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June 23, 2010
L-10-083

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT:
Davis-Besse Nuclear Power Station, Unit No.1
Docket No. 50-346, License No. NPF-3
Core Operating Limits Report for Cycle 17

Enclosed please find the Davis-Besse Nuclear Power Station, Unit No. 1 (DBNPS) Core Operating Limits Report for Cycle 17, Revision 0. Submittal of this report is in accordance with DBNPS Technical Specification 5.6.3, "Core Operating Limits Report (COLR)."

There are no regulatory commitments contained in this letter. If there are any questions or if additional information is required, please contact Mr. Thomas A. Lentz, Manager – Fleet Licensing, at (330) 761-6071.

Sincerely,

Barry S. Allen

Enclosure:
FirstEnergy Nuclear Operating Company, Davis-Besse Unit 1, Cycle 17,
Core Operating Limits Report, Revision 0

cc: NRC Region III Administrator
NRC Resident Inspector
NRR Project Manager
Utility Radiological Safety Board

A001
NRR

Enclosure

FirstEnergy Nuclear Operating Company, Davis-Besse Unit 1, Cycle 17,
Core Operating Limits Report, Revision 0

(24 Pages Follow)

FIRSTENERGY NUCLEAR OPERATING COMPANY

DAVIS-BESSE UNIT 1

CYCLE 17

CORE OPERATING LIMITS REPORT

Prepared by Dan B. Kelley 3/11/10
D. B. Kelley

Reviewed by Paul R Gilles 3/11/2010
P. R. Gilles

Approved by Paul R Gilles for 3/11/2010
R. J. Borland

LIST OF EFFECTIVE PAGES

Page 1 through 24 Rev. 0

1.0 Core Operating Limits

This CORE OPERATING LIMITS REPORT for DB-1 Cycle 17 has been prepared in accordance with the requirements of Technical Specification 5.6.3. The Core Operating Limits have been developed using the methodology provided in Reference 2.0 (1). The licensed length of Cycle 17 is 685 EFPDs.

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. SL 2.1.1.1 Reactor Core Safety Limits
2. LCO 3.1.1 SHUTDOWN MARGIN (SDM)
3. LCO 3.1.3 Moderator Temperature Coefficient (MTC)
4. LCO 3.1.7 Position Indicator Channels
5. LCO 3.1.8 PHYSICS TESTS Exceptions – MODE 1
6. LCO 3.1.9 PHYSICS TESTS Exceptions – MODE 2
7. LCO 3.2.1 Regulating Rod Insertion Limits
8. LCO 3.2.2 AXIAL POWER SHAPING ROD (APSR) Insertion Limits
9. LCO 3.2.3 AXIAL POWER IMBALANCE Operating Limits
10. LCO 3.2.4 QUADRANT POWER TILT (QPT)
11. LCO 3.2.5 Power Peaking Factors
12. LCO 3.3.1 Reactor Protection Systems (RPS) Instrumentation
    Function 8: (Flux - ΔFlux – Flow) Allowable Values
13. LCO 3.9.1 Boron Concentration
14. TRM 8.1.3 Rod Program

2.0 References

1) BAW-10179P-A, Rev. 7, "Safety Criteria and Methodology for Acceptable Cycle Reload Analyses", January 2008.
2) BAW-10164P-A, Rev. 6, "RELAP5/MOD2-B&W – An Advanced Computer Program for Light Water Reactor LOCA and Non-LOCA Transient Analysis", June, 2007.

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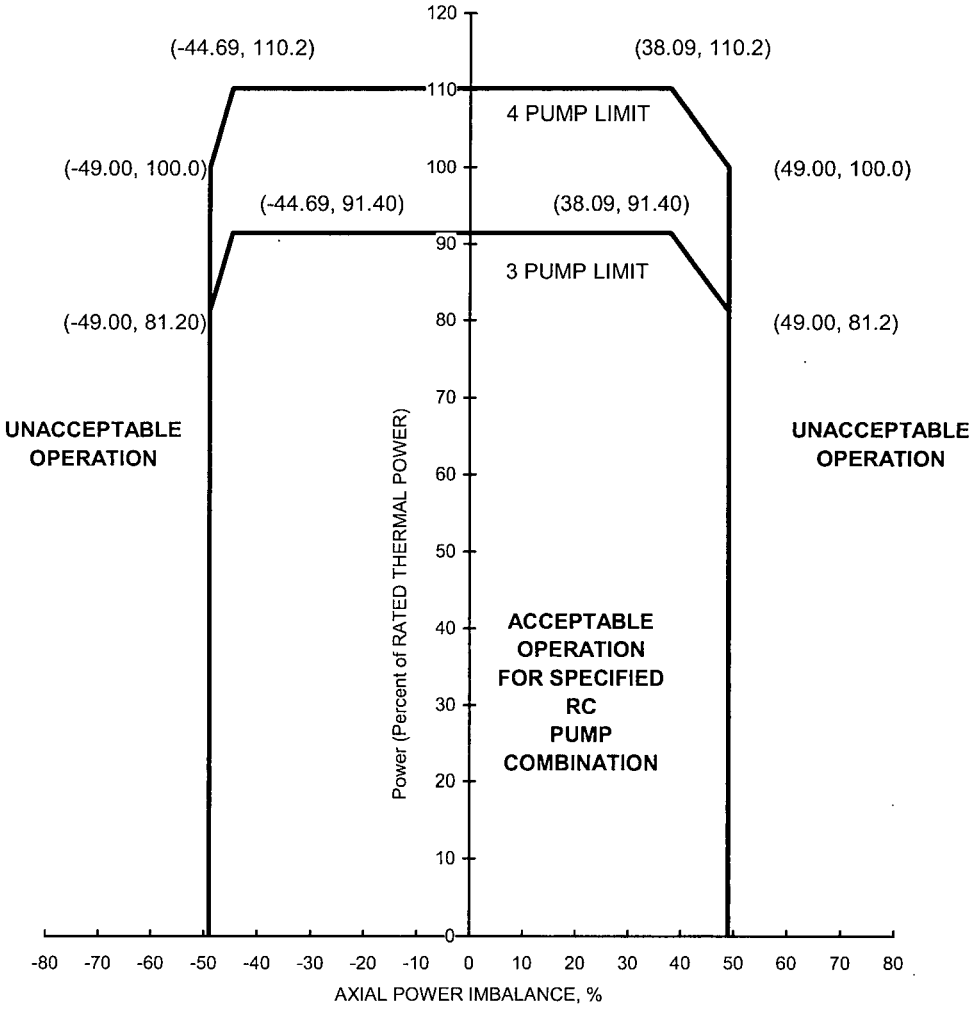
Figure 1 AXIAL POWER IMBALANCE Protective Limits
2817 MWt RTP, Davis-Besse 1, Cycle 17

This Figure is referred to by
Technical Specification 2.1.1.1



Pumps Operating	Reactor Coolant Flow, gpm	Required Measured Flow to Ensure Compliance, gpm
4	380,000	389,500
3	283,860	290,957

Table 1 Shutdown Margin Requirements

Verify SHUTDOWN MARGIN per the table below.

APPLICABILITY	REQUIRED SHUTDOWN MARGIN	TECHNICAL SPECIFICATIONS LCO REFERENCE
MODE 1*	≥ 1 %Δk/k	3.1.4, 3.1.5
MODE 2*	≥ 1 %Δk/k	3.1.4, 3.1.5, 3.3.9
MODE 3	≥ 1 %Δk/k	3.1.1, 3.3.9
MODE 4	≥ 1 %Δk/k	3.1.1, 3.3.9
MODE 5	≥ 1 %Δk/k	3.1.1, 3.3.9
MODE 1 PHYSICS TESTS Exceptions**	≥ 1 %Δk/k	3.1.8
MODE 2 PHYSICS TESTS Exceptions	≥ 1 %Δk/k	3.1.9

* The required Shutdown Margin capability of 1%Δk/k in MODE 1 and MODE 2 is preserved by the Regulating Rod Insertion Limits specified in Figures 2a through 2d as required by Technical Specification 3.2.1.

** Entry into Mode 1 Physics Tests Exceptions is not supported by existing analyses. For example, Regulating Rod Shutdown Margin Insertion Limits assumptions may not be met and as such requires actual shutdown margin to be ≥ 1 %Δk/k via alternate verification or calculation.

Table 2 Moderator Temperature Coefficient Limit

These limits are referred to by Technical Specifications 3.1.3

1. Lower Limit:

   MTC at HFP ≥ -3.81×10^{-4} Δk/k/°F

2. The following Upper Limits may not be exceeded without prior NRC approval:

   MTC $< 0.9 \times 10^{-4}$ Δk/k/°F when Thermal Power <95% RTP

   MTC $< 0.0 \times 10^{-4}$ Δk/k/°F when Thermal Power ≥95% RTP

3. The following Upper Limits may not be exceeded for operation in Modes 1 and 2:

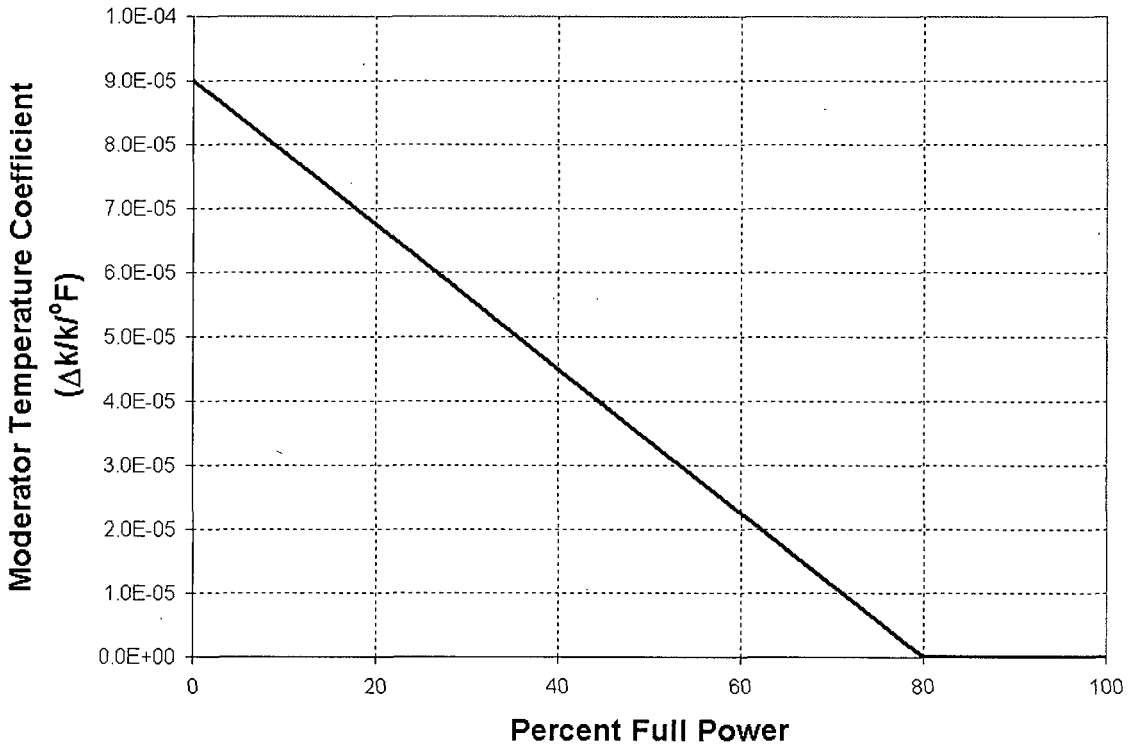


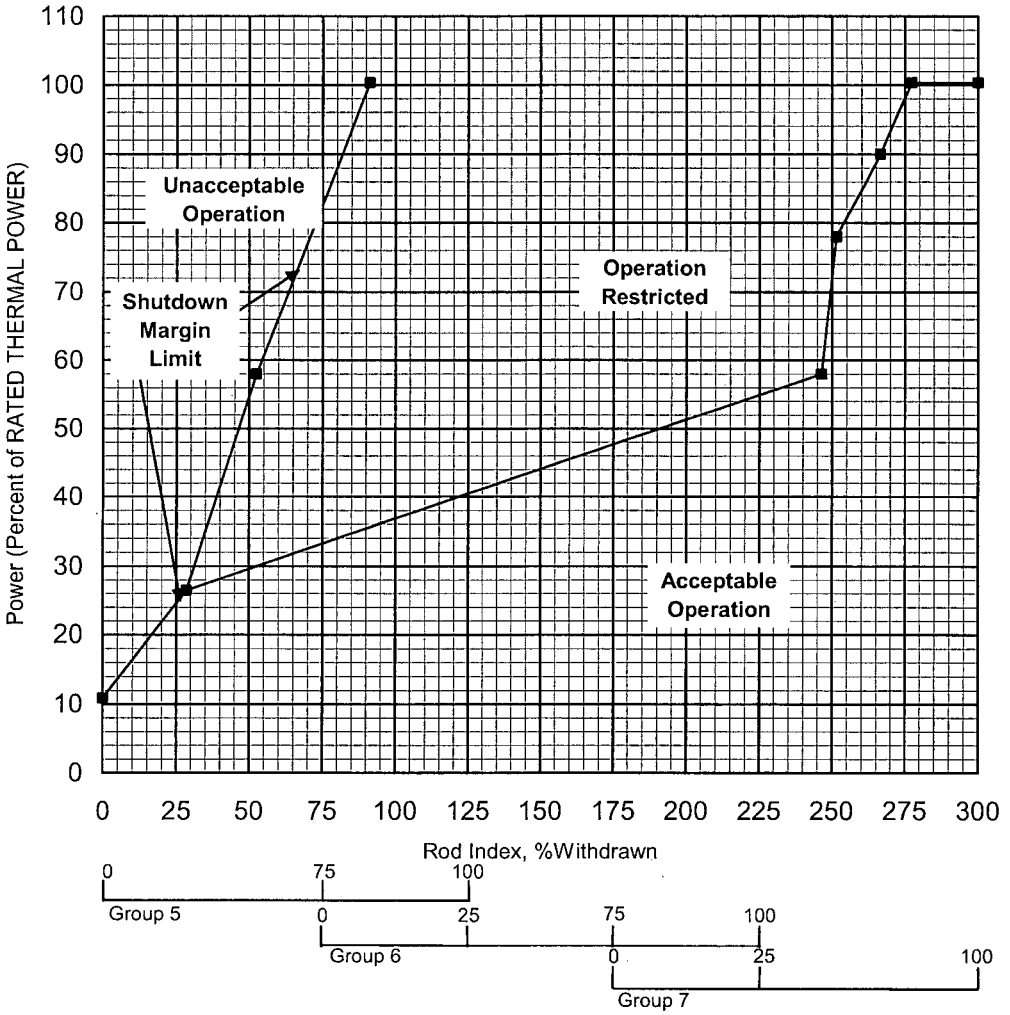
Table 3 Absolute Position Indicator (API) / Relative Position Indicator (RPI) Agreement Limit

This limit is referred to by Technical Specifications 3.1.7

The absolute position indicator channels and the relative position indicator channels agree within 3.46%.

Figure 2a Regulating Group Position Operating Limits
0 to 300 ±10 EFPD, Four RC Pumps--2817 MWt RTP
Davis-Besse 1, Cycle 17

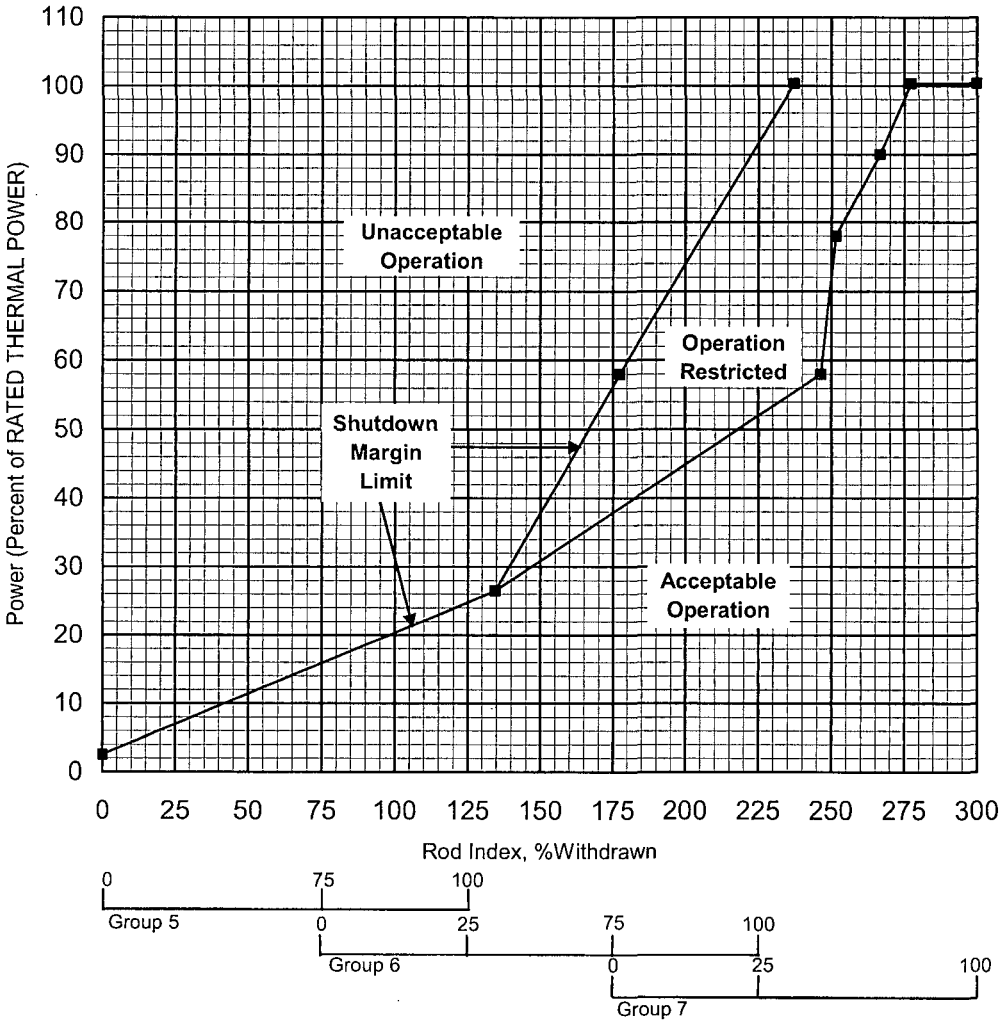
This Figure is referred to by Technical Specifications 3.2.1



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.
Note 3: Maximum plotted power level is 100.37 %RTP.

Figure 2b Regulating Group Position Operating Limits
After 300 ±10 EFPD, Four RC Pumps--2817 MWt RTP
Davis-Besse 1, Cycle 17

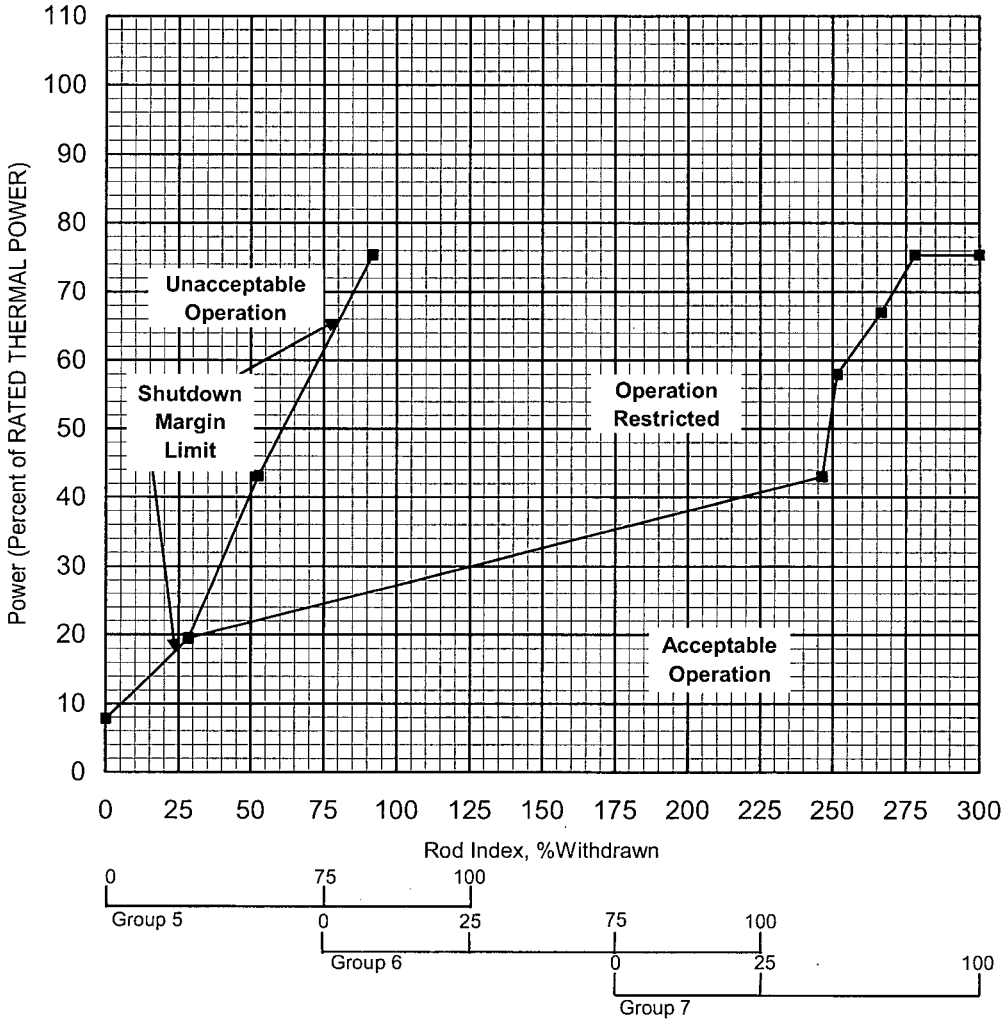
This Figure is referred to by Technical Specifications 3.2.1



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.
Note 3: Maximum plotted power level is 100.37 %RTP.

Figure 2c Regulating Group Position Operating Limits
0 to 300 ±10 EFPD, Three RC Pumps--2817 MWt RTP
Davis-Besse 1, Cycle 17

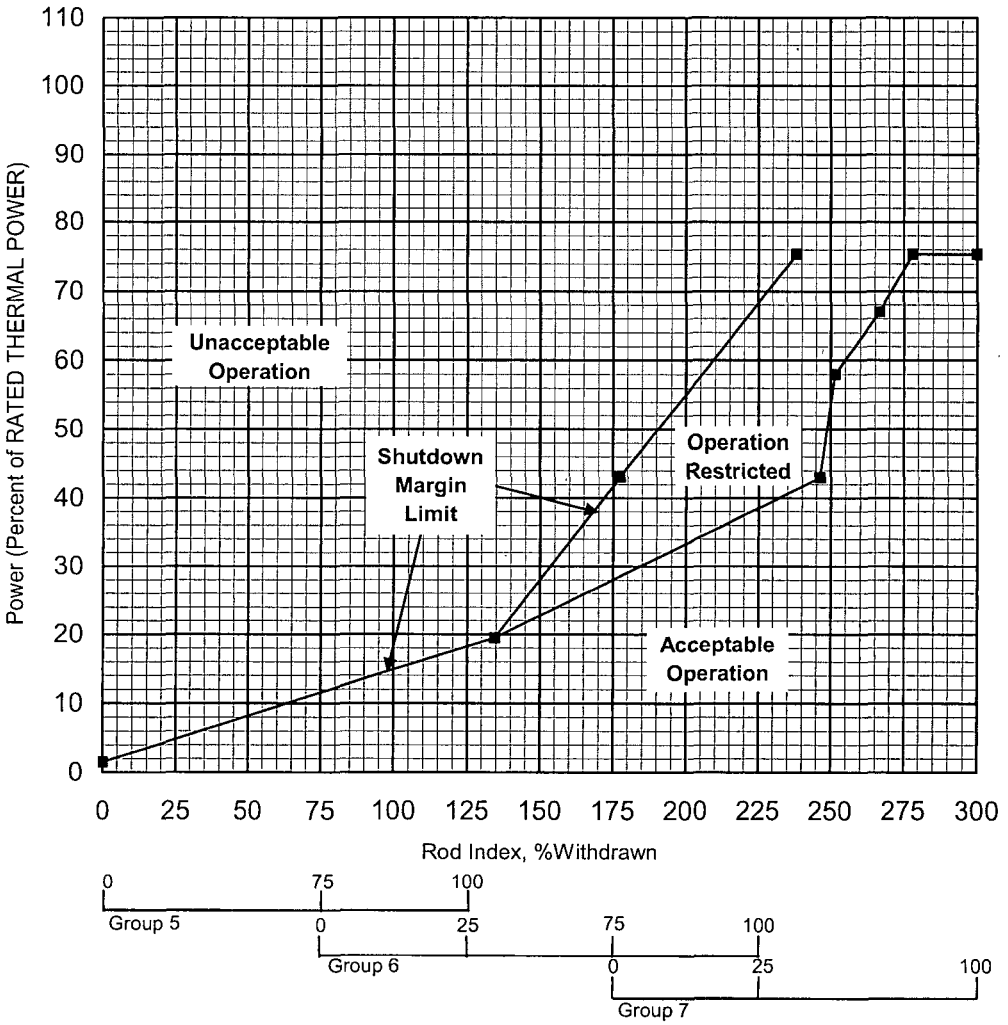
This Figure is referred to by Technical Specifications 3.2.1



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.
Note 3: Maximum plotted power level is 75.37 %RTP.

Figure 2d Regulating Group Position Operating Limits
After 300 ±10 EFPD, Three RC Pumps--2817 MWt RTP
Davis-Besse 1, Cycle 17

This Figure is referred to by Technical Specifications 3.2.1



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.
Note 3: Maximum plotted power level is 75.37 %RTP.

Figure 3 APSR Position Operating Limits

This Figure is referred to by Technical Specifications 3.2.2

Before APSR Pull: 0 EFPD to 615 ± 10 EFPD,
Three or Four RC pumps operation*

Lower Limit: 0 %WD

Upper Limit: 100 %WD

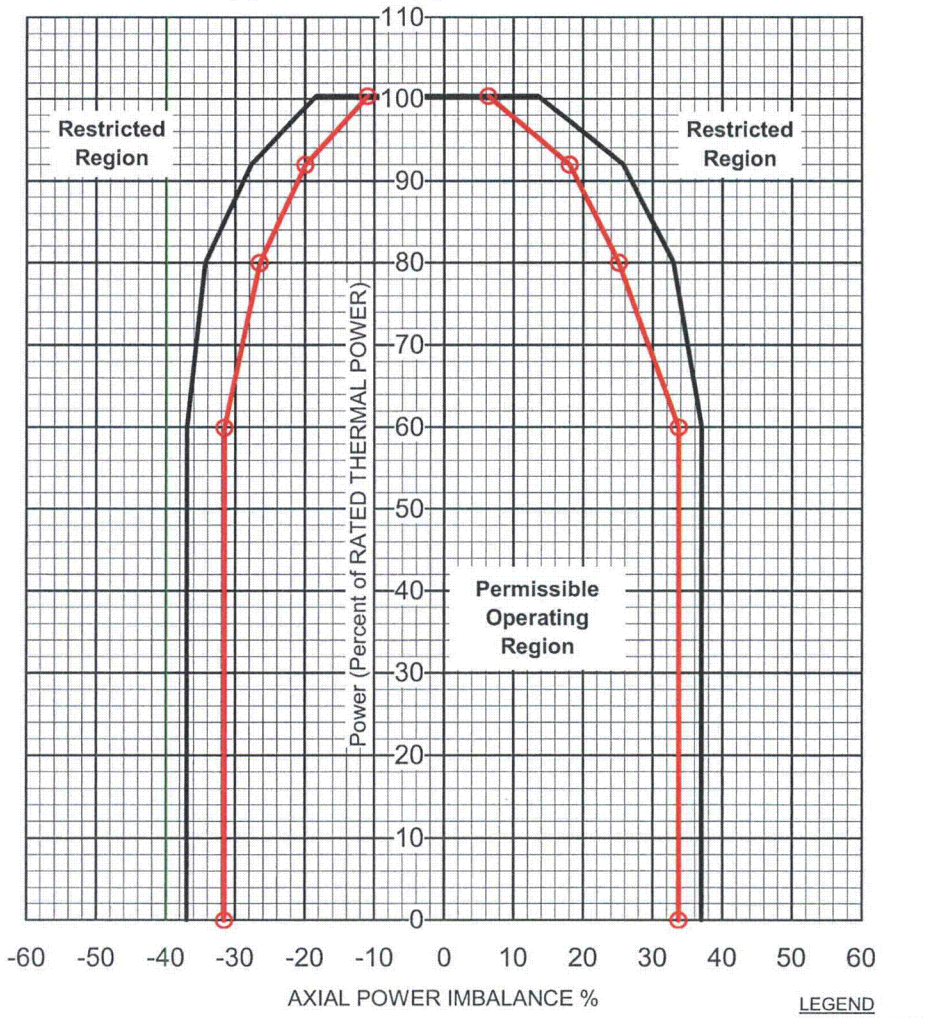
After APSR Pull: 615 ± 10 EFPD to End-of-Cycle
Three or Four RC pumps operation*

Insertion Prohibited (maintain ≥ 99%WD)

* Power restricted to 75.37% for 3-pump operation.

Figure 4a AXIAL POWER IMBALANCE Operating Limits
0 EFPD to EOC, Four RC Pumps--2817 MWt RTP
Davis-Besse 1, Cycle 17

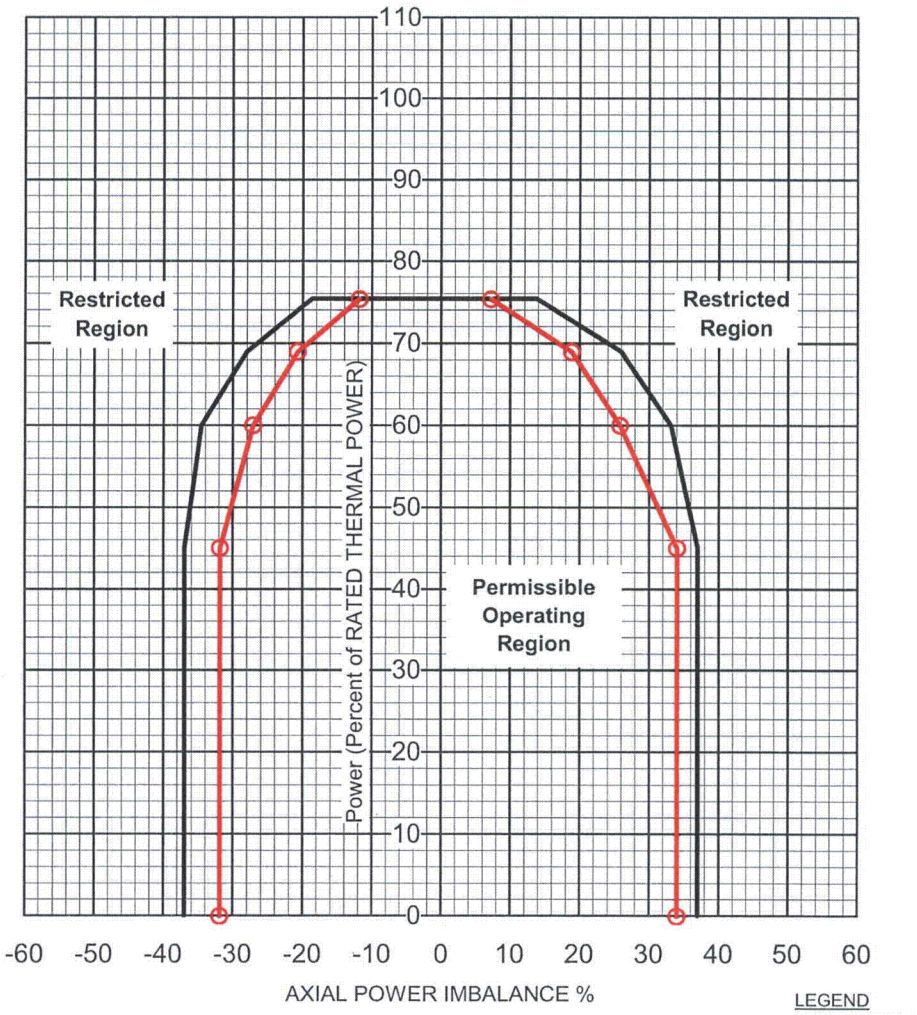
This Figure is referred to by
Technical Specification 3.2.3



Note 1: Instrument error is accounted for in these Operating Limits.
Note 2: The Excore Imbalance Operating Limits are available for use when the Full Incore system is non-functional.
Note 3: Maximum plotted power level is 100.37 %RTP.

Figure 4b AXIAL POWER IMBALANCE Operating Limits
0 EFPD to EOC, Three RC Pumps--2817 MWt RTP
Davis-Besse 1, Cycle 17

This Figure is referred to by
Technical Specification 3.2.3



Note 1: Instrument error is accounted for in these Operating Limits.
Note 2: The Excore Imbalance Operating Limits are available for use when the Full Incore system is non-functional.
Note 3: Maximum plotted power level is 75.37 %RTP.

Table 4 QUADRANT POWER TILT Limits

This Table is referred to by Technical Specifications 3.2.4

QUADRANT POWER TILT as measured by:	From 0 EFPD to EOC			
	Steady-state Limit for THERMAL POWER ≤ 60% (%)	Steady-state Limit for THERMAL POWER >60% (%)	Transient Limit (%)	Maximum Limit (%)
Symmetric Incore Detector System	7.90	4.44	10.03	20.00

Table 5 Power Peaking Factors - F_Q (NAS)

This Table is referred to by Technical Specifications 3.2.5

The measured F_Q shall be increased by 1.4% to account for manufacturing tolerances and further increased by 7.5% to account for measurement uncertainty before comparing to the limits.

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] (for $P \leq 1.0$)

LHR^{allow} (Bu) = See the following tables

LHR^{avg} = 6.4322 kW/ft at 2817 MWt for Batch 17B, 17C2, 17D and 17E2 Mark-B-HTP fuel
LHR^{avg} = 6.4209 kW/ft at 2817 MWt for Batch 18A2, 18B and 18C Mark-B-HTP fuel
LHR^{avg} = 6.4209 kW/ft at 2817 MWt for Batch 19 A-D Mark-B-HTP fuel

P = ratio of THERMAL POWER / RATED THERMAL POWER
Bu = fuel burnup (MWd/mtU)

UO_2 Fuel (Mark-B-HTP) — All Batches LHR^{ALLOW} kW/ft[(a)]

Axial Segment	0 MWd/mtU	40,000 MWd/mtU	62,000 MWd/mtU
1	17.6	17.2	13.1
2	17.5	17.1	13.1
3	17.4	17.1	13.1
4	17.4	17.1	13.1
5	17.0	16.7	13.1
6	16.2	16.3	13.1
7	15.6	15.7	12.6
8	15.4	15.5	12.4

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

Table 6 Power Peaking Factors - F_Q (FIDMS)

This Table is referred to by Technical Specifications 3.2.5

The measured F_Q shall be increased by 1.4% to account for manufacturing tolerances and further increased by 7.5% to account for measurement uncertainty before comparing to the limits.

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] (for $P \leq 1.0$)

LHR^{allow} (Bu) = See the following tables

LHR^{avg} = 6.4322 kW/ft at 2817 MWt for Batch 17B, 17C2, 17D and 17E2 Mark-B-HTP fuel
LHR^{avg} = 6.4209 kW/ft at 2817 MWt for Batch 18A2, 18B and 18C Mark-B-HTP fuel
LHR^{avg} = 6.4209 kW/ft at 2817 MWt for Batch 19 A - D Mark-B-HTP fuel

P = ratio of THERMAL POWER / RATED THERMAL POWER
Bu = fuel burnup (MWd/mtU)

UO_2 Fuel (Mark-B-HTP) – All Batches LHR^{ALLOW} kW/ft[(a)]

Core Elevation (ft)	0 MWd/mtU	40,000 MWd/mtU	62,000 MWd/mtU
0	17.6	17.2	13.1
2.506	17.6	17.2	13.1
4.264	17.5	17.1	13.1
6.021	17.4	17.1	13.1
7.779	17.0	16.7	13.1
9.536	16.2	16.3	13.1
12.000	15.4	15.5	12.4

[(a)] Linear interpolation for allowable LHR between specified burnup points is valid for these tables.

Table 6 (continued)

4 wt% Gad Fuel (Mark-B-HTP) – All Batches LHR^{ALLOW} kW/ft[(a)]

Core Elevation (ft)	0 MWd/mtU	40,000 MWd/mtU	62,000 MWd/mtU
0	15.8	15.7	11.8
2.506	15.8	15.7	11.8
4.264	15.7	15.5	11.8
6.021	15.6	15.5	11.8
7.779	15.3	15.2	11.8
9.536	14.6	14.8	11.8
12.000	13.8	14.1	11.2

8 wt% Gad Fuel (Mark-B-HTP) – Batches 17E2, 18A2, 18C, 19A and 19C LHR^{ALLOW} kW/ft[(a)]

Core Elevation (ft)	0 MWd/mtU	40,000 MWd/mtU	62,000 MWd/mtU
0	14.9	14.9	11.0
2.506	14.9	14.9	11.0
4.264	14.8	14.9	11.0
6.021	14.8	14.9	11.0
7.779	14.4	14.5	11.0
9.536	13.7	14.2	11.0
12.000	13.0	13.5	10.4

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

Table 7 Power Peaking Factors - $F^N_{\Delta H}$

This Table is referred to by Technical Specifications 3.2.5

Enthalpy Rise Hot Channel Factors - $F^N_{\Delta H}$

$F^N_{\Delta H} \leq MARP\ [1 + (1/RH)\ (1 - P/P_m)]$ (see note below)

MARP = Maximum Allowable Radial Peak, see MARP Figures and data Tables

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

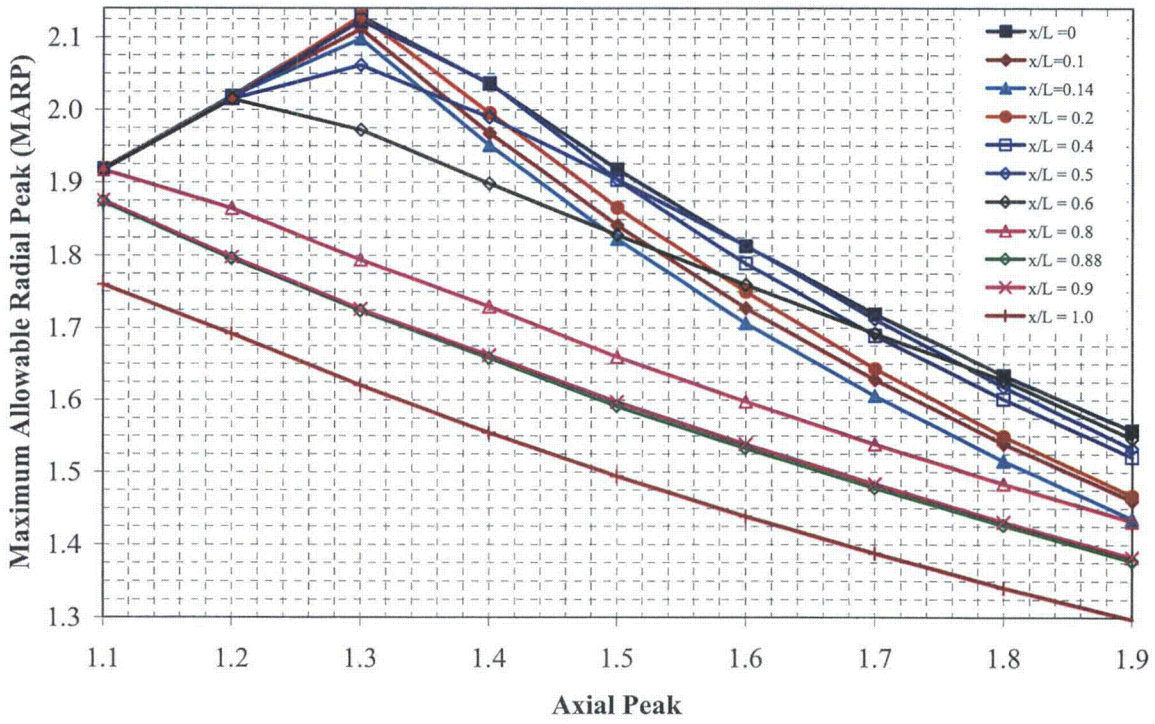
$P_m = 1.0$ for 4-RCP operation

$P_m = 0.75$ for 3-RCP operation

1/RH = 0.3

Note: The measured $F^N_{\Delta H}$ shall be increased by 5.0% to account for measurement uncertainty prior to comparing to the limits.

Figure 5 Maximum Allowable Radial Peak for $F^N_{\Delta H}$ in Mark-B-HTP Fuel Assemblies *



* Linear interpolation is acceptable. The MARP values are based on an active fuel height of 142.75 inches.

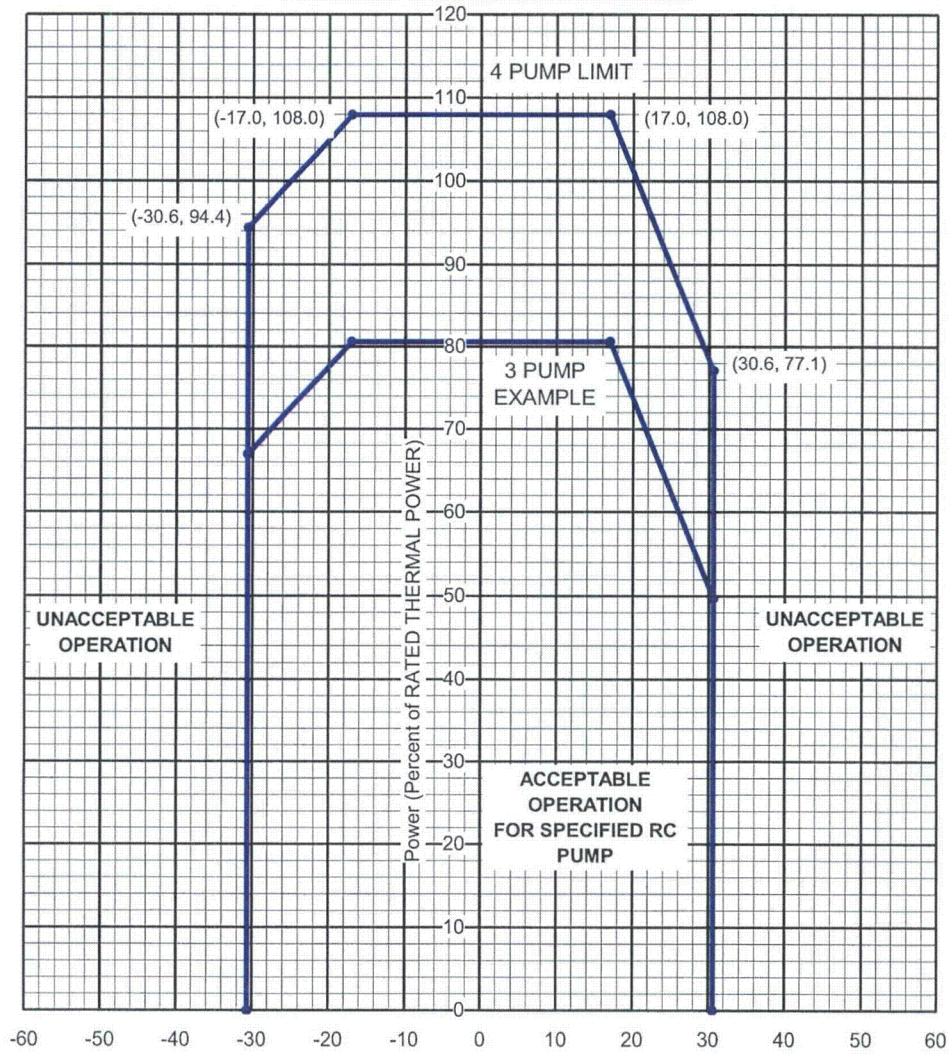
Table 8 Maximum Allowable Radial Peak for $F^N_{\Delta H}$ in Mark-B-HTP Fuel Assemblies

Axial Peak	x/L	Axial Height (inches)	MARP Limit	Axial Peak	x/L	Axial Height (inches)	MARP Limit
	0.0	0.000	1.91828		0.0	0.000	1.81332
	0.1	14.275	1.91912		0.1	14.275	1.72752
	0.14	19.985	1.91916		0.14	19.985	1.70690
	0.2	28.550	1.91893		0.2	28.550	1.75024
	0.4	57.100	1.91727		0.4	57.100	1.78912
1.1	0.5	71.375	1.91659	1.6	0.5	71.375	1.81428
	0.6	85.650	1.91652		0.6	85.650	1.75934
	0.8	114.200	1.91726		0.8	114.200	1.59848
	0.88	125.620	1.87428		0.88	125.620	1.53299
	0.9	128.475	1.87570		0.9	128.475	1.53906
	1.0	142.750	1.76005		1.0	142.750	1.43922
	0.0	0.000	2.01903		0.0	0.000	1.71924
	0.1	14.275	2.01905		0.1	14.275	1.62855
	0.14	19.985	2.01902		0.14	19.985	1.60598
	0.2	28.550	2.01760		0.2	28.550	1.64367
	0.4	57.100	2.01566		0.4	57.100	1.68971
1.2	0.5	71.375	2.01506	1.7	0.5	71.375	1.71250
	0.6	85.650	2.01472		0.6	85.650	1.69234
	0.8	114.200	1.86510		0.8	114.200	1.53913
	0.88	125.620	1.79631		0.88	125.620	1.47793
	0.9	128.475	1.79807		0.9	128.475	1.48398
	1.0	142.750	1.69236		1.0	142.750	1.38831
	0.0	0.000	2.12863		0.0	0.000	1.63428
	0.1	14.275	2.11181		0.1	14.275	1.53965
	0.14	19.985	2.09817		0.14	19.985	1.51542
	0.2	28.550	2.12998		0.2	28.550	1.54992
	0.4	57.100	2.12313		0.4	57.100	1.60163
1.3	0.5	71.375	2.06182	1.8	0.5	71.375	1.61867
	0.6	85.650	1.97202		0.6	85.650	1.62746
	0.8	114.200	1.79424		0.8	114.200	1.48433
	0.88	125.620	1.72438		0.88	125.620	1.42669
	0.9	128.475	1.72615		0.9	128.475	1.43160
	1.0	142.750	1.62069		1.0	142.750	1.34126
	0.0	0.000	2.03596		0.0	0.000	1.55767
	0.1	14.275	1.96785		0.1	14.275	1.46097
	0.14	19.985	1.95126		0.14	19.985	1.43560
	0.2	28.550	1.99602		0.2	28.550	1.46745
	0.4	57.100	2.03723		0.4	57.100	1.52104
1.4	0.5	71.375	1.98993	1.9	0.5	71.375	1.53278
	0.6	85.650	1.89829		0.6	85.650	1.54669
	0.8	114.200	1.72980		0.8	114.200	1.43258
	0.88	125.620	1.65869		0.88	125.620	1.37762
	0.9	128.475	1.66256		0.9	128.475	1.38298
	1.0	142.750	1.55477		1.0	142.750	1.29807
	0.0	0.000	1.91811				
	0.1	14.275	1.84228				
	0.14	19.985	1.82345				
	0.2	28.550	1.86637				
	0.4	57.100	1.90396				
1.5	0.5	71.375	1.90467				
	0.6	85.650	1.82883				
	0.8	114.200	1.66024				
	0.88	125.620	1.59179				
	0.9	128.475	1.59788				
	1.0	142.750	1.49464				

Figure 6

Flux-ΔFlux-Flow
(or Power/Imbalance/Flow)
Allowable Values
Davis-Besse 1

This Figure is referred to by
Technical Specification 3.3.1



The 3 pump example curve shows allowable values for an approximately 25% flow reduction for three pump operation (283,860 gpm). The actual setpoint will be calculated by the Reactor Protection System and will be directly proportional to the actual RC flow with three pumps.

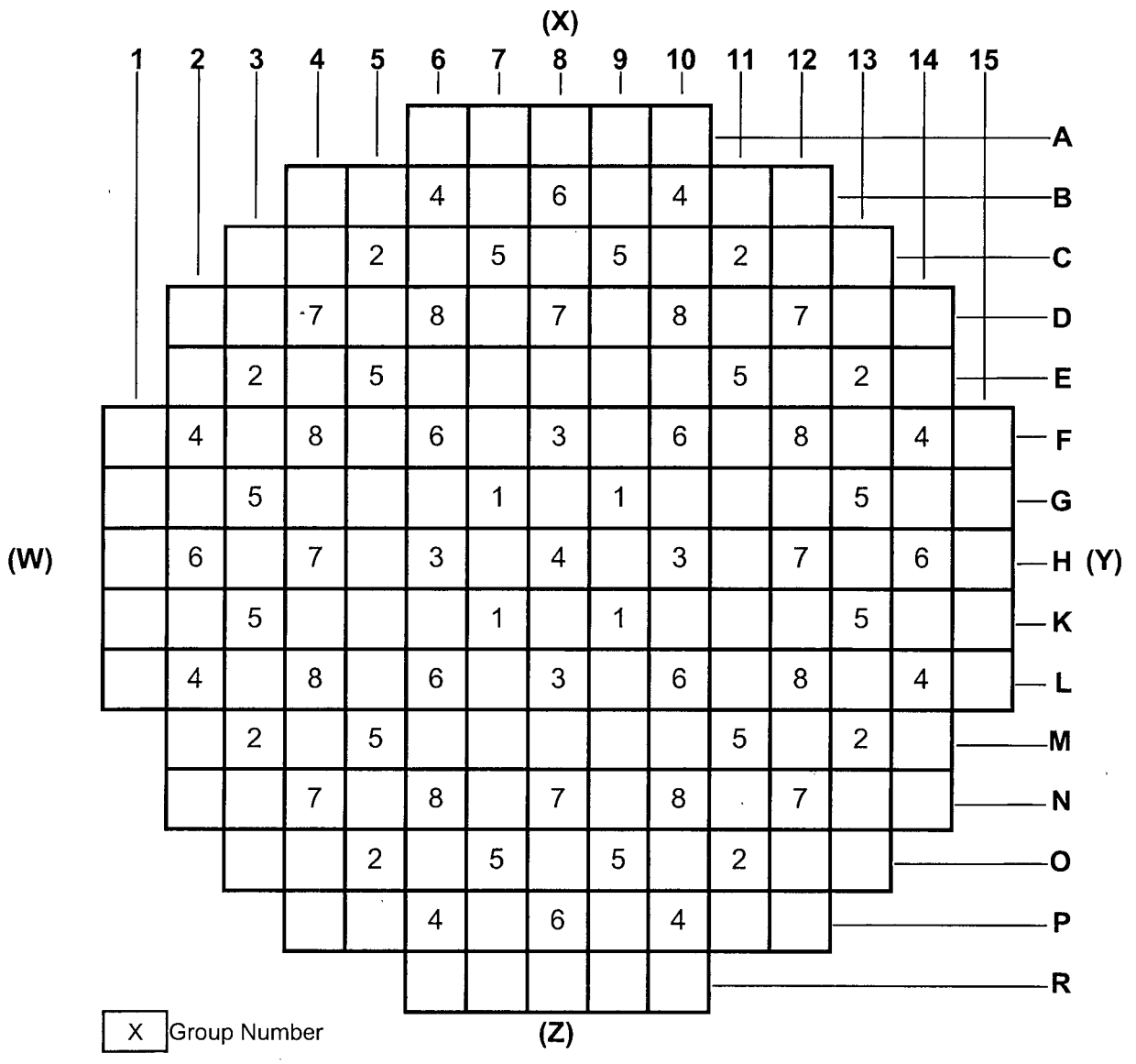
Table 9 Refueling Boron Concentration Limit

This limit is referred to by Technical Specifications 3.9.1

The minimum required boron concentration for use during refueling shall be sufficient to ensure a K_{eff} of 0.95 or less, plus an additional 1% $\Delta k/k$ conservatism allowance for uncertainties.

Figure 7 Control Rod Core Locations and Group Assignments Davis-Besse 1

This Figure is referred to by Technical Requirements Manual 8.1.3



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