Dominion Nuclear Connecticut, Inc.
Millstone Power Station
Rope Ferry Road
Waterford, CT 06385

Dominion

MAY 31 2001

Docket No. 50-423
B18413

RE: TS 6.9.1.6

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Millstone Nuclear Power Station, Unit No. 3
Core Operating Limits Report, Cycle 8

Pursuant to Technical Specification 6.9.1.6, Dominion Nuclear Connecticut, Inc., hereby submits the Core Operating Limits Report (COLR) for Cycle 8. The COLR is enclosed as Attachment 1.

There are no regulatory commitments contained within this letter.

If you have any additional questions concerning this submittal, please contact Mr. David W. Dodson at (860) 447-1791, extension 2346.

Very truly yours,

DOMINION NUCLEAR CONNECTICUT, INC.

Raymond P. Necci - Vice President
Nuclear Technical Services/Millstone

Attachment: Core Operating Limits Report, Cycle 8

cc: H. J. Miller, Region I Administrator
V. Nerses, NRC Senior Project Manager, Millstone Unit No. 3
A. C. Cerne, Senior Resident Inspector, Millstone Unit No. 3

A001

Docket No. 50-423
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Attachment 1

Millstone Nuclear Power Station, Unit No. 3

Core Operating Limits Report, Cycle 8

APPENDIX A

MILLSTONE UNIT 3
CYCLE 8
CORE OPERATING LIMITS REPORT

Revision 1

PORC APPROVED

2/3-01-031 3/5/01

PORC # / Date

Approval

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Millstone Unit 3
Cycle 8
Core Operating Limits Report

1.0 Core Operating Limits Report

This Core Operating Limits Report (COLR) for Millstone Unit 3 Cycle 8 has been prepared in accordance with the requirements of Technical Specification 6.9.1.6.a. The Technical Specifications affected by this report are listed below.

3/4.1.1.3	Moderator Temperature Coefficient
3/4.1.3.5	Shutdown Rod Insertion Limit
3/4.1.3.6	Control Rod Insertion Limits (Four Loop)
3/4.2.1.1	Axial Flux Difference - Four Loop
3/4.2.2.1	Heat Flux Hot Channel Factor - Four Loop
3/4.2.3.1	Nuclear Enthalpy Rise Hot Channel Factor - Four Loop
3/4.3.5	Shutdown Margin Monitor Alarm Setpoint

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 have been developed using the NRC-approved methodologies specified in Technical Specification 6.9.1.6.b. Limits for N-1 loop operation are not provided. Power operation in N-1 loop conditions is not allowed for Cycle 8.

2.1 Moderator Temperature Coefficient (Specification 3/4.1.1.3)

2.1.1 The Moderator Temperature Coefficient (MTC) limits are as follows:

- The BOL/ARO/0% - 70% RTP MTC shall be less positive than + 0.5 x 10^{-4} $\Delta k/k/°F$. Above 70% RTP, the MTC limit is a linear ramp to 0 $\Delta k/k/°F$ at 100% RTP.
- The EOL/ARO/RTP MTC shall be less negative than - 5.65 x 10^{-4} $\Delta k/k/°F$.

2.1.2 The MTC surveillance limit is as follows:

- The 300 ppm/ARO/RTP MTC should be less negative than or equal to -4.9×10^{-4} $\Delta k/k/°F$,

  where: BOL stands for Beginning Of Cycle Life
  ARO stands for All Rods Out
  HZP stands for Hot Zero Power
  EOL stands for End Of Cycle Life
  RTP stands for Rated Thermal Power.

2.2 Shutdown Rod Insertion Limit (Specification 3/4.1.3.5)

- The shutdown rods shall be at least 222 steps withdrawn (inclusive).

2.3 Control Rod Insertion Limits (Specification 3/4.1.3.6)

- The control rod banks shall be limited in physical insertion as shown in Figure 1 for four-loop operation.

2.4 Axial Flux Difference (Four - Loop Operation) (Specification 3/4.2.1.1)

2.4.1 The Axial Flux Difference (AFD) limits are provided in Figure 2.

2.4.2 The AFD target band during base load operation is $\pm$ 5%.

2.4.3 The minimum allowable (nuclear design) power level for base load operation (APL^{ND}) is 80% of Rated Thermal Power.

2.5 Section Deleted

2.6 Heat Flux Hot Channel Factor (Four-Loop Operation) - $F_Q(Z)$ (Specification 3/4.2.2.1)

$$F_Q(Z) \leq \frac{F^{RTP}_Q}{P} * K(Z) \qquad \text{for } P > 0.5$$

$$F_Q(Z) \leq \frac{F^{RTP}_Q}{0.5} * K(Z) \qquad \text{for } P \leq 0.5$$

where: $P = \frac{\text{Thermal Power}}{\text{Rated Thermal Power}}$

2.6.1 $F^{RTP}_Q = 2.60$.

2.6.2 K(Z) is provided in Figure 3.

2.6.3* W(Z) values for 4-Loop RAOC operation are provided in Table 1. Note that the W(Z) values at Axial Mesh 1 are at the top of the core. The Cycle 8 burnup dependent RAOC W(Z) values are valid over the range of burnup from 0 to 21,400 MWD/MTU.

2.6.4* W(Z) values for 4-Loop Base Load (BL) operation are provided in Table 2. Note that the W(Z) values at Axial Mesh 1 are at the top of the core. The Cycle 8 burnup dependent BL W(Z) values are valid over the range of burnup from 0 to 21,400 MWD/MTU.

2.6.5 A 2% factor shall be used for surveillance requirements 4.2.2.1.2 and 4.2.2.1.4 .

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* Sections 2.6.3 and 2.6.4 are prepared by NU.

2.7 Heat Flux Hot Channel Factor Surveillance (Four-Loop Operation) - $F_Q(Z)$ (Specification 3/4.2.2.1.2)

$$F^M_Q(Z) \leq \frac{F^{RTP}_Q}{P * W(Z)} * K(Z) \quad \text{for } P > 0.5$$

$$F^M_Q(Z) \leq \frac{F^{RTP}_Q}{0.5 * W(Z)} * K(Z) \quad \text{for } P \leq 0.5$$

where: $P = \frac{\text{Thermal Power}}{\text{Rated Thermal Power}}$

2.8 Section Deleted

2.9 Section Deleted

2.10 Nuclear Enthalpy Rise Hot Channel Factor (Four-Loop Operation) - $F^N_{\Delta H}$ (Specification 3/4.2.3.1)

$$F^N_{\Delta H} \leq F^{RTP}_{\Delta H} * (1 + PF_{\Delta H} * [1 - P])$$

where: $P = \frac{\text{Thermal Power}}{\text{Rated Thermal Power}}$

2.10.1 $F^{RTP}_{\Delta H}$ = 1.54 for VANTAGE 5H fuel assembly

$F^{RTP}_{\Delta H}$ = 1.58 for Robust Fuel Assembly (RFA).

2.10.2 $PF_{\Delta H}$ = 0.3 for $P < 1.0$.

2.11 Section Deleted

2.12 Shutdown Margin Monitor Alarm Setpoint (Specification 3/4.3.5) +

The Shutdown Margin Monitor (SMM) minimum count rate and Alarm Ratio Setting to meet LIMITING CONDITION FOR OPERATION (LCO) 3.3.5 shall be as shown below.

Tech. Spec. LCO	SMM Alarm Ratio Setting	Min. Count Rate (counts/sec)
3.3.5.a	1.50	1.0
	1.25	0.6
3.3.5.b.1	1.50	0.50
	1.25	0.35
3.3.5.b.2	1.50	0.35
	1.25	0.25

The combination of the SMM Alarm Ratio setting and minimum count rate accounts for the time lag between the indicated and actual count rates, as well as other uncertainties. The specified SMM Alarm Ratio setting ensures that the assumption that an alarm is generated at flux doubling in the Boron Dilution Event analysis remains valid. The count rate is displayed on the SMM.

+ Section 2.12 was prepared by NU based on boron dilution analyses performed by Westinghouse.

Figure 1

Control Rod Bank Insertion Limits versus Thermal Power for Four Loop Operation

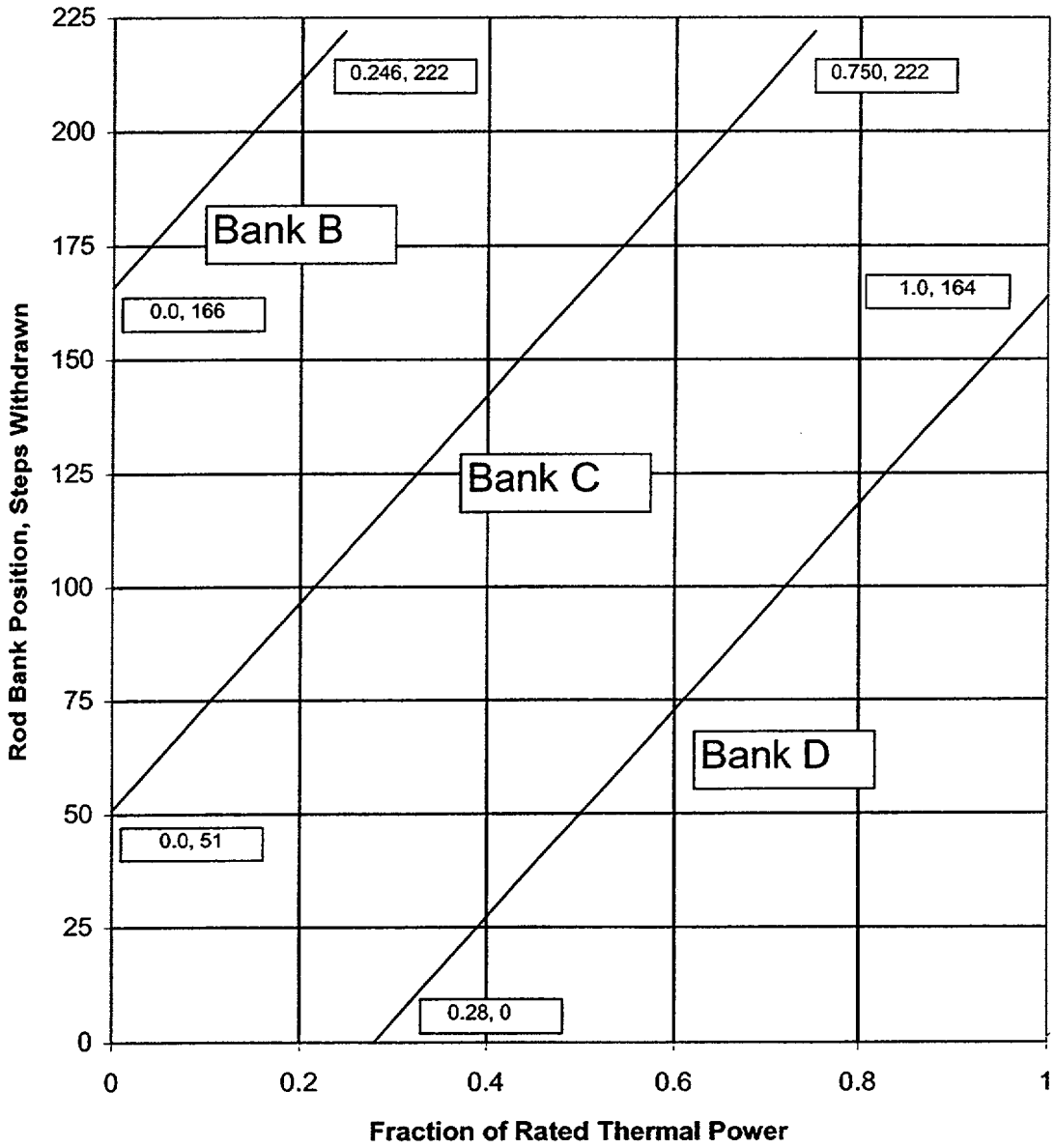

Figure 2
Axial Flux Difference Limits as a Function of Rated Thermal Power for Four Loop Operation

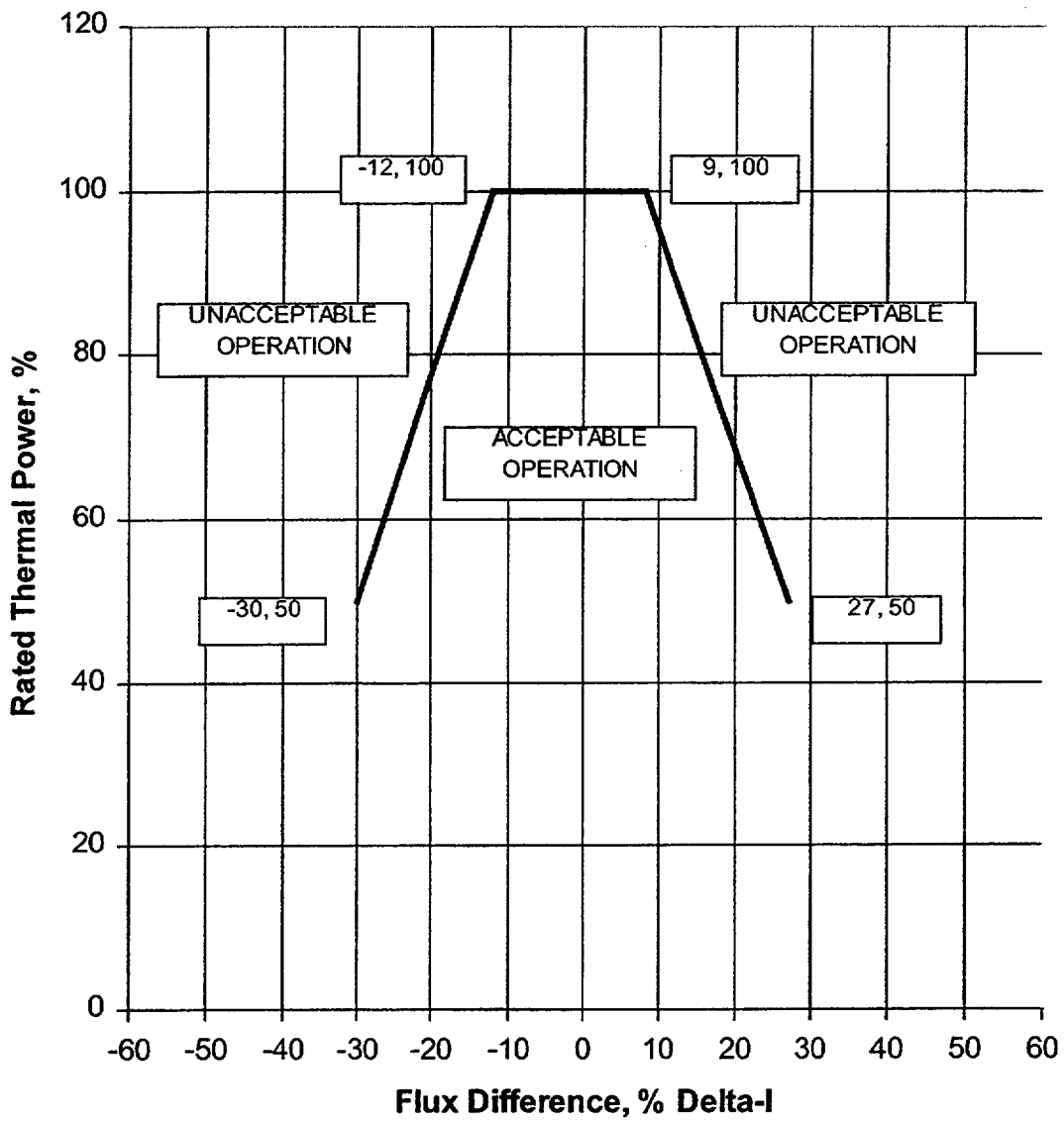

Figure 3

K(Z) - Normalized $F_Q(Z)$ as a Function of Core Height for Four Loop Operation

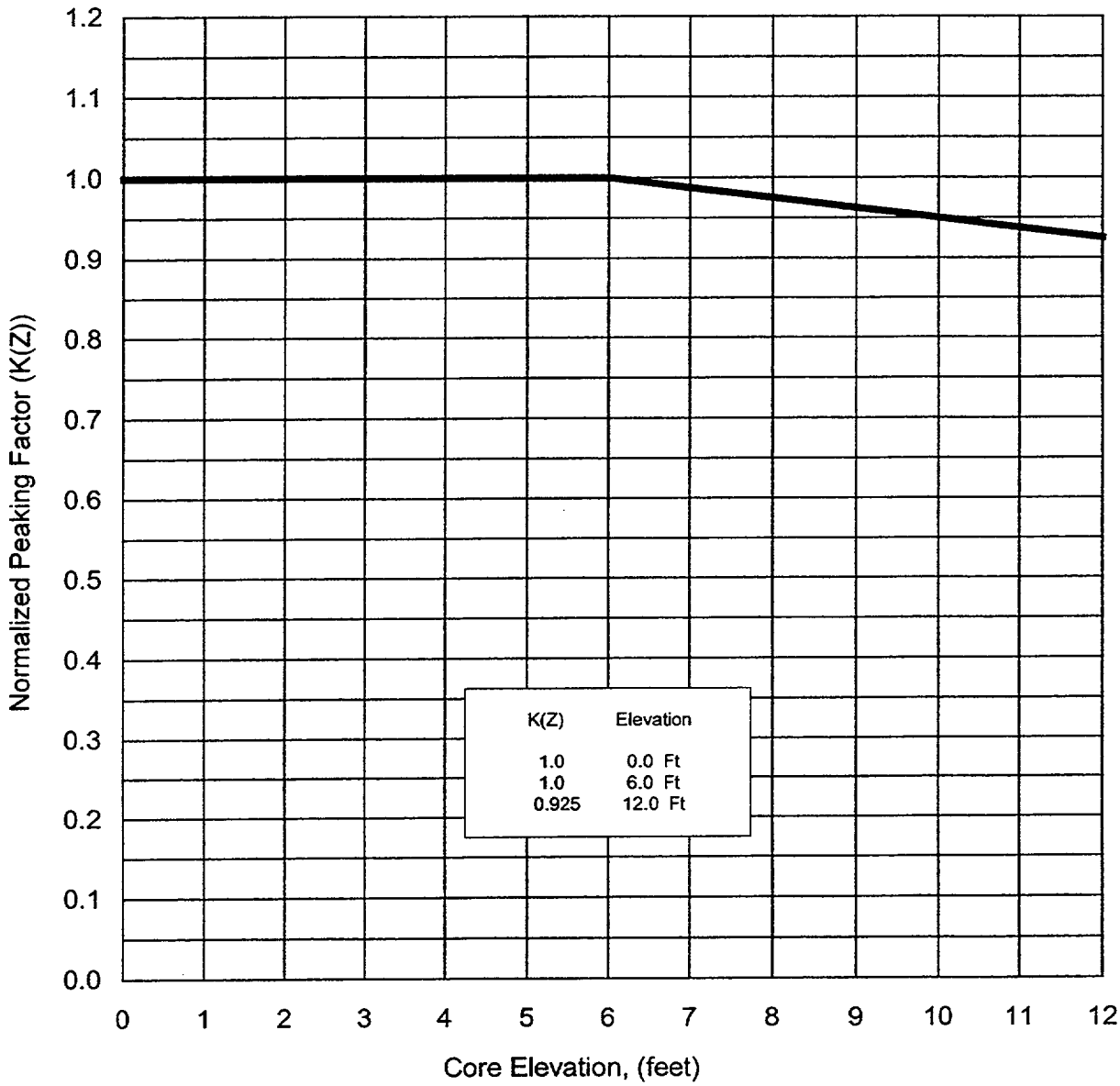

Table 1
Four Loop RAOC W(Z) Function
Millstone Unit 3 - Cycle 8
-12/+9 AFD at 100% RTP

Mesh No.	Axial * Height	Burnup 150 MWD/MTU	Burnup 3000 MWD/MTU	Burnup 10000 MWD/MTU	Burnup 18000 MWD/MTU
1	12.0000	1.0000	1.0000	1.0000	1.0000
2	11.8333	1.0000	1.0000	1.0000	1.0000
3	11.6667	1.0000	1.0000	1.0000	1.0000
4	11.5000	1.0000	1.0000	1.0000	1.0000
5	11.3333	1.0000	1.0000	1.0000	1.0000
6	11.1667	1.0000	1.0000	1.0000	1.0000
7	11.0000	1.0000	1.0000	1.0000	1.0000
8	10.8333	1.0000	1.0000	1.0000	1.0000
9	10.6667	1.0000	1.0000	1.0000	1.0000
10	10.5000	1.0000	1.0000	1.0000	1.0000
11	10.3333	1.3786	1.3539	1.3029	1.3145
12	10.1667	1.3647	1.3424	1.2920	1.3053
13	10.0000	1.3470	1.3374	1.2787	1.2932
14	9.8333	1.3332	1.3296	1.2631	1.2788
15	9.6667	1.3272	1.3140	1.2462	1.2629
16	9.5000	1.3168	1.2950	1.2307	1.2471
17	9.3333	1.2994	1.2733	1.2199	1.2354
18	9.1667	1.2784	1.2506	1.2140	1.2290
19	9.0000	1.2606	1.2326	1.2081	1.2224
20	8.8333	1.2463	1.2190	1.2030	1.2159
21	8.6667	1.2338	1.2084	1.2009	1.2119
22	8.5000	1.2208	1.2008	1.2012	1.2127
23	8.3333	1.2066	1.1935	1.2008	1.2146
24	8.1667	1.1929	1.1859	1.1981	1.2155
25	8.0000	1.1827	1.1808	1.1959	1.2188
26	7.8333	1.1735	1.1762	1.1932	1.2223
27	7.6667	1.1638	1.1699	1.1891	1.2233
28	7.5000	1.1578	1.1627	1.1856	1.2228
29	7.3333	1.1526	1.1547	1.1817	1.2208
30	7.1667	1.1456	1.1459	1.1760	1.2174
31	7.0000	1.1379	1.1366	1.1691	1.2124
32	6.8333	1.1290	1.1264	1.1611	1.2062
33	6.6667	1.1195	1.1157	1.1520	1.1987
34	6.5000	1.1126	1.1072	1.1420	1.1898
35	6.3333	1.1094	1.1037	1.1310	1.1802
36	6.1667	1.1085	1.1035	1.1192	1.1701
37	6.0000	1.1070	1.1027	1.1084	1.1596

Table 1(continued)
Four Loop RAOC W(Z) Function
Millstone Unit 3 - Cycle 8
-12/+9 AFD at 100% RTP

38	5.8333	1.1056	1.1018	1.1026	1.1496
39	5.6667	1.1049	1.1017	1.1009	1.1424
40	5.5000	1.1062	1.1027	1.1023	1.1421
41	5.3333	1.1093	1.1047	1.1057	1.1436
42	5.1667	1.1130	1.1075	1.1094	1.1436
43	5.0000	1.1165	1.1099	1.1131	1.1437
44	4.8333	1.1196	1.1118	1.1168	1.1436
45	4.6667	1.1223	1.1134	1.1205	1.1429
46	4.5000	1.1248	1.1148	1.1240	1.1416
47	4.3333	1.1269	1.1157	1.1271	1.1397
48	4.1667	1.1288	1.1165	1.1300	1.1374
49	4.0000	1.1304	1.1181	1.1324	1.1350
50	3.8333	1.1318	1.1204	1.1352	1.1338
51	3.6667	1.1330	1.1228	1.1390	1.1338
52	3.5000	1.1344	1.1249	1.1425	1.1348
53	3.3333	1.1351	1.1274	1.1458	1.1361
54	3.1667	1.1353	1.1307	1.1489	1.1370
55	3.0000	1.1433	1.1347	1.1511	1.1384
56	2.8333	1.1574	1.1430	1.1551	1.1443
57	2.6667	1.1738	1.1577	1.1634	1.1562
58	2.5000	1.1905	1.1740	1.1750	1.1681
59	2.3333	1.2070	1.1906	1.1878	1.1793
60	2.1667	1.2236	1.2071	1.2000	1.1906
61	2.0000	1.2399	1.2234	1.2119	1.2017
62	1.8333	1.2556	1.2391	1.2234	1.2123
63	1.6667	1.2706	1.2541	1.2342	1.2224
64	1.5000	1.0000	1.0000	1.0000	1.0000
65	1.3333	1.0000	1.0000	1.0000	1.0000
66	1.1667	1.0000	1.0000	1.0000	1.0000
67	1.0000	1.0000	1.0000	1.0000	1.0000
68	0.8333	1.0000	1.0000	1.0000	1.0000
69	0.6667	1.0000	1.0000	1.0000	1.0000
70	0.5000	1.0000	1.0000	1.0000	1.0000
71	0.3333	1.0000	1.0000	1.0000	1.0000
72	0.1667	1.0000	1.0000	1.0000	1.0000
73	0.0000	1.0000	1.0000	1.0000	1.0000

* Distance from bottom of active core (feet).

Table 2
Four Loop Base Load W(Z) Function
Millstone Unit 3 - Cycle 8

Mesh No.	Axial * Height	Burnup 150 MWD/MTU	Burnup 3000 MWD/MTU	Burnup 10000 MWD/MTU	Burnup 18000 MWD/MTU
1	12.0000	1.0000	1.0000	1.0000	1.0000
2	11.8333	1.0000	1.0000	1.0000	1.0000
3	11.6667	1.0000	1.0000	1.0000	1.0000
4	11.5000	1.0000	1.0000	1.0000	1.0000
5	11.3333	1.0000	1.0000	1.0000	1.0000
6	11.1667	1.0000	1.0000	1.0000	1.0000
7	11.0000	1.0000	1.0000	1.0000	1.0000
8	10.8333	1.0000	1.0000	1.0000	1.0000
9	10.6667	1.0000	1.0000	1.0000	1.0000
10	10.5000	1.0000	1.0000	1.0000	1.0000
11	10.3333	1.2555	1.2323	1.1891	1.1577
12	10.1667	1.2547	1.2272	1.1837	1.1565
13	10.0000	1.2524	1.2224	1.1773	1.1579
14	9.8333	1.2484	1.2160	1.1705	1.1583
15	9.6667	1.2433	1.2072	1.1637	1.1558
16	9.5000	1.2346	1.1958	1.1577	1.1539
17	9.3333	1.2204	1.1807	1.1508	1.1506
18	9.1667	1.2027	1.1632	1.1422	1.1452
19	9.0000	1.1890	1.1490	1.1340	1.1419
20	8.8333	1.1792	1.1399	1.1317	1.1379
21	8.6667	1.1708	1.1351	1.1335	1.1336
22	8.5000	1.1619	1.1314	1.1376	1.1365
23	8.3333	1.1521	1.1270	1.1401	1.1420
24	8.1667	1.1427	1.1225	1.1410	1.1460
25	8.0000	1.1362	1.1218	1.1424	1.1526
26	7.8333	1.1321	1.1215	1.1433	1.1596
27	7.6667	1.1290	1.1205	1.1433	1.1645
28	7.5000	1.1265	1.1188	1.1439	1.1681
29	7.3333	1.1236	1.1166	1.1441	1.1705
30	7.1667	1.1201	1.1137	1.1427	1.1716
31	7.0000	1.1176	1.1098	1.1402	1.1715
32	6.8333	1.1155	1.1067	1.1368	1.1702
33	6.6667	1.1132	1.1053	1.1323	1.1679
34	6.5000	1.1111	1.1043	1.1270	1.1646
35	6.3333	1.1096	1.1037	1.1208	1.1603
36	6.1667	1.1086	1.1035	1.1138	1.1552
37	6.0000	1.1069	1.1025	1.1068	1.1503

Table 2 (continued)
Four Loop Base Load W(Z) Function
Millstone Unit 3 - Cycle 8

38	5.8333	1.1056	1.1017	1.1020	1.1457
39	5.6667	1.1049	1.1017	1.1007	1.1419
40	5.5000	1.1051	1.1018	1.1004	1.1400
41	5.3333	1.1055	1.1020	1.1001	1.1383
42	5.1667	1.1053	1.1025	1.0995	1.1354
43	5.0000	1.1047	1.1026	1.0985	1.1328
44	4.8333	1.1038	1.1022	1.0972	1.1302
45	4.6667	1.1025	1.1015	1.0956	1.1268
46	4.5000	1.1010	1.1006	1.0938	1.1228
47	4.3333	1.0998	1.0994	1.0915	1.1182
48	4.1667	1.0988	1.0980	1.0896	1.1133
49	4.0000	1.0971	1.0961	1.0912	1.1089
50	3.8333	1.0967	1.0950	1.0943	1.1050
51	3.6667	1.0988	1.0947	1.0965	1.1011
52	3.5000	1.1011	1.0952	1.0985	1.0981
53	3.3333	1.1021	1.0957	1.1003	1.0959
54	3.1667	1.1034	1.0961	1.1019	1.0942
55	3.0000	1.1109	1.0988	1.1048	1.0947
56	2.8333	1.1236	1.1073	1.1120	1.0973
57	2.6667	1.1382	1.1220	1.1243	1.1066
58	2.5000	1.1530	1.1371	1.1369	1.1163
59	2.3333	1.1679	1.1517	1.1490	1.1256
60	2.1667	1.1828	1.1667	1.1613	1.1350
61	2.0000	1.1976	1.1815	1.1735	1.1443
62	1.8333	1.2119	1.1958	1.1852	1.1534
63	1.6667	1.2255	1.2095	1.1962	1.1620
64	1.5000	1.0000	1.0000	1.0000	1.0000
65	1.3333	1.0000	1.0000	1.0000	1.0000
66	1.1667	1.0000	1.0000	1.0000	1.0000
67	1.0000	1.0000	1.0000	1.0000	1.0000
68	0.8333	1.0000	1.0000	1.0000	1.0000
69	0.6667	1.0000	1.0000	1.0000	1.0000
70	0.5000	1.0000	1.0000	1.0000	1.0000
71	0.3333	1.0000	1.0000	1.0000	1.0000
72	0.1667	1.0000	1.0000	1.0000	1.0000
73	0.0000	1.0000	1.0000	1.0000	1.0000

* Distance from bottom of active core (feet).