Constellation.

Technical Specification 5.6.5

NMP2L2807
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U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-001

Nine Mile Point Nuclear Station, Unit 2
Renewed Facility Operating License No. NPF-69
NRC Docket No. 50-410

Subject: Core Operating Limits Report

Enclosed is a copy of the Core Operating Limits Report, Revision 7, for Nine Mile Point Unit 2 Cycle 19. This report is being submitted pursuant to NMP2 Technical Specification 5.6.5.d.

Should you have any questions regarding the information in this submittal, please contact Mr. Eric Kelsey at (315) 349-7037

Sincerely,

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Enclosure: Core Operating Limits Report, Revision 7 for Nine Mile Point Unit 2, Cycle 19

cc: NRC Regional Administrator, Region I
NRC Project Manager
NRC Senior Resident Inspector

A001
NRR

Enclosure

Core Operating Limits Report, Revision 7

for

Nine Mile Point Unit 2, Cycle 19

CORE OPERATING LIMITS REPORT

FOR

NINE MILE POINT UNIT 2 CYCLE 19

(This is a complete re-write; no revision bars are used)

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Table of Contents

Summary of Revisions

Revision	Description
Revision 7	New Issue for Cycle 19

List of Tables

1.0 Terms and Definitions

ADS	Automatic Depressurization System
ADSOOS	Automatic Depressurization System Out of Service. ADSOOS is defined as any ADS valve inoperable.
APLHGR	Average Planar Linear Heat Generation Rate
APRM	Average Power Range Monitor
ARTS	Average Power Range Monitor, Rod Block Monitor, and Technical Specification (ARTS) improvements program
BSP	Backup Stability Protection
COLR	Core Operating Limits Report
DLO	Dual Loop Operation
ECCS	Emergency Core Cooling System
EIS	Equipment in Service
EOOS	Equipment Out of Service
EOR	End of Rated. The cycle exposure at which reactor power is equal to 100% rated (3988 MW_{th}), recirculation flow equal to 100% rated (108.5 Mlb/hr), and all control blades are fully withdrawn with equilibrium xenon.
EPU	Extended Power Uprate
GEH	General Electric-Hitachi
GNF	Global Nuclear Fuel
HFCL	High Flow Control Line
HTSP	High Power Trip Set Point (regarding RBM)
ICF	Increased Core Flow
INOP	Inoperable
ITSP	Intermediate Power Trip Set Point (regarding RBM)
K_P	Off-rated power dependent OLMCPR multiplier
LCO	Limiting Condition for Operation
LHGR	Linear Heat Generation Rate
$LHGRFAC_F$	Off-rated flow dependent LHGR multiplier
$LHGRFAC_P$	Off-rated power dependent LHGR multiplier
LOCA	Loss of Coolant Accident
LTSP	Low Power Trip Set Point (regarding RBM)
$MAPFAC_F$	Off-rated flow dependent MAPLHGR multiplier
$MAPFAC_P$	Off-rated power dependent MAPLHGR multiplier
MAPLHGR	Maximum Average Planar Linear Heat Generation Rate
MCPR	Minimum Critical Power Ratio
MCPR99.9%	Limiting MCPR value such that 99.9 percent of the fuel in the core is not susceptible to boiling transition. Also known as the cycle-specific SLMCPR.
$MCPR_F$	Off-rated flow dependent OLMCPR

$MCPR_P$	Off-rated power dependent OLMCPR
MELLLA	Maximum Extended Load Line Limit Analysis
MELLLA+	Maximum Extended Load Line Limit Analysis Plus
MSIVOOS	Main Steam Isolation Valve Out of Service
MSROOS	Moisture Separator Reheater Out of Service
NCL	Natural Circulation Line
NRC	Nuclear Regulatory Commission
OLMCPR	Operating Limit MCPR
OPRM	Oscillation Power Range Monitor
PLUOOS	Power Load Unbalance Out of Service
PROOS	Pressure Regulator Out of Service
RBM	Rod Block Monitor
RDF	Recirculation Drive Flow
RPTOOS	Recirculation Pump Trip Out of Service; also known as EOC-RPT
RTP	Rated Thermal Power (3988 MW_t)
RWE	Rod Withdrawal Error
SLMCPR	Safety Limit MCPR
SLO	Single Loop Operation
SRVOOS	Safety Relief Valve(s) Out of Service
TBV	Turbine Bypass Valve
TBVOOS	Turbine Bypass Valve Out of Service. TBVOOS supports 3 of 5 TBVs slow open and 2 of 5 TBVs do not slow open (stuck closed). TBVOOS also supports 5 TBV to not fast open.
TCV	Turbine Control Valve
TCVFASOOS	Turbine Control Valve Fast Acting Solenoid Out of Service
TCVOOS	Turbine Control Valve Out of Service
TS	Technical Specification
TSV	Turbine Stop Valve
TSVOOS	Turbine Stop Valve Out of Service

2.0 General Information

This report is prepared in accordance with Technical Specification (TS) 5.6.5 of Reference 1. Power and flow dependent limits are listed for various power and flow levels. Linear interpolation is to be used for intermediate values.

This report provides the values of the power distribution limits, control rod withdraw block instrumentation, and stability protection setpoints for Nine Mile Point Unit 2 Cycle 19.

This report provides the following cycle-specific parameter limits for Nine Mile Point Unit 2 Cycle 19 (Reload 18):

- Maximum Average Planar Linear Heat Generation Rate (MAPLHGR)
- Single Loop Operation (SLO) MAPLHGR multipliers
- Operating Limit Minimum Critical Power Ratio (OLMCPR)
- ARTS MCPR thermal limit adjustments and multipliers
- Single Loop Operation (SLO) MCPR adjustment
- Cycle-specific SLMCPRs (MCPR99.9%)
- Linear Heat Generation Rate (LHGR)
- ARTS LHGR thermal limit multipliers
- Single Loop Operation (SLO) LHGR multipliers
- Rod Block Monitor (RBM) Nominal Trip Setpoints, Allowable Values and MCPR Limits
- Turbine Bypass Valve (TBV) parameters
- Backup Stability Protection (BSP) parameters

The BASE thermal limit values shown in the tables are for normal, equipment in service (EIS) two loop operation. Analysis also supports Increased Core Flow (ICF) for operational flexibility. Additional equipment out of service (EOOS) applicability can be found in Section 8.0, Modes of Operation.

The data presented in this report is valid for all licensed operating domains on the operating map, including (Reference 2):

- Maximum Extended Load Line Limit Analysis Plus (MELLLA+) to a minimum core flow of 85% of rated.
- ICF up to 105% rated (rated core flow is 108.5 Mlb/hr).
- Extended Power Uprate (EPU) to 3988 MW_{th}.
- Coastdown operation down to 40% Rated Thermal Power (RTP)

3.0 MAPLHGR Limits

Technical Specification Sections 3.2.1, 3.4.1

The MAPLHGR limits obtained from the ECCS analysis are provided in Table 3-1 and Table 3-2 for GNF2 and GNF3 fuel respectively. The limiting MAPLHGR value for the most limiting lattice of each fuel type as a function of exposure is given. For SLO, a multiplier is used as shown in Table 3-3.

The power and flow dependent LHGR multipliers are sufficient to provide adequate protection for the off-rated conditions from an ECCS-LOCA analysis perspective and there is no need for MAPLHGR multipliers, in addition to off-rated LHGR multipliers per Reference 2 – Section 16.

Table 3-1
MAPLHGR Versus Average Planar Exposure
GNF2 Fuel
(Reference 2 – Table 8)

Average Planar Exposure [GWd/ST]	MAPLHGR Limit [kW/ft]
0.00	13.78
17.15	13.78
60.78	6.87
63.50	5.50

Table 3-2
MAPLHGR Versus Average Planar Exposure
GNF3 Fuel
(Reference 2 – Table 9)

Average Planar Exposure [GWd/ST]	MAPLHGR Limit [kW/ft]
0.00	14.36
21.22	13.01
40.82	10.75
57.60	8.00
63.50	6.00

Table 3-3
MAPLHGR SLO Multiplier
All Fuel Types
(Reference 2 – Table 10)

Fuel Type	SLO Multiplier
GNF2	0.78
GNF3	0.95

4.0 MCPR Limits

Technical Specification Sections 3.2.2, 3.3.4.1, 3.4.1, 3.7.5

OLMCPR values listed in Table 4-1 cover all conditions listed in Section 8.0, Modes of Operation. Additional EOOS information can be found in Section 8.0. ARTS provides for power and flow dependent thermal limits adjustments, which allow for a more reliable administration of the MCPR thermal limit. Per TS 3.2.2, all MCPR's shall be verified in accordance with limits specified in this section.

Control rod scram time verification is also required per TS 3.1.4, Control Rod Scram Times. The applicable MCPR thermal limit set shall be determined with Tau (τ), a measure of scram time performance throughout the cycle based on the cumulative plant scram time test results (Reference 13). The calculation of Tau shall be performed in accordance with site procedures.

The power dependent MCPR limits ($MCPR_P$) and multipliers (Kp) are provided in Table 4-2 for all fuel types. The flow dependent MCPR limits ($MCPR_F$) are provided in Tables 4-3 through 4-6. Table 4-3 for GNF2 fuel and Table 4-4 for GNF3 fuel are valid for DLO conditions. Table 4-5 for GNF2 fuel and Table 4- 6 for GNF3 fuel are valid for SLO conditions.

ARTS power and flow dependent thermal limits have been confirmed for the following modes of operation:

1. Base
2. TBVOOS combined with RPTOOS (TBVOOS + RPTOOS)
3. The combination of PLUOOS, PROOS, TCVFASOOS, and RPTOOS (PLUOOS + PROOS + TCVFASOOS + RPTOOS)
4. MSROOS
5. The combination of PLUOOS, PROOS, TCVFASOOS, RPTOOS, MSROOS, and TBVOOS (PLUOOS + PROOS + TCVFASOOS + RPTOOS + MSROOS + TBVOOS)

The cycle-specific exposure-dependent SLMCPRs, known as MCPR99.9%, can be found in Table 4-7 for dual loop and single loop operating conditions. The values in Table 4-7 or conservative values were used to calculate the MCPR limits and off-rated limits in this section.

Table 4-1
Operating Limit Minimum Critical Power Ratio (OLMCPR)
All Fuel Types
(Reference 2 – Section 11)

EOOS Combination	SCRAM Time Option[1]	Cycle Exposure		
		≤ 1779 MWd/ST	> 1779 MWd/ST & < EOR-4001 MWd/ST	≥ EOR-4001 MWd/ST
BASE	A	1.49	1.49	1.52
	B	1.43	1.36	1.39
BASE SLO[2]	A	1.52	1.52	1.55
	B	1.46	1.45	1.45
TBVOOS + RPTOOS	A	1.54	1.54	1.55
	B	1.43	1.38	1.39
TBVOOS + RPTOOS SLO[2]	A	1.57	1.57	1.58
	B	1.46	1.45	1.45
PLUOOS + PROOS + TCVFASOOS + RPTOOS	A	1.49	1.49	1.52
	B	1.43	1.36	1.39
PLUOOS + PROOS + TCVFASOOS + RPTOOS SLO[2]	A	1.52	1.52	1.55
	B	1.46	1.45	1.45
MSROOS	A	1.53	1.54	1.56
	B	1.43	1.40	1.42
MSROOS SLO[2]	A	1.56	1.57	1.59
	B	1.46	1.45	1.45
PLUOOS + PROOS + TCVFASOOS + RPTOOS + MSROOS + TBVOOS	A	1.58	1.58	1.58
	B	1.43	1.42	1.42
PLUOOS + PROOS + TCVFASOOS + RPTOOS + MSROOS + TBVOOS SLO[2]	A	1.61	1.61	1.61
	B	1.46	1.45	1.45

[1] For tau (τ) = 0, use SCRAM Time Option B limits. For (τ) = 1, use SCRAM Time Option A limits. When tau does not equal 0 or 1, use linear interpolation in accordance with site procedure to calculate OLMCPR.

[2] For single-loop operation, the MCPR operating limit is 0.03 greater than the analyzed DLO value. However, a minimum value of 1.45 for all fuel types is required to bound the Recirculation Pump Seizure Event (Reference 2).

Table 4-2
Power Dependent MCPR Limits ($MCPR_P$) and Multipliers (K_P)
All Fuel Types
(Reference 2 – Appendix D)

EOOS Combination	Core Flow [% of rated]	Core Thermal Power [% of rated]									
		0	23	≤26	>26	30	55	65	≤85	>85	100
		Operating Limit $MCPR_P$			Operating Limit MCPR Multiplier (K_P)						
BASE	≥50	2.33	2.33	2.32	1.278	1.266	1.188	1.130	1.056		1.000
	<50	2.29	2.29	2.28							
BASE SLO	≥50	2.36	2.36	2.35	1.278	1.266	1.188	1.130	1.056		1.000
	<50	2.32	2.32	2.31							
TBVOOS + RPTOOS	≥50	2.67	2.67	2.56	1.278	1.266	1.188	1.130	1.056		1.000
	<50	2.54	2.54	2.39							
TBVOOS + RPTOOS SLO	≥50	2.70	2.70	2.59	1.278	1.266	1.188	1.130	1.056		1.000
	<50	2.57	2.57	2.42							
PLUOOS + PROOS + TCVFASOOS + RPTOOS	≥50	2.33	2.33	2.33	1.289	1.277	1.198	1.178	1.072	1.056	1.000
	<50	2.29	2.29	2.28							
PLUOOS + PROOS + TCVFASOOS + RPTOOS SLO	≥50	2.36	2.36	2.36	1.289	1.277	1.198	1.178	1.072	1.056	1.000
	<50	2.32	2.32	2.31							
MSROOS	≥50	2.34	2.34	2.34	1.278	1.266	1.188	1.130	1.056		1.000
	<50	2.30	2.30	2.30							
MSROOS SLO	≥50	2.37	2.37	2.37	1.278	1.266	1.188	1.130	1.056		1.000
	<50	2.33	2.33	2.33							
PLUOOS + PROOS + TCVFASOOS + RPTOOS + MSROOS + TBVOOS	≥50	2.67	2.67	2.56	1.289	1.277	1.198	1.178	1.072	1.056	1.000
	<50	2.54	2.54	2.39							
PLUOOS + PROOS + TCVFASOOS + RPTOOS + MSROOS + TBVOOS SLO	≥50	2.70	2.70	2.59	1.289	1.277	1.198	1.178	1.072	1.056	1.000
	<50	2.57	2.57	2.42							

Table 4-3
Flow Dependent MCPR Limits ($MCPR_F$) for DLO
GNF2 Fuel
(Reference 2 – Appendix D)

Flow [% of rated]	$MCPR_F$ Limit
0.0	2.01
30.0	1.78
94.2	1.29
112.0	1.29

Table 4-4
Flow Dependent MCPR Limits ($MCPR_F$) for DLO
GNF3 Fuel
(Reference 2 – Appendix D)

Flow [% of rated]	$MCPR_F$ Limit
0.0	1.82
30.0	1.61
89.5	1.20
105.0	1.20

Table 4-5
Flow Dependent MCPR Limits ($MCPR_F$) for SLO
GNF2 Fuel
(Reference 2 – Appendix D)

Flow [% of rated]	$MCPR_F$ Limit
0.0	2.04
30.0	1.81
94.2	1.32
112.0	1.32

Table 4-6
Flow Dependent MCPR Limits ($MCPR_F$) for SLO
GNF3 Fuel
(Reference 2 – Appendix D)

Flow [% of rated]	$MCPR_F$ Limit
0.0	1.85
30.0	1.64
89.5	1.23
105.0	1.23

Table 4-7
Cycle Specific SLMCPR (MCPR99.9%)
(Reference 2 – Section 11)

Flow Mode	MCPR99.9%	
	< 8500 MWd/ST	≥ 8500 MWd/ST
DLO	1.10	1.11
SLO	1.12	1.12

5.0 LHGR Limits

Technical Specification Section 3.2.3

The LHGR limit is the product of the exposure dependent LHGR limit and the minimum of the $LHGRFAC_P$ or the $LHGRFAC_F$.

The off-rated limits assumed in the ECCS-LOCA analyses are confirmed to be consistent with the cycle-specific off-rated LHGR multipliers calculated for MELLLA+ operation. The off-rated LHGR multipliers provide adequate protection for MELLLA+ operation (Reference 2).

Table 5-1
LHGR Limits for UO_2 Fuel Rods
(Reference 3, Reference 5, Reference 11, Reference 12)

Fuel Type	LHGR Limit [kW/ft]
GNF2	See Reference 5
GNF3	See Reference 12

Table 5-2
LHGR Limits for Gadolinia Rods
(Reference 3, Reference 5, Reference 11, Reference 12)

Fuel Type	LHGR Limit [kW/ft]
GNF2	See Reference 5
GNF3	See Reference 12

Table 5-3
Power Dependent LHGR Multipliers ($LHGRFAC_P$)
GNF2 Fuel
DLO and SLO
(Reference 2 – Appendix D)

EOOS Combination	Core Flow [% of rated]	Core Thermal Power [% of rated]							
		0	23	≤26	>26	55	60	85	100
BASE	≥75				0.613	0.720	0.791	0.922	1.000
	<75	0.495	0.495	0.502					
TBVOOS + RPTOOS	≥75				0.613	0.720	0.791	0.922	1.000
	<75	0.475	0.475	0.502					
PLUOOS + PROOS + TCVFASOOS + RPTOOS	≥75				0.613	0.720	0.740	0.831	1.000
	<75	0.495	0.495	0.502					
MSROOS	≥75				0.613	0.720	0.791	0.922	1.000
	<75	0.495	0.495	0.502					
PLUOOS + PROOS + TCVFASOOS + RPTOOS + MSROOS + TBVOOS	≥75				0.613	0.720	0.740	0.831	1.000
	<75	0.475	0.475	0.502					

Table 5-4
Power Dependent LHGR Multipliers ($LHGRFAC_P$)
GNF3 Fuel
DLO and SLO
(Reference 2 – Appendix D)

EOOS Combination	Core Flow [% of rated]	Core Thermal Power [% of rated]								
		0	23	≤26	>26	30	55	65	85	100
BASE	≥50	0.430	0.430	0.440	0.630	0.650	0.760	0.980	1.000	1.000
	<50	0.430	0.430	0.440						
TBVOOS + RPTOOS	≥50	0.430	0.430	0.440	0.630	0.650	0.760	0.870	0.970	1.000
	<50	0.430	0.430	0.440						
PLUOOS + PROOS + TCVFASOOS + RPTOOS	≥50	0.430	0.430	0.440	0.630	0.650	0.760	0.850	0.960	1.000
	<50	0.430	0.430	0.440						
MSROOS	≥50	0.430	0.430	0.440	0.630	0.650	0.760	0.980	1.000	1.000
	<50	0.430	0.430	0.440						
PLUOOS + PROOS + TCVFASOOS + RPTOOS + MSROOS + TBVOOS	≥50	0.430	0.430	0.440	0.630	0.650	0.760	0.810	0.920	1.000
	<50	0.430	0.430	0.440						

Table 5-5
Flow Dependent LHGR Multipliers ($LHGRFAC_F$)
GNF2 Fuel
All Modes of Operation
(Reference 2 – Appendix D and Table 10)

EOOS Condition	Core Flow [% of rated]					
	0	30	40	52.7	85	112
DLO	0.241	0.580	0.693		1.000	1.000
SLO	0.241	0.580	0.693	0.780	0.780	0.780

Table 5-6
Flow Dependent LHGR Multipliers ($LHGRFAC_F$)
GNF3 Fuel
All Modes of Operation
(Reference 2 – Appendix D and Table 10)

EOOS Condition	Core Flow [% of rated]				
	0	30	74.3	80	105
DLO	0.298	0.561		1.000	1.000
SLO	0.298	0.561	0.950	0.950	0.950

6.0 Rod Block Monitor Setpoints

Technical Specification Section 3.3.2.1

Per Technical Specifications 3.3.2.1, the RBM instrumentation channels will be operable with the allowable values set to the values shown in Table 6-1. The values given in Table 6-1 are unfiltered; these unfiltered values are applicable as the time filter constant is set to zero. (Reference 7 – Table 5B). The RBM operability requirements have been evaluated and shown to be sufficient to ensure that the cycle specific exposure dependent SLMCPR and cladding 1% plastic strain criteria will not be exceeded in the event of a Rod Withdrawal Error.

The ARTS RWE analysis validated the MCPR values in Table 6-2 below for use in Cycle 19. The RWE MCPR values have been analyzed at discrete setpoint values and unblocked (continuous withdrawal) conditions.

Table 6-1
Rod Block Monitor Setpoints[3]
(Reference 2 – Section 10, Reference 8 – Section 3)

Power Level	Allowable Value	Nominal Trip Setpoint	Analytical Limit
LTSP	124.6%	124.2%	127.0%
ITSP	119.6%	119.2%	122.0%
HTSP	114.6%	114.2%	117.0%

Table 6-2
ARTS RWE Validated MCPR Values
(Reference 2 – Section 10)

Power Level [% of Rated]	MCPR
<90%	≥1.76
≥90%	≥1.45

[3] See Reference 8 for filtered values. NMP2C19 is analyzed for the following RBM set points which correspond to set D from Reference 8. However, the station may elect to have more restrictive state points listed in Reference 8 Section 3.

7.0 Turbine Bypass Valve Parameters

Technical Specification Section 3.7.5

Per Technical Specification LCO 3.7.5, whenever the reactor power is at or above 23% RTP the main turbine bypass system shall be operable or the plant must operate with the TBVOOS penalties. The definition of operable is given in Table 7-1 below.

Table 7-1
Turbine Bypass Valve Response Time
(Reference 9 – Section 1.6)

Event	Response Time [sec]
Maximum delay time before start of bypass valve opening following initial turbine inlet valve movement	0.15
Maximum time after initial turbine inlet valve movement for bypass valve position to reach 80% of full flow (includes the above delay time)	0.30

8.0 Modes of Operation

The following conditions are supported by the Cycle 19 licensing analysis; operation in a condition (or conditions) is controlled by station procedures. If a combination of options is not listed, it is not supported. Table 8-1 provides allowed modes of operation with thermal limit sets in the COLR. Table 8-2 provides allowed modes of operation that do not contain explicit thermal limit sets but are included in the BASE option.

Note that per TS LCO 3.4.1, SLO in the MELLLA and MELLLA+ domains is prohibited (Reference 1). The MELLLA+ domain and the MELLLA domain upper boundary are defined in Figure 1. The MELLLA domain lower boundary is bounded by the 95% load line (Ref 4). Refer to site power-flow map drawings for allowed SLO regions.

Table 8-1
Modes of Operation
(Reference 2, Reference 10)

Options[4]	Allowed Operating Region
BASE	Yes
BASE SLO	Yes
TBVOOS + RPTOOS[5]	Yes
TBVOOS + RPTOOS SLO[5]	Yes
PLUOOS + PROOS + TCVFASOOS + RPTOOS[6]	Yes
PLUOOS + PROOS + TCVFASOOS + RPTOOS SLO[6]	Yes
MSROOS	Yes
MSROOS SLO	Yes
PLUOOS + PROOS + TCVFASOOS + RPTOOS + MSROOS +TBVOOS[5,6,7]	Yes
PLUOOS + PROOS + TCVFASOOS + RPTOOS + MSROOS +TBVOOS SLO[5,6,7]	Yes

Table 8-2
EOOS Conditions Included under BASE Option
(Reference 2, Reference 10)

EOOS Condition[8]
SRVOOS
ADSOOS[9]
MSIVOOS[10]
TCV/TSVOOS[5,6]

[4] The EOOS Options listed apply to both Option A and Option B
[5] TCV/TSVOOS not analyzed concurrent with TBVOOS + RPTOOS or PLUOOS + PROOS + TCVFASOOS + RPTOOS + MSROOS +TBVOOS
[6] 1 TCV/TSVOOS limited to 85% rated thermal power.
[7] MSROOS + TBVOOS is restricted to 92% power (Reference 14)
[8] Base includes 2 SRVOOS, 1 MSIVOOS (limited to 75% power), 1 TCV/TSVOOS (limited to 85% power), and 1 ADSOOS
[9] ADSOOS defined as 1 ADS valve out of service only in the relief function. LCO 3.5.1 (Reference 1) allows a single ADS valve inoperable for 14 days.
[10] 1 MSIVOOS limited to 75% rated thermal power

9.0 Stability Protection

Technical Specification Section 3.3.1.1

The OPRM Amplitude Discriminator Setpoint (S_{AD}) is 1.10 (Reference 2 – Section 15.1). Results have been validated with rated feedwater temperature ≥ 420.5°F as described by Reference 2. Per TS 5.6.5.a.4, the Backup Stability Protection (BSP) regions and values are as shown below in Tables 9-1 and 9-2. The manual BSP region boundary endpoints are connected using the Generic Shape Function. A graphical representation of the BSP regions can be found in Reference 2 – Figure 1.

Table 9-1
BSP Endpoints for Normal Feedwater Temperature[11,12]
(Reference 2 – Table 4)

Endpoint	Power [% of rated]	Flow [% of rated]	Definition
A1	70.4	45.3	Scram Region Boundary, HFCL
B1	39.5	29.5	Scram Region Boundary, NCL
A2	64.5	50.0	Controlled Entry Region Boundary, HFCL
B2	27.5	28.9	Controlled Entry Region Boundary, NCL

Note: The BSP Boundary for Normal Feedwater Temperature is defined by the MELLLA boundary line, per Reference 2. See Figure 1 in Reference 2.

Table 9-2
Automated BSP Setpoints[13]
(Reference 2 – Table 5)

Parameter	Symbol	Value
Slope of Automated BSP APRM flow-biased trip linear segment.	m_{TRIP}	1.26
Automated BSP APRM flow-biased trip setpoint power intercept. Constant Power Line for Trip from zero Drive Flow to Flow Breakpoint value.	$P_{BSP-TRIP}$	39.5% RTP
Automated BSP APRM flow-biased trip setpoint drive flow intercept. Constant Flow Line for Trip.	$W_{BSP-TRIP}$	39.2% RDF
Flow Breakpoint value.	$W_{BSP-BREAK}$	20.4% RDF

[11] Bounding for both DLO and SLO
[12] Station may elect to place additional administrative margin on the endpoints provided in Table 9-1
[13] Applicable to both DLO and SLO

10.0 Power Flow Operating Map

Per M+LTR SER Limitation and Condition 12.5.c, the MELLLA+ Power/Flow operating map is provided as Figure 1.

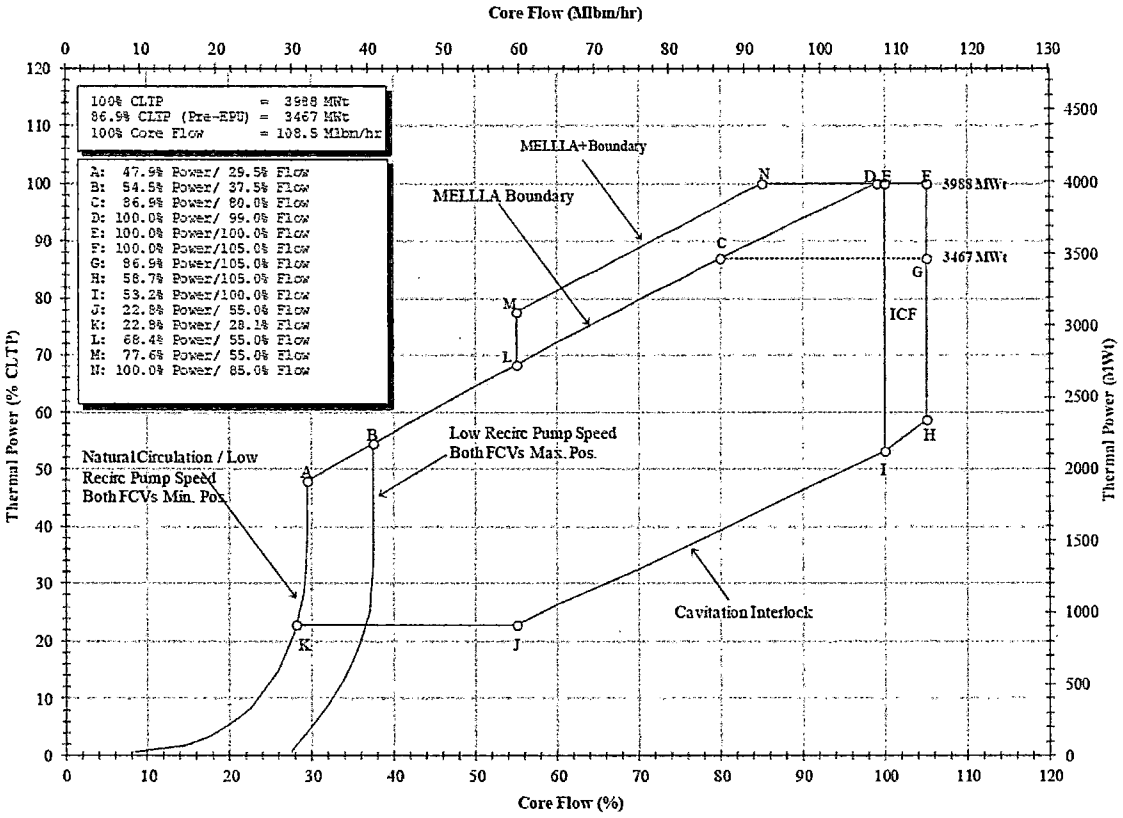

Figure 1: Power/Flow Operating Map for MELLLA+ in Dual Loop Operation (Reference 6)

11.0 Methodology

The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the Nuclear Regulatory Commission, particularly those described in the following documents:

1. "General Electric Standard Application for Reactor Fuel (GESTAR II) (Supplement for United States)", NEDE-24011-P-A-31-US, November 2020.

12.0 References

1. "Nine Mile Point Nuclear Station, Unit 2 Renewed Facility Operating License", Constellation Document, Docket No. 50-410, Renewed License No. NPF-69.
2. "Supplemental Reload Licensing Report for Nine Mile Point Unit 2 Reload 18 Cycle 19", Global Nuclear Fuel Document, No. 006N2197, Revision 0, January 2022.
3. "Fuel Bundle Information Report for Nine Mile Point Unit 2 Reload 18 Cycle 19", Global Nuclear Fuel Document, No. 006N2198, Revision 0, December 2021.
4. "Nine Mile Point Nuclear Station Unit 2 Cycle 2 Equipment Out of Service Analysis", GE Nuclear Energy Document, No EAS 18-0390, April 1990
5. "Revised GNF2 Thermal Mechanical Operating Limits for Nine Mile Point Unit 2" Global Nuclear Fuel Document, No 005N5546, Revision 1, January 2020.
6. "Safety Analysis Report for Nine Mile Point Unit 2 Maximum Extended Load Line Limit Analysis Plus", GEH Document, No. NEDC-33576P, Revision 0, October 2013.
7. "Revise 22A2843AM", Engineering Change Notice for NSSS161405000 "Design Spec Data Sheet, Neutron Monitoring System", Constellation Document, No. 007242, Revision 1, April 2008.
8. "Instrument Limits Calculation Constellation Generation Group Nine Mile Point Nuclear Station Unit 2 Rod Block Monitor (NUMAC ARTS-MELLLA)", GEH Document, No. 0000-0053-1006 NMP2 A-M-T506-RBM-Calc-2006, Revision 1, March 2008.
9. "Nine Mile Point Unit 2 Cycle 19 Completed OPL-3 Form", Constellation Document, NF210576, Revision 0, September 2021.
10. "GNF3 Fuel Design Cycle-Independent Analyses for Exelon Nine Mile Point Nuclear Station Unit 2", GEH Document, No. 006N6601 Revision 1, January 2022.
11. "GNF2 Advantage Generic Compliance with NEDE-24011-P-A (GESTAR II)", Global Nuclear Fuel Document, No. NEDC-33270P, Revision 11, August 2020.
12. "GNF3 Generic Compliance with NEDE-24011-P-A (GESTAR II)", Global Nuclear Fuel Document, No NEDC-33879P, Revision 4, August 2020.
13. "Nine Mile Point Unit 2 Option B' Scram Speed Implementation", GEH Document, No. 004N0521-R0, September 2017.
14. "Nine Mile Point Unit 2 Cycle 19 Power Restriction with Moisture Separator Reheater Out Of Service", Global Nuclear Fuel Document, No. 006N9862-R0, February 2022.

CORE OPERATING LIMITS REPORT

FOR

NINE MILE POINT UNIT 2 CYCLE 19

(This is a complete re-write; no revision bars are used)

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Table of Contents

Summary of Revisions

Revision	Description
Revision 7	New Issue for Cycle 19

List of Tables

1.0 Terms and Definitions

ADS	Automatic Depressurization System
ADSOOS	Automatic Depressurization System Out of Service. ADSOOS is defined as any ADS valve inoperable.
APLHGR	Average Planar Linear Heat Generation Rate
APRM	Average Power Range Monitor
ARTS	Average Power Range Monitor, Rod Block Monitor, and Technical Specification (ARTS) improvements program
BSP	Backup Stability Protection
COLR	Core Operating Limits Report
DLO	Dual Loop Operation
ECCS	Emergency Core Cooling System
EIS	Equipment in Service
EOOS	Equipment Out of Service
EOR	End of Rated. The cycle exposure at which reactor power is equal to 100% rated (3988 MW_{th}), recirculation flow equal to 100% rated (108.5 Mlb/hr), and all control blades are fully withdrawn with equilibrium xenon.
EPU	Extended Power Uprate
GEH	General Electric-Hitachi
GNF	Global Nuclear Fuel
HFCL	High Flow Control Line
HTSP	High Power Trip Set Point (regarding RBM)
ICF	Increased Core Flow
INOP	Inoperable
ITSP	Intermediate Power Trip Set Point (regarding RBM)
K_P	Off-rated power dependent OLMCPR multiplier
LCO	Limiting Condition for Operation
LHGR	Linear Heat Generation Rate
$LHGRFAC_F$	Off-rated flow dependent LHGR multiplier
$LHGRFAC_P$	Off-rated power dependent LHGR multiplier
LOCA	Loss of Coolant Accident
LTSP	Low Power Trip Set Point (regarding RBM)
$MAPFAC_F$	Off-rated flow dependent MAPLHGR multiplier
$MAPFAC_P$	Off-rated power dependent MAPLHGR multiplier
MAPLHGR	Maximum Average Planar Linear Heat Generation Rate
MCPR	Minimum Critical Power Ratio
MCPR99.9%	Limiting MCPR value such that 99.9 percent of the fuel in the core is not susceptible to boiling transition. Also known as the cycle-specific SLMCPR.
$MCPR_F$	Off-rated flow dependent OLMCPR

$MCPR_P$	Off-rated power dependent OLMCPR
MELLLA	Maximum Extended Load Line Limit Analysis
MELLLA+	Maximum Extended Load Line Limit Analysis Plus
MSIVOOS	Main Steam Isolation Valve Out of Service
MSROOS	Moisture Separator Reheater Out of Service
NCL	Natural Circulation Line
NRC	Nuclear Regulatory Commission
OLMCPR	Operating Limit MCPR
OPRM	Oscillation Power Range Monitor
PLUOOS	Power Load Unbalance Out of Service
PROOS	Pressure Regulator Out of Service
RBM	Rod Block Monitor
RDF	Recirculation Drive Flow
RPTOOS	Recirculation Pump Trip Out of Service; also known as EOC-RPT
RTP	Rated Thermal Power (3988 MW_t)
RWE	Rod Withdrawal Error
SLMCPR	Safety Limit MCPR
SLO	Single Loop Operation
SRVOOS	Safety Relief Valve(s) Out of Service
TBV	Turbine Bypass Valve
TBVOOS	Turbine Bypass Valve Out of Service. TBVOOS supports 3 of 5 TBVs slow open and 2 of 5 TBVs do not slow open (stuck closed). TBVOOS also supports 5 TBV to not fast open.
TCV	Turbine Control Valve
TCVFASOOS	Turbine Control Valve Fast Acting Solenoid Out of Service
TCVOOS	Turbine Control Valve Out of Service
TS	Technical Specification
TSV	Turbine Stop Valve
TSVOOS	Turbine Stop Valve Out of Service

2.0 General Information

This report is prepared in accordance with Technical Specification (TS) 5.6.5 of Reference 1. Power and flow dependent limits are listed for various power and flow levels. Linear interpolation is to be used for intermediate values.

This report provides the values of the power distribution limits, control rod withdraw block instrumentation, and stability protection setpoints for Nine Mile Point Unit 2 Cycle 19.

This report provides the following cycle-specific parameter limits for Nine Mile Point Unit 2 Cycle 19 (Reload 18):

- Maximum Average Planar Linear Heat Generation Rate (MAPLHGR)
- Single Loop Operation (SLO) MAPLHGR multipliers
- Operating Limit Minimum Critical Power Ratio (OLMCPR)
- ARTS MCPR thermal limit adjustments and multipliers
- Single Loop Operation (SLO) MCPR adjustment
- Cycle-specific SLMCPRs (MCPR99.9%)
- Linear Heat Generation Rate (LHGR)
- ARTS LHGR thermal limit multipliers
- Single Loop Operation (SLO) LHGR multipliers
- Rod Block Monitor (RBM) Nominal Trip Setpoints, Allowable Values and MCPR Limits
- Turbine Bypass Valve (TBV) parameters
- Backup Stability Protection (BSP) parameters

The BASE thermal limit values shown in the tables are for normal, equipment in service (EIS) two loop operation. Analysis also supports Increased Core Flow (ICF) for operational flexibility. Additional equipment out of service (EOOS) applicability can be found in Section 8.0, Modes of Operation.

The data presented in this report is valid for all licensed operating domains on the operating map, including (Reference 2):

- Maximum Extended Load Line Limit Analysis Plus (MELLLA+) to a minimum core flow of 85% of rated.
- ICF up to 105% rated (rated core flow is 108.5 Mlb/hr).
- Extended Power Uprate (EPU) to 3988 MW_{th}.
- Coastdown operation down to 40% Rated Thermal Power (RTP)

3.0 MAPLHGR Limits

Technical Specification Sections 3.2.1, 3.4.1

The MAPLHGR limits obtained from the ECCS analysis are provided in Table 3-1 and Table 3-2 for GNF2 and GNF3 fuel respectively. The limiting MAPLHGR value for the most limiting lattice of each fuel type as a function of exposure is given. For SLO, a multiplier is used as shown in Table 3-3.

The power and flow dependent LHGR multipliers are sufficient to provide adequate protection for the off-rated conditions from an ECCS-LOCA analysis perspective and there is no need for MAPLHGR multipliers, in addition to off-rated LHGR multipliers per Reference 2 – Section 16.

Table 3-1
MAPLHGR Versus Average Planar Exposure
GNF2 Fuel
(Reference 2 – Table 8)

Average Planar Exposure [GWd/ST]	MAPLHGR Limit [kW/ft]
0.00	13.78
17.15	13.78
60.78	6.87
63.50	5.50

Table 3-2
MAPLHGR Versus Average Planar Exposure
GNF3 Fuel
(Reference 2 – Table 9)

Average Planar Exposure [GWd/ST]	MAPLHGR Limit [kW/ft]
0.00	14.36
21.22	13.01
40.82	10.75
57.60	8.00
63.50	6.00

Table 3-3
MAPLHGR SLO Multiplier
All Fuel Types
(Reference 2 – Table 10)

Fuel Type	SLO Multiplier
GNF2	0.78
GNF3	0.95

4.0 MCPR Limits

Technical Specification Sections 3.2.2, 3.3.4.1, 3.4.1, 3.7.5

OLMCPR values listed in Table 4-1 cover all conditions listed in Section 8.0, Modes of Operation. Additional EOOS information can be found in Section 8.0. ARTS provides for power and flow dependent thermal limits adjustments, which allow for a more reliable administration of the MCPR thermal limit. Per TS 3.2.2, all MCPR's shall be verified in accordance with limits specified in this section.

Control rod scram time verification is also required per TS 3.1.4, Control Rod Scram Times. The applicable MCPR thermal limit set shall be determined with Tau (τ), a measure of scram time performance throughout the cycle based on the cumulative plant scram time test results (Reference 13). The calculation of Tau shall be performed in accordance with site procedures.

The power dependent MCPR limits ($MCPR_P$) and multipliers (Kp) are provided in Table 4-2 for all fuel types. The flow dependent MCPR limits ($MCPR_F$) are provided in Tables 4-3 through 4-6. Table 4-3 for GNF2 fuel and Table 4-4 for GNF3 fuel are valid for DLO conditions. Table 4-5 for GNF2 fuel and Table 4- 6 for GNF3 fuel are valid for SLO conditions.

ARTS power and flow dependent thermal limits have been confirmed for the following modes of operation:

1. Base
2. TBVOOS combined with RPTOOS (TBVOOS + RPTOOS)
3. The combination of PLUOOS, PROOS, TCVFASOOS, and RPTOOS (PLUOOS + PROOS + TCVFASOOS + RPTOOS)
4. MSROOS
5. The combination of PLUOOS, PROOS, TCVFASOOS, RPTOOS, MSROOS, and TBVOOS (PLUOOS + PROOS + TCVFASOOS + RPTOOS + MSROOS + TBVOOS)

The cycle-specific exposure-dependent SLMCPRs, known as MCPR99.9%, can be found in Table 4-7 for dual loop and single loop operating conditions. The values in Table 4-7 or conservative values were used to calculate the MCPR limits and off-rated limits in this section.

Table 4-1
Operating Limit Minimum Critical Power Ratio (OLMCPR)
All Fuel Types
(Reference 2 – Section 11)

EOOS Combination	SCRAM Time Option[1]	Cycle Exposure		
		≤ 1779 MWd/ST	> 1779 MWd/ST & < EOR-4001 MWd/ST	≥ EOR-4001 MWd/ST
BASE	A	1.49	1.49	1.52
	B	1.43	1.36	1.39
BASE SLO[2]	A	1.52	1.52	1.55
	B	1.46	1.45	1.45
TBVOOS + RPTOOS	A	1.54	1.54	1.55
	B	1.43	1.38	1.39
TBVOOS + RPTOOS SLO[2]	A	1.57	1.57	1.58
	B	1.46	1.45	1.45
PLUOOS + PROOS + TCVFASOOS + RPTOOS	A	1.49	1.49	1.52
	B	1.43	1.36	1.39
PLUOOS + PROOS + TCVFASOOS + RPTOOS SLO[2]	A	1.52	1.52	1.55
	B	1.46	1.45	1.45
MSROOS	A	1.53	1.54	1.56
	B	1.43	1.40	1.42
MSROOS SLO[2]	A	1.56	1.57	1.59
	B	1.46	1.45	1.45
PLUOOS + PROOS + TCVFASOOS + RPTOOS + MSROOS + TBVOOS	A	1.58	1.58	1.58
	B	1.43	1.42	1.42
PLUOOS + PROOS + TCVFASOOS + RPTOOS + MSROOS + TBVOOS SLO[2]	A	1.61	1.61	1.61
	B	1.46	1.45	1.45

[1] For tau (τ) = 0, use SCRAM Time Option B limits. For (τ) = 1, use SCRAM Time Option A limits. When tau does not equal 0 or 1, use linear interpolation in accordance with site procedure to calculate OLMCPR.

[2] For single-loop operation, the MCPR operating limit is 0.03 greater than the analyzed DLO value. However, a minimum value of 1.45 for all fuel types is required to bound the Recirculation Pump Seizure Event (Reference 2).

Table 4-2
Power Dependent MCPR Limits ($MCPR_P$) and Multipliers (K_P)
All Fuel Types
(Reference 2 – Appendix D)

EOOS Combination	Core Flow [% of rated]	Core Thermal Power [% of rated]									
		0	23	≤26	>26	30	55	65	≤85	>85	100
		Operating Limit $MCPR_P$			Operating Limit MCPR Multiplier (K_P)						
BASE	≥50	2.33	2.33	2.32	1.278	1.266	1.188	1.130	1.056		1.000
	<50	2.29	2.29	2.28							
BASE SLO	≥50	2.36	2.36	2.35	1.278	1.266	1.188	1.130	1.056		1.000
	<50	2.32	2.32	2.31							
TBVOOS + RPTOOS	≥50	2.67	2.67	2.56	1.278	1.266	1.188	1.130	1.056		1.000
	<50	2.54	2.54	2.39							
TBVOOS + RPTOOS SLO	≥50	2.70	2.70	2.59	1.278	1.266	1.188	1.130	1.056		1.000
	<50	2.57	2.57	2.42							
PLUOOS + PROOS + TCVFASOOS + RPTOOS	≥50	2.33	2.33	2.33	1.289	1.277	1.198	1.178	1.072	1.056	1.000
	<50	2.29	2.29	2.28							
PLUOOS + PROOS + TCVFASOOS + RPTOOS SLO	≥50	2.36	2.36	2.36	1.289	1.277	1.198	1.178	1.072	1.056	1.000
	<50	2.32	2.32	2.31							
MSROOS	≥50	2.34	2.34	2.34	1.278	1.266	1.188	1.130	1.056		1.000
	<50	2.30	2.30	2.30							
MSROOS SLO	≥50	2.37	2.37	2.37	1.278	1.266	1.188	1.130	1.056		1.000
	<50	2.33	2.33	2.33							
PLUOOS + PROOS + TCVFASOOS + RPTOOS + MSROOS + TBVOOS	≥50	2.67	2.67	2.56	1.289	1.277	1.198	1.178	1.072	1.056	1.000
	<50	2.54	2.54	2.39							
PLUOOS + PROOS + TCVFASOOS + RPTOOS + MSROOS + TBVOOS SLO	≥50	2.70	2.70	2.59	1.289	1.277	1.198	1.178	1.072	1.056	1.000
	<50	2.57	2.57	2.42							

Table 4-3
Flow Dependent MCPR Limits ($MCPR_F$) for DLO
GNF2 Fuel
(Reference 2 – Appendix D)

Flow [% of rated]	$MCPR_F$ Limit
0.0	2.01
30.0	1.78
94.2	1.29
112.0	1.29

Table 4-4
Flow Dependent MCPR Limits ($MCPR_F$) for DLO
GNF3 Fuel
(Reference 2 – Appendix D)

Flow [% of rated]	$MCPR_F$ Limit
0.0	1.82
30.0	1.61
89.5	1.20
105.0	1.20

Table 4-5
Flow Dependent MCPR Limits ($MCPR_F$) for SLO
GNF2 Fuel
(Reference 2 – Appendix D)

Flow [% of rated]	$MCPR_F$ Limit
0.0	2.04
30.0	1.81
94.2	1.32
112.0	1.32

Table 4-6
Flow Dependent MCPR Limits ($MCPR_F$) for SLO
GNF3 Fuel
(Reference 2 – Appendix D)

Flow [% of rated]	$MCPR_F$ Limit
0.0	1.85
30.0	1.64
89.5	1.23
105.0	1.23

Table 4-7
Cycle Specific SLMCPR (MCPR99.9%)
(Reference 2 – Section 11)

Flow Mode	MCPR99.9%	
	< 8500 MWd/ST	≥ 8500 MWd/ST
DLO	1.10	1.11
SLO	1.12	1.12

5.0 LHGR Limits

Technical Specification Section 3.2.3

The LHGR limit is the product of the exposure dependent LHGR limit and the minimum of the $LHGRFAC_P$ or the $LHGRFAC_F$.

The off-rated limits assumed in the ECCS-LOCA analyses are confirmed to be consistent with the cycle-specific off-rated LHGR multipliers calculated for MELLLA+ operation. The off-rated LHGR multipliers provide adequate protection for MELLLA+ operation (Reference 2).

Table 5-1
LHGR Limits for UO_2 Fuel Rods
(Reference 3, Reference 5, Reference 11, Reference 12)

Fuel Type	LHGR Limit [kW/ft]
GNF2	See Reference 5
GNF3	See Reference 12

Table 5-2
LHGR Limits for Gadolinia Rods
(Reference 3, Reference 5, Reference 11, Reference 12)

Fuel Type	LHGR Limit [kW/ft]
GNF2	See Reference 5
GNF3	See Reference 12

Table 5-3
Power Dependent LHGR Multipliers ($LHGRFAC_P$)
GNF2 Fuel
DLO and SLO
(Reference 2 – Appendix D)

EOOS Combination	Core Flow [% of rated]	Core Thermal Power [% of rated]							
		0	23	≤26	>26	55	60	85	100
BASE	≥75				0.613	0.720	0.791	0.922	1.000
	<75	0.495	0.495	0.502					
TBVOOS + RPTOOS	≥75				0.613	0.720	0.791	0.922	1.000
	<75	0.475	0.475	0.502					
PLUOOS + PROOS + TCVFASOOS + RPTOOS	≥75				0.613	0.720	0.740	0.831	1.000
	<75	0.495	0.495	0.502					
MSROOS	≥75				0.613	0.720	0.791	0.922	1.000
	<75	0.495	0.495	0.502					
PLUOOS + PROOS + TCVFASOOS + RPTOOS + MSROOS + TBVOOS	≥75				0.613	0.720	0.740	0.831	1.000
	<75	0.475	0.475	0.502					

Table 5-4
Power Dependent LHGR Multipliers ($LHGRFAC_P$)
GNF3 Fuel
DLO and SLO
(Reference 2 – Appendix D)

EOOS Combination	Core Flow [% of rated]	Core Thermal Power [% of rated]								
		0	23	≤26	>26	30	55	65	85	100
BASE	≥50	0.430	0.430	0.440	0.630	0.650	0.760	0.980	1.000	1.000
	<50	0.430	0.430	0.440						
TBVOOS + RPTOOS	≥50	0.430	0.430	0.440	0.630	0.650	0.760	0.870	0.970	1.000
	<50	0.430	0.430	0.440						
PLUOOS + PROOS + TCVFASOOS + RPTOOS	≥50	0.430	0.430	0.440	0.630	0.650	0.760	0.850	0.960	1.000
	<50	0.430	0.430	0.440						
MSROOS	≥50	0.430	0.430	0.440	0.630	0.650	0.760	0.980	1.000	1.000
	<50	0.430	0.430	0.440						
PLUOOS + PROOS + TCVFASOOS + RPTOOS + MSROOS + TBVOOS	≥50	0.430	0.430	0.440	0.630	0.650	0.760	0.810	0.920	1.000
	<50	0.430	0.430	0.440						

Table 5-5
Flow Dependent LHGR Multipliers ($LHGRFAC_F$)
GNF2 Fuel
All Modes of Operation
(Reference 2 – Appendix D and Table 10)

EOOS Condition	Core Flow [% of rated]					
	0	30	40	52.7	85	112
DLO	0.241	0.580	0.693		1.000	1.000
SLO	0.241	0.580	0.693	0.780	0.780	0.780

Table 5-6
Flow Dependent LHGR Multipliers ($LHGRFAC_F$)
GNF3 Fuel
All Modes of Operation
(Reference 2 – Appendix D and Table 10)

EOOS Condition	Core Flow [% of rated]				
	0	30	74.3	80	105
DLO	0.298	0.561		1.000	1.000
SLO	0.298	0.561	0.950	0.950	0.950

6.0 Rod Block Monitor Setpoints

Technical Specification Section 3.3.2.1

Per Technical Specifications 3.3.2.1, the RBM instrumentation channels will be operable with the allowable values set to the values shown in Table 6-1. The values given in Table 6-1 are unfiltered; these unfiltered values are applicable as the time filter constant is set to zero. (Reference 7 – Table 5B). The RBM operability requirements have been evaluated and shown to be sufficient to ensure that the cycle specific exposure dependent SLMCPR and cladding 1% plastic strain criteria will not be exceeded in the event of a Rod Withdrawal Error.

The ARTS RWE analysis validated the MCPR values in Table 6-2 below for use in Cycle 19. The RWE MCPR values have been analyzed at discrete setpoint values and unblocked (continuous withdrawal) conditions.

Table 6-1
Rod Block Monitor Setpoints[3]
(Reference 2 – Section 10, Reference 8 – Section 3)

Power Level	Allowable Value	Nominal Trip Setpoint	Analytical Limit
LTSP	124.6%	124.2%	127.0%
ITSP	119.6%	119.2%	122.0%
HTSP	114.6%	114.2%	117.0%

Table 6-2
ARTS RWE Validated MCPR Values
(Reference 2 – Section 10)

Power Level [% of Rated]	MCPR
<90%	≥1.76
≥90%	≥1.45

[3] See Reference 8 for filtered values. NMP2C19 is analyzed for the following RBM set points which correspond to set D from Reference 8. However, the station may elect to have more restrictive state points listed in Reference 8 Section 3.

7.0 Turbine Bypass Valve Parameters

Technical Specification Section 3.7.5

Per Technical Specification LCO 3.7.5, whenever the reactor power is at or above 23% RTP the main turbine bypass system shall be operable or the plant must operate with the TBVOOS penalties. The definition of operable is given in Table 7-1 below.

Table 7-1
Turbine Bypass Valve Response Time
(Reference 9 – Section 1.6)

Event	Response Time [sec]
Maximum delay time before start of bypass valve opening following initial turbine inlet valve movement	0.15
Maximum time after initial turbine inlet valve movement for bypass valve position to reach 80% of full flow (includes the above delay time)	0.30

8.0 Modes of Operation

The following conditions are supported by the Cycle 19 licensing analysis; operation in a condition (or conditions) is controlled by station procedures. If a combination of options is not listed, it is not supported. Table 8-1 provides allowed modes of operation with thermal limit sets in the COLR. Table 8-2 provides allowed modes of operation that do not contain explicit thermal limit sets but are included in the BASE option.

Note that per TS LCO 3.4.1, SLO in the MELLLA and MELLLA+ domains is prohibited (Reference 1). The MELLLA+ domain and the MELLLA domain upper boundary are defined in Figure 1. The MELLLA domain lower boundary is bounded by the 95% load line (Ref 4). Refer to site power-flow map drawings for allowed SLO regions.

Table 8-1
Modes of Operation
(Reference 2, Reference 10)

Options[4]	Allowed Operating Region
BASE	Yes
BASE SLO	Yes
TBVOOS + RPTOOS[5]	Yes
TBVOOS + RPTOOS SLO[5]	Yes
PLUOOS + PROOS + TCVFASOOS + RPTOOS[6]	Yes
PLUOOS + PROOS + TCVFASOOS + RPTOOS SLO[6]	Yes
MSROOS	Yes
MSROOS SLO	Yes
PLUOOS + PROOS + TCVFASOOS + RPTOOS + MSROOS +TBVOOS[5,6,7]	Yes
PLUOOS + PROOS + TCVFASOOS + RPTOOS + MSROOS +TBVOOS SLO[5,6,7]	Yes

Table 8-2
EOOS Conditions Included under BASE Option
(Reference 2, Reference 10)

EOOS Condition[8]
SRVOOS
ADSOOS[9]
MSIVOOS[10]
TCV/TSVOOS[5,6]

[4] The EOOS Options listed apply to both Option A and Option B
[5] TCV/TSVOOS not analyzed concurrent with TBVOOS + RPTOOS or PLUOOS + PROOS + TCVFASOOS + RPTOOS + MSROOS +TBVOOS
[6] 1 TCV/TSVOOS limited to 85% rated thermal power.
[7] MSROOS + TBVOOS is restricted to 92% power (Reference 14)
[8] Base includes 2 SRVOOS, 1 MSIVOOS (limited to 75% power), 1 TCV/TSVOOS (limited to 85% power), and 1 ADSOOS
[9] ADSOOS defined as 1 ADS valve out of service only in the relief function. LCO 3.5.1 (Reference 1) allows a single ADS valve inoperable for 14 days.
[10] 1 MSIVOOS limited to 75% rated thermal power

9.0 Stability Protection

Technical Specification Section 3.3.1.1

The OPRM Amplitude Discriminator Setpoint (S_{AD}) is 1.10 (Reference 2 – Section 15.1). Results have been validated with rated feedwater temperature ≥ 420.5°F as described by Reference 2. Per TS 5.6.5.a.4, the Backup Stability Protection (BSP) regions and values are as shown below in Tables 9-1 and 9-2. The manual BSP region boundary endpoints are connected using the Generic Shape Function. A graphical representation of the BSP regions can be found in Reference 2 – Figure 1.

Table 9-1
BSP Endpoints for Normal Feedwater Temperature[11,12]
(Reference 2 – Table 4)

Endpoint	Power [% of rated]	Flow [% of rated]	Definition
A1	70.4	45.3	Scram Region Boundary, HFCL
B1	39.5	29.5	Scram Region Boundary, NCL
A2	64.5	50.0	Controlled Entry Region Boundary, HFCL
B2	27.5	28.9	Controlled Entry Region Boundary, NCL

Note: The BSP Boundary for Normal Feedwater Temperature is defined by the MELLLA boundary line, per Reference 2. See Figure 1 in Reference 2.

Table 9-2
Automated BSP Setpoints[13]
(Reference 2 – Table 5)

Parameter	Symbol	Value
Slope of Automated BSP APRM flow-biased trip linear segment.	m_{TRIP}	1.26
Automated BSP APRM flow-biased trip setpoint power intercept. Constant Power Line for Trip from zero Drive Flow to Flow Breakpoint value.	$P_{BSP-TRIP}$	39.5% RTP
Automated BSP APRM flow-biased trip setpoint drive flow intercept. Constant Flow Line for Trip.	$W_{BSP-TRIP}$	39.2% RDF
Flow Breakpoint value.	$W_{BSP-BREAK}$	20.4% RDF

[11] Bounding for both DLO and SLO
[12] Station may elect to place additional administrative margin on the endpoints provided in Table 9-1
[13] Applicable to both DLO and SLO

10.0 Power Flow Operating Map

Per M+LTR SER Limitation and Condition 12.5.c, the MELLLA+ Power/Flow operating map is provided as Figure 1.

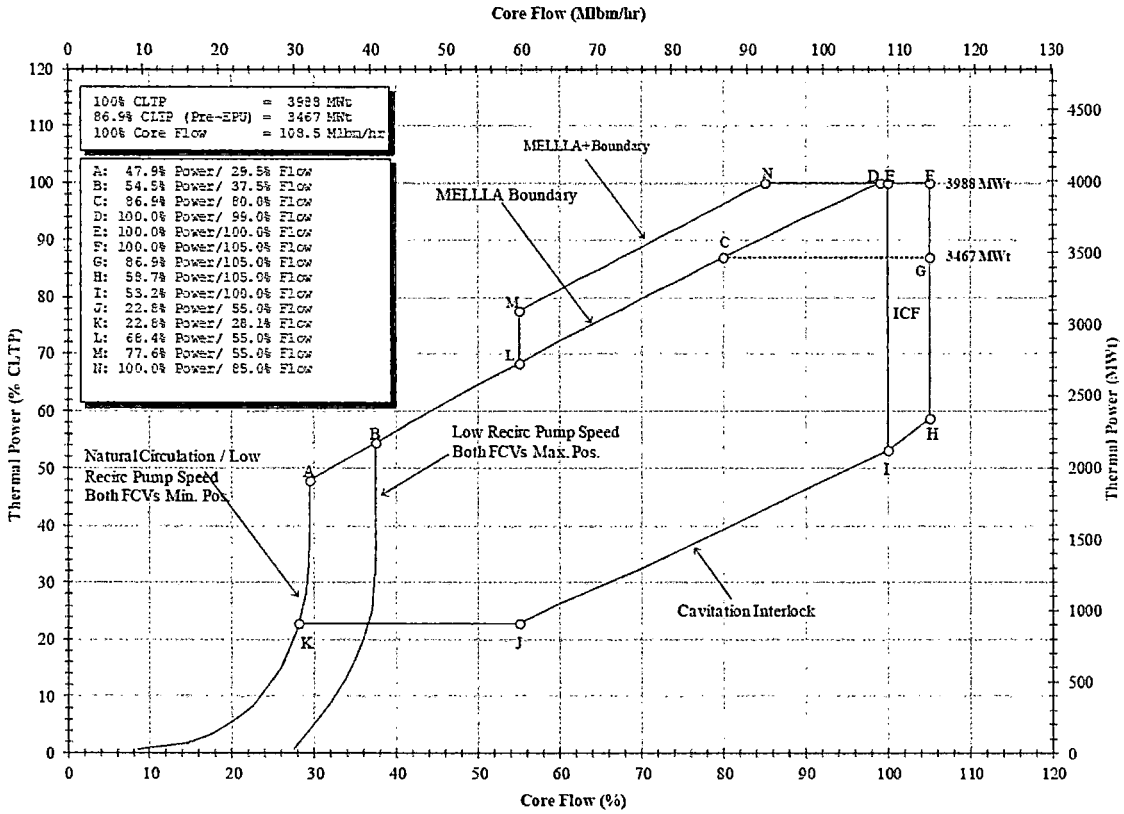

Figure 1: Power/Flow Operating Map for MELLLA+ in Dual Loop Operation (Reference 6)

11.0 Methodology

The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the Nuclear Regulatory Commission, particularly those described in the following documents:

1. "General Electric Standard Application for Reactor Fuel (GESTAR II) (Supplement for United States)", NEDE-24011-P-A-31-US, November 2020.

12.0 References

1. "Nine Mile Point Nuclear Station, Unit 2 Renewed Facility Operating License", Constellation Document, Docket No. 50-410, Renewed License No. NPF-69.
2. "Supplemental Reload Licensing Report for Nine Mile Point Unit 2 Reload 18 Cycle 19", Global Nuclear Fuel Document, No. 006N2197, Revision 0, January 2022.
3. "Fuel Bundle Information Report for Nine Mile Point Unit 2 Reload 18 Cycle 19", Global Nuclear Fuel Document, No. 006N2198, Revision 0, December 2021.
4. "Nine Mile Point Nuclear Station Unit 2 Cycle 2 Equipment Out of Service Analysis", GE Nuclear Energy Document, No EAS 18-0390, April 1990
5. "Revised GNF2 Thermal Mechanical Operating Limits for Nine Mile Point Unit 2" Global Nuclear Fuel Document, No 005N5546, Revision 1, January 2020.
6. "Safety Analysis Report for Nine Mile Point Unit 2 Maximum Extended Load Line Limit Analysis Plus", GEH Document, No. NEDC-33576P, Revision 0, October 2013.
7. "Revise 22A2843AM", Engineering Change Notice for NSSS161405000 "Design Spec Data Sheet, Neutron Monitoring System", Constellation Document, No. 007242, Revision 1, April 2008.
8. "Instrument Limits Calculation Constellation Generation Group Nine Mile Point Nuclear Station Unit 2 Rod Block Monitor (NUMAC ARTS-MELLLA)", GEH Document, No. 0000-0053-1006 NMP2 A-M-T506-RBM-Calc-2006, Revision 1, March 2008.
9. "Nine Mile Point Unit 2 Cycle 19 Completed OPL-3 Form", Constellation Document, NF210576, Revision 0, September 2021.
10. "GNF3 Fuel Design Cycle-Independent Analyses for Exelon Nine Mile Point Nuclear Station Unit 2", GEH Document, No. 006N6601 Revision 1, January 2022.
11. "GNF2 Advantage Generic Compliance with NEDE-24011-P-A (GESTAR II)", Global Nuclear Fuel Document, No. NEDC-33270P, Revision 11, August 2020.
12. "GNF3 Generic Compliance with NEDE-24011-P-A (GESTAR II)", Global Nuclear Fuel Document, No NEDC-33879P, Revision 4, August 2020.
13. "Nine Mile Point Unit 2 Option B' Scram Speed Implementation", GEH Document, No. 004N0521-R0, September 2017.
14. "Nine Mile Point Unit 2 Cycle 19 Power Restriction with Moisture Separator Reheater Out Of Service", Global Nuclear Fuel Document, No. 006N9862-R0, February 2022.