Commonwealth Edison Company
Byron Generating Station
4450 North German Church Road
Byron, IL 61010-9794
Tel 815-234-5441

October 31, 1996

ComEd

LTR: BYRON-96-0281
FILE: 1.10.0101

Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555-001

ATTENTION: Document Control Desk

SUBJECT: Report on Timed Rod Drop Testing and Drag Force Testing

Byron Nuclear Power Station Units 1 and/or 2
Facility Operating Licenses NPF-37 and NPF-66
NRC Docket Nos. 50-454 and 50-455

REFERENCES:
1. NRC Bulletin (NRCB) 96-01, "Control Rod Insertion Problems," dated March 8, 1996.
2. Letter from J. B. Hosmer (ComEd) to U. S. Nuclear Regulatory Commission transmitting ComEd's response to NRCB 96-01, dated April 4, 1996.
3. Letter from K. L. Kofron (ComEd) to U. S. Nuclear Regulatory Commission transmitting Byron Unit 1, Cycle 8 Rod Drop Testing information, dated July 29, 1996.

In Reference 1, the Nuclear Regulatory Commission (NRC) transmitted a request for input from holders of pressurized water reactor operating licenses regarding control rod insertion problems. ComEd's response to this Bulletin (Reference 2) committed to providing a report to the NRC within 30 days of any testing results for scheduled refueling outages. Byron Station commenced refueling outage B2R06 on August 19, 1996, transitioning from a forced outage resulting from primary-to-secondary tube leakage. Due to the nature of the shutdown into the forced outage, rod drop testing was not conducted at the beginning of the outage sequence. It was determined to be more prudent to stabilize the leakage than hold at a higher pressure and temperature for testing. Drag force testing was performed prior to refueling activities. The results of this testing are included in Attachment 1. Rod drop testing and drag force testing was performed following completion of refueling activities. Testing was completed on October 2, 1996. The results of these tests are contained in Attachment 2. Attachment 3 is a core map of rodded fuel assemblies indicating fuel types and current and projected end of cycle burnup.

If Reference 3, ComEd submitted timed rod drop test results for refueling outage B1R07. It was later noticed that the drag force testing data had been inadvertently omitted from the report. The drag force test results for B1R07 are included as Attachment 4.

IE50 1/1

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If there are any additional questions, please contact Marcia Lesniak, Nuclear Licensing Administrator, at (630) 663-6484.

Sincerely,

K. L. Kofron
Station Manager
Byron Nuclear Power Station

KLK/LZ/rp

Attachments

cc: A.B. Beach, NRC Regional Administrator - RIII
G.F. Dick, Jr., Byron Project Manager - NRR
S. D. Burgess, Senior Resident Inspector - Byron
Office of Nuclear Safety - IDNS

Subscribed and sworn to before me, a Notary Public, this 1st day of November, 1996

Notary Public

"OFFICIAL SEAL"
Tracey Fleck
Notary Public State of Illinois
My Commission Expires 1-13-00

Attachment 1

Results of B2R06 Drag Force Testing
prior to commencing Refueling Activities

RCCA Drop Times and Drag Forces at the End of Byron Unit 2 Cycle 6

No. (*)	RCCA Location	Fuel Assembly Burnup	Drop Time (to Entry into Dashpot)	Difference from Average Drop Time	Drop Time (Dashpot Entry to Full Insertion)	Difference from Average Dashpot Time	Adequate Recoil (Yes/No)	Maximum Drag Forces during Unlatching
1	B-04	35,921	*	*	*	*	*	20
2	B-06	24,355	*	*	*	*	*	20
3	B-08	24,598	*	*	*	*	*	20
4	B-10	25,676	*	*	*	*	*	25
5	B-12	36,197	*	*	*	*	*	20
6	C-05	44,556	*	*	*	*	*	30
7	C-07	41,643	*	*	*	*	*	25
8	C-09	41,998	*	*	*	*	*	25
9	C-11	43,885	*	*	*	*	*	20
10	D-02	35,874	*	*	*	*	*	25
11	D-04	49,655	*	*	*	*	*	40
12	D-08	47,872	*	*	*	*	*	30
13	D-12	49,305	*	*	*	*	*	20
14	D-14	35,972	*	*	*	*	*	20
15	E-03	44,862	*	*	*	*	*	25
16	E-13	44,402	*	*	*	*	*	20
17	F-02	25,030	*	*	*	*	*	10
18	F-06	49,290	*	*	*	*	*	20
19	F-08	41,188	*	*	*	*	*	15
20	F-10	49,067	*	*	*	*	*	20
21	F-14	24,456	*	*	*	*	*	15
22	G-03	41,733	*	*	*	*	*	20
23	G-13	41,684	*	*	*	*	*	15
24	H-02	24,554	*	*	*	*	*	20
25	H-04	47,801	*	*	*	*	*	20
26	H-06	41,091	*	*	*	*	*	20
27	H-08	51,671	*	*	*	*	*	20
28	H-10	40,926	*	*	*	*	*	20
29	H-12	47,864	*	*	*	*	*	15
30	H-14	24,488	*	*	*	*	*	15
31	J-03	41,620	*	*	*	*	*	20
32	J-13	41,551	*	*	*	*	*	20
33	K-02	24,703	*	*	*	*	*	20
34	K-06	49,039	*	*	*	*	*	25
35	K-08	41,347	*	*	*	*	*	20
36	K-10	49,019	*	*	*	*	*	15
37	K-14	24,948	*	*	*	*	*	15
38	L-03	44,554	*	*	*	*	*	15
39	L-13	44,182	*	*	*	*	*	15
40	M-02	36,110	*	*	*	*	*	10
41	M-04	49,495	*	*	*	*	*	15
42	M-08	47,820	*	*	*	*	*	10
43	M-12	49,807	*	*	*	*	*	15
44	M-14	36,008	*	*	*	*	*	10
45	N-05	44,839	*	*	*	*	*	15
46	N-07	41,673	*	*	*	*	*	15
47	N-09	41,632	*	*	*	*	*	20
48	N-11	45,690	*	*	*	*	*	10
49	P-04	35,591	*	*	*	*	*	20
50	P-06	25,139	*	*	*	*	*	20
51	P-08	24,591	*	*	*	*	*	10
52	P-10	25,125	*	*	*	*	*	20
53	P-12	36,066	*	*	*	*	*	20
	Average Drop Time		*		*			

* No rod drops were performed at the end of Byron Unit 2 Cycle 6. A Steam Generator tube leak forced the early shutdown.

Attachment 2

Results of B2R06 Timed Rod Drop and Drag Force Testing
following completion of Refueling Activities

RCCA Drop Times and Drag Forces at the Begining of Byron Unit 2 Cycle 7

No. (n)	RCCA Location	Fuel Assembly Burnup	Drop Time (to Entry into Dashpot)	Difference from Average Drop Time	Drop Time (Dashpot Entry to Full Insertion)	Difference from Average Dashpot Time	Adequate Recoil (Yes/No)	Maximum Drag Forces during Unlatching
1	B-04	25,139	1.460	-0.044	0.445	-0.026	Yes	15
2	B-06	0	1.530	0.026	0.390	-0.081	Yes	25
3	B-08	0	1.475	-0.029	0.435	-0.036	Yes	30
4	B-10	0	1.480	-0.024	0.480	0.009	Yes	20
5	B-12	25,125	1.435	-0.069	0.430	-0.041	Yes	20
6	C-05	24,320	1.495	-0.009	0.465	-0.006	Yes	20
7	C-07	24,919	1.525	0.021	0.465	-0.006	Yes	20
8	C-09	24,599	1.525	0.021	0.485	0.014	Yes	20
9	C-11	24,629	1.515	0.011	0.480	0.009	Yes	20
10	D-02	24,456	1.535	0.031	0.465	-0.006	Yes	20
11	D-04	25,737	1.485	-0.019	0.470	-0.001	Yes	20
12	D-08	24,488	1.485	-0.019	0.465	-0.006	Yes	20
13	D-12	24,971	1.475	-0.029	0.490	0.019	Yes	20
14	D-14	25,030	1.550	0.046	0.490	0.019	Yes	20
15	E-03	24,755	1.545	0.041	0.475	0.004	Yes	20
16	E-13	24,732	1.510	0.006	0.485	0.014	Yes	15
17	F-02	0	1.560	0.056	0.470	-0.001	Yes	20
18	F-06	25,307	1.515	0.011	0.485	0.014	Yes	20
19	F-08	31,507	1.475	-0.029	0.425	-0.046	Yes	20
20	F-10	25,749	1.515	0.011	0.460	-0.011	Yes	15
21	F-14	0	1.525	0.021	0.485	0.014	Yes	15
22	G-03	24,768	1.540	0.036	0.500	0.029	Yes	15
23	G-13	24,843	1.490	-0.014	0.455	-0.016	Yes	15
24	H-02	0	1.485	-0.019	0.475	0.004	Yes	20
25	H-04	24,598	1.465	-0.039	0.495	0.024	Yes	15
26	H-06	31,469	1.485	-0.019	0.475	0.004	Yes	10
27	H-08	34,028	1.500	-0.004	0.495	0.024	Yes	15
28	H-10	31,702	1.475	-0.029	0.435	-0.036	Yes	10
29	H-12	24,591	1.450	-0.054	0.460	-0.011	Yes	15
30	H-14	0	1.485	-0.019	0.475	0.004	Yes	15
31	J-03	24,664	1.500	-0.004	0.515	0.044	Yes	15
32	J-13	24,952	1.500	-0.004	0.465	-0.006	Yes	15
33	K-02	0	1.550	0.046	0.480	0.009	Yes	15
34	K-06	25,076	1.465	-0.039	0.480	0.009	Yes	15
35	K-08	31,631	1.475	-0.029	0.450	-0.021	Yes	10
36	K-10	25,626	1.515	0.011	0.470	-0.001	Yes	15
37	K-14	0	1.550	0.046	0.490	0.019	Yes	15
38	L-03	24,156	1.540	0.036	0.475	0.004	Yes	15
39	L-13	24,119	1.525	0.021	0.475	0.004	Yes	15
40	M-02	24,948	1.475	-0.029	0.460	-0.011	Yes	15
41	M-04	25,597	1.520	0.016	0.505	0.034	Yes	15
42	M-08	24,554	1.500	-0.004	0.495	0.024	Yes	15
43	M-12	25,181	1.525	0.021	0.465	-0.006	Yes	10
44	M-14	24,703	1.535	0.031	0.475	0.004	Yes	15
45	N-05	24,701	1.520	0.016	0.480	0.009	Yes	10
46	N-07	24,941	1.540	0.036	0.460	-0.011	Yes	15
47	N-09	24,703	1.500	-0.004	0.500	0.029	Yes	10
48	N-11	24,519	1.515	0.011	0.475	0.004	Yes	15
49	P-04	24,355	1.450	-0.054	0.440	-0.031	Yes	10
50	P-06	0	1.520	0.016	0.470	-0.001	Yes	10
51	P-08	0	1.500	-0.004	0.465	-0.006	Yes	15
52	P-10	0	1.510	0.006	0.460	-0.011	Yes	10
53	P-12	25,676	1.475	-0.029	0.485	0.014	Yes	5
	Average Drop Time		1.504		0.471			

Attachment 3

Unit 2, Cycle 7 Core Map of Rodded Fuel Assemblies/Fuel Types
and Current and Projected End of Cycle Burnup

Byron Unit 2 Cycle 7 Fuel Types

Region 7

Westinghouse 17X17 Vantage-5 (0.360 in. O. D. fuel rod), with anti-snag grids, Removable Top Nozzle (RTN), Debris Filter Bottom Nozzle (DFBN), Intermediate Flow Mixing Grids (IFM), Inconel top and bottom grids, Zr-4 cladding, mid-grids, IFMs, guide and instrument thimbles. Guide thimble inner diameter dimension: 0.422 in. and 0.3970 in. in dashpot.

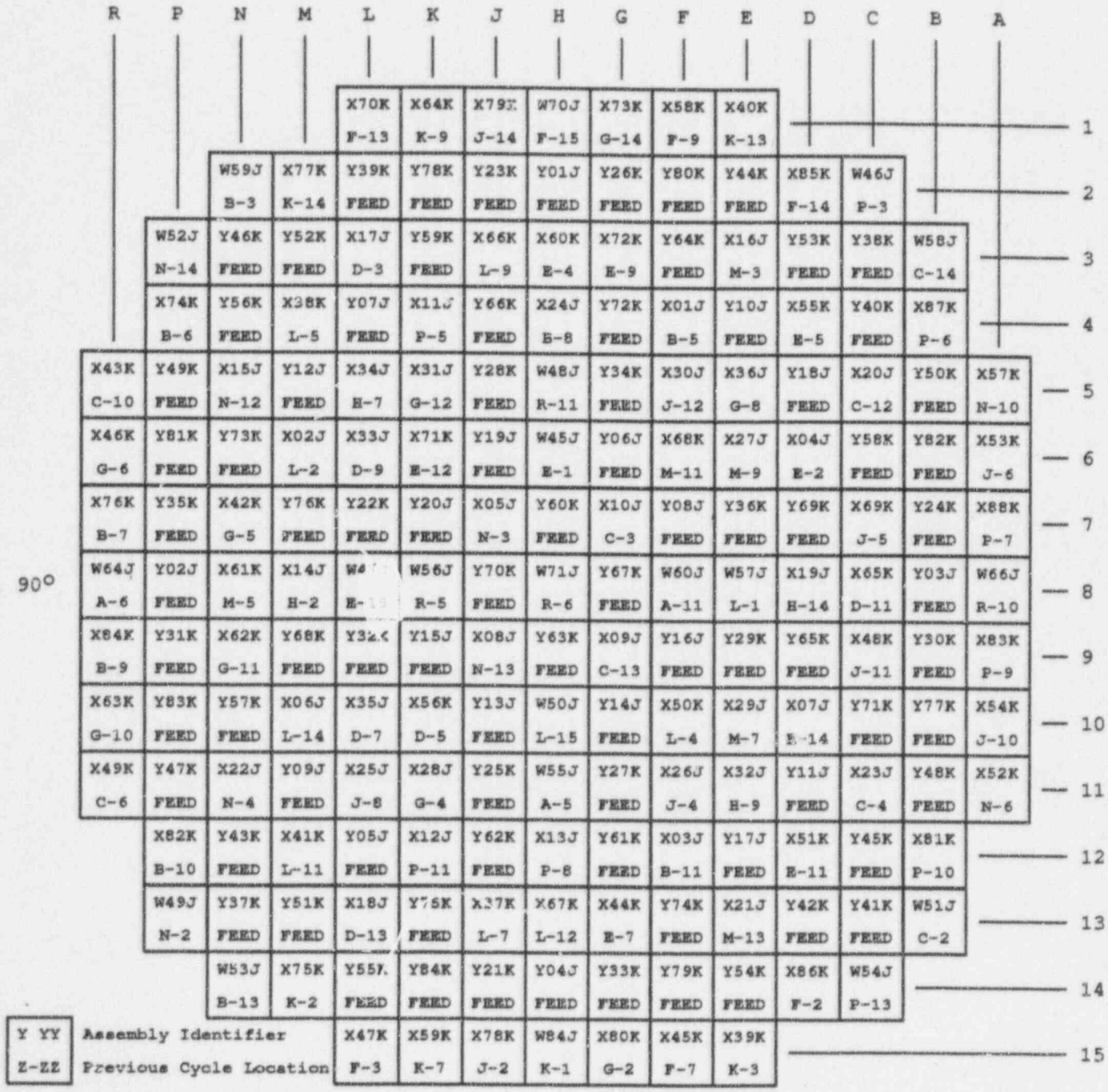
Region 8

Westinghouse 17X17 Vantage-5 (0.360 in. O. D. fuel rod), with anti-snag grids, oxide coated fuel rod bottom ends, Removable Top Nozzle (RTN), Debris Filter Bottom Nozzle (DFBN). Intermediate Flow Mixing Grids (IFM),Debris filter bottom grid, Inconel top and bottom grids, Zr-4 cladding, mid-grids, IFMs, guide and instrument thimbles. Guide thimble inner diameter dimension: 0.422 in. and 0.3970 in. in dashpot.

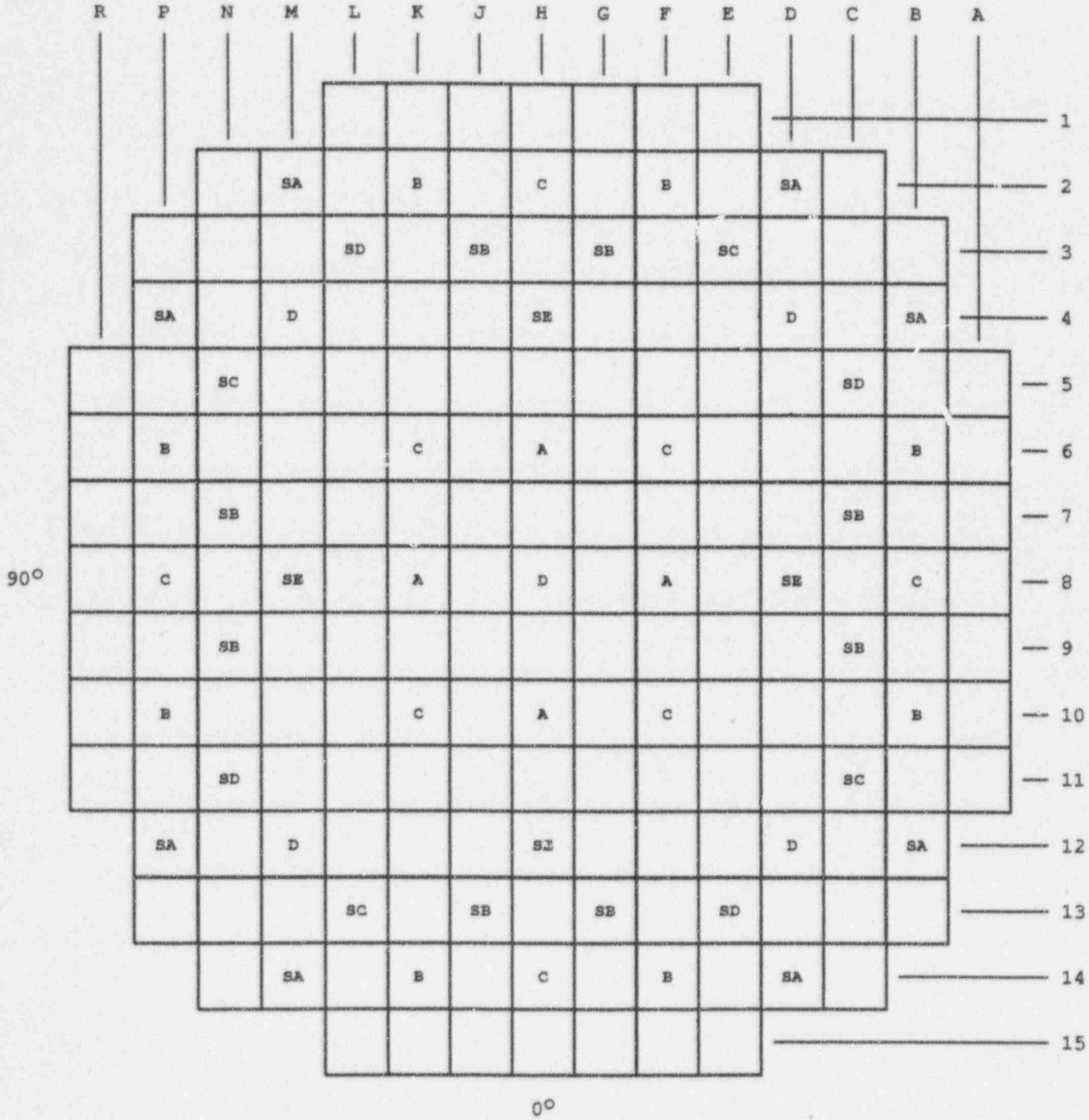
Region 9

Westinghouse 17X17 Vantage-5 (0.360 in. O. D. fuel rod), V5 with anti-snag grids, oxide coated fuel rod bottom ends, Removable Top Nozzle (RTN), Debris Filter Bottom Nozzle (DFBN), Intermediate Flow Mixing Grids (IFM), Debris filter bottom grid, Inconel top and bottom grids, ZIRLO cladding, mid-grids, IFMs, guide and instrument thimbles. Guide thimble inner diameter dimension: 0.422 in. and 0.3970 in. in dashpot.

BYRON UNIT 2, CYCLE 7
REFERENCE CORE LOADING PATTERN



BYRON UNIT 2, CYCLE 7
CONTROL AND SHUTDOWN ROD LOCATIONS



Bank Identifier	Number of Locations
A	4
B	8
C	8
D	5

Bank Identifier	Number of Locations
SA	8
SB	8
SC	4
SD	4
SE	4

0 MWD/MTU
1434 PPM
100 % POWER
1.478 CORE F-DELTA-H

7 .895 .923 33731	9B 1.147 1.276 0	7 .984 1.043 31135	7 1.020 1.078 31135	8A 1.154 1.210 24482	8B 1.105 1.157 25524	9A 1.181 1.340 0	7 .428 .684 33731
9B 1.147 1.276 0	8A 1.197 1.353 20374	9A 1.280 1.436 0	9B 1.360 1.478 0	9B 1.258 1.411 0	8B 1.118 1.191 25053	9B 1.090 1.295 0	8B .489 .767 24486
7 .984 1.043 31135	9A 1.278 1.435 0	8B 1.201 1.268 25524	8A 1.253 1.325 25055	8A 1.258 1.357 21858	9B 1.208 1.353 0	9B 1.087 1.254 0	8B .462 .721 25449
7 1.020 1.078 31135	9B 1.361 1.477 0	8A 1.251 1.323 25055	8A 1.219 1.290 25853	9A 1.294 1.422 0	8A 1.124 1.206 24094	9B .976 1.232 0	8B .342 .648 25866
8A 1.154 1.210 24482	9B 1.254 1.410 0	8A 1.256 1.355 21858	9A 1.293 1.420 0	8B 1.147 1.231 25471	9B 1.198 1.359 0	8B .585 .931 24414	
8B 1.105 1.157 25524	8B 1.115 1.188 25053	9B 1.207 1.351 0	8A 1.123 1.208 24094	9B 1.198 1.358 0	9B .902 1.242 0	7 .299 .635 30341	
9A 1.181 1.340 0	9B 1.089 1.293 0	9B 1.085 1.252 0	9B .975 1.230 0	8B .585 .931 24414	7 .299 .635 30341		
7 .428 .684 33731	8B .488 .766 24486	8B .461 .720 25449	8B .341 .648 25856				

1A	REGION
AP	ASSEMBLY POWER
MP	MAXIMUM POWER
AB	ASSEMBLY BURNUP

■ PEAK QUADRANT

REGION IDENT.	NUMBER OF ASSEMBLIES	POWER SHARING	BURNUPS TOTAL	CYCLE
7	21	.620	31451	0
9B	64	1.150	0	0
8A	36	1.204	23636	0
8B	52	.726	25158	0
9A	20	1.265	0	0

BYRON UNIT 2 CYCLE 7 POWER AND BURNUP
DISTRIBUTION AT 0 MWD/MTU, HFP, ARO, NO XENON

22400 MWD/MTU
3 PPM
52 % POWER
1.411 CORE F-DELTA-H

7 .908 .939 54304	9B 1.308 1.353 28959	7 .908 .952 52106	7 .888 .928 51821	8A .985 1.030 47494	8B .952 .993 47579	9A 1.233 1.325 27234	7 .521 .754 44240
9B 1.308 1.353 28959	8A 1.086 1.162 45851	9A 1.322 1.382 30011	9B 1.284 1.352 29758	9B 1.288 1.361 29006	8B 1.002 1.070 46262	9B 1.239 1.361 26698	8B .597 .853 36597
7 .908 .952 52106	9A 1.321 1.381 29980	8B .962 1.037 48538	8A .975 1.030 48399	8A 1.051 1.136 46722	9B 1.342 1.411 29850	9B 1.256 1.398 27563	8B .585 .840 37273
7 .888 .928 51821	9B 1.284 1.352 29762	8A .975 1.030 48387	8A .967 1.038 48789	9A 1.311 1.381 29527	8A 1.034 1.095 47882	9B 1.116 1.306 24082	8B .447 .769 34747
8A .985 1.030 47494	9B 1.287 1.360 29023	8A 1.050 1.136 46707	9A 1.311 1.382 29518	8B .999 1.047 48750	9B 1.211 1.302 27138	8B .648 .896 38030	
8B .952 .993 47579	8B 1.001 1.070 48238	9B 1.342 1.411 ■ 29837	8A 1.034 1.095 47877	9B 1.211 1.302 27137	9B 1.035 1.250 21824	7 .382 .703 37836	
9A 1.233 1.325 27234	9B 1.239 1.361 26687	9B 1.257 1.398 27556	9B 1.116 1.306 24078	8B .648 .896 38030	7 .382 .703 37836		
7 .521 .754 44240	8B .597 .855 36591	8B .585 .840 37271	8B .447 .769 34746				

1A	REGION
AP	ASSEMBLY POWER
MP	MAXIMUM POWER
AB	ASSEMBLY BURNUP

■ PEAK QUADRANT

REGION IDENT.	NUMBER OF ASSEMBLIES	POWER SHARING	BURNUPS TOTAL	CYCLE
7	21	.630	45222	13771
9B	64	1.238	27439	27439
8A	36	1.018	47568	23932
8B	52	.729	41127	15969
9A	20	1.299	29254	29254

BYRON UNIT 2 CYCLE 7 POWER AND BURNUP
DISTRIBUTION AT 22400 MWD/MTU, COASTDOWN, ARO, EQUILIBRIUM XENON

Attachment 4

Results of B1R07 Drag Force Testing
following completion of Refueling Activities

RCCA Drop Times and Drag Forces at the Begining of Byron Unit 1 Cycle 8

No. (n)	RCCA Location	Fuel Assembly Burnup	Drop Time (to Entry into Dashpot)	Difference from Average Drop Time	Drop Time (Dashpot Entry to Full Insertion)	Difference from Average Dashpot Time	Adequate Recoil (Yes/No)	Maximum Drag Forces during Unlatching
1	B-04	21,185	1.475	-0.023	0.450	-0.018	Yes	10
2	B-06	0	1.475	-0.023	0.470	0.002	Yes	15
3	B-08	0	1.485	-0.013	0.495	0.027	Yes	10
4	B-10	0	1.490	-0.008	0.460	-0.008	Yes	15
5	B-12	20,918	1.490	-0.008	0.470	0.002	Yes	20
6	C-05	18,060	1.495	-0.003	0.445	-0.023	Yes	15
7	C-07	21,389	1.465	-0.033	0.430	-0.038	Yes	15
8	C-09	21,542	1.470	-0.028	0.460	-0.008	Yes	15
9	C-11	18,052	1.500	0.002	0.470	0.002	Yes	15
10	D-02	20,880	1.520	0.022	0.460	-0.008	Yes	10
11	D-04	16,976	1.485	-0.013	0.440	-0.028	Yes	10
12	D-08	0	1.480	-0.018	0.470	0.002	Yes	20
13	D-12	17,194	1.480	-0.018	0.455	-0.013	Yes	10
14	D-14	20,582	1.510	0.012	0.450	-0.018	Yes	15
15	E-03	18,902	1.535	0.037	0.470	0.002	Yes	10
16	E-13	18,370	1.510	0.012	0.495	0.027	Yes	10
17	F-02	0	1.505	0.007	0.475	0.007	Yes	15
18	F-06	21,012	1.505	0.007	0.445	-0.023	Yes	10
19	F-08	18,956	1.505	0.007	0.450	-0.018	Yes	10
20	F-10	20,974	1.525	0.027	0.460	-0.008	Yes	10
21	F-14	0	1.535	0.037	0.505	0.037	Yes	15
22	G-03	21,486	1.515	0.017	0.450	-0.018	Yes	15
23	G-13	21,381	1.485	-0.013	0.480	0.012	Yes	15
24	H-02	0	1.510	0.012	0.480	0.012	Yes	10
25	H-04	0	1.480	-0.018	0.490	0.022	Yes	10
26	H-06	18,572	1.495	-0.003	0.455	-0.013	Yes	10
27	H-08	34,846	1.505	0.007	0.485	0.017	Yes	15
28	H-10	18,868	1.480	-0.018	0.455	-0.013	Yes	10
29	H-12	0	1.490	-0.008	0.485	0.017	Yes	15
30	H-14	0	1.495	-0.003	0.485	0.017	Yes	10
31	J-03	21,330	1.490	-0.008	0.475	0.007	Yes	10
32	J-13	21,324	1.520	0.022	0.470	0.002	Yes	10
33	K-02	0	1.530	0.032	0.470	0.002	Yes	20
34	K-06	20,609	1.470	-0.028	0.450	-0.018	Yes	10
35	K-08	18,496	1.490	-0.008	0.465	-0.003	Yes	15
36	K-10	20,984	1.490	-0.008	0.465	-0.003	Yes	15
37	K-14	0	1.500	0.002	0.460	-0.008	Yes	10
38	L-03	18,542	1.535	0.037	0.510	0.042	Yes	10
39	L-13	18,479	1.520	0.022	0.465	-0.003	Yes	10
40	M-02	21,038	1.535	0.037	0.485	0.017	Yes	10
41	M-04	17,466	1.490	-0.008	0.465	-0.003	Yes	10
42	M-08	0	1.475	-0.023	0.495	0.027	Yes	15
43	M-12	17,103	1.500	0.002	0.475	0.007	Yes	15
44	M-14	20,673	1.520	0.022	0.450	-0.018	Yes	10
45	N-05	18,533	1.520	0.022	0.485	0.017	Yes	10
46	N-07	21,382	1.485	-0.013	0.455	-0.013	Yes	10
47	N-09	21,508	1.470	-0.028	0.475	0.007	Yes	10
48	N-11	17,994	1.490	-0.008	0.485	0.017	Yes	10
49	P-04	20,965	1.495	-0.003	0.455	-0.013	Yes	10
50	P-06	0	1.480	-0.018	0.450	-0.018	Yes	10
51	P-08	0	1.520	0.022	0.475	0.007	Yes	10
52	P-10	0	1.495	-0.003	0.480	0.012	Yes	20
53	P-12	21,044	1.475	-0.023	0.480	0.012	Yes	15
	Average Drop Time		1.498		0.468			