

Commonwealth Edison Company  
Quad Cities Generating Station  
22710 206th Avenue North  
Cordova, IL 61242-9740  
Tel 309-654-2241



October 20, 2000

SVP-00-163

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

Attention: Document Control Desk

Subject: Quad Cities Nuclear Power Station Unit 1  
Q1C17 Core Operating Limits Report  
NRC Docket Number 50-254

On October 14, 2000 Quad Cities Unit 1 was shutdown for its sixteenth refueling outage. In accordance with Technical Specifications Section 6.9.A.6.c., "CORE OPERATING LIMITS REPORT," the Quad Cities Unit 1 Cycle 17 Core Operating Limits Report is enclosed.

Should you have any questions concerning this letter, please contact Mr. C.C. Peterson at (309) 654-2241, extension 3609.

Respectfully,

A handwritten signature in cursive script that reads "Joel P. Dimmette, Jr." followed by a flourish.

Joel P. Dimmette, Jr.  
Site Vice President  
Quad Cities Nuclear Power Station

Attachment A: Q1C17 Core Operating Limits Report

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

A001

October 20, 2000  
U.S. Nuclear Regulatory Commission  
Page 2

bcc: Project Manager – NRR  
Office of Nuclear Facility Safety, - IDNS  
Senior Reactor Analyst – IDNS  
Manager of Energy Practice – Winston and Strawn  
Director, Licensing and Compliance – ComEd  
Vice President, Regulatory Services– ComEd  
ComEd Document Control Desk Licensing (Hard Copy)  
ComEd Document Control Desk Licensing (Electronic Copy)  
W. Leech – MidAmerican Energy Company  
D. Tubbs – MidAmerican Energy Company  
Regulatory Assurance Manager – Dresden Nuclear Power Station  
Regulatory Assurance Manager – Quad Cities Nuclear Power Station  
NRC Coordinator – Quad Cities Nuclear Power Station  
NSRB Site Coordinator – Quad Cities Nuclear Power Station  
Site Vice President - Quad Cities Nuclear Power Station  
Station Manager - Quad Cities Nuclear Power Station  
SVP Letter File

**ATTACHMENT A**

**Quad Cities Nuclear Power Station Unit 1  
Q1C17 Core Operating Limits Report**

**Core Operating Limits Report**

**For**

**Quad Cities Unit 1 Cycle 17**

**October 2000**

**ISSUANCE OF CHANGES SUMMARY**

<b>Affected Section</b>	<b>Affected Pages</b>	<b>Summary of Changes</b>	<b>Date</b>
All	All	Original Issue (Cycle 17)	10/00

## TABLE OF CONTENTS

REFERENCES.....	iii
LIST OF TABLES.....	iv
1.0 CONTROL ROD WITHDRAWAL BLOCK INSTRUMENTATION.....	1-1
1.1 TECHNICAL SPECIFICATION REFERENCE.....	1-1
1.2 DESCRIPTION (TLO).....	1-1
1.3 DESCRIPTION (SLO).....	1-1
2.0 AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR).....	2-1
2.1 TECHNICAL SPECIFICATION REFERENCE.....	2-1
2.2 DESCRIPTION.....	2-1
2.3 SINGLE LOOP OPERATION MULTIPLIER.....	2-1
3.0 LINEAR HEAT GENERATION RATE (LHGR).....	3-1
3.1 TECHNICAL SPECIFICATION REFERENCE.....	3-1
3.2 DESCRIPTION.....	3-1
4.0 MINIMUM CRITICAL POWER RATIO (MCPR).....	4-1
4.1 TECHNICAL SPECIFICATION REFERENCE.....	4-1
4.2 DESCRIPTION.....	4-1
5.0 ANALYTICAL METHODS.....	5-1

## REFERENCES

1. Commonwealth Edison Company and MidAmerican Energy Company Docket No. 50-254, Quad Cities 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.
3. "Quad Cities Unit 1 Cycle 17 Neutronics Licensing Report", Document ID # DG00-001158.
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-96-185(P), Revision 4, "Quad Cities LOCA-ECCS Analysis MAPLHGR Limits for ATRIUM-9B Fuel", August 1998, NDIT # NFM970015 Seq 3.
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. NFM:BSA:99-004, "Change to the Quad Cities Unit 1 Cycle 16 and Unit 2 Cycle 15 Rod Withdrawal Block Monitor Instrumentation Trip Set Points", R. W. Tsai to D. B. Wozniak, January 19, 1999.
11. DEG:00:091, "Revised Measured Nodal Power Distribution Uncertainty for POWERPLEX Operation with Uncalibrated LPRMs", David Garber to Dr. R. J. Chin, April 5, 2000.
12. J11-03692-LHGR, Revision 1, Class 3, February 2000, "ComEd GE9/GE10 LHGR Improvement Program", Document ID# DG00-000467.

## LIST OF TABLES

Table	Title	Page
2-1	Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) vs. Average Planar Exposure for GE10-P8HXB311-8GZ-100M-145-CECO	2-2
2-2	Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) vs. Average Planar Exposure for GE10-P8HXB312-7GZ-100M-145-CECO	2-3
2-3	Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) vs. Average Planar Exposure for GE10-P8HXB332-8G5.0-100M-145-CECO	2-4
2-4	Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) vs. Average Planar Exposure for GE10-P8HXB333-4G5.0/6G4.0-100M-145-CECO	2-5
2-5	Maximum Average Planar Linear Heat Generation Rate (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	2-6
3-1	LHGR vs Average Planar Exposure for ATRIUM-9B Steady State	3-2
3-2	LHGR vs Average Planar Exposure for ATRIUM-9B Transient	3-2
4-1	Q1C17 Operating Limit MCPRs based on 1.11 SLMCPR	4-2
4-2	Q1C17 Operating Limit MCPRs for Manual Flow Control	4-2
4-3	Q1C17 Operating Limit MCPRs for Automatic Flow Control (Base Case OLMCPR)	4-2
4-4	Q1C17 Operating Limit MCPRs for Automatic Flow Control EOD/EOOS	4-2

## 1.0 CONTROL ROD WITHDRAWAL BLOCK INSTRUMENTATION

### 1.1 TECHNICAL SPECIFICATION REFERENCE:

CTS TLO: 3.2.E-1  
CTS SLO:3.6.A.1.c  
ITS 3.3.2.1

### 1.2 DESCRIPTION (TLO):

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

$$\leq (0.65)Wd + 55\% **$$

### 1.3 DESCRIPTION (SLO):

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

$$\leq (0.65)Wd + 51\% **$$

\*\* 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:

CTS 3.6.A.1.d and 3.11.A, ITS 3.2.1

### 2.2 DESCRIPTION:

- a. For operation with uncalibrated LPRMs from BOC to 500 MWd/MT a penalty of 15.52% must be applied to all MAPLHGR limits.
- b. 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**

<b>AVERAGE PLANAR EXPOSURE (GWD/MTU)</b>	<b>ATRIUM-9B MAPLHGR (KW/FT)</b>
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:**

CTS 3.11.D & 3.11.B, ITS 3.2.3 & 3.2.4

3.2 **DESCRIPTION**

A. For operation with with uncalibrated LPRMs from BOC to 500 MWd/MT a penalty of 15.52% must be applied to all LHGR limits.

B. The LHGR limit for the GE fuel types in the Q1C17 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 Q1C17 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**

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

**TABLE 3-2**

**LHGR vs AVERAGE PLANAR EXPOSURE for ATRIUM-9B  
Transient**

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

#### 4.0 MINIMUM CRITICAL POWER RATIO (MCPR)

##### 4.1 TECHNICAL SPECIFICATION REFERENCE:

CTS 2.1.B, 3.6.A.1.a&b, and 3.11.C, ITS 3.2.2

##### 4.2 DESCRIPTION

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  
Operation with uncalibrated LPRMs at startup  
Single Loop Operating  
No reused channels

**NOTE:** For operation with uncalibrated LPRMs at BOC, analysis results support these limits for cycle exposures up to 500.0 MWd/MTU and therefore, the Q1C17 MCPR Operating Limits are bounding.

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 operating 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 Recirculation Flow based on 98 MLB/hr with 110% Maximum Flow in Manual Flow Control. (Technical Specification 4.6.A)*

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 or Table 4-4 using the appropriate operating conditions. *Percent Rated Recirculation Flow based on 98 MLB/hr with 108% Maximum Flow in Automatic Flow Control Operation (Technical Specification 4.6.A)*
4. During PLU Out of Service Conditions a 0.979 MFLCPR Administrative Limit shall be used during operation up to EOFP and a 0.980 MFLCPR Administrative Limit shall be used during coastdown.

**TABLE 4-1**

**Q1C17 Operating Limit MCPRs based on 1.11 SLMCPR**

	<b>GE10 OLMCPR</b>	<b>ATRIUM-9B OLMCPR</b>
<b>Normal Operation</b> (Supports ICF and RVOOS)	1.51	1.46
<b>EOD/EOOS Operation</b> (FFTR, FHOOS, Coastdown, or any combination thereof)	1.55	1.50

**TABLE 4-2**

**Q1C17 Operating Limit MCPRs for Manual Flow Control**  
(For Normal Operation or EOD/EOOS Operation)

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

**TABLE 4-3**

**Q1C17 Operating Limit MCPRs for Automatic Flow Control (Base Case OLMCPR)**

<b>Total Core Flow (% of Rated)</b>	<b>GE10 OLMCPR</b>	<b>ATRIUM-9B Offset OLMCPR</b>
108	1.51	1.46
30	2.83	2.81
0	3.73	3.66

**TABLE 4-4**

**Q1C17 Operating Limit MCPRs for Automatic Flow Control EOD/EOOS**

<b>Total Core Flow (% of Rated)</b>	<b>GE10 OLMCPR</b>	<b>ATRIUM-9B Offset OLMCPR</b>
108	1.55	1.50
30	2.91	2.89
0	3.82	3.77

## **5.0 ANALYTICAL METHODS**

The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC in the latest approved revision or supplement of the topical reports describing the methodology and are listed in the Technical Specifications.