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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 (LSCS) Technical Specifications (TS) 5.6.5.d, "CORE OPERATING LIMITS REPORT (COLR)," attached is a copy of Revision 4 of the COLR for Unit 2. This report was revised for LSCS Unit 2, Cycle 16 to update thermal limits and references to incorporate the mid-cycle TRACG AOO and GS3 analysis.

There are no regulatory commitments contained within 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,

William J. Trafton
Site Vice President
LaSalle County Station

Attachment: Core Operating Limits Report for LaSalle Unit 2 Cycle 16 Revision 4

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

Core Operating Limits Report for

LaSalle Unit 2

Cycle 16 Revision 4

Table of Contents

Revision History

Record of LaSalle 2 Cycle 16 COLR Revisions

Revision	Description
10	Initial issuance for L2C16
11	Add short term operational limits to account for potential peripheral orifice blockage due to lost jet pump plug seals (Appendix A) and longer term operational limit due to potential lower tie plate blockage (reduced MFLCPR limit)
12	Add clarification in Appendix A to add FWHOOS to the list of EOOS that are exempted from the requirement to be in service in the Base Case
13	Remove Appendix A and add this revision list
14	Update thermal limits and References to incorporate the mid-cycle TRACG AOO and GS3 analysis, delete Reference 2 because it is not needed, and add Reference 15.

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. Deleted.

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 13-029 from B. R. Moore to Document Control Desk, "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 from G.A. Watford to Distribution, "Scram Times Verses Notch Position," 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.

14. Exelon Tech Eval EC 401294-002, "Supplemental Evaluation to LaSalle 2 Cycle 16 Lost Parts Eval," March 2015.

15. NRC Letter from D. M. Skay to I. M. Johnson, "Issuance of Amendments (TAC NOS. M95156 and M95157)," October 29, 1996.

16. GNF Report 003N4001-R0, "LaSalle County Generating Station Unit 2 Cycle 16 Mid-Cycle TRACG AOO and GS3 Implementation," May 2016.

17. Exelon transmittal ES1600002 Revision 0, "Design Input Request for LaSalle 2 Cycle 16 Mid-Cycle TRACG04 AOO Implementation," February 8, 2016.

18. Exelon transmittal ES1600004 Revision 0 "Design Input Request for LaSalle 2 Cycle 16 GS3 Implementation," February 26, 2016.

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
MFLCPR	Maximum faction of limiting critical power ratio
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
RCPR	Relative Critical Power Ratio
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.

A mid-cycle analysis was performed to support implementation of TRACG AOO and GS3 methodologies (References 16, 17, and 18). The TRACG AOO analysis provides updated OLMCPR values and K_P values for the Base Case DLO application group for GNF2 and GNF3 fuel only. The OLMCPR values for ATRIUM-10 and ATRIUM-10XM fuel for all application conditions and the GNF2 and GNF3 fuel for all EOOS conditions are unchanged and are based on the original transient analysis. The GS3 methodology is applicable to all fuel types in the core and was used to confirm that both OPRM set-points given in Section 9 are applicable.

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 and non-pressurization events, and they are determined based on the cycle-specific fuel reload analyses in References 7 and 16. 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, 5-5, and 5-6 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 or Table 5-4 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 5-5 and 5-6 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).

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.

5.4. OLMCPR Requirements with Lost Jet Pump Plug Seals

To account for the lost jet pump plug seals, an RCPR value was determined to generically apply to the applicable OLMCPR limits discussed in Section 5.1. A maximum allowable MFLCPR value of 0.97 will ensure that the OLMCPR limits discussed in Section 5.1 are bounded with the lost jet pump plug seal RCPR value applied. (Reference 14)

Table 5-2 Operating Limit Minimum Critical Power Ratio (OLMCPR) for GNF2, GNF3, ATRIUM-10, and ATRIUM-10XM Fuel
(References 7 and 16)

Application Group	DLO/ SLO	Exposure Range	Option A			Option B		
			GNF2	GNF3	ATRM10/ ATRM10XM	GNF2	GNF3	ATRM10/ ATRM10XM
Base Case	DLO	BOC-MOC	1.44	1.46	1.51	1.40	1.42	1.51
		MOC-EOC	1.46	1.48	1.53	1.42	1.44	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 and GNF3 Fuel, DLO only, BOC to EOC, Option A and Option B
(Reference 16)

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	1.156	1.156	1.156	1.156	1.045	1.045	1.000

Table 5-4 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
(For GNF2 and GNF3 fuel, Base Case K_P values apply for SLO only)
(References 7 and 16)

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 5-5 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
(References 7 and 16)

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

Table 5-6 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, 12 and 16)

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
(References 7 and 16)

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
(References 7 and 16)

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
(References 7 and 16)

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 (Reference 15)

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 16)

PBDA Trip Amplitude Setpoint (Sp)	Corresponding Maximum Confirmation Count Setpoint (Np)
1.11	14
1.15	16

Both OPRM PBDA trip settings provided in Table 9-1 were confirmed.

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, 7 and 16)

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 (References 7 and 16). 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 **not** credited for fast opening and 3 TBVs are **not** 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 (References 7 and 16). 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, December 2013.
6. NEDC-33106P-A Revision 2, "GEXL97 Correlation for ATRIUM-10 Fuel," June 2004.
7. Deleted.
8. NEDE-24011-P-A-22 (Revision 22), "General Electric Standard Application for Reactor Fuel," November 2015 and the U.S. Supplement NEDE-24011-P-A-22-US, November 2015.

#10688

bcc: Joshua Shea (w/o attachment)
Eric Stein (w/o attachment)
P. Weggeman (NFM) (w/o attachment)
NRC Project Manager – NRR (Bhalchandra Vaidya)
DCD Licensing (hard copy and electronic)

TYPICAL LICENSING AND REGULATORY AFFAIRS CORRESPONDENCE CONCURRENCE FORM

Station(s): LaSalle Correspondence No.: RA16-039

Subject/Document: Submittal of Unit 2 Cycle 16 COLR (Rev. 4) to NRC

Document Prepared by: D. Murray Location: LaSalle Extension: 2814

Required Review and Disciplines Assigned by: Guy Ford / RAM
Title

Type of Review Required: (Reference LS-AA-117)
- ☐ Technical Verification Team Review
- X Individual or Series Review
- ☐ No Technical Review

Note: If the subject document falls within the scope of AD-AA-102, "Station Qualified Review," one of the reviewers must be a Station Qualified Reviewer.

Disciplines Required:

☐ Maintenance	☐ Radiation Protection	☐ Chemistry	☐ Training
X Operations	☐ Engineering - I&C	☐ Radwaste	☐ Reg Assurance / Licensing
X Rx Engineering	☐ Design Engineering	☐ Engr - Mech Systems	☐ Programs Engineering
☐ Nuclear Fuels	☐ Work Management	☐ Engr - Elect Systems	☐ Other:

Review Concurrence: Signature indicates that the individual has reviewed the subject document and concurs that the content is factual and accurate. Concurrence via e-mail shall be provided using the declaration provided in LS-AA-117.

Print Name / Signature	Discipline	Date
E. Stein/	Rx Engineering	6/28/16
J. Shea/ John Shea	Rx Engineering	6/29/16
J. Keenan/	Operations	6/29/16

Does this letter contain commitments? ☐ Yes X No
If yes, corporate or site commitment coordinator has been notified: _____ Date: _____

Required Reviews and Signatures (check as appropriate):

X Station Qualified Review Required: (RA16-038, TRM App J Change) Date: _____

☐ PORC Approval Required: PORC Meeting No. N/A

X Corporate Licensing Concurrence Required: See attached e-mail Date: 7/5/16

X Site Regulatory Assurance Concurrence Required: Tammy Tame for G Ford Date: 6-30-16

X Station Manager Approval Required: Date: 7-5-16

X Site Vice President Approval Required: See Letter Date: _____

SRRS Record ID: 5A.113 (Destroy at Option (DAO))

ATTACHMENT A
TECHNICAL REQUIREMENTS MANUAL CHANGE REQUEST FORM

1. Change Request #: RA16-038

2. Affected TRM Section(s): Appendix J

3. Description of changes: Revised U2 COLR to update thermal limits and References to incorporate the mid-cycle TRACG AOO and GS3 analysis.

4. Reason for changes (attach all supporting documentation): Thermal limit improvements through the use of TRACG AOO and GS3 analysis.

5. Schedule Requirements: Outage Related (check one) (x) No ( ) Yes, Outage # _____
Other (explain) _____

6. Implementation Requirements (attach additional pages, as necessary):
Identify the impact of the changes on the following:

Affected	N/A	
(x)	( )	UFSAR LUCR-374
( )	(x)	TS/TS Bases
( )	(x)	NRC Safety Evaluation
( )	(x)	Fire Protection Report
( )	(x)	NRC Commitments
( )	(x)	Vendor Documentation
( )	(x)	Special Permits/Licenses
( )	(x)	Procedures
( )	(x)	Environmental Qualification
( )	(x)	Design Basis Documentation
( )	(x)	Engineering Calculations
( )	(x)	Drawings/Prints
( )	(x)	PRA Information
( )	(x)	Programs
( )	(x)	Reportability Manual
( )	(x)	QA Topical Report
( )	(x)	Passport
( )	(x)	Pre-Implementation Training Required
( )	(x)	Maintenance Rule
( )	(x)	Offsite Dose Calculation Manual
( )	(x)	Other

7. Check one:
(x) 10 CFR 50.59 REVIEW Attached, 10 CFR 50.59 REVIEW #: L16-108
( ) NRC SE Attached, Changes consistent with and entirely bounded by NRC SE
( ) EDITORIAL CHANGE, No 10 CFR 50.59 REVIEW required

8. Requestor: _____ / 6/17/16 / Ops - Rx Eng
(Signature) (Date) (Department)

9. Regulatory Assurance Approval: _____ / 6/17/16
(Signature) (Date)

10. PORC Approval Required: ( ) Yes (X) No

11. Licensing Engineer Review: Terry Lane / 6/17/16
(Signature) (Date)

REGULATORY ASSURANCE
STATION QUALITY REVIEW FORM

Date Assignment Made: 6/17/2016 **SQR Review Number: RA16-038**

Document(s) Reviewed: Revision to TRM Appendix J
(include document number and revision, if applicable)

Subject of Review:
Unit 2 Core Operating Limits Report (COLR) is being revised to update thermal limits and references to incorporate the midcycle TRACG AOO and GS3 analysis.

PORC Approval Required? ☐ Yes ☒ No
If yes, reviewed by PORC number/date
_____

NRSB Required? ☐ Yes ☒ No
If yes, reviewed by NSRB (location /date)
_____

Disciplines/Participants Designated:

☐ **Maintenance**	☐ **Radiation Protection**	☐ **Chemistry**	☐ **Training**
☒ **Operations**	☐ **Engr - I&C Systems**	☐ **Radwaste**	☐ **Reg Assurance / Licensing**
☒ **Rx Engineering**	☐ **Design Engineering**	☐ **Engr - Mech Systems**	☐ **Programs Engineering**
☐ **Nuclear Fuels**	☐ **Work Management**	☐ **Engr - Elect Systems**	☐ **Other:** _____

for Date: 6/17/16
Regulatory Assurance Manager

Reviewers:

Print Name / Signature	Discipline	Date
Josh Shea/	Rx Engineering	6/17/16
John Keenan/	Operations	6/17/16

Document any applicable Action Tracking Number(s) (e.g., implementation activities): None

Approval: for DWI MURRAY NPPT Date: 6/17/16
Station Quality Review

Authorization: Terry Lane for Date: 6/17/16
Regulatory Assurance Manager/
Station Manager (if PORC required)

Kusumawatimurray, Putri:(GenCo-Nuc)

From: Simpson, Lisa A.:(GenCo-Nuc)
Sent: Tuesday, July 05, 2016 12:19 PM
To: Kusumawatimurray, Putri:(GenCo-Nuc)
Subject: RE: Concurrence for Unit 2 COLR Revision 4 for Cycle 16.
Attachments: Important message from Exelon.pdf; FW: Revised Writers Guide

Attached are my comments on the transmittal letter for the COLR. I limited my review to the letter since the COLR revision has already been issued. Also attached is the revised Exelon Nuclear Licensing Writer's Guide.

In accordance with LS-AA-117, I have reviewed and concur with the subject regulatory correspondence (with the attached comments).

Lisa A. Simpson
Exelon Corporate Licensing
630-657-2815
lisa.simpson@exeloncorp.com

From: Kusumawatimurray, Putri:(GenCo-Nuc)
Sent: Wednesday, June 29, 2016 4:08 PM
To: Simpson, Lisa A.:(GenCo-Nuc)
Subject: Concurrence for Unit 2 COLR Revision 4 for Cycle 16.

Lisa,

Please see the attached RA16-039 for your review and concurrence regarding NRC submittal of Unit 2 COLR Revision 4 for Cycle 16. We have updated TRM Appendix J to implement Revision 4 of the COLR for Cycle 16 on 6/20/16. The submittal has gone through Rx Engineering and Ops concurrence review. Do you think you'll be able to provide your concurrence by COB Friday, 7/1/16? Please let me know of any questions or concerns.

Thank you for your support as always,

Dwi Murray
Principal Regulatory Engineer
Regulatory Assurance – LaSalle County Station

Exelon Generation

815-415-2814
Putri.Kusumawatimurray@exeloncorp.com

NUCLEAR FUELS
TRANSMITTAL OF DESIGN INFORMATION

☒ SAFETY RELATED ☐ NON-SAFETY RELATED ☐ REGULATORY RELATED	**Originating Organization** ☒ Nuclear Fuels ☐ Other (specify) _____	NF ID# NF150845 Revision# 5 SRRS # 3A.130 Page 1 of 2 (Coversheet)

Station: LaSalle **Unit:** 2 **Cycle:** 16 **Generic:** N/A

Subject: COLR LaSalle 2 Revision 14

To: Joshua Shea (LaSalle, Reactor Engineering Manager) **EC/ECR#:** 401347

Michael D. Thomas Prepared by	Michael Thomas Signature	Digitally signed by Thomas, Michael D. Date: 2016-06-16 13:53-05:00 Date
Peter A. Weggeman Verified by	Peter A Weggeman Signature	Digitally signed by Peter A Weggeman Date: 2016.06.16 14:15:56 -05'00' Date
Doug J. Wise Approved by	Douglas Wise Signature	Digitally signed by Douglas Wise Date: 2016.06.16 17:01:27 -05'00' Date

Status of Information:

☒ Verified
☐ Unverified
☐ Engineering Judgment

Action Tracking # for Method and Schedule of Verification for Unverified DESIGN INFORMATION: N/A

Description of Information:

Rev. 5: Reissued COLR incorporating administrative comments from Reg Assurance. The 21 page COLR (Revision 14) is attached to this transmittal.

Rev. 4: Revise COLR to Revision 14 to update thermal limits and References to incorporate the mid-cycle TRACG AOO and GS3 analysis, delete Reference 2 because it is not needed, and add Reference 15.

Rev. 3: Remove Appendix A as it no longer applies and add revision history information. The 21 page L2C16 COLR (Revision 13) is attached to this one page transmittal coversheet.

Rev. 2: Revise COLR to add FWHOOS as exempt from all equipment in service requirement in Appendix A. The 21 page L2C16 COLR (Revision 12) is attached to this one page transmittal coversheet.

Rev. 1: Revised COLR to incorporate limits for lost jet pump plug seals mitigation plan and subsequent operation. The 21 page L2C16 COLR (Revision 11) is attached to this one page transmittal coversheet.

Rev. 0: Original issue of the LaSalle Unit 2 Cycle 16 (L2C16) COLR with all thermal/operating limits as identified and required by Technical Specifications. The 20 page L2C16 COLR (Revision 10) is attached to this one page transmittal cover sheet.

Purpose of Information:

Provide L2C16 COLR for Station Qualified Review (SQR) and Station PORC review (as necessary) and implementation.

Source of Information:	See COLR References and Methodology Sections.	
Supplemental Distribution:	**E – Mail:** Eric Stein (LS)	**Hard Copy:** LaSalle Records Management

5.6 Reporting Requirements

5.6.2 Annual Radiological Environmental Operating Report (continued)

(ODCM), and in 10 CFR 50, Appendix I, Sections IV.B.2, IV.B.3, and IV.C.

5.6.3 Radioactive Effluent Release Report

----------NOTE----------
A single submittal may be made for a multiple unit station. The submittal should combine sections common to all units at the station.

The Radioactive Effluent Release Report covering the operation of the unit shall be submitted prior to May 1 of each year in accordance with 10 CFR 50.36a. The report shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the unit. The material provided shall be consistent with the objectives outlined in the ODCM and the Process Control Program and in conformance with 10 CFR 50.36a and 10 CFR 50, Appendix I, Section IV.B.1.

5.6.4 (Deleted)

5.6.5 CORE OPERATING LIMITS REPORT (COLR)

a. Core operating limits shall be established prior to each reload cycle, or prior to any remaining portion of a reload cycle, and shall be documented in the COLR for the following:

1. The APLHGR for Specification 3.2.1.

2. The MCPR for Specification 3.2.2.

3. The LHGR for Specification 3.2.3.

(continued)

5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

4. The Rod Block Monitor Upscale Instrumentation Setpoint for the Rod Block Monitor—Upscale Function Allowable Value for Specification 3.3.2.1.

5. The OPRM setpoints for the trip function for SR 3.3.1.3.3.

b. 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-524(P)(A), "ANF Critical Power Methodology for Boiling Water Reactors."

2. ANF-913(P)(A), "COTRANSA 2: A Computer Program for Boiling Water Reactor Transient Analysis."

3. ANF-CC-33(P)(A), "HUXY: A Generalized Multirod Heatup Code with 10 CFR 50, Appendix K Heatup Option."

4. XN-NF-80-19(P)(A), "Advanced Nuclear Fuel Methodology for Boiling Water Reactors."

5. XN-NF-85-67(P)(A), "Generic Mechanical Design for Exxon Nuclear Jet Pump BWR Reload Fuel."

6. EMF-CC-074(P)(A), Volume 4 - "BWR Stability Analysis: Assessment of STAIF with input from MICROBURN-B2."

7. XN-NF-81-58(P)(A), "RODEX2 Fuel Rod Thermal-Mechanical Response Evaluation Model."

8. XN-NF-84-105(P)(A), "XCOBRA-T: A Computer Code for BWR Transient Thermal-Hydraulic Core Analysis."

(continued)

5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

9. EMF-2209(P)(A), "SPCB Critical Power Correlation."

10. ANF-89-98(P)(A), "Generic Mechanical Design Criteria for BWR Fuel Designs."

11. NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel."

12. NFSR-0091, "Benchmark of CASMO/MICROBURN BWR Nuclear Design Methods."

13. EMF-85-74(P)(A), "RODEX2A (BWR) Fuel Rod Thermal-Mechanical Evaluation Model."

14. EMF-2158(P)(A), "Siemens Power Corporation Methodology for Boiling Water Reactors: Evaluation and Validation of CASMO-4/MICROBURN-B2."

15. NEDC-33106P, "GEXL97 Correlation for Atrium-10 Fuel."

16. EMF-2245(P)(A), "Application of Siemens Power Corporation's Critical Power Correlations to Co-Resident Fuel."

17. EMF-2361(P)(A), "EXEM BWR-2000 ECCS Evaluation Model."

18. NEDO-32465-A, "BWR Owners' Group Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology and Reload Applications," August 1996.

19. ANF-1358(P)(A), "The Loss of Feedwater Heating Transient in Boiling Water Reactors."

(continued)

5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

The COLR will contain the complete identification for each of the TS referenced topical reports used to prepare the COLR (i.e., report number, title, revision, date, and any supplements).

c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems (ECCS) limits, nuclear limits such as SDM, transient analysis limits, and accident analysis limits) of the safety analysis are met.

d. The COLR, including any midcycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

5.6.6 Post Accident Monitoring (PAM) Instrumentation Report

When a report is required by Condition B or F of LCO 3.3.3.1, "Post Accident Monitoring (PAM) Instrumentation," a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring, the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the Function to OPERABLE status.

Sorn, Denise M:(GenCo-Nuc)

From: mshd.resource@nrc.gov
Sent: Friday, July 08, 2016 12:28 PM
To: Sorn, Denise M:(GenCo-Nuc)
Subject: [EXTERNAL] General Form Submission Received

The NRC received your General Form submission on: 07/08/2016 at 01:27 PM. It is being tracked as submission ID# 10688.

If it is a 'Publicly Available' submission after 6 work days from today the submission's attached document(s) will be available for viewing and download from the Agency's Public Web Based ADAMS website (http://adams.nrc.gov/wba) by searching for the following document accession number(s): [ML16190A257]. If this is a 'Non-Public submission the submission's attachment(s) will be retained in NRC's document management system (ADAMS) and will not be published to the public website.

Should you have questions about this submission please contact our Help Desk by phone at 866-672-7640 or by e-mail at mshd.resource@nrc.gov. When doing so, please refer to the Submission ID# shown above.

Note: The Help Desk is staffed daily from 9:00AM to 7:00PM Eastern Time Monday through Friday (except for Federal holidays)

Sorn, Denise M:(GenCo-Nuc)

From:	Sorn, Denise M:(GenCo-Nuc)
Sent:	Friday, July 08, 2016 12:38 PM
To:	Shea, Joshua M.:(GenCo-Nuc); Stein, Eric Jordan:(GenCo-Nuc); Weggeman, Peter A:(GenCo-Nuc)
Cc:	Kusumawatimurray, Putri:(GenCo-Nuc); Lanc, Terry L:(GenCo-Nuc)
Subject:	LaSalle NRC Correspondence RA16-039 - Unit 2 Cycle 16 Core Operating Limits Report (COLR)
Attachments:	NRC RA16-039.pdf

See Attached - Electronically submitted to the NRC on 7/11/16

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((¸¸.·´ ***Denise Sorn*** :¦:- -:¦:-
-:¦:- ((¸¸.·´LaSalle Station, Reg Assurance 815-415-2801

Sorn, Denise M:(GenCo-Nuc)

To: DCD-Licensing
Subject: LaSalle NRC Correspondence RA16-039 - Unit 2 Cycle 16 Core Operating Limits Report (COLR)
Attachments: NRC RA16-039 - Unit 2 Cycle 16 Revision 4 of COLR.pdf

See Attached - Electronically submitted to the NRC on 7/11/16

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LaSalle Station, Reg Assurance 815-415-2801