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Docket Number 50-346

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Serial Number 3233

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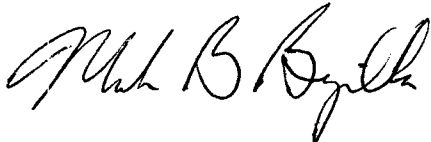
United States Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555-0001Subject: Davis-Besse Nuclear Power Station
Revision to Core Operating Limits Report for Cycle 14

Ladies and Gentlemen:

This letter transmits Revision 1 of the Davis-Besse Nuclear Power Station, Unit 1 (DBNPS) Core Operating Limits Report (COLR) for the current Cycle 14 operation (Enclosure 1). This revision accommodates additional operational flexibility by allowing the Axial Power Shaping Rods (APSRs) to remain in their normally inserted operating position through the remainder of Cycle 14. Submittal of this revision is in accordance with DBNPS Technical Specification 6.9.1.7.

A list of any regulatory commitments made in this letter is included in Enclosure 2.

If there are any questions or if additional information is required, please contact Mr. Gregory A. Dunn, Manager – Fleet Licensing, at (330) 315-7243.



MKL

Enclosure

cc: Regional Administrator, NRC Region III
NRC/NRR Project Manager
NRC Region III, DB-1 Senior Resident Inspector
Utility Radiological Safety Board

A001

Docket Number 50-346
License Number NPF-3
Serial Number 3233
Enclosure 1

FIRSTENERGY NUCLEAR OPERATING COMPANY

DAVIS-BESSE UNIT 1

CYCLE 14

CORE OPERATING LIMITS REPORT

REVISION 1


(25 pages follow)

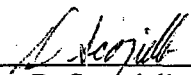
FIRSTENERGY NUCLEAR OPERATING COMPANY

DAVIS-BESSE UNIT 1

CYCLE 14

CORE OPERATING LIMITS REPORT

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FIRSTENERGY NUCLEAR OPERATING COMPANY

DAVIS-BESSE UNIT 1

CYCLE 14

CORE OPERATING LIMITS REPORT

1.0 Core Operating Limits

This CORE OPERATING LIMITS REPORT for DB-1 Cycle 14 has been prepared in accordance with the requirements of Technical Specification 6.9.1.7. The core Operating Limits have been developed using the methodology provided in reference 2.0 (1). The licensed length of Cycle 14 is 736.8 EFPDs (based on a reactor thermal rating of 2772 MWt).

The following cycle-specific core Operating Limits, Protective Limit and Flux - Δ Flux/Flow Reactor Protection System Allowable Values are included in this report:

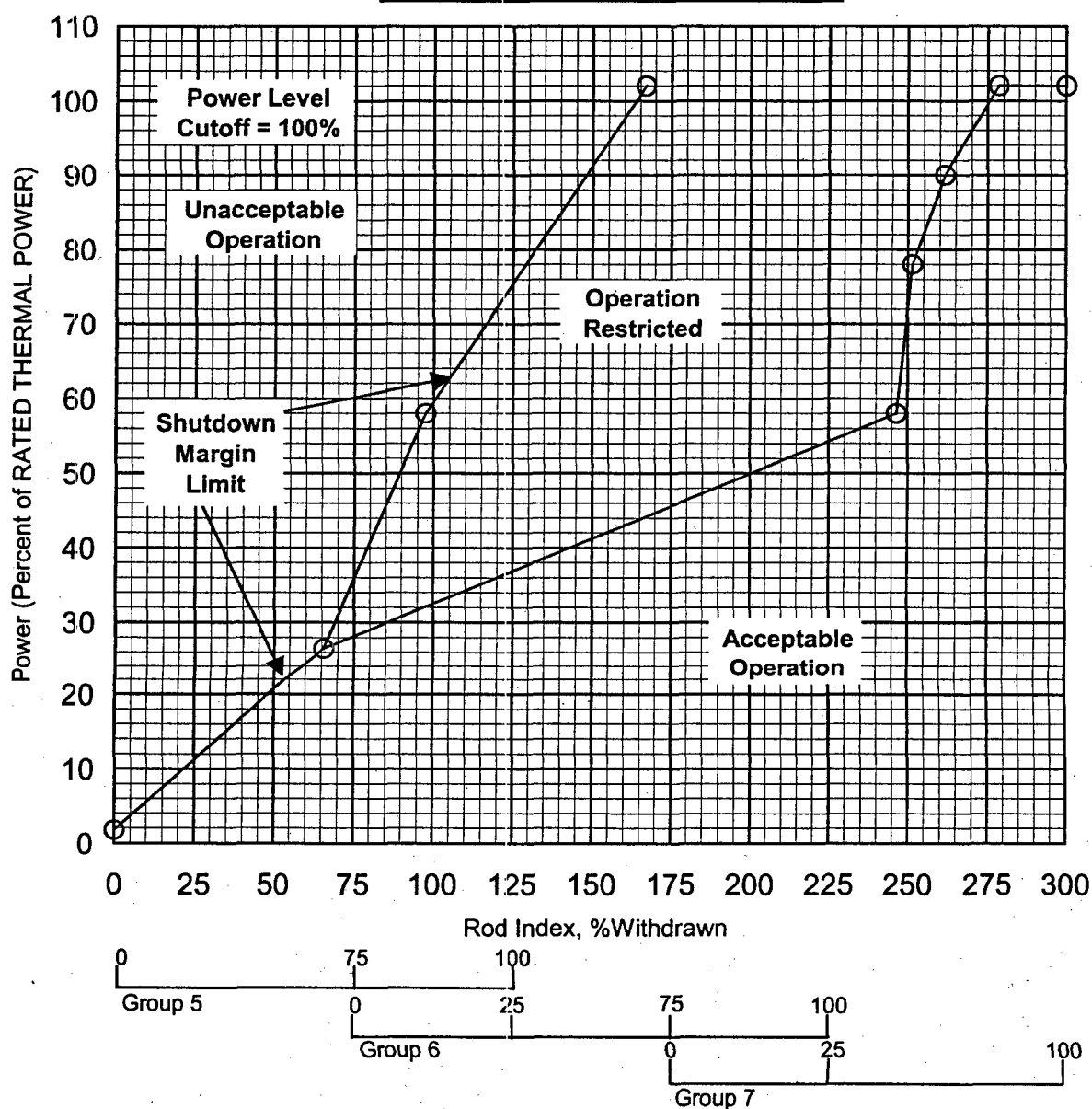
- 1) Regulating Group Position Alarm Setpoints (error adjusted Operating Limits) and Xenon reactivity "power level cutoff"
- 2) Rod program group positions (Control Rod Core locations and group assignments)
- 3) Axial Power Shaping Rod Alarm Setpoints (error adjusted Operating Limits)
- 4) AXIAL POWER IMBALANCE Alarm Setpoints (error adjusted Operating Limits)
- 5) AXIAL POWER IMBALANCE Protective Limits
- 6) Flux- Δ Flux/Flow (or Power/Imbalance/Flow) Allowable Values
- 7) QUADRANT POWER TILT limits
- 8) Negative Moderator Temperature Coefficient limit
- 9) Nuclear Heat Flux Hot Channel Factor, F_Q and
- 10) Nuclear Enthalpy Rise Hot Channel Factor, $F_{\Delta H}^N$

2.0 References

- (1) BAW-10179P-A, Rev. 4, "Safety Criteria and Methodology For Acceptable Cycle Reload Analyses.", August, 2001.
- (2) BAW-10164P-A, Rev. 4, "RELAP5/MOD2-B&W – An Advanced Computer Program for Light Water Reactor LOCA and Non-LOCA Transient Analysis," November, 2002.

Figure 1a Regulating Group Position Operating Limits
0 to 400±10 EFPD, Four RC Pumps -- 2772 MWt
Davis-Besse 1, Cycle 14

This Figure is referred to by Technical
Specifications 3.1.3.6 and 3.1.3.8

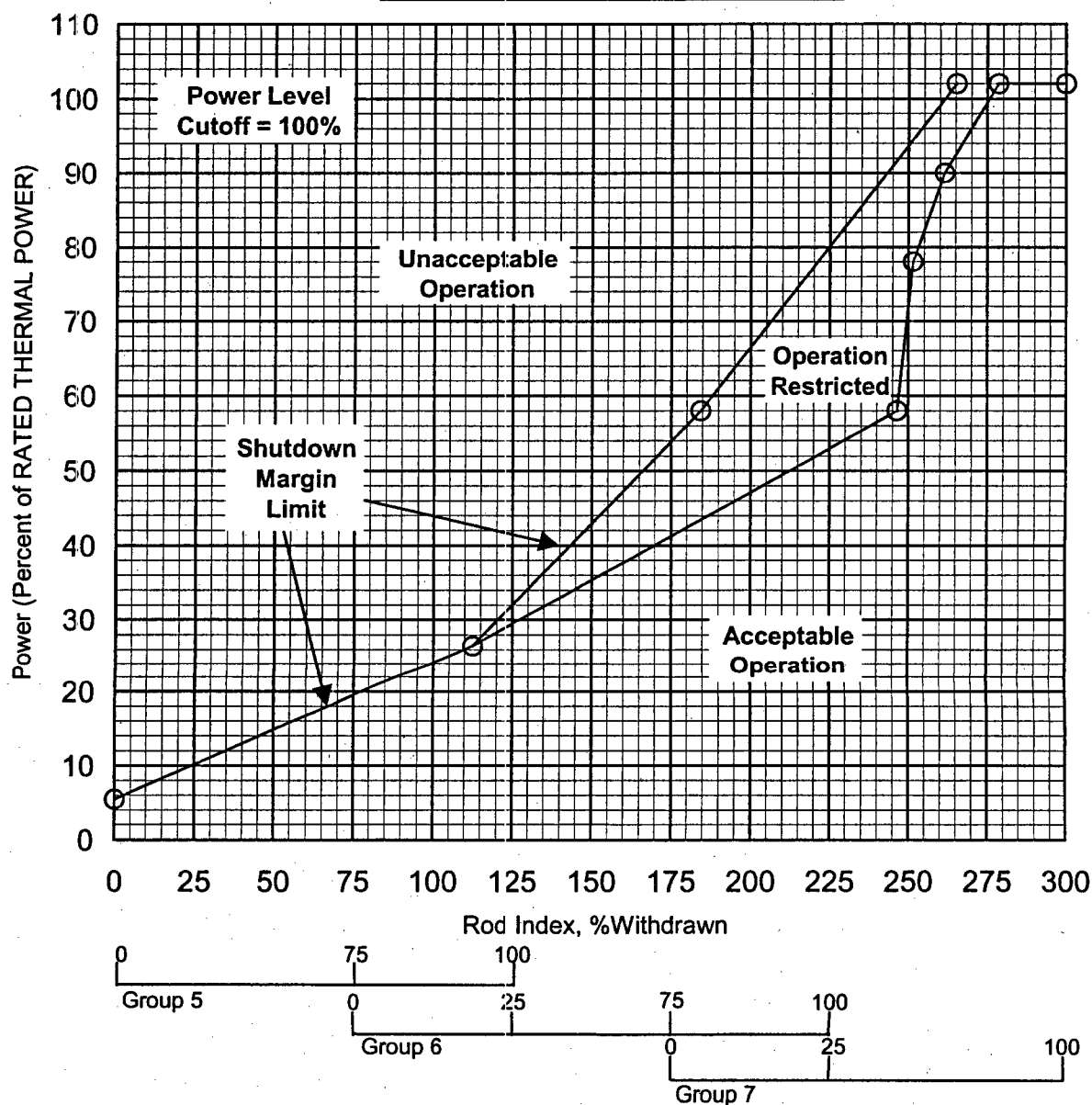


Note 1: A Rod Group overlap of 25 ±5% between sequential withdrawn groups 5 and 6, and 6 and 7, shall be maintained.

Note 2: Instrument error is accounted for in these Operating Limits.

Figure 1b Regulating Group Position Operating Limits
After 400 ± 10 EFPD, Four RC Pumps -- 2772 MWt
Davis-Besse 1, Cycle 14

This Figure is referred to by Technical
Specifications 3.1.3.6 and 3.1.3.8

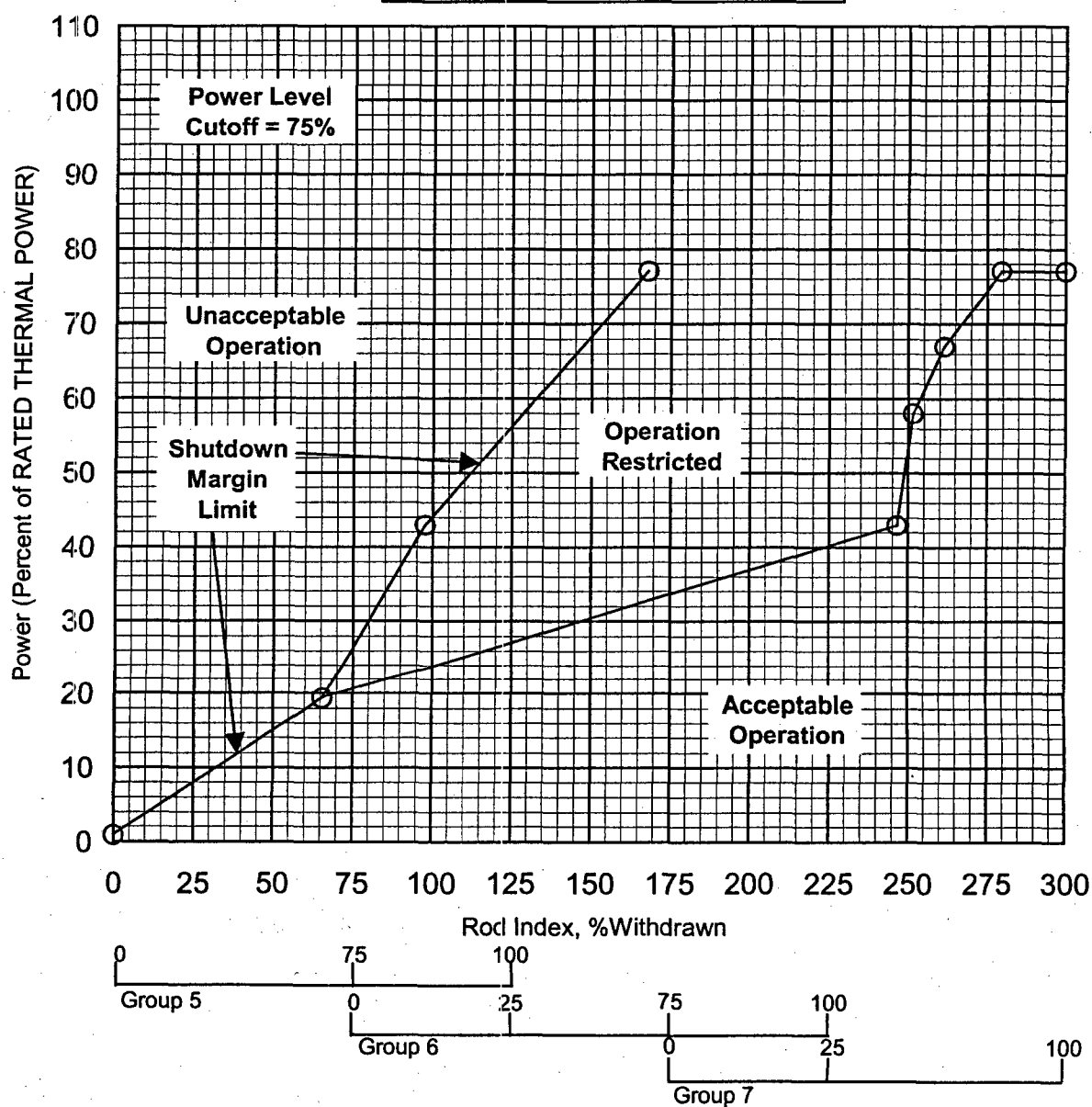


Note 1: A Rod Group overlap of $25 \pm 5\%$ between sequential withdrawn groups 5 and 6, and 6 and 7, shall be maintained.

Note 2: Instrument error is accounted for in these Operating Limits.

Figure 1c Regulating Group Position Operating Limits
0 to 400±10 EFPD, Three RC Pumps -- 2772 MWt
Davis-Besse 1, Cycle 14

This Figure is referred to by Technical
Specifications 3.1.3.6 and 3.1.3.8

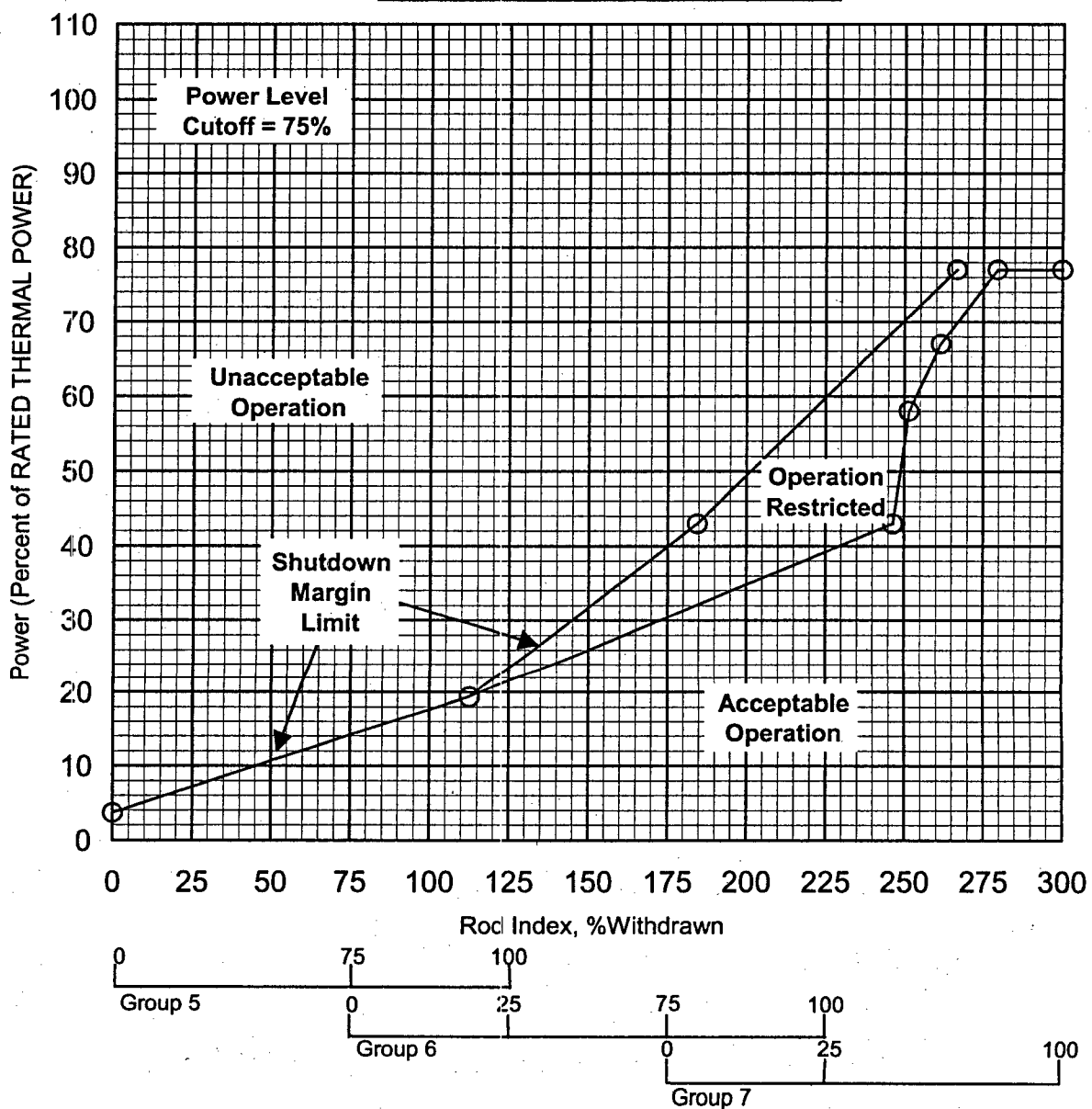


Note 1: A Rod Group overlap of 25 ±5% between sequential withdrawn groups 5 and 6, and 6 and 7, shall be maintained.

Note 2: Instrument error is accounted for in these Operating Limits.

Figure 1d Regulating Group Position Operating Limits
After 400 ± 10 EFPD, Three RC Pumps -- 2772 MWt
Davis-Besse 1, Cycle 14

This Figure is referred to by Technical
Specifications 3.1.3.6 and 3.1.3.8

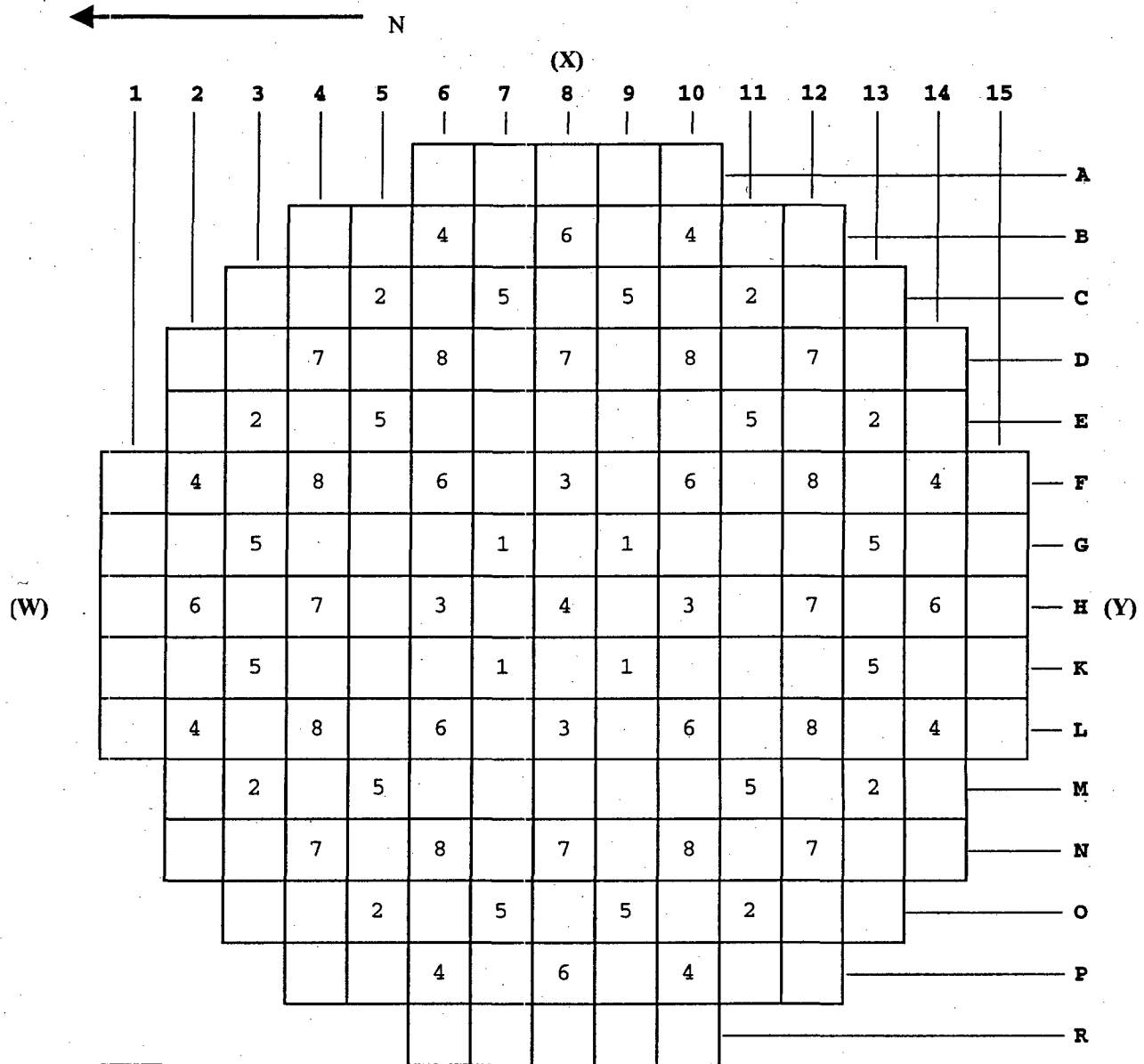


Note 1: A Rod Group overlap of $25 \pm 5\%$ between sequential withdrawn groups 5 and 6, and 6 and 7, shall be maintained.

Note 2: Instrument error is accounted for in these Operating Limits.

Figure 2 Control Rod Core Locations
and Group Assignments
Davis-Besse 1, Cycle 14

This Figure is referred to by Technical
Specification 3.1.3.7



Group Number	Group	No. of Rods	Function	Group	No. of Rods	Function
1	1	4	Safety	5	12	Control
2	2	8	Safety	6	8	Control
3	3	4	Safety	7	8	Control
4	4	9	Safety	8	8	APSRs
	Total				61	

Figure 3 APSR Position Operating Limits

This Figure is referred to by Technical
Specification 3.1.3.9

**Before APSR Pull: 0 EFPD to 654 +20/-10 EFPD,
Three or Four RC pumps operation***

Lower Limit: 0 %WD

Upper Limit: 100 %WD

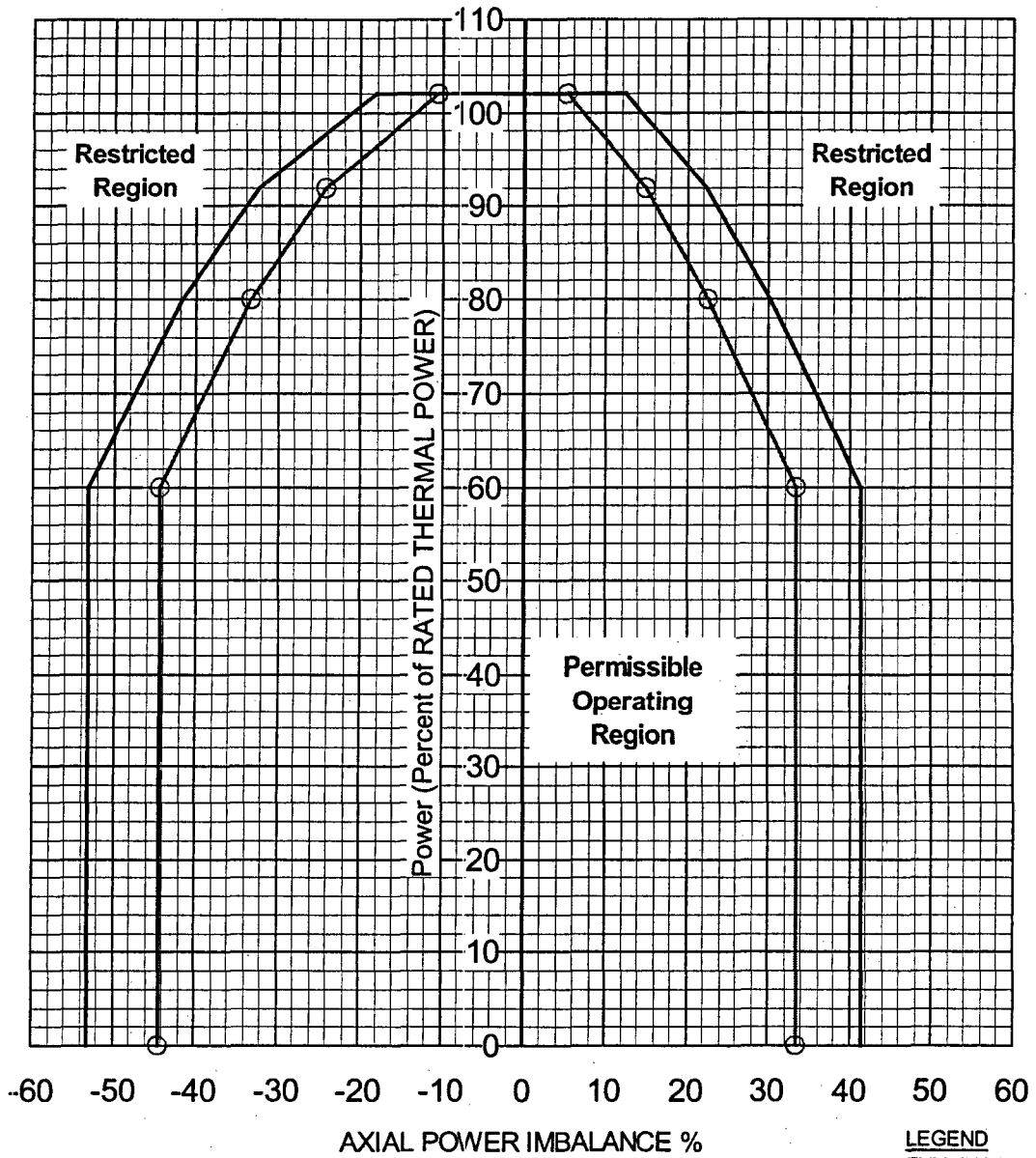
**After APSR Pull: 654 +20/-10 EFPD to End-of-Cycle
Three or Four RC pumps operation***

Insertion Prohibited (maintain $\geq 99\%$ WD)

*** Power restricted to 77% for 3 pump operation**

Figure 4a AXIAL POWER IMBALANCE Operating Limits
0 to 300 \pm 10 EFPD, Four RC Pumps -- 2772 MWt RTP
Davis-Besse 1, Cycle 14

This Figure is referred to by
Technical Specification 3.2.1

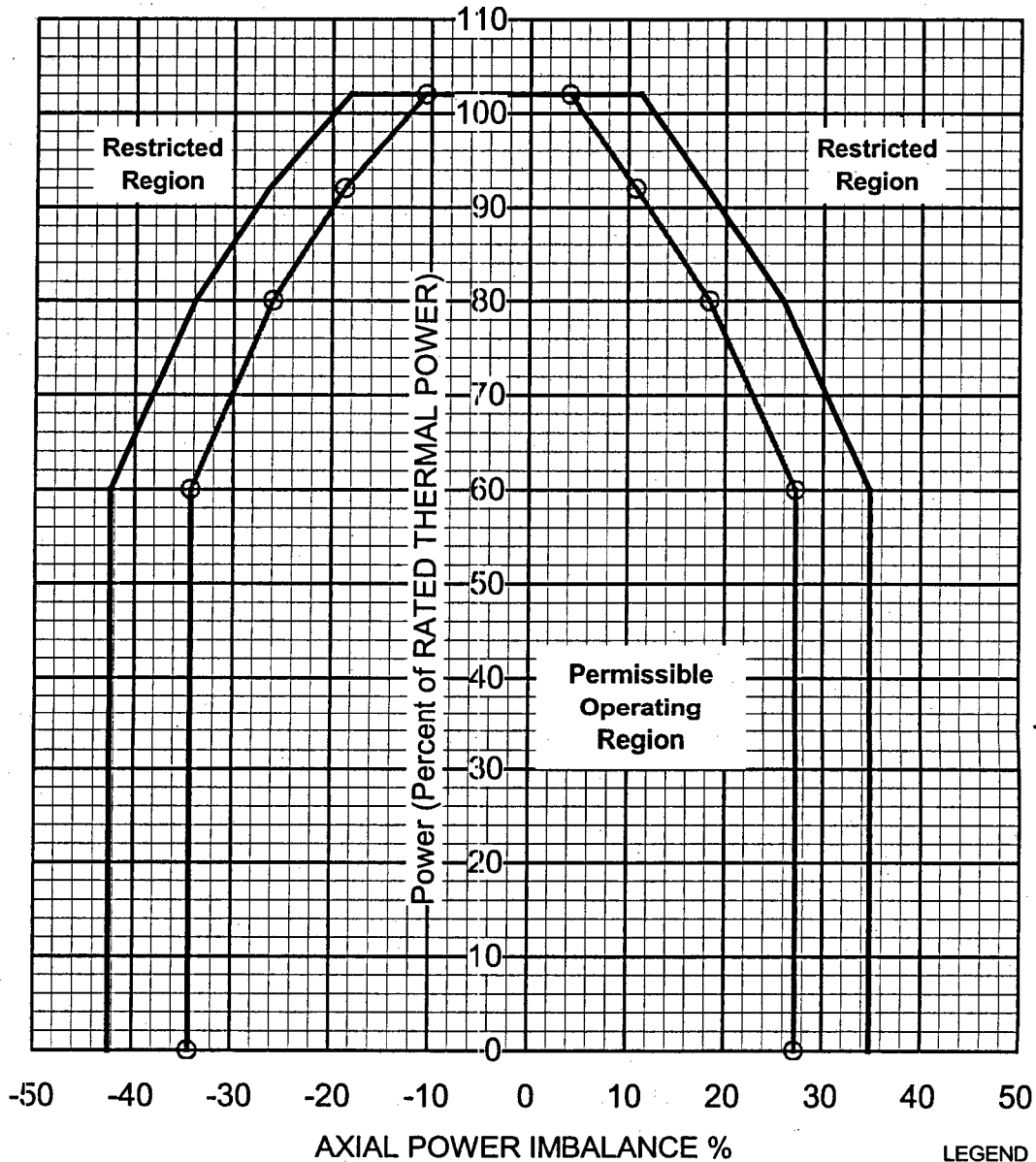


Note 1: Instrument error is accounted for in these Operating Limits.

LEGEND
FULL INCORE
EXCORE

Figure 4b AXIAL POWER IMBALANCE Operating Limits
300 \pm 10 to 654 +20/-10 EFPD, Four RC Pumps – 2772 MWt RTP
Davis-Besse 1, Cycle 14

This Figure is referred to by
Technical Specification 3.2.1



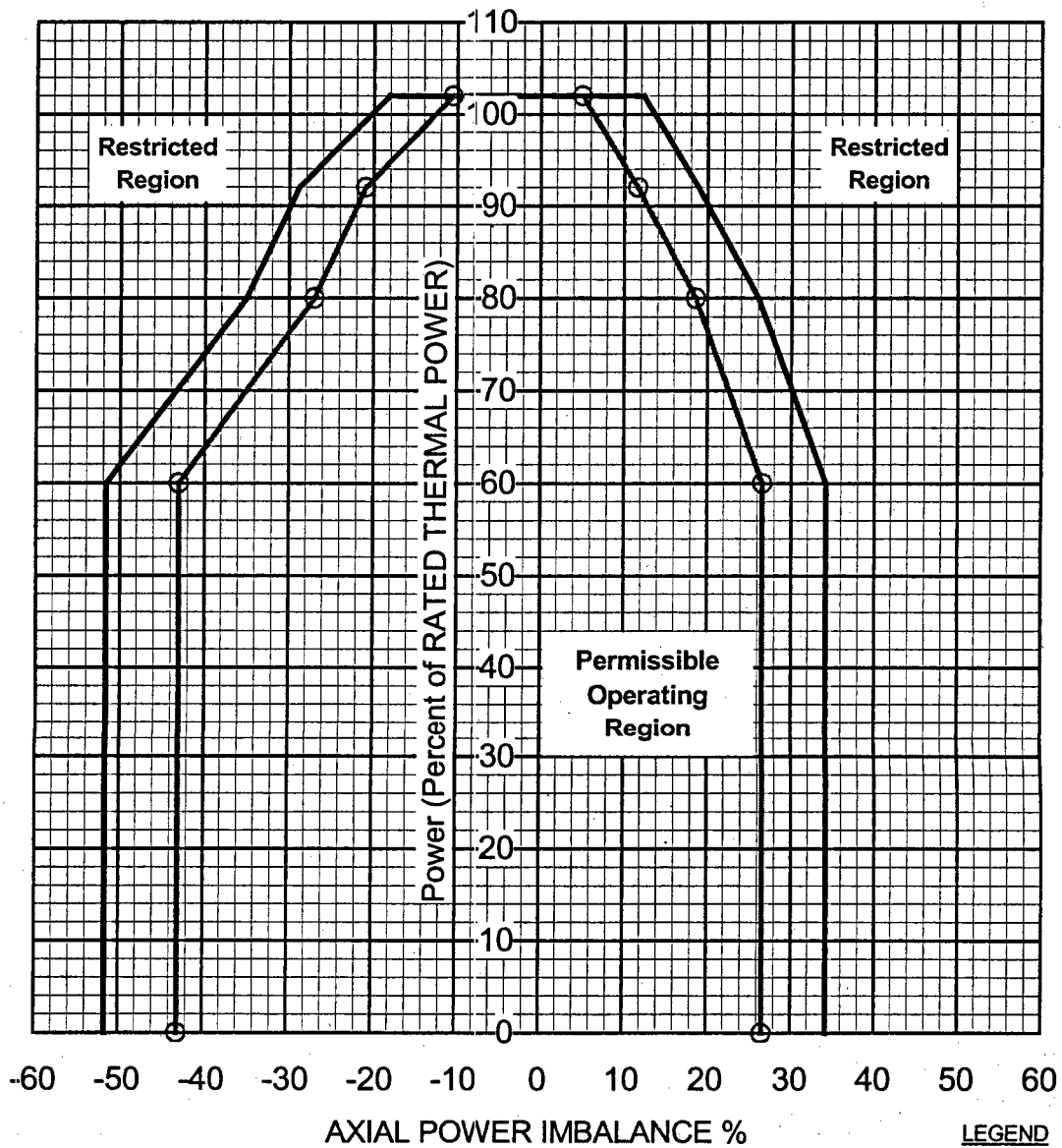
Note 1: Instrument error is accounted for in these Operating Limits.

LEGEND
FULL INCORE

EXCORE

Figure 4c AXIAL POWER IMBALANCE Operating Limits
After 654 +20/-10 EFPD, Four RC Pumps – 2772 MWt RTP
Davis-Besse 1, Cycle 14

This Figure is referred to by
Technical Specification 3.2.1

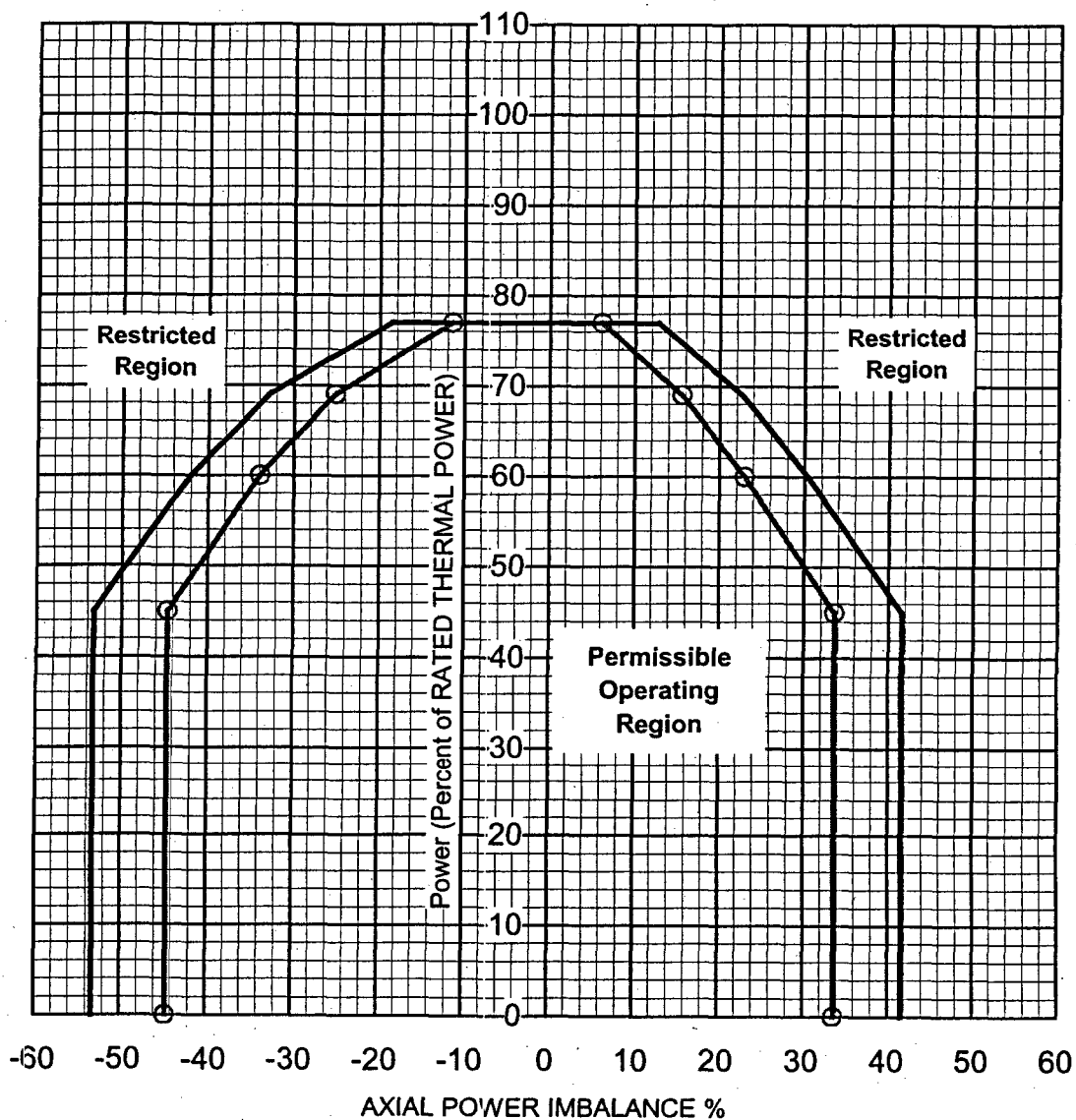


Note 1: Instrument error is accounted for in these Operating Limits.

LEGEND
FULL INCORE
EXCORE

Figure 4d AXIAL POWER IMBALANCE Operating Limits
0 to 300 \pm 10 EFPD, Three RC Pumps – 2772 MWt RTP
Davis-Besse 1, Cycle 14

This Figure is referred to by Technical
Specification 3.2.1

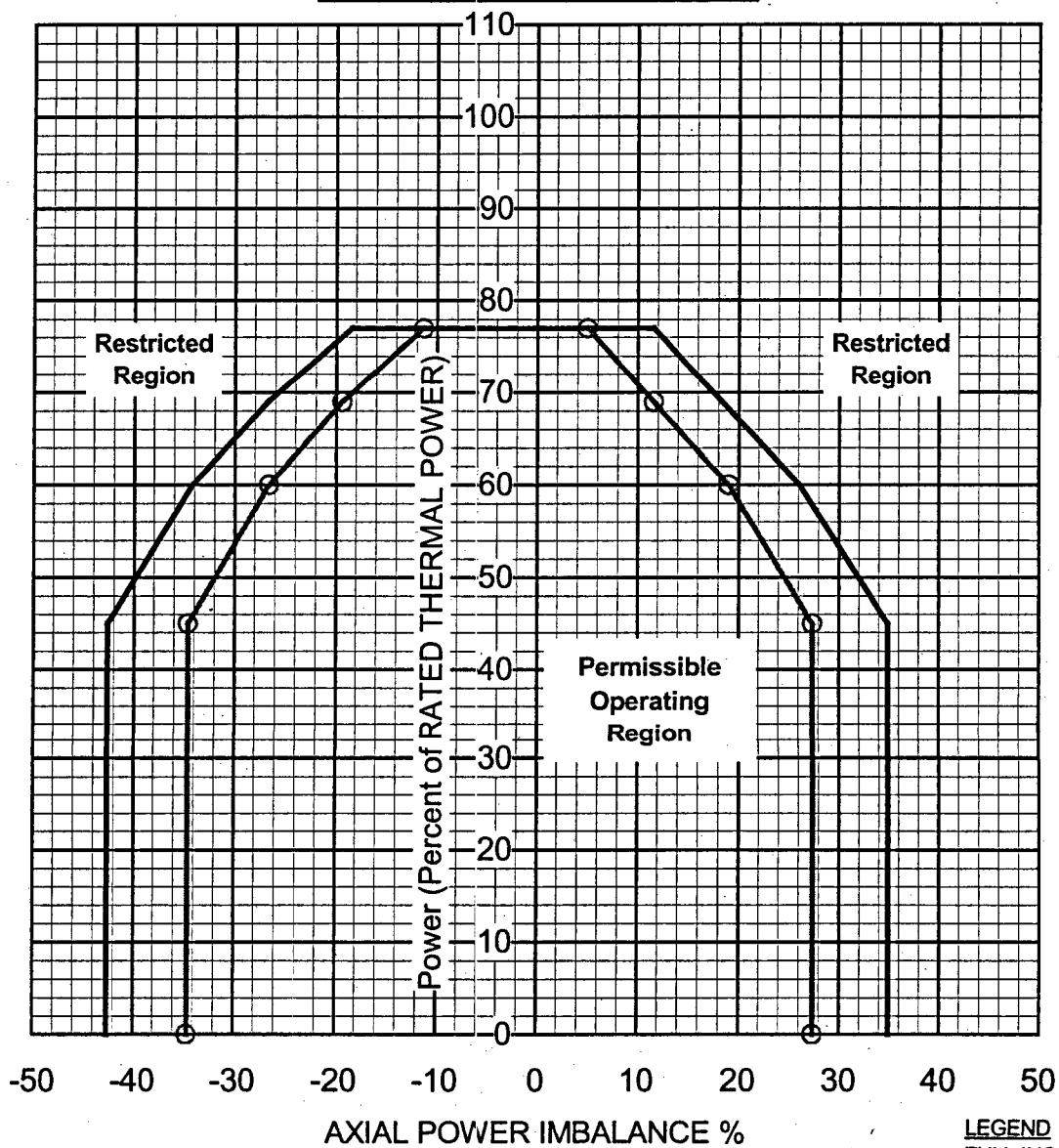


Note 1: Instrument error is accounted for in these Operating Limits.

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Figure 4e AXIAL POWER IMBALANCE Operating Limits
300 \pm 10 to 654 \pm 20/-10 EFPD, Three RC Pumps – 2772 MWt RTP
Davis-Besse 1, Cycle 14

This Figure is referred to by
Technical Specification 3.2.1

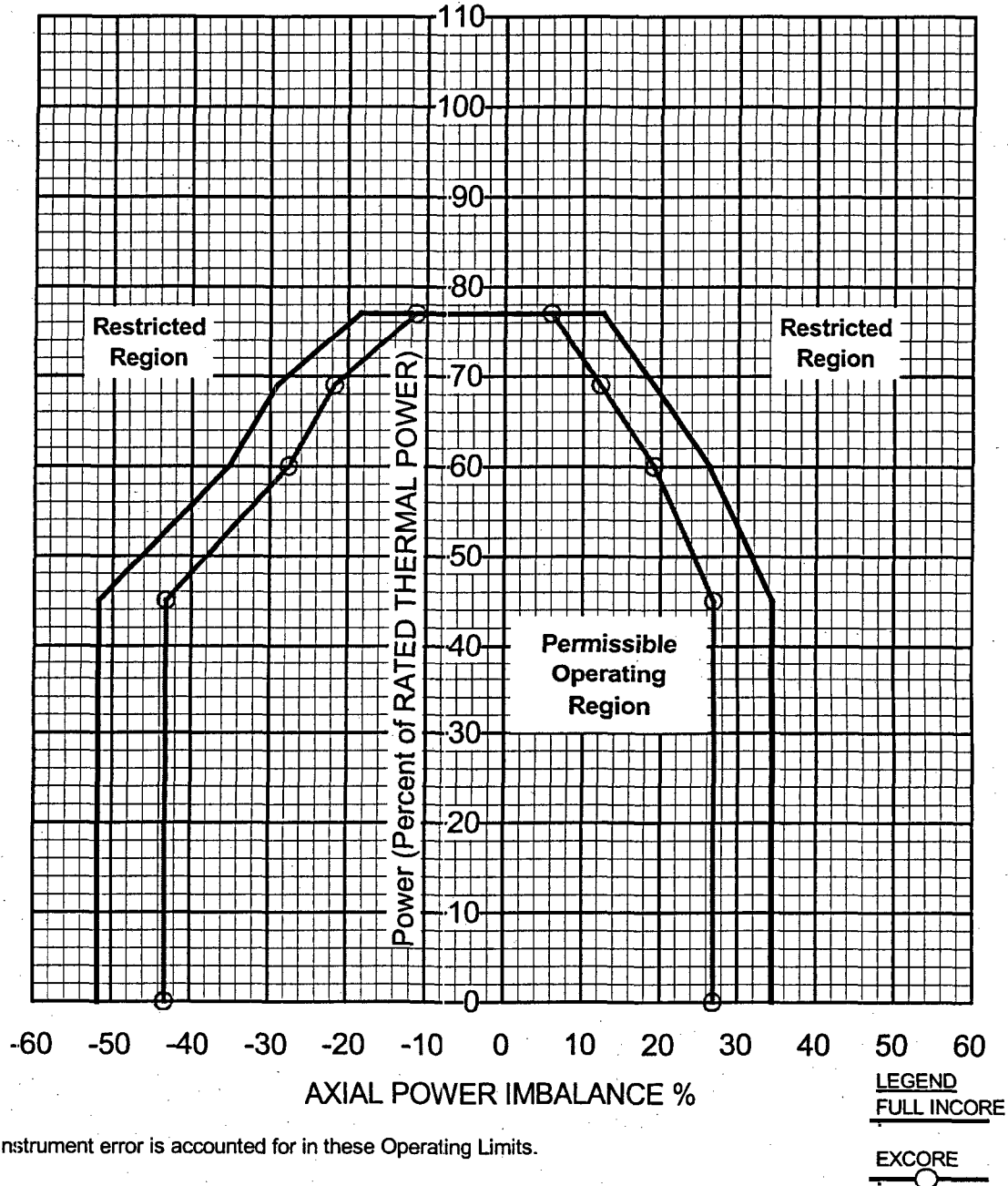


Note 1: Instrument error is accounted for in these Operating Limits.

LEGEND
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EXCORE

Figure 4f AXIAL POWER IMBALANCE Operating Limits
After 654 +20/-10 EFPD, Three RC Pumps – 2772 MWt RTP
Davis-Besse 1, Cycle 14

This Figure is referred to by
Technical Specification 3.2.1



Note 1: Instrument error is accounted for in these Operating Limits.

Figure 5 AXIAL POWER IMBALANCE Protective Limits
2772 MWt RTP

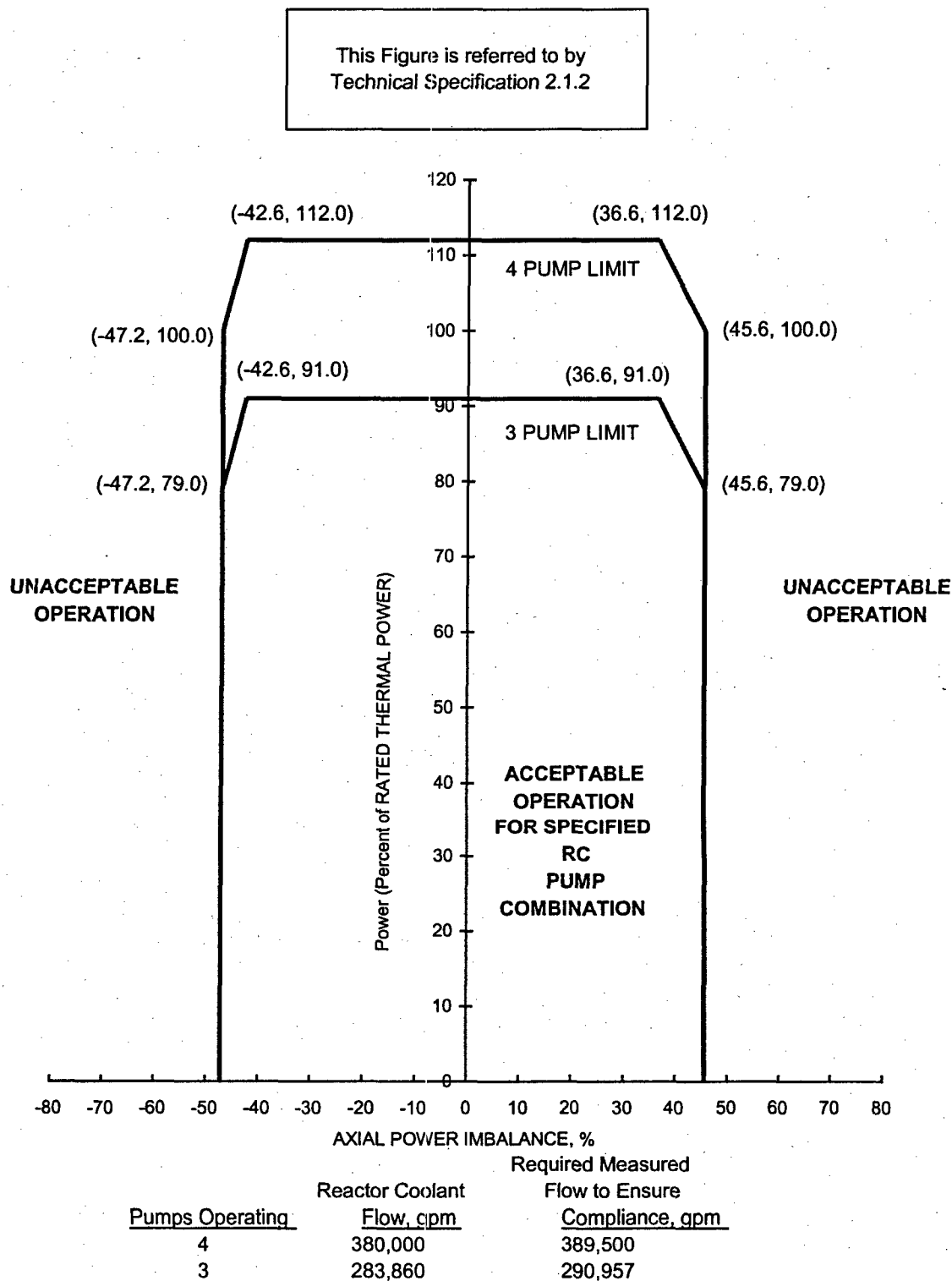


Figure 6 Flux-- Δ Flux/Flow
(or Power/Imbalance/Flow)
Allowable Values

This Figure is referred to by
Technical Specification 2.2.1

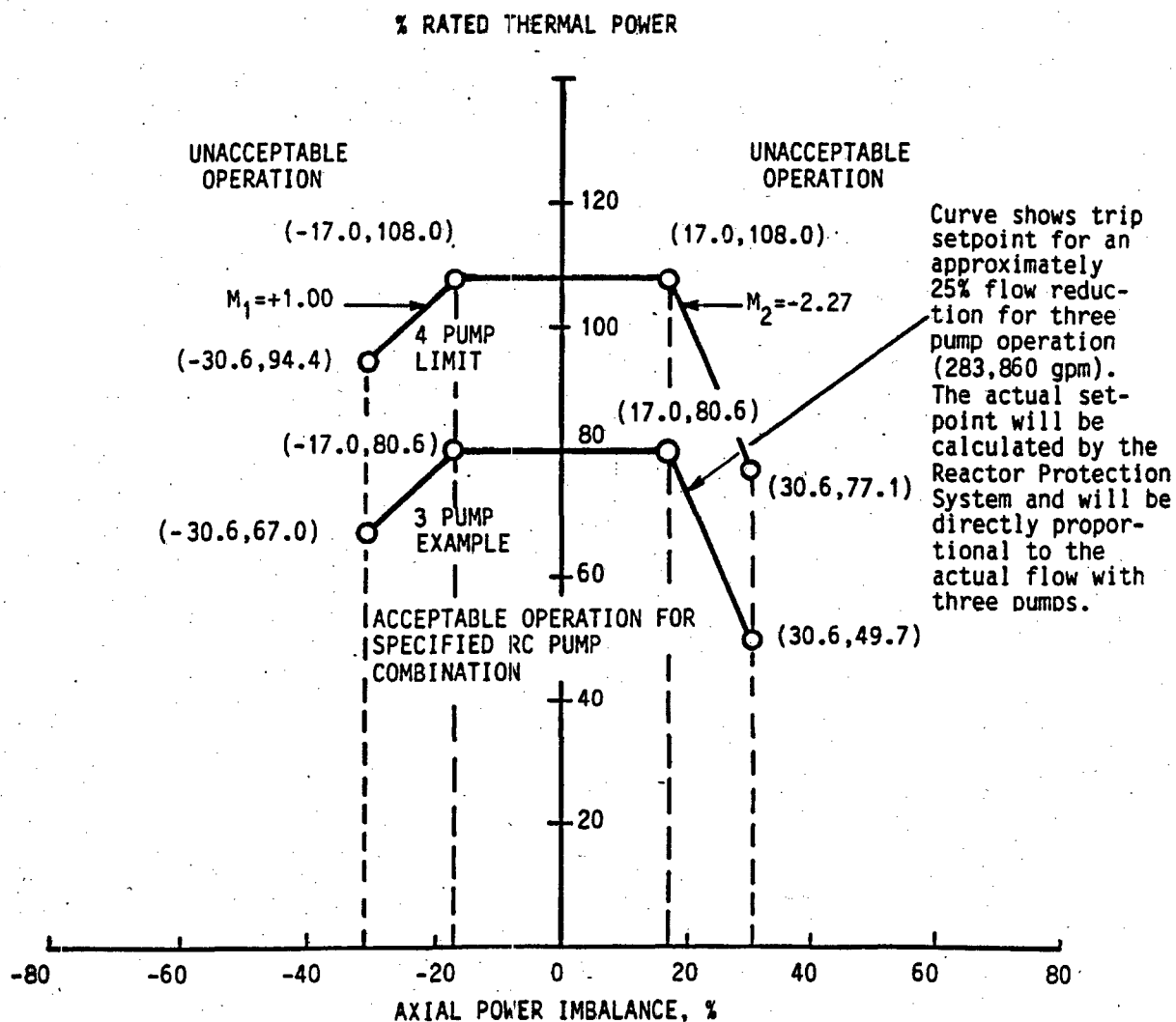


Table 1 QUADRANT POWER TILT Limits

This Table is referred to by Technical Specification 3.2.4

QUADRANT POWER TILT as measured by:	From 0 EFPD to EOC-14			
	Steady-state Limit for THERMAL POWER $\leq 60\%$ (%)	Steady-state Limit for THERMAL POWER $> 60\%$ (%)	Transient Limit (%)	Maximum Limit (%)
Symmetrical Incore detector system	7.90	4.00	10.03	20.0

Table 2 Negative Moderator Temperature Coefficient Limit

This Table is referred
to by Technical Specification
3.1.1.3c

Negative Moderator Temperature
Coefficient Limit
(at RATED THERMAL POWER)

$-3.83 \times 10^{-4} \Delta k/k/^{\circ}F$

Table 3 Power To Melt Limits

This Table is referred to by Technical
Specification Bases B2.1

	<u>Batch 9H</u>	<u>Batch 14</u>	<u>Batch 15</u>	<u>Batch 16</u>
Fuel Assembly Type	Mark-B8A	Mark-B10M	Mark-B10K	Mark-B12
Minimum linear heat rate to melt, kW/ft	20.5	22.3 (20.8) ^(a) (19.9) ^(b)	22.1 (21.1) ^(c) (20.7) ^(d) (19.3) ^(e)	22.1 (20.3) ^(f) (19.3) ^(g)

- (a) Limit for 3 wt% Gd rods - Batch 14
- (b) Limit for 6 wt% Gd rods - Batch 14
- (c) Limit for 2 wt% Gd rods - Batch 15
- (d) Limit for 3 wt% Gd rods - Batch 15
- (e) Limit for 8 wt% Gd rods - Batch 15
- (f) Limit for 4 wt% Gd rods - Batch 16
- (g) Limit for 8 wt% Gd rods - Batch 16

Table 4a Nuclear Heat Flux Hot Channel Factor - F_Q (NAS)

2772 MWt RTP

This Table is referred to by Technical
Specification 3.2.2

Heat Flux Hot Channel Factor F_Q

F_Q shall be limited by the following relationships:

$$F_Q \leq \text{LHR}^{\text{ALLOW}}(\text{Bu}) / [\text{LHR}^{\text{AVG}} * P] \quad (\text{for } P \leq 1.0)$$

$\text{LHR}^{\text{ALLOW}}(\text{Bu})$: See Tables below

$\text{LHR}^{\text{AVG}} = 6.3095 \text{ kW/ft}$ for Mark-B8A fuel

$\text{LHR}^{\text{AVG}} = 6.4201 \text{ kW/ft}$ for Mark-B10M fuel

$\text{LHR}^{\text{AVG}} = 6.3183 \text{ kW/ft}$ for Mark-B10K fuel

$\text{LHR}^{\text{AVG}} = 6.3183 \text{ kW/ft}$ for Mark-B12 fuel

P = ratio of THERMAL POWER/RATED THERMAL POWER

Bu = Fuel Burnup (MWd/mtU)

Batch 9H (Mark-B8A) $\text{LHR}^{\text{ALLOW}}$ kW/ft^(a)

Axial Segment	0 MWd/mtU	24,500 MWd/mtU	52,000 MWd/mtU	60,000 MWd/mtU
1	16.1	16.1	12.0	10.2
2	15.8	15.8	12.0	10.2
3	15.0	15.0	12.0	10.2
4	15.0	15.0	12.0	10.2
5	15.4	15.4	12.0	10.2
6	15.4	15.4	12.0	10.2
7	14.6	14.6	12.0	10.2
8	14.3	14.3	12.0	10.2

Batch 14 (Mark-B10M) $\text{LHR}^{\text{ALLOW}}$ kW/ft^(a)

Axial Segment	0 MWd/mtU	35,000 MWd/mtU	62,000 MWd/mtU
1	17.6	16.8	12.8
2	17.5	16.7	12.8
3	17.0	15.6	12.8
4	16.6	15.3	12.8
5	16.0	15.3	12.8
6	15.3	15.3	12.8
7	14.7	14.7	12.8
8	14.5	14.5	12.8

Table 4a, continued

Batch 15 (Mark-B10K) LHR^{ALLOW} kW/ft^(a)

<u>Axial Segment</u>	<u>0 MWd/mtU</u>	<u>35,000 MWd/mtU</u>	<u>58,000 MWd/mtU</u>	<u>59,000 MWd/mtU</u>	<u>60,000 MWd/mtU</u>	<u>62,000 MWd/mtU</u>
1	17.6	16.8	14.7	14.4	14.1	13.5
2	17.5	16.7	14.7	14.4	14.1	13.5
3	17.0	15.6	14.6	14.4	14.1	13.5
4	16.6	15.3	14.4	14.4	14.1	13.5
5	16.0	15.3	14.2	14.2	14.1	13.5
6	15.3	15.3	13.8	13.7	13.6	13.5
7	14.7	14.7	13.3	13.2	13.1	13.0
8	14.5	14.5	13.1	13.0	12.9	12.8

Batch 16 (Mark-E12) LHR^{ALLOW} kW/ft^(a)

<u>Axial Segment</u>	<u>0 MWd/mtU</u>	<u>35,000 MWd/mtU</u>	<u>58,000 MWd/mtU</u>	<u>59,000 MWd/mtU</u>	<u>60,000 MWd/mtU</u>	<u>62,000 MWd/mtU</u>
1	17.6	16.8	14.7	14.4	14.1	13.5
2	17.5	16.7	14.7	14.4	14.1	13.5
3	17.0	15.6	14.6	14.4	14.1	13.5
4	16.6	15.3	14.4	14.4	14.1	13.5
5	16.0	15.3	14.2	14.2	14.1	13.5
6	15.3	15.3	13.8	13.7	13.6	13.5
7	14.7	14.7	13.3	13.2	13.1	13.0
8	14.5	14.5	13.1	13.0	12.9	12.8

(a) Linear interpolation for allowable linear heat rate between specified burnup points is valid for these tables.

Table 4b Nuclear Heat Flux Hot Channel Factor - F_Q (FIDMS)

2772 MWt RTP

This Table is referred
to by Technical Specification 3.2.2

Heat Flux Hot Channel Factor F_Q

F_Q shall be limited by the following relationships:

$$F_Q \leq LHR^{ALLOW}(Bu) / [LHR^{AVG} * P] \quad (\text{for } P \leq 1.0)$$

$LHR^{ALLOW}(Bu)$: See the Tables below

$LHR^{AVG} = 6.3095$ kW/ft for Mark-B8A fuel

$LHR^{AVG} = 6.4201$ kW/ft for Mark-B10M fuel

$LHR^{AVG} = 6.3183$ kW/ft for Mark-B10K fuel

$LHR^{AVG} = 6.3183$ kW/ft for Mark-B12 fuel

P = ratio of THERMAL POWER/RATED THERMAL POWER

Bu = Fuel Burnup (MWd/mtU)

Batch 9H (Mark-B8A) LHR^{ALLOW} kW/ft ^(a)

Core Elevation (feet)	0 MWd/mtU	24,500 MWd/mtU	52,000 MWd/mtU	60,000 MWd/mtU
0.000	16.3	16.3	12.0	10.2
2.506	15.9	15.9	12.0	10.2
4.264	15.1	15.1	12.0	10.2
6.021	15.5	15.5	12.0	10.2
7.779	16.0	16.0	12.0	10.2
9.536	15.4	15.4	12.0	10.2
12.000	14.3	14.3	12.0	10.2

Batch 14 (Mark-B10M) LHR^{ALLOW} kW/ft ^(a)

Core Elevation (feet)	0 MWd/mtU	35,000 MWd/mtU	62,000 MWd/mtU
0.000	17.6	16.8	12.8
2.506	17.6	16.8	12.8
4.264	17.1	15.7	12.8
6.021	16.6	15.3	12.8
7.779	16.0	15.8	12.8
9.536	15.3	15.3	12.8
12.000	14.5	14.5	12.8

Table 4b, continued

Batch 15 (Mark-B10K) LHR^{ALLOW} kW/ft ^(a)

Core Elevation	0	35,000	58,000	59,000	60,000	62,000
(feet)	MWd/mtU	MWd/mtU	MWd/mtU	MWd/mtU	MWd/mtU	MWd/mtU
0.000	17.6	16.8	14.7	14.4	14.1	13.5
2.506	17.6	16.8	14.7	14.4	14.1	13.5
4.264	17.1	15.7	14.7	14.4	14.1	13.5
6.021	16.6	15.3	14.4	14.4	14.1	13.5
7.779	16.0	15.8	14.2	14.2	14.1	13.5
9.536	15.3	15.3	13.8	13.7	13.6	13.5
12.000	14.5	14.5	13.1	13.0	12.9	12.8

Batch 16 (Mark-B12) LHR^{ALLOW} kW/ft ^(a)

Core Elevation	0	35,000	58,000	59,000	60,000	62,000
(feet)	MWd/mtU	MWd/mtU	MWd/mtU	MWd/mtU	MWd/mtU	MWd/mtU
0.000	17.6	16.8	14.7	14.4	14.1	13.5
2.506	17.6	16.8	14.7	14.4	14.1	13.5
4.264	17.1	15.7	14.7	14.4	14.1	13.5
6.021	16.6	15.3	14.4	14.4	14.1	13.5
7.779	16.0	15.8	14.2	14.2	14.1	13.5
9.536	15.3	15.3	13.8	13.7	13.6	13.5
12.000	14.5	14.5	13.1	13.0	12.9	12.8

^(a) Linear interpolation for allowable linear heat rate between specified burnup points is valid for these tables.

Table 5 Nuclear Enthalpy Rise Hot Channel Factor - $F_{\Delta H}^N$

This Table is referred
to by Technical Specification 3.2.3

Enthalpy Rise Hot Channel Factor $F_{\Delta H}^N$

$$F_{\Delta H}^N \leq \text{ARP} [1 + 0.3(1 - P/P_m)]$$

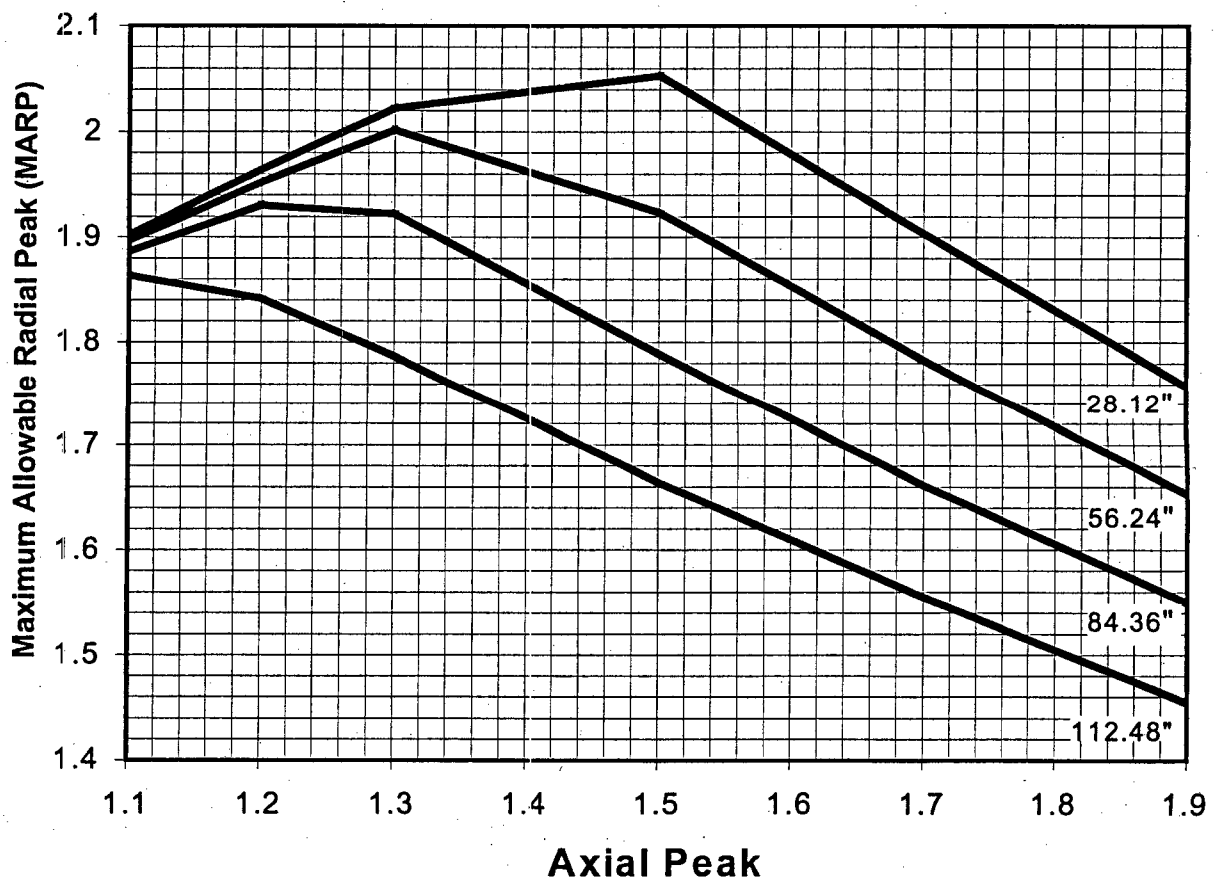
ARP = Allowable Radial Peak, see Figure

P = THERMAL POWER/RATED THERMAL POWER and $P \leq 1.0$

$P_m = 1.0$ for 4-RCP operation

$P_m = 0.75$ for 3-RCP operation

Figure 7* Allowable Radial Peak for $F_{\Delta H}^N$



* This figure is applicable to all fuel in the core. Linear interpolation and extrapolation above 112.48 inches are acceptable. For axial heights <28.12 inches, the value at 28.12 inches will be used.

Docket Number 50-346
License Number NPF-3
Serial Number 3233
Enclosure 2

COMMITMENT LIST

THE FOLLOWING LIST IDENTIFIES THOSE ACTIONS COMMITTED TO BY THE DAVIS-BESSE NUCLEAR POWER STATION (DBNPS) IN THIS DOCUMENT. ANY OTHER ACTIONS DISCUSSED IN THE SUBMITTAL REPRESENT INTENDED OR PLANNED ACTIONS BY THE DBNPS. THEY ARE DESCRIBED ONLY FOR INFORMATION AND ARE NOT REGULATORY COMMITMENTS. PLEASE NOTIFY THE MANAGER – FLEET LICENSING (330-315-7243) OF ANY QUESTIONS REGARDING THIS DOCUMENT OR ANY ASSOCIATED REGULATORY COMMITMENTS.

COMMITMENTS	DUE DATE
None	N/A