

ISSUANCE OF CHANGES SUMMARY

Affected Section	Affected Pages	Summary of Changes	Date
All	All	Original Issue (Cycle 11).	06/89
All	All	Original Issue (Cycle 12).	10/90
All	All	Original Issue (Cycle 13).	11/92
2	iv, 2 2-1 - 2-8	Converted Figures 2-1 through 2-8 to actual tables from References 4 and 5.	01/93
All 2,4,5	All 2,4,5	Original Issue (Cycle 14), Added Section 2.3 on SLO, Revised Section 4.2 requiring OLMCPR penalty during coastdown operation, Added Section 5.0 on Analytical Methods.	3/94
All	All	Original Issue (Cycle 15), Latest Date Revised added to each COLR page, Added Special Instructions and boxed in TSUP References for TSUP Implementation, Added Control Rod Withdrawal Block Equation for Single Loop Operation.	5/96

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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 Specification 6.6.A.4, (TSUP Section 6.9.A.6). 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. Implementation of the Technical Specification Upgrade Program (TSUP): The referenced Technical Specifications in this Report contain a notation as shown below, when indicating the applicable TSUP section(s). This reference is to be used when the COLR is used after the activation of TSUP, for the duration of the current operating cycle.

Example of Technical Specification reference:

TECHNICAL SPECIFICATION REFERENCE:
Technical Specification 3.5.1

TSUP TECHNICAL SPECIFICATION: 3.11.A

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; Concerning the Removal of Cycle-Specific Parameter Limits from Technical Specifications.
3. Supplemental Reload Licensing Report for Quad Cities Nuclear Power Station, Unit 1 Reload 14 Cycle 15, 24A5182, Revision 0, Class I, December, 1995.
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. Extended Operating Domain and Equipment Out-Of-Service (EOD/EOOS) for Quad Cities Nuclear Power Station Units 1 and 2, NEDC-31449, Revision 1, Class II, April 1992.
6. GE document GENE-637-037-1193, Class II, "Analysis of End of Full Power Capability Coastdown with Load Following for Quad Cities 1 and 2, dated November, 1993.
7. NFS letter NFS:BSA:95-054 R. W. Tsai to R. E. Kingston, "Changes to Q1C15 OPL-3 Proposed Inputs", dated July 31, 1995.
8. NFS letter NFS:BSS:96-023, "Turbine Bypass Valve Profile Change for Q1C15 and the Effect on the EOD/EOOS Generic Analysis", dated February 9, 1996.
9. NFS Calcnote NFSCN:96-006 "Q1C15 Kf curve verification", dated February 19, 1996.

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1.0 CONTROL ROD WITHDRAWAL BLOCK INSTRUMENTATION (3.2/4.2)

1.1. TECHNICAL SPECIFICATION REFERENCE:

Technical Specification Table 3.2-3 and 3.6.H.3.d

TSUP TECHNICAL SPECIFICATION:
Table 3.2.E-1 [COLR 1.2], 3.6.A.1.c [COLR 1.3]

1.2. DESCRIPTION:

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

$$\leq (0.65)Wd + 43\% **$$

1.3. DESCRIPTION:

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

$$\leq (0.65)Wd + 39\% **$$

** 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) (3.5/4.5)

2.1 TECHNICAL SPECIFICATION REFERENCE:

Technical Specification 3.5.1

TSUP TECHNICAL SPECIFICATION: 3.11.A

2.2 DESCRIPTION:

The Maximum Average Planar Linear Heat Generation Rates (MAPLHGR) versus Average Planar Exposure for GE8B-P8DQB301-9GZ-80M-4WR-145-T is determined from Table 2-1.

The Maximum Average Planar Linear Heat Generation Rates (MAPLHGR) versus Average Planar Exposure for GE9B-P8DWB258-4G4.0/3G3.0-80M-145-T is determined from Table 2-2.

The Maximum Average Planar Linear Heat Generation Rates (MAPLHGR) versus Average Planar Exposure for GE9B-P8DWB258-9GZ-80M-145-T is determined from Table 2-3.

The Maximum Average Planar Linear Heat Generation Rates (MAPLHGR) versus Average Planar Exposure for GE9B-P8DWB305-7GZ-80M-145-T is determined from Table 2-4.

The Maximum Average Planar Linear Heat Generation Rates (MAPLHGR) versus Average Planar Exposure for GE10-P8HXB311-8GZ-100M-145-T is determined from Table 2-5.

The Maximum Average Planar Linear Heat Generation Rates (MAPLHGR) versus Average Planar Exposure for GE10-P8HXB312-7GZ-100M-145-T is determined from Table 2-6.

The Maximum Average Planar Linear Heat Generation Rates (MAPLHGR) versus Average Planar Exposure for GE10-P8HXB332-8G5.0-100T-145-T is determined from Table 2-7.

The Maximum Average Planar Linear Heat Generation Rates (MAPLHGR) versus Average Planar Exposure for GE10-P8HXB333-4G5.0/6G4.0-100T-145-T is determined from Table 2-8.

2.3 SINGLE LOOP OPERATION MULTIPLIER

The tabulated values are multiplied by 0.85 whenever Quad Cities enters Single Loop Operation.

TABLE 2-1

**MAPLHGR vs. AVERAGE PLANAR EXPOSURE
FOR BUNDLE TYPE GE8B-P8DQB301-9GZ-80M-4WR-145-T**

LATTICE 565 : P8DQL071-NOG-80M-T
LATTICE 854 : P8DQL320-6G2.0-80M-T
LATTICE 855 : P8DQL320-3G3.0/6G2.0-80M-T
LATTICE 856 : P8DQL071-9GE-80M-T

AVERAGE PLANAR EXPOSURE (GWd/ST)	MAPLHGR LIMITS (KW/FT)			
	565	854	855	856
0.0	11.57	12.18	11.41	11.57
0.2	11.50	12.23	11.49	11.50
1.0	11.30	12.34	11.63	11.30
2.0	11.28	12.60	11.94	11.28
3.0	11.33	12.89	12.34	11.33
4.0	11.40	13.01	12.61	11.40
5.0	11.48	13.14	12.82	11.48
6.0	11.55	13.24	13.02	11.55
7.0	11.61	13.31	13.18	11.61
8.0	11.66	13.34	13.28	11.66
9.0	11.69	13.35	13.34	11.69
10.0	11.72	13.35	13.37	11.72
12.5	11.44	13.33	13.31	11.44
15.0	11.07	12.95	12.94	11.07
20.0	10.29	12.23	12.21	10.29
25.0	9.50	11.50	11.48	9.50
35.0	7.93	10.13	10.11	7.93
45.0	-	8.52	8.48	-
50.0	-	6.27	6.21	-

TABLE 2-2

**MAPLHGR vs. AVERAGE PLANAR EXPOSURE
FOR BUNDLE TYPE GE9B-P8DWB258-4G4.0/3G3.0-80M-145-T**

LATTICE 731 : P8DWL071-NOG-80M-T
LATTICE 1002 : P8DWL278-4G4.0/3G3.0-80M-T
LATTICE 1003 : P8DWL290-4G4.0/3G3.0-80M-T
LATTICE 1004 : P8DWL071-7GE-80M-T

AVERAGE PLANAR EXPOSURE (GWd/ST)	MAPLHGR LIMITS (KW/FT)			
	731	1002	1003	1004
0.0	11.64	12.02	11.23	11.64
0.2	11.57	12.09	11.30	11.57
1.0	11.33	12.25	11.47	11.38
2.0	11.36	12.46	11.69	11.36
3.0	11.41	12.66	11.98	11.41
4.0	11.49	12.86	12.20	11.49
5.0	11.56	13.07	12.40	11.56
6.0	11.63	13.20	12.54	11.63
7.0	11.69	13.30	12.69	11.69
8.0	11.74	13.40	12.84	11.74
9.0	11.78	13.46	12.97	11.78
10.0	11.81	13.50	13.06	11.81
12.5	11.54	13.44	13.04	11.54
15.0	11.16	13.07	12.79	11.16
20.0	10.37	12.34	12.29	10.37
25.0	9.58	11.66	11.75	9.58
35.0	8.01	10.34	10.24	8.01
43.7	4.71	-	-	4.71
45.0	-	8.33	8.15	-
50.9	-	-	5.10	-
52.4	-	4.90	-	-

TABLE 2-3

**MAPLHGR vs. AVERAGE PLANAR EXPOSURE
FOR BUNDLE TYPE GE9B-P8DWB258-9GZ-80M-145-T**

LATTICE 731 : P8DWL071-NOG-80M-T
LATTICE 1005 : P8DWL277-7G3.0-80M-T
LATTICE 1006 : P8DWL288-7G3.0-80M-T
LATTICE 1007 : P8DWL288-2G4.0/7G3.0-80M-T
LATTICE 1008 : P8DWL071-9GE-80M-T

AVERAGE PLANAR EXPOSURE (GWd/ST)	MAPLHGR LIMITS (KW/FT)				
	731	1005	1006	1007	1008
0.0	11.64	12.07	11.27	10.75	11.64
0.2	11.57	12.14	11.35	10.85	11.57
1.0	11.38	12.33	11.55	11.04	11.38
2.0	11.36	12.56	11.80	11.33	11.36
3.0	11.41	12.79	12.10	11.70	11.41
4.0	11.49	13.03	12.31	11.99	11.49
5.0	11.56	13.23	12.53	12.25	11.56
6.0	11.63	13.33	12.71	12.47	11.63
7.0	11.69	13.41	12.84	12.67	11.69
8.0	11.74	13.45	12.94	12.86	11.74
9.0	11.78	13.47	13.00	12.99	11.78
10.0	11.81	13.47	13.05	13.08	11.81
12.5	11.54	13.41	13.02	13.03	11.54
15.0	11.16	13.04	12.77	12.78	11.16
20.0	10.37	12.32	12.27	12.28	10.37
25.0	9.58	11.64	11.73	11.73	9.58
35.0	8.01	10.32	10.23	10.20	8.01
43.7	4.71	-	-	-	4.71
45.0	-	8.33	8.15	8.12	-
50.7	-	-	-	5.12	-
50.9	-	-	5.09	-	-
52.4	-	4.89	-	-	-

TABLE 2-4

**MAPLHGR vs. AVERAGE PLANAR EXPOSURE
FOR BUNDLE TYPE GE9B-P8DWB305-7GZ-80M-145-T**

LATTICE 731 : P8DWL071-NOG-80M-T
LATTICE 1516 : P8DWL339-3G4.0/4G3.0-80M-T
LATTICE 1517 : P8DWL339-7G3.0-80M-T
LATTICE 1518 : P8DWL324-7G3.0-80M-T
LATTICE 1061 : P8DWL071-7GE1-80M-T

AVERAGE PLANAR EXPOSURE (GWD/ST)	MAPLHGR LIMITS (KW/FT)				
	731	1516	1517	1518	1061
0.0	11.64	12.00	12.00	11.97	11.64
0.2	11.57	12.10	12.11	12.04	11.57
1.0	11.38	12.26	12.27	12.11	11.38
2.0	11.36	12.42	12.44	12.31	11.36
3.0	11.41	12.59	12.60	12.59	11.41
4.0	11.49	12.74	12.75	12.91	11.49
5.0	11.56	12.88	12.89	13.09	11.56
6.0	11.63	13.01	13.01	13.23	11.63
7.0	11.69	13.10	13.06	13.36	11.69
8.0	11.74	13.13	13.09	13.48	11.74
9.0	11.78	13.15	13.12	13.54	11.78
10.0	11.81	13.16	13.15	13.56	11.81
12.5	11.54	13.07	13.08	13.52	11.54
15.0	11.16	12.72	12.73	13.12	11.16
20.0	10.37	12.04	12.05	12.35	10.37
25.0	9.58	11.39	11.40	11.60	9.58
35.0	8.01	10.15	10.15	10.19	8.01
43.7	4.71	-	-	-	4.71
45.0	-	8.69	8.69	8.68	-
50.7	-	-	5.90	-	-
50.7	-	5.89	-	-	-
51.2	-	-	-	5.78	-

TABLE 2-5

MAPLHGR vs. AVERAGE PLANAR EXPOSURE
FOR BUNDLE TYPE GE10-P8HXB311-8GZ-100M-145-T

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
35.0	8.26	10.13	10.39	10.13	8.26
44.9	4.93	-	-	-	4.93
45.0	-	8.55	9.00	8.55	-
50.4	-	5.85	-	-	-
50.5	-	-	-	5.85	-
51.5	-	-	5.86	-	-

TABLE 2-6

MAPLHGR vs. AVERAGE PLANAR EXPOSURE
FOR BUNDLE TYPE GE10-P8HXB312-7GZ-100M-145-T

LATTICE 1811 : P8HXL071-7GE-100M-T
LATTICE 1810 : P8HXL336-7G3.0-100M-T
LATTICE 1809 : P8HXL355-1G4.0/6G3.0-100M-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
35.0	8.26	10.15	10.41	10.14	8.26
44.9	4.93	-	-	-	4.93
45.0	-	8.60	9.01	8.61	-
50.5	-	5.85	-	-	-
50.6	-	-	-	5.85	-
51.6	-	-	5.86	-	-

TABLE 2-7

**MAPLHGR vs. AVERAGE PLANAR EXPOSURE
FOR BUNDLE TYPE GE10-P8HXB332-8G5.0-100T-145-T**

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
35.0	8.26	10.09	10.08	8.26
44.9	4.93	-	-	4.93
45.0	-	8.82	8.51	-
50.5	-	-	5.80	-
51.4	-	5.78	-	-

TABLE 2-8

**MAPLHGR vs. AVERAGE PLANAR EXPOSURE
FOR BUNDLE TYPE GE10-P8HXB333-4G5.0/6G4.0-100T-145-T**

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
35.0	8.26	10.08	10.08	8.26
44.9	4.93	-	-	4.93
45.0	-	8.81	8.47	-
50.4	-	-	5.81	-
51.4	-	5.77	-	-

3.0 LINEAR HEAT GENERATION RATE (LHGR) (3.5/4.5)

3.1 TECHNICAL SPECIFICATION REFERENCE:

Technical Specification 3.5.J

TSUP TECHNICAL SPECIFICATION: 3.11.D

3.2 DESCRIPTION:

A. The LHGR limit is 14.4 Kw/ft for all fuel types in the Q1C15 core:

1. GE8B-P8DQB301-9GZ-80M-4WR-145-T
2. GE9B-P8DWB258-4G4.0/3G3.0-80M-145-T
3. GE9B-P8DWB258-9GZ-80M-145-T
4. GE9B-P8DWB305-7GZ-80M-145-T
5. GE10-P8HXB311-8GZ-100M-145-T
6. GE10-P8HXB312-7GZ-100M-145-T
7. GE10-P8HXB332-8G5.0-100T-145-T
8. GE10-P8HXB333-4G5.0/6G4.0-100T-145-T

4.0 MINIMUM CRITICAL POWER RATIO (MCPR) (3.5/4.5)

4.1 TECHNICAL SPECIFICATION REFERENCE:

Technical Specifications 3.5.K, 3.6.H.3, 3.3.L

TSUP TECHNICAL SPECIFICATION: 3.11.C, 3.3.E

4.2 DESCRIPTION:

During steady-state operation at rated core flow, the Operating Limit MCPR (OLMCPR) shall be greater than or equal to:

$$1.32 \text{ for } t_{ave} \leq 0.68 \text{ seconds}$$

$$(0.556)t_{ave} + 0.942 \text{ for } 0.68 \leq t_{ave} \leq 0.86 \text{ seconds}$$

where t_{ave} = mean 20% scram insertion time for all surveillance data from Technical Specification 4.3.C which has been generated in the current cycle.

For core flows other than rated, these nominal values of OLMCPR shall be increased by a factor of K_f where K_f is as shown in Figure 4-1.

The (τ -ave dependent) OLMCPR limit stated above is valid for all planned Operational modes, including Increased Core Flow (ICF) and Final Feedwater Temperature Reduction (FFTR). The value corresponds to the cycle specific determination of the bounding event. For Unit 1 Cycle 15 this event is the Feedwater Controller Failure (FWCF), with the above Operational modes incorporated. This value was determined to be 1.32 for the minimum τ -ave of .68 seconds. This limit matches the cycle independent limit from the Quad Cities Equipment Out-Of-Service / Extended Operating Domain analysis.

Q1C15 has been approved for operating up to 15% (Reference 6) above equilibrium coastdown power level with multiple control rods inserted. At End of Full Power Capability (EFPC) a generic MCPR operating limit MCPR penalty of 0.06 must be added to the operating limit MCPR in order to exceed equilibrium coastdown power.

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. For Quad Cities Unit 1, the topical reports are:

- (1) NEDE-24011-P-A "General Electric Standard Application for Reactor Fuel," (latest approved revision).
- (2) Commonwealth Edison Topical Report NFSR-0085, "Benchmark of BWR Nuclear Design Methods," (latest approved revision).
- (3) Commonwealth Edison Topical Report NFSR-0085, Supplement 1, Quad Cities Gamma Scan Comparisons," (latest approved revision).
- (4) Commonwealth Edison Topical Report NFSR-0085, Supplement 2, Design Methods - Neutronics Licensing Analyses," (latest approved revision).

FIGURE 4-1
Kf FACTOR

