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April 26, 2016
GO2-16-060

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Rockville, MD 20852

Subject: **COLUMBIA GENERATING STATION, DOCKET NO. 50-397**
CYCLE 23 CORE OPERATING LIMITS REPORT (COLR), REVISION 1

Dear Sir or Madam:

In accordance with the Columbia Generating Station Technical Specifications (TS) 5.6.3.d, Energy Northwest herewith submits the Cycle 23 COLR, Revision 1. The operating limits in the COLR revision were developed in accordance with the requirements of TS 5.6.3.a, b, and c. The changes to the COLR have been reviewed by the Columbia Generating Station Plant Operations Committee.

No new regulatory commitments are made in this letter. If you have any questions or require additional information, please contact Ms. L. L. Williams at (509) 377-8148.

Executed on this 21 day of April, 2016.

Respectfully,

D. W. Gregoire
Manager, Regulatory Affairs and Performance Improvement

Enclosures: As stated

cc: NRC RIV
NRC NRR Project Manager
NRC Senior Resident Inspector - 988C
CD Sonada - BPA - 1399 (email w/o enclosures)
WA Horin - Winston & Strawn (email w/o enclosures)

Columbia Generating Station

Cycle 23

Core Operating Limits Report

November 2015

Columbia Generating Station
Cycle 23
Core Operating Limits Report

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Columbia Generating Station
Cycle 23
Core Operating Limits Report

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1.0 Introduction and Summary

This report provides the core operating limits for **Average Planar Linear Heat Generation Rate (APLHGR)**, **Minimum Critical Power Ratio (MCPR)**, **Linear Heat Generation Rate (LHGR)**, **Oscillation Power Range Monitor (OPRM) Instrumentation** and **Rod Block Monitor Instrumentation** for Columbia Generating Station Cycle 23 as required by Technical Specification 5.6.3. As required by Technical Specification 5.6.3, these limits were determined using NRC-approved methodology and are established so that all applicable limits of the plant safety analysis are met. The specific topical report revisions and supplements which describe the methodology utilized in this cycle specific analysis are shown in Table 1.1.

The reload licensing analyses for this cycle provide operating limits for Average Power Range Monitor / Rod Block Monitor and Technical Specifications Improvement Program (ARTS) and Maximum Extended Load Line Limit Analysis (MELLLA) operation which extends the power and flow operating regime for Columbia Generating Station up to the MELLLA boundary for Two Loop Operation (TLO). The core operating limits are applicable up to 100% of rated thermal power along and below the MELLLA boundary. The minimum flow for operation at rated power is 80.7% of rated flow; the maximum is 106%. Single Loop Operation (SLO) is restricted to the Extended Load Line Limit Analysis (ELLLA) boundary. The core operating limits for both TLO and SLO are applicable for normal feedwater temperature, feedwater heaters out of service, final feedwater temperature reduction and coastdown. The Pressure Regulator Out of Service (PROOS) MCPR and LHGR limits are applicable if two (2) of the three (3) Digital Electro-hydraulic (DEH) pressure controllers are not functional.

The FSAR references the COLR for the most recent approved version of the General Electric Standard Application for Reactor Fuel (GESTAR II), which is listed in Table 1.1. The FSAR references the COLR for the most recent versions of the Supplemental Reload Licensing Report, the Fuel Bundle Information Report, and the GE14 and GNF2 Fuel Design Cycle-Independent Analyses, which are References 7.2, 7.3, 7.6 and 7.7. The FSAR references the COLR for the most recent version of the Reference Loading Pattern, which is documented in References 7.2 and 7.5. The FSAR references the COLR for the most recent versions of the GE14 and GNF2 Generic Compliance with GESTAR II, which are References 7.8 and 7.9.

Table 1.1

Columbia Generating Station
Reference Topical Reports

NEDE-24011-P-A and NEDE-24011-P-A-US, *General Electric Standard Application for Reactor Fuel (GESTAR II) and Supplement for the United States*, Revision 21, May 2015.

2.0 Average Planar Linear Heat Generation Rate (APLHGR) Limits for Technical Specification 3.2.1

The APLHGR limits for use in Technical Specification 3.2.1, as a function of Average Planar Exposure, shall not exceed the limits shown in the following tables. APLHGR limits for single loop operation for GE14 and GNF2 fuel are obtained by applying a 1.00 multiplier to the two loop operation APLHGR limits. See Technical Specification 3.2.1 and the applicable Bases for further application details.

a. Table 2.1 – GE14 Reload Fuel

b. Table 2.2 – GNF2 Reload Fuel

Table 2.1

Maximum Average Planar Linear Heat Generation Rate (MAPLHGR)
Versus Average Planar Exposure
GE14 Reload Fuel

Average Planar Exposure		MAPLHGR Limit
GWd/MTU	**GWd/ST**	**kW/ft**
0.00	0.00	12.82
21.10	19.14	12.82
63.50	57.61	8.00
70.00	63.50	5.00

(Reference 7.2 Table 16.3-1)

Table 2.2

Maximum Average Planar Linear Heat Generation Rate (MAPLHGR)
Versus Average Planar Exposure
GNF2 Reload Fuel

Average Planar Exposure		MAPLHGR Limit
GWd/MTU	**GWd/ST**	**kW/ft**
0.00	0.00	13.78
18.92	17.16	13.78
67.00	60.78	6.87
70.00	63.50	5.50

(Reference 7.2 Table 16.3-2)

3.0 Minimum Critical Power Ratio (MCPR) Operating Limits for Technical Specification 3.2.2

The MCPR operating limits for use in Technical Specification 3.2.2 are determined by the larger of the flow dependent (MCPRf) and power dependent (MCPRp) limits from Table 3.1 through Table 3.7. See Technical Specification 3.2.2 and the applicable Bases for further application details.

The MCPR safety limit for Cycle 23 is 1.10 for two loop operation (TLO) and 1.13 for single loop operation (SLO). The power and flow dependent MCPR limits for SLO require a 0.03 adder to the TLO MCPR limits due to the difference in the MCPR safety limit.

Table 3.1
MCPR Operating Limits
Two Loop Operation[1]
All Fuel Types

Appl. Group	Exposure Range[2]	Option A	Option B[3]	Non-Pressurization Events[1,4]
1	**Equipment In Service**[8]			
	Full Power Limits (BOC to MOC)	1.41	1.36	1.40
	Full Power Limits (MOC to EOC)	1.41	1.36	1.40
	Flow Dependent Limits[5]	Table 3.7		
	Power Dependent Limits[6]	Table 3.2		
2	**EOC RPT Out of Service (RPTOOS)**[8]			
	Full Power Limits (BOC to MOC)	1.47	1.38	1.40
	Full Power Limits (MOC to EOC)	1.47	1.38	1.40
	Flow Dependent Limits[5]	Table 3.7		
	Power Dependent Limits[6]	Table 3.3		
3	**Turbine Bypass Valves Out of Service (TBVOOS)**[8]			
	Full Power Limits (BOC to MOC)	1.46	1.40	
	Full Power Limits (MOC to EOC)	1.46	1.40	
	Flow Dependent Limits[5]	Table 3.7		
	Power Dependent Limits[6]	Table 3.4		
4	**TBVOOS and RPTOOS**[8]			
	Full Power Limits (BOC to MOC)	1.53	1.42	
	Full Power Limits (MOC to EOC)	1.53	1.42	
	Flow Dependent Limits[5]	Table 3.7		
	Power Dependent Limits[6]	Table 3.5		
5	**Pressure Regulator Out of Service (PROOS)**[8]			
	Full Power Limits (BOC to MOC)	1.41	1.36	1.40
	Full Power Limits (MOC to EOC)	1.45	1.36	1.40
	Flow Dependent Limits[5]	Table 3.7		
	Power Dependent Limits[6,7]	Table 3.6		

(Reference 7.2 Section 11)

Notes for Table 3.1

Note 1: For Single Loop Operation (SLO), the SLMCPR increases by 0.03. This 0.03 increase must also be applied to the Two Loop Operation (TLO) MCPR Operating Limit to obtain the SLO Operating Limit. See Notes 5 and 6 for application details.

(Reference 7.2 Section 11)

Note 2: The cycle exposure range designation is defined in Table 3.1-1 for use in Table 3.1. End of Rated (EOR) is defined as the cycle exposure corresponding to all rods out, 100% power, 100% flow and normal feedwater temperature.

Table 3.1-1

Cycle Exposure Range Designation

Name	**Exposure Range**
BOC to MOC	≤ EOR-2373 MWd/MTU (2153 MWd/ST)
MOC to EOC	> EOR-2373 MWd/MTU (2153 MWd/ST)

(Reference 7.2 Section 7)

Note 3: The NRC has concluded that a statistical approach (Option B) may be used for pressurization events analyzed with TRACG (Reference 7.4, Section 7.5.2.6). In order to take credit for conservatism in the scram speed performance, it must be demonstrated that there is insufficient reason to reject the plant-specific scram speed as being within the distribution assumed in the statistical analysis.

The procedure described below determines the full power MCPR limit based on the scram times of SR 3.2.2.2. If the scram speed distribution is not within the assumed distribution, the MCPR limit for pressurization events must be re-established based on an interpolation between the applicable limits for Option A (scram times of LCO 3.1.4, "Control Rod Scram Times") and Option B (realistic scram times) analyses.

The surveillance information for the fuel cycle is the number of active control rods measured for each surveillance test (the first test is at the BOC and is denoted N_1; the i^{th} test denoted N_i) and the average scram time to Notch 39 for the active rods measured in test i denoted τ_i.

The equation used to calculate the overall average of all the scram data generated to date in the cycle is:

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

where:

n = number of surveillance tests performed to date in the cycle;

$\sum_{i=1}^{n} N_i$ = total number of active rods measured to date in the cycle; and

$\sum_{i=1}^{n} N_i \tau_i$ = sum of the scram time to Notch 39 of all active rods measured to date in the cycle to comply with the Technical Specification surveillance requirements.

The average scram time, τ_{ave}, is tested against the analysis mean using the following equation:

$$\tau_{ave} \leq \tau_B \quad (2)$$

where:

$$\tau_B = \mu + 1.65 \sqrt{\left(\frac{N_1}{\sum_{i=1}^{n} N_i} \right)} \sigma \quad (3)$$

μ = 0.672 seconds (mean scram time to Notch 39 used in the Option B analysis)

σ = 0.016 seconds (standard deviation of μ)

N_1 = total number of active rods measured at BOC to comply with the Technical Specification surveillance requirements.

If the cycle average scram time satisfies the Equation 2 criterion, continued plant operation under the Option B MCPR limits for pressurization events is permitted. If not, the MCPR limits for pressurization events must be re-established, based on a linear interpolation between the Option B and Option A MCPR limits.

The equation to establish the new operating limit is given below:

$$OLMCPR_{New} = \left(OLMCPR_{OptionB} + \frac{\tau_{ave} - \tau_B}{\tau_A - \tau_B}(SSAF) \right) \quad (4)$$

where:

τ_{ave} and τ_B =	defined in Equations 1 and 3, respectively
τ_A =	0.866 seconds (the Technical Specification limit on core average scram time to Notch 39)
SSAF =	$OLMCPR_{Option\ A}$ - $OLMCPR_{Option\ B}$ (the difference between the MCPR calculated using Option A and that using Option B for pressurization events from Table 3.1)
$OLMCPR_{Option\ A}$ =	the limiting pressurization event Option A MCPR limit
$OLMCPR_{Option\ B}$ =	the limiting pressurization event Option B MCPR limit

If continued plant operation under the Option B MCPR limits for pressurization events is permitted, the Full Power Limit is the maximum of $OLMCPR_{Option\ B}$ and, if applicable, the Full Power Limit for Non-Pressurization Events. Otherwise, the Full Power Limit is the maximum of $OLMCPR_{New}$ and, if applicable, the Full Power Limit for Non-Pressurization Events. (Reference 7.2 Section 11)

Note 4: The Full Power Limit for Non-Pressurization Events is only applicable to SLO. The Full Power Limit for Non-Pressurization Events is specified when greater than the Option B Full Power Limit for Pressurization Events. See Note 3 for application guidance. (Reference 7.2 Section 11)

Note 5: Flow dependent MCPR limits (MCPRf) are applicable to TLO and require the SLO 0.03 adder when operating in SLO.

Note 6: Power dependent MCPR limits are provided for core thermal powers greater than or equal to 25% of rated power at all core flows. The power dependent MCPR limits for core thermal powers less than 30% of rated power are subdivided by core flow. Limits are provided for core flows greater than 50% of rated flow and less than or equal to 50% of rated flow. A step change in the power dependent MCPR limits occurs at 30% of rated power because direct scrams on turbine throttle valve closure and turbine governor valve fast closure are automatically bypassed below 30% of rated power and not applicable per Technical Specification 3.3.1.1.

The power dependent MCPR limits in Tables 3.2 through 3.6 are provided as Kp multipliers above the direct scram bypass power level (Pbypass) and as absolute MCPRp limits below Pbypass. MCPRp limits above Pbypass are determined through the following equation: MCPRp = Kp × (Full Power Limit). Power dependent MCPR limits are applicable to TLO and require the SLO 0.03 adder when operating in SLO. (Reference 7.2 Appendix D)

Note 7: A step change in the power dependent MCPR limits occurs at 85% of rated power because the APRM Neutron Flux - High scram is limiting at and above 85% and the Reactor Vessel Steam Dome Pressure – High scram is limiting below 85%.

Note 8: MCPR operating limits for Application Groups 1, 2 and 5 remain applicable for one bypass valve out of service. For two or more bypass valves out of service, Application Groups 3 and 4 are applicable.

Table 3.2

Columbia Generating Station
Application Group 1: Equipment In Service
TLO Power Dependent MCPR Limits
All Fuel Types

Limits for Power < 30.0%		
Power (%)	**Limit for Flow > 50.0%** *MCPRp*	**Limit for Flow ≤ 50.0%** *MCPRp*
25.0	2.32	2.29
30.0	2.27	2.23

Limits for Power ≥ 30.0%	
Power (%)	**Limit** *Kp*
30.0	1.483
45.0	1.280
60.0	1.150
85.0	1.072
100.0	1.000

Table 3.3

Columbia Generating Station
Application Group 2: EOC RPT Out of Service (RPTOOS)
TLO Power Dependent MCPR Limits
All Fuel Types

Limits for Power < 30.0%		
Power (%)	**Limit for Flow > 50.0%** *MCPRp*	**Limit for Flow ≤ 50.0%** *MCPRp*
25.0	2.32	2.29
30.0	2.27	2.23

Limits for Power ≥ 30.0%	
Power (%)	**Limit** *Kp*
30.0	1.483
45.0	1.280
60.0	1.150
85.0	1.072
100.0	1.000

Table 3.4

Columbia Generating Station
Application Group 3: Turbine Bypass Valve Out of Service (TBVOOS)
TLO Power Dependent MCPR Limits
All Fuel Types

Limits for Power < 30.0%		
Power (%)	**Limit for Flow > 50.0%** *MCPRp*	**Limit for Flow ≤ 50.0%** *MCPRp*
25.0	3.53	3.28
30.0	3.10	2.87

Limits for Power ≥ 30.0%	
Power (%)	**Limit** *Kp*
30.0	1.483
45.0	1.280
60.0	1.150
85.0	1.072
100.0	1.000

Table 3.5

Columbia Generating Station
Application Group 4: TBVOOS and RPTOOS
TLO Power Dependent MCPR Limits
All Fuel Types

Limits for Power < 30.0%		
Power (%)	**Limit for Flow > 50.0%** *MCPRp*	**Limit for Flow ≤ 50.0%** *MCPRp*
25.0	3.53	3.28
30.0	3.10	2.87

Limits for Power ≥ 30.0%	
Power (%)	**Limit** *Kp*
30.0	1.483
45.0	1.280
60.0	1.150
85.0	1.072
100.0	1.000

Table 3.6

Columbia Generating Station
Application Group 5: Pressure Regulator Out of Service (PROOS)
TLO Power Dependent MCPR Limits
All Fuel Types

Limits for Power < 30.0%		
Power (%)	**Limit for Flow > 50.0%** *MCPRp*	**Limit for Flow ≤ 50.0%** *MCPRp*
25.0	2.32	2.29
30.0	2.27	2.23

Limits for Power ≥ 30.0%	
Power (%)	**Limit** *Kp*
30.0	1.483
45.0	1.367
60.0	1.316
85.0	1.197
85.0	1.094
100.0	1.000

Table 3.7

Columbia Generating Station
All Application Groups
TLO Flow Dependent MCPR Limits
All Fuel Types

Flow (%)	**Limit** *MCPRf*
30.0	1.68
90.0	1.27
108.5	1.27

4.0 Linear Heat Generation Rate (LHGR) Limits for Technical Specification 3.2.3

The LHGR limits for use in Technical Specification 3.2.3 are provided as a function of pellet exposure, power and flow for GE14 and GNF2 fuel. The LHGR limits shall not exceed the product of the exposure dependent LHGR limit and the minimum of the power dependent LHGR Factor (LHGRFACp) or the flow dependent LHGR Factor (LHGRFACf).

a. The exposure dependent LHGR limits are provided in the Fuel Bundle Information Report (Reference 7.3) for GE14 and GNF2.

b. The power dependent LHGR Factor (LHGRFACp) is provided in Table 4.1 through Table 4.5 for all fuel types. (Reference 7.2, Appendix D)

c. The flow dependent LHGR Factor (LHGRFACf) is provided in Table 4.6 for all fuel types. (Reference 7.2, Appendix D)

See Technical Specification 3.2.3 and the applicable Bases for further application details.

Table 4.1

Columbia Generating Station
Application Group 1: Equipment In Service
Power Dependent LHGR Factor (LHGRFACp)
All Fuel Types

Limits for Power < 30.0%		
Power (%)	**Limit for Flow > 50.0%** *LHGRFACp*	**Limit for Flow ≤ 50.0%** *LHGRFACp*
25.0	0.540	0.540
30.0	0.540	0.540

Limits for Power ≥ 30.0%	
Power (%)	**Limit** *LHGRFACp*
30.0	0.634
45.0	0.713
60.0	0.791
85.0	0.922
100.0	1.000

Table 4.1a

Columbia Generating Station
Application Group 1a: One Bypass Valve Out of Service (1TBVOOS)[9]
Power Dependent LHGR Factor (LHGRFACp)
All Fuel Types

Limits for Power < 30.0%		
Power (%)	**Limit for Flow > 50.0%** *LHGRFACp*	**Limit for Flow ≤ 50.0%** *LHGRFACp*
25.0	0.485	0.485
30.0	0.485	0.485

Limits for Power ≥ 30.0%	
Power (%)	**Limit** *LHGRFACp*
30.0	0.634
45.0	0.713
60.0	0.791
85.0	0.922
100.0	1.000

[9] LHGRFACp limits for Application Groups 1a, 2a and 5 remain applicable for one bypass valve out of service. For two or more bypass valves out of service, Application Groups 3 and 4 are applicable.

Table 4.2

Columbia Generating Station
Application Group 2: EOC RPT Out of Service (RPTOOS)
Power Dependent LHGR Factor (LHGRFACp)
All Fuel Types

Limits for Power < 30.0%		
Power (%)	**Limit for Flow > 50.0%** *LHGRFACp*	**Limit for Flow ≤ 50.0%** *LHGRFACp*
25.0	0.540	0.540
30.0	0.540	0.540

Limits for Power ≥ 30.0%	
Power (%)	**Limit** *LHGRFACp*
30.0	0.634
45.0	0.713
60.0	0.791
85.0	0.922
100.0	1.000

Table 4.2a

Columbia Generating Station
Application Group 2a: RPTOOS and 1TBVOOS[9]
Power Dependent LHGR Factor (LHGRFACp)
All Fuel Types

Limits for Power < 30.0%		
Power (%)	**Limit for Flow > 50.0%** *LHGRFACp*	**Limit for Flow ≤ 50.0%** *LHGRFACp*
25.0	0.485	0.485
30.0	0.485	0.485

Limits for Power ≥ 30.0%	
Power (%)	**Limit** *LHGRFACp*
30.0	0.634
45.0	0.713
60.0	0.791
85.0	0.922
100.0	1.000

Table 4.3

Columbia Generating Station
Application Group 3: Turbine Bypass Valve Out of Service (TBVOOS)[9]
Power Dependent LHGR Factor (LHGRFACp)
All Fuel Types

Limits for Power < 30.0%		
Power (%)	**Limit for Flow > 50.0%** *LHGRFACp*	**Limit for Flow ≤ 50.0%** *LHGRFACp*
25.0	0.390	0.433
30.0	0.425	0.433

Limits for Power ≥ 30.0%	
Power (%)	**Limit** *LHGRFACp*
30.0	0.634
45.0	0.713
60.0	0.735
85.0	0.922
100.0	1.000

Table 4.4

Columbia Generating Station
Application Group 4: TBVOOS and RPTOOS[9]
Power Dependent LHGR Factor (LHGRFACp)
All Fuel Types

Limits for Power < 30.0%		
Power (%)	**Limit for Flow > 50.0%** *LHGRFACp*	**Limit for Flow ≤ 50.0%** *LHGRFACp*
25.0	0.390	0.433
30.0	0.425	0.433

Limits for Power ≥ 30.0%	
Power (%)	**Limit** *LHGRFACp*
30.0	0.634
45.0	0.713
60.0	0.735
85.0	0.922
100.0	1.000

Table 4.5

Columbia Generating Station
Application Group 5: Pressure Regulator Out of Service (PROOS) [9,10]
Power Dependent LHGR Factor (LHGRFACp)
All Fuel Types

Limits for Power < 30.0%		
Power (%)	**Limit for Flow > 50.0%** *LHGRFACp*	**Limit for Flow ≤ 50.0%** *LHGRFACp*
25.0	0.540	0.540
30.0	0.540	0.540

Limits for Power ≥ 30.0%	
Power (%)	**Limit** *LHGRFACp*
30.0	0.634
45.0	0.672
60.0	0.728
85.0	0.728
85.0	0.909
100.0	1.000

Table 4.6

Columbia Generating Station
All Application Groups
Flow Dependent LHGR Factor (LHGRFACf)
All Fuel Types

Flow (%)	**Limit** *LHGRFACf*
30.0	0.592
50.0	0.761
80.0	0.966
85.0	1.000
108.5	1.000

[10] A step change in LHGRFACp occurs at 85% of rated power because the APRM Neutron Flux - High scram is limiting at and above 85% and the Reactor Vessel Steam Dome Pressure – High scram is limiting below 85%.

5.0 Oscillation Power Range Monitor (OPRM) Instrumentation for Technical Specification 3.3.1.1

5.1 Period Based Detection Algorithm (PBDA) trip setpoints for Technical Specification Table 3.3.1.1-1, Footnote (g) and THERMAL POWER value for use in Table 3.3.1.1-1, Footnote (f). See Technical Specification 3.3.1.1 and the applicable Bases for further application details.

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	TRIP SETPOINT
2 Average Power Range Monitors		
f. OPRM Upscale	(f)	
Amplitude Trip (Sp)		1.15 Peak/Average
Confirmation Count (Np)		16

(f) THERMAL POWER ≥ 20% RTP
(Reference 7.2, Section 15.2; Reference 7.1, Table 3-2, Item 8.9)

5.2 THERMAL POWER value for Technical Specification 3.3.1.1, Required Action J.1:

THERMAL POWER < 20% RTP
(Reference 7.1, Table 3-2, Item 8.9)

5.3 OPRM Not Bypassed setpoints for SR 3.3.1.1.17

APRM Simulated Thermal Power (Pb)	≥ 25 %
Recirculation Drive Flow (Wb)	< 60 %

(Reference 7.2, Section 15.3)
(Reference 7.1, Table 3-2, Item 8.9)

6.0 **Rod Block Monitor Instrumentation for Technical Specification 3.3.2.1**

6.1 Rod Block Monitor Instrumentation for Technical Specification Table 3.3.2.1-1, Footnote (f) and Licensee Controlled Specifications Table 1.3.2.1-2 and Appendix A. See Technical Specification 3.3.2.1 and the applicable Bases for further application details.

FUNCTION	LIMITING TRIP SETPOINT	ALLOWABLE VALUE
1 Rod Block Monitor		
a. Low Power Range – Upscale	121.2	121.6
b. Intermediate Power Range – Upscale	116.2	116.6
c. High Power Range – Upscale	111.2	111.6

(Reference 7.1, Table 3-2, Item 10.7)

6.2 Rod Block Monitor (RBM) Instrumentation MCPR limits for Technical Specification Table 3.3.2.1-1, Footnotes (a), (b) and (c). See Technical Specification 3.3.2.1 and the applicable Bases for further application details.

THERMAL POWER	RBM MCPR Limit
< 90 % RTP	1.70
≥ 90 % RTP	1.40

(Reference 7.2, Section 10)

7.0 References

7.1 Design Specification for Division 60, “Reactor Core and System Analysis Parameters for Columbia Generating Station.”

7.2 002N7610-R2, “Supplemental Reload Licensing Report for Columbia Reload 22 Cycle 23,” June 2015.

7.3 000N9006-R1, “Fuel Bundle Information Report for Columbia Reload 22 Cycle 23,” February 2015.

7.4 NEDE-32906P-A, Revision 3, “TRACG Application for Anticipated Operational Occurrences (AOO) Transient Analyses,” GE Nuclear Energy, September 2006.

7.5 CVI 981-01,14, Revision 2, Reference Loading Pattern Cycle 23.

7.6 GEH-0000-0075-4920-R5, “GE14 Fuel Design Cycle-Independent Analyses for Energy Northwest Columbia Generating Station”, March 2015.

7.7 002N3439, Revision 1, GNF2 Fuel Design Cycle-Independent Analyses for Energy Northwest Columbia Generating Station, June 2015.

7.8 NEDC-32868P, Revision 5, "GE14 Compliance with Amendment 22 of NEDE-24011-P-A (GESTAR II)," May 2013.

7.9 NEDC-33270P, Revision 5, "GNF2 Advantage Generic Compliance with NEDE-24011-P-A (GESTAR II),” May 2013.