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February 18, 2015

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

LaSalle County Station, Unit 2
Facility Operating License No. NPF-18
NRC Docket No. 50-374

Subject: Unit 2 Cycle 16 Core Operating Limits Report (COLR)

In accordance with LaSalle County Station Technical Specifications (TS) 5.6.5.d, "Core Operating Limits Report (COLR)," attached is a copy of the COLR for Unit 2. This report was revised for LSCS Unit 2, Cycle 16.

Exelon Generation Company, LLC makes no new or revised regulatory commitments in this letter.

Should you have any questions concerning this submittal, please contact Mr. Guy V. Ford, Jr., Regulatory Assurance Manager, at (815) 415-2800.

Respectfully,

Peter J. Karaba
Site Vice President
LaSalle County Station

Attachment: Core Operating Limits Report for LaSalle Unit 2 Cycle 16, Revision 0

cc: Regional Administrator - NRC Region III
NRC Senior Resident Inspector - LaSalle County Station

# Core Operating Limits Report for

# LaSalle Unit 2

# Cycle 16 Revision 0

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## List of Tables

# 1. References

1. Exelon Generation Company, LLC Docket No. 50-374 LaSalle County Station, Unit 2, Facility Operating License No. NPF-18.

2. NRC 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. Nuclear Fuels Letter NFM:MW:01-0106, from A. Giancatarino to J. Nugent, "LaSalle Unit 1 and Unit 2 Rod Block Monitor COLR Setpoint Change," April 3, 2001.

4. GE Nuclear Energy Report NEDC-32694P-A, Revision 0, "Power Distribution Uncertainties for Safety Limit MCPR Evaluations," August 1999.

5. GE Nuclear Energy Document GE-NE-A1300384-07-01, Revision 1, "LaSalle County Station Power Uprate Project Task 201: Reactor Power/Flow Map", September 1999.

6. GE Hitachi Nuclear Energy Report, GE-NE-0000-0099-8344-R1, Revision 1, "Exelon Nuclear LaSalle Units 1 and 2 Thermal Power Optimization Task T0201: Operating Power/Flow Map", November 2009.

7. GNF Report GNF-000N9256-SRLR-R0, Revision 0, "Supplemental Reload Licensing Report for LaSalle Unit 2 Reload 15 Cycle 16," January 2015.

8. GNF Letter from B. R. Moore to Document Control Desk, Subject: "GNF2 Advantage Generic Compliance with NEDE-24011-P-A (GESTAR II), NEDC-33270P, Revision 5, May 2013," MFN 13-029, May 24, 2013 (ADAMS Accession No. ML13148A318)

9. AREVA Report ANP-2914(P), Revision 1, "Mechanical Design Report for LaSalle Units 1 and 2 MUR ATRIUM-10 Fuel Assemblies," AREVA NP Inc., June 2010.

10. Exelon Transmittal ES1400016, Revision 0, "LaSalle 2 Cycle 16 Final Resolved OPL-3 Parameters," September 11, 2014.

11. GNF DRF A12-00038-3, Vol. 4, "Scram Times Verses Notch Position," G. A. Watford, May 22, 1992.

12. GEH Nuclear Energy DRF Section 0000-0151-0765 Rev. 0, "Application of SLO MCPR", February 12, 2013.

13. GNF Report GNF-000N9257-FBIR-R0, Revision 0, "Fuel Bundle Information Report for LaSalle Unit 2 Reload 15 Cycle 16," January 2015.

## 2. Terms and Definitions

| | |
|---|---|
| ARTS | Average Power Range Monitor, Rod Block Monitor and Technical Specification Improvement Program |
| ATRM10 | AREVA ATRIUM-10 fuel type |
| ATRM10XM | AREVA ATRIUM-10XM fuel type |
| BOC | Beginning of cycle |
| BWR | Boiling water reactor |
| COLR | Core operating limits report |
| CRD | Control rod drive mechanism |
| DLO | Dual loop operation |
| ELLLA | Extended load line limit analysis |
| EOC | End of cycle |
| EOOS | Equipment out of service |
| EOR16 | End of rated operation for Cycle 16 |
| FFWTR | Final feedwater temperature reduction |
| FWHOOS | Feedwater heater out of service |
| GNF | Global Nuclear Fuels - Americas |
| ICF | Increased core flow |
| $K_P$ | Power-dependent MCPR Multiplier |
| L2C16 | LaSalle Unit 2 Cycle 16 |
| LHGR | Linear heat generation rate |
| $LHGRFAC_F$ | Flow-dependent LHGR multiplier |
| $LHGRFAC_P$ | Power-dependent LHGR multiplier |
| LPRM | Local power range monitor |
| MAPLHGR | Maximum average planar linear heat generation rate |
| MCPR | Minimum critical power ratio |
| $MCPR_F$ | Flow-dependent MCPR |
| MELLLA | Maximum extended load line limit analysis |
| MOC | Middle of Cycle Point for Licensing Purposes |
| MSIVOOS | Main steam isolation valve out of service |
| 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 |
| RPTOOS | Recirculation pump trip out of service |
| RWE | Rod withdrawal error |
| SLO | Single loop operation |
| SRVOOS | Safety-relief valve out of service |
| TBV | Turbine bypass valve |
| TBVOOS | Turbine bypass valve out of service |
| TCV | Turbine control valve |
| TCVSC | Turbine control valve slow closure |
| TIP | Traversing in-core probe |
| TIPOOS | Traversing in-core probe out of service |
| TSV | Turbine stop valve |
| 3DM | 3D-MONICORE |

# 3. General Information

Power and flow dependent limits are listed for various power and flow levels. Linear interpolation is to be used to find intermediate values.

Rated core flow is 108.5 Mlbm/hr. Operation up to 105% rated flow is licensed for this cycle. Licensed rated thermal power is 3546 MWth.

For thermal limit monitoring above 100% rated power or 100% rated core flow, the 100% rated power and the 100% core flow values, respectively, can be used unless otherwise indicated in the applicable table.

Table 3-1 defines the three exposure ranges used in the COLR. The end of rated (EOR) exposure is defined as the cycle exposure corresponding to all rods out, 100% power/100% flow, and normal feedwater temperature. The term (EOR – 2288 MWd/ST) means the EOR exposure minus 2288 MWd/ST of exposure. The value of the EOR exposure is based on actual plant operation and is thus determined from projections to this condition made near, but before, the time when the EOR16 – 2288 MWd/ST exposure will be reached. For cycle exposure dependent limits at the exact MOC exposure, the more limiting of the BOC to MOC and the MOC to EOC limits should be used. This can be achieved by applying the MOC to EOC limits to the MOC point as all cycle exposure dependent limits in the MOC to EOC limit sets are the same as, or more limiting than, those in the BOC to MOC limit sets.

**Table 3-1 Cycle Exposure Range Definitions**
(Reference 7)

| Nomenclature | Cycle Exposure Range |
|---|---|
| BOC to MOC | BOC16 to (EOR16 – 2288 MWd/ST) |
| MOC to EOC | (EOR16 – 2288 MWd/ST) to EOC16 |
| BOC to EOC | BOC16 to EOC16 |

# 4. Average Planar Linear Heat Generation Rate

Technical Specification Sections 3.2.1 and 3.4.1

The MAPLHGR values for the most limiting lattice of each fuel type as a function of average planar exposure are given in Tables 4-1 and 4-2. During single loop operation, these limits are multiplied by the fuel-dependent SLO multiplier listed in Table 4-3. The MAPLHGR values in Tables 4-1 and 4-2 along with the MAPLHGR SLO multipliers in Table 4-3 provide coverage for all modes of operation.

**Table 4-1 MAPLHGR for GNF2 and GNF3 Fuel**
(Reference 7)

| Avg. Planar Exposure (GWd/ST) | MAPLHGR (kW/FT) |
|---|---|
| 0.00 | 13.78 |
| 17.15 | 13.78 |
| 60.78 | 6.87 |
| 63.50 | 5.50 |

**Table 4-2 MAPLHGR for ATRIUM-10 and ATRIUM-10XM Fuel**
(Reference 7)

| Avg. Planar Exposure (GWd/ST) | MAPLHGR (kW/FT) |
|---|---|
| 0 | 12.81 |
| 21.41 | 12.81 |
| 55.42 | 9.10 |
| 63.86 | 7.30 |

**Table 4-3 MAPLHGR SLO Multiplier for GNF2, GNF3, ATRIUM-10, and ATRIUM-10XM Fuel, BOC to EOC**
(Reference 7)

| Fuel Type | SLO MAPLHGR Multiplier |
|---|---|
| GNF2 | 0.78 |
| GNF3 | 0.78 |
| ATRIUM-10 | 0.78 |
| ATRIUM-10XM | 0.78 |

# 5. Operating Limit Minimum Critical Power Ratio

Technical Specification Sections 3.2.2, 3.3.4.1, 3.4.1, and 3.7.7

## 5.1. Manual Flow Control MCPR Limits

The steady-state OLMCPRs given in Table 5-2 are the maximum values obtained from analysis of the pressurization events, non-pressurization events, and the Option III stability evaluation. MCPR values are determined by the cycle-specific fuel reload analyses in Reference 7. Table 5-2 is used in conjunction with the ARTS-based power (Kp) and flow ($MCPR_F$) dependencies presented in Tables 5-3, 5-4, and 5-5 below. The OLMCPR is determined for a given power and flow condition by evaluating the power and flow dependent MCPR values and selecting the greater of the two.

### 5.1.1. Power-Dependent MCPR

The power-dependent MCPR multiplier, $K_P$, is determined from Table 5-3, and is dependent only on the power level and the Application Group (EOOS). The product of the steady state OLMCPR and the proper $K_P$ provides the power-dependent OLMCPR.

### 5.1.2. Flow-Dependent MCPR

Tables 5-4 through 5-5 give the $MCPR_F$ limit as a function of the core flow, based on the applicable plant conditions. The $MCPR_F$ limit determined from these tables is the flow-dependent OLMCPR.

## 5.2. Scram Time

Option A and Option B MCPR analyses and results are dependent upon core average control rod blade scram speed insertion times.

The Option A scram time is the Improved Technical Specification scram speed based insertion time. The core average scram speed insertion time for 20% insertion must be less than or equal to the Technical Specification scram speed insertion time to utilize the Option A MCPR limits. Reload analyses performed by GNF for Cycle 16 Option A MCPR limits utilized a 20% core average insertion time of 0.900 seconds (Reference 10).

To utilize the MCPR limits for the Option B scram speed insertion times, the core average scram speed insertion time for 20% insertion must be less than or equal to 0.694 seconds (Reference 10) (0.672 seconds at notch position 39, Reference 11). See Table 5-1 for a summary of scram time requirements related to the use of Option A and Option B MCPR limits.

If the core average scram insertion time does not meet the Option B criteria, but is within the Option A criteria, the appropriate steady state 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 the linear interpolation to determine MCPR limits, ensure that the time used for Option A is 0.900 seconds (0.875 seconds to notch position 39, Reference 11). Note that making interpolations using the Table 5-2 data is conservative because the stability based OLMCPR sets the limit in many conditions. The Option A to Option B linear interpolation need not include the stability OLMCPR penalty on the endpoints when the calculation is made. However, the result of the linear interpolation is required to be 1.51 or greater for the steady state OLMCPR due to the OPRM PBDA setpoint (see Section 9 of the COLR and Reference 7).

**Table 5-1 Scram Times Required for Option A and Option B Application at Notch Position 39**
(References 10 and 11)

| Notch Position* | Scram Time Required for Option A Application | Scram Time Required for Option B Application |
|---|---|---|
| 39 | ≤ 0.875 sec. | ≤ 0.672 sec. |

* - The insertion time to a notch position is conservatively calculated using the CRD reed switch drop-out time per Reference 11.

## 5.3. Recirculation Flow Control Valve Settings

Cycle 16 was analyzed with a maximum core flow runout of 105%; therefore the recirculation pump flow control valves must be set to maintain core flow less than 105% (113.925 Mlbm/hr) for all runout events.

**Table 5-2 Operating Limit Minimum Critical Power Ratio (OLMCPR) for GNF2, GNF3, ATRIUM-10, and ATRIUM-10XM Fuel**

(Reference 7)

| Application Group | DLO/ SLO | Exposure Range | Option A | | | Option B | | |
|---|---|---|---|---|---|---|---|---|
| | | | GNF2 | GNF3 | ATRM10/ ATRM10XM | GNF2 | GNF3 | ATRM10/ ATRM10XM |
| Base Case | DLO | BOC-MOC | 1.54 | 1.55 | 1.51 | 1.51 | 1.51 | 1.51 |
| | | MOC-EOC | 1.63 | 1.64 | 1.53 | 1.58 | 1.59 | 1.51 |
| Base Case | SLO | BOC-MOC | 1.59 | 1.59 | 1.51 | 1.59 | 1.59 | 1.51 |
| | | MOC-EOC | 1.66 | 1.67 | 1.56 | 1.61 | 1.62 | 1.53 |
| Base Case + TCVSC + RPTOOS + PROOS | DLO | BOC-MOC | 1.61 | 1.62 | 1.59 | 1.51 | 1.52 | 1.51 |
| | | MOC-EOC | 1.70 | 1.72 | 1.72 | 1.60 | 1.62 | 1.55 |
| Base Case + TCVSC + RPTOOS + PROOS | SLO | BOC-MOC | 1.64 | 1.65 | 1.62 | 1.59 | 1.59 | 1.51 |
| | | MOC-EOC | 1.73 | 1.75 | 1.75 | 1.63 | 1.65 | 1.58 |
| Base Case + TCVSC + TBVOOS (all 5 valves) | DLO | BOC-MOC | 1.57 | 1.58 | 1.51 | 1.52 | 1.53 | 1.51 |
| | | MOC-EOC | 1.66 | 1.68 | 1.57 | 1.61 | 1.63 | 1.54 |
| Base Case + TCVSC + TBVOOS (all 5 valves) | SLO | BOC-MOC | 1.60 | 1.61 | 1.54 | 1.59 | 1.59 | 1.51 |
| | | MOC-EOC | 1.69 | 1.71 | 1.60 | 1.64 | 1.66 | 1.57 |
| Base Case + TCVSC + TBVOOS (all 5 valves) + RPTOOS + PROOS | DLO | BOC-MOC | 1.65 | 1.66 | 1.62 | 1.55 | 1.56 | 1.51 |
| | | MOC-EOC | 1.75 | 1.76 | 1.75 | 1.65 | 1.66 | 1.58 |
| Base Case + TCVSC + TBVOOS (all 5 valves) + RPTOOS + PROOS | SLO | BOC-MOC | 1.68 | 1.69 | 1.65 | 1.59 | 1.59 | 1.54 |
| | | MOC-EOC | 1.78 | 1.79 | 1.78 | 1.68 | 1.69 | 1.61 |

**Table 5-3 Power-Dependent MCPR Multipliers ($K_P$) for GNF2, GNF3, ATRIUM-10, and ATRIUM-10XM Fuel, DLO and SLO, BOC to EOC, Option A and Option B**
(Reference 7)

| Application Group | $K_P$, MCPR Limit Multiplier (as a function of % rated power) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0% P | 25% P | 45% P | 60% P | 85% P | 85.01%P | 100% P |
| Base Case | 1.338 | 1.338 | 1.191 | 1.191 | 1.061 | 1.061 | 1.000 |
| Base Case + TCVSC + RPTOOS + PROOS | 1.488 | 1.488 | 1.378 | 1.296 | 1.174 | 1.097 | 1.000 |
| Base Case + TCVSC + TBVOOS (all 5 valves) | 1.379 | 1.379 | 1.228 | 1.207 | 1.097 | 1.097 | 1.000 |
| Base Case + TCVSC + TBVOOS (all 5 valves) + RPTOOS + PROOS | 1.488 | 1.488 | 1.378 | 1.296 | 1.174 | 1.097 | 1.000 |

**Table 5-4 DLO Flow-Dependent MCPR Limits ($MCPR_F$) for GNF2, GNF3, ATRIUM-10, and ATRIUM-10XM Fuel, BOC to EOC, All Application Groups, Option A and Option B**
(Reference 7)

| Flow (% Rated) | $MCPR_F$ |
|---|---|
| 0.0 | 1.91 |
| 30.0 | 1.72 |
| 105.0 | 1.25 |

**Table 5-5 SLO Flow-Dependent MCPR Limits ($MCPR_F$) for GNF2, GNF3, ATRIUM-10, and ATRIUM-10XM Fuel, BOC to EOC, All Application Groups, Option A and Option B**
(References 7 and 12)

| Flow (% Rated) | $MCPR_F$ |
|---|---|
| 0.0 | 1.94 |
| 30.0 | 1.75 |
| 105.0 | 1.28 |

# 6. Linear Heat Generation Rate

Technical Specification Sections 3.2.3 and 3.4.1

The linear heat generation rate (LHGR) limit is the product of the exposure dependent LHGR limit from Table 6-1 or Table 6-2 and the minimum of: the power dependent LHGR Factor, $LHGRFAC_P$, or the flow dependent LHGR Factor, $LHGRFAC_F$ as applicable. The $LHGRFAC_P$ multiplier is determined from Table 6-3. The $LHGRFAC_F$ multiplier is determined from either Table 6-4 or Table 6-5. The SLO multipliers in Tables 6-4 and 6-5 have been limited to a maximum value of 0.78, the SLO LHGR multiplier for GNF2, GNF3, ATRIUM-10, and ATRIUM-10XM fuel.

**Table 6-1 LHGR Limit for GNF2 and GNF3 Fuel**
(References 8 and 13)

| **Peak Pellet Exposure** | **$UO_2$ LHGR Limit** |
|---|---|
| See Table B-1 of Reference 8 | |

| **Peak Pellet Exposure** | **Most Limiting Gadolinia LHGR Limit** |
|---|---|
| See Table B-2 of Reference 8 | |

**Table 6-2 LHGR Limit for ATRIUM-10 and ATRIUM-10XM Fuel**
(Reference 9)

| **Peak Pellet Exposure (GWd/ST)** | **LHGR Limit (kW/ft)** |
|---|---|
| 0.0 | 13.4 |
| 16.06 | 13.4 |
| 55.43 | 9.1 |
| 63.87 | 7.3 |

**Table 6-3 Power-Dependent LHGR Multipliers ($LHGRFAC_P$) for GNF2, GNF3, ATRIUM-10, and ATRIUM-10XM Fuel, DLO and SLO, BOC to EOC**

(Reference 7)

| Application Group | $LHGRFAC_P$ (as a function of % rated power) | | | | | |
|---|---|---|---|---|---|---|
| | 0% P | 25% P | 45% P | 60% P | 85% P | 100% P |
| Base Case | 0.608 | 0.608 | 0.713 | 0.791 | 0.922 | 1.000 |
| Base Case + TCVSC + RPTOOS + PROOS | 0.608 | 0.608 | 0.713 | 0.761 | 0.831 | 1.000 |
| Base Case + TCVSC + TBVOOS (all 5 valves) | 0.608 | 0.608 | 0.713 | 0.791 | 0.922 | 1.000 |
| Base Case + TCVSC + TBVOOS (all 5 valves) + RPTOOS + PROOS | 0.608 | 0.608 | 0.713 | 0.761 | 0.822 | 1.000 |

**Table 6-4 Flow-Dependent LHGR Multipliers ($LHGRFAC_F$) for GNF2, GNF3, ATRIUM-10, and ATRIUM-10XM Fuel, BOC to EOC, Pressurization (1 TCV/TSV Closed or OOS), All Application Groups**
(Reference 7)

| Flow (% Rated) | DLO $LHGRFAC_F$ | SLO $LHGRFAC_F$ |
|---|---|---|
| 0.0 | 0.110 | 0.110 |
| 30.0 | 0.410 | 0.410 |
| 67.0 | 0.780 | 0.780 |
| 89.0 | 1.000 | 0.780 |
| 105.0 | 1.000 | 0.780 |

**Table 6-5 Flow-Dependent LHGR Multipliers ($LHGRFAC_F$) for GNF2, GNF3, ATRIUM-10, and ATRIUM-10XM Fuel, BOC to EOC, No Pressurization (All TCV/TSV In-Service), All Application Groups**
(Reference 7)

| Flow (% Rated) | DLO $LHGRFAC_F$ | SLO $LHGRFAC_F$ |
|---|---|---|
| 0.0 | 0.250 | 0.250 |
| 30.0 | 0.550 | 0.550 |
| 53.0 | 0.780 | 0.780 |
| 75.0 | 1.000 | 0.780 |
| 105.0 | 1.000 | 0.780 |

# 7. Rod Block Monitor

Technical Specification Sections 3.3.2.1 and 3.4.1

The Rod Block Monitor Upscale Instrumentation Setpoints are determined from the relationships shown below (Reference 3):

**Table 7-1 Rod Block Monitor Setpoints**

| **Rod Block Monitor Upscale Trip Function** | **Allowable Value** |
|---|---|
| Two Recirculation Loop Operation | 0.66 $W_d$ + 54.0% |
| Single Recirculation Loop Operation | 0.66 $W_d$ + 48.7% |

The setpoint may be lower/higher and will still comply with the rod withdrawal error (RWE) analysis because RWE is analyzed unblocked. The allowable value is clamped with a maximum value not to exceed the allowable value for a recirculation loop drive flow ($W_d$) of 100%.

$W_d$ – percent of recirculation loop drive flow required to produce a rated core flow of 108.5 Mlbm/hr.

# 8. Traversing In-Core Probe System

## 8.1. Description

When the traversing in-core probe (TIP) system (for the required measurement locations) is used for recalibration of the LPRM detectors and monitoring thermal limits, the TIP system shall be operable with the following:

1. movable detectors, drives and readout equipment to map the core in the required measurement locations, and
2. indexing equipment to allow all required detectors to be calibrated in a common location.

The following applies for use with 3DM (Reference 4):

The total number of failed and/or bypassed LPRMs does not exceed 25%. In addition, no more than 14 TIP channels can be OOS (failed or rejected).

Otherwise, with the TIP system inoperable, suspend use of the system for the above applicable calibration functions.

## 8.2. Bases

The operability of the TIP system with the above specified minimum complement of equipment ensures that the measurements obtained from use of this equipment accurately represent the spatial neutron flux distribution of the reactor core. The normalization of the required detectors is performed internal to the core monitoring software system.

# 9. Stability Protection Setpoints

Technical Specification Section 3.3.1.3

**Table 9-1 OPRM PBDA Trip Setpoints**
(Reference 7)

| PBDA Trip Amplitude Setpoint (Sp) | Corresponding Maximum Confirmation Count Setpoint (Np) |
|---|---|
| 1.11 | 14 |

The PBDA is the only OPRM setting credited in the safety analysis as documented in the licensing basis for the OPRM system.

The OPRM PBDA trip settings are based, in part, on the cycle specific OLMCPR and the power and flow dependent MCPR limits. Any change to the OLMCPR values and/or the power and flow dependent MCPR limits should be evaluated for potential impact on the OPRM PBDA trip settings.

The OPRM PBDA trip settings are applicable when the OPRM system is declared operable, and the associated Technical Specifications are implemented.

# 10. Modes of Operation

The allowed modes of operation with combinations of equipment out-of-service are as described below (Reference 7).

**Table 10-1 Allowed Modes of Operation and EOOS Combinations**
(References 4 and 7)

| Equipment Out of Service Options (1) (2) (4) (5) | Short Name |
|---|---|
| Base Case (Option A or B) (3) | Base |
| Base Case + SLO (Option A or B) | Base SLO |
| Base Case + TCVSC + RPTOOS + PROOS (Option A or B) | Combined EOOS 1 |
| Base Case + TCVSC + RPTOOS + PROOS + SLO (Option A or B) | Combined EOOS 1 SLO |
| Base Case + TCVSC + TBVOOS (all 5 valves) (Option A or B) | Combined EOOS 2 |
| Base Case + TCVSC + TBVOOS (all 5 valves) + SLO (Option A or B) | Combined EOOS 2 SLO |
| Base Case + TCVSC + TBVOOS (all 5 valves) + RPTOOS + PROOS (Option A or B) | Combined EOOS 3 |
| Base Case + TCVSC + TBVOOS (all 5 valves) + RPTOOS + PROOS + SLO (Option A or B) | Combined EOOS 3 SLO |

(1) Base case includes 1 SRVOOS + 1 TCV/TSV OOS + FWHOOS/FFWTR + 1 MSIVOOS + 2 TBVOOS + PLUOOS (Reference 7). All Modes of Operation and EOOS Combinations allow 1 TIPOOS (up to 14 TIP channels not available) any time during the cycle, including BOC, and up to 25% of the LPRMs out-of-service (Reference 4). The FWHOOS/FFWTR analyses cover a maximum reduction of 100°F for the feedwater temperature. A nominal LPRM calibration interval of 2000 EFPH (2500 EFPH maximum) is supported for L2C16.

(2) TBVOOS (all 5 valves) is the turbine bypass system out of service which means that 5 TBVs are <u>not</u> credited for fast opening and 3 TBVs are <u>not</u> credited to open in pressure control. For the 2 TBVOOS condition that is a part of the base case, the assumption is that both of the TBVs do not open on any signal and thus remain shut for the transients analyzed (i.e. 3 TBVs are credited to open in pressure control) (Reference 10). The MCFL is currently set at 126.6 and will only allow opening of TBV's #1, #2, #3, and #4 during a slow pressurization event. The MCFL does not use the TBV position feedback signal to know how many TBVs have opened or how far each has opened. The #5 TBV is not available based on the current MCFL setpoint and thus cannot be used as one of the credited valves to open in pressure control.

(3) With all TCV/TSV In-Service, the Base Case should be used with the $LHGRFAC_F$ values from Table 6-5 (Reference 7). With 1 TCV/TSV OOS, the Base Case must be used with the $LHGRFAC_F$ values from Table 6-4. The one Stuck Closed TCV and/or TSV EOOS conditions require power level ≤ 85% of rated. The one MSIVOOS condition is also supported as long as thermal power is maintained ≤ 75% of the rated (Reference 7 Appendix D).

(4) The + sign that is used in the Equipment Out of Service Option / Application Group descriptions designates an "and/or".

(5) All EOOS Options (Reference 7 Application Groups) are applicable to ELLLA, MELLLA, ICF and Coastdown realms of operation with the exception that SLO is not applicable to MELLLA or ICF (References 5 and 6). The MOC to EOC exposure range limit sets are generated by GNF to include application to coastdown operation (Methodology Reference 5).

# 11. 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 documents:

1. XN-NF-81-58 (P)(A), Revision 2 and Supplements 1 and 2, "RODEX2 Fuel Rod Thermal-Mechanical Response Evaluation Model," March 1984.
2. ANF-89-98 (P)(A), Revision 1 and Supplement 1, "Generic Mechanical Design Criteria for BWR Fuel Designs," May 1995.
3. EMF-85-74 (P) Revision 0 Supplement 1(P)(A) and Supplement 2(P)(A), "RODEX2A (BWR) Fuel Rod Thermal-Mechanical Evaluation Model," February 1998.
4. XN-NF-85-67 (P)(A) Revision 1, "Generic Mechanical Design for Exxon Nuclear Jet Pump BWR Reload Fuel," September 1986.
5. NEDE-24011-P-A-20 (Revision 20), "General Electric Standard Application for Reactor Fuel," December 2013 and the U.S. Supplement NEDE-24011-P-A-20-US, of December 2013.
6. NEDC-33106P-A Revision 2, "GEXL97 Correlation for ATRIUM-10 Fuel," June 2004.
7. NEDO-32465-A, "BWR Owner's Group Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications," August 1996.