

Exelon Generation Company, LLC  
Byron Station  
4450 North German Church Road  
Byron, IL 61010-9794

www.exeloncorp.com

February 27, 2002

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United States Nuclear Regulatory Commission  
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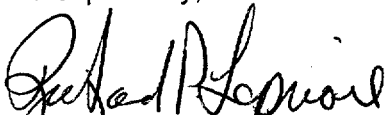
Byron Station, Unit 1  
Facility Operating License No. NPF-37  
NRC Docket No. STN 50-454

Subject: Revision 3 to Byron Station Unit 1 Cycle 11A Core Operating Limits Report

In accordance with Technical Specification 5.6.5, "Core Operating Limits Report (COLR)," we are submitting Revision 3 to the Unit 1 COLR. The Unit 1 COLR was revised to specify the power distribution transient function (i.e.,  $W(z)$ ) for cycle burnup of 18000 MWD/MTU and beyond. Please note that Revision 2 of the COLR was issued but not implemented due to Plant Review comments. These comments were addressed and incorporated into Revision 3.

Should you have any questions concerning these reports, please contact William Grundmann, Regulatory Assurance Manager, at (815) 234-5441, extension 2800.

Respectfully,



Richard P. Lopriore  
Site Vice President  
Byron Nuclear Generating Station

Attachment: Byron Station Unit 1 Cycle 11A COLR, Revision 3

RPL/JL/dpk

cc: Regional Administrator – NRC Region III  
NRC Senior Resident Inspector – Byron Station  
NRC Project Manager – NRR – Byron Station  
Office of Nuclear Facility Safety – Illinois Department of Nuclear Safety

A001

**ATTACHMENT 1**

**Byron Station Unit 1 Cycle 11A Core Operating Limits Report  
Revision 3**

NUCLEAR FUEL MANAGEMENT DEPARTMENT  
TRANSMITTAL OF DESIGN INFORMATION

☒ SAFETY RELATED  
☐ NON-SAFETY RELATED  
☐ REGULATORY RELATED

Originating Organization  
☒ Nuclear Fuel Management  
☐ Other (specify) \_\_\_\_\_

NFM ID # NFM0100048  
Rev. No. 3  
Page 1 of 16

Station Byron Unit 1 Cycle 11A Generic \_\_\_\_\_

To: Ronald J. Niederer - Byron

Subject Byron Unit 1 Cycle 11A Core Operating Limits Report in ITS Format and W(z) Function

Brian L. Manges

Preparer

Preparer's Signature

Date

Tyrone L. Stevens

Reviewer

Reviewer's Signature

Date

R. Tsai

NFM Supervisor

Approver's Signature

Date

Status of Information:

☒ Verified  
☐ Unverified  
☐ Engineering Judgement

Method and Schedule of Verification for Unverified TODIs: \_\_\_\_\_

Description of Information:

Attached is the Byron Unit 1 Cycle 11A Core Operating Limits Report (COLR) in the ITS format and W(z) function. This COLR is for uprate at 3586.6 MWt. **Revision 3 of this TODI supercedes Revision 2.**

Purpose of Information:

In Revision 3, the wording for Item 2.6.2 will be revised to say "W(z) values have been specified for burnups of". This is only a wording change to more clearly describe the change. In Revision 2, the W(z) factors were revised to eliminate the overly conservative extrapolation of the W(z) factors past 18000 MWD/MTU. The same set of W(z) factors are provided at 17000, 18000, 22000, and 25000 MWD/MTU (Reference 6). In Revision 1, the SDM limits for MODE 5 were revised to 1.3%  $\Delta k/k$  for LCO 3.1.1. Revision 1 also incorporates the EOL HFP ARO MTC surveillance limit at 60 ppm. Byron Station is requested to perform a Plant Review of this document. Upon completion of the Plant Review, Byron Station is to transmit the COLR portion to the Nuclear Regulatory Commission pursuant to Technical Specification 5.6.5. Please provide NFM (Brian Manges) with a copy of Byron Station's completed Plant Review and COLR submittal to the NRC.

Source of Information:

1. Westinghouse Letter 01CB-G-057 (CAC-01-104), dated April 6, 2001
2. TODI NFM0000188, Sequence 0 "Pressurizer Pressure DNB Limit", A. W. Wong to D. Wozniak and T. Luke, December 15, 2000
3. Westinghouse Letter 01CB-G-047 (ASD-01-90), dated March 23, 2001
4. Westinghouse Letter CAC-01-123, dated April 11, 2001
5. TODI NFM0100054, Sequence 0, "RCS Average Temperature DNB Limit", A. Wong to D. Wozniak and C. Dunn, dated 4/19/2001
6. Westinghouse Letter NF-CB-02-2 (CAC-02-10), January 11, 2002

Supplemental Distribution: P. E. Reister / J. E. Langan (BY)

## CORE OPERATING LIMITS REPORT (COLR) for BYRON UNIT 1 CYCLE 11A

1.0 CORE OPERATING LIMITS REPORT

This Core Operating Limits Report (COLR) for Byron Station Unit 1 Cycle 11A has been prepared in accordance with the requirements of Technical Specification 5.6.5 (ITS).

The Technical Specifications affected by this report are listed below:

SL	2.1.1	Reactor Core Safety Limits (SLs)
LCO	3.1.1	Shutdown Margin (SDM)
LCO	3.1.3	Moderator Temperature Coefficient
LCO	3.1.4	Rod Group Alignment Limits
LCO	3.1.5	Shutdown Bank Insertion Limits
LCO	3.1.6	Control Bank Insertion Limits
LCO	3.1.8	Physics Tests Exceptions – Mode 2
LCO	3.2.1	Heat Flux Hot Channel Factor ( $F_Q(Z)$ )
LCO	3.2.2	Nuclear Enthalpy Rise Hot Channel Factor ( $F_{\Delta H}^N$ )
LCO	3.2.3	Axial Flux Difference (AFD)
LCO	3.2.5	Departure from Nucleate Boiling Ratio (DNBR)
LCO	3.3.1	Reactor Trip System (RTS) Instrumentation
LCO	3.3.9	Boron Dilution Protection System (BDPS)
LCO	3.4.1	Reactor Coolant System (RCS) DNB Parameters
LCO	3.9.1	Boron Concentration

The portions of the Technical Requirements Manual affected by this report are listed below:

TRM TLCO 3.1.b	Boration Flow Paths - Operating
TRM TLCO 3.1.d	Charging Pumps - Operating
TRM TLCO 3.1.f	Borated Water Sources - Operating
TRM TLCO 3.1.g	Position Indication System – Shutdown
TRM TLCO 3.1.h	Shutdown Margin (SDM) – MODE 1 and MODE 2 with $k_{eff} \geq 1.0$
TRM TLCO 3.1.i	Shutdown Margin (SDM) – MODE 5
TRM TLCO 3.1.j	Shutdown and Control Rods
TRM TLCO 3.1.k	Position Indication System – Shutdown (Special Test Exception)

## CORE OPERATING LIMITS REPORT (COLR) for BYRON UNIT 1 CYCLE 11A

**2.0 OPERATING LIMITS**

The cycle-specific parameter limits for the specifications listed in Section 1.0 are presented in the following subsections. These limits are applicable for the entire cycle unless otherwise identified. These limits have been developed using the NRC-approved methodologies specified in Technical Specification 5.6.5.

**2.1 Reactor Core Limits (SL 2.1.1)**

- 2.1.1 In Modes 1 and 2, the combination of Thermal Power, Reactor Coolant System (RCS) highest loop average temperature, and pressurizer pressure shall not exceed the limits specified in Figure 2.1.1.

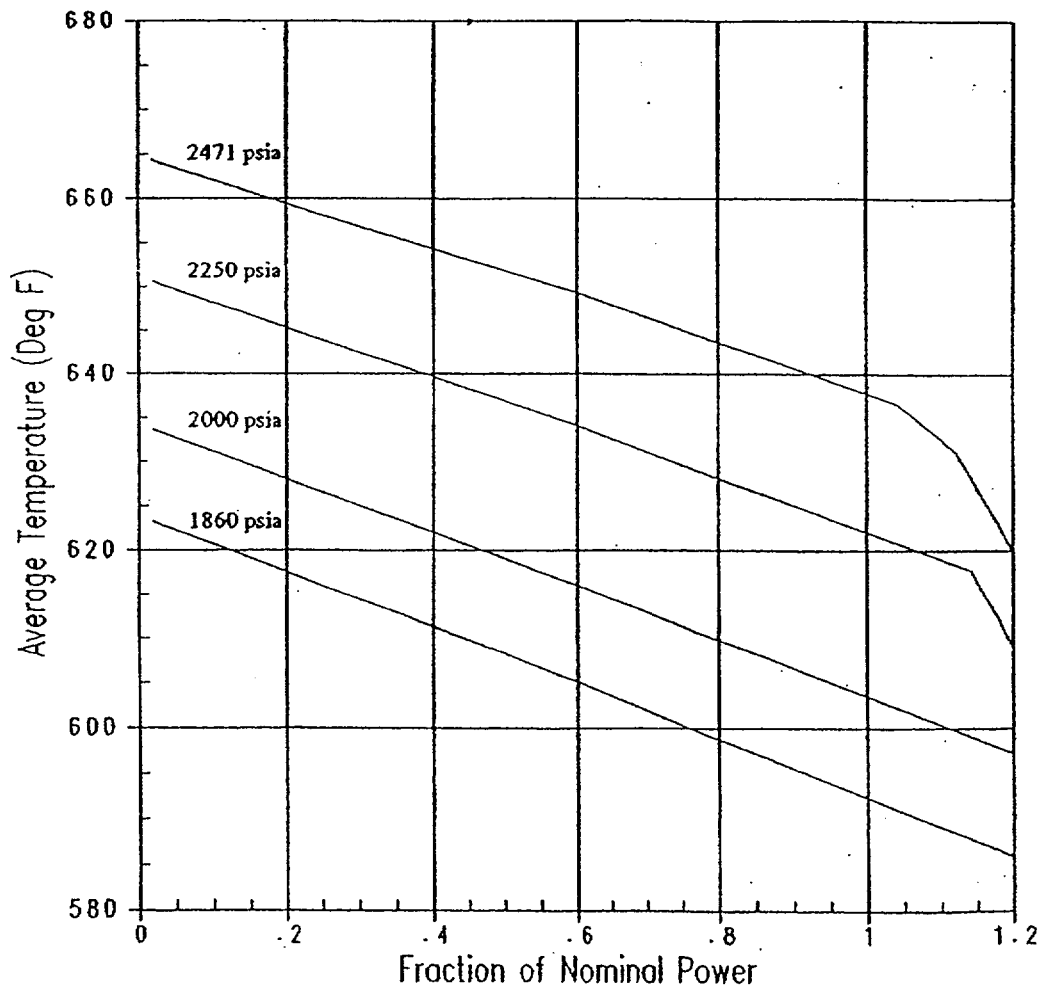


Figure 2.1.1: Reactor Core Limits

## CORE OPERATING LIMITS REPORT (COLR) for BYRON UNIT 1 CYCLE 11A

2.2 Shutdown Margin (SDM)

The SDM limit for MODES 1, 2, 3, 4, and 5 is:

- 2.2.1 The SDM shall be greater than or equal to 1.3%  $\Delta k/k$  (LCOs 3.1.1, 3.1.4, 3.1.5, 3.1.6, 3.1.8, 3.3.9; TRM TLCOs 3.1.b, 3.1.d, 3.1.f, 3.1.h, 3.1.i, and 3.1.j).

2.3 Moderator Temperature Coefficient (LCO 3.1.3)

The Moderator Temperature Coefficient (MTC) limits are:

- 2.3.1 The BOL/ARO/HZP-MTC upper limit shall be  $+3.73 \times 10^{-5} \Delta k/k/^{\circ}F$ .
- 2.3.2 The EOL/ARO/HFP-MTC lower limit shall be  $-4.6 \times 10^{-4} \Delta k/k/^{\circ}F$ .
- 2.3.3 The EOL/ARO/HFP-MTC Surveillance limit at 300 ppm shall be less negative than or equal to  $-3.7 \times 10^{-4} \Delta k/k/^{\circ}F$ .
- 2.3.4 The EOL/ARO/HFP-MTC Surveillance limit at 60 ppm shall be less negative than or equal to  $-4.3 \times 10^{-4} \Delta k/k/^{\circ}F$

where: BOL stands for Beginning of Cycle Life  
ARO stands for All Rods Out  
HZP stands for Hot Zero Thermal Power  
EOL stands for End of Cycle Life  
HFP stands for Hot Full Thermal Power

2.4 Shutdown Bank Insertion Limit (LCO 3.1.5)

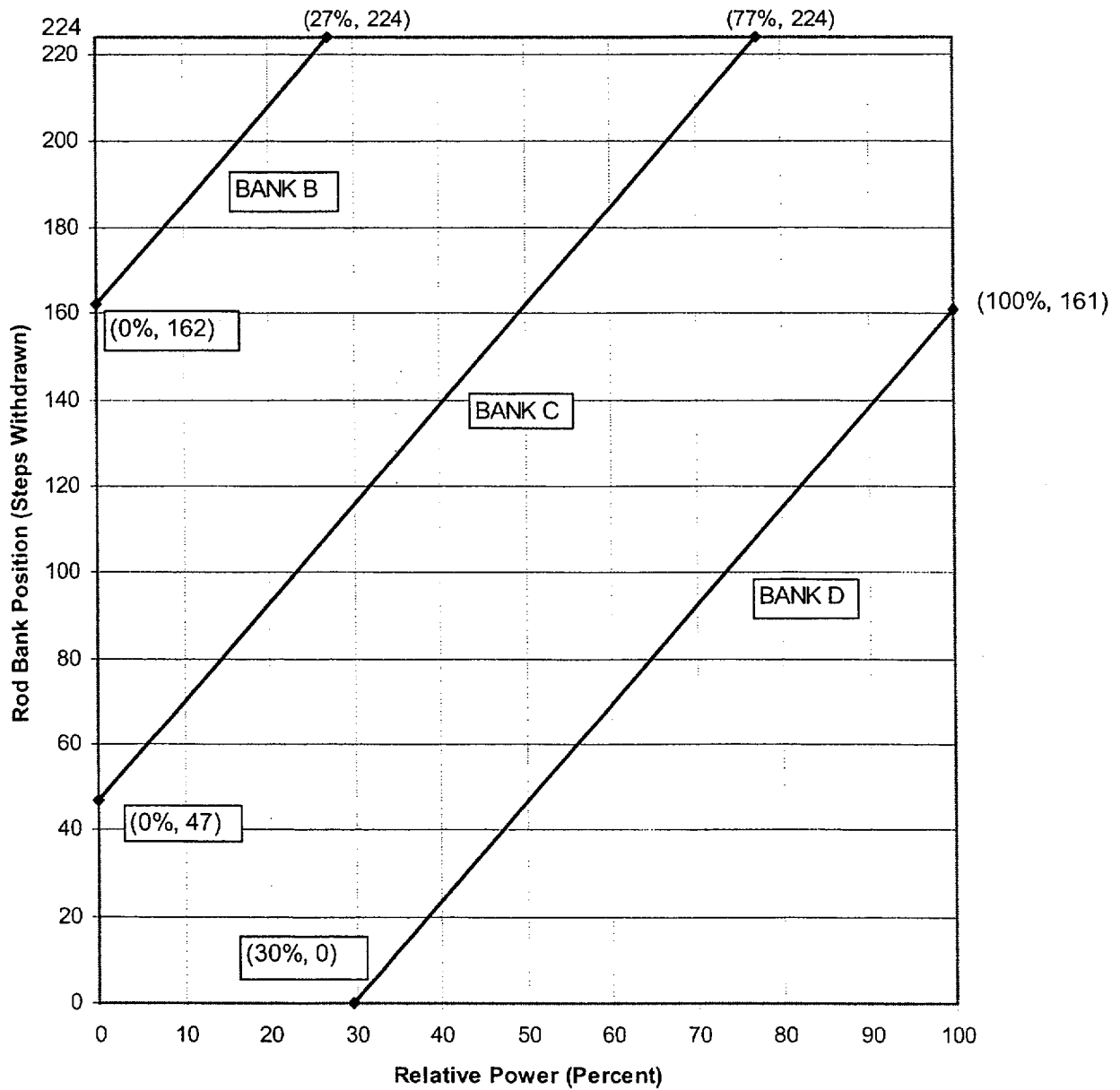
- 2.4.1 All shutdown banks shall be fully withdrawn to at least 224 steps.

2.5 Control Bank Insertion Limits (LCO 3.1.6)

- 2.5.1 The control banks shall be limited in physical insertion as shown in Figure 2.5.1.
- 2.5.2 Each control bank shall be considered fully withdrawn from the core at greater than or equal to 224 steps.
- 2.5.3 The control banks shall be operated in sequence by withdrawal of Bank A, Bank B, Bank C and Bank D. The control banks shall be sequenced in reverse order upon insertion.
- 2.5.4 Each control bank not fully withdrawn from the core shall be operated with a 113 step overlap limit.

## CORE OPERATING LIMITS REPORT (COLR) for BYRON UNIT 1 CYCLE 11A

**Figure 2.5.1:**  
**Control Bank Insertion Limits Versus Percent Rated Thermal Power**



## CORE OPERATING LIMITS REPORT (COLR) for BYRON UNIT 1 CYCLE 11A

2.6 Heat Flux Hot Channel Factor ( $F_Q(Z)$ ) (LCO 3.2.1)

## 2.6.1

$$F_Q(Z) \leq \frac{F_Q^{RTP}}{0.5} \times K(Z) \quad \text{for } P \leq 0.5$$

$$F_Q(Z) \leq \frac{F_Q^{RTP}}{P} \times K(Z) \quad \text{for } P > 0.5$$

where:  $P$  = the ratio of THERMAL POWER to RATED THERMAL POWER

$$F_Q^{RTP} = 2.60$$

$K(Z)$  is provided in Figure 2.6.1.

2.6.2  $W(Z)$  Values:

a) When PDMS is OPERABLE,  $W(Z) = 1.00000$  for all axial points.

b) When PDMS is Inoperable,  $W(Z)$  is provided in Figures 2.6.2.a through 2.6.2.d

The normal operation  $W(Z)$  values have been specified for burnups of 17000, 18000, 22000, and 25000 MWD/MTU.

For this cycle, the  $F_Q^C(z)$  penalty factors are equal to 2% per 31 Effective Full Power Days (EFPD). These values shall be used to increase the  $F_Q^W(z)$  as per Surveillance Requirement 3.2.1.2. A 2% penalty factor shall be used at all cycle burnups.

$$\text{Multiplication Factor} = 1.02$$

## 2.6.3 Uncertainty:

The uncertainty,  $U_{FQ}$ , to be applied to the Heat Flux Hot Channel Factor  $F_Q(Z)$  shall be calculated by the following formula

$$U_{FQ} = U_{qu} \bullet U_e$$

where:

$U_{qu}$  = Base FQ measurement uncertainty = 1.05 when PDMS is Inoperable

$U_e$  = Engineering uncertainty factor = 1.03

## 2.6.4 PDMS Alarms:

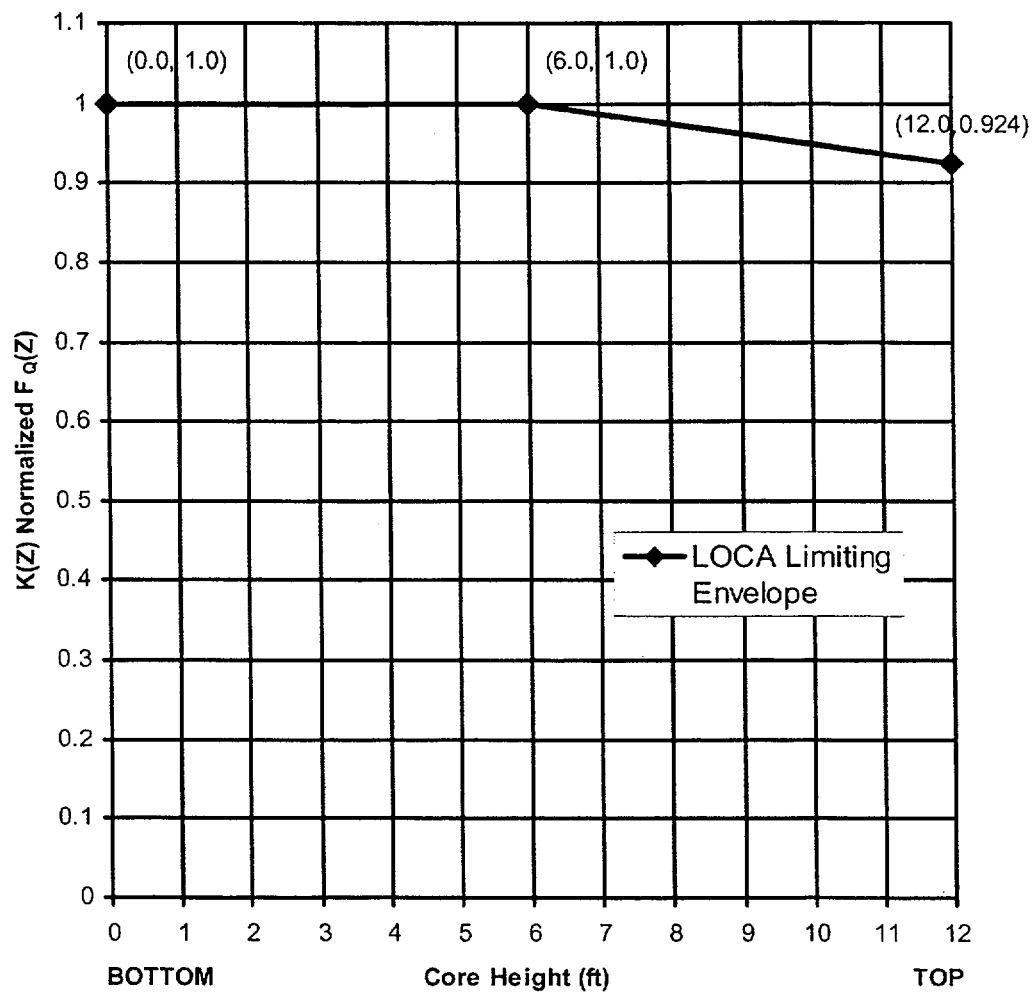
$F_Q(Z)$  Warning Setpoint  $\geq 2\%$  of  $F_Q(Z)$  Margin

$F_Q(Z)$  Alarm Setpoint  $\geq 0\%$  of  $F_Q(Z)$  Margin



## CORE OPERATING LIMITS REPORT (COLR) for BYRON UNIT 1 CYCLE 11A

**Figure 2.6.1**  
**K(Z) - Normalized  $F_Q(Z)$  as a Function of Core Height**



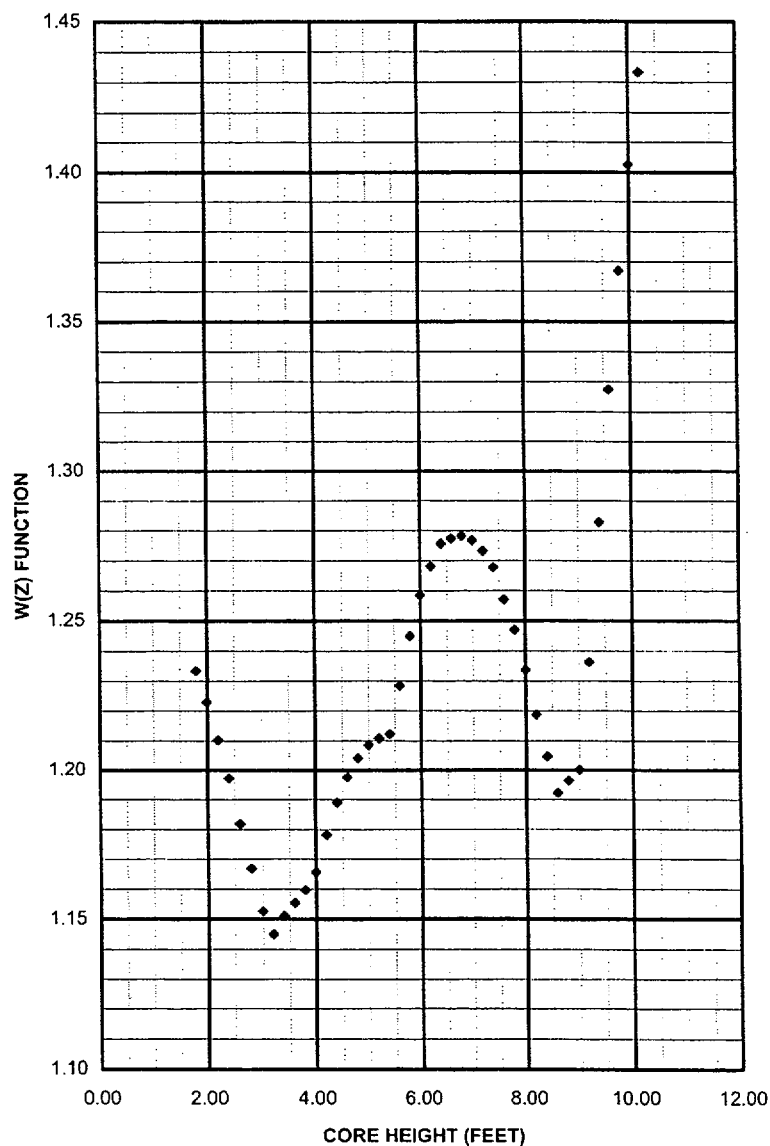
## CORE OPERATING LIMITS REPORT (COLR) for BYRON UNIT 1 CYCLE 11A

Height  
Feet

0.00	1.0000
0.20	1.0000
0.40	1.0000
0.60	1.0000
0.80	1.0000
1.00	1.0000
1.20	1.0000
1.40	1.0000
1.60	1.0000
1.80	1.2333
2.00	1.2230
2.20	1.2102
2.40	1.1972
2.60	1.1819
2.80	1.1669
3.00	1.1526
3.20	1.1450
3.40	1.1511
3.60	1.1554
3.80	1.1597
4.00	1.1656
4.20	1.1782
4.40	1.1890
4.60	1.1975
4.80	1.2041
5.00	1.2086
5.20	1.2108
5.40	1.2122
5.60	1.2284
5.80	1.2449
6.00	1.2585
6.20	1.2681
6.40	1.2757
6.60	1.2774
6.80	1.2782
7.00	1.2768
7.20	1.2733
7.40	1.2679
7.60	1.2571
7.80	1.2469
8.00	1.2337
8.20	1.2186
8.40	1.2047
8.60	1.1922
8.80	1.1965
9.00	1.2001
9.20	1.2363
9.40	1.2828
9.60	1.3274
9.80	1.3669
10.00	1.4026
10.20	1.4333
10.40	1.0000
10.60	1.0000
10.80	1.0000
11.00	1.0000
11.20	1.0000
11.40	1.0000
11.60	1.0000
11.80	1.0000
12.00	1.0000

Byron Unit 1 Cycle 11A

Figure 2.6.2.a

Summary of W(Z) Function at 17000 MWD/MTU  
(Top and Bottom 15% Excluded per WCAP-10216)

## CORE OPERATING LIMITS REPORT (COLR) for BYRON UNIT 1 CYCLE 11A

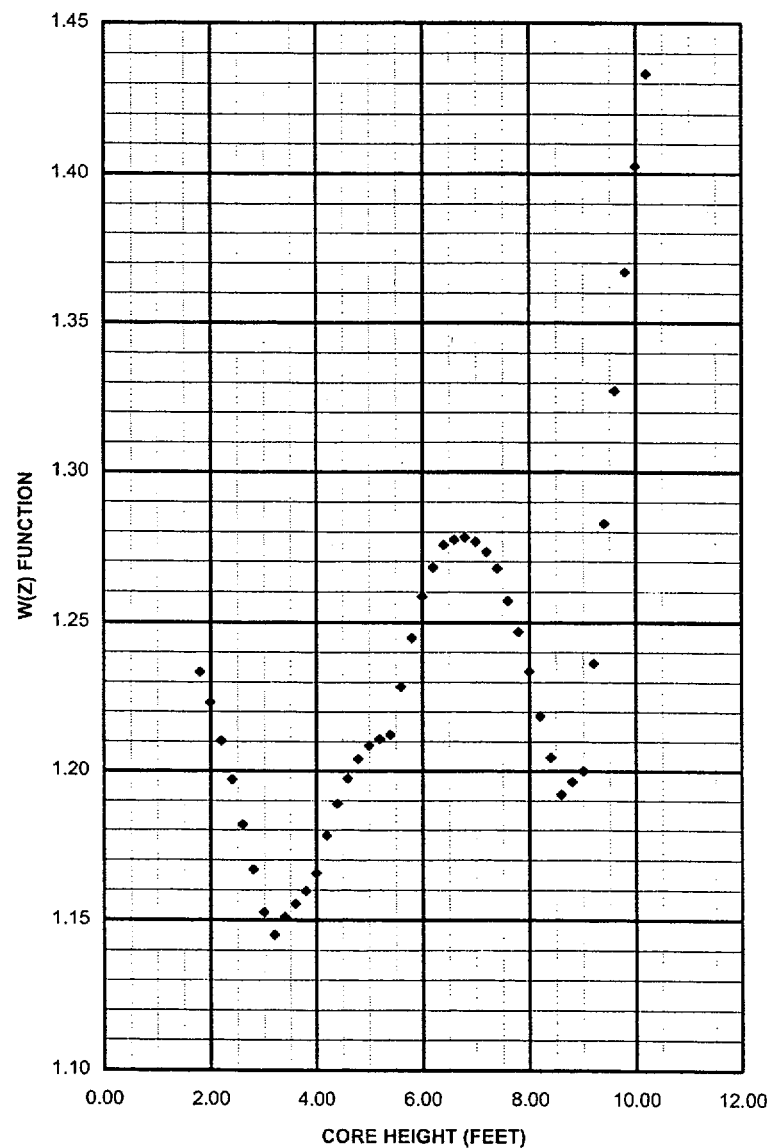
Height MAX W(Z)

Feet	
0.00	1.0000
0.20	1.0000
0.40	1.0000
0.60	1.0000
0.80	1.0000
1.00	1.0000
1.20	1.0000
1.40	1.0000
1.60	1.0000
1.80	1.2333
2.00	1.2230
2.20	1.2102
2.40	1.1972
2.60	1.1819
2.80	1.1669
3.00	1.1526
3.20	1.1450
3.40	1.1511
3.60	1.1554
3.80	1.1597
4.00	1.1656
4.20	1.1782
4.40	1.1890
4.60	1.1975
4.80	1.2041
5.00	1.2086
5.20	1.2108
5.40	1.2122
5.60	1.2284
5.80	1.2449
6.00	1.2585
6.20	1.2681
6.40	1.2757
6.60	1.2774
6.80	1.2782
7.00	1.2768
7.20	1.2733
7.40	1.2679
7.60	1.2571
7.80	1.2469
8.00	1.2337
8.20	1.2186
8.40	1.2047
8.60	1.1922
8.80	1.1965
9.00	1.2001
9.20	1.2363
9.40	1.2828
9.60	1.3274
9.80	1.3669
10.00	1.4026
10.20	1.4333
10.40	1.0000
10.60	1.0000
10.80	1.0000
11.00	1.0000
11.20	1.0000
11.40	1.0000
11.60	1.0000
11.80	1.0000
12.00	1.0000

Byron Unit 1 Cycle 11A

Figure 2.6.2.b

Summary of W(Z) Function at 18000 MWD/MTU  
(Top and Bottom 15% Excluded per WCAP-10216)



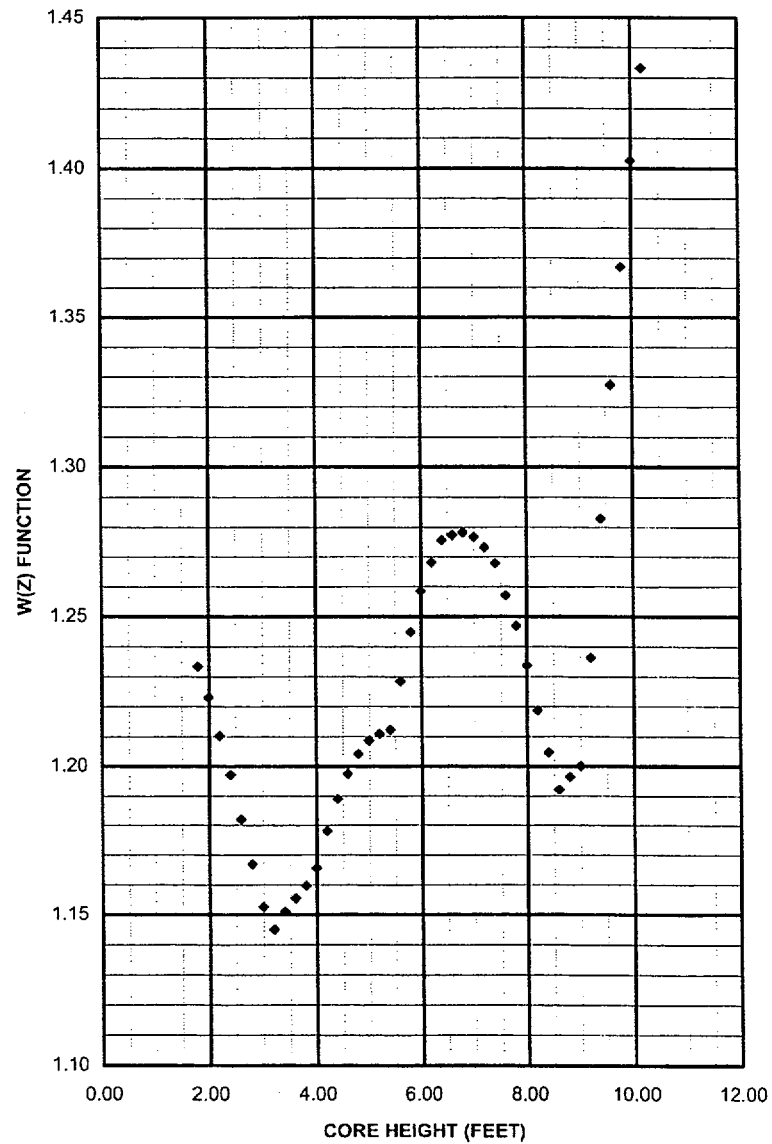
## CORE OPERATING LIMITS REPORT (COLR) for BYRON UNIT 1 CYCLE 11A

Height Feet	MAX W(Z)
0.00	1.0000
0.20	1.0000
0.40	1.0000
0.60	1.0000
0.80	1.0000
1.00	1.0000
1.20	1.0000
1.40	1.0000
1.60	1.0000
1.80	1.2333
2.00	1.2230
2.20	1.2102
2.40	1.1972
2.60	1.1819
2.80	1.1669
3.00	1.1526
3.20	1.1450
3.40	1.1511
3.60	1.1554
3.80	1.1597
4.00	1.1656
4.20	1.1782
4.40	1.1890
4.60	1.1975
4.80	1.2041
5.00	1.2086
5.20	1.2108
5.40	1.2122
5.60	1.2284
5.80	1.2449
6.00	1.2585
6.20	1.2681
6.40	1.2757
6.60	1.2774
6.80	1.2782
7.00	1.2768
7.20	1.2733
7.40	1.2679
7.60	1.2571
7.80	1.2469
8.00	1.2337
8.20	1.2186
8.40	1.2047
8.60	1.1922
8.80	1.1965
9.00	1.2001
9.20	1.2363
9.40	1.2828
9.60	1.3274
9.80	1.3669
10.00	1.4026
10.20	1.4333
10.40	1.0000
10.60	1.0000
10.80	1.0000
11.00	1.0000
11.20	1.0000
11.40	1.0000
11.60	1.0000
11.80	1.0000
12.00	1.0000

Byron Unit 1 Cycle 11A

Figure 2.6.2.c

Summary of W(Z) Function at 22000 MWD/MTU  
(Top and Bottom 15% Excluded per WCAP-10216)



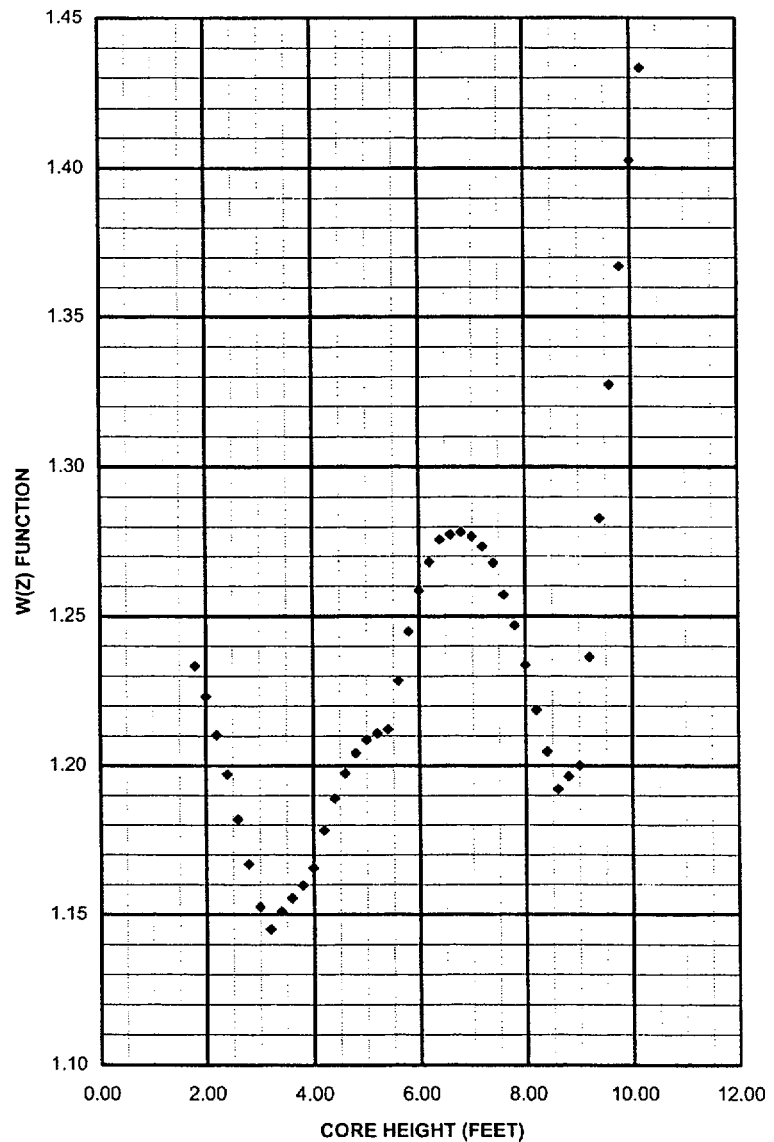
## CORE OPERATING LIMITS REPORT (COLR) for BYRON UNIT 1 CYCLE 11A

Height  
Feet

0.00	1.0000
0.20	1.0000
0.40	1.0000
0.60	1.0000
0.80	1.0000
1.00	1.0000
1.20	1.0000
1.40	1.0000
1.60	1.0000
1.80	1.2333
2.00	1.2230
2.20	1.2102
2.40	1.1972
2.60	1.1819
2.80	1.1669
3.00	1.1526
3.20	1.1450
3.40	1.1511
3.60	1.1554
3.80	1.1597
4.00	1.1656
4.20	1.1782
4.40	1.1890
4.60	1.1975
4.80	1.2041
5.00	1.2086
5.20	1.2108
5.40	1.2122
5.60	1.2284
5.80	1.2449
6.00	1.2585
6.20	1.2681
6.40	1.2757
6.60	1.2774
6.80	1.2782
7.00	1.2768
7.20	1.2733
7.40	1.2679
7.60	1.2571
7.80	1.2469
8.00	1.2337
8.20	1.2186
8.40	1.2047
8.60	1.1922
8.80	1.1965
9.00	1.2001
9.20	1.2363
9.40	1.2828
9.60	1.3274
9.80	1.3669
10.00	1.4026
10.20	1.4333
10.40	1.0000
10.60	1.0000
10.80	1.0000
11.00	1.0000
11.20	1.0000
11.40	1.0000
11.60	1.0000
11.80	1.0000
12.00	1.0000

Byron Unit 1 Cycle 11A

Figure 2.6.2.d

Summary of W(Z) Function at 25000 MWD/MTU  
(Top and Bottom 15% Excluded per WCAP-10216)

## CORE OPERATING LIMITS REPORT (COLR) for BYRON UNIT 1 CYCLE 11A

2.7 Nuclear Enthalpy Rise Hot Channel Factor ( $F_{\Delta H}^N$ ) (LCO 3.2.2)

$$2.7.1 \quad F_{\Delta H}^N \leq F_{\Delta H}^{RTP} [1.0 + PF_{\Delta H}(1.0 - P)]$$

where: P = the ratio of THERMAL POWER to RATED THERMAL POWER

$$F_{\Delta H}^{RTP} = 1.70$$

$$PF_{\Delta H} = 0.3$$

## 2.7.2 Uncertainty when PDMS is inoperable

The uncertainty,  $U_{F_{\Delta H}}$ , to be applied to the Nuclear Enthalpy Rise Hot Channel Factor  $F_{\Delta H}^N$  shall be calculated by the following formula:

$$U_{F_{\Delta H}} = U_{F_{\Delta Hm}}$$

where:

$$U_{F_{\Delta Hm}} = \text{Base } F_{\Delta H}^N \text{ measurement uncertainty} = 1.04$$

## 2.7.3 PDMS Alarms:

$F_{\Delta H}^N$  Warning Setpoint  $\geq 2\%$  of  $F_{\Delta H}^N$  Margin

$F_{\Delta H}^N$  Alarm Setpoint  $\geq 0\%$  of  $F_{\Delta H}^N$  Margin

2.8 Axial Flux Difference (AFD) (LCO 3.2.3)

2.8.1 When PDMS is Inoperable, the AXIAL FLUX DIFFERENCE (AFD) Acceptable Operation Limits are provided in Figure 2.8.1 or the latest valid PDMS Surveillance Report, whichever is more conservative.

2.8.2 When PDMS is OPERABLE, no AFD Acceptable Operation Limits are applicable.

2.9 Departure from Nucleate Boiling Ratio (DNBR) (LCO 3.2.5)

$$2.9.1 \quad \text{DNBR}_{\text{APSL}} \geq 1.659$$

The Axial Power Shape Limiting DNBR ( $\text{DNBR}_{\text{APSL}}$ ) is applicable with THERMAL POWER  $\geq 50\%$  RTP when PDMS is OPERABLE.

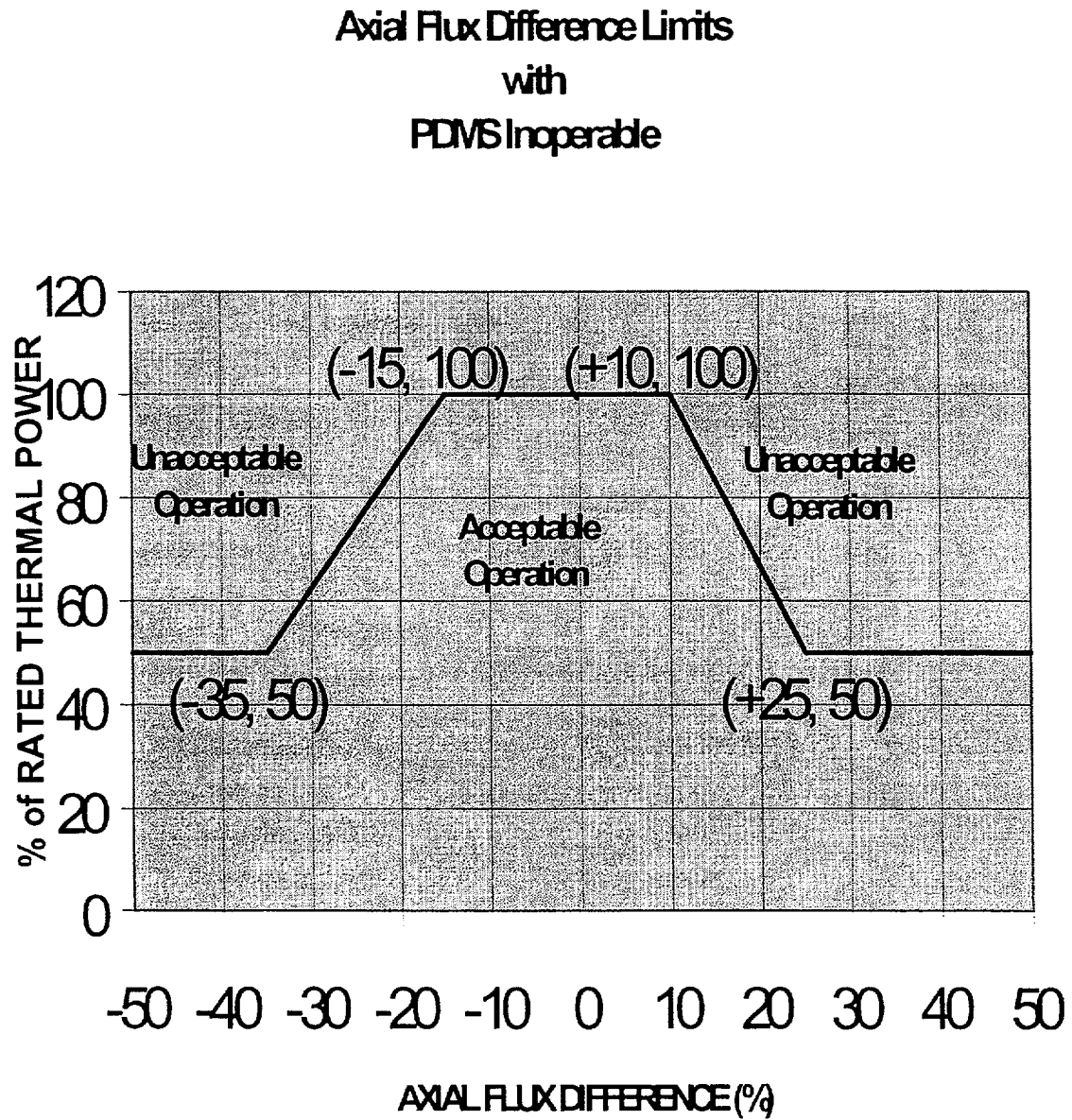
## 2.9.2 PDMS Alarms:

DNBR Warning Setpoint  $\geq 2\%$  of DNBR Margin

DNBR Alarm Setpoint  $\geq 0\%$  of DNBR Margin

## CORE OPERATING LIMITS REPORT (COLR) for BYRON UNIT 1 CYCLE 11A

Figure 2.8.1 Axial Flux Difference Limits as a Function of Rated Thermal Power



## CORE OPERATING LIMITS REPORT (COLR) for BYRON UNIT 1 CYCLE 11A

2.10 Reactor Trip System Overtemperature  $\Delta T$  Setpoint Parameter Values (LCO 3.3.1)

- 2.10.1 The Overtemperature  $\Delta T$  reactor trip setpoint  $K_1$  shall be equal to 1.325.
- 2.10.2 The Overtemperature  $\Delta T$  reactor trip setpoint  $T_{avg}$  coefficient  $K_2$  shall be equal to 0.0297 / °F.
- 2.10.3 The Overtemperature  $\Delta T$  reactor trip setpoint pressure coefficient  $K_3$  shall be equal to 0.00181 / psig.
- 2.10.4 The nominal  $T_{avg}$  at RTP (indicated)  $T'$  shall be less than or equal to 588.0 °F.
- 2.10.5 The nominal RCS operating pressure (indicated)  $P'$  shall be equal to 2235 psig.
- 2.10.6 The measured reactor vessel  $\Delta T$  lead/lag time constant  $\tau_1$  shall be equal to 8 sec.
- 2.10.7 The measured reactor vessel  $\Delta T$  lead/lag time constant  $\tau_2$  shall be equal to 3 sec.
- 2.10.8 The measured reactor vessel  $\Delta T$  lag time constant  $\tau_3$  shall be less than or equal to 2 sec.
- 2.10.9 The measured reactor vessel average temperature lead/lag time constant  $\tau_4$  shall be equal to 33 sec.
- 2.10.10 The measured reactor vessel average temperature lead/lag time constant  $\tau_5$  shall be equal to 4 sec.
- 2.10.11 The measured reactor vessel average temperature lag time constant  $\tau_6$  shall be less than or equal to 2 sec.
- 2.10.12 The  $f_1(\Delta I)$  "positive" breakpoint shall be +10%  $\Delta I$ .
- 2.10.13 The  $f_1(\Delta I)$  "negative" breakpoint shall be -18%  $\Delta I$ .
- 2.10.14 The  $f_1(\Delta I)$  "positive" slope shall be +3.47% / %  $\Delta I$ .
- 2.10.15 The  $f_1(\Delta I)$  "negative" slope shall be -2.61% / %  $\Delta I$ .



## CORE OPERATING LIMITS REPORT (COLR) for BYRON UNIT 1 CYCLE 11A

2.11 Reactor Trip System Overpower  $\Delta T$  Setpoint Parameter Values (LCO 3.3.1)

- 2.11.1 The Overpower  $\Delta T$  reactor trip setpoint  $K_4$  shall be equal to 1.072.
- 2.11.2 The Overpower  $\Delta T$  reactor trip setpoint  $T_{avg}$  rate/lag coefficient  $K_5$  shall be equal to 0.02 /  $^{\circ}\text{F}$  for increasing  $T_{avg}$ .
- 2.11.3 The Overpower  $\Delta T$  reactor trip setpoint  $T_{avg}$  rate/lag coefficient  $K_5$  shall be equal to 0 /  $^{\circ}\text{F}$  for decreasing  $T_{avg}$ .
- 2.11.4 The Overpower  $\Delta T$  reactor trip setpoint  $T_{avg}$  heatup coefficient  $K_6$  shall be equal to 0.00245 /  $^{\circ}\text{F}$  when  $T > T''$ .
- 2.11.5 The Overpower  $\Delta T$  reactor trip setpoint  $T_{avg}$  heatup coefficient  $K_6$  shall be equal to 0 /  $^{\circ}\text{F}$  when  $T \leq T''$ .
- 2.11.6 The nominal  $T_{avg}$  at RTP (indicated)  $T''$  shall be less than or equal to 588.0  $^{\circ}\text{F}$ .
- 2.11.7 The measured reactor vessel  $\Delta T$  lead/lag time constant  $\tau_1$  shall be equal to 8 sec.
- 2.11.8 The measured reactor vessel  $\Delta T$  lead/lag time constant  $\tau_2$  shall be equal to 3 sec.
- 2.11.9 The measured reactor vessel  $\Delta T$  lag time constant  $\tau_3$  shall be less than or equal to 2 sec.
- 2.11.10 The measured reactor vessel average temperature lag time constant  $\tau_6$  shall be less than or equal to 2 sec.
- 2.11.11 The measured reactor vessel average temperature rate/lag time constant  $\tau_7$  shall be equal to 10 sec.
- 2.11.12 The  $f_2(\Delta I)$  "positive" breakpoint shall be 0 for all  $\Delta I$ .
- 2.11.13 The  $f_2(\Delta I)$  "negative" breakpoint shall be 0 for all  $\Delta I$ .
- 2.11.14 The  $f_2(\Delta I)$  "positive" slope shall be 0 for all  $\Delta I$ .
- 2.11.15 The  $f_2(\Delta I)$  "negative" slope shall be 0 for all  $\Delta I$ .

## CORE OPERATING LIMITS REPORT (COLR) for BYRON UNIT 1 CYCLE 11A

2.12 Reactor Coolant System (RCS) DNB Parameter Limits (LCO 3.4.1)

2.12.1 The pressurizer pressure shall be greater than or equal to 2209 psig.

2.12.2 The RCS average temperature ( $T_{avg}$ ) shall be less than or equal to 593.1 °F.

2.12.3 The RCS total flow rate shall be greater than or equal to 380,900 gpm.

2.13 Boron Concentration

2.13.1 The refueling boron concentration shall be greater than or equal to 2000 ppm (LCO 3.9.1).

2.13.2 The Reactor Coolant System boron concentration shall be greater than or equal to 2075 ppm at all times in core life, to maintain adequate shutdown margin for MODES 3, 4, and 5 during performance of rod drop time measurements and during the surveillance of Digital Rod Position Indication (DRPI) for OPERABILITY (TLCO 3.1.g and TLCO 3.1.k)