

ATTACHMENT 1

NORTH ANNA UNIT 2, CYCLE 5

RPDC CORE SURVEILLANCE REPORT FOR FQ = 2.20

REVISION 1

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## NORTH ANNA UNIT 2 CYCLE 5 CORE SURVEILLANCE REPORT, REV. 1

This Core Surveillance Report is provided in accordance with Section 6.9.1.7 of the North Anna Unit 2 Technical Specifications.

The Burnup-dependent Cycle 5  $N(z)$  function for Technical Specification 4.2.2.2 is shown in Figures 1-6.  $N(z)$  was calculated according to the procedure of VEP-NE-1A.

The  $N(z)$  function\* will be used to confirm that the heat flux hot channel factor,  $FQ(z)$ , will be limited to the Technical Specifications values of

$$FQ(z) \leq \frac{2.20}{P} K(z), \quad P > 0.5 \text{ and}$$

$$FQ(z) \leq 4.40 K(z), \quad P \leq 0.5.$$

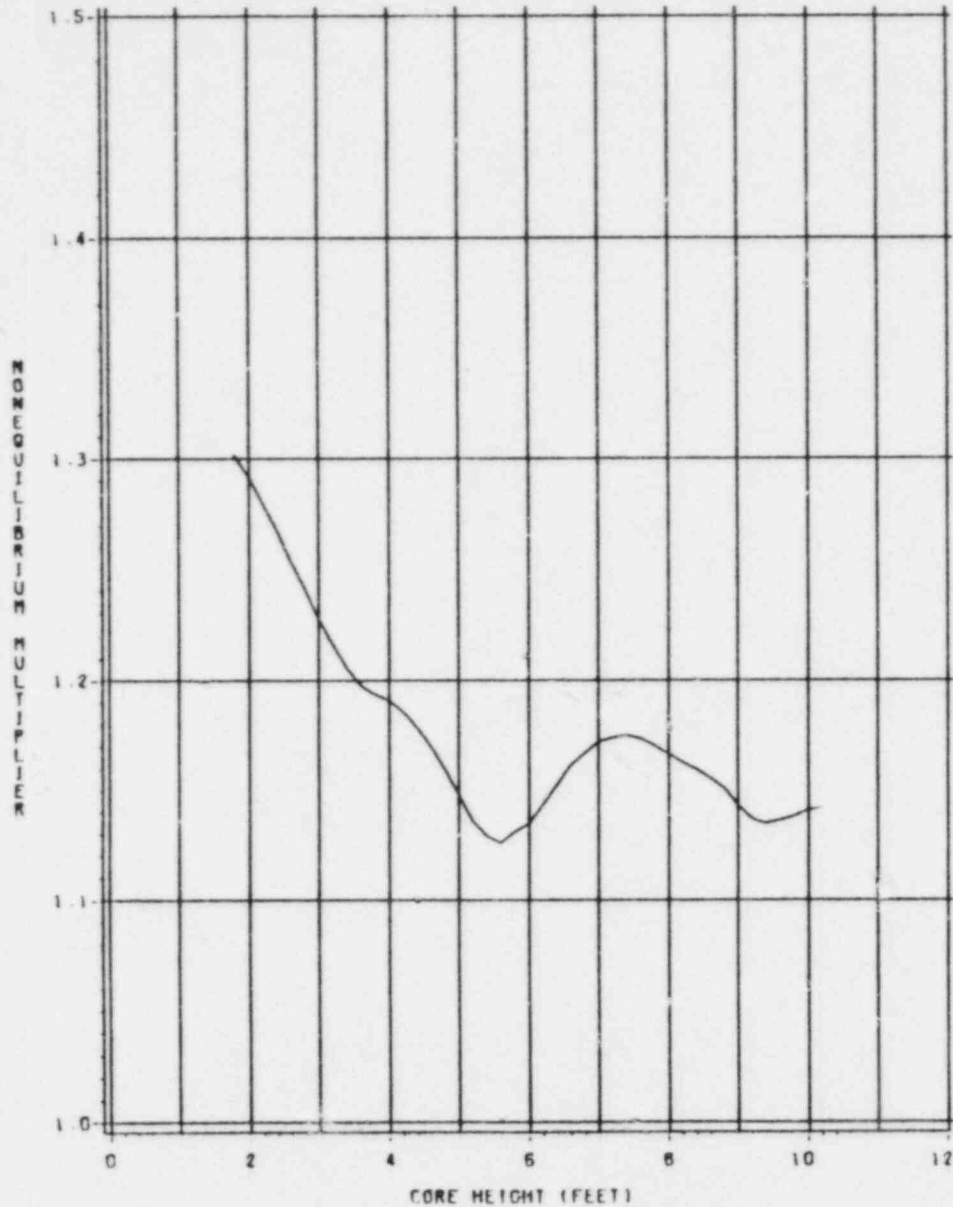
The Cycle 5 Axial Flux Difference (AFD) limits for Technical Specification 3.2.1 are shown in Figure 7. These limits were calculated according to the methods of VEP-NE-1A and are the same as the cycle 4 limits.

The limits on Axial Flux Difference assure that the  $FQ(z)$  upper bound envelope is not exceeded during either normal operation or in the event of xenon redistribution following power changes.

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\* The  $N(z)$  function, when applied to a power distribution measured under equilibrium conditions, demonstrates that the initial conditions assumed in the LOCA analysis are met, along with the ECCS acceptance criteria of 10CFR50.46.

TOP AND BOTTOM 15% EXCLUDED  
AS PER TECHNICAL SPECIFICATION 4.2.2.2.G

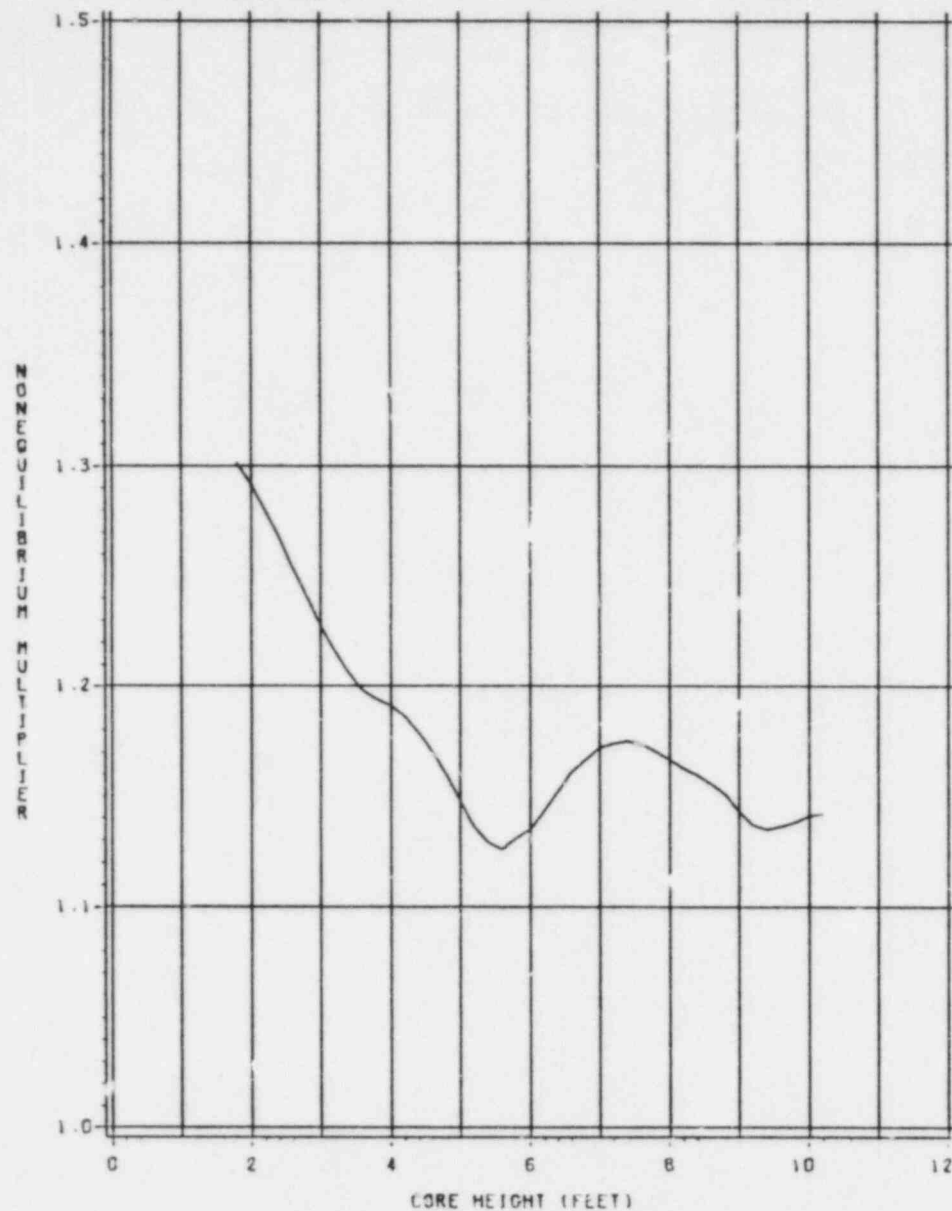


N(Z) FUNCTION  
NORTH ANNA UNIT 2 CYCLE 5 AT 2775 MW  
BURNUPS 500 TO 1,000 MWD/MTU

HEIGHT (FEET)	N(Z)	HEIGHT (FEET)	N(Z)
0.0	.	6.2	1.143
0.2	.	6.4	1.152
0.4	.	6.6	1.161
0.6	.	6.8	1.167
0.8	.	7.0	1.172
1.0	.	7.2	1.174
1.2	.	7.4	1.175
1.4	.	7.6	1.174
1.6	.	7.8	1.171
1.8	1.302	8.0	1.167
2.0	1.292	8.2	1.163
2.2	1.280	8.4	1.160
2.4	1.268	8.6	1.156
2.6	1.254	8.8	1.151
2.8	1.241	9.0	1.143
3.0	1.228	9.2	1.137
3.2	1.217	9.4	1.135
3.4	1.206	9.6	1.136
3.6	1.198	9.8	1.138
3.8	1.194	10.0	1.141
4.0	1.191	10.2	1.142
4.2	1.186	10.4	.
4.4	1.179	10.6	.
4.6	1.171	10.8	.
4.8	1.160	11.0	.
5.0	1.148	11.2	.
5.2	1.136	11.4	.
5.4	1.129	11.6	.
5.6	1.126	11.8	.
5.8	1.131	12.0	.
6.0	1.135		

Figure 1 - N(Z) Function for N2C5 at 2775 MW  
from 500 to 1,000 MWD/MTU Burnup

TOP AND BOTTOM 15% EXCLUDED  
AS PER TECHNICAL SPECIFICATION 4.2.2.2.G



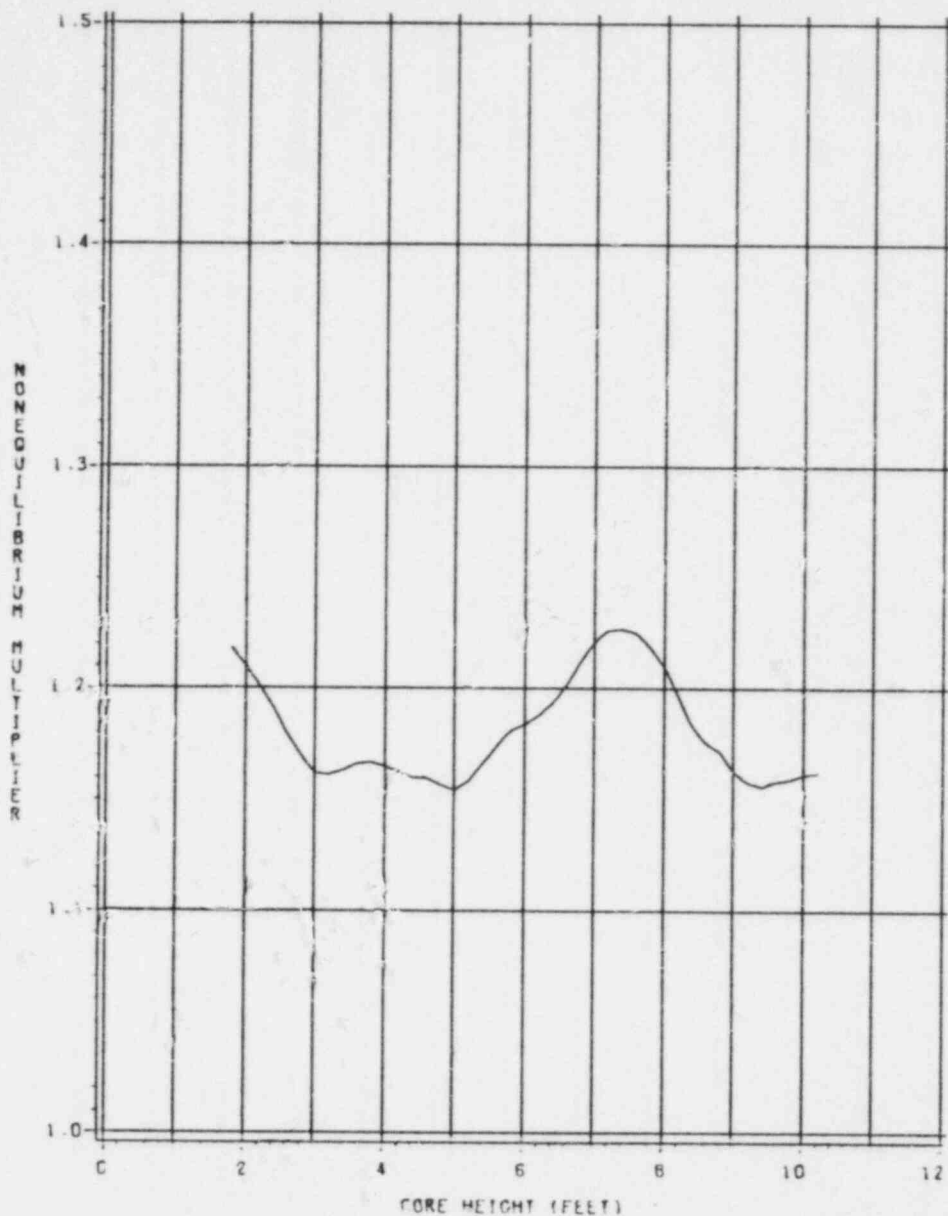
N(Z) FUNCTION  
NORTH ANNA UNIT 2 CYCLE 5 AT 2775 MW  
BURNUPS 1,000 TO 3,000 MWD/MTU

HEIGHT (FEET)	N(Z)	HEIGHT (FEET)	N(Z)
0.0	.	6.2	1.143
0.2	.	6.4	1.152
0.4	.	6.6	1.161
0.6	.	6.8	1.167
0.8	.	7.0	1.172
1.0	.	7.2	1.174
1.2	.	7.4	1.175
1.4	.	7.6	1.174
1.6	.	7.8	1.171
1.8	1.302	8.0	1.167
2.0	1.292	8.2	1.163
2.2	1.280	8.4	1.160
2.4	1.268	8.6	1.156
2.6	1.254	8.8	1.151
2.8	1.241	9.0	1.143
3.0	1.228	9.2	1.137
3.2	1.217	9.4	1.135
3.4	1.206	9.6	1.136
3.6	1.198	9.8	1.138
3.8	1.194	10.0	1.141
4.0	1.191	10.2	1.142
4.2	1.186	10.4	.
4.4	1.179	10.6	.
4.6	1.171	10.8	.
4.8	1.160	11.0	.
5.0	1.148	11.2	.
5.2	1.136	11.4	.
5.4	1.129	11.6	.
5.6	1.126	11.8	.
5.8	1.131	12.0	.
6.0	1.135		

Figure 2 - N(Z) Function for N2C5 at 2775 MW  
from 1,000 to 3,000 MWD/MTU Burnup

TOP AND BOTTOM 15% EXCLUDED  
AS PER TECHNICAL SPECIFICATION 4.2.2.2.G

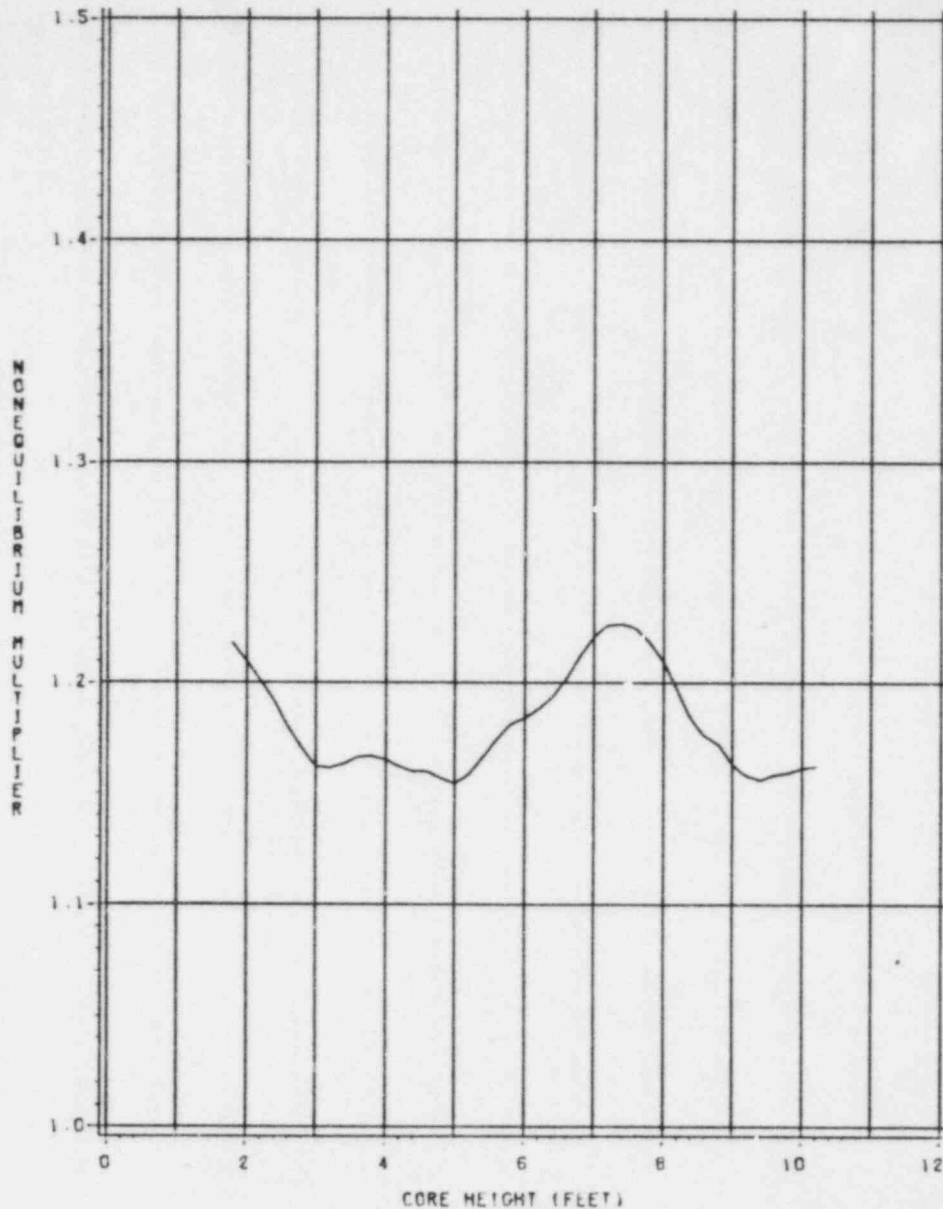
N(Z) FUNCTION  
NORTH ANNA UNIT 2 CYCLE 5 AT 2775 MW  
BURNUPS 3,000 TO 5,000 MWD/MTU



HEIGHT (FEET)	N(Z)	HEIGHT (FEET)	N(Z)
0.0	.	6.2	1.188
0.2	.	6.4	1.193
0.4	.	6.6	1.201
0.6	.	6.8	1.212
0.8	.	7.0	1.221
1.0	.	7.2	1.226
1.2	.	7.4	1.227
1.4	.	7.6	1.225
1.6	.	7.8	1.219
1.8	1.218	8.0	1.210
2.0	1.210	8.2	1.197
2.2	1.201	8.4	1.184
2.4	1.192	8.6	1.176
2.6	1.180	8.8	1.172
2.8	1.170	9.0	1.163
3.0	1.162	9.2	1.158
3.2	1.161	9.4	1.156
3.4	1.163	9.6	1.158
3.6	1.166	9.8	1.159
3.8	1.167	10.0	1.161
4.0	1.165	10.2	1.162
4.2	1.162	10.4	.
4.4	1.160	10.6	.
4.6	1.160	10.8	.
4.8	1.157	11.0	.
5.0	1.154	11.2	.
5.2	1.158	11.4	.
5.4	1.166	11.6	.
5.6	1.174	11.8	.
5.8	1.181	12.0	.
6.0	1.184		

Figure 3 - N(Z) Function for N2C5 at 2775 MW  
from 3,000 to 5,000 MWD/MTU Burnup

TOP AND BOTTOM 15% EXCLUDED  
AS PER TECHNICAL SPECIFICATION 4.2.2.2.G

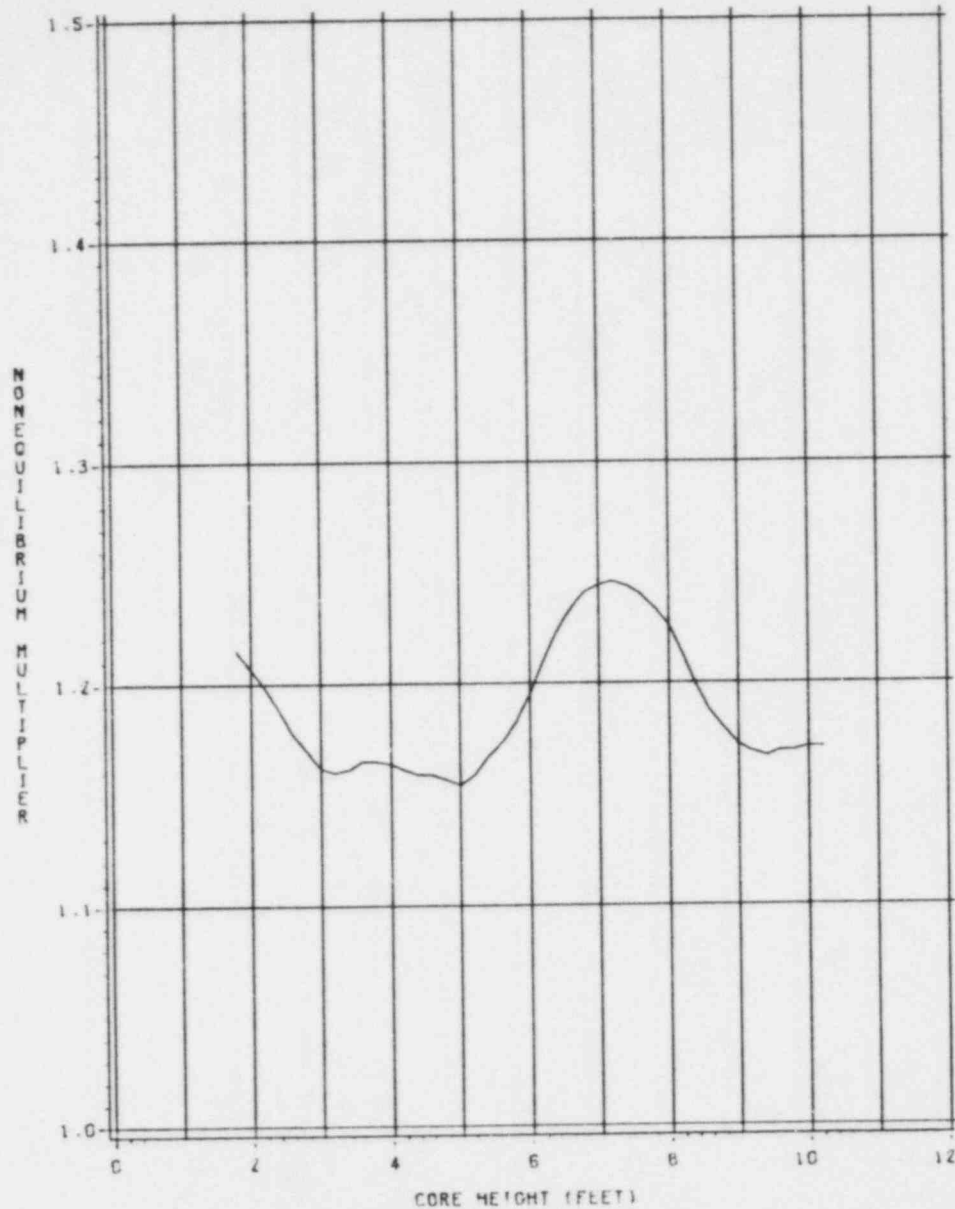


N(Z) FUNCTION  
NORTH ANNA UNIT 2 CYCLE 5 at 2775 MW  
BURNUPS BETWEEN 5,000 AND 7,000 MWD/MTU

HEIGHT (FEET)	N(Z)	HEIGHT (FEET)	N(Z)
0.0	.	6.2	1.188
0.2	.	6.4	1.193
0.4	.	6.6	1.201
0.6	.	6.8	1.212
0.8	.	7.0	1.221
1.0	.	7.2	1.226
1.2	.	7.4	1.227
1.4	.	7.6	1.225
1.6	.	7.8	1.219
1.8	1.218	8.0	1.210
2.0	1.210	8.2	1.197
2.2	1.201	8.4	1.184
2.4	1.192	8.6	1.176
2.6	1.180	8.8	1.172
2.8	1.170	9.0	1.163
3.0	1.162	9.2	1.158
3.2	1.161	9.4	1.156
3.4	1.163	9.6	1.158
3.6	1.166	9.8	1.159
3.8	1.167	10.0	1.161
4.0	1.165	10.2	1.162
4.2	1.162	10.4	.
4.4	1.160	10.6	.
4.6	1.160	10.8	.
4.8	1.157	11.0	.
5.0	1.154	11.2	.
5.2	1.158	11.4	.
5.4	1.166	11.6	.
5.6	1.174	11.8	.
5.8	1.181	12.0	.
6.0	1.184		

Figure 4 - N(Z) Function for N2C5 at 2775 MW  
from 5,000 to 7,000 MWD/MTU Burnup

TOP AND BOTTOM 15% EXCLUDED  
AS PER TECHNICAL SPECIFICATION 4.2.2.2.G

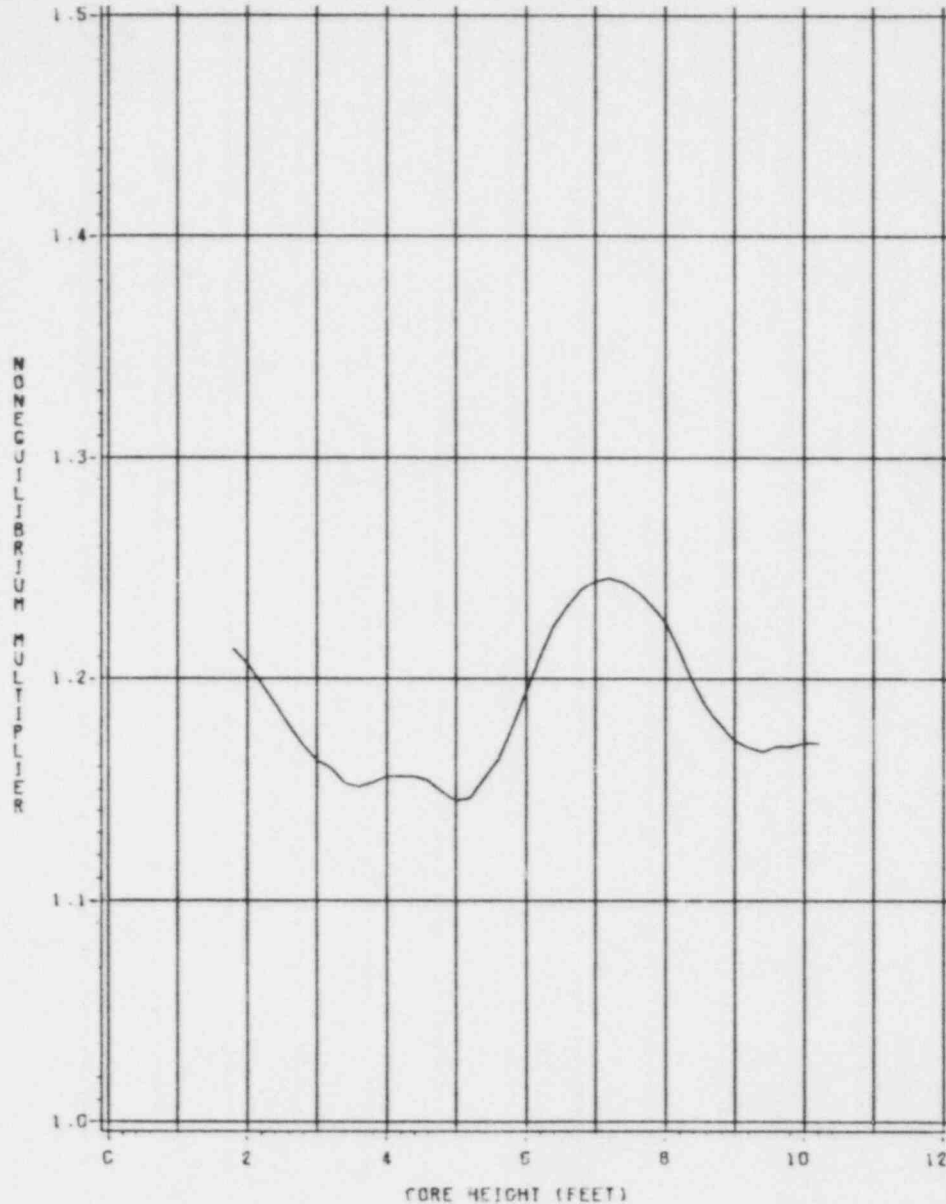


N(Z) FUNCTION  
NORTH ANNA UNIT 2 CYCLE 5 AT 2775 MW  
BURNUPS 7,000 TO 14,500 MWD/MTU

HEIGHT (FEET)	N(Z)	HEIGHT (FEET)	N(Z)
0.0	.	6.2	1.210
0.2	.	6.4	1.223
0.4	.	6.6	1.233
0.6	.	6.8	1.241
0.8	.	7.0	1.244
1.0	.	7.2	1.246
1.2	.	7.4	1.244
1.4	.	7.6	1.240
1.6	.	7.8	1.234
1.8	1.215	8.0	1.226
2.0	1.207	8.2	1.213
2.2	1.199	8.4	1.199
2.4	1.189	8.6	1.187
2.6	1.178	8.8	1.179
2.8	1.170	9.0	1.172
3.0	1.162	9.2	1.169
3.2	1.160	9.4	1.167
3.4	1.161	9.6	1.169
3.6	1.165	9.8	1.169
3.8	1.165	10.0	1.171
4.0	1.164	10.2	1.171
4.2	1.161	10.4	.
4.4	1.159	10.6	.
4.6	1.159	10.8	.
4.8	1.157	11.0	.
5.0	1.154	11.2	.
5.2	1.158	11.4	.
5.4	1.167	11.6	.
5.6	1.173	11.8	.
5.8	1.182	12.0	.
6.0	1.195		

Figure 5 - N(Z) Function for N2C5 at 2775 MW  
from 7,000 to 14,500 MWD/MTU Burnup

TOP AND BOTTOM 15% EXCLUDED  
AS PER TECHNICAL SPECIFICATION 4.2.2.2.G



N(Z) FUNCTION  
NORTH ANNA UNIT 2 CYCLE 5 AT 2775 MW  
BURNUPS GREATER THAN 14,500 MWD/MTU

HEIGHT (FEET)	N(Z)	HEIGHT (FEET)	N(Z)
0.0	.	6.2	1.210
0.2	.	6.4	1.224
0.4	.	6.6	1.233
0.6	.	6.8	1.241
0.8	.	7.0	1.244
1.0	.	7.2	1.246
1.2	.	7.4	1.244
1.4	.	7.6	1.240
1.6	.	7.8	1.234
1.8	1.214	8.0	1.226
2.0	1.207	8.2	1.213
2.2	1.198	8.4	1.199
2.4	1.189	8.6	1.187
2.6	1.179	8.8	1.179
2.8	1.170	9.0	1.172
3.0	1.163	9.2	1.169
3.2	1.160	9.4	1.167
3.4	1.153	9.6	1.169
3.6	1.151	9.8	1.169
3.8	1.153	10.0	1.171
4.0	1.156	10.2	1.171
4.2	1.156	10.4	.
4.4	1.156	10.6	.
4.6	1.154	10.8	.
4.8	1.149	11.0	.
5.0	1.145	11.2	.
5.2	1.146	11.4	.
5.4	1.155	11.6	.
5.6	1.163	11.8	.
5.8	1.177	12.0	.
6.0	1.194		

Figure 6 - N(Z) Function for N2C5 at 2775 MW  
greater than 14,500 MWD/MTU Burnup



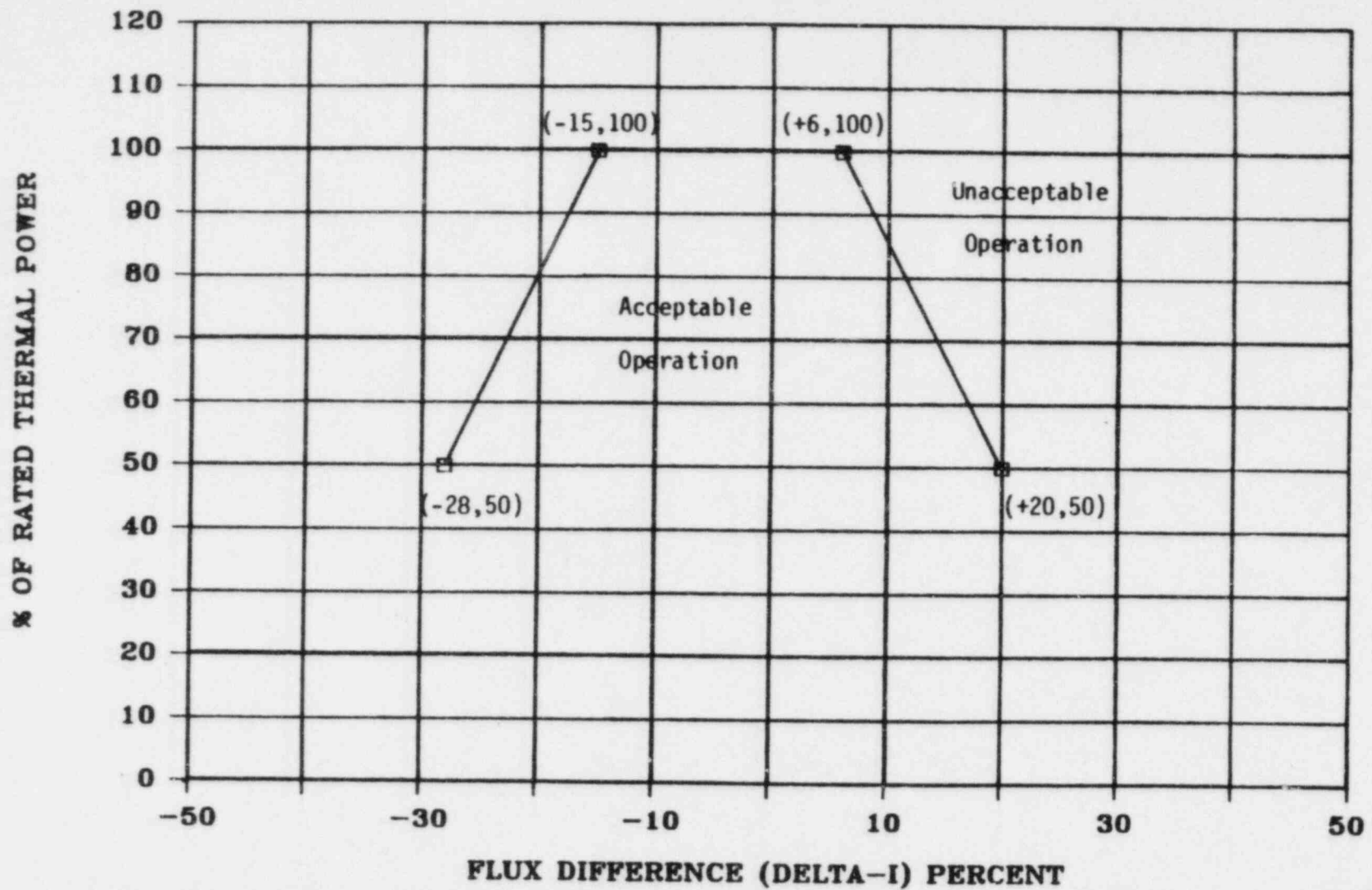


Figure 7 - Axial Flux Difference Limits as a Function of Rated Thermal Power  
for North Anna Unit 2 Cycle 5