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February 01, 2002

SVP-02-008

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Quad Cities Nuclear Power Station, Unit 1
Facility Operating License No. DPR-29
NRC Docket Number 50-254

Subject: Core Operating Limits Report for Quad Cities Unit 1 Cycle 17A

In accordance with Technical Specifications Section 5.6.5.d, enclosed is the Core Operating Limits Report (COLR) for Quad Cities Unit 1 Cycle 17A.

On January 9, 2002, Quad Cities Nuclear Power Station (QCNPS) Unit 1 was forced to shutdown (Q1F49) as a result of a failed jet pump. During the forced shutdown QCNPS replaced a leaking fuel bundle with a bundle from the spent fuel pool, and elected to shuffle additional fuel bundles to extend full power operation for the Unit 1 core. As a result, Cycle 17A has been developed for Unit 1. The enclosed COLR is applicable until the first sequence exchange of Cycle 17A or 4140 MWD/MT cycle exposure, whichever occurs first in the cycle. Analyses for the remainder of Cycle 17A are in progress and any necessary revision to the enclosed COLR will be submitted in accordance with Technical Specifications Section 5.6.5.d.

Should you have any questions concerning this letter, please contact Mr. W. J. Beck at (309) 227-2800.

Respectfully,

Timothy J. Tulon
Site Vice President
Quad Cities Nuclear Power Station

Attachment A: Core Operating Limits Report for Quad Cities Unit 1 Cycle 17A

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – Quad Cities Nuclear Power Station

A001

Attachment A

Core Operating Limits Report

for

Quad Cities Unit 1 Cycle 17A

Core Operating Limits Report

For

Quad Cities Unit 1 Cycle 17A

January 2002

ISSUANCE OF CHANGES SUMMARY

Affected Section	Affected Pages	Summary of Changes	Date
All	All	Original Issue (Cycle 17A)	1/02

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SPECIAL INSTRUCTIONS

1. This Core Operating Limits Report (COLR) contains the applicable reactor core limits and operational information mandated by Technical Specifications Section 5.6.5. When the COLR is referenced by applicable Technical Specifications or procedures for Technical Specification compliance, a controlled copy of this report shall be used as the official source of the applicable limit or requirement.
2. This COLR and all limits contained within are applicable until the first sequence exchange of Cycle 17A. Additional analyses by Framatome-ANP are required prior to Cycle 17A operation beyond the first sequence exchange of the cycle or 4140 MWD/MTU cycle exposure, whichever occurs first in the cycle.

REFERENCES

1. Exelon Generation Company, LLC and MidAmerican Energy Company Docket No. 50-254, Quad Cities Nuclear Power Station, Unit 1 Facility Operating License, License No. DPR-29.

2. Letter from D.M. Crutchfield to All Power Reactor Licenses and Applicants, Generic Letter 88-16; Removal of Cycle-Specific Parameter Limits from Technical Specifications, 10/3/1998.

3. "Quad Cities Unit 1 Cycle 17 Neutronics Licensing Report (NLR)", Document ID # DG00-001158, TODI NFM0000100, Sequence 0.

4. Quad Cities Nuclear Power Station, Units 1 and 2, SAFER/GESTR - LOCA Loss-of-Coolant Accident Analysis, NEDC-31345P, Revision 2, Class III, July 1989 (as amended).

5. EMF-96-037(P), Rev. 1, "Quad Cities Extended Operating Domain (EOD) and Equipment Out Of Service (EOOS) Safety Analysis for ATRIUM-9B Fuel", September 1996, NFS NDIT # 9600134 Seq 02.

6. EMF-2415, "Quad Cities Unit 1 Cycle 17 Plant Transient Analysis", Rev. 0, August 2000.

7. EMF-2416, "Quad Cities Unit 1 Cycle 17 Reload Analysis", Rev. 0, August 2000.

8. EMF-2348(P), Revision 0, "Quad Cities LOCA-ECCS Analysis MAPLHGR Limits for ATRIUM-9B Fuel", February 2000.

9. DEG:98:177, "Permission to Send the NRC Nonproprietary Transient Analysis and Reload Analysis Reports", D.E. Garber to R.J. Chin, June 1, 1998.

10. GE DRF C51-00217-01, "Instrument Setpoint Calculation Nuclear Instrumentation, Rod Block Monitor, Quad Cites 1 & 2", December 14, 1999.

11. EMF-2706(P) Revision 0, "Quad Cities Unit 1 Cycle 17A Neutronic and Safety Analyses," January 2002.

12. J11-03692-LHGR, Revision 1, Class 3, February 2000, "ComEd GE9/GE10 LHGR Improvement Program", NDIT NFM0000067, Sequence 0.

13. DEG:01:077, "Quad Cities Unit 1 Cycle 17 Evaluation of Fuel Thermal Conductivity (Non-Proprietary Version for Exelon)," David Garber to Dr. R. J. Chin, May 14, 2001.

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1.0 CONTROL ROD WITHDRAWAL BLOCK INSTRUMENTATION

1.1 TECHNICAL SPECIFICATION REFERENCE:

TS 3.3.2.1, Table 3.3.2.1-1 (COLR 1.2) and
TS 3.4.1 (COLR 1.3)

1.2 DESCRIPTION (TLO):

The Rod Withdrawal Block Monitor Upscale Instrumentation Allowable Value for two recirculation loop operation is determined from the following relationship:

$$\leq (0.65)Wd + 56.1\% \text{ **}$$

1.3 DESCRIPTION (SLO):

The Rod Withdrawal Block Monitor Upscale Instrumentation Allowable Value for Single Loop Operation (SLO) is determined from the following relationship:

$$\leq (0.65)Wd + 51.4\% \text{ **}$$

** Clamped with an allowable value not to exceed the allowable value for recirculation loop drive flow (Wd) of 100%

Wd is the percent of drive flow required to produce a rated core flow of 98 million lb/hr. Trip level setting is in percent of rated power (2511 MWth).

2.0 AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)

2.1 TECHNICAL SPECIFICATION REFERENCE:

TS 3.2.1 (COLR 2.2) and
TS 3.4.1 (COLR 2.3)

2.2 DESCRIPTION:

The base MAPLHGR limits are determined as follows:

The Maximum Average Planar Linear Heat Generation Rates (MAPLHGR) vs. Average Planar Exposure for GE10-P8HXB311-8GZ-100M-145-CECO is determined from Table 2-1.

The Maximum Average Planar Linear Heat Generation Rates (MAPLHGR) vs. Average Planar Exposure for GE10-P8HXB312-7GZ-100M-145-CECO is determined from Table 2-2.

The Maximum Average Planar Linear Heat Generation Rates (MAPLHGR) vs. Average Planar Exposure for GE10-P8HXB332-8G5.0-100M-145-CECO is determined from Table 2-3.

The Maximum Average Planar Linear Heat Generation Rates (MAPLHGR) vs. Average Planar Exposure for GE10-P8HXB333-4G5.0/6G4.0-100M-145-CECO is determined from Table 2-4.

The Maximum Average Planar Linear Heat Generation Rates (MAPLHGR) vs. Average Planar Exposure for SPCA9-3.48B-11G6.5-ADV, SPCA9-3.60B-11G6.5-ADV, SPCA9-383B-11GZH-ADV, and SPCA9-382B-12GZL-ADV is determined from Table 2-5.

2.3 SINGLE LOOP OPERATION MULTIPLIER:

The tabulated values are multiplied by 0.85 for GE fuel and 0.90 for SPC fuel whenever Quad Cities enters Single Loop Operation.

TABLE 2-1

MAPLHGR vs. Average Planar Exposure for GE10-P8HXB311-8GZ-100M-145-CECO

LATTICE 1807: P8HXL071-8GE-100M-T
LATTICE 1806: P8HXL335-8G3.0-100M-T
LATTICE 1805: P8HXL353-2G4.0/6G3.0-100M-T
LATTICE 1804: P8HXL335-4G4.0/4G3.0-100M-T
LATTICE 1054: P8HXL071-NOG-100M-T

AVERAGE PLANAR EXPOSURE (GWD/ST)	MAPLHGR LIMITS (KW/FT)				
	1054	1806	1805	1804	1807
0.0	11.85	12.06	11.10	12.02	11.85
0.2	11.78	12.12	11.14	12.08	11.78
1.0	11.59	12.28	11.27	12.22	11.59
2.0	11.57	12.48	11.51	12.40	11.57
3.0	11.61	12.68	11.81	12.57	11.61
4.0	11.68	12.89	12.14	12.76	11.68
5.0	11.75	13.11	12.50	12.94	11.75
6.0	11.81	13.29	12.88	13.12	11.81
7.0	11.86	13.41	13.19	13.28	11.86
8.0	11.91	13.47	13.28	13.40	11.91
9.0	11.94	13.48	13.34	13.46	11.94
10.0	11.97	13.46	13.39	13.49	11.97
12.5	11.75	13.34	13.44	13.33	11.75
15.0	11.38	12.96	13.09	12.95	11.38
20.0	10.59	12.22	12.40	12.22	10.59
25.0	9.81	11.51	11.73	11.50	9.81
27.22	12.314	12.314	12.314	12.314	12.314
48.08	10.800	10.800	10.800	10.800	10.800
58.97	6.000	6.000	6.000	6.000	6.000

TABLE 2-2

MAPLHGR vs. Average Planar Exposure for GE10-P8HXB312-7GZ-100M-145-CECO

LATTICE 1811: P8HXL071-7GE-100M-T
LATTICE 1810: P8HXL336-7G3.0-100M-T
LATTICE 1809: P8HXL354-1G4.0/6G3.0-100M-T
LATTICE 1808: P8HXL336-3G4.0/4G3.0-100M-T
LATTICE 1054: P8HXL071-NOG-100M-T

AVERAGE PLANAR EXPOSURE (GWD/ST)	MAPLHGR LIMITS (KW/FT)				
	1054	1810	1809	1808	1811
0.0	11.85	12.04	11.27	12.01	11.85
0.2	11.78	12.11	11.31	12.08	11.78
1.0	11.59	12.27	11.42	12.23	11.59
2.0	11.57	12.49	11.65	12.43	11.57
3.0	11.61	12.72	11.93	12.65	11.61
4.0	11.68	12.96	12.24	12.88	11.68
5.0	11.75	13.15	12.58	13.09	11.75
6.0	11.81	13.30	12.94	13.22	11.81
7.0	11.86	13.41	13.15	13.32	11.86
8.0	11.91	13.46	13.32	13.40	11.91
9.0	11.94	13.47	13.43	13.45	11.94
10.0	11.97	13.45	13.50	13.47	11.97
12.5	11.75	13.35	13.45	13.35	11.75
15.0	11.38	12.97	13.10	12.97	11.38
20.0	10.59	12.24	12.41	12.23	10.59
25.0	9.81	11.52	11.74	11.51	9.81
27.22	12.314	12.314	12.314	12.314	12.314
48.08	10.800	10.800	10.800	10.800	10.800
58.97	6.000	6.000	6.000	6.000	6.000

TABLE 2-3

MAPLHGR vs. Average Planar Exposure for
GE10-P8HXB332-8G5.0-100M-145-CECO

LATTICE 1054: P8HXL071-NOG-100T-T
LATTICE 2080: P8HXL358-8G5.0-100T-T
LATTICE 2081: P8HXL377-8G5.0-100T-T
LATTICE 2082: P8HXL071-8GE-100T-T

AVERAGE PLANAR EXPOSURE (GWD/ST)	MAPLHGR LIMITS (KW/FT)			
	1054	2080	2081	2082
0.0	11.85	11.98	11.55	11.85
0.2	11.78	12.05	11.58	11.78
1.0	11.59	12.18	11.65	11.59
2.0	11.57	12.33	11.80	11.57
3.0	11.61	12.48	11.97	11.61
4.0	11.68	12.57	12.11	11.68
5.0	11.75	12.67	12.25	11.75
6.0	11.81	12.77	12.38	11.81
7.0	11.86	12.88	12.47	11.86
8.0	11.91	12.85	12.57	11.91
9.0	11.94	12.83	12.67	11.94
10.0	11.97	12.84	12.77	11.97
12.5	11.75	13.05	12.92	11.75
15.0	11.38	12.89	12.77	11.38
20.0	10.59	12.17	12.24	10.59
25.0	9.81	11.46	11.50	9.81
27.22	12.314	12.314	12.314	12.314
48.08	10.800	10.800	10.800	10.800
58.97	6.0000	6.000	6.000	6.000

TABLE 2-4

MAPLHGR vs. Average Planar Exposure for GE10-P8HXB333-4G5.0/6G4.0-100M-145-CECO

LATTICE 1054: P8HXL071-NOG-100T-T
LATTICE 2077: P8HXL358-4G5.0/6G4.0-100T-T
LATTICE 2078: P8HXL377-4G5.0/6G4.0-100T-T
LATTICE 2079: P8HXL071-10GE-100T-T

AVERAGE PLANAR EXPOSURE (GWD/ST)	MAPLHGR LIMITS (KW/FT)			
	1054	2077	2078	2079
0.0	11.85	11.81	11.22	11.85
0.2	11.78	11.86	11.26	11.78
1.0	11.59	11.95	11.36	11.59
2.0	11.57	12.11	11.52	11.57
3.0	11.61	12.25	11.69	11.61
4.0	11.68	12.40	11.88	11.68
5.0	11.75	12.56	12.08	11.75
6.0	11.81	12.72	12.29	11.81
7.0	11.86	12.85	12.46	11.86
8.0	11.91	12.89	12.61	11.91
9.0	11.94	12.94	12.76	11.94
10.0	11.97	13.00	12.90	11.97
12.5	11.75	13.14	13.02	11.75
15.0	11.38	12.90	12.79	11.38
20.0	10.59	12.17	12.24	10.59
25.0	9.81	11.46	11.50	9.81
27.22	12.314	12.314	12.314	12.314
48.08	10.800	10.800	10.800	10.800
58.97	6.0000	6.000	6.000	6.000

TABLE 2-5

MAPLHGR vs. Average Planar Exposure for
SPCA9-3.48B-11G6.5-ADV
SPCA9-3.60B-11G6.5-ADV
SPCA9-383B-11GZH-ADV
and
SPCA9-382B-12GZL-ADV

AVERAGE PLANAR EXPOSURE (GWD/MTU)	ATRIUM-9B MAPLHGR (KW/FT)
0.0	13.5
20.0	13.5
60.0	8.7
61.1	8.6

3.0 LINEAR HEAT GENERATION RATE (LHGR)

3.1 TECHNICAL SPECIFICATION REFERENCE:

TS 3.2.3 and
TS 3.2.4

3.2 DESCRIPTION

A. Thermal limits provided in this section are only valid until the first sequence exchange of Cycle 17A or a cycle exposure of 4140 MWD/MTU, whichever occurs first. Additional analyses by Framatome-ANP are required prior to Cycle 17A operation beyond this point.

B. The LHGR limit for the GE fuel types in the Q1C17A core are as follows:

GE10-P8HXB311-8GZ-100M-145-CECO

NODAL EXPOSURE (GWD/MTU)	LHGR (KW/ft)
0.0	14.40
12.87	14.40
27.16	12.31
48.91	10.80
60.61	6.00

GE10-P8HXB312-7GZ-100M-145-CECO

NODAL EXPOSURE (GWD/MTU)	LHGR (KW/ft)
0.0	14.40
13.00	14.40
27.27	12.31
49.01	10.80
60.70	6.00

GE10-P8HXB332-8G5.0-100M-145-CECO

NODAL EXPOSURE (GWD/MTU)	LHGR (KW/ft)
0.0	14.40
12.75	14.40
27.25	12.31
48.97	10.8
60.62	6.00

GE10-P8HXB333-4G5.0/6G4.0-100M-145-CECO

NODAL EXPOSURE (GWD/MTU)	LHGR (KW/ft)
0.0	14.40
12.69	14.40
27.11	12.31
48.87	10.80
60.54	6.00

C. The LHGR limits are provided in Table 3-1 for all of the SPC fuel types (ATRIUM-9B Offset) in the Q1C17A core.

The Protection Against Power Transient LHGR Limits for ATRIUM-9B Offset fuel are provided in Table 3-2.

TABLE 3-1

LHGR vs AVERAGE PLANAR EXPOSURE for ATRIUM-9B
Steady State

AVERAGE PLANAR EXPOSURE (GWD/MTU)	ATRIUM-9B LHGR (KW/FT)
0.0	14.4
15.0	14.4
61.1	8.32

TABLE 3-2

LHGR vs AVERAGE PLANAR EXPOSURE for ATRIUM-9B
Transient

AVERAGE PLANAR EXPOSURE (GWD/MTU)	ATRIUM-9B LHGR (KW/FT)
0.0	19.4
15.0	19.4
61.1	11.2

4.0 MINIMUM CRITICAL POWER RATIO (MCPR)

4.1 TECHNICAL SPECIFICATION REFERENCE:

TS 2.1.1.2,
TS 3.2.2 and
TS 3.4.1

4.2 DESCRIPTION

Thermal limits provided in this section are only valid until the first sequence exchange of Cycle 17A or a cycle exposure of 4140 MWD/MTU, whichever occurs first. Additional analyses by Framatome-ANP are required prior to Cycle 17A operation beyond this point.

The MCPR Operating Limits are based on the dual loop MCPR Safety Limit of 1.11. For Single Loop Operation the MCPR Safety Limit is 1.12 which increases the MCPR Operating Limit by 0.01. The MCPR Safety Limit is based on the following equipment conditions:

50% of the LPRMs out of service
40% of the TIPs out of service
2500 EFPH LPRM calibration interval
Single Loop Operation
No reused channels

The MCPR Operating Limits are based on a 15 psi reduction in steam dome pressure and Technical Specification SCRAM speeds.

The Operating Limit MCPR shall be determined as follows:

1. During steady-state operation at rated core flow, the Operating Limit MCPR shall be greater than or equal to the limits provided in Table 4-1 for the appropriate operating conditions.

2. During off-rated flow conditions in Manual Flow Control Mode, the Operating Limit MCPR for each fuel type at a specific core flow condition shall be determined from the greater of the following:

   a. Table 4-2 using the appropriate flow rate, or

   b. Table 4-1 using the appropriate operating condition.

Percent Rated Core Flow based on 98 MLB/hr with 110% Maximum Flow in Manual Flow Control. (Technical Requirements Manual 2.1.a.1 and Bases of TS 3.2.2)

3. During off-rated flow conditions in Automatic Flow Control Mode, the Operating Limit MCPR for each fuel type at a specific core flow condition shall be determined from Table 4-3, Table 4-4, or Table 4-5 using the appropriate operating conditions. *Percent Rated Core Flow based on 98 MLB/hr with 108% Maximum Flow in Automatic Flow Control Operation* (Technical Requirements Manual 2.1.a.1 and Bases of TS 3.2.2).

4. During PLU Out of Service Conditions a 0.980 MFLCPR Administrative Limit shall be used.

TABLE 4-1
Q1C17A Operating Limit MCPRs based on 1.11 SLMCPR

	GE10 OLMCPR	ATRIUM-9B OLMCPR
Normal Operation (Supports ICF and RVOOS)	1.51	1.47
EOD/EOOS Operation (FHOOS)	1.55	1.51
1 Bypass Valve OOS (Supports ICF and RVOOS)	1.51	1.47
All Bypass Valves OOS (Supports ICF and RVOOS)	1.56	1.52

TABLE 4-2
Q1C17A Operating Limit MCPRs for Manual Flow Control

Total Core Flow (% of Rated)	GE10 OLMCPR	ATRIUM-9B Offset OLMCPR
110	1.11	1.11
30	2.00	2.05
0	2.56	2.59

TABLE 4-3
Q1C17A Operating Limit MCPRs for Automatic Flow Control
(Normal Operation or 1 Bypass Valve OOS)

Total Core Flow (% of Rated)	GE10 OLMCPR	ATRIUM-9B Offset OLMCPR
108	1.51	1.47
30	2.83	2.82
0	3.73	3.68

TABLE 4-4
Q1C17A Operating Limit MCPRs for Automatic Flow Control EOD/EOOS

Total Core Flow (% of Rated)	GE10 OLMCPR	ATRIUM-9B Offset OLMCPR
108	1.55	1.51
30	2.90	2.90
0	3.82	3.79

TABLE 4-5
Q1C17A Operating Limit MCPRs for Automatic Flow Control All Bypass Valves OOS

Total Core Flow (% of Rated)	GE10 OLMCPR	ATRIUM-9B Offset OLMCPR
108	1.56	1.52
30	2.92	2.92
0	3.85	3.81

5.0 ANALYTICAL METHODS

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. NEDE-24011-P-A-14, "General Electric Standard Application for Reactor Fuel," June 2000.
2. Commonwealth Edison Topical Report NFSR-0085, "Benchmark of BWR Nuclear Design Methods," Revision 0, November 1990.
3. Commonwealth Edison Topical Report NFSR-0085, Supplement 1, "Benchmark of BWR Nuclear Design Methods - Quad Cities Gamma Scan Comparisons," Revision 0, April 1991.
4. Commonwealth Edison Topical Report NFSR-0085, Supplement 2, "Benchmark of BWR Nuclear Design Methods – Neutronic Licensing Analyses," Revision 0, April 1991.
5. Advanced Nuclear Fuels Methodology for Boiling Water Reactors: Benchmark Results for CASMO-3G/MICROBURN-B Calculation Methodology, XN-NF-80-19 (P)(A), Volume 1, Supplement 3, Supplement 3 Appendix F, and Supplement 4, Advanced Nuclear Fuels Corporation, November 1990.
6. Exxon Nuclear Methodology for Boiling Water Reactors: Application of the ENC Methodology to BWR Reloads, XN-NF-80-19 (P)(A), Volume 4, Revision 1, Exxon Nuclear Company, June 1986.
7. Exxon Nuclear Methodology for Boiling Water Reactors THERMEX: Thermal Limits Methodology Summary Description, XN-NF-80-19 (P)(A), Volume 3, Revision 2, Exxon Nuclear Company, January 1987.
8. Exxon Nuclear Methodology for Boiling Water Reactors – Neutronic Methods for Design and Analysis, XN-NF-80-19 (P)(A), Volume 1 and Supplements 1 and 2, Exxon Nuclear Company, March 1983.
9. Generic Mechanical Design for Exxon Nuclear Jet Pump BWR Reload Fuel, XN-NF-85-67 (P)(A), Revision 1, Exxon Nuclear Company, September 1986.
10. Qualification of Exxon Nuclear Fuel for Extended Burnup, Supplement 1: Extended Burnup Qualification of ENC 9x9 BWR Fuel, XN-NF-82-06 (P)(A), Supplement 1, Revision 2, Advanced Nuclear Fuels Corporation, May 1988.
11. Advanced Nuclear Fuels Corporation Generic Mechanical Design for Advanced Nuclear Fuels Corporation 9x9-IX and 9x9-9X BWR Reload Fuel, ANF-89-014 (P)(A), Revision 1, and Supplements 1 and 2, Advanced Nuclear Fuels Corporation, October 1991.
12. Generic Mechanical Design Criteria for BWR Fuel Designs, ANF-89-98 (P)(A), Revision 1, and Revision 1 Supplement 1, Advanced Nuclear Fuels Corporation, May 1995.
13. Exxon Nuclear Plant Transient Methodology for Boiling Water Reactors, XN-NF-79-71 (P)(A), Revision 2 Supplements 1, 2 and 3, Exxon Nuclear Company, March 1986.
14. ANFB Critical Power Correlation, ANF-1125 (P)(A) and Supplements 1 and 2, Advanced Nuclear Fuels Corporation, April 1990.
15. Advanced Nuclear Fuels Corporation Critical Power Methodology for Boiling Water Reactors/Advanced Nuclear Fuels Corporation Critical Power Methodology for Boiling Water Reactors: Methodology for Analysis of Assembly Channel Bowing Effects/NRC Correspondence, ANF-524 (P)(A), Revision 2, Supplement 1 Revision 2, Supplement 2, Advanced Nuclear Fuels Corporation, November 1990.
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