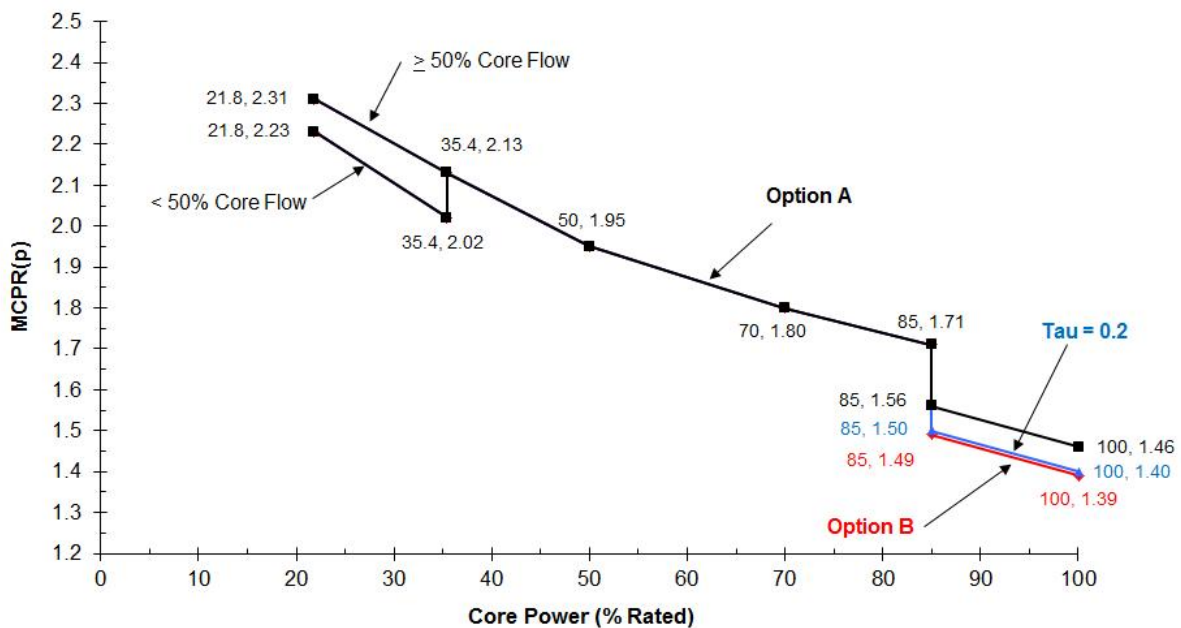


Figure 2-7B
Cycle 23 GNF3 Power-Dependent MCPR Limits with PR+FWH OOS
MOC to EOC

CORE OPERATING LIMITS REPORT

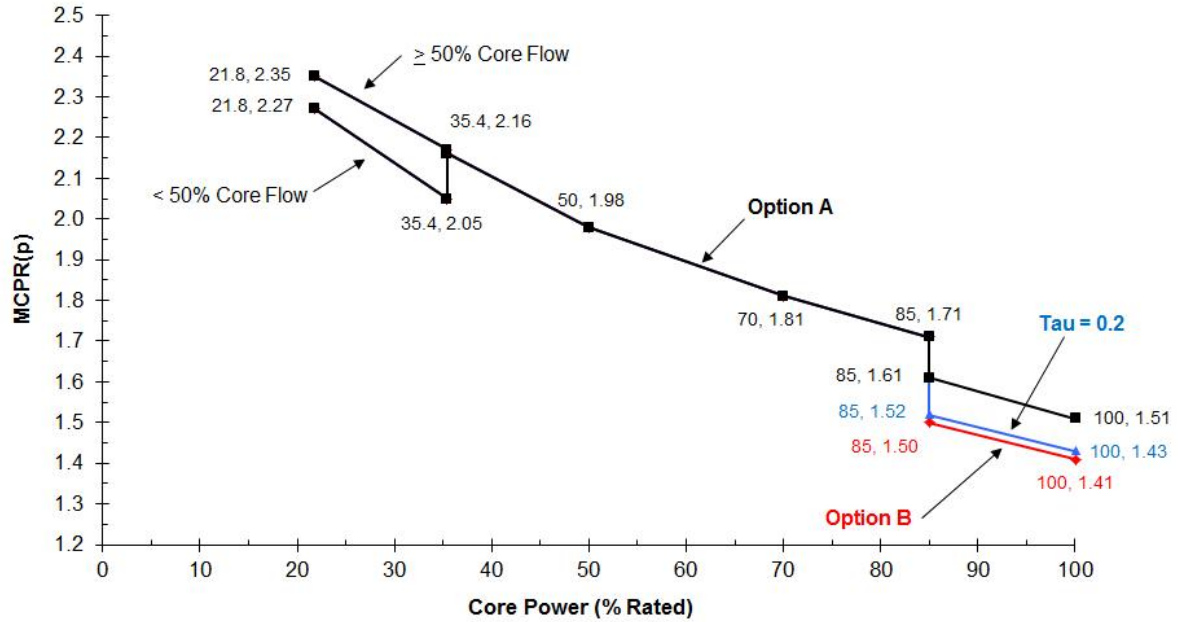


Figure 2-8A
Cycle 23 GNF2 Power-Dependent MCPR Limits with PR+EOC-RPT+FWH OOS
MOC to EOC

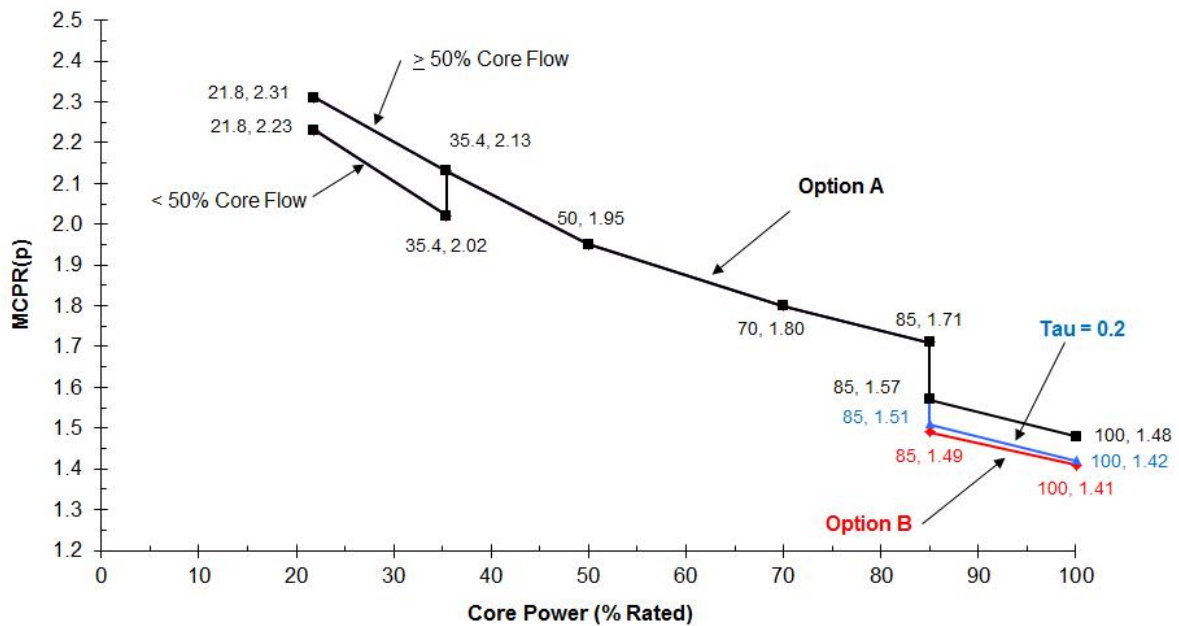


Figure 2-8B
Cycle 23 GNF3 Power-Dependent MCPR Limits with PR+EOC-RPT+FWH OOS
MOC to EOC

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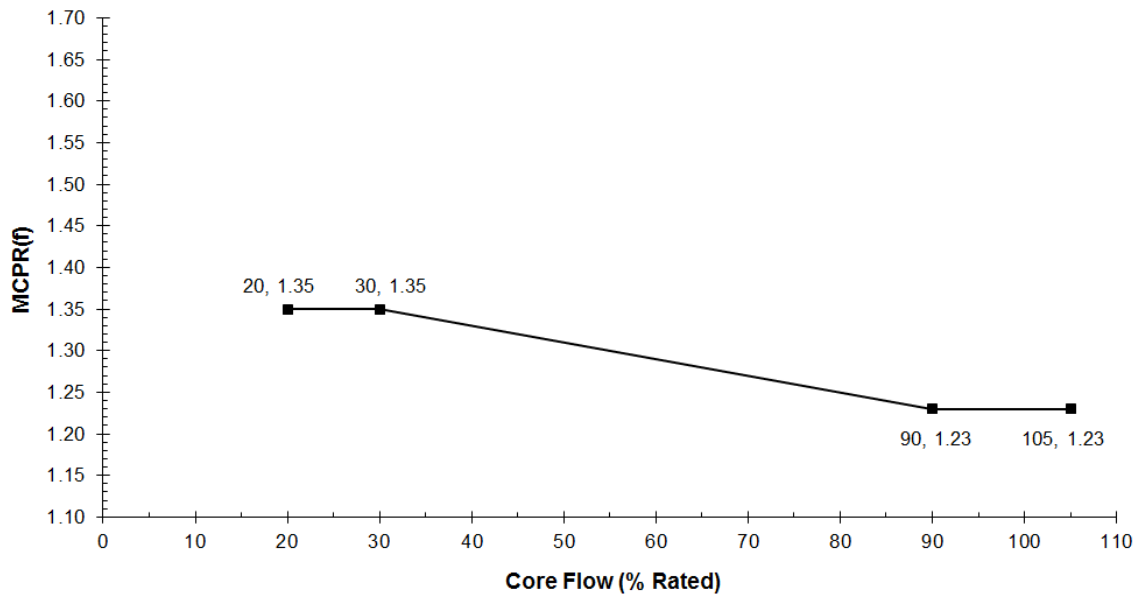


Figure 2-9A
Cycle 23 GNF2 Flow-Dependent MCPR Limits, All Application conditions

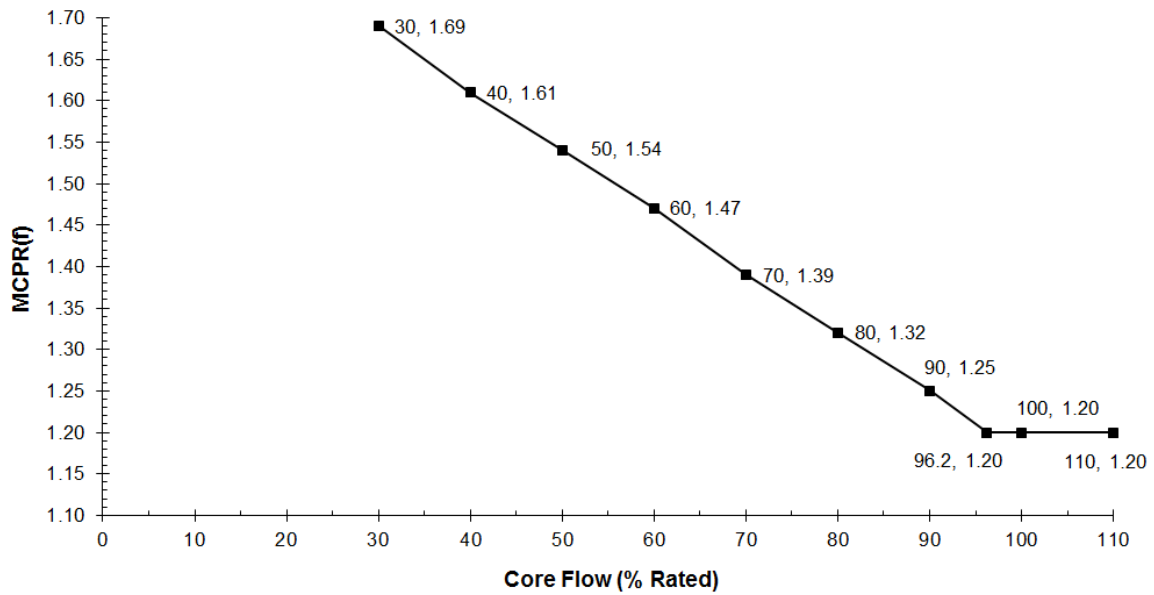


Figure 2-9B
Cycle 23 GNF3 Flow-Dependent MCPR Limits, All Application Conditions

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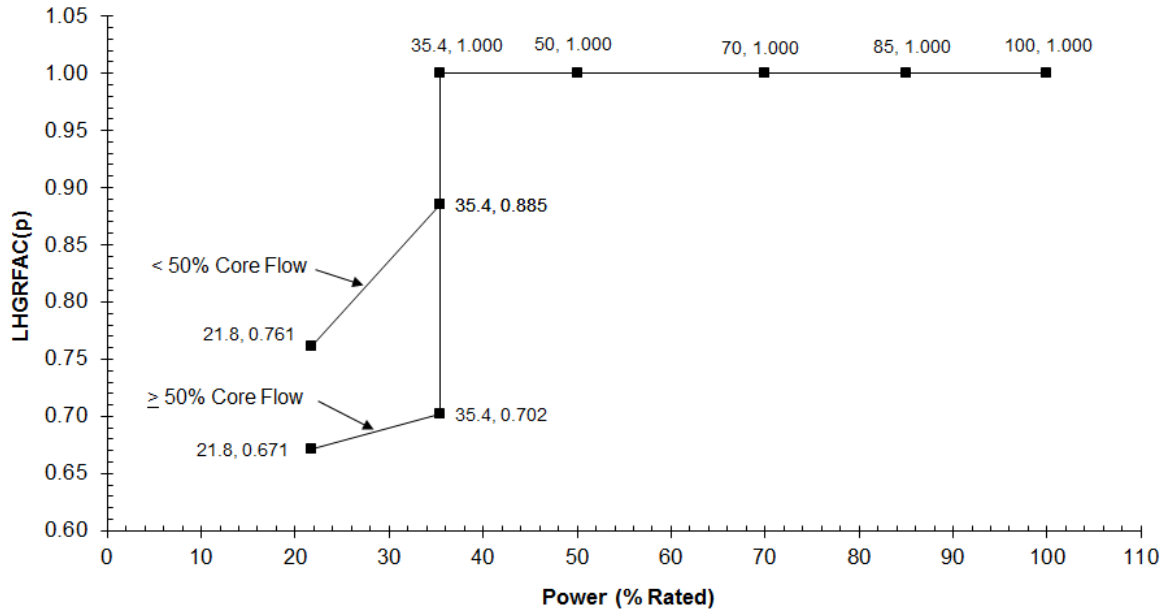


Figure 3-1A
Cycle 23 GNF2 Power-Dependent LHGR Factor BOC-MOC, EIS
 Note: These factors to be applied to the exposure-dependent limits as described in Section 5.3

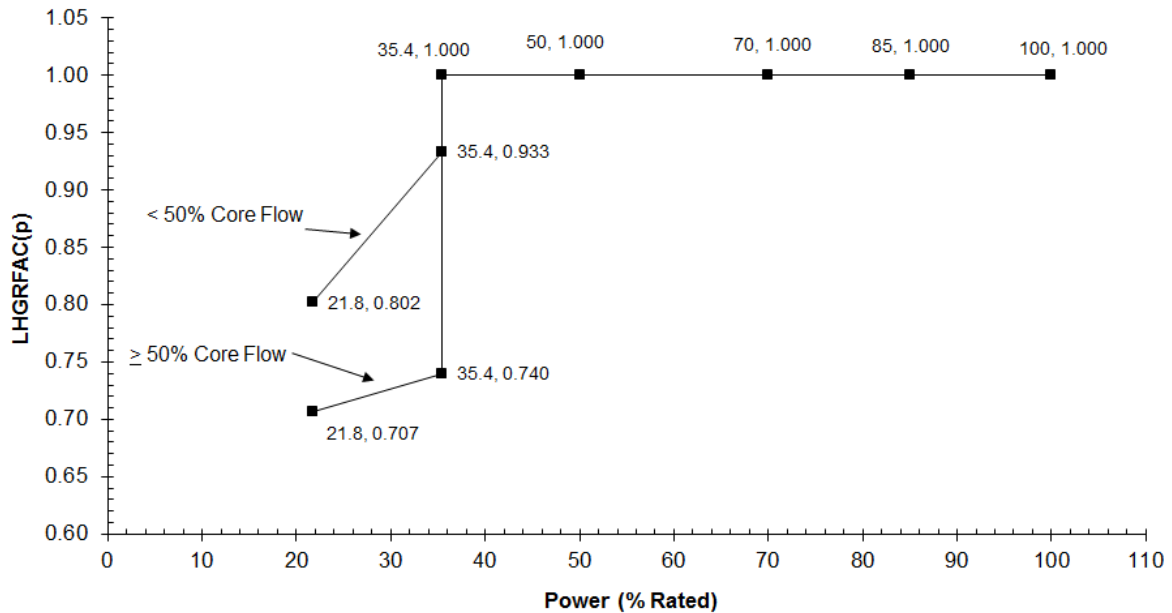


Figure 3-1B
Cycle 23 GNF3 Power-Dependent LHGR Factor BOC-MOC, EIS
 Note: These factors to be applied to the exposure-dependent limits as described in Section 5.3

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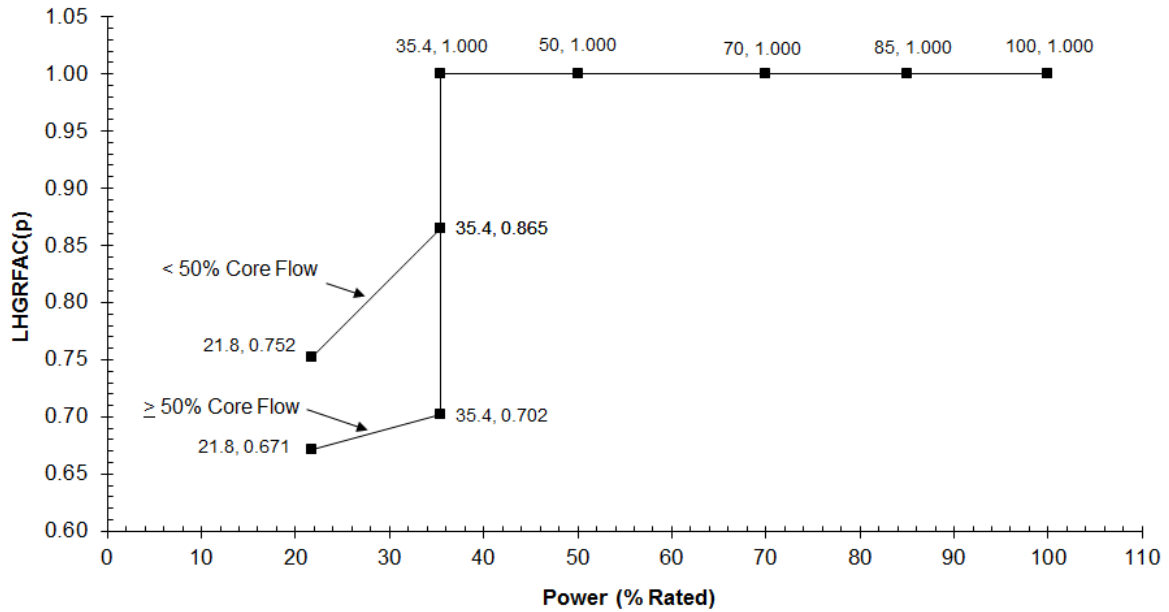


Figure 3-2A
Cycle 23 GNF2 Power-Dependent LHGR Factor BOC-MOC with FWHOOS
 Note: These factors to be applied to the exposure-dependent limits as described in Section 5.3

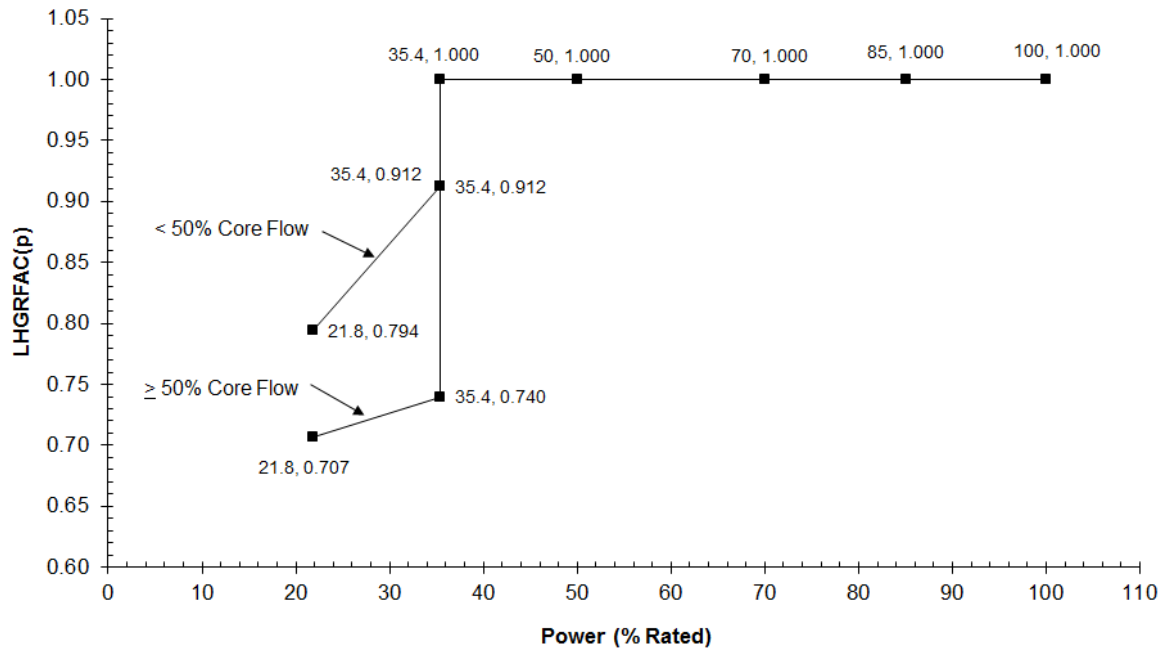


Figure 3-2B
Cycle 23 GNF3 Power-Dependent LHGR Factor BOC-MOC with FWHOOS
 Note: These factors to be applied to the exposure-dependent limits as described in Section 5.3

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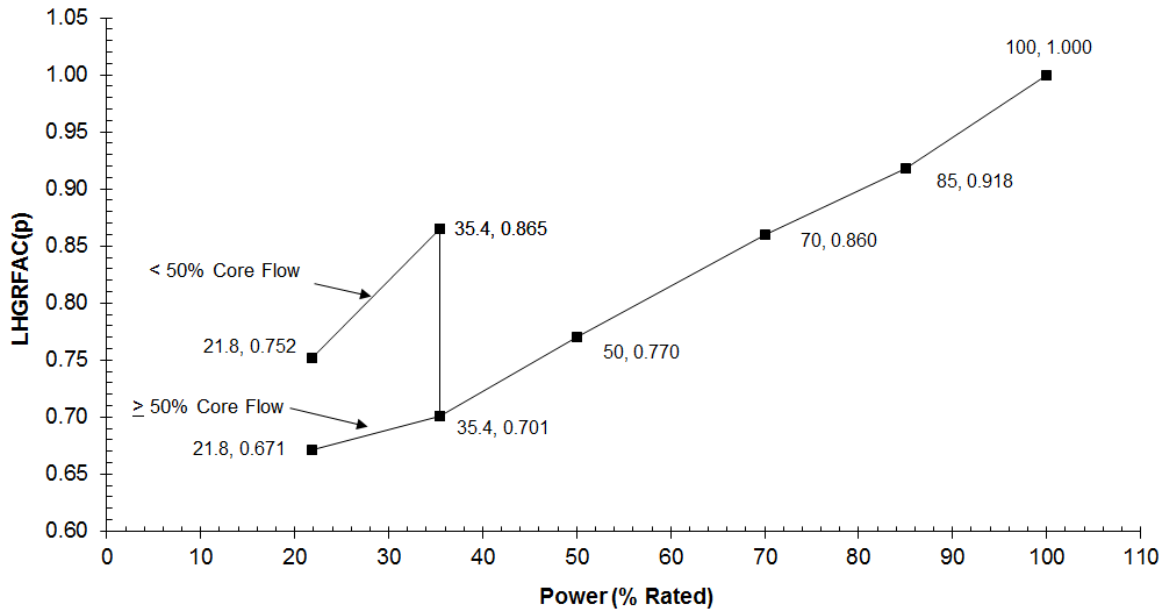


Figure 3-3A
Cycle 23 GNF2 Power-Dependent LHGR Factor BOC-MOC with PROOS, FWHOOS and EOC-RPT
 (Application Conditions 6 and 8); Note: These factors to be applied to the exposure-dependent limits as described in Section 5.3

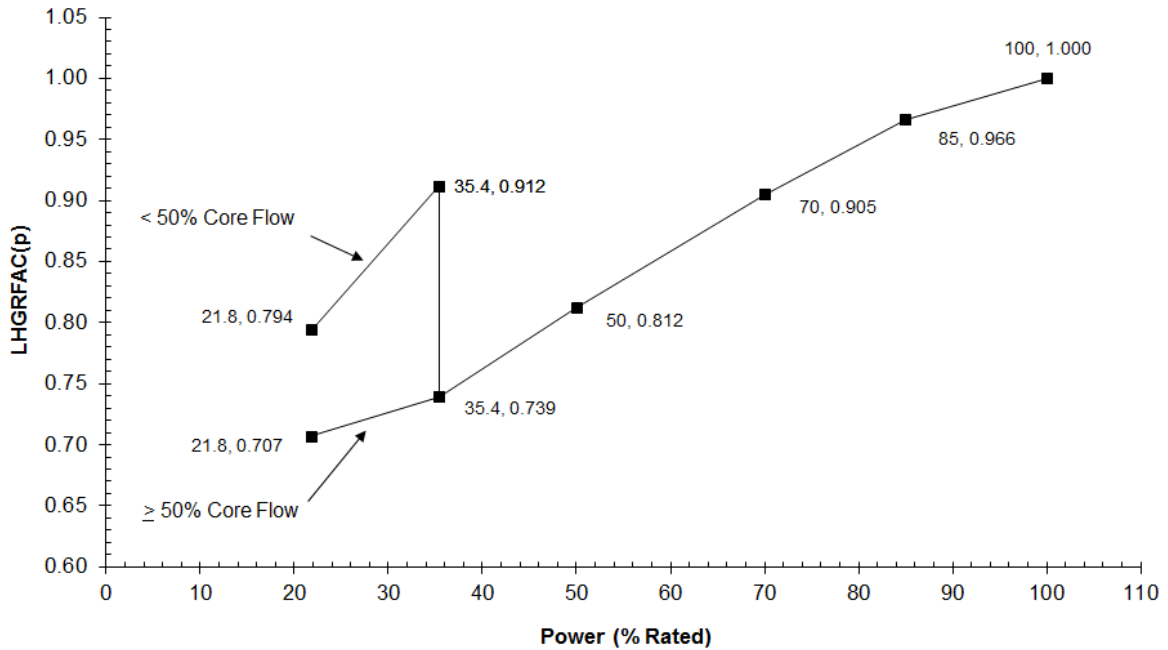


Figure 3-3B
Cycle 23 GNF3 Power-Dependent LHGR Factor BOC-MOC with PROOS, FWHOOS and EOC-RPT
 (Application Conditions 6 and 8); Note: These factors to be applied to the exposure-dependent limits as described in Section 5.3

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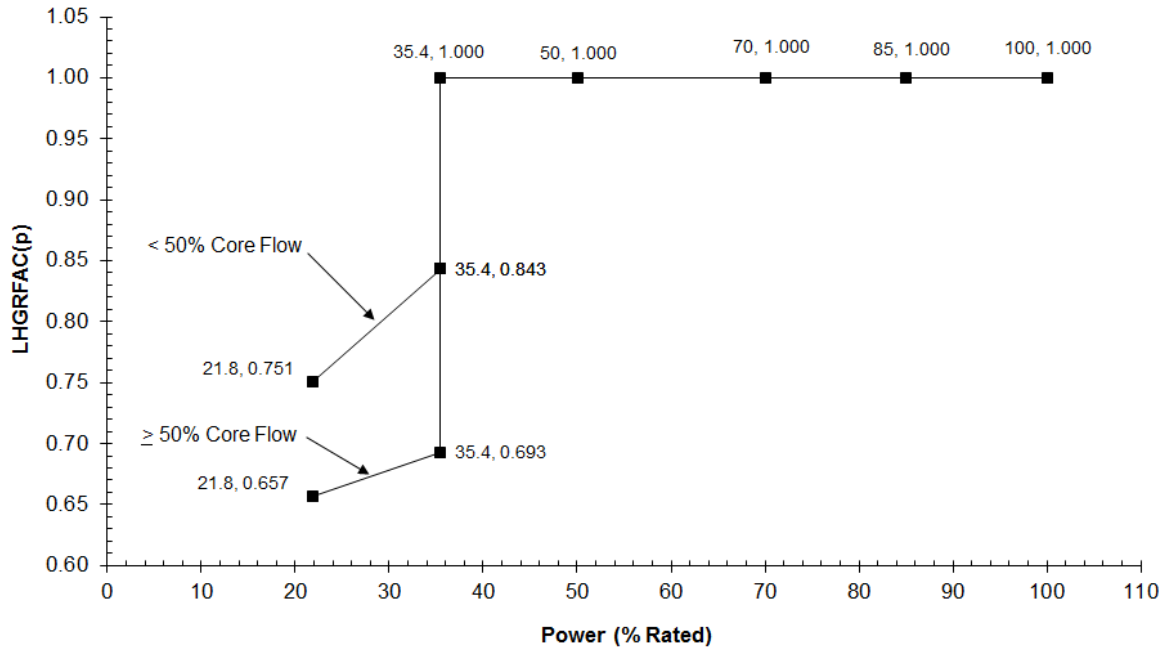


Figure 3-4A
Cycle 23 GN2 Power-Dependent LHGR Factor MOC-EOC, EIS
 Note: These factors to be applied to the exposure-dependent limits as described in Section 5.3

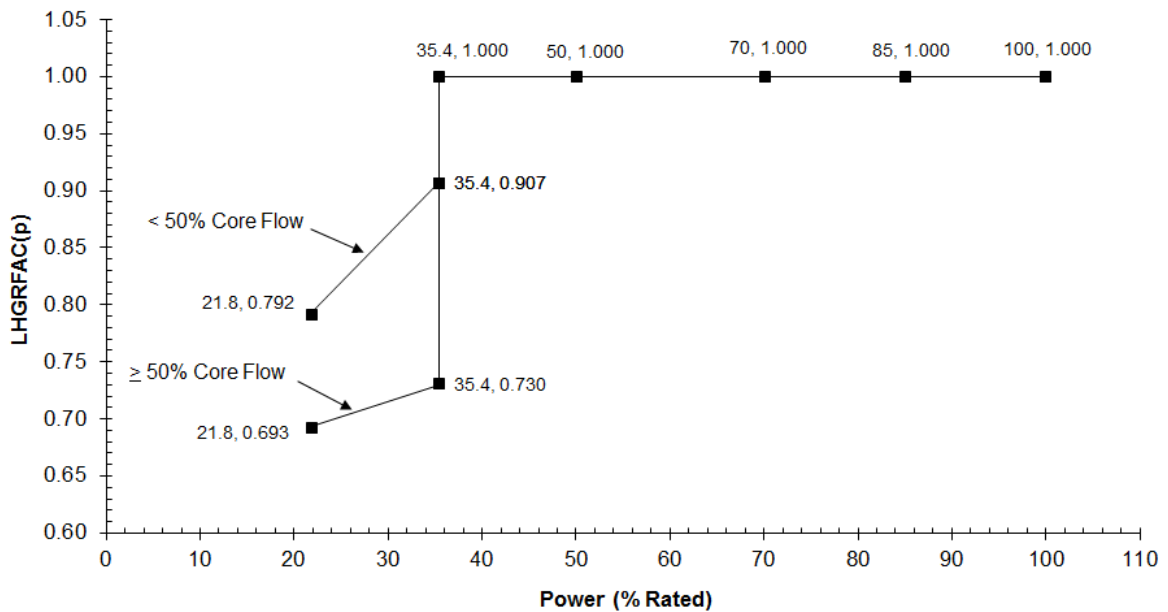


Figure 3-4B
Cycle 23 GN3 Power-Dependent LHGR Factor MOC-EOC, EIS
 Note: These factors to be applied to the exposure-dependent limits as described in Section 5.3

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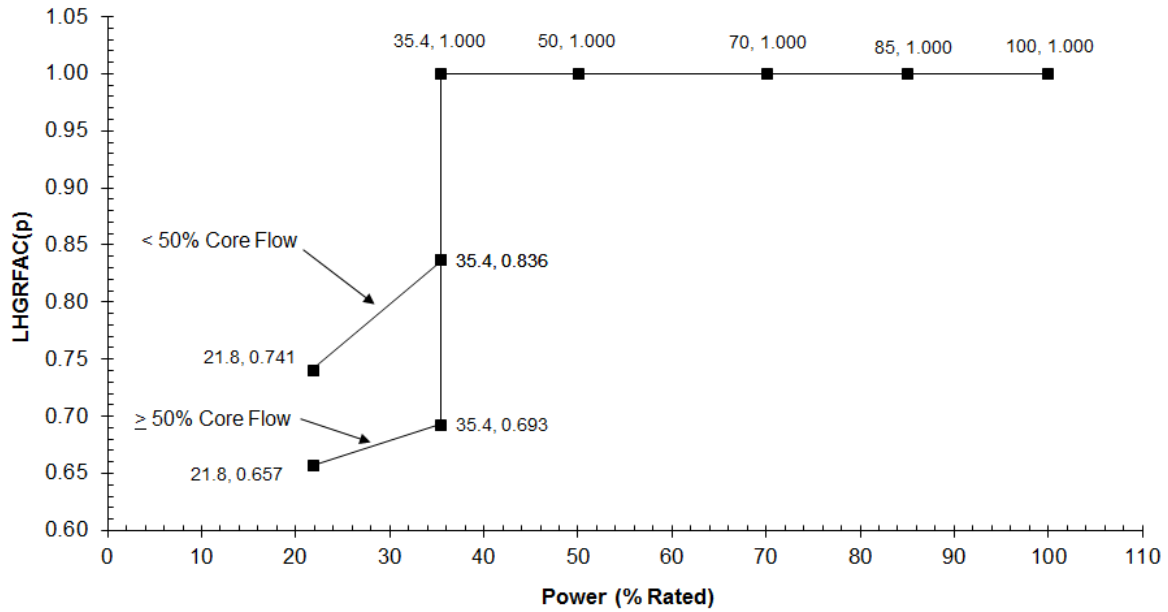


Figure 3-5A
Cycle 23 GNF2 Power-Dependent LHGR Factor MOC-EOC with FWHOOS
 Note: These factors to be applied to the exposure-dependent limits as described in Section 5.3

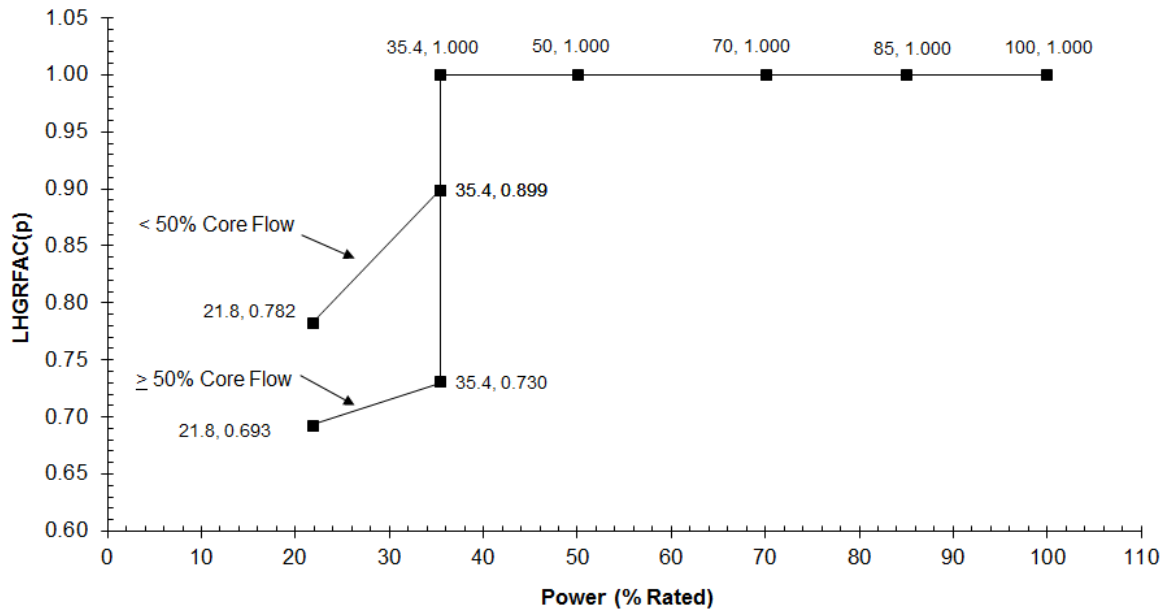


Figure 3-5B
Cycle 23 GNF3 Power-Dependent LHGR Factor MOC-EOC with FWHOOS
 Note: These factors to be applied to the exposure-dependent limits as described in Section 5.3

CORE OPERATING LIMITS REPORT

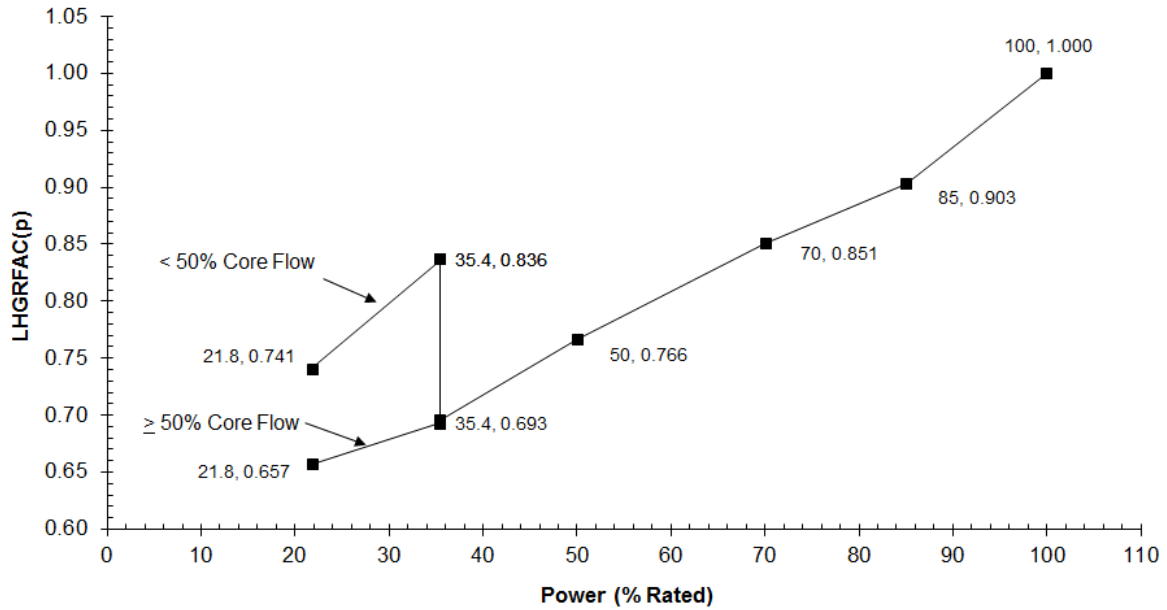


Figure 3-6A
Cycle 23 GNF2 Power-Dependent LHGR Factor MOC-EOC with PROOS, FWHOOS and EOC-RPT
 (Application Conditions 6 and 8); Note: These factors to be applied to the exposure-dependent limits as described in Section 5.3

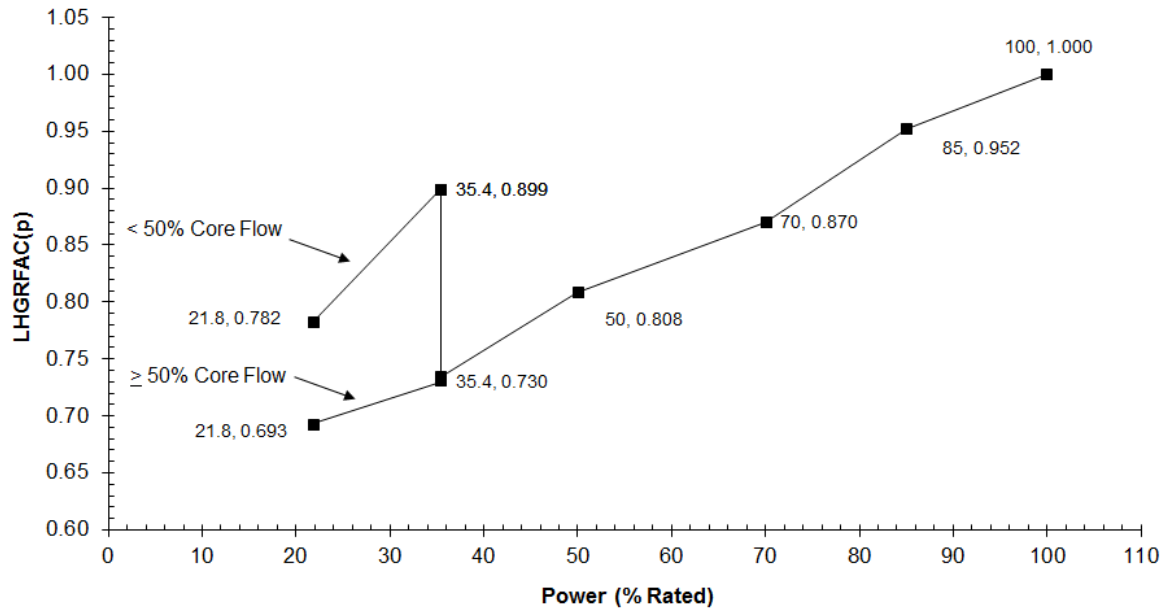


Figure 3-6B
Cycle 23 GNF3 Power-Dependent LHGR Factor MOC-EOC with PROOS, FWHOOS and EOC-RPT
 (Application Conditions 6 and 8); Note: These factors to be applied to the exposure-dependent limits as described in Section 5.3

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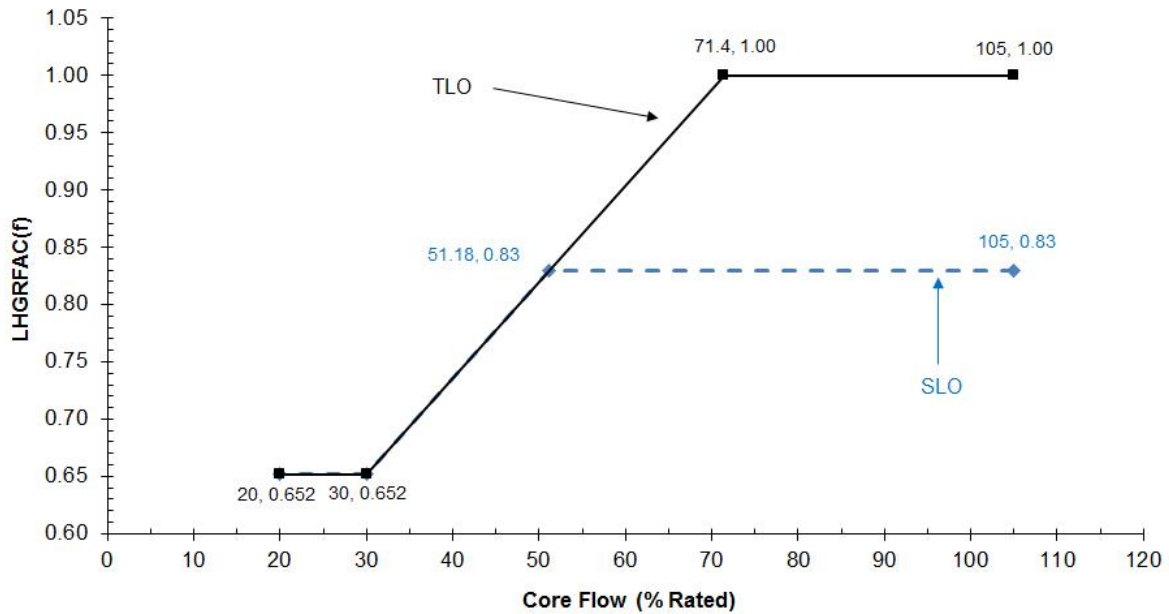


Figure 3-7A
Cycle 23 GNF2 Flow-Dependent LHGR Factor
 Note: These factors to be applied to the exposure-dependent limits as described in Section 5.3

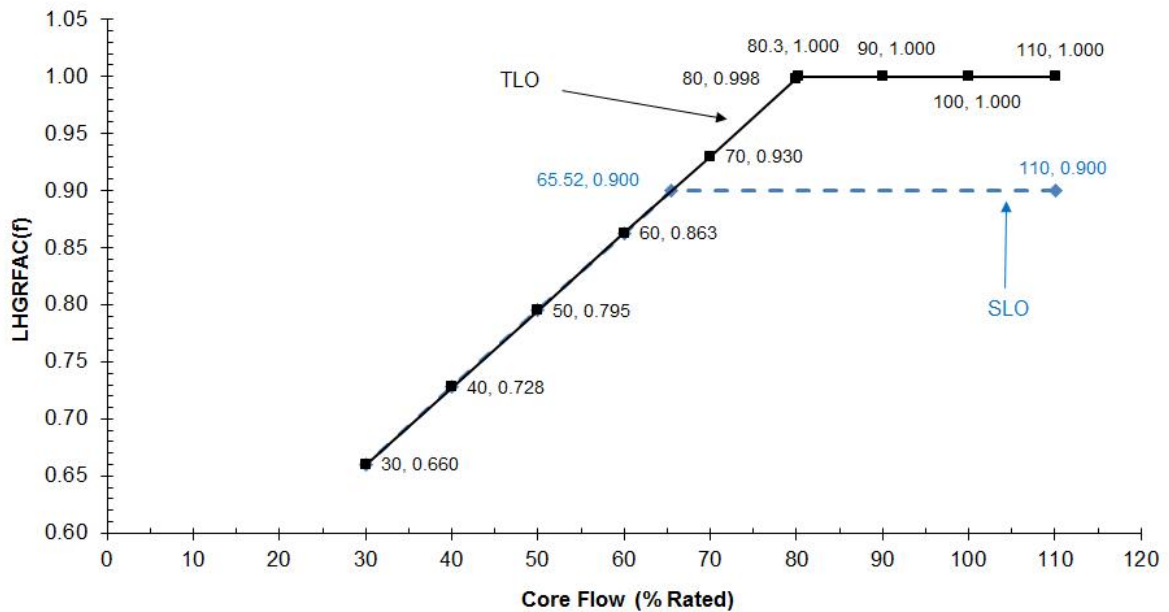


Figure 3-7B
Cycle 23 GNF3 Flow-Dependent LHGR Factor
 Note: These factors to be applied to the exposure-dependent limits as described in Section 5.3

CORE OPERATING LIMITS REPORT

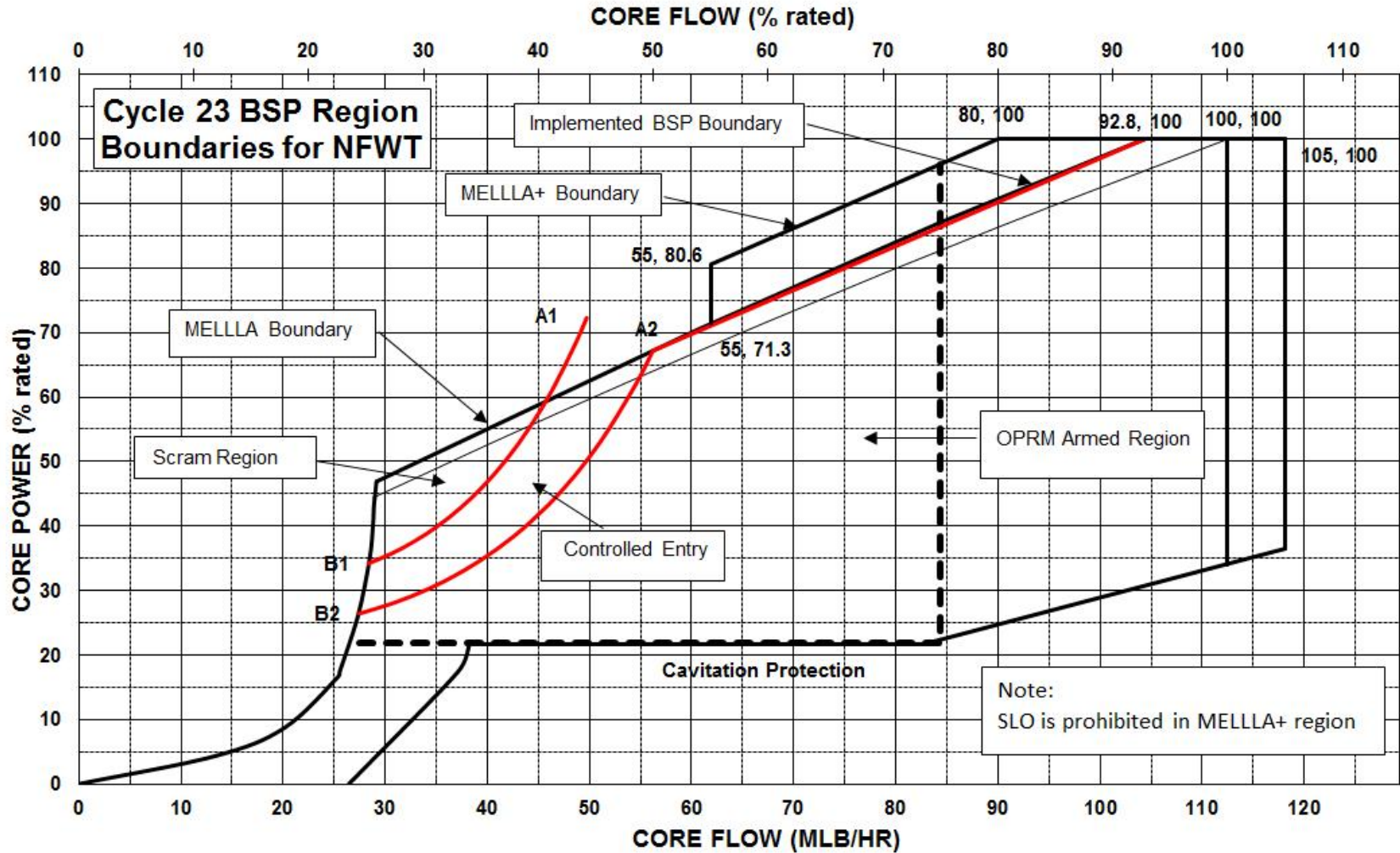


Figure 4 Backup Stability Protection Region Boundaries for Normal Feedwater Temperature (NFWT)

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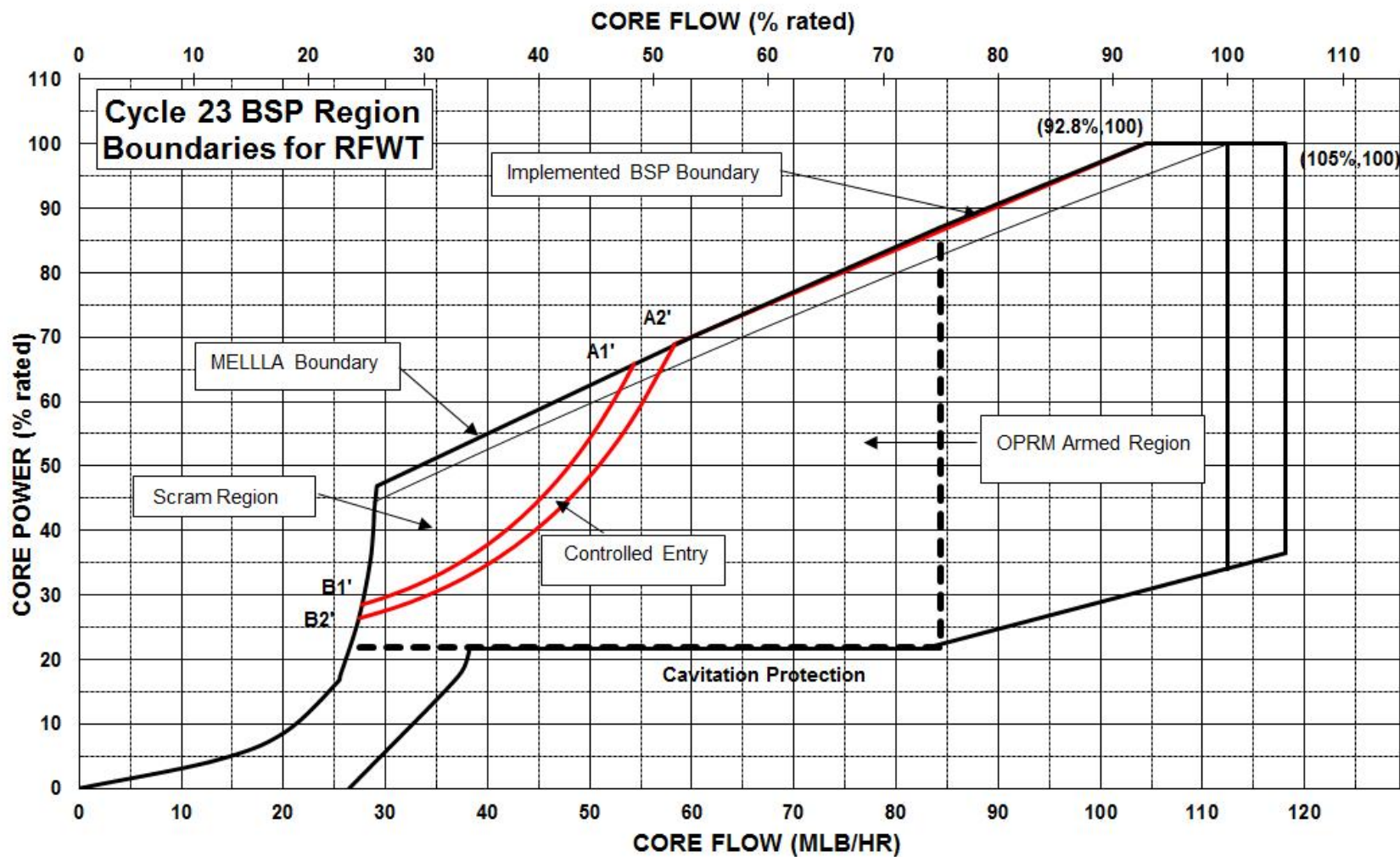


Figure 5 Backup Stability Protection Region Boundaries for Reduced Feedwater Temperature (RFWT)