



Exelon Generation®

Clinton Power Station
8401 Power Road
Clinton, IL 61727

U-604510

October 13, 2019

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

Clinton Power Station, Unit 1
Facility Operating License No. NPF-62
NRC Docket No. 50-461

Subject: Submittal of the Core Operating Limits Report
for Clinton Power Station, Unit 1, Cycle 20, Revision 15

In accordance with Technical Specification 5.6.5, Core Operating Limits Report (COLR), Item d., Exelon Generation Company (EGC), LLC is submitting Revision 15 of the COLR for Clinton Power Station, Unit 1, Cycle 20.

There are no regulatory commitments contained in this letter.

Should you have any questions concerning this report, please contact Mr. Dale Shelton at (217) 937-2800.

Respectfully,

Theodore R. Stoner
Site Vice President
Clinton Power Station

Attachment: Core Operating Limits Report for Clinton Power Station Unit 1, Cycle 20,
Revision 15

cc: NRC Regional Administrator, Region III
NRC Senior Resident Inspector - Clinton Power Station

ADD1
NRR

ATTACHMENT
Core Operating Limits Report for Clinton Power Station Unit 1, Cycle 20
Revision 15

CORE OPERATING LIMITS REPORT
FOR
CLINTON POWER STATION UNIT 1 CYCLE 20

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Revision History

Revision

Rev. 15

Description

First issuance for Cycle 20

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1.0 Terms and Definitions

AFTO	Asymmetric Feedwater Temperature Operation
Base Case	A case analyzed with two (2) Safety-Relief Valves Out-of-Service (OOS), one (1) Turbine Control Valve stuck closed, one (1) Turbine Stop Valve stuck closed, one (1) Turbine Bypass Valve OOS, one (1) Main Steam Isolation Valve OOS, and up to a 50°F feedwater temperature reduction (FWTR includes feedwater heater OOS or final feedwater temperature reduction) at any point in the cycle operation in Dual Loop mode (Reference 12).
Coastdown	The reactor condition where thermal power gradually decreases due to fuel depletion while the following conditions are met: 1) all operable control rods are fully withdrawn, 2) all cycle extension techniques have been exhausted including FFWTR and ICF and 3) equilibrium xenon.
Design NORMAL Temperature	Nominal operating temperature for Clinton is 430°F at rated power.
DLO	Dual Reactor Recirculation Loop Operation
EOOS	Equipment Out of Service
FWTR	Feedwater Temperature Reduction, including FFWTR or feedwater heater OOS
FFWTR	Final Feedwater Temperature Reduction
FWHOOS	Feedwater Heaters Out of Service
ICF	Increased Core Flow
LCO	Limiting Condition of Operation
LHGR	Linear Heat Generation Rate
LHGRFAC(F)	LHGR thermal limit flow dependent multipliers
LHGRFAC(P)	LHGR thermal limit power dependent multipliers
Loss of 'FULL' Feedwater Heating	'FULL' Feedwater heating is temperature within ± 10 °F of design NORMAL temperature. The Loss of 'FULL' Feedwater Heating constitutes a change in temperature greater than 10 °F, but less than or equal to 50 °F FWTR. This condition accounts for effects of Asymmetric Feedwater Temperature Operation or AFTO.
LTA	Lead Test Assembly. LTAs at Clinton consist of (4) GNF-2 ARMOR and three (3) GNF2-IronClad assemblies.
MAPLHGR	Maximum Average Planar Linear Heat Generation Rate
MCPR	Minimum Critical Power Ratio

MCPR _{99.9%}	Limiting MCPR value such that 99.9% of the fuel in the core is not susceptible to transition boiling
MCPR(F)	MCPR thermal limit flow dependent adjustments and multipliers
MCPR(P)	MCPR thermal limit power dependent adjustments and multipliers
MELLLA	Maximum Extended Load Line Limit Analysis
MSIV	Main Steam Isolation Valve
OLMCPR	Operating Limit Minimum Critical Power Ratio
OOS	Out of Service
OPRM	Oscillation Power Range Monitor
PBDA	Period Based Detection Algorithm
PLUOOS	Power Load Unbalance Out of Service
PROOS	Pressure Regulator Out of Service
SLO	Single Reactor Recirculation Loop Operation
SRVOOS	Safety Relief Valve Out of Service
TBVOOS	Turbine Bypass Valve(s) Out of Service – valves are not credited for fast opening or for normal pressure control
TBSOOS	Turbine Bypass System Out of Service
TCV	Turbine Control Valve
TSV	Turbine Stop Valve

2.0 General Information

This report is prepared in accordance with Technical Specification 5.6.5 of Reference 1. Power and flow dependent limits and multipliers are listed for various power and flow levels.

These values have been determined using NRC-approved methodologies presented in Section 10 and are established such that all applicable limits of the plant safety analysis are met.

The data presented in this report is valid for all licensed operating domains on the operating map, including (Reference 3):

- Maximum Extended Load Line Limit down to 99% of rated core flow during full power operation
- Increased Core Flow (ICF) up to 107% of rated core flow
- Final Feedwater Temperature Reduction (FFWTR) up to 50°F during cycle extension operation
- Feedwater Heater Out of Service (FWHOOS) up to 50°F feedwater temperature reduction at any time during the cycle prior to cycle extension.

Equipment out of service conditions are as defined in Section 1 and Section 9.

3.0 MAPLHGR Limits

3.1 Technical Specification Reference:

Sections 3.2.1 and 3.4.1.

3.2 Description:

Table 3-1 is used to determine the maximum average planar linear heat generation rate (MAPLHGR) limit for all fuel types. Limits listed in Table 3-1 are for dual reactor recirculation loop operation (DLO).

For single reactor recirculation loop operation (SLO), the MAPLHGR limits given in Table 3-1 must be multiplied by a SLO MAPLHGR multiplier provided in Table 3-2.

For Loss of 'FULL' Feedwater Heating (a change in temperature greater than 10 °F, but less than or equal to 50 °F FWTR), the MAPLHGR limits given in Table 3-1 must be multiplied by a MAPLHGR multiplier provided in Table 3-3. This multiplier accounts for potential core monitoring discrepancies from feedwater riser flow asymmetries (Reference 7).

Table 3-1
MAPLHGR Versus Average Planar Exposure¹
(Reference 3)

Avg. Planar Exposure (GWd/ST)	MAPLHGR Limit (kW/ft)
0.00	13.78
17.15	13.78
60.78	6.87
63.50	5.50

¹ Linear interpolation should be used for points not listed in the table.

Table 3-2
MAPLHGR Single Loop Operation (SLO) Multiplier
(Reference 3)

Fuel Type	MAPLHGR SLO Multiplier
All Fuel Types	0.760

Table 3-3
MAPLHGR Multiplier for Loss of 'FULL' Feedwater Heating
(Reference 7)

Fuel Type	MAPLHGR Multiplier
All Fuel Types	0.990

4.0 MCPR Limits

4.1 Technical Specification Reference:

Sections 3.2.2, 3.4.1, and 3.7.6.

4.2 Description:

The cycle-specific SLMCPR, known as $MCPR_{99.9\%}$, can be found in Table 4-1 for dual loop and single loop operating conditions.

The Operating Limit MCPR (OLMCPR) is determined for a given power and flow condition by calculating the power and flow dependent MCPR values from Sections 4.2.1 and 4.2.2 and selecting the greater of the two.

ARMOR and IronClad LTAs are subject to an additional 10% OLMCPR penalty above the GNF2 limits, which is reflected in the Section 4 tables (Reference 3). Off-rated limits based on multipliers (i.e. K_p) do not require this penalty as it is already applied to the applicable OLMCPR.

4.2.1 Power-Dependent MCPR

For operation less than or equal to 33.3% core thermal power, the $MCPR(P)$ as a function of core thermal power is determined from Table 4-3 or Table 4-4 depending on plant conditions.

For operation at greater than 33.3% core thermal power, the OLMCPR as a function of core thermal power is determined by multiplying the applicable rated condition OLMCPR limit shown in Table 4-2 by the applicable MCPR multiplier $K(P)$ given in Table 4-3 or Table 4-4.

4.2.2 Flow-Dependent MCPR

Table 4-5 through Table 4-8 give the $MCPR(F)$ as a function of flow based on the applicable plant condition. The limits for dual loop operation are listed in Table 4-5 and Table 4-7. The limits for single loop operation are listed in Table 4-6 and Table 4-8. The $MCPR(F)$ determined from these tables is the flow dependent OLMCPR.

4.2.3 Option A and Option B

Option A and Option B refer to use of scram speeds for establishing MCPR operating limits.

Option A scram speed is the BWR/6 Technical Specification scram speed. The Technical Specification scram speeds must be met to utilize the Option A MCPR limits. Cycle-specific reload analyses performed by GNF for Option A MCPR limits utilized a 20% core average insertion time of 0.516 seconds (Reference 6).

To utilize the MCPR limits for the Option B scram speed, the cycle average scram insertion time for 20% insertion must satisfy equation 2 in Reference 5 Section 4. If the cycle average scram insertion time does not meet the Option B criteria, the appropriate MCPR value may be determined from a linear interpolation between the Option A and B limits as specified by equation 4 in Reference 5 Section 4.

4.2.4 Recirculation Flow Control Valve Settings

The cycle was analyzed with a maximum core flow runout of 109%; therefore, the recirculation flow control valve must be set to maintain core flow less than 109% (92.105 Mlb/hr) for all runout events (Reference 3).

Table 4-1
Cycle Specific SLMCPR (MCPR_{99.9%})
(Reference 3)

Loop Operation	MCPR _{99.9%} Limit
DLO	1.07
SLO	1.08

Table 4-2
Operating Limit Minimum Critical Power Ratio^{1,2}
(Reference 3)

EOOS Combination	GNF2 - Option A All Exposures	GNF2 - Option B All Exposures	LTA - Option A All Exposures ²	LTA - Option B All Exposures ²
Base Case DLO	1.26	1.25	1.39	1.38
Base Case SLO ¹	1.28	1.27	1.41	1.40
PROOS/PLUOOS DLO	1.33	1.33	1.46	1.46
PROOS/PLUOOS SLO ¹	1.35	1.35	1.48	1.48
Two or More TBVOOS DLO	1.31	1.27	1.44	1.40
Two or More TBVOOS SLO ¹	1.33	1.29	1.46	1.42

¹ For SLO, the MCPR operating limit is 0.02 greater than the two (or full) loop value (Reference 3).

² An adder of 10% is applied to the GNF2 OLMCPR values for LTAs

Table 4-3
Power Dependent MCPR Limits MCPR(P) and Multipliers K(P) for Base Case and
Two or More TBVOOS^{1,2,3}
(Reference 3)

EOOS Combination	Core Flow (% of Rated)	Core Thermal Power (%)										
		0.0	21.6	≤33.3	>33.3	<43.3	>43.3	60	≤70.0	>70.0	85	100
		MCPR(P)			K(P)							
Base Case DLO Option A/B - GNF2	< 50	1.97	1.97	1.92	1.391	1.391	1.296	1.239	1.205	1.122	1.051	1.000
	≥ 50	2.04	2.04	2.02								
Base Case SLO Option A/B - GNF2	< 50	1.99	1.99	1.94	1.391	1.391	1.296	1.239	1.205	1.122	1.051	1.000
	≥ 50	2.06	2.06	2.04								
Two or More TBVOOS DLO Option A/B - GNF2	< 50	1.97	1.97	1.92	1.391	1.391	1.296	1.239	1.205	1.122	1.051	1.000
	≥ 50	2.04	2.04	2.02								
Two or More TBVOOS SLO Option A/B - GNF2	< 50	1.99	1.99	1.94	1.391	1.391	1.296	1.239	1.205	1.122	1.051	1.000
	≥ 50	2.06	2.06	2.04								
Base Case DLO Option A/B - LTA ³	< 50	2.17	2.17	2.11	1.391	1.391	1.296	1.239	1.205	1.122	1.051	1.000
	≥ 50	2.24	2.24	2.22								
Base Case SLO Option A/B - LTA ³	< 50	2.19	2.19	2.13	1.391	1.391	1.296	1.239	1.205	1.122	1.051	1.000
	≥ 50	2.26	2.26	2.24								
Two or More TBVOOS DLO Option A/B - LTA ³	< 50	2.17	2.17	2.11	1.391	1.391	1.296	1.239	1.205	1.122	1.051	1.000
	≥ 50	2.24	2.24	2.22								
Two or More TBVOOS SLO Option A/B - LTA ³	< 50	2.19	2.19	2.13	1.391	1.391	1.296	1.239	1.205	1.122	1.051	1.000
	≥ 50	2.26	2.26	2.24								

¹ Linear interpolation should be used for points not listed in the table.

² Allowable EOOS conditions are listed in Section 9.0.

³ An adder of 10% is applied to the GNF2 MCPR(P) values for LTAs

Table 4-4
Power Dependent MCPR Limits MCPR(P) and Multipliers K(P) for PROOS/PLUOOS^{1, 2, 3}
(Reference 3)

EOOS Combination	Core Flow (% of Rated)	Core Thermal Power (%)									
		0.0	21.6	≤33.3	>33.3	43.3	60	70	≤85.0	>85.0	100.0
		MCPR(P)			K(P)						
PROOS/PLUOOS DLO Option A/B - GNF2	< 50	1.97	1.97	1.92	1.391	1.391	1.347	1.253	1.076	1.060	1.000
	≥ 50	2.04	2.04	2.02							
PROOS/PLUOOS SLO Option A/B - GNF2	< 50	1.99	1.99	1.94	1.391	1.391	1.347	1.253	1.076	1.060	1.000
	≥ 50	2.06	2.06	2.04							
PROOS/PLUOOS DLO Option A/B - LTA ³	< 50	2.17	2.17	2.11	1.391	1.391	1.347	1.253	1.076	1.060	1.000
	≥ 50	2.24	2.24	2.22							
PROOS/PLUOOS SLO Option A/B - LTA ³	< 50	2.19	2.19	2.13	1.391	1.391	1.347	1.253	1.076	1.060	1.000
	≥ 50	2.26	2.26	2.24							

¹Linear interpolation should be used for points not listed in the table.

²Allowable EOOS conditions are listed in Section 9.0.

³ An adder of 10% is applied to the GNF2 MCPR(P) values for LTAs

Table 4-5
Dual Loop Operation (DLO) Flow Dependent MCPR Limits MCPR(F) for Base Case or PROOS/PLUOOS^{1,2}
(Reference 3)

Core Flow (% rated)	MCPR(F) GNF2	MCPR(F) LTA ²
0.0	1.85	2.04
25.0	1.67	1.84
84.1	1.25	1.38
109.0	1.25	1.38

Table 4-6
Single Loop Operation (SLO) Flow Dependent MCPR Limits MCPR(F) for Base Case or PROOS/PLUOOS^{1,2}
(Reference 3)

Core Flow (% rated)	MCPR(F) GNF2	MCPR(F) LTA ²
0.0	1.87	2.06
25.0	1.69	1.86
84.1	1.27	1.40
109.0	1.27	1.40

¹ Linear interpolation should be used for points not listed in the table.

² An adder of 10% is applied to the GNF2 MCPR(F) values for LTAs

Table 4-7
Dual Loop Operation (DLO) Flow Dependent MCPR Limits MCPR(F) for Two or More TBVOOS^{1,2}
(Reference 3)

Core Flow (% rated)	MCPR(F) GNF2	MCPR(F) LTA ²
0.0	2.01	2.21
25.0	1.82	2.00
100.0	1.25	1.38
109.0	1.25	1.38

Table 4-8
Single Loop Operation (SLO) Flow Dependent MCPR Limits MCPR(F) for Two or More TBVOOS^{1,2}
(Reference 3)

Core Flow (% rated)	MCPR(F) GNF2	MCPR(F) LTA ²
0.0	2.03	2.23
25.0	1.84	2.02
100.0	1.27	1.40
109.0	1.27	1.40

¹ Linear interpolation should be used for points not listed in the table.

² An adder of 10% is applied to the GNF2 MCPR(F) values for LTAs

5.0 Linear Heat Generation Rate Limits

5.1 Technical Specification Reference:

Section 3.2.3, 3.4.1, and 3.7.6.

5.2 Description:

The linear heat generation rate (LHGR) limit is the product of the exposure dependent LHGR limit (from Table 5-1 for UO₂ fuel rods and Table 5-2 for Gadolinia fuel rods) and the minimum of: the power dependent LHGR Multiplier, LHGRFAC(P), the flow dependent LHGR Multiplier, LHGRFAC(F), or the single loop operation (SLO) Multiplier if applicable. The SLO multiplier can be found in Table 5-3. The LHGRFAC(P) is determined from Table 5-4 and Table 5-5. The LHGRFAC(F) is determined from Table 5-6 and Table 5-7, depending on plant conditions. Table 5-1 and Table 5-2 show the LHGR limit as a function of peak pellet exposure.

For Loss of 'FULL' Feedwater Heating (a change in temperature greater than 10 °F, but less than or equal to 50 °F FWTR), LHGRFAC(P) is determined from Table 5-8 and Table 5-9, and LHGRFAC(F) is determined from Table 5-10 and Table 5-11, depending on plant conditions. Concurrent operation with SLO and reduced feedwater heating has not been evaluated and thus is not a valid operating mode. (Reference 8)

The Licensing Results for GNF2 fuel remain bounding when considering the LTAs, so no additional LHGR considerations are required for these assemblies (Reference 3).

Table 5-1
Linear Heat Generation Rate Limits for UO₂ Rods¹
(References 4 and 9)

Fuel Type	LHGR Limit
All Fuel Types	See Table B-1 of Reference 9

Table 5-2
Linear Heat Generation Rate Limits for Gad Rods¹
(References 4 and 9)

Fuel Type	LHGR Limit
All Fuel Types	See Table B-2 of Reference 9

Table 5-3
LHGR Single Loop Operation (SLO) Multiplier
(Reference 3)

Fuel Type	LHGR SLO Multiplier
All Fuel Types	0.760

¹ Linear interpolation should be used for points not listed in the table.

Table 5-4
Power Dependent LHGR Multipliers LHGRFAC(P) for Base Case or Two or More TBVOOS¹
(Reference 3)

EOOS Combination	Core Flow (% of Rated)	Core Thermal Power (%)									
		0.0	21.6	≤33.3	>33.3	≤43.3	>43.3	60.0	70.0	85.0	100
		LHGRFAC(P)									
Base Case DLO/SLO	< 50	0.660	0.660	0.755	0.720	0.775	0.815	0.930	0.975	1.000	1.000
	≥ 50	0.635	0.635	0.720							
Two or More TBVOOS DLO/SLO	< 50	0.660	0.660	0.755	0.720	0.775	0.815	0.930	0.975	1.000	1.000
	≥ 50	0.635	0.635	0.720							

Table 5-5
Power Dependent LHGR Multipliers LHGRFAC(P) for PROOS/PLUOOS¹
(Reference 3)

EOOS Combination	Core Flow (% of Rated)	Core Thermal Power (%)									
		0.0	21.6	≤33.3	>33.3	43.3	60.0	70.0	85.0	100.0	
		LHGRFAC(P)									
PROOS/PLUOOS DLO/SLO	< 50	0.660	0.660	0.755	0.720	0.775	0.930	0.975	0.975	1.000	
	≥ 50	0.635	0.635	0.720							

¹ Linear interpolation should be used for points not listed in the table.

Table 5-6
Flow Dependent LHGR Multipliers LHGRFAC(F) for Base Case or PROOS/PLUOOS¹
(Reference 3)

Core Flow (% rated)	LHGRFAC(F)
0.0	0.442
25.0	0.612
30.0	0.646
82.2	1.000
109.0	1.000

Table 5-7
Flow Dependent LHGR Multipliers LHGRFAC(F) for Two or More TBVOOS¹
(Reference 3)

Core Flow (% rated)	LHGRFAC(F)
0.0	0.140
25.0	0.365
30.0	0.410
40.0	0.500
50.0	0.630
80.0	0.860
98.3	1.000
109.0	1.000

¹ Linear interpolation should be used for points not listed in the table.

Table 5-8
Power Dependent LHGR Multipliers LHGRFAC(P) for Base Case or Two or More TBVOOS
(Loss of 'FULL' Feedwater Heating)^{1,2,3}
(Reference 3)

EOOS Combination	Core Flow (% of Rated)	Core Thermal Power (%)									
		0.0	21.6	≤33.3	>33.3	≤43.3	>43.3	60.0	70.0	85.0	100
		LHGRFAC(P)									
Base Case DLO	< 50	0.653	0.653	0.747	0.713	0.767	0.807	0.921	0.965	0.990	0.990
	≥ 50	0.629	0.629	0.713							
Two or More TBVOOS DLO	< 50	0.653	0.653	0.747	0.713	0.767	0.807	0.921	0.965	0.990	0.990
	≥ 50	0.629	0.629	0.713							

Table 5-9
Power Dependent LHGR Multipliers LHGRFAC(P) for PROOS/PLUOOS
(Loss of 'FULL' Feedwater Heating)^{17,18,19}
(Reference 3)

EOOS Combination	Core Flow (% of Rated)	Core Thermal Power (%)								
		0.0	21.6	≤33.3	>33.3	43.3	60.0	70.0	85.0	100.0
		LHGRFAC(P)								
PROOS/PLUOOS DLO	< 50	0.653	0.653	0.747	0.713	0.767	0.921	0.965	0.965	0.990
	≥ 50	0.629	0.629	0.713						

¹ Values in Table 5-8 and 5-9 are determined by applying the required 1% adjustment from Appendix E of Reference 3 to the values provided in Table 5-4 and 5-5.

² Linear interpolation should be used for points not listed in the table.

³ Concurrent operation with SLO and reduced feedwater heating has not been evaluated and thus is not a valid operating mode (Reference 8)

Table 5-10
Flow Dependent LHGR Multipliers LHGRFAC(F) for Base Case or PROOS/PLUOOS
(Loss of 'FULL' Feedwater Heating)^{1,2,3}
(Reference 3)

Core Flow (% rated)	LHGRFAC(F)
0.0	0.438
25.0	0.606
30.0	0.640
82.2	0.990
109.0	0.990

Table 5-11
Flow Dependent LHGR Multipliers LHGRFAC(F) for Two or More TBVOOS
(Loss of 'FULL' Feedwater Heating)^{20,21,22}
(Reference 3)

Core Flow (% rated)	LHGRFAC(F)
0.0	0.139
25.0	0.361
30.0	0.406
40.0	0.495
50.0	0.624
80.0	0.851
98.3	0.990
109.0	0.990

¹ Values in Table 5-10 and 5-11 are determined by applying the required 1% adjustment from Appendix E of Reference 3 to the values provided in Table 5-6 and 5-7.

² Linear interpolation should be used for points not listed in the table.

³ Concurrent operation with SLO and reduced feedwater heating has not been evaluated and thus is not a valid operating mode (Reference 8)

6.0 Reactor Protection System (RPS) Instrumentation

6.1 Technical Specification Reference:

Section 3.3.1.1

6.2 Description:

The Average Power Range Monitor (APRM) flow biased simulated thermal power-high time constant shall be between 5.4 seconds and 6.6 seconds (References 6 and 11).

7.0 Turbine Bypass System Parameters

7.1 Technical Specification Reference:

Section 3.7.6

7.2 Description:

The operability requirements for the Main Turbine Bypass System are governed by Technical Specification 3.7.6. If the requirements of LCO 3.7.6 cannot be met, the appropriate reactor thermal power, minimum critical power ratio (MCPR), and linear heat generation rate (LHGR) limits must be used to comply with the assumptions in the design basis transient analysis.

Table 7-1 provides the reactor thermal power limitations for an inoperable Main Turbine Bypass System as specified in Technical Specification LCO 3.7.6. The MCPR and LHGR limits for one TBVOOS are included in the Base Case, as identified in Table 9-1. The MCPR and LHGR limits for two or more TBVOOS are provided in Sections 4.0 and 5.0.

Table 7-1
Reactor Power Limitation – Turbine Bypass Valves Out of Service
(References 3 and 10)

Turbine Bypass System Status	Maximum Reactor Thermal Power (% Rated)
One Turbine Bypass Valve Out of Service	100.0
Two or More Turbine Bypass Valves Out of Service	100.0

8.0 Stability Protection Setpoints

8.1 Technical Specification Reference:

Section 3.3.1.3

8.2 Description:

The OPRM Period Based Detection Algorithm (PBDA) Trip Setpoint for the OPRM System for use in Technical Specification 3.3.1.3 is found in Table 8-1. This value is based on the cycle specific analysis documented in Reference 3.

Stability-based OLMCPR is non-limiting for the PBDA setpoint in Table 8-1.

Table 8-1
OPRM PBDA Trip Setpoint
(Valid for All Conditions)
(Reference 3)

PBDA Trip Amplitude	Corresponding Maximum Confirmation Count Trip Setting
1.15	16

9.0 Modes of Operation

The Allowed Modes of Operation with combinations of Equipment Out-of-Service (EOOS) are as described below in Table 9-1:

Table 9-1
Modes of Operation
(Reference 3)

EOOS Options ¹	Operating Region				
	Standard	MELLLA	ICF	FFWTR ²	Coastdown ⁷
Base Case DLO ^{3,4}	Yes	Yes	Yes	Yes	Yes
Base Case SLO ^{2,3}	Yes	No	No	No	Yes
PROOS/PLUOOS DLO ^{3,4,5}	Yes	Yes	Yes	Yes	Yes
PROOS/PLUOOS SLO ^{2,3,5}	Yes	No	No	No	Yes
Two or More TBVOOS DLO ^{4,6}	Yes	Yes	Yes	Yes	Yes
Two or More TBVOOS SLO ^{2,6}	Yes	No	No	No	Yes

Notes:

1. A single Main Steam Isolation Valve (MSIV) out of service is supported at or below 75% power. (Reference 3)
2. Concurrent operation with SLO and Loss of 'FULL' Feedwater Heating (a change in temperature greater than 10 °F, but less than or equal to 50 °F FWTR), MELLLA, ICF, or FFWTR has not been evaluated and thus is not a valid operating mode. (Reference 8)
3. Includes 2 SRVOOS, 1 TCV stuck closed, 1 TSV stuck closed, 1 TBVOOS, and up to a 50°F feedwater temperature reduction (FWTR includes feedwater heater OOS or final feedwater temperature reduction) at any point in cycle operation in Dual Loop mode. (Reference 12)
4. For operation with Loss of 'FULL' Feedwater Heating (a change in temperature greater than 10 °F, but less than or equal to 50 °F FWTR), the MAPLHGR is determined using the multiplier in Table 3-3 and the LHGR value is determined from Tables 5-8, 5-9, 5-10, and 5-11.
5. Concurrent operation with either or both of PROOS + PLUOOS is allowed.
6. Includes 2 SRVOOS and up to a 50°F feedwater temperature reduction (FWTR includes feedwater heater OOS or final feedwater temperature reduction) at any point in cycle operation in Dual Loop mode. (Reference 12)
7. End-of-cycle power coastdown operation down to 40% reactor power is supported by Methodology Reference 1. Coastdown operation beyond the EOR condition is conservatively bounded by the reload licensing analyses at the EOR condition for a normal coastdown power profile. During coastdown, operation at a power level above that which can be achieved (at all-rods-out with all cycle extension features utilized, e.g., ICF, FFWTR) with steady-state equilibrium xenon concentrations is not supported. (Reference 3)

10.0 Methodology

The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following document:

1. Global Nuclear Fuel Document, "General Electric Standard Application for Reactor Fuel (GESTAR II)", NEDE-24011-P-A-28, September 2019, and U.S. Supplement NEDE-24011-P-A-28-US, September 2019.

11.0 References

1. Nuclear Regulatory Commission, Technical Specifications for Clinton Power Station Unit 1, Docket No. 50-461, License No. NPF-62.
2. Deleted.
3. Global Nuclear Fuel Document, 004N8197 Revision 0, "Supplemental Reload Licensing Report for Clinton Unit 1 Reload 19 Cycle 20," July 2019.
4. Global Nuclear Fuel Document, 004N8198 Revision 0, "Fuel Bundle Information Report for Clinton Unit 1 Reload 19 Cycle 20," July 2019.
5. General Electric Document, GE-NE-0000-0000-7456-01P, "Option B Scram Times For Clinton Power Station," February 2002.
6. Exelon Transmittal of Design Information, TODI ES1900005 Revision 0, "Exelon Approved OPL-3 Parameters for Clinton Unit 1 Cycle 20 Reload Analysis," April 8, 2019.
7. GE Hitachi Nuclear Energy Letter, CFL-EXN-LH1-12-059, "Affirmation of the Clinton Power Station Unit 1 MAPLHGR Reduction for Feedwater Riser Flow Asymmetry," April 25, 2012.
8. General Electric Document, GE-NE-0000-0026-1857-R1 Revision 1, "Evaluation of Operation With Equipment Out Of Service for the Clinton Power Station," June 28, 2004.
9. Global Nuclear Fuel Document, NEDC-33270P, Rev. 9, "GNF2 Advantage Generic Compliance with NEDE-24011-P-A (GESTAR II)," December 2017.
10. GE Hitachi Nuclear Energy Report, 003N4558-R0, "Removal of TBSOOS Power Restriction for Clinton," March 10, 2016.
11. General Electric Document, 22A3167, Rev. 6, "Neutron Monitoring System-Solid State Safety Option," December 22, 1988.
12. Exelon Transmittal of Design Information, TODI NF194545 Revision 0, "Clinton Unit 1 Cycle 20 Customer Approved FRED Form," March 1, 2019.