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Dominion®

April 21, 2016

United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

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VIRGINIA ELECTRIC AND POWER COMPANY (DOMINION)
NORTH ANNA POWER STATION UNIT 2
CORE OPERATING LIMITS REPORT
NORTH ANNA 2 CYCLE 25 PATTERN KTY REVISION 1

Pursuant to North Anna Technical Specification 5.6.5.d, attached is a copy of the Dominion Core Operating Limits Report for North Anna Unit 2 Cycle 25, Pattern KTY, Revision 1.

If you have any questions or require additional information, please contact Ms. Diane Aitken at (804) 273-2694.

Sincerely,

T. R. Huber, Director
Nuclear Licensing and Operations Support
Dominion Resources Services, Inc. for
Virginia Electric and Power Company

Attachment:

COLR-N2C25, Revision 1, Core Operating Limits Report, North Anna Unit 2 Cycle 25 Pattern KTY

Commitment Summary: There are no new commitments contained in this letter.

A001
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ATTACHMENT

COLR-N2C25, Revision 1

CORE OPERATING LIMITS REPORT
North Anna Unit 2 Cycle 25 Pattern KTY

N2C25 CORE OPERATING LIMITS REPORT

INTRODUCTION

The Core Operating Limits Report (COLR) for North Anna Unit 2 Cycle 25 has been prepared in accordance with North Anna Technical Specification 5.6.5. The technical specifications affected by this report are listed below:

TS 2.1.1	Reactor Core Safety Limits
TS 3.1.1	Shutdown Margin (SDM)
TS 3.1.3	Moderator Temperature Coefficient (MTC)
TS 3.1.4	Rod Group Alignment Limits
TS 3.1.5	Shutdown Bank Insertion Limit
TS 3.1.6	Control Bank Insertion Limits
TS 3.1.9	PHYSICS TESTS Exceptions – Mode 2
TS 3.2.1	Heat Flux Hot Channel Factor
TS 3.2.2	Nuclear Enthalpy Rise Hot Channel Factor ($F^N_{\Delta H}$)
TS 3.2.3	Axial Flux Difference (AFD)
TS 3.3.1	Reactor Trip System (RTS) Instrumentation
TS 3.4.1	RCS Pressure, Temperature, and Flow DNB Limits
TS 3.5.6	Boron Injection Tank (BIT)
TS 3.9.1	Boron Concentration

In addition, a technical requirement (TR) in the NAPS Technical Requirements Manual (TRM) refers to the COLR:

TR 3.1.1	Boration Flow Paths – Operating

The analytical methods used to determine the core operating limits are those previously approved by the NRC and discussed in the documents listed in the References Section.

Cycle-specific values are presented **in bold.** Text in *italics* is provided for information only.

REFERENCES

1. VEP-FRD-42, Rev. 2.1-A, "Reload Nuclear Design Methodology," August 2003.

   Methodology for:
   TS 3.1.1 – Shutdown Margin,
   TS 3.1.3 – Moderator Temperature Coefficient,
   TS 3.1.4 – Rod Group Alignment Limits
   TS 3.1.5 – Shutdown Bank Insertion Limit
   TS 3.1.6 – Control Bank Insertion Limits,
   TS 3.1.9 – Physics Tests Exceptions – Mode 2,
   TS 3.2.1 – Heat Flux Hot Channel Factor,
   TS 3.2.2 – Nuclear Enthalpy Rise Hot Channel Factor
   TS 3.5.6 – Boron Injection Tank (BIT) and
   TS 3.9.1 – Boron Concentration

2. Plant-specific adaptation of WCAP-16009-P-A, "Realistic Large Break LOCA Evaluation Methodology Using the Automated Statistical Treatment of Uncertainty Method (ASTRUM)," as approved by NRC Safety Evaluation Report dated February 29, 2012.

   Methodology for: TS 3.2.1 – Heat Flux Hot Channel Factor

3. WCAP-10054-P-A, "Westinghouse Small Break ECCS Evaluation Model Using the NOTRUMP Code," August 1985.

   Methodology for: TS 3.2.1 – Heat Flux Hot Channel Factor

4. WCAP-10079-P-A, "NOTRUMP, A Nodal Transient Small Break and General Network Code," August 1985.

   Methodology for: TS 3.2.1 – Heat Flux Hot Channel Factor

5. WCAP-12610-P-A, "VANTAGE+ FUEL ASSEMBLY – REFERENCE CORE REPORT," April 1995.

   Methodology for:
   TS 2.1.1 – Reactor Core Safety Limits
   TS 3.2.1 – Heat Flux Hot Channel Factor

6. VEP-NE-2, Rev. 0-A, Statistical DNBR Evaluation Methodology, June 1987.

   Methodology for:
   TS 3.2.2 – Nuclear Enthalpy Rise Hot Channel Factor and
   TS 3.4.1 – RCS Pressure, Temperature and Flow DNB Limits

7. VEP-NE-1, Rev. 0.1-A, Relaxed Power Distribution Control Methodology and Associated FQ Surveillance Technical Specifications, August 2003.

   Methodology for:

   TS 3.2.1 – Heat Flux Hot Channel Factor and

   TS 3.2.3 – Axial Flux Difference

8. WCAP-8745-P-A, Design Bases for the Thermal Overpower ΔT and Thermal Overtemperature ΔT Trip Functions, September 1986.

   Methodology for:

   TS 2.1.1 – Reactor Core Safety Limits and

   TS 3.3.1 – Reactor Trip System Instrumentation

9. WCAP-14483-A, Generic Methodology for Expanded Core Operating Limits Report, January 1999.

   Methodology for:

   TS 2.1.1 – Reactor Core Safety Limits,

   TS 3.1.1 – Shutdown Margin,

   TS 3.1.4 – Rod Group Alignment Limits

   TS 3.1.9 – Physics Tests Exceptions – Mode 2

   TS 3.3.1 – Reactor Trip System Instrumentation,

   TS 3.4.1 – RCS Pressure, Temperature, and Flow DNB Limits

   TS 3.5.6 – Boron Injection Tank (BIT) and

   TS 3.9.1 – Boron Concentration

10. DOM-NAF-2, Rev. 0.3- P-A, "Reactor Core Thermal-Hydraulics Using the VIPRE-D Computer Code," including Appendix C, "Qualification of the Westinghouse WRB-2M CHF Correlation in the Dominion VIPRE-D Computer Code," August 2010 and Appendix D, "Qualification of the ABB-NV and WLOP CHF Correlations in the Dominion VIPRE-D Computer Code," September 2014.

    Methodology for:

    TS 3.2.2 – Nuclear Enthalpy Rise Hot Channel Factor and

    TS 3.4.1 – RCS Pressure, Temperature and Flow DNB Limits

11. WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™," July 2006.

    Methodology for:

    TS 2.1.1 – Reactor Core Safety Limits and

    TS 3.2.1 – Heat Flux Hot Channel Factor

Note: In some instances, the North Anna COLR lists multiple methodologies that are used to verify a single Technical Specification parameter. This is due to the reload verification scope split between Dominion and the fuel vendor.

2.0 SAFETY LIMITS (SLs)

2.1 SLs

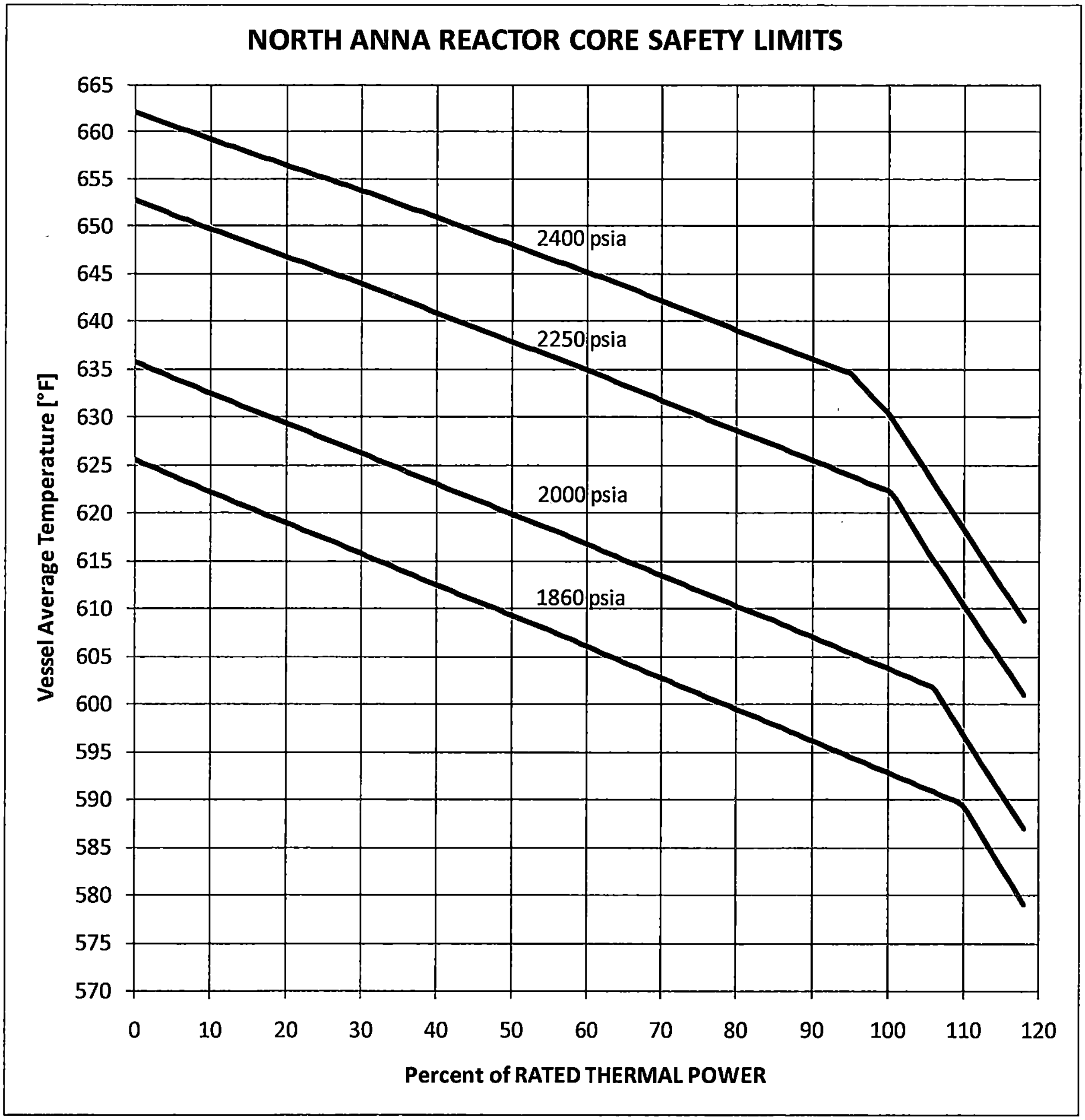
2.1.1 Reactor Core SLs

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 **COLR Figure 2.1-1**; and the following SLs shall not be exceeded.

2.1.1.1 The departure from nucleate boiling ratio (DNBR) shall be maintained greater than or equal to the 95/95 DNBR criterion for the DNB correlations and methodologies specified in the References Section.

2.1.1.2 The peak fuel centerline temperature shall be maintained < 5080°F, decreasing by 58°F per 10,000 MWD/MTU of burnup, for Westinghouse fuel *and < 5173°F, decreasing by 65°F per 10,000 MWD/MTU of burnup, for AREVA fuel.*

COLR Figure 2.1-1



3.1 REACTIVITY CONTROL SYSTEMS

3.1.1 SHUTDOWN MARGIN (SDM)

LCO 3.1.1 SDM shall be ≥ **1.77 % Δk/k.**

3.1.3 Moderator Temperature Coefficient (MTC)

LCO 3.1.3 The MTC shall be maintained within the limits specified below. The upper limit of MTC is **+0.6 x 10^{-4} Δk/k/°F**, when < 70% RTP, and **0.0 Δk/k/°F** when ≥ 70% RTP.

The BOC/ARO-MTC shall be ≤ **+0.6 x 10^{-4} Δk/k/°F** (upper limit), when < 70% RTP, and ≤ **0.0 Δk/k/°F** when ≥ 70% RTP.

The EOC/ARO/RTP-MTC shall be less negative than **–5.0 x 10^{-4} Δk/k/°F** (lower limit).

The MTC surveillance limits are:

The 300 ppm/ARO/RTP-MTC should be less negative than or equal to **–4.0 x 10^{-4} Δk/k/°F** [Note 2].

The 60 ppm/ARO/RTP-MTC should be less negative than or equal to **–4.7 x 10^{-4} Δk/k/°F** [Note 3].

SR 3.1.3.2 Verify MTC is within **–5.0 x 10^{-4} Δk/k/°F** (lower limit).

Note 2: If the MTC is more negative than **–4.0 x 10^{-4} Δk/k/°F**, SR 3.1.3.2 shall be repeated once per 14 EFPD during the remainder of the fuel cycle.

Note 3: SR 3.1.3.2 need not be repeated if the MTC measured at the equivalent of equilibrium RTP-ARO boron concentration of ≤ 60 ppm is less negative than **–4.7 x 10^{-4} Δk/k/°F.**

3.1.4 Rod Group Alignment Limits

Required Action A.1.1 Verify SDM to be ≥ **1.77 % Δk/k.**

Required Action B.1.1 Verify SDM to be ≥ **1.77 % Δk/k.**

Required Action D.1.1 Verify SDM to be ≥ **1.77 % Δk/k.**

3.1.5 Shutdown Bank Insertion Limits

LCO 3.1.5 Each shutdown bank shall be withdrawn to at least **227** steps.

Required Action A.1.1 Verify SDM to be ≥ **1.77 % Δk/k**.

Required Action B.1 Verify SDM to be ≥ **1.77 % Δk/k**.

SR 3.1.5.1 Verify each shutdown bank is withdrawn to at least **227** steps.

3.1.6 Control Bank Insertion Limits

LCO 3.1.6 Control banks shall be limited in physical insertion as shown in **COLR Figure 3.1-1**. Sequence of withdrawal shall be A, B, C and D, in that order; and the overlap limit during withdrawal shall be **99** steps.

Required Action A.1.1 Verify SDM to be ≥ **1.77 % Δk/k**.

Required Action B.1.1 Verify SDM to be ≥ **1.77 % Δk/k**.

Required Action C.1 Verify SDM to be ≥ **1.77 % Δk/k**.

SR 3.1.6.1 Verify estimated critical control bank position is within the insertion limits specified in **COLR Figure 3.1-1**.

SR 3.1.6.2 Verify each control bank is within the insertion limits specified in **COLR Figure 3.1-1**.

SR 3.1.6.3 Verify each control bank not fully withdrawn from the core is within the sequence and overlap limits specified in **LCO 3.1.6 above**.

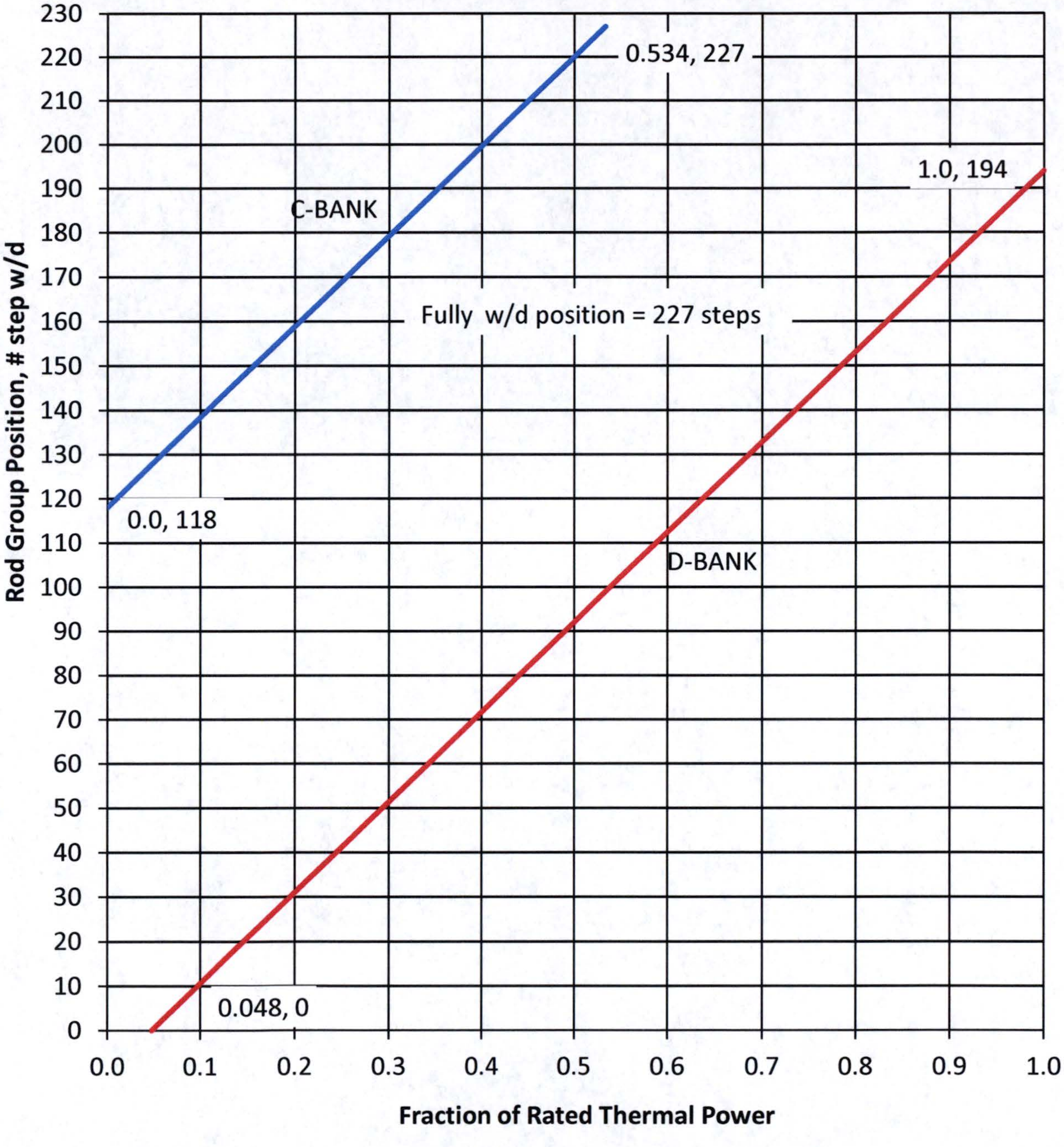
3.1.9 PHYSICS TESTS Exceptions – MODE 2

LCO 3.1.9.b SDM is ≥ **1.77 % Δk/k**.

SR 3.1.9.4 Verify SDM to be ≥ **1.77 % Δk/k**.

COLR Figure 3.1-1

North Anna 2 Cycle 25
Control Rod Bank Insertion Limits



3.2 POWER DISTRIBUTION LIMITS

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

LCO 3.2.1 $F_Q(Z)$, as approximated by $F_Q^M(Z)$, shall be within the limits specified below.

CFQ = 2.32

The Measured Heat Flux Hot Channel Factor, $F_Q^M(Z)$, shall be limited by the following relationships:

$$F_Q^M(Z) \leq \frac{CFQ}{P} \frac{K(Z)}{N(Z)} \qquad for\ P > 0.5$$

$$F_Q^M(Z) \leq \frac{CFQ}{0.5} \frac{K(Z)}{N(Z)} \qquad for\ P \leq 0.5$$

where: $P = \dfrac{THERMAL\ POWER}{RATED\ THERMAL\ POWER}$; and

K(Z) is provided in **COLR Figure 3.2-1**

N(Z) is a cycle-specific non-equilibrium multiplier on $F_Q^M(Z)$ to account for power distribution transients during normal operation, provided in **COLR Table 3.2-1.**

The discussion in the Bases Section B 3.2.1 for this LCO requires the application of a cycle dependent non-equilibrium multiplier, N(Z), to the CFQ limit. N(Z) accounts for power distribution transients encountered during normal operation. As function N(Z) is dependent on the predicted equilibrium $F_Q(Z)$ and is sensitive to the axial power distribution, it is typically generated from the actual EOC burnup distribution that can only be obtained after the shutdown of the previous cycle. The cycle-specific N(Z) function is presented in **COLR Table 3.2-1**.

COLR Table 3.2-1

N2C25 Normal Operation N(Z)

NODE	HEIGHT (FEET)	0 to 1000 MWD/MTU	1000 to 2000 MWD/MTU	2000 to 3000 MWD/MTU	3000 to 4000 MWD/MTU	4000 to 5000 MWD/MTU
10	10.2	1.153	1.155	1.165	1.165	1.159
11	10.0	1.152	1.153	1.159	1.160	1.155
12	9.8	1.151	1.152	1.154	1.152	1.149
13	9.6	1.150	1.151	1.151	1.147	1.145
14	9.4	1.149	1.150	1.149	1.143	1.142
15	9.2	1.149	1.149	1.149	1.145	1.145
16	9.0	1.147	1.146	1.150	1.153	1.153
17	8.8	1.147	1.146	1.152	1.162	1.162
18	8.6	1.151	1.150	1.155	1.166	1.166
19	8.4	1.155	1.155	1.157	1.167	1.167
20	8.2	1.159	1.159	1.159	1.168	1.168
21	8.0	1.161	1.162	1.159	1.167	1.167
22	7.8	1.162	1.162	1.159	1.165	1.165
23	7.6	1.160	1.161	1.157	1.161	1.161
24	7.4	1.157	1.157	1.154	1.155	1.155
25	7.2	1.153	1.153	1.148	1.148	1.148
26	7.0	1.150	1.147	1.142	1.141	1.141
27	6.8	1.149	1.145	1.140	1.139	1.139
28	6.6	1.148	1.143	1.137	1.136	1.137
29	6.4	1.139	1.131	1.125	1.125	1.124
30	6.2	1.127	1.116	1.111	1.111	1.109
31	6.0	1.125	1.111	1.107	1.108	1.105
32	5.8	1.123	1.110	1.106	1.106	1.105
33	5.6	1.111	1.102	1.098	1.092	1.095
34	5.4	1.105	1.098	1.094	1.085	1.091
35	5.2	1.109	1.097	1.094	1.089	1.096
36	5.0	1.117	1.102	1.099	1.098	1.105
37	4.8	1.121	1.111	1.108	1.104	1.113
38	4.6	1.125	1.121	1.117	1.109	1.120
39	4.4	1.129	1.128	1.123	1.112	1.124
40	4.2	1.133	1.133	1.129	1.114	1.126
41	4.0	1.138	1.139	1.135	1.118	1.127
42	3.8	1.145	1.146	1.141	1.123	1.131
43	3.6	1.152	1.152	1.148	1.130	1.136
44	3.4	1.156	1.156	1.152	1.135	1.136
45	3.2	1.158	1.158	1.156	1.140	1.138
46	3.0	1.162	1.163	1.162	1.148	1.146
47	2.8	1.169	1.171	1.171	1.158	1.158
48	2.6	1.180	1.181	1.178	1.168	1.168
49	2.4	1.193	1.192	1.187	1.178	1.178
50	2.2	1.203	1.203	1.198	1.188	1.188
51	2.0	1.213	1.213	1.208	1.197	1.197
52	1.8	1.223	1.222	1.217	1.205	1.205

These decks are generated for normal operation flux maps that are typically taken at full power ARO. Additional N(z) decks may be generated, if necessary, consistent with the methodology described in the RPDC topical (Reference 7). EOR is defined as Hot Full Power End of Reactivity.

COLR Table 3.2-1

N2C25 Normal Operation N(Z)

NODE	HEIGHT (FEET)	5000 to 7000 MWD/MTU	7000 to 9000 MWD/MTU	9000 to 11000 MWD/MTU	11000 to 13000 MWD/MTU	13000 to 15000 MWD/MTU
10	10.2	1.156	1.154	1.123	1.116	1.109
11	10.0	1.152	1.152	1.126	1.123	1.116
12	9.8	1.148	1.148	1.129	1.128	1.122
13	9.6	1.145	1.145	1.133	1.131	1.125
14	9.4	1.142	1.142	1.134	1.131	1.125
15	9.2	1.142	1.141	1.137	1.134	1.128
16	9.0	1.143	1.144	1.143	1.142	1.138
17	8.8	1.148	1.150	1.151	1.151	1.150
18	8.6	1.149	1.152	1.155	1.155	1.153
19	8.4	1.152	1.160	1.162	1.161	1.162
20	8.2	1.157	1.175	1.176	1.174	1.183
21	8.0	1.162	1.186	1.186	1.184	1.198
22	7.8	1.164	1.189	1.189	1.187	1.201
23	7.6	1.167	1.193	1.193	1.195	1.206
24	7.4	1.170	1.201	1.201	1.210	1.215
25	7.2	1.171	1.206	1.206	1.219	1.221
26	7.0	1.168	1.206	1.206	1.222	1.223
27	6.8	1.168	1.207	1.207	1.224	1.225
28	6.6	1.166	1.206	1.206	1.223	1.226
29	6.4	1.156	1.202	1.202	1.220	1.228
30	6.2	1.143	1.194	1.194	1.214	1.229
31	6.0	1.136	1.194	1.192	1.213	1.231
32	5.8	1.131	1.187	1.188	1.207	1.226
33	5.6	1.123	1.167	1.176	1.189	1.214
34	5.4	1.119	1.151	1.166	1.174	1.200
35	5.2	1.117	1.148	1.163	1.173	1.194
36	5.0	1.117	1.149	1.161	1.173	1.189
37	4.8	1.116	1.149	1.156	1.168	1.184
38	4.6	1.118	1.148	1.150	1.163	1.182
39	4.4	1.122	1.146	1.145	1.158	1.183
40	4.2	1.125	1.143	1.143	1.151	1.185
41	4.0	1.127	1.141	1.144	1.146	1.185
42	3.8	1.134	1.141	1.148	1.148	1.176
43	3.6	1.144	1.144	1.156	1.155	1.165
44	3.4	1.147	1.145	1.160	1.160	1.161
45	3.2	1.147	1.147	1.162	1.164	1.163
46	3.0	1.150	1.149	1.163	1.165	1.164
47	2.8	1.155	1.155	1.163	1.166	1.166
48	2.6	1.160	1.159	1.161	1.165	1.164
49	2.4	1.171	1.171	1.164	1.169	1.169
50	2.2	1.188	1.189	1.172	1.180	1.183
51	2.0	1.201	1.201	1.178	1.190	1.197
52	1.8	1.202	1.201	1.179	1.193	1.203

These decks are generated for normal operation flux maps that are typically taken at full power ARO. Additional N(z) decks may be generated, if necessary, consistent with the methodology described in the RPDC topical (Reference 7). EOR is defined as Hot Full Power End of Reactivity.

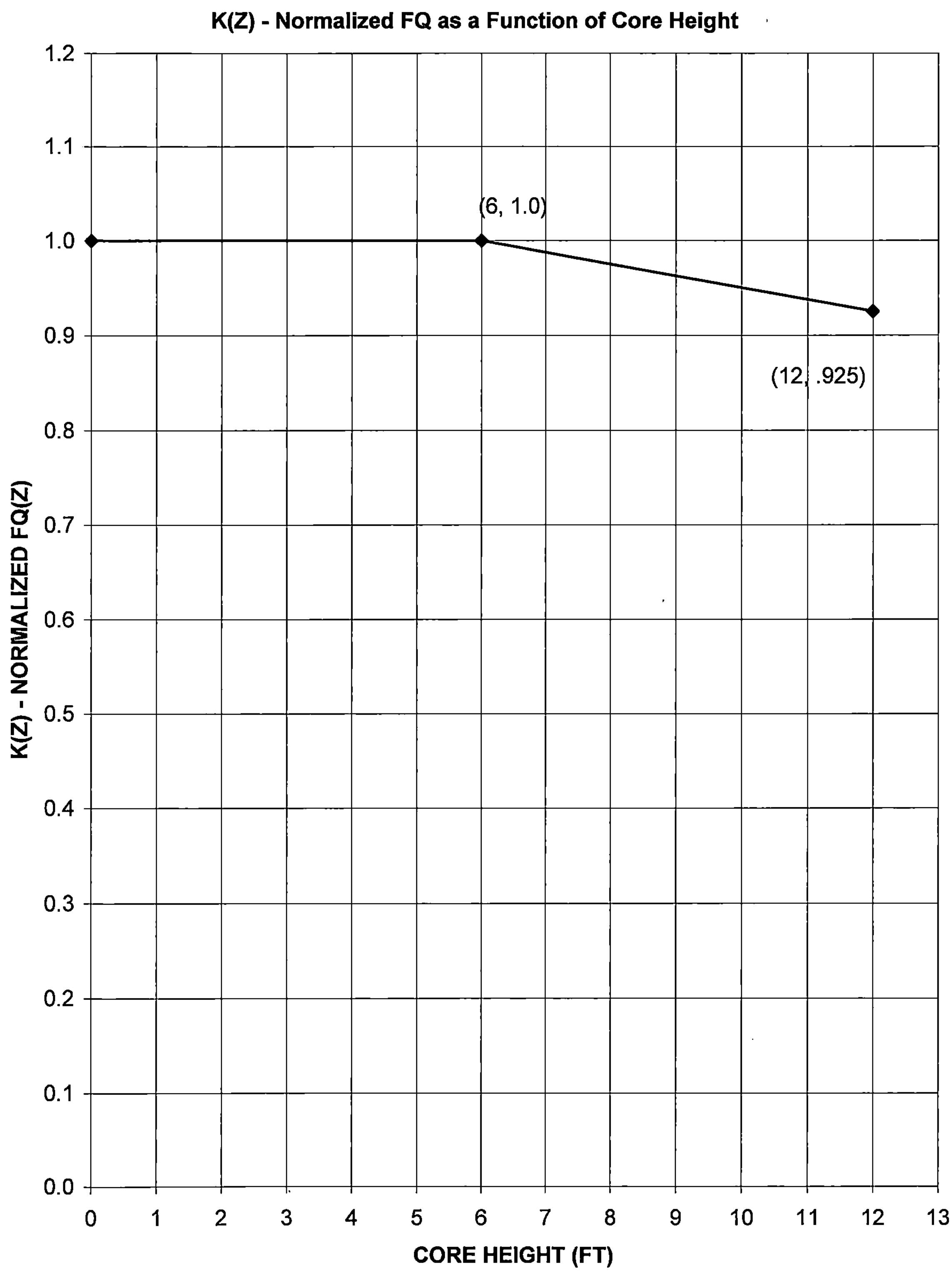
COLR Table 3.2-1

N2C25 Normal Operation N(Z)

NODE	HEIGHT (FEET)	15000 to 17000 MWD/MTU	17000 to 19000 MWD/MTU	19000 to EOR MWD/MTU
10	10.2	1.106	1.106	1.109
11	10.0	1.111	1.107	1.110
12	9.8	1.115	1.111	1.112
13	9.6	1.118	1.117	1.118
14	9.4	1.120	1.120	1.119
15	9.2	1.126	1.126	1.124
16	9.0	1.136	1.137	1.138
17	8.8	1.149	1.149	1.155
18	8.6	1.153	1.152	1.161
19	8.4	1.162	1.161	1.170
20	8.2	1.183	1.183	1.189
21	8.0	1.197	1.200	1.203
22	7.8	1.200	1.203	1.206
23	7.6	1.207	1.209	1.211
24	7.4	1.221	1.222	1.219
25	7.2	1.230	1.230	1.225
26	7.0	1.233	1.232	1.225
27	6.8	1.234	1.235	1.226
28	6.6	1.234	1.234	1.224
29	6.4	1.233	1.231	1.218
30	6.2	1.229	1.224	1.208
31	6.0	1.230	1.223	1.204
32	5.8	1.226	1.218	1.201
33	5.6	1.214	1.203	1.195
34	5.4	1.200	1.189	1.190
35	5.2	1.193	1.184	1.186
36	5.0	1.189	1.179	1.179
37	4.8	1.184	1.171	1.168
38	4.6	1.182	1.164	1.161
39	4.4	1.183	1.160	1.159
40	4.2	1.184	1.159	1.160
41	4.0	1.184	1.162	1.163
42	3.8	1.178	1.166	1.166
43	3.6	1.171	1.170	1.167
44	3.4	1.172	1.174	1.163
45	3.2	1.177	1.177	1.161
46	3.0	1.176	1.177	1.162
47	2.8	1.178	1.178	1.170
48	2.6	1.177	1.177	1.175
49	2.4	1.185	1.185	1.186
50	2.2	1.201	1.201	1.202
51	2.0	1.217	1.218	1.218
52	1.8	1.226	1.229	1.229

These decks are generated for normal operation flux maps that are typically taken at full power ARO. Additional N(z) decks may be generated, if necessary, consistent with the methodology described in the RPDC topical (Reference 7). EOR is defined as Hot Full Power End of Reactivity.

COLR Figure 3.2-1



3.2.2 Nuclear Enthalpy Rise Hot Channel Factor ($F^N_{\Delta H}$)

LCO 3.2.2 $F^N_{\Delta H}$ shall be within the limits specified below.

$$\mathbf{F^N_{\Delta H} \leq 1.587\{1 + 0.3(1 - P)\}}$$

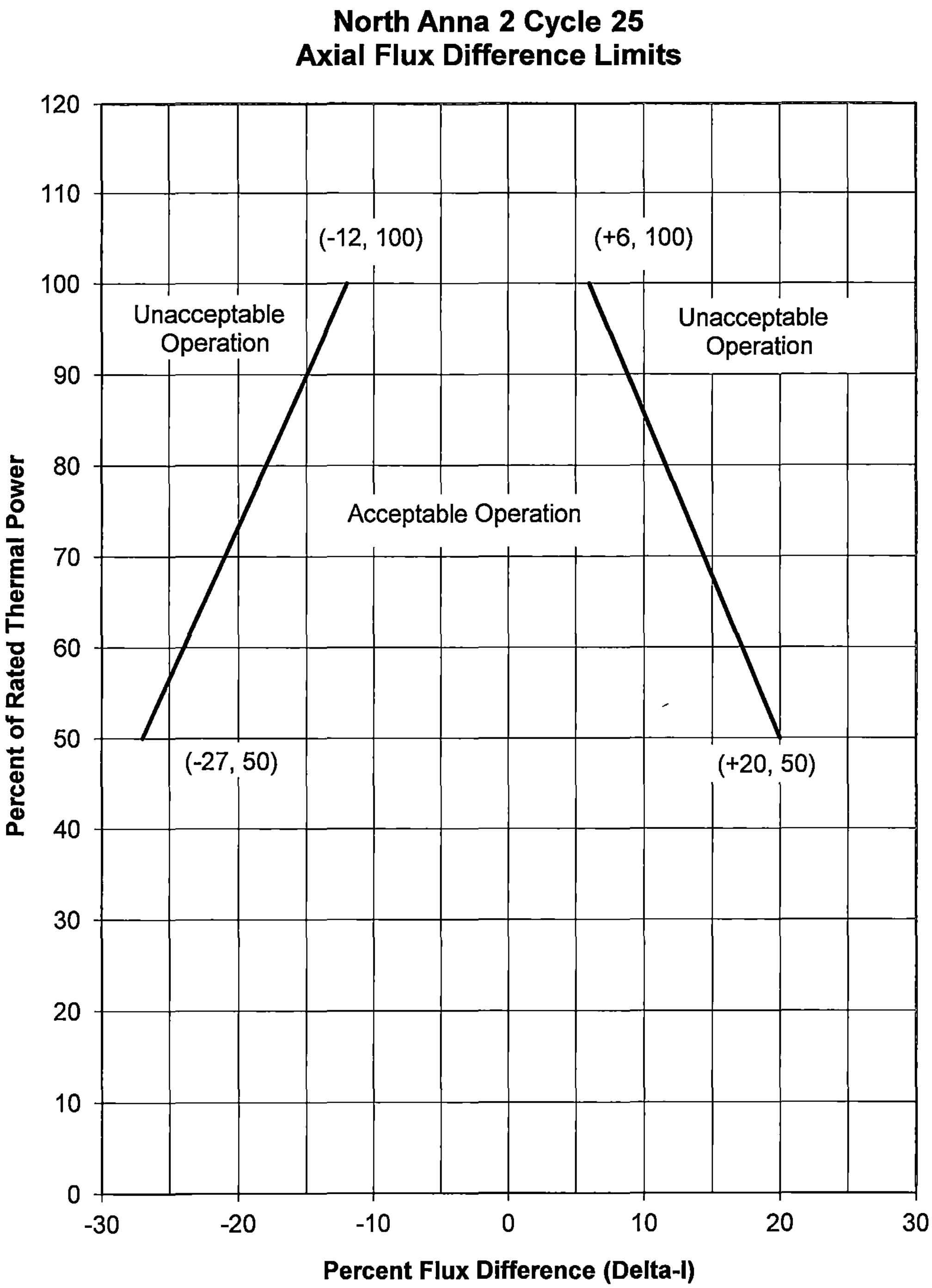
where: $P = \dfrac{THERMAL\ POWER}{RATED\ THERMAL\ POWER}$

SR 3.2.2.1 Verify $F^N_{\Delta H}$ is within limits specified above.

3.2.3 AXIAL FLUX DIFFERENCE (AFD)

LCO 3.2.3 The AFD in % flux difference units shall be maintained within the limits specified in **COLR Figure 3.2-2**.

COLR Figure 3.2-2



3.3 INSTRUMENTATION

3.3.1 Reactor Trip System (RTS) Instrumentation

TS Table 3.3.1-1 Note 1: Overtemperature ΔT

The Overtemperature ΔT Function Allowable Value shall not exceed the following nominal trip setpoint by more than 2% of ΔT span, with the numerical values of the parameters as specified below.

$$\Delta T \leq \Delta T_0 \left\{ K_1 - K_2 \frac{(1+\tau_1 s)}{(1+\tau_2 s)} [T - T'] + K_3 (P - P') - f_1(\Delta I) \right\}$$

where:
- ΔT is measured RCS ΔT, °F
- ΔT_0 is the indicated ΔT at RTP, °F
- s is the Laplace transform operator, sec^{-1}
- T is the measured RCS average temperature, °F
- T′ is the nominal T_{avg} at RTP, ≤ **586.8 °F**
- P is the measured pressurizer pressure, psig
- P′ is the nominal RCS operating pressure, ≥ **2235 psig**

$K_1 \leq$ **1.2715** $K_2 \geq$ **0.02174 /°F** $K_3 \geq$ **0.001145 /psig**

τ_1, τ_2 = time constants utilized in the lead-lag controller for T_{avg}

$\tau_1 \geq$ **23.75 sec** $\tau_2 \leq$ **4.4 sec**

$(1+\tau_1 s)/(1+\tau_2 s)$ = function generated by the lead-lag controller for T_{avg} dynamic compensation

$f_1(\Delta I) \geq$	**0.0291**{-13.0 – ($q_t - q_b$)}	when ($q_t - q_b$) < **–13.0%** RTP
	0	when **–13.0%** RTP ≤ ($q_t - q_b$) ≤ **+7.0%** RTP
	0.0251{($q_t - q_b$) – **7.0**}	when ($q_t - q_b$) > **+7.0%** RTP

Where q_t and q_b are percent RTP in the upper and lower halves of the core, respectively, and $q_t + q_b$ is the total THERMAL POWER in percent RTP.

TS Table 3.3.1-1 Note 2: Overpower ΔT

The Overpower ΔT Function Allowable Value shall not exceed the following nominal trip setpoint by more than 2% of ΔT span, with the numerical values of the parameters as specified below.

$$\Delta T \leq \Delta T_0 \left\{ K_4 - K_5 \left[\frac{\tau_3 s}{1+\tau_3 s} \right] T - K_6 [T - T'] - f_2(\Delta I) \right\}$$

where: ΔT is measured RCS ΔT, °F.

ΔT_0 is the indicated ΔT at RTP, °F.

s is the Laplace transform operator, sec^{-1}.

T is the measured RCS average temperature, °F.

T′ is the nominal T_{avg} at RTP, **≤ 586.8 °F.**

K_4 ≤ **1.0865**

K_5 ≥ **0.0198 /°F** for increasing T_{avg}		K_6 ≥ **0.00162 /°F**	when T > T′
0 /°F for decreasing T_{avg}		**0 /°F**	when T ≤ T′

τ_3 = time constant utilized in the rate lag controller for T_{avg}

τ_3 **≥ 9.5 sec**

$\tau_3 s/(1+\tau_3 s)$ = function generated by the rate lag controller for T_{avg} dynamic compensation

$f_2(\Delta I)$ = **0, for all ΔI.**

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.1 RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits

LCO 3.4.1 RCS DNB parameters for pressurizer pressure, RCS average temperature, and RCS total flow rate shall be within the limits specified below:

a. Pressurizer pressure is greater than or equal to **2205 psig;**

b. RCS average temperature is less than or equal to **591 °F**; and

c. RCS total flow rate is greater than or equal to **295,000 gpm**.

SR 3.4.1.1 Verify pressurizer pressure is greater than or equal to **2205 psig**.

SR 3.4.1.2 Verify RCS average temperature is less than or equal to **591 °F**.

SR 3.4.1.3 Verify RCS total flow rate is greater than or equal to **295,000 gpm**.

SR 3.4.1.4 ------------------------------NOTE---
Not required to be performed until 30 days after ≥ 90% RTP.

Verify by precision heat balance that RCS total flow rate is ≥ **295,000 gpm**.

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

3.5.6 Boron Injection Tank (BIT)

Required Action B.2 Borate to a SDM ≥ **1.77 % Δk/k at 200 °F**.

3.9 REFUELING OPERATIONS

3.9.1 Boron Concentration

LCO 3.9.1 Boron concentrations of the Reactor Coolant System (RCS), the refueling canal, and the refueling cavity shall be maintained ≥ **2600 ppm**.

SR 3.9.1.1 Verify boron concentration is within the limit specified above.

TRM 3.1 REACTIVITY CONTROL SYSTEMS

TR 3.1.1 Boration Flow Paths – Operating

Required Action D.2 Borate to a SHUTDOWN MARGIN ≥ **1.77 % Δk/k at 200 °F,** after xenon decay.