Attachment C

# Core Operating Limits Report

for

Dresden Unit 3 Cycle 18A

Revision 1

Non - Proprietary Information

# Core Operating Limits Report

for

Dresden Unit 3 Cycle 18A

Revision 1

# Issuance of Changes Summary

| Affected Sections | Affected Pages | Summary of Changes | Revision | Date |
|---|---|---|---|---|
| All | All | Original Issue (Cycle 18A) | 0 | 12/03 |
| 2 and 3 | iv, v, 2-3, 2-4, 3-1 thru 3-4 | Revision 1 – COLR revision to remove Control Blade History (CBH) impact on LHGR. Deleted the references (15 and 24) that previously implemented the CBH penalties and Reference 14. Additionally, removed Reference 14 from Tables 2-1 and 2-2 because the reference is no longer applicable. | 1 | 3/04 |

# Table of Contents

# References


1. Exelon Generation Company, LLC Docket No. 50-249, Dresden Nuclear Power Station, Unit 3 Facility Operating License, License No. DPR-25.

2. Letter from D. M. Crutchfield to All Power Reactor Licensees and Applicants, Generic Letter 88-16; Concerning the Removal of Cycle-Specific Parameter Limits from Tech Specs, October 3, 1988.

3. "Supplemental Reload Licensing Report for DRESDEN UNIT 3 Reload 17 Cycle 18", 0000-0006-9848-SRLR, Revision 2, October 2003. TODI NF0200124 Revision 1, December 2003.

4. "Determination of D3C18 MICROBURN GE14 LHGR Limits", BNDD:02-001, Revision 1, June 18, 2002.

5. "DRESDEN 2 and 3 QUAD CITIES 1 and 2 Equipment Out-Of-Service and Legacy Fuel Transient Analysis", GE-NE-J11-03912-00-01-R2, TODI NFM0100091 Sequence 02, September 2003.

6. "Instrument Setpoint Calculation Nuclear Instrumentation Rod Block Monitor Dresden 2 & 3", GE DRF C51-00217-01, December 15, 1999.

7. "OPL-3 Parameters for Dresden Unit 3 Cycle 18 Transient Analysis", TODI NF2002-9994, April 5, 2002.

8. "Fuel Mechanical Design Report Exposure Extension for ATRIUM-9B Fuel Assemblies at Dresden, Quad Cities, and LaSalle Units", EMF-2563(P) Revision 1, TODI NFM0100107 Sequence 0, August 2001.

9. "Determination of Generic $MCPR_F$ Limits", BNDG:02-001, Revision 0, May 17, 2002.

10. General Electric Standard Application for Reactor Fuel (GESTAR II) and US supplement, NEDE-24011-P-A-14, June 2000.

11. Letter from Carlos de la Hoz to Doug Wise and Alex Misak, "Approval of GE Evaluation of MSIV out of Service for Dresden and Quad Cities", NFM-MW:02-0274, dated August 2, 2002.

12. "Dresden Unit 3 Cycle 18 FRED Form Revision 2", TODI NFM0200041 Sequence 02, April 24, 2002.

13. Letter from Russell Lindquist (GNF) to Jim Nevling (Exelon), "NFM-MW-B088 D3C18 Licensing Applicability Review", FRL02DR3-007, dated August 26, 2002.

14. Deleted

15. Deleted

16. "Single Loop Operation (SLO) LHGR Limits", TGO:03-008, May 30, 2003.

17. "SAFER/GESTR – LOCA Loss-of-Coolant Accident Analysis for Dresden Nuclear Station 2 and 3 and Quad Cities Nuclear Station Units 1 and 2", NEDC-32990P, Revision 2, September 2003. TODI NF0100086 Sequence 02, October 2003.

18. "Approval of GE Evaluation of Dresden and Quad Cities Pressure Regulator Out of Service Analysis", NF-MW:02-0413, October 22, 2002.

19. Letter from R. Lindquist to J. Nevling, "Dresden and Quad Cities Equipment Out of Service (EOOS) Interpretation Letter", FRL02EX-011, dated September 6, 2002.

20. Letter from Candice Chou to Alex Misak and Doug Wise, "Dresden and Quad Cities Operation with one TSV OOS", NF-MW:03-069, July 28, 2003.

21. Letter from Carlos de la Hoz to Doug Wise and Alex Misak, "Approval of GE evaluation of Dresden and Quad Cities Extended Final Feedwater Temperature Reduction," NF-MW:02-0081, August 27, 2002.

22. Letter from R. Lindquist to J. Nevling, "Licensing Analysis Applicability based on D3C18A final loading pattern, TSD NF-MW-175", FRL-EXN-EB3-03-005, dated December 15, 2003.

23. EC 346302: Justification of the Applicability of D3C18 Licensing Analyses, Associated Results, and Neutronic Analyses to the D3C18A cycle.

24. Deleted

## 1. Average Planar Linear Heat Generation Rate

### 1.1 Technical Specification Reference:

Sections 3.2.1 and 3.4.1.

### 1.2 Description:

Tables 1-1 and 1-2 are used to determine the maximum average planar linear heat generation rate (MAPLHGR) limit for each fuel type. Limits listed in Tables 1-1 and 1-2 are for Dual Reactor Recirculation Loop Operation.

For Single Reactor Recirculation Loop Operation (SLO), the MAPLHGR limits given in Tables 1-1 and 1-2 must be multiplied by a SLO MAPLHGR multiplier from Table 1-3.

Table 1-1
Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) for All ATRIUM-9B Fuel
ATRM9-P9DATB326-11GZ-SPC80M-9WR-144-T6-2447
ATRM9-P9DATB326-11GZ-SPC80M-9WR-144-T6-2448
ATRM9-P9DATB339-6GZ-SPC80M-9WR-144-T6-2449
ATRM9-P9DATB362-12GZ-SPC100T-9WR-144-T6-2450
ATRM9-P9DATB360-12GZ-SPC100T-9WR-144-T6-2451
ATRM9-P9DATB378-13GZ-SPC100T-9WR-144-T6-2464
ATRM9-P9DATB378-11GZ-SPC100T-9WR-144-T6-2465
(Reference 3 and 13)

| Planar Average Exposure (GWd/MTU) | MAPLHGR (kW/ft) |
|---|---|
| 0.00 | 13.52 |
| 17.25 | 13.52 |
| 70.00 | 7.84 |

Table 1-2
Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) for All GE14 Fuel
GE14-P10DNAB408-16GZ-100T-145-T6-2554
GE14-P10DNAB411-4G7.0/9G6.0-100T-145-T6-2553
(Reference 3)

| Planar Average Exposure (GWd/MTU) | MAPLHGR (kW/ft) |
|---|---|
| 0.00 | 11.68 |
| 16.00 | 11.68 |
| 55.12 | 8.01 |
| 63.50 | 6.97 |
| 70.00 | 4.36 |

## Table 1-3
## Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) SLO Multipliers for All Fuel Types

(Reference 3)

| Fuel Product Line | SLO MAPLHGR Multiplier |
|---|---|
| ATRIUM-9B | 0.84 |
| GE-14 | 0.77 |

## 2. Minimum Critical Power Ratio

### 2.1 Technical Specification Reference:

Sections 3.2.2, 3.4.1 and 3.7.7.

### 2.2 Description:

The various MCPR limits are described below.

#### 2.2.1 Manual Flow Control MCPR Limits

The Operating Limit MCPR (OLMCPR) is determined from either section 2.2.1.1 or 2.2.1.2, whichever is greater at any given power and flow condition.

##### 2.2.1.1 Power-Dependent MCPR

For operation at less than 38.5% core thermal power, the OLMCPR as a function of core thermal power is shown in Table 2-3. For operation at greater than 38.5% core thermal power, the OLMCPR as a function of core thermal power is determined by multiplying the applicable EOOS condition limit shown in Table 2-1 or 2-2 by the applicable MCPR multiplier $K_P$ given in Table 2-3. For operation at exactly 38.5% core thermal power, the OLMCPR as a function of core thermal power is the higher of either of the two aforementioned methods evaluated at exactly 38.5% core thermal power.

##### 2.2.1.2 Flow-Dependent MCPR

Tables 2-4 and 2-5 provide the $MCPR_F$ limit as a function of flow. The $MCPR_F$ limit determined from these tables is the flow dependent OLMCPR.

#### 2.2.2 Automatic Flow Control MCPR Limits

Automatic Flow Control MCPR Limits are not provided.

### 2.2.3 Option A and Option B

Option A and Option B refer to scram speeds.

Option A scram speed is the Improved Technical Specification scram speed. The core average scram speed insertion time for 20% insertion must be less than or equal to the Technical Specification Scram Speed to utilize Option A MCPR limits. Reload analyses performed by Global Nuclear Fuel (GNF) applicable for Cycle 18A Option A MCPR limits utilized a 20% core average insertion time of 0.900 seconds (Reference 7).

To utilize the MCPR limits for the Option B scram speed, the core average scram insertion time for 20% insertion must be less than or equal to 0.694 seconds (Reference 7). If the core average scram insertion time does not meet the Option B criteria, but is within the Option A criteria, the appropriate MCPR value may be determined from a linear interpolation between the Option A and B limits with standard mathematical rounding to two decimal places. When performing a linear interpolation to determine MCPR limits, ensure that the time used for Option A is 0.900 seconds, which is the 20% insertion time utilized by GNF in the reload analysis.

### 2.2.4 Recirculation Pump Motor Generator Settings

Cycle 18A was analyzed with a maximum core flow runout of 110%; therefore the Recirculation Pump Motor Generator scoop tube mechanical and electrical stops must be set to maintain core flow less than 110% (107.8 Mlb/hr) for all runout events (Reference 12 Section 15). This value is consistent with the analyses of Reference 5.

## Table 2-1
## MCPR Option A Based Operating Limits
(Reference 3)

| EOOS Combination | Fuel Type | Cycle Exposure | |
|---|---|---|---|
| | | <EOR[1]-1663 MWd/MT | ≥EOR[1]-1663 MWd/MT |
| Base Case | GE14 | 1.53 | 1.65 |
| | ATRIUM-9B | 1.52 | 1.61 |
| Base Case SLO | GE14 | 1.54 | 1.66 |
| | ATRIUM-9B | 1.53 | 1.62 |
| TBPOOS | GE14 | 1.73 | 1.75 |
| | ATRIUM-9B | 1.67 | 1.69 |
| TBPOOS SLO | GE14 | 1.74 | 1.76 |
| | ATRIUM-9B | 1.68 | 1.70 |
| TCV Slow Closure | GE14 | 1.63 | 1.65 |
| | ATRIUM-9B | 1.58 | 1.61 |
| TCV Slow Closure SLO | GE14 | 1.64 | 1.66 |
| | ATRIUM-9B | 1.59 | 1.62 |
| PLUOOS | GE14 | 1.68 | 1.68 |
| | ATRIUM-9B | 1.63 | 1.63 |
| PLUOOS SLO | GE14 | 1.69 | 1.69 |
| | ATRIUM-9B | 1.64 | 1.64 |
| TCV Stuck Closed | GE14 | 1.53 | 1.65 |
| | ATRIUM-9B | 1.52 | 1.61 |
| TCV Stuck Closed SLO | GE14 | 1.54 | 1.66 |
| | ATRIUM-9B | 1.53 | 1.62 |

1. EOR refers to the end of rated power (i.e., 100% power/100% flow operation with all rods out)

# Table 2-2
## MCPR Option B Based Operating Limits
(Reference 3)

| EOOS Combination | Fuel Type | Cycle Exposure | |
|---|---|---|---|
| | | <EOR[1]-1663 MWd/MT | ≥EOR[1]-1663 MWd/MT |
| Base Case | GE14 | 1.42 | 1.48 |
| | ATRIUM-9B | 1.41 | 1.44 |
| Base Case SLO | GE14 | 1.43 | 1.49 |
| | ATRIUM-9B | 1.42 | 1.45 |
| TBPOOS | GE14 | 1.56 | 1.58 |
| | ATRIUM-9B | 1.50 | 1.52 |
| TBPOOS SLO | GE14 | 1.57 | 1.59 |
| | ATRIUM-9B | 1.51 | 1.53 |
| TCV Slow Closure | GE14 | 1.46 | 1.48 |
| | ATRIUM-9B | 1.41 | 1.44 |
| TCV Slow Closure SLO | GE14 | 1.47 | 1.49 |
| | ATRIUM-9B | 1.42 | 1.45 |
| PLUOOS | GE14 | 1.51 | 1.51 |
| | ATRIUM-9B | 1.46 | 1.46 |
| PLUOOS SLO | GE14 | 1.52 | 1.52 |
| | ATRIUM-9B | 1.47 | 1.47 |
| TCV Stuck Closed | GE14 | 1.43 | 1.48 |
| | ATRIUM-9B | 1.43 | 1.44 |
| TCV Stuck Closed SLO | GE14 | 1.44 | 1.49 |
| | ATRIUM-9B | 1.44 | 1.45 |

1. EOR refers to the end of rated power (i.e., 100% power/100% flow operation with all rods out)

# Table 2-3
# $MCPR_P$ for All Fuel Types

(Reference 5)

| EOOS Combination | Core Flow (% of rated) | Core Thermal Power (% of rated) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 25 | 38.5 | 38.5 | 45 | 60 | 70 | 70 | 100 |
| | | Operating Limit MCPR | | | Operating Limit MCPR Multiplier, $K_P$ | | | | | |
| Base Case | ≤ 60 | 3.16 | 2.58 | 2.27 | 1.32 | 1.28 | 1.15 | [redacted] | [redacted] | 1.00 |
| | > 60 | 3.77 | 2.99 | 2.56 | | | | | | |
| Base Case SLO | ≤ 60 | 3.17 | 2.59 | 2.28 | 1.32 | 1.28 | 1.15 | [redacted] | [redacted] | 1.00 |
| | > 60 | 3.78 | 3.00 | 2.57 | | | | | | |
| TBPOOS | ≤ 60 | 5.55 | 3.77 | 2.82 | 1.37 | 1.28 | 1.15 | [redacted] | [redacted] | 1.00 |
| | > 60 | 6.79 | 4.62 | 3.45 | | | | | | |
| TBPOOS SLO | ≤ 60 | 5.56 | 3.78 | 2.83 | 1.37 | 1.28 | 1.15 | [redacted] | [redacted] | 1.00 |
| | > 60 | 6.80 | 4.63 | 3.46 | | | | | | |
| TCV Slow Closure | ≤ 60 | 5.55 | 3.77 | 2.82 | 1.64 | [redacted] | 1.45 | 1.26 | 1.11 | 1.00 |
| | > 60 | 6.79 | 4.62 | 3.45 | | | | | | |
| TCV Slow Closure SLO | ≤ 60 | 5.56 | 3.78 | 2.83 | 1.64 | [redacted] | 1.45 | 1.26 | 1.11 | 1.00 |
| | > 60 | 6.80 | 4.63 | 3.46 | | | | | | |
| PLUOOS | ≤ 60 | 5.55 | 3.77 | 2.82 | 1.64 | [redacted] | 1.45 | 1.26 | 1.11 | 1.00 |
| | > 60 | 6.79 | 4.62 | 3.45 | | | | | | |
| PLUOOS SLO | ≤ 60 | 5.56 | 3.78 | 2.83 | 1.64 | [redacted] | 1.45 | 1.26 | 1.11 | 1.00 |
| | > 60 | 6.80 | 4.63 | 3.46 | | | | | | |
| TCV Stuck Closed | ≤ 60 | 3.16 | 2.58 | 2.27 | 1.32 | 1.28 | 1.15 | [redacted] | [redacted] | 1.00 |
| | > 60 | 3.77 | 2.99 | 2.56 | | | | | | |
| TCV Stuck Closed SLO | ≤ 60 | 3.17 | 2.59 | 2.28 | 1.32 | 1.28 | 1.15 | [redacted] | [redacted] | 1.00 |
| | > 60 | 3.78 | 3.00 | 2.57 | | | | | | |

Notes for Table 2-3:

- Values are interpolated between relevant power levels.
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power multiplier, $K_P$, should be applied.
- Allowable EOOS conditions are listed in Section 5.
- $MCPR_P$ limits are independent of scram speed.

## Table 2-4
## $MCPR_F$ limits for All Fuel Types and All Operating Conditions except TCV Stuck Closed

(Reference 9)

| Flow (% rated) | $MCPR_F$ |
|---|---|
| 110.0 | 1.22 |
| 100.0 | 1.22 |
| 0.0 | 1.86 |

Notes for Tables 2-4:

- Values are interpolated between relevant flow values.
- Rated flow is 98 Mlb/hr.
- $MCPR_F$ limit is independent of scram speed.
- This table is not applicable to TCV Stuck Closed operating conditions.

## Table 2-5
## $MCPR_F$ limits for All Fuel Types with a TCV Stuck Closed

(Reference 9)

| Flow (% rated) | $MCPR_F$ |
|---|---|
| 110.0 | 1.27 |
| 108.9 | 1.27 |
| 0.0 | 1.97 |

Notes for Tables 2-5:

- Values are interpolated between relevant flow values.
- Rated flow is 98 Mlb/hr.
- $MCPR_F$ limit is independent of scram speed.
- This table is only applicable to TCV Stuck Closed operating conditions.

## 3. Linear Heat Generation Rate

### 3.1 Technical Specification Reference:

Section 3.2.3.

### 3.2 Description:

The linear heat generation rate (LHGR) limit is the product of the LHGR Limit from Tables 3-1, 3-2 or 3-3 and the minimum of either the power dependent LHGR Factor, $LHGRFAC_P$, the flow dependent LHGR Factor, $LHGRFAC_F$ or the single loop operation (SLO) multiplication factor. The applicable power dependent LHGR Factor ($LHGRFAC_P$) is determined from Table 3-4. The applicable flow dependent LHGR Factor ($LHGRFAC_F$) is determined from Tables 3-5 and 3-6. The SLO multiplication factor can be found in Table 3-7.

Table 3-1
LHGR Limits for Bundle Types
GE14-P10DNAB408-16GZ-100T-145-T6-2554
(Bundle 2554, bundle types 4, 14, 24 and 34)
(Reference 4)

| Nodal Exposure (GWd/MT) | LHGR Limit (kW/ft) |
|---|---|
| [[ | ]] |

Table 3-2
LHGR Limits for Bundle Types
GE14-P10DNAB411-4G7.0/9G6.0-100T-145-T6-2553
(Bundle 2553, bundle types 3, 23, 33, and 43)
(Reference 4)

| Nodal Exposure (GWd/MT) | LHGR Limit (kW/ft) |
|---|---|
| [[ | ]] |

# Table 3-3
## LHGR Limits for All ATRIUM-9B Fuel

ATRM9-P9DATB326-11GZ-SPC80M-9WR-144-T6-2447
ATRM9-P9DATB326-11GZ-SPC80M-9WR-144-T6-2448
ATRM9-P9DATB339-6GZ-SPC80M-9WR-144-T6-2449
ATRM9-P9DATB362-12GZ-SPC100T-9WR-144-T6-2450
ATRM9-P9DATB360-12GZ-SPC100T-9WR-144-T6-2451
ATRM9-P9DATB378-13GZ-SPC100T-9WR-144-T6-2464
ATRM9-P9DATB378-11GZ-SPC100T-9WR-144-T6-2465
(Reference 8)

| Nodal Exposure (GWd/MT) | LHGR Limit (kW/ft) |
|---|---|
| 0.00 | 14.40 |
| 15.00 | 14.40 |
| 64.30 | 7.90 |

## Table 3-4
## LHGRFAC$_P$ for All Fuel Types

(Reference 5)

| EOOS Combination | Core Flow (% of rated) | Core Thermal Power (% of rated) 0 | 25 | 38.5 | 38.5 | 70 | 70 | 80 | 100 |
|---|---|---|---|---|---|---|---|---|---|
| | | LHGRFAC$_P$ multiplier | | | | | | | |
| Base Case | ≤ 60 | 0.50 | 0.56 | 0.59 | 0.68 | [redacted] | [redacted] | 0.86 | 1.00 |
| | > 60 | | | | | | | | |
| Base Case SLO | ≤ 60 | 0.50 | 0.56 | 0.59 | 0.68 | [redacted] | [redacted] | 0.86 | 1.00 |
| | > 60 | | | | | | | | |
| TBPOOS | ≤ 60 | 0.22 | 0.39 | 0.48 | 0.54 | [redacted] | [redacted] | [redacted] | 1.00 |
| | > 60 | 0.33 | | 0.42 | | | | | |
| TBPOOS SLO | ≤ 60 | 0.22 | 0.39 | 0.48 | 0.54 | [redacted] | [redacted] | [redacted] | 1.00 |
| | > 60 | 0.33 | | 0.42 | | | | | |
| TCV Slow Closure | ≤ 60 | 0.22 | 0.39 | 0.48 | 0.54 | 0.73 | 0.78 | [redacted] | 1.00 |
| | > 60 | 0.33 | | 0.42 | | | | | |
| TCV Slow Closure SLO | ≤ 60 | 0.22 | 0.39 | 0.48 | 0.54 | 0.73 | 0.78 | [redacted] | 1.00 |
| | > 60 | 0.33 | | 0.42 | | | | | |
| PLUOOS | ≤ 60 | 0.22 | 0.39 | 0.48 | 0.54 | 0.73 | 0.78 | [redacted] | 1.00 |
| | > 60 | 0.33 | | 0.42 | | | | | |
| PLUOOS SLO | ≤ 60 | 0.22 | 0.39 | 0.48 | 0.54 | 0.73 | 0.78 | [redacted] | 1.00 |
| | > 60 | 0.33 | | 0.42 | | | | | |
| TCV Stuck Closed | ≤ 60 | 0.50 | 0.56 | 0.59 | 0.68 | [redacted] | [redacted] | 0.86 | 1.00 |
| | > 60 | | | | | | | | |
| TCV Stuck Closed SLO | ≤ 60 | 0.50 | 0.56 | 0.59 | 0.68 | [redacted] | [redacted] | 0.86 | 1.00 |
| | > 60 | | | | | | | | |

Notes for Table 3-4:

- Values are interpolated between relevant power levels.
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power LHGRFAC$_P$ multiplier should be applied.
- Allowable EOOS conditions are listed in Section 5.
- LHGRFAC$_P$ multiplier is independent of scram speed.
- The LHGR multiplier for any core power/flow condition is the limiting of the LHGRFAC$_P$, LHGRFAC$_F$, and SLO Multiplier (if applicable)

## Table 3-5
## LHGRFAC$_F$ multipliers
(Reference 5)

| Flow (% rated) | LHGRFAC$_F$ |
|---|---|
| 110 | 1.00 |
| 100 | 1.00 |
| 80 | 1.00 |
| 50 | 0.77 |
| 40 | 0.64 |
| 30 | 0.55 |
| 0 | 0.28 |

## Table 3-6
## LHGRFAC$_F$ multipliers for Turbine Control Valve Stuck Closed
(Reference 5)

| Flow (% rated) | LHGRFAC$_F$ |
|---|---|
| 110 | 1.00 |
| 100 | 1.00 |
| 98.3 | 1.00 |
| 80 | 0.86 |
| 50 | 0.63 |
| 40 | 0.50 |
| 30 | 0.41 |
| 0 | 0.14 |

Notes for Tables 3-5 and 3-6:

- Values are interpolated between relevant flow values.
- 98 Mlb/hr is rated flow.
- LHGRFAC$_F$ multipliers are applicable to all fuel types used in cycle 18A.
- Table 3-5 is valid for all operating conditions for all EOOS scenarios except TCV stuck closed.
- Table 3-6 is valid for all operating conditions with a TCV stuck closed.
- LHGRFAC$_F$ multipliers are independent of scram speed.
- The LHGR multiplier for any core power/flow condition is the limiting of the LHGRFAC$_P$, LHGRFAC$_F$, and SLO Multiplier (if applicable).

## Table 3-7
## LHGR SLO Multipliers for All Fuel Types
(Reference 3, 16 and 17)

| Fuel Product Line | SLO LHGR Multiplier |
|---|---|
| ATRIUM-9B | 0.84 |
| GE-14 | 0.77 |

Note for Table 3-7:

- The LHGR multiplier for any core power/flow condition is the limiting of the LHGRFAC$_P$, LHGRFAC$_F$, and SLO Multiplier (if applicable).

## 4. Control Rod Withdrawal Block Instrumentation

4.1 Technical Specification Reference:

Table 3.3.2.1-1

4.2 Description:

The Rod Block Monitor Upscale Instrumentation Setpoints are determined from the relationships shown below (Reference 6):

| ROD BLOCK MONITOR UPSCALE TRIP FUNCTION | ALLOWABLE VALUE |
|---|---|
| Two Recirculation Loop Operation | $0.65\ W_d + 55\%$ |
| Single Recirculation Loop Operation | $0.65\ W_d + 51\%$ |

The setpoint may be lower/higher and will still comply with the Rod Withdrawal Event (RWE) Analysis because RWE is analyzed unblocked.

$W_d$ – percent of drive flow required to produce a rated core flow of 98 Mlb/hr.

## 5. Allowed Modes of Operation (B 3.2.2, B 3.2.3)

The Allowed Modes of Operation with combinations of Equipment Out-of-Service are as described below:

| | ----------OPERATING REGION--------- | | |
|---|---|---|---|
| **Equipment Out of Service Options[1,2,3]** | **Standard** | **MELLLA** | **Coastdown[4]** |
| Base Case, Option A or B | Yes | Yes | Yes |
| Base Case SLO, Option A or B | Yes | Yes | Yes |
| TBPOOS, Option A or B | Yes | Yes | Yes |
| TBPOOS SLO, Option A or B | Yes | Yes | Yes |
| TCV Slow Closure[5], Option A or B | Yes | Yes | Yes |
| TCV Slow Closure SLO[5], Option A or B | Yes | Yes | Yes |
| PLUOOS, Option A or B | Yes | Yes | Yes |
| PLUOOS SLO, Option A or B | Yes | Yes | Yes |
| TCV Stuck Closed[6], Option A or B | Yes | Yes | Yes |
| TCV Stuck Closed SLO[6], Option A or B | Yes | Yes | Yes |

[1] Each OOS Option may be combined with up to 18 TIP channels OOS (provided the requirements for utilizing SUBTIP methodology are met) with all TIPS available at startup from a refuel outage, a 120°F reduction in feedwater temperature throughout the cycle (Final Feedwater Temperature Reduction was analyzed for the entire cycle which is subject to restrictions in Reference 21), and up to 50% of the LPRMs OOS with an LPRM calibration frequency of 2500 Effective Full Power Hours (EFPH) (2000 EFPH +25%).

[2] Additionally, a single MSIV may be taken OOS (shut) under any and all OOS Options, so long as core thermal power is maintained ≤75% of 2957 MWt (Reference 11).

[3] All OOS Options support 1 Turbine Bypass Valve OOS, if the OPL-3 (Reference 7) assumed opening profile for the Turbine Bypass system is met. If the OPL-3 opening profile is not met, or if more than one Turbine Bypass Valve is OOS, utilize the TBPOOS condition.

[4] Coastdown operation is defined as any cycle exposure beyond the full power, all rods out condition with plant power slowly lowering to a lesser value while core flow is held constant (Reference 10 Section 4.3.1.2.8). Up to a 15% overpower is analyzed per Reference 5.

[5] For operation with a pressure regulator out-of-service (PROOS), the TCV Slow Closure limits should be applied (Reference 18) and the operational notes from Reference 18 reviewed. PROOS <u>and</u> TCV Slow Closure is <u>not</u> an analyzed out-of-service combination.

[6] Operation with one TSV OOS is allowed as evaluated in Reference 20. Combination of one TCV OOS and one TSV OOS is not allowed.

## 6. Methodology (5.6.5)

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 documents:

1. ANF-1125 (P)(A) and Supplements 1 and 2, "Critical Power Correlation – ANFB," April 1990.
2. ANF-524 (P)(A) Revision 2 and Supplements 1 and 2, "ANF Critical Power Methodology for Boiling Water Reactors," November 1990.
3. XN-NF-79-71 (P)(A) Revision 2 and Supplements 1, 2 & 3, "Exxon Nuclear Plant Transient Methodology for Boiling Water Reactors," March 1986.
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