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December 16, 2008
L-08-317

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

SUBJECT:
Davis-Besse Nuclear Power Station, Unit 1
Docket Number 50-346, License No. NPF-3
Core Operating Limits Report and
Pressure and Temperature Limits Report

Enclosed please find the current Davis-Besse Nuclear Power Station, Unit 1 (DBNPS) Core Operating Limits Report (COLR) and the Pressure and Temperature Limits Report (PTLR). Both reports support the implementation of License Amendment No. 279, Improved Technical Specifications. Enclosure 1 contains the COLR and is submitted in accordance with the DBNPS Technical Specification 5.6.3. Enclosure 2 contains the PTLR and is submitted in accordance with the DBNPS Technical Specification 5.6.4.

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

Enclosures:

A. FirstEnergy Nuclear Operating Company, Davis-Besse Unit 1, Cycle 16, Core Operating Limits Report, Revision 2

B. FirstEnergy Nuclear Operating Company, Davis-Besse Unit 1, 21 Effective Full Power Years Pressure and Temperature Limits Report, Revision 0

A001
NRR

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

Enclosure A
L-08-317

FirstEnergy Nuclear Operating Company, Davis-Besse Unit 1, Cycle 16, Core Operating Limits Report, Revision 2

(34 Pages)

FIRSTENERGY NUCLEAR OPERATING COMPANY

DAVIS-BESSE UNIT 1

CYCLE 16

CORE OPERATING LIMITS REPORT

Prepared by Daniel B. Kelley 9/11/08
D. B. Kelley

Reviewed by Paul R Gilles 9/12/08
P. R. Gilles

Approved by 9/12/08
R. J. Borland

LIST OF EFFECTIVE PAGES

Page 1 through 34 Rev. 2

1.0 Core Operating Limits

This CORE OPERATING LIMITS REPORT for DB-1 Cycle 16 has been prepared in accordance with the requirements of Improved 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 16 is 730 EFPDs (based on a reactor thermal rating of 2817 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. 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 Value
13. LCO 3.9.1 Boron Concentration
14. TRM 8.1.3 Rod Program

2.0 References

1) BAW-10179P-A, Rev. 6, "Safety Criteria and Methodology for Acceptable Cycle Reload Analyses", August, 2001.
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.
3) BAW-10243P-A, "Statistical Fuel Assembly Hold Down Methodology", September, 2005.

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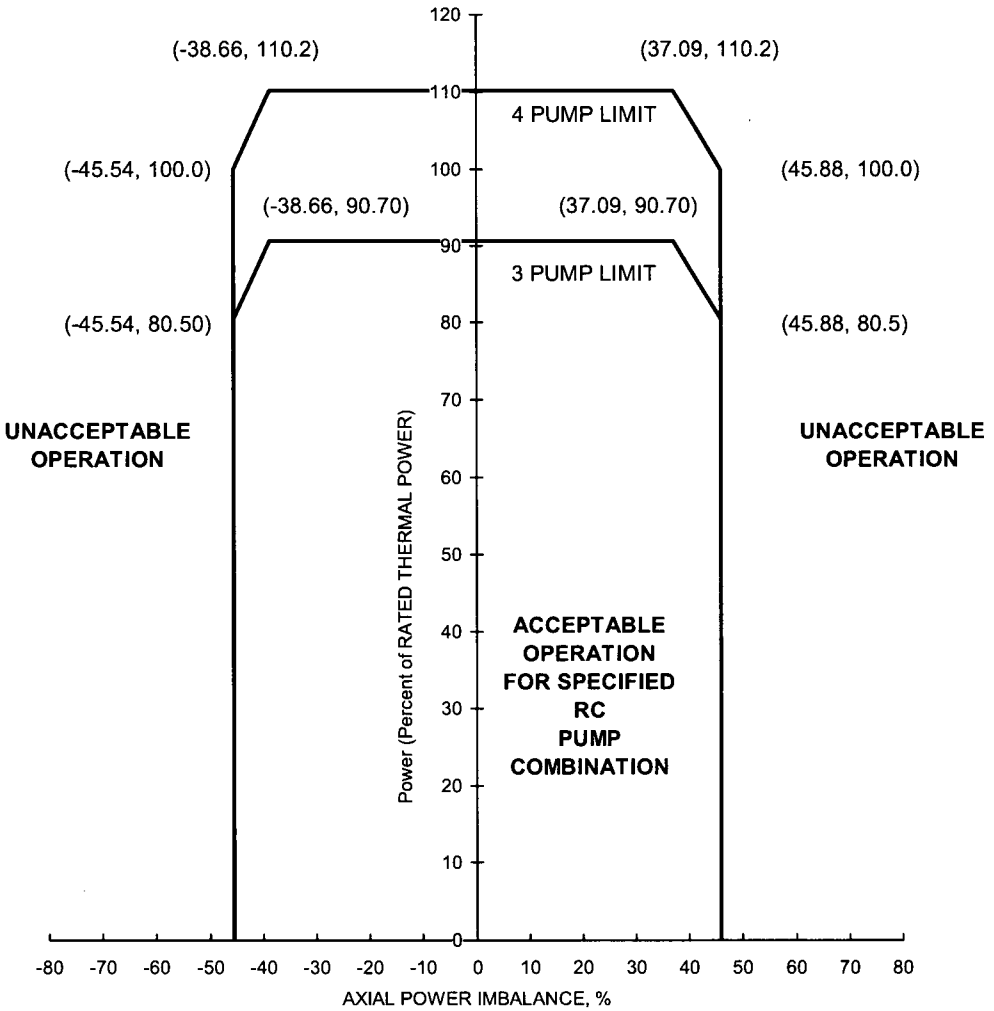
Figure 1 AXIAL POWER IMBALANCE Protective Limits
2817MWt RTP

This Figure is referred to by
Improved 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	IMPROVED 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 Improved Technical Specification 3.2.1.

** Entry into Mode 1 Physics Tests Exceptions is not supported by existing analyses (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 Improved Technical Specifications 3.1.3

1. Lower Limit:

   MTC at HFP ≥ -3.76×10^{-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:

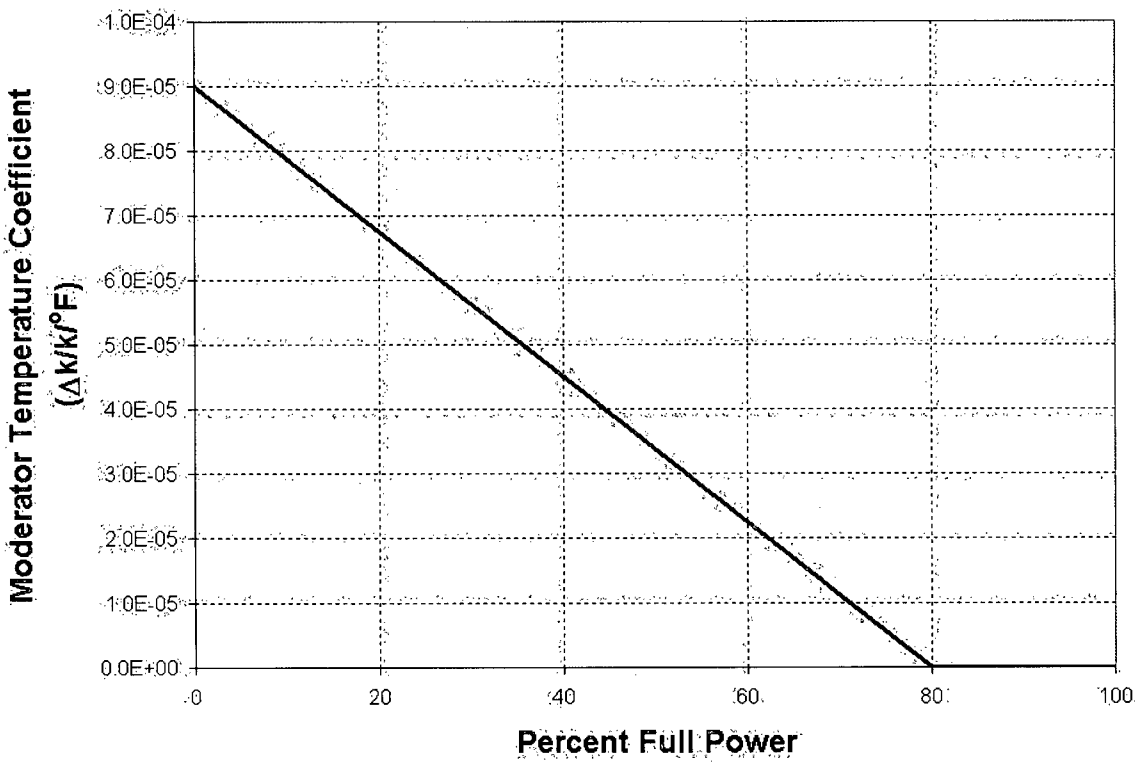


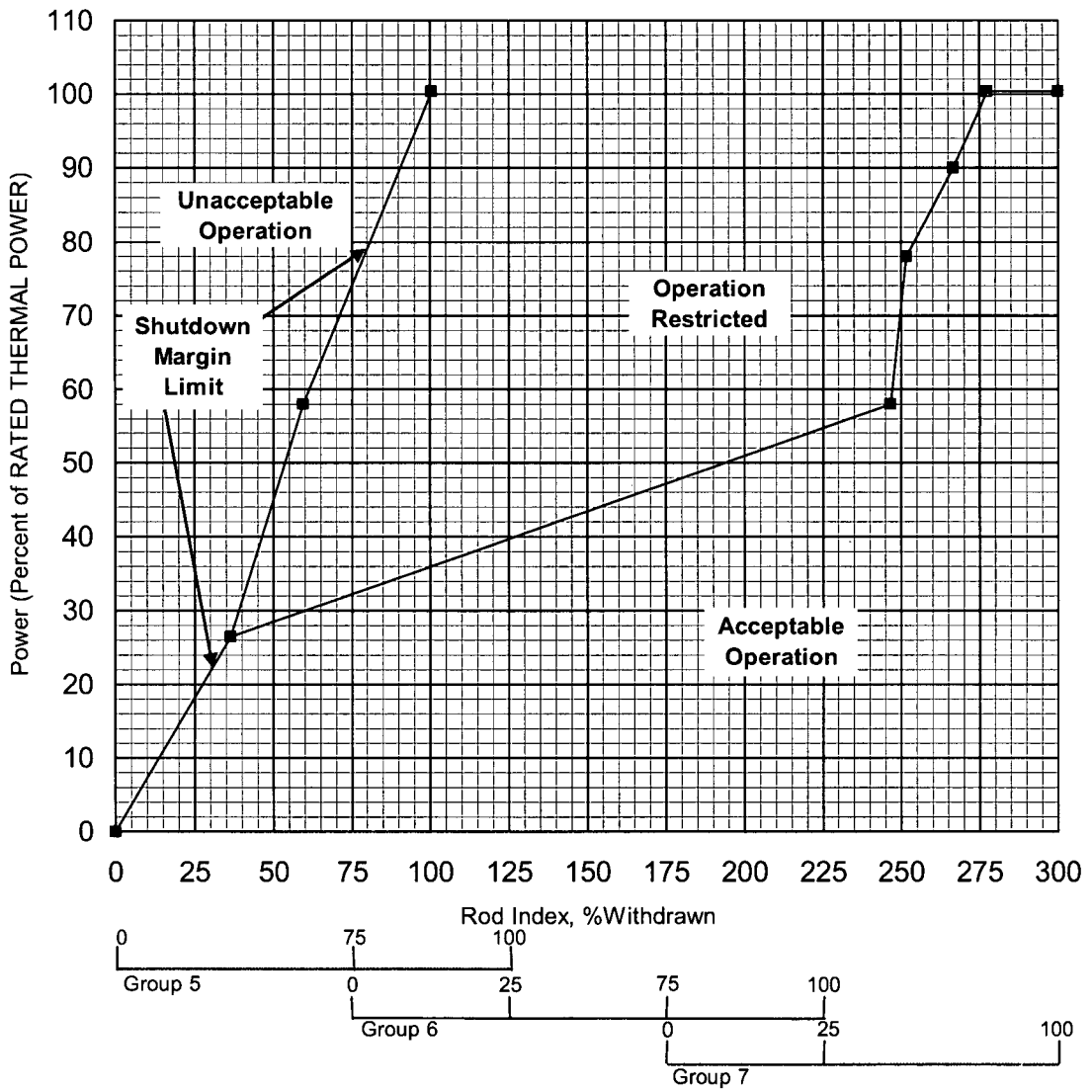
Table 3 Absolute Position Indicator (API) / Relative Position Indicator (RPI) Agreement Limit

This limit is referred to by Improved 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--2817MWt RTP
Davis-Besse 1, Cycle 16

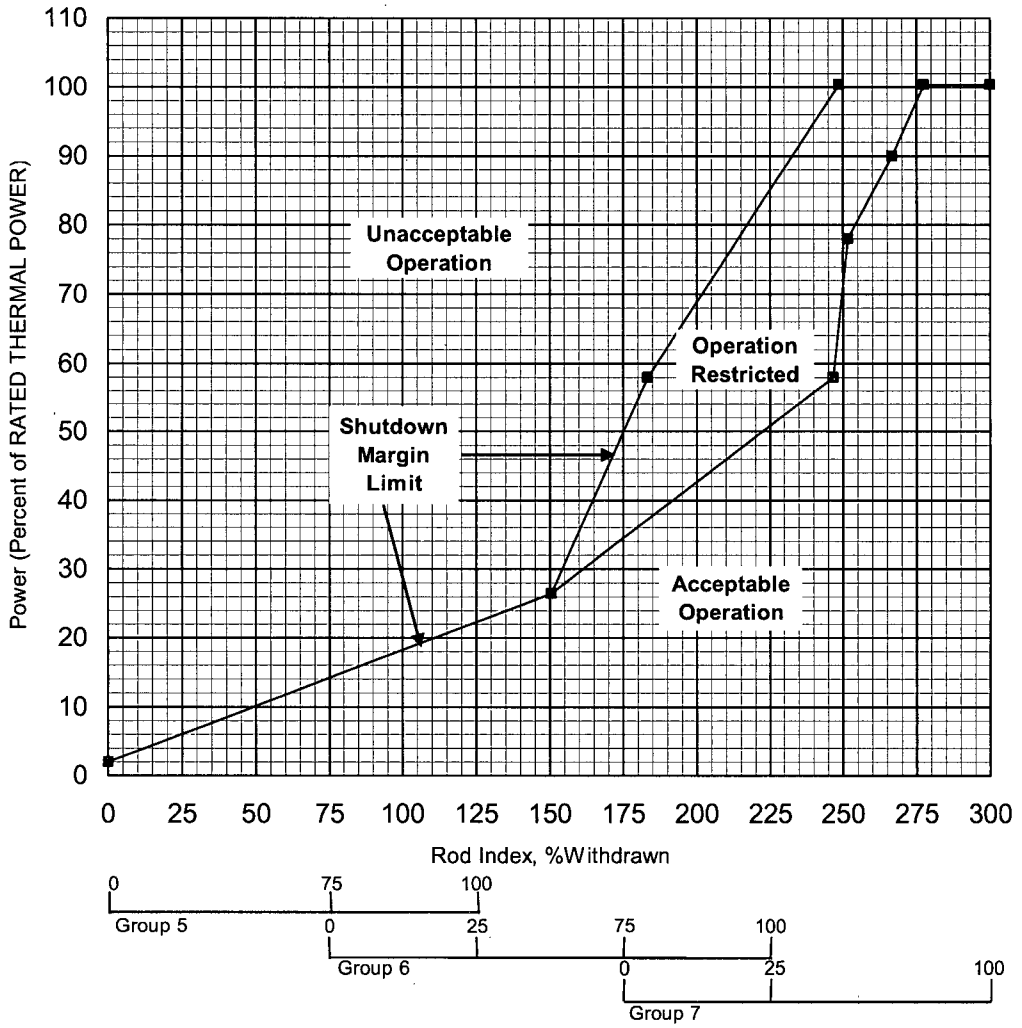
This Figure is referred to by Improved Technical Specifications 3.2.1



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.

Figure 2b Regulating Group Position Operating Limits
After 300 ±10 EFPD, Four RC Pumps--2817MWt RTP
Davis-Besse 1, Cycle 16

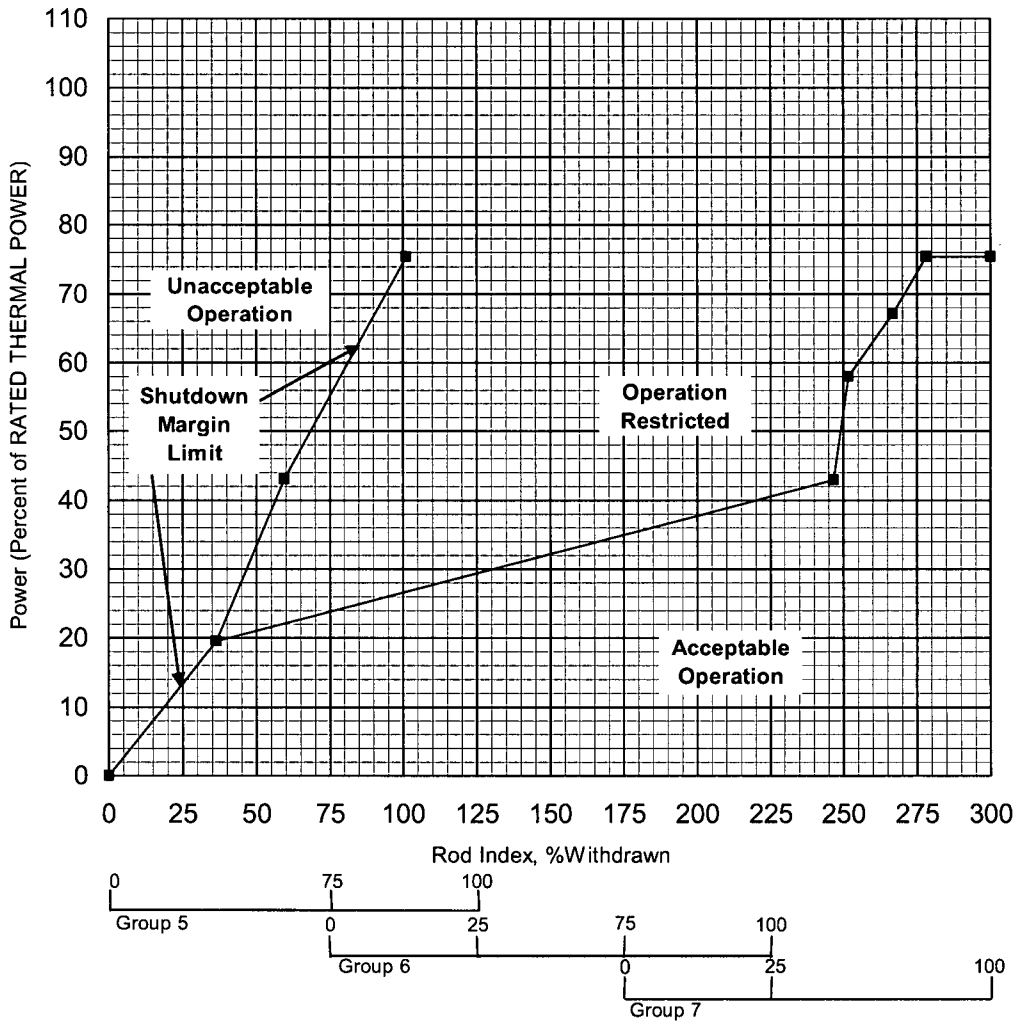
This Figure is referred to by Improved Technical Specifications 3.2.1



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.

Figure 2c Regulating Group Position Operating Limits
0 to 300 ±10 EFPD, Three RC Pumps--2817 MWt RTP
Davis-Besse 1, Cycle 16

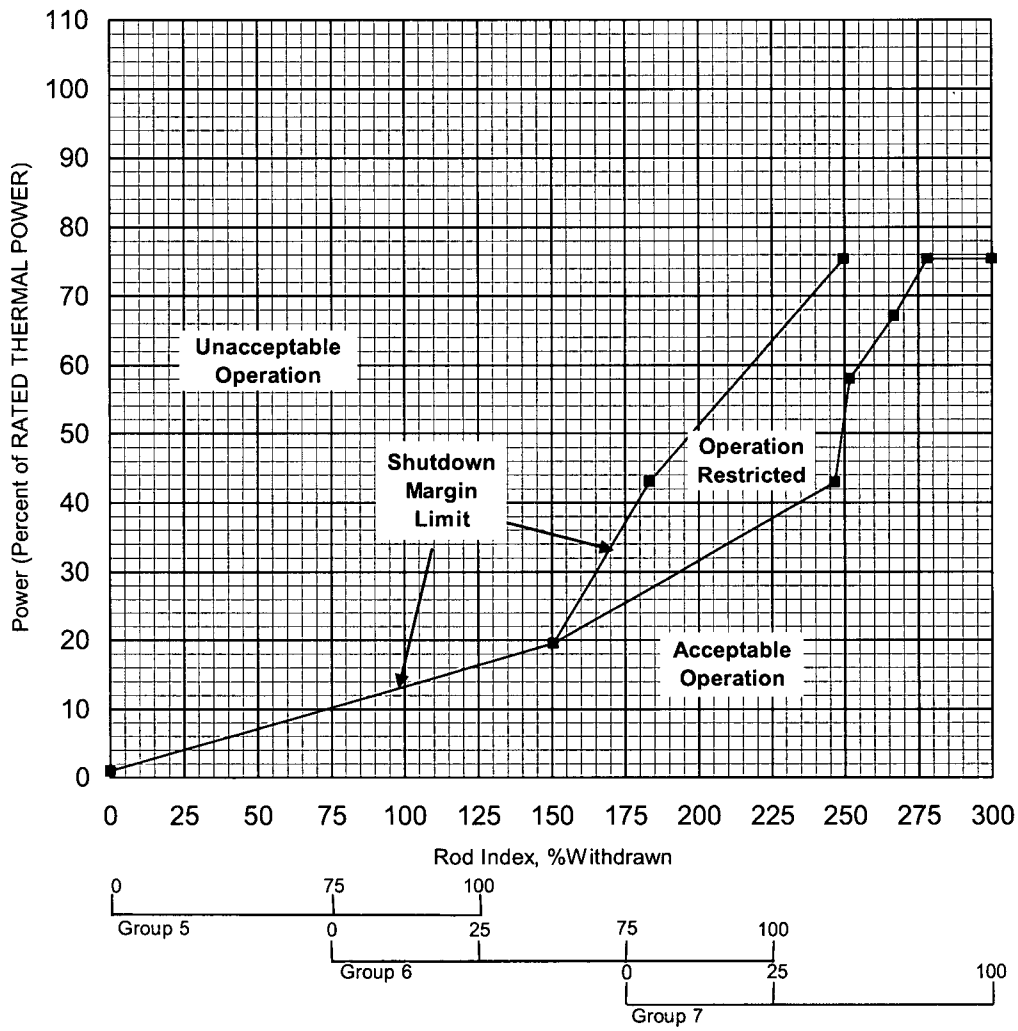
This Figure is referred to by Improved Technical Specifications 3.2.1



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.

Figure 2d Regulating Group Position Operating Limits
After 300 ±10 EFPD, Three RC Pumps--2817MWt RTP
Davis-Besse 1, Cycle 16

This Figure is referred to by Improved 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.

Figure 3 APSR Position Operating Limits – 2817 MWt RTP

This Figure is referred to by Improved Technical Specifications 3.2.2

Before APSR Pull: 0 EFPD to 675 ± 10 EFPD,
Three or Four RC pumps operation*

Lower Limit: 0 %WD

Upper Limit: 100 %WD

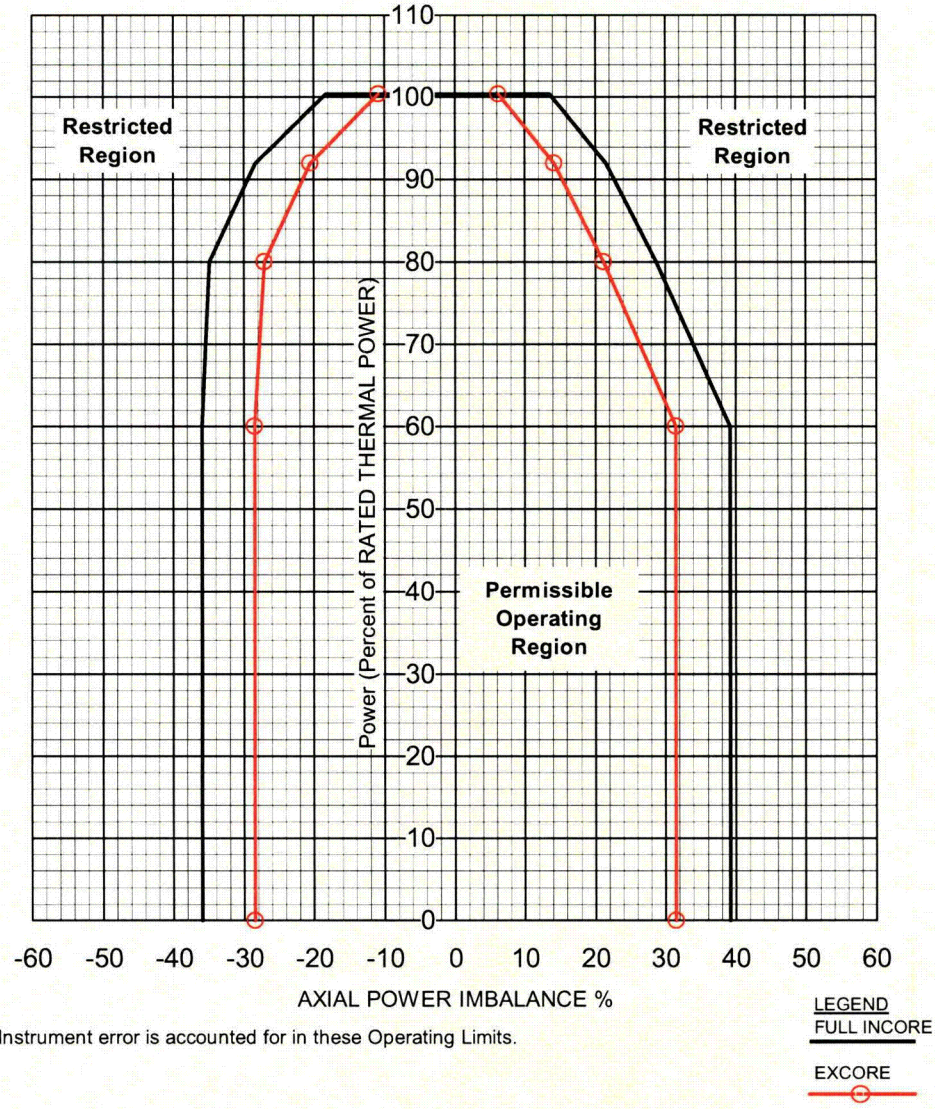
After APSR Pull: 675 ± 10 EFPD to End-of-Cycle
Three or Four RC pumps operation*

Insertion Prohibited (maintain ≥ 99%WD)

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

Figure 4a AXIAL POWER IMBALANCE Operating Limits
0 to 350 ±10 EFPD, Four RC Pumps--2817 MWt RTP
Davis-Besse 1, Cycle 16

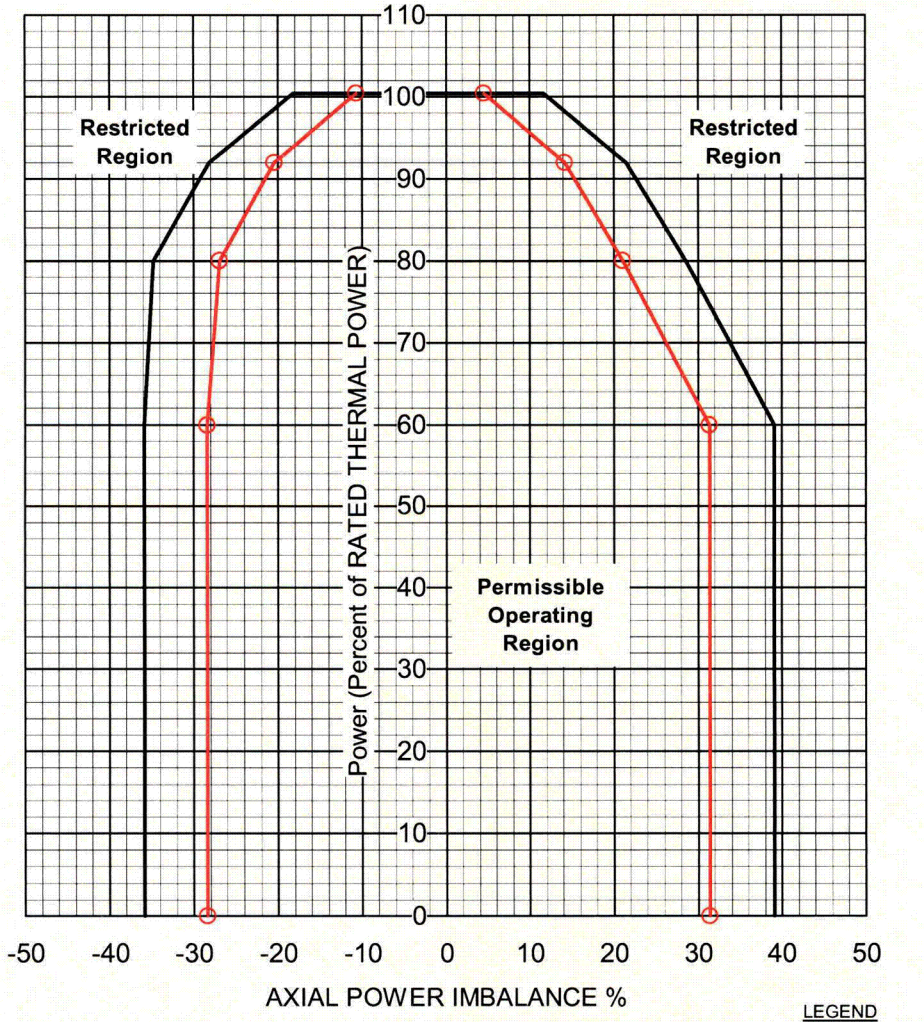
This Figure is referred to by Improved Technical Specification 3.2.3



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

Figure 4b AXIAL POWER IMBALANCE Operating Limits
350 ±10 to 600 ±10 EFPD, Four RC Pumps--2817MWt RTP
Davis-Besse 1, Cycle 16

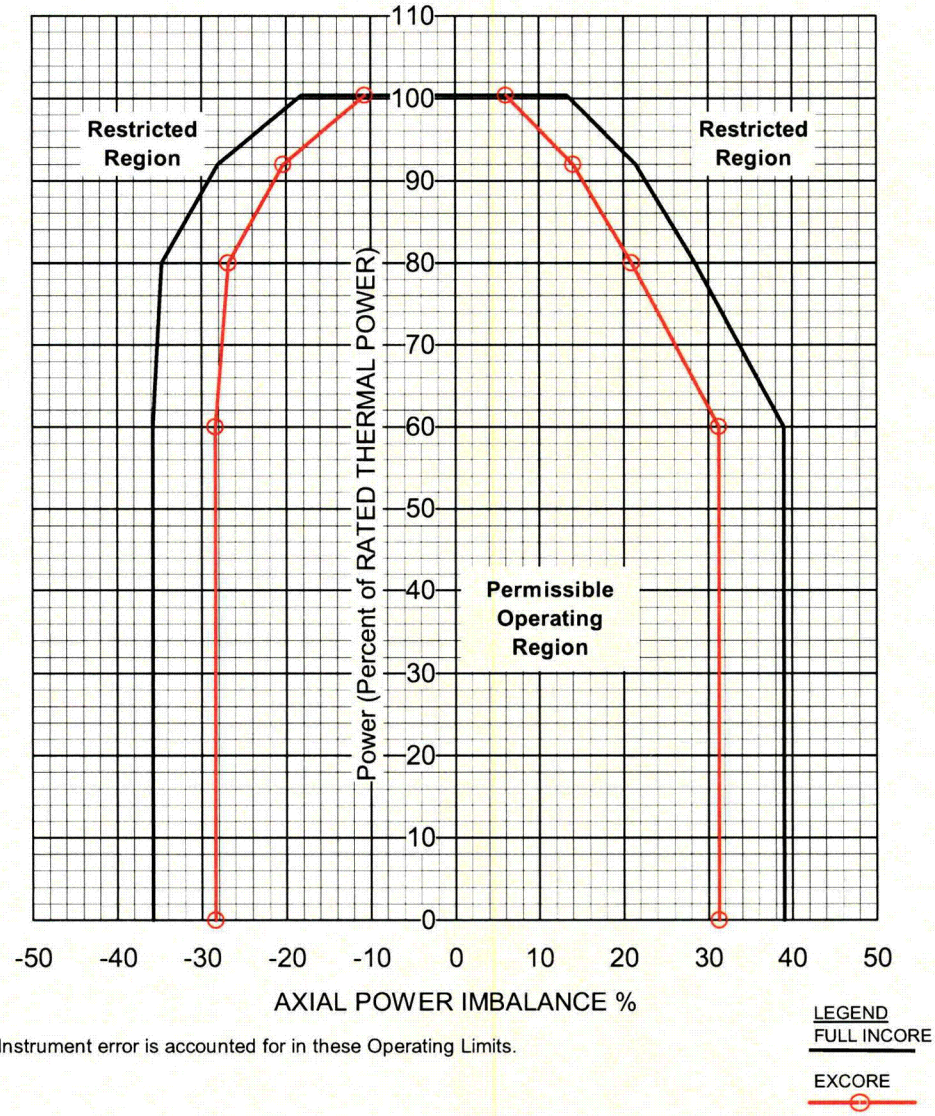
This Figure is referred to by
Improved Technical Specification
3.2.3



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

Figure 4c AXIAL POWER IMBALANCE Operating Limits
After 600 ±10 EFPD, Four RC Pumps--2817MWt RTP
Davis-Besse 1, Cycle 16

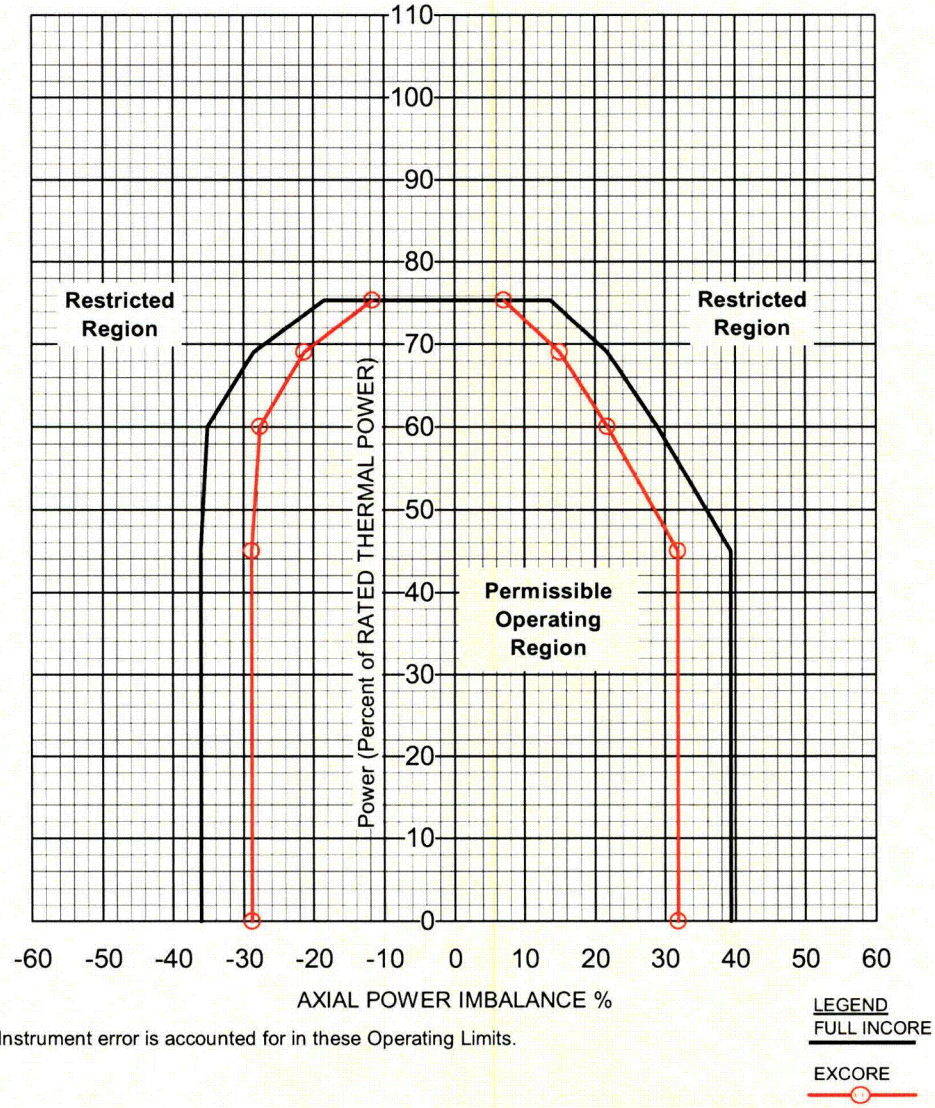
This Figure is referred to by
Improved Technical Specification
3.2.3



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

Figure 4d AXIAL POWER IMBALANCE Operating Limits
0 to 350 ±10 EFPD, Three RC Pumps--2817 MWt RTP
Davis-Besse 1, Cycle 16

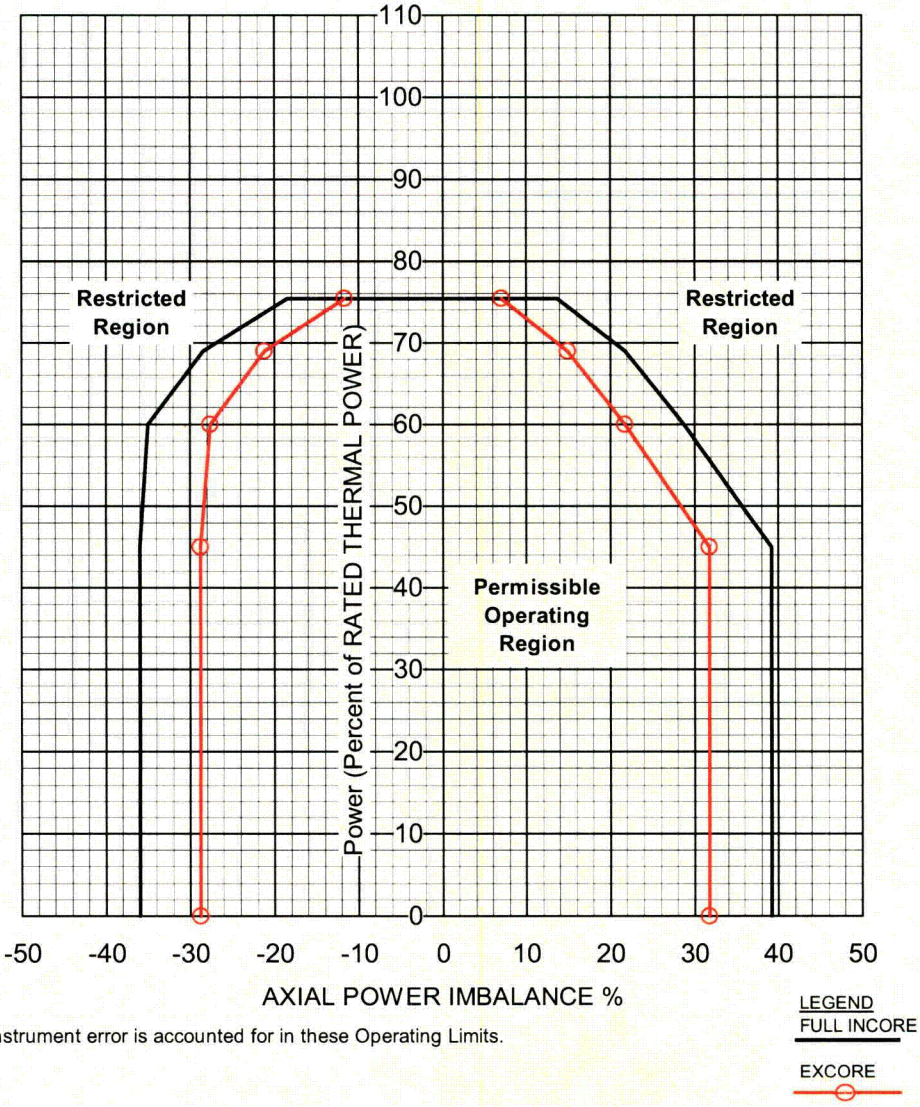
This Figure is referred to by
Improved Technical Specification
3.2.3



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

Figure 4e AXIAL POWER IMBALANCE Operating Limits
350 ±10 to 600 ±10 EFPD, Three RC Pumps--2817MWt RTP
Davis-Besse 1, Cycle 16

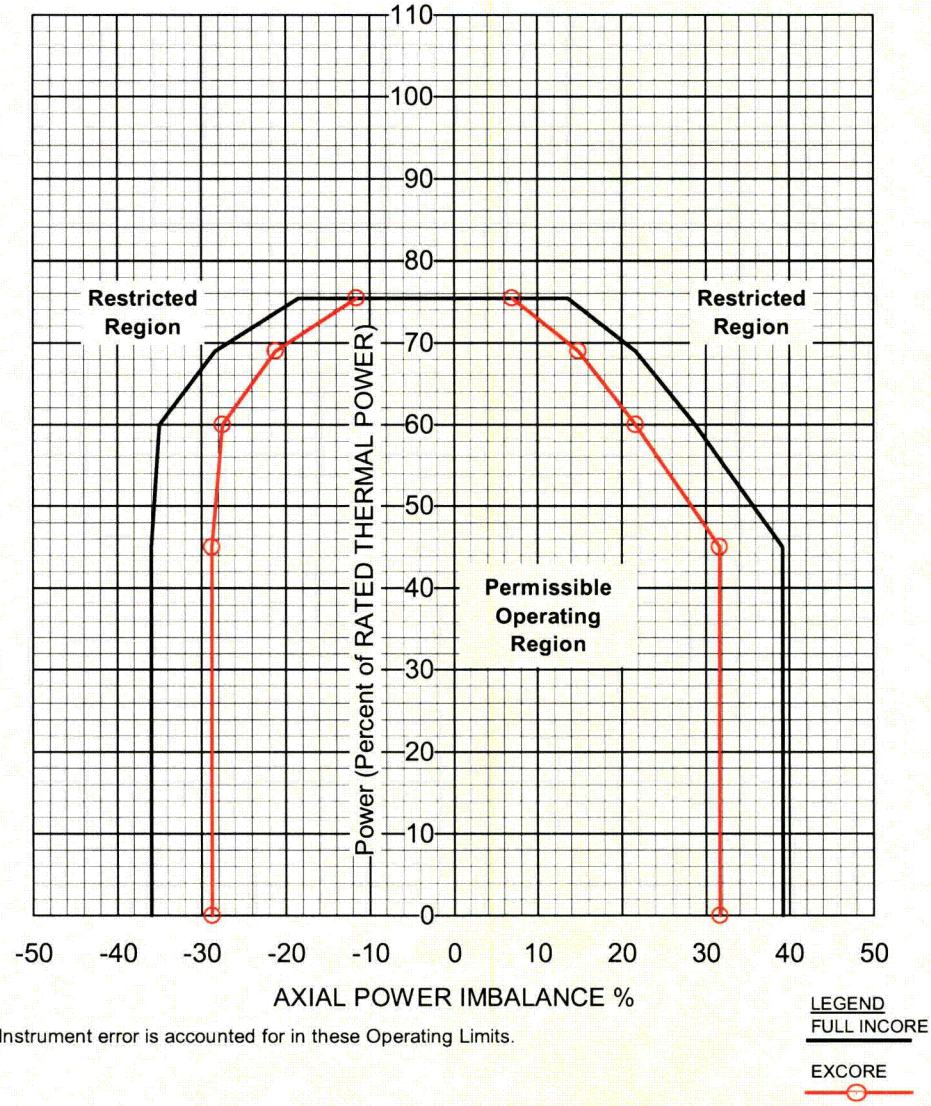
This Figure is referred to by
Improved Technical Specification
3.2.3



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

Figure 4f AXIAL POWER IMBALANCE Operating Limits
After 600 ±10 EFPD, Three RC Pumps--2817MWt RTP
Davis-Besse 1, Cycle 16

This Figure is referred to by
Improved Technical Specification
3.2.3



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

Table 4 QUADRANT POWER TILT Limits – 2817 MWt

This Table is referred to by Improved Technical Specifications 3.2.4

QUADRANT POWER TILT as measured by:	From 0 EFPD to EOC-16			
	Steady-state Limit for THERMAL POWER ≤ 60% (%)	Steady-state Limit for THERMAL POWER >60% (%)	Transient Limit (%)	Maximum Limit (%)
Symmetric Incore Detector System	7.90	4.25	10.03	20.00

Table 5 Power Peaking Factors - F_Q (NAS)

This Table is referred to by Improved 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 **2817 MWt RTP**

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} = 6.4119 kW/ft at 2817 MWt for Batch 9K Mark-B8A fuel
LHR^{avg} = 6.4209 kW/ft at 2817 MWt for Batches 15C3 and 15E Mark-B10K fuel
LHR^{avg} = 6.4209 kW/ft at 2817 MWt for Batches 16C2, 16D2 and 16E2 Mark-B12 fuel
LHR^{avg} = 6.4321 kW/ft at 2817 MWt for Batch 17A-E Mark-B-HTP fuel
LHR^{avg} = 6.4209 kW/ft at 2817 MWt for Batch 18A-C Mark-B-HTP fuel

P = ratio of THERMAL POWER / RATED THERMAL POWER

Bu = fuel burnup (MWd/mtU)

Batch 9K UO2 Fuel (Mark-B8A) LHR^{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

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

Table 5 (continued)

Batch 15C3 and 15E UO2 Fuel (Mark-B10K) LHR^{ALLOW} kW/ft[(a)]

Axial Segment	0 MWd/mtU	35,000 MWd/mtU	58,000 MWd/mtU	59,000 MWd/mtU	60,000 MWd/mtU	62,000 MWd/mtU
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	14.1	14.1	13.5
6	15.3	15.3	13.7	13.7	13.6	13.5
7	14.7	14.7	13.2	13.1	13.1	13.0
8	14.5	14.5	13.0	12.9	12.9	12.8

Batch 16C2, 16D2, and 16E2 UO2 Fuel (Mark-B12) LHR^{ALLOW} kW/ft[(a)]

Axial Segment	0 MWd/mtU	35,000 MWd/mtU	58,000 MWd/mtU	59,000 MWd/mtU	60,000 MWd/mtU	62,000 MWd/mtU
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	14.1	14.1	13.5
6	15.3	15.3	13.7	13.7	13.6	13.5
7	14.7	14.7	13.2	13.1	13.1	13.0
8	14.5	14.5	13.0	12.9	12.9	12.8

Batch 17A-17E UO2 Fuel (Mark-B-HTP) LHR^{ALLOW} kW/ft[(a)]

Axial Segment	0 MWd/mtU	40,000 MWd/mtU	62,000 MWd/mtU
1	17.6	17.2	13.6
2	17.5	17.1	13.5
3	17.1	16.7	13.2
4	17.0	16.7	13.2
5	16.5	16.2	13.1
6	15.9	16.0	13.1
7	15.3	15.4	12.8
8	15.1	15.2	12.6

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

Table 5 (continued)

Batch 18A-18C UO2 Fuel (Mark-B-HTP) LHR^{ALLOW} kW/ft[(a)]

Axial Segment	0 MWd/mtU	40,000 MWd/mtU	62,000 MWd/mtU
1	17.6	17.2	13.6
2	17.5	17.1	13.5
3	17.1	16.7	13.2
4	17.0	16.7	13.2
5	16.5	16.2	13.1
6	15.9	16.0	13.1
7	15.3	15.4	12.8
8	15.1	15.2	12.6

[(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 Improved 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 **2817 MWt RTP**

F_Q shall be limited by the following relationships:

$F_Q \leq LHR^{allow}$ (Bu) / [LHR^{avg} * P] (for P ≤ 1.0)

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

LHR^{avg} = 6.4119 kW/ft at 2817 MWt for Batch 9K Mark-B8A fuel
LHR^{avg} = 6.4209 kW/ft at 2817 MWt for Batches 15C3 and 15E Mark-B10K fuel
LHR^{avg} = 6.4209 kW/ft at 2817 MWt for Batches 16C2, 16D2 and 16E2 Mark-B12 fuel
LHR^{avg} = 6.4321 kW/ft at 2817 MWt for Batch 17A-E Mark-B-HTP fuel
LHR^{avg} = 6.4209 kW/ft at 2817 MWt for Batch 18A-C Mark-B-HTP fuel

P = ratio of THERMAL POWER / RATED THERMAL POWER

Bu = fuel burnup (MWd/mtU)

Batch 9K – UO2 Fuel LHR^{ALLOW} kW/ft*

Core Elevation (ft)	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

* Linear interpolation for allowable LHR between specified burnup points is valid for these tables

Table 6 (continued)

Batches 15C3 and 15E – UO2 Fuel LHR^{ALLOW} kW/ft*

Core Elevation (ft)	0 MWd/mtU	35,000 MWd/mtU	58,000 MWd/mtU	59,000 MWd/mtU	60,000 MWd/mtU	62,000 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	14.1	14.1	13.5
9.536	15.3	15.3	13.7	13.7	13.6	13.5
12.000	14.5	14.5	13.0	12.9	12.9	12.8

* Linear interpolation for allowable LHR between specified burnup points is valid for these tables.

Batch 16C2, 16D2, and 16E2 – UO2 Fuel LHR^{ALLOW} kW/ft*

Core Elevation (ft)	0 MWd/mtU	35,000 MWd/mtU	58,000 MWd/mtU	59,000 MWd/mtU	60,000 MWd/mtU	62,000 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	14.1	14.1	13.5
9.536	15.3	15.3	13.7	13.7	13.6	13.5
12.000	14.5	14.5	13.0	12.9	12.9	12.8

* Linear interpolation for allowable LHR between specified burnup points is valid for these tables.

Batch 17A-E – UO2 Fuel LHR^{ALLOW} kW/ft*

Core Elevation (ft)	0 MWd/mtU	40,000 MWd/mtU	62,000 MWd/mtU
0.000	17.6	17.2	13.6
2.506	17.6	17.2	13.6
4.264	17.2	16.8	13.3
6.021	17.0	16.7	13.2
7.779	16.5	16.2	13.1
9.536	15.9	16.0	13.3
12.000	15.1	15.2	12.6

* Linear interpolation for allowable LHR between specified burnup points is valid for these tables.

Batch 18A-C – UO2 Fuel LHR^{ALLOW} kW/ft*

Core Elevation (ft)	0 MWd/mtU	40,000 MWd/mtU	62,000 MWd/mtU
0.000	17.6	17.2	13.6
2.506	17.6	17.2	13.6
4.264	17.2	16.8	13.3
6.021	17.0	16.7	13.2
7.779	16.5	16.2	13.1
9.536	15.9	16.0	13.3
12.000	15.1	15.2	12.6

* Linear interpolation for allowable LHR between specified burnup points is valid for these tables.

Table 6 (continued)

Batch 15 – 2 wt% Gadolinia Fuel LHR^{ALLOW} kW/ft*

Core Elevation (ft)	0 MWd/mtU	35,000 MWd/mtU	58,000 MWd/mtU	59,000 MWd/mtU	60,000 MWd/mtU	62,000 MWd/mtU
0.000	16.5	15.7	13.9	13.6	13.3	12.8
2.506	16.5	15.7	13.9	13.6	13.3	12.8
4.264	16.0	14.7	13.9	13.6	13.3	12.8
6.021	15.5	14.3	13.6	13.6	13.3	12.8
7.779	15.0	14.8	13.4	13.3	13.3	12.8
9.536	14.3	14.3	13.0	12.9	12.9	12.8
12.000	13.6	13.6	12.4	12.3	12.3	12.2

* Linear interpolation for allowable LHR between specified burnup points is valid for these tables.

Batch 16 – 4 wt% Gadolinia Fuel LHR^{ALLOW} kW/ft*

Core Elevation (ft)	0 MWd/mtU	35,000 MWd/mtU	58,000 MWd/mtU	59,000 MWd/mtU	60,000 MWd/mtU	62,000 MWd/mtU
0.000	15.8	15.1	13.3	13.0	12.7	12.2
2.506	15.8	15.1	13.3	13.0	12.7	12.2
4.264	15.3	14.1	13.3	13.0	12.7	12.2
6.021	14.9	13.7	13.0	13.0	12.7	12.2
7.779	14.3	14.2	12.9	12.8	12.8	12.2
9.536	13.7	13.7	12.4	12.3	12.3	12.2
12.000	13.0	13.0	11.8	11.7	11.7	11.6

* Linear interpolation for allowable LHR between specified burnup points is valid for these tables.

Batches 15 and 16 – 8 wt% Gadolinia Fuel LHR^{ALLOW} kW/ft*

Core Elevation (ft)	0 MWd/mtU	35,000 MWd/mtU	58,000 MWd/mtU	59,000 MWd/mtU	60,000 MWd/mtU	62,000 MWd/mtU
0.000	14.9	14.2	12.4	12.1	11.9	11.4
2.506	14.9	14.2	12.4	12.1	11.9	11.4
4.264	14.5	13.3	12.4	12.1	11.9	11.4
6.021	14.0	12.9	12.2	12.2	11.9	11.4
7.779	13.5	13.4	12.0	11.9	11.9	11.4
9.536	12.9	12.9	11.6	11.5	11.5	11.4
12.000	12.2	12.2	11.0	10.9	10.9	10.8

* Linear interpolation for allowable LHR between specified burnup points is valid for these tables.

Batches 17 and 18 – 4 wt% Gadolinia Fuel LHR^{ALLOW} kW/ft*

Core Elevation (ft)	0 MWd/mtU	40,000 MWd/mtU	62,000 MWd/mtU
0.000	15.8	15.7	12.3
2.506	15.8	15.7	12.3
4.264	15.4	15.2	12.0
6.021	15.2	15.1	11.9
7.779	14.8	14.7	11.8
9.536	14.3	14.5	12.0
12.000	13.6	13.8	11.4

* Linear interpolation for allowable LHR between specified burnup points is valid for these tables.

Table 6 (continued)

Batches 17 and 18 – 8 wt% Gadolinia Fuel LHR^{ALLOW} kW/ft*

Core Elevation (ft)	0 MWd/mtU	40,000 MWd/mtU	62,000 MWd/mtU
0.000	14.9	14.9	11.5
2.506	14.9	14.9	11.5
4.264	14.5	14.6	11.2
6.021	14.4	14.5	11.1
7.779	13.9	14.0	11.0
9.536	13.4	13.9	11.2
12.000	12.7	13.2	10.6

* 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 Improved 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 $P \leq 1.0$

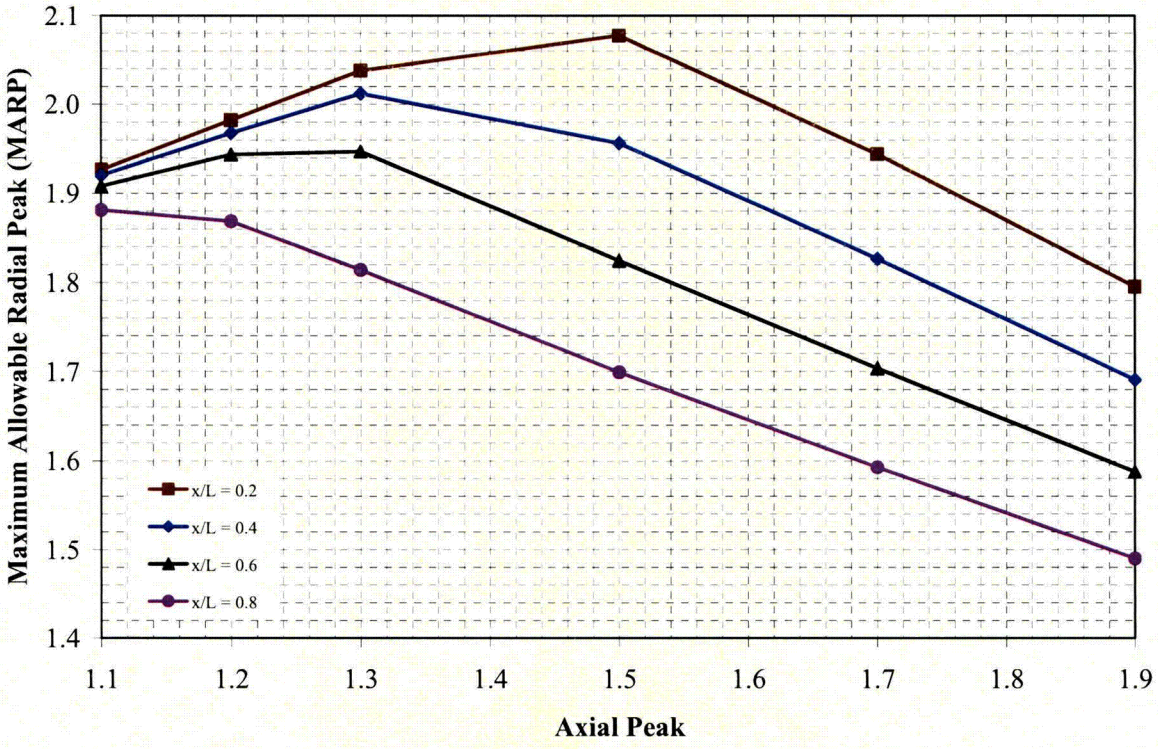
P_m = 1.0 for 4-RCP operation

P_m = 0.75 for 3-RCP operation

1/RH = 0.3

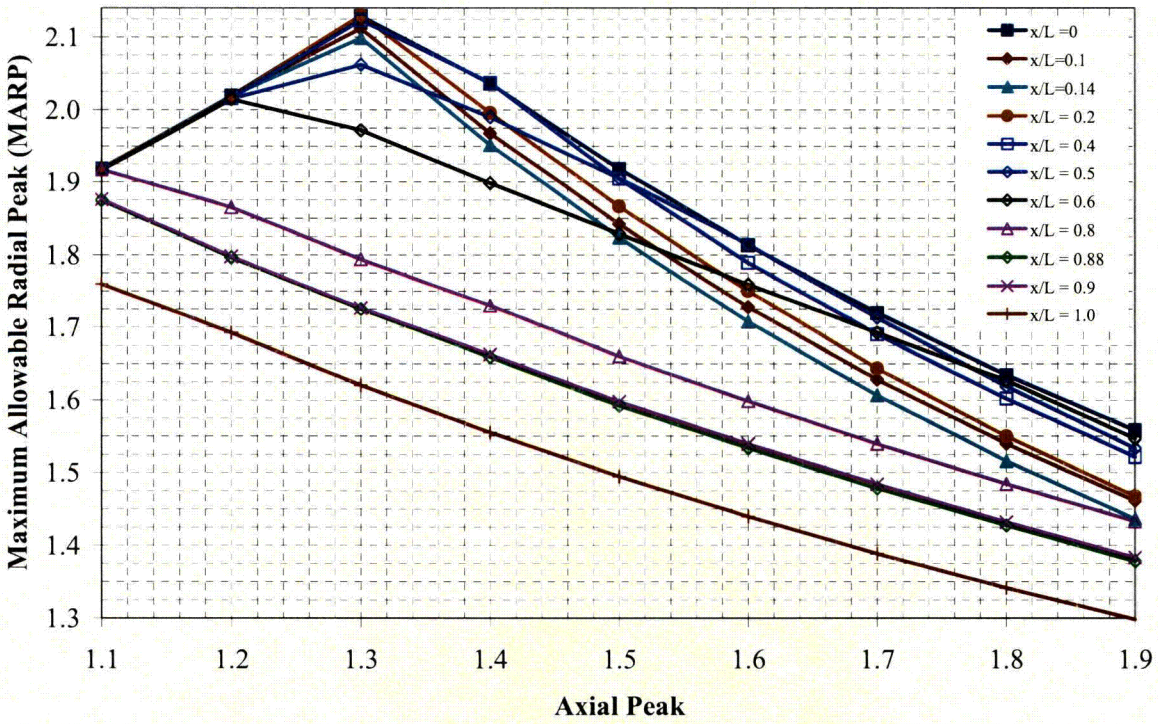
Note: The measured $F^N_{\Delta H}$ shall be increased by 5.0% to account for measurement uncertainty prior to comparing to the limits.

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



* This figure is applicable to all Mark-B fuel in the core. Linear interpolation and extrapolation above x/L of 0.8 are acceptable. For axial heights < x/L of 0.2, the value at x/L of 0.2 will be used.

Figure 6 Maximum Allowable Radial Peak for $F^N_{\Delta H}$ in Mark-B-HTP Fuel Assemblies *



* This figure is applicable to all Mark-B-HTP fuel in the core. 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 Fuel Assemblies

Axial Peak	x/L	Axial Height (inches)	MAP Limit	MARP Limit
1.1	0.2	28.12	2.0415	1.9264
	0.4	56.24	2.0345	1.9198
	0.6	84.36	2.0221	1.9081
	0.8	112.48	1.9934	1.8810
1.2	0.2	28.12	2.2918	1.9824
	0.4	56.24	2.2749	1.9678
	0.6	84.36	2.2470	1.9437
	0.8	112.48	2.1601	1.8685
1.3	0.2	28.12	2.5521	2.0378
	0.4	56.24	2.5197	2.0119
	0.6	84.36	2.4387	1.9472
	0.8	112.48	2.2719	1.8140
1.5	0.2	28.12	3.0022	2.0775
	0.4	56.24	2.8272	1.9564
	0.6	84.36	2.6367	1.8246
	0.8	112.48	2.4553	1.6991
1.7	0.2	28.12	3.1839	1.9441
	0.4	56.24	2.9911	1.8263
	0.6	84.36	2.7902	1.7037
	0.8	112.48	2.6084	1.5927
1.9	0.2	28.12	3.2865	1.7955
	0.4	56.24	3.0945	1.6906
	0.6	84.36	2.9062	1.5877
	0.8	112.48	2.7279	1.4903

Table 9 Maximum Allowable Radial Peak for $F^N_{\Delta H}$ in Mark-B-HTP Fuel Assemblies

Axial Peak	x/L	Axial Height (inches)	MAP Limit	MARP Limit	Axial Peak	x/L	Axial Height (inches)	MAP Limit	MARP Limit
	0.0	0.000	2.03286	1.91828		0.0	0.000	2.79510	1.81332
	0.1	14.275	2.03375	1.91912		0.1	14.275	2.66285	1.72752
	0.14	19.985	2.03379	1.91916		0.14	19.985	2.63106	1.70690
	0.2	28.550	2.03355	1.91893		0.2	28.550	2.69787	1.75024
	0.4	57.100	2.03179	1.91727		0.4	57.100	2.75779	1.78912
1.1	0.5	71.375	2.03107	1.91659	1.6	0.5	71.375	2.79658	1.81428
	0.6	85.650	2.03099	1.91652		0.6	85.650	2.71189	1.75934
	0.8	114.200	2.03178	1.91726		0.8	114.200	2.46394	1.59848
	0.88	125.620	1.98623	1.87428		0.88	125.620	2.36299	1.53299
	0.9	128.475	1.98774	1.87570		0.9	128.475	2.37234	1.53906
	1.0	142.750	1.86518	1.76005		1.0	142.750	2.21845	1.43922
	0.0	0.000	2.33414	2.01903		0.0	0.000	2.81571	1.71924
	0.1	14.275	2.33416	2.01905		0.1	14.275	2.66718	1.62855
	0.14	19.985	2.33413	2.01902		0.14	19.985	2.63022	1.60598
	0.2	28.550	2.33248	2.01760		0.2	28.550	2.69195	1.64367
	0.4	57.100	2.33024	2.01566		0.4	57.100	2.76735	1.68971
1.2	0.5	71.375	2.32955	2.01506	1.7	0.5	71.375	2.80468	1.71250
	0.6	85.650	2.32916	2.01472		0.6	85.650	2.77165	1.69234
	0.8	114.200	2.15618	1.86510		0.8	114.200	2.52074	1.53913
	0.88	125.620	2.07666	1.79631		0.88	125.620	2.42051	1.47793
	0.9	128.475	2.07869	1.79807		0.9	128.475	2.43041	1.48398
	1.0	142.750	1.95649	1.69236		1.0	142.750	2.27373	1.38831
	0.0	0.000	2.66591	2.12863		0.0	0.000	2.83401	1.63428
	0.1	14.275	2.64485	2.11181		0.1	14.275	2.66992	1.53965
	0.14	19.985	2.62777	2.09817		0.14	19.985	2.62789	1.51542
	0.2	28.550	2.66761	2.12998		0.2	28.550	2.68772	1.54992
	0.4	57.100	2.65903	2.12313		0.4	57.100	2.7774	1.60163
1.3	0.5	71.375	2.58224	2.06182	1.8	0.5	71.375	2.80694	1.61867
	0.6	85.650	2.46978	1.97202		0.6	85.650	2.82218	1.62746
	0.8	114.200	2.24712	1.79424		0.8	114.200	2.57398	1.48433
	0.88	125.620	2.15963	1.72438		0.88	125.620	2.47403	1.42669
	0.9	128.475	2.16184	1.72615		0.9	128.475	2.48254	1.43160
	1.0	142.750	2.02976	1.62069		1.0	142.750	2.32589	1.34126
	0.0	0.000	2.74599	2.03596		0.0	0.000	2.85122	1.55767
	0.1	14.275	2.65413	1.96785		0.1	14.275	2.67423	1.46097
	0.14	19.985	2.63176	1.95126		0.14	19.985	2.62778	1.43560
	0.2	28.550	2.69213	1.99602		0.2	28.550	2.68609	1.46745
	0.4	57.100	2.74771	2.03723		0.4	57.100	2.78418	1.52104
1.4	0.5	71.375	2.68391	1.98993	1.9	0.5	71.375	2.80567	1.53278
	0.6	85.650	2.56032	1.89829		0.6	85.650	2.83113	1.54669
	0.8	114.200	2.33307	1.72980		0.8	114.200	2.62225	1.43258
	0.88	125.620	2.23716	1.65869		0.88	125.620	2.52166	1.37762
	0.9	128.475	2.24237	1.66256		0.9	128.475	2.53147	1.38298
	1.0	142.750	2.09699	1.55477		1.0	142.750	2.37605	1.29807
	0.0	0.000	2.77184	1.91811					
	0.1	14.275	2.66225	1.84228					
	0.14	19.985	2.63504	1.82345					
	0.2	28.550	2.69706	1.86637					
	0.4	57.100	2.75139	1.90396					
1.5	0.5	71.375	2.75241	1.90467					
	0.6	85.650	2.64282	1.82883					
	0.8	114.200	2.39919	1.66024					
	0.88	125.620	2.30027	1.59179					
	0.9	128.475	2.30907	1.59788					
	1.0	142.750	2.15988	1.49464					

Figure 7 Flux-ΔFlux-Flow (Power/Imbalance/Flow) Allowable Values

This Figure is referred to by Improved Technical Specifications 3.3.1

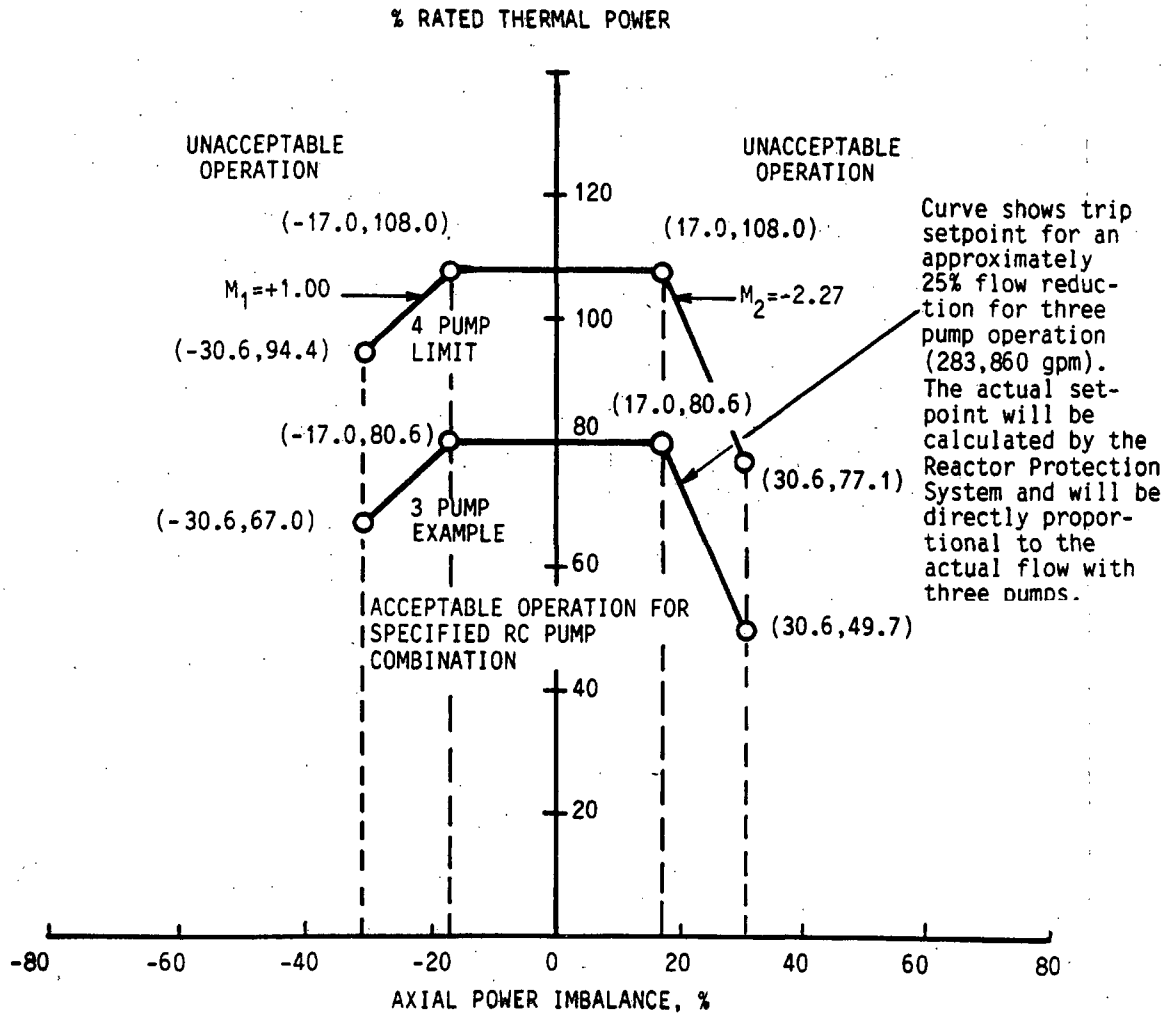


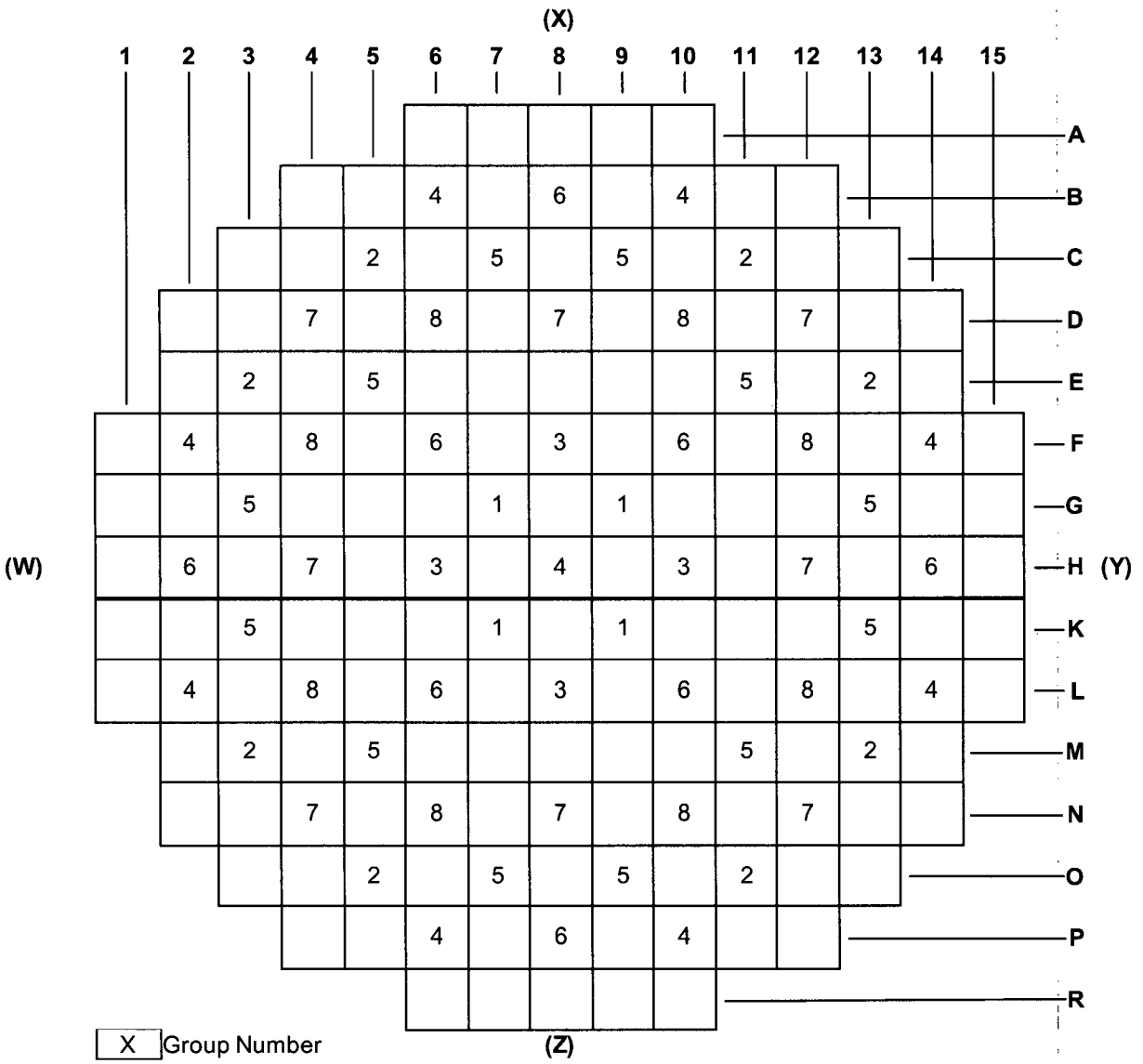
Table 10 Refueling Boron Concentration Limit

This limit is referred to by Improved 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 8 Control Rod Core Locations and Group Assignments Davis-Besse 1, Cycle 16

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	

Enclosure B
L-08-317

FirstEnergy Nuclear Operating Company, Davis-Besse Unit 1, 21 Effective Full Power Years Pressure and Temperature Limits Report, Revision 0

(7 Pages)

FIRSTENERGY NUCLEAR OPERATING COMPANY

DAVIS-BESSE UNIT 1

21 EFFECTIVE FULL POWER YEARS

PRESSURE AND TEMPERATURE LIMITS REPORT

Prepared by: Jessica Kemp _____

Reviewed by: Dennis Blakely _____

Approved by: Kevin Zellers _____ 9-10-08

FirstEnergy Nuclear Operating Company
Davis-Besse Unit 1
21 Effective Full Power Year
Pressure and temperature Limit Report

1.0 Introduction

This Pressure and Temperature Limit Report (PTLR) provides the information required by Davis-Besse Nuclear Power Station (DBNPS) Technical Specification 5.6.4 to ensure that the Reactor Coolant System Pressure Boundary is operated in accordance with its design.

The PTLR provides the RCS Operating Limits in Section 2.0, which satisfy Technical Specification 5.6.4.a. The Analytical Methods used to develop the limits, including determination of the vessel neutron fluence, are provided in Section 3.0, fulfilling Technical Specification 5.6.4.b. The PTLR Requirements are provided in Section 4.0 of the report, fulfilling Technical Specification 5.6.4.c.

Revisions to the PTLR are to be submitted to the NRC after issuance.

2.0 RCS Pressure and Temperature Limits

a. The Reactor Coolant System (except the pressurizer) temperature and pressure shall be limited in accordance with the limit lines shown on Figures 1, 2 and 3 during heatup, cooldown, criticality and inservice leak, and hydrostatic testing with (Reference 1):

   1. A maximum heatup of 50°F in any one hour period, and

   2. A maximum cooldown of 100°F in any one hour period with a cold leg temperature of $\geq$ 270°F and a maximum cooldown of 50°F in any one hour period with a cold leg temperature of < 270°F.

b. During periods of low temperature operation (T_{avg} <280 °F), Technical Specification 3.4.12 provides additional requirements for RCS pressure and temperature limits. Those limits are maintained in the Technical Specifications because they are not determined using methods generically approved by the NRC.

Figure 1

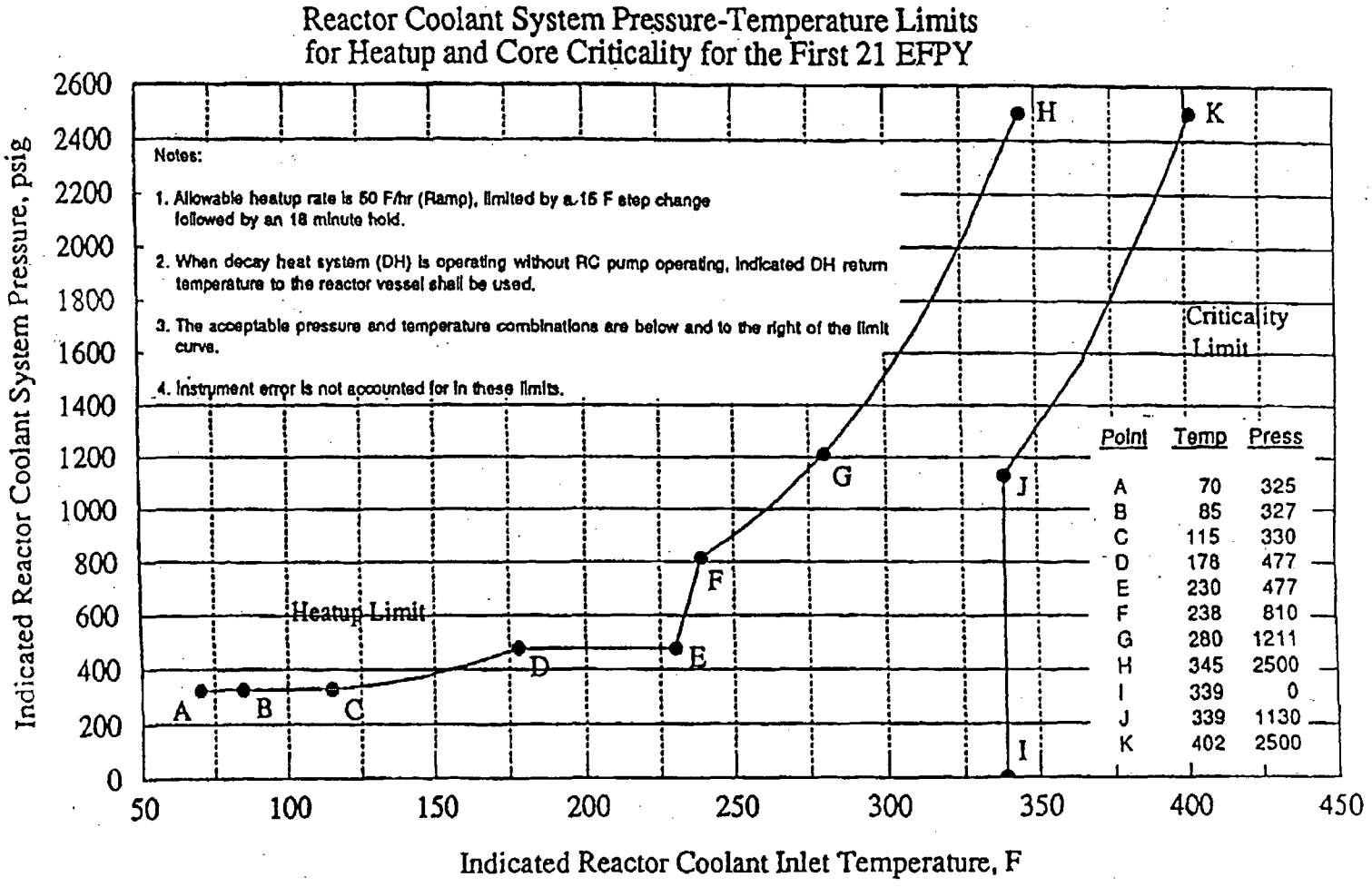

Reactor Coolant System Pressure-Temperature Limits
for Heatup and Core Criticality for the First 21 EFPY
Indicated Reactor Coolant System Pressure, psig
Indicated Reactor Coolant Inlet Temperature, F
Notes:
1. Allowable heatup rate is 50 F/hr (Ramp), limited by a 15 F step change followed by an 18 minute hold.
2. When decay heat system (DH) is operating without RC pump operating, indicated DH return temperature to the reactor vessel shall be used.
3. The acceptable pressure and temperature combinations are below and to the right of the limit curve.
4. Instrument error is not accounted for in these limits.
Heatup Limit
Criticality Limit
Point Temp Press
A 70 325
B 85 327
C 115 330
D 178 477
E 230 477
F 238 810
G 280 1211
H 345 2500
I 339 0
J 339 1130
K 402 2500
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
50
100
150
200
250
300
350
400
450

Figure 2

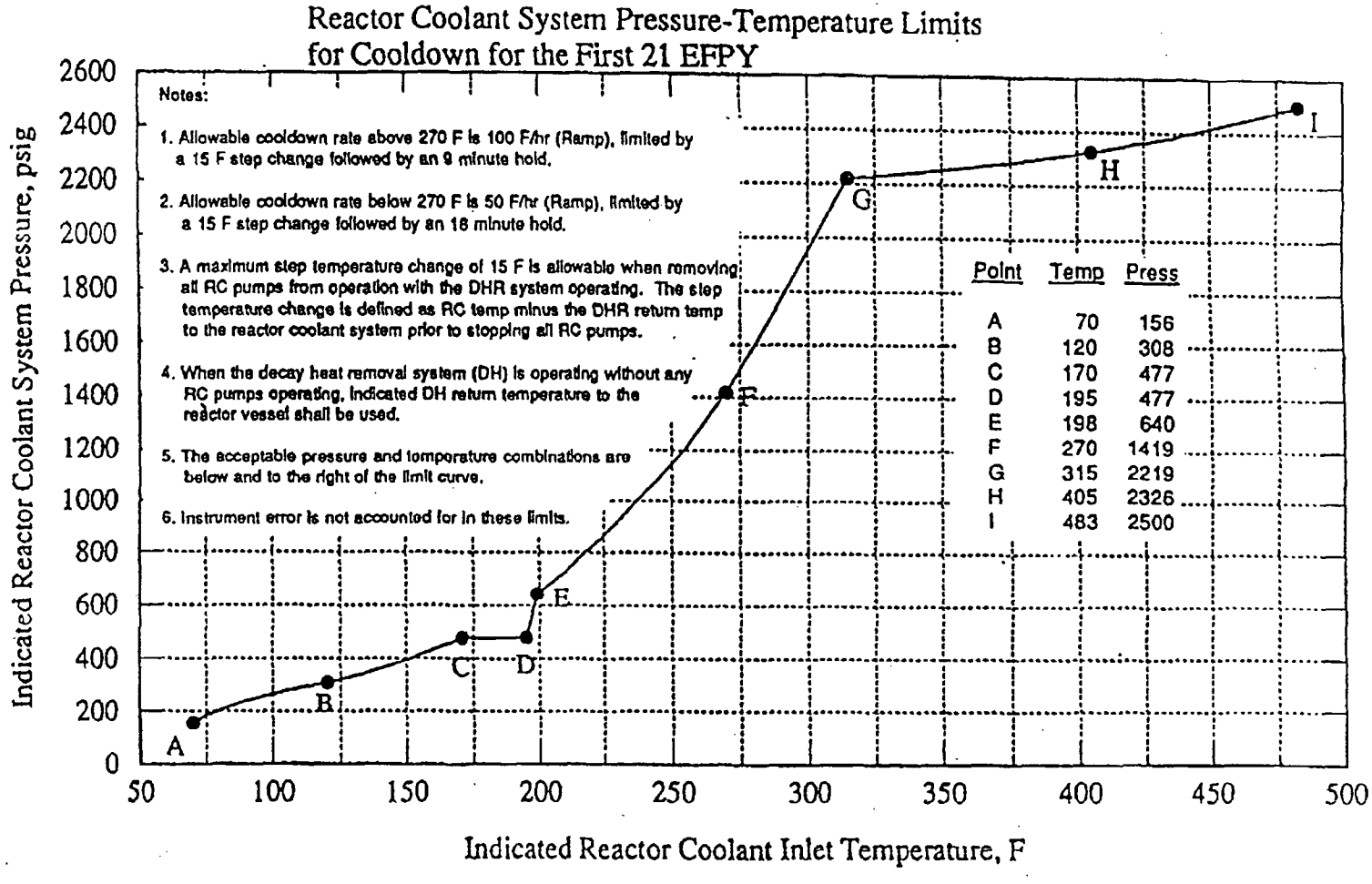
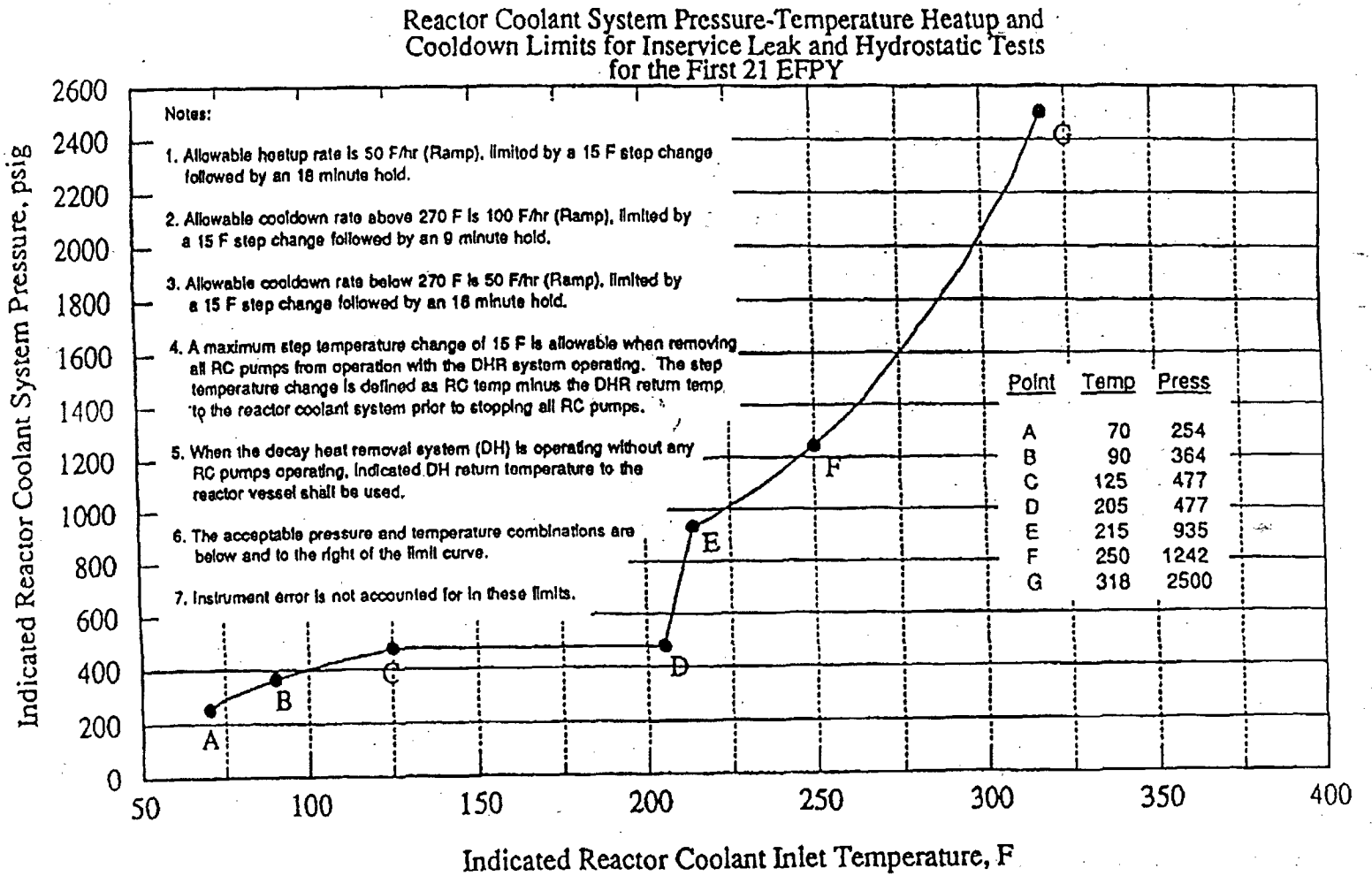

Reactor Coolant System Pressure-Temperature Limits
for Cooldown for the First 21 EFPY
Notes:
1. Allowable cooldown rate above 270 F is 100 F/hr (Ramp), limited by a 15 F step change followed by an 9 minute hold.
2. Allowable cooldown rate below 270 F is 50 F/hr (Ramp), limited by a 15 F step change followed by an 18 minute hold.
3. A maximum step temperature change of 15 F is allowable when removing all RC pumps from operation with the DHR system operating. The step temperature change is defined as RC temp minus the DHR return temp to the reactor coolant system prior to stopping all RC pumps.
4. When the decay heat removal system (DH) is operating without any RC pumps operating, indicated DH return temperature to the reactor vessel shall be used.
5. The acceptable pressure and temperature combinations are below and to the right of the limit curve.
6. Instrument error is not accounted for in these limits.
Point Temp Press
A 70 156
B 120 308
C 170 477
D 195 477
E 198 640
F 270 1419
G 315 2219
H 405 2326
I 483 2500
Indicated Reactor Coolant System Pressure, psig
Indicated Reactor Coolant Inlet Temperature, F
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
50
100
150
200
250
300
350
400
450
500
A
B
C
D
E
F
G
H
I

Figure 3


Reactor Coolant System Pressure-Temperature Heatup and Cooldown Limits for Inservice Leak and Hydrostatic Tests for the First 21 EFPY
Notes:
1. Allowable heatup rate is 50 F/hr (Ramp), limited by a 15 F step change followed by an 18 minute hold.
2. Allowable cooldown rate above 270 F is 100 F/hr (Ramp), limited by a 15 F step change followed by an 9 minute hold.
3. Allowable cooldown rate below 270 F is 50 F/hr (Ramp), limited by a 15 F step change followed by an 18 minute hold.
4. A maximum step temperature change of 15 F is allowable when removing all RC pumps from operation with the DHR system operating. The step temperature change is defined as RC temp minus the DHR return temp to the reactor coolant system prior to stopping all RC pumps.
5. When the decay heat removal system (DH) is operating without any RC pumps operating, indicated DH return temperature to the reactor vessel shall be used.
6. The acceptable pressure and temperature combinations are below and to the right of the limit curve.
7. Instrument error is not accounted for in these limits.
Point Temp Press
A 70 254
B 90 364
C 125 477
D 205 477
E 215 935
F 250 1242
G 318 2500
Indicated Reactor Coolant System Pressure, psig
Indicated Reactor Coolant Inlet Temperature, F
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
50
100
150
200
250
300
350
400
A
B
C
D
E
F
G

3.0 Analytical Methods

3.1 The limits provided in Figures 1, 2, and 3 are valid until the Reactor Vessel has accumulated 21 Effective Full Power Years (EFPY) of fast (E> 1 MeV) neutron fluence.

3.2 The Pressure-Temperature (P/T) Limits were generated using the methods described in BAW-10046A (Reference 4).

3.3 The P/T limits contained in the PTLR (applicable through 21 Effective Full Power Years (EFPY)) were generated in accordance with the methods described in BAW-10046A (Reference 4), consistent with the requirements of 10 CFR 50 Appendix G, and Regulatory Guide 1.99, Revision 2. The NRC has reviewed the methods described in BAW-10046A (Reference 4) and approved the topical report by issuance of a Safety Evaluation Report (SER) dated April 30, 1986. Section 1.2 of BAW-10046A states that it is applicable to all current B&W nuclear steam systems.

3.4 The neutron fluence is calculated using the methodology described in BAW-2108 (Reference 5). This methodology was approved by the NRC in the SER of Amendment 199 (Reference 1).

3.5 The Davis-Besse Reactor Vessel Material Surveillance Program complies with the requirements of Appendix H to 10 CFR 50 and is described in BAW-1543A (Reference 6). This information was approved by the NRC in the SER of Amendment 199 (Reference 1).

3.6 The PORV (valve RC-2A) is not currently used for Low Temperature Overpressure Protection (LTOP), thus not required in ITS 3.4.12, "Low Temperature Overpressure Protection (LTOP)." Therefore, the PTLR does not include any PORV lift setting requirements.

3.7 Davis-Besse calculates Adjusted Reference Temperature (ART) in accordance with Regulatory Guide 1.99, Revision 2. This information was approved by the NRC in the SER of Amendment 199 (Reference 1).

3.8 The NRC has previously determined that the current limiting ART calculation complies with the NUREG-0800, Standard Review Plan 5.3.2, as documented in the SER of Amendment 199 (Reference 1). This is not meant to infer a commitment to NUREG-0800 by DBNPS.

3.9 The NRC has previously determined that the Davis-Besse P/T limit curves comply with 10 CFR 50 Appendix G as documented in the SER of Amendment 199 (Reference 1).

3.10 Davis-Besse has not tested any plant-specific capsules since the last time P/T limit curves were adjusted and approved by the NRC in Amendment 199. Therefore no changes need be made at this time.

4.0 PTLR Requirements

4.1 The PTLR has been prepared in accordance with the requirements of Technical Specification 5.6.4. The PTLR shall be provided to the NRC upon issuance for each reactor vessel fluence period and for any revision or supplement thereto. Davis-Besse will continue to meet the requirements of 10 CFR 50, Appendix G and any changes to the Davis-Besse P/T limits will be generated in accordance with the NRC approved methodology described in TS 5.6.4.

5.0 References

5.1 Safety Evaluation by the Office of Nuclear Reactor Regulation Related to Amendment No. 199 to Facility Operating License No. NPF-3 Davis-Besse Nuclear Power Station, Unit No. 1. Attached to correspondence dated July 20, 1995.

5.2 Improved Technical Specification 5.6.4

5.3 Improved Technical Specification 3.4.12

5.4 BAW-10046A, Revision 2 "Methods of Compliance with Fracture Toughness and Operational Requirements of 10 CFR 50 Appendix G."

5.5 BAW-2108, Revision 1, "Fluence Tracking System," dated May 1992.

5.6 BAW-1543A, "Master Integrated Reactor Vessel Material Surveillance Program."

5.7 Additional References

- Technical Specification 5.6.4, Reactor Coolant System (RCS) Pressure and Temperature Limits Report (PTLR)
- License Amendment 116, Serial No. 1490 Dated March 30, 1988, Attachment 1, Page 5
- Improved Technical Specification Conversion Project (LAR 06-0003) Section 5.6, Description of Change L03
- Current Technical Specification 3/4.4.9, Pressure/Temperature Limits