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June 15, 2017
GO2-17-120

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

Subject: **COLUMBIA GENERATING STATION, DOCKET NO. 50-397; CYCLE 24 CORE OPERATING LIMITS REPORT, REVISION 0**

Dear Sir or Madam:

In accordance with Columbia Generating Station Technical Specification (TS) 5.6.3.d, Energy Northwest herewith submits the Cycle 24 Core Operating Limits Report (COLR), Revision 0. 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 15th day of June, 2017.

Respectfully,

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

Enclosure – as stated

cc: NRC Region IV Regional Admin
NRC Region IV PM
NRC Senior Resident Inspector
C.D. Sonoda – BPA (w/o enc)
W.A. Horin – Winston & Strawn (w/o enc)

GO2-17-120
Enclosure

Core Operating Limits Report
Columbia Generating Station Cycle 24

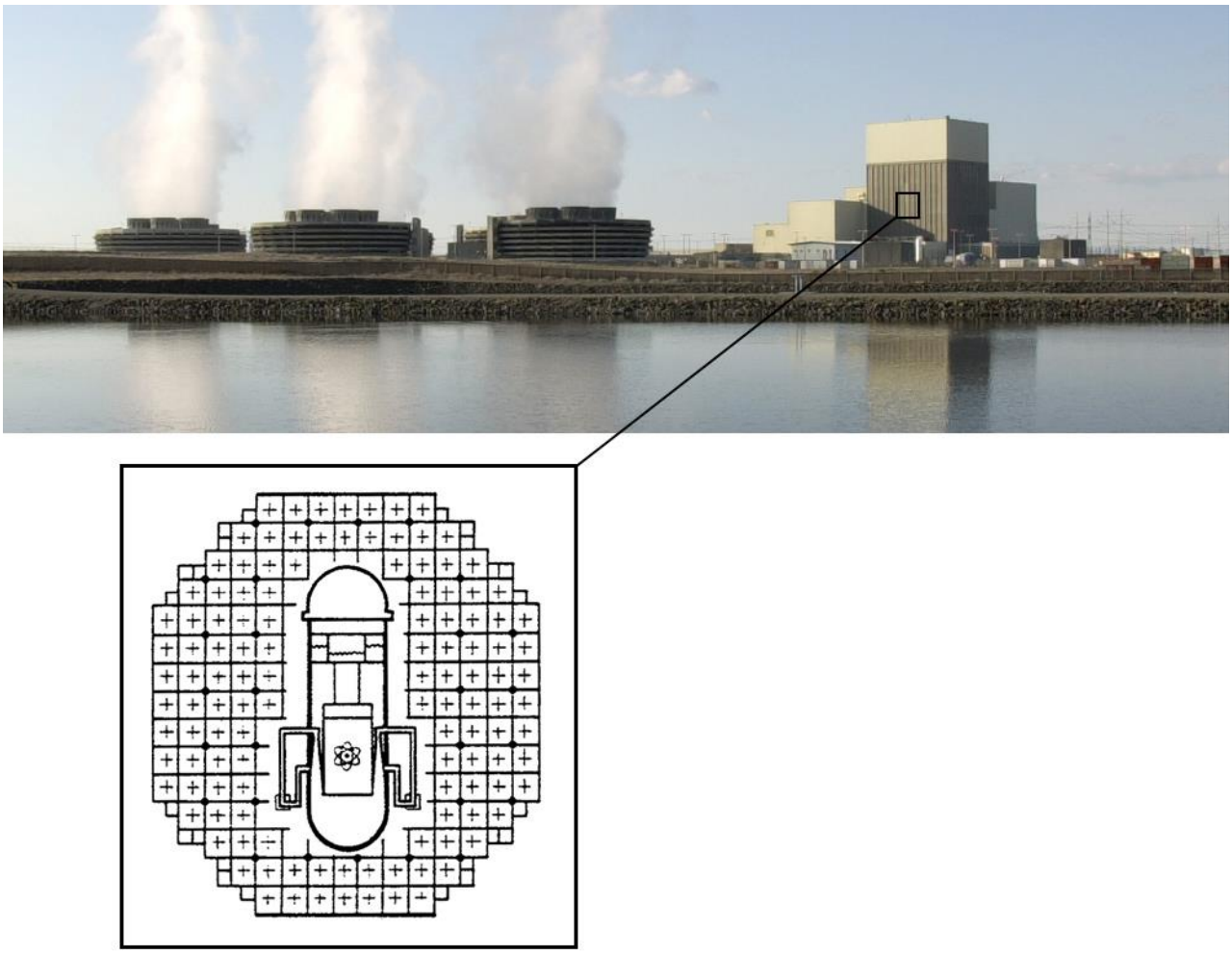
Revision 24.0
January 2017

CORE OPERATING LIMITS REPORT

COLUMBIA GENERATING STATION CYCLE 24

Revision 24.0

January 2017



ENERGY NORTHWEST

DESCRIPTION OF CHANGES

Justification
The operating limits are established per Technical Specification (TS) 5.6.3a using NRC approved methodology listed in TS 5.6.3b. As required by TS 5.6.3c, the core operating limits are determined such that all applicable limits of the safety analysis are met.

Page(s)	**Description (including summary, reason, initiating document, if applicable)**
All	Document revision and cycle number changed for Cycle 24 initial issue.
4	Technical Specification Bases added to identify that the Bases refer to the COLR for the current version of reference documents.
4,8,9,11,12 – 19	Guidance provided for applying operating limits before and after MUR in accordance with SRLR Appendix I and NEDC-33853P.
5	GESTAR II revision updated as specified in SRLR.
8,9,11	Table 3.1 updated for the Cycle 24 MCPR operating limits specified in the SRLR. Cycle 24 has two MOC exposure break points for MCPR limits. Added BOC to MOC1 because non-pressurization event, Control Rod Withdrawal Error is limiting from BOC to 2344 MWd/ST. Added MOC1 to MOC2 MCPR limits for the BOC to MOC pressurization events and MOC2 to EOC for the MOC to EOC pressurization events. The exposure break points are defined in Table 3.1-1.
7,9,11	The SLO MCPR adder increased to 0.04. Applying the SLO uncertainties to the TLO transient results from TRACG resulted in a SLO MCPR operating limit that increased by more than the difference between the TLO and SLO MCPR safety limits (0.03).
8,11,15 – 18	Deleted Notes 8 and 9 and Tables 4.1a and 4.2a because the SRLR does not provide operating limits for one bypass valve out of service. The operating limits for all bypass valves out of service are applicable for Cycle 24. Subsequent notes re-numbered.
15 – 18	The power dependent LHGR Factors corrected to add margin to ensure that the limits are cycle independent.
20	RBM inoperable MCPR limits updated for Cycle 24 as specified in the SRLR.
21	The SRLR, FBIR and RLP are updated to reflect the Cycle 24 reload analyses. GE14 and GNF2 GESTAR II, Amendment 22 compliance reports updated.
21	The GNF2 Fuel Design Cycle-Independent Analyses are updated to correct an error in the spent fuel storage criticality analysis. No impact on the conclusions.
21	The MUR safety analysis added as a source reference for the OPRM applicability, required action and not bypassed setpoints.

Table of Contents

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 24 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 reload licensing analyses support operation prior to and after the Measurement Uncertainty Recapture (MUR) power uprate, also known as Thermal Power Optimization (TPO). Notes are provided for changes in the operating limits impacted by MUR.

The core operating limits are applicable up to 100% of rated thermal power along and below the MELLLA boundary. Prior to the MUR power uprate, the minimum flow for operation at rated power is 80.7% of rated flow. After the MUR power uprate, the minimum flow for operation at rated power is 82.7%. The maximum flow is 106% prior to and after the MUR power uprate.

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 and Technical Specification Bases reference 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 and Technical Specification Bases reference 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 Analytical Methods

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 22, November 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 24 is 1.10 for two loop operation (TLO) and 1.13 for single loop operation (SLO).

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**			
	Full Power Limits (BOC to MOC1)	1.39	1.34	1.41
	Full Power Limits (MOC1 to MOC2)	1.39	1.34	1.39
	Full Power Limits (MOC2 to EOC)	1.40	1.35	1.39
	Flow Dependent Limits[5]	Table 3.7		
	Power Dependent Limits[6]	Table 3.2		
2	**EOC RPT Out of Service (RPTOOS)**			
	Full Power Limits (BOC to MOC1)	1.44	1.35	1.41
	Full Power Limits (MOC1 to MOC2)	1.44	1.35	1.39
	Full Power Limits (MOC2 to EOC)	1.46	1.37	1.39
	Flow Dependent Limits[5]	Table 3.7		
	Power Dependent Limits[6]	Table 3.3		
3	**Turbine Bypass Valves Out of Service (TBVOOS)**			
	Full Power Limits (BOC to MOC1)	1.42	1.36	1.41
	Full Power Limits (MOC1 to MOC2)	1.42	1.36	1.39
	Full Power Limits (MOC2 to EOC)	1.44	1.38	1.39
	Flow Dependent Limits[5]	Table 3.7		
	Power Dependent Limits[6]	Table 3.4		
4	**TBVOOS and RPTOOS**			
	Full Power Limits (BOC to MOC1)	1.49	1.38	1.41
	Full Power Limits (MOC1 to MOC2)	1.49	1.38	1.39
	Full Power Limits (MOC2 to EOC)	1.51	1.40	
	Flow Dependent Limits[5]	Table 3.7		
	Power Dependent Limits[6]	Table 3.5		
5	**Pressure Regulator Out of Service (PROOS)**			
	Full Power Limits (BOC to MOC1)	1.39	1.34	1.41
	Full Power Limits (MOC1 to MOC2)	1.39	1.34	1.39
	Full Power Limits (MOC2 to EOC)	1.42	1.35	1.39
	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 MCPR Operating Limit is 0.04 greater than the Two Loop Operation (TLO) MCPR 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 MOC1	≤ 2344 MWd/ST
MOC1 to MOC2	≤ EOR-2154 MWd/MTU (1954 MWd/ST)
MOC2 to EOC	> EOR-2154 MWd/MTU (1954 MWd/ST)

(Reference 7.2 Sections 7 & 10)

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:

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

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: From BOC to MOC1, Full Power Limit for Non-Pressurization Events is applicable to TLO and SLO. From MOC1 to EOC, 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 0.04 adder when operating in SLO.

Note 6: Prior to the Measurement Uncertainty Recapture (MUR) power uprate, Pbypass is 30% of rated power. After the MUR power uprate, Pbypass is 29.5% of rated power.

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 Pbypass 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 Pbypass because direct scrams on turbine throttle valve closure and turbine governor valve fast closure are automatically bypassed below Pbypass 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 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 0.04 adder when operating in SLO.
(Reference 7.2 Appendices D & I)

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%.

Table 3.2

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

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

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

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

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

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

Limits for Power ≥ Pbypass	
Power (%)	**Limit** *Kp*
Pbypass	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, Appendices D & I)

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

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)[8]
All Fuel Types

Limits for Power < Pbypass		
Power (%)	**Limit for Flow > 50.0%** *LHGRFACp*	**Limit for Flow ≤ 50.0%** *LHGRFACp*
25.0	0.527	0.527
Pbypass	0.527	0.527

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

[8] Prior to the Measurement Uncertainty Recapture (MUR) power uprate, Pbypass is 30% of rated power. After the MUR power uprate, Pbypass is 29.5% of rated power.

Table 4.2

Columbia Generating Station
Application Group 2: EOC RPT Out of Service (RPTOOS)
Power Dependent LHGR Factor (LHGRFACp) [8]
All Fuel Types

Limits for Power < Pbypass		
Power (%)	**Limit for Flow > 50.0%** *LHGRFACp*	**Limit for Flow ≤ 50.0%** *LHGRFACp*
25.0	0.527	0.527
Pbypass	0.527	0.527

Limits for Power ≥ Pbypass	
Power (%)	**Limit** *LHGRFACp*
Pbypass	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)
Power Dependent LHGR Factor (LHGRFACp) [8]
All Fuel Types

Limits for Power < Pbypass		
Power (%)	**Limit for Flow > 50.0%** *LHGRFACp*	**Limit for Flow ≤ 50.0%** *LHGRFACp*
25.0	0.380	0.420
Pbypass	0.414	0.420

Limits for Power ≥ Pbypass	
Power (%)	**Limit** *LHGRFACp*
Pbypass	0.634
45.0	0.713
60.0	0.735
85.0	0.902
100.0	1.000

Table 4.4

Columbia Generating Station
Application Group 4: TBVOOS and RPTOOS
Power Dependent LHGR Factor (LHGRFACp) [8]
All Fuel Types

Limits for Power < Pbypass		
Power (%)	**Limit for Flow > 50.0%** *LHGRFACp*	**Limit for Flow ≤ 50.0%** *LHGRFACp*
25.0	0.380	0.420
Pbypass	0.414	0.420

Limits for Power ≥ Pbypass	
Power (%)	**Limit** *LHGRFACp*
Pbypass	0.634
45.0	0.713
60.0	0.735
85.0	0.902
100.0	1.000

Table 4.5

Columbia Generating Station
Application Group 5: Pressure Regulator Out of Service (PROOS)[9]
Power Dependent LHGR Factor (LHGRFACp)[8]
All Fuel Types

Limits for Power < Pbypass		
Power (%)	**Limit for Flow > 50.0%** *LHGRFACp*	**Limit for Flow ≤ 50.0%** *LHGRFACp*
25.0	0.527	0.527
Pbypass	0.527	0.527

Limits for Power ≥ Pbypass	
Power (%)	**Limit** *LHGRFACp*
Pbypass	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

[9] 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) Prior to the Measurement Uncertainty Recapture (MUR) power uprate, THERMAL POWER ≥ 20% RTP. After the MUR power uprate, THERMAL POWER ≥ 19.6% RTP.

(Reference 7.2, Section 15.2)
(Reference 7.1, Table 3-2, Item 8.9)
(Reference 7.10, Section 2.4.1)

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

Prior to the Measurement Uncertainty Recapture (MUR) power uprate:
THERMAL POWER < 20% RTP

After the MUR power uprate:
THERMAL POWER < 19.6% RTP

(Reference 7.1, Table 3-2, Item 8.9)
(Reference 7.10, Section 2.4.1)

5.3 OPRM Not Bypassed setpoints for SR 3.3.1.1.17

Prior to the Measurement Uncertainty Recapture (MUR) power uprate:
APRM Simulated Thermal Power (Pb) ≥ 25 %
Recirculation Drive Flow (Wb) < 60 %

After the MUR power uprate:
APRM Simulated Thermal Power (Pb) ≥ 24.6 %
Recirculation Drive Flow (Wb) < 60 %

(Reference 7.2, Section 15.3)
(Reference 7.1, Table 3-2, Item 8.9)
(Reference 7.10, Section 2.4.1)

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	1.75
≥ 90 % RTP	1.44

(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 003N4284, Revision 2, “Supplemental Reload Licensing Report for Columbia Reload 23 Cycle 24,” January 2017.

7.3 003N4250, Revision 0, “Fuel Bundle Information Report for Columbia Reload 23 Cycle 24,” December 2016.

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 3, Reference Loading Pattern.

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 2, GNF2 Fuel Design Cycle-Independent Analyses for Energy Northwest Columbia Generating Station, October 2016.

7.8 NEDC-32868P, Revision 6, "GE14 Compliance with Amendment 22 of NEDE-24011-P-A (GESTAR II)," March 2016.

7.9 NEDC-33270P, Revision 7, "GNF2 Advantage Generic Compliance with NEDE-24011-P-A (GESTAR II),” October 2016.

7.10 NEDC-33853P, Revision 0, "Safety Analysis Report for Columbia Generating Station Thermal Power Optimization,” March 2016.