

# The Light company

Hot - a Lighting & Power South Texas Project Electric Generating Station P. O. Box 289 Wadsworth, Texas 77483

April 23, 1997  
ST-HL-AE-5605  
File No.: G03.03  
10CFR50

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

South Texas Project  
Unit 1 and Unit 2  
Docket No. STN 50-498

## Results of Control Rod Testing in Response to NRC Bulletin 96-01

- References: 1) NRC Bulletin 96-01 dated March 8, 1996, "Control Rod Insertion Problems"
- 2) Letter from T. H. Cloninger to the U. S. Regulatory Commission dated April 4, 1996, "Response to Nuclear Regulatory Commission Bulletin 96-01," (ST-HL-AE-5333)

Attached are the South Texas Project's results for:

- the hot, full flow rod drop testing in Unit 1 Cycle 7, which was performed on January 25, 1997 (Attachment 3);
- the hot, full flow rod drop testing in Unit 1 Cycle 7, which was performed on April 5, 1997 (Attachment 4);
- the Unit 2 end of Cycle 5 (hot, full flow) rod drop testing performed on February 8, 1997 (Attachment 5);
- the Unit 2 beginning of Cycle 6 (cold) rod drop testing performed February 20, 1997 (Attachment 6); and
- the Unit 2 beginning of Cycle 6 (hot, full flow) rod drop testing performed on February 24, 1997 (Attachment 7).

A core map is provided in Attachment 1 to assist in understanding the test data provided. In addition, Attachment 2 is provided to show the current Unit 1 and Unit 2 specific core design data.

Attachment 8 shows the results of fuel assembly drag testing that was performed prior to the start of Unit 2 refueling outage in February 1997.

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Project Manager on Behalf of the Participants in the South Texas Project

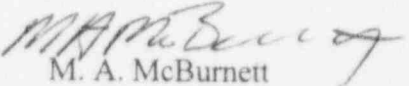
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A chronological history of correspondence regarding NRC Bulletin 96-01 and subsequent testing between the South Texas Project and the Nuclear Regulatory Commission is provided in Attachment 9.

Based on the results of the January 25, 1997, testing in Unit 1, the South Texas Project will perform additional testing during the current cycle. A rod drop testing schedule will be developed for Unit 1 for the current fuel cycle. This rod drop testing schedule is planned to be discussed with the Nuclear Regulatory Commission on April 24, 1997.

If you have any questions regarding this subject, please contact Mr. R. F. Dunn at (512) 972-7743 or me at (512) 972-7206.

  
M. A. McBurnett  
Manager,  
Nuclear Licensing

JMP/

- Attachments:
1. Core Map of Control Rod Locations (Common to both Units)
  2. Unit 1 and Unit 2 Core Design Data
  3. Unit 1 Cycle 7, January 25, 1997, Hot Rod Drop Test Results
  4. Unit 1 Cycle 7, April 5, 1997, Hot Rod Drop Test Results
  5. Unit 2 February 8, 1997 End of Cycle 5, Hot Rod Drop Test Results
  6. Unit 2 February 20, 1997 Beginning of Cycle 6, Cold Rod Drop Test Results
  7. Unit 2 February 24, 1997 Beginning of Cycle 6, Hot Rod Drop Test Results
  8. Unit 2 Fuel Assembly Drag Test Results
  9. NRC Bulletin 96-01 Correspondence Table

Ellis W. Merschoff  
Regional Administrator, Region IV  
U. S. Nuclear Regulatory Commission  
611 Ryan Plaza Drive, Suite 400  
Arlington, TX 76011-8064

Thomas W. Alexion  
Project Manager, Mail Code 13H3  
U. S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

David P. Loveless  
Sr. Resident Inspector  
c/o U. S. Nuclear Regulatory Comm.  
P. O. Box 910  
Bay City, TX 77404-0910

J. R. Newman, Esquire  
Morgan, Lewis & Bockius  
1800 M Street, N.W.  
Washington, DC 20036-5869

M. T. Hardt/W. C. Gunst  
City Public Service  
P. O. Box 1771  
San Antonio, TX 78296

J. C. Lanier/M. B. Lee  
City of Austin  
Electric Utility Department  
721 Barton Springs Road  
Austin, TX 78704

Central Power and Light Company  
ATTN: G. E. Vaughn/C. A. Johnson  
P. O. Box 289, Mail Code: N5012  
Wadsworth, TX 77483

Rufus S. Scott  
Associate General Counsel  
Houston Lighting & Power Company  
P. O. Box 61067  
Houston, TX 77208

Institute of Nuclear Power  
Operations - Records Center  
700 Galleria Parkway  
Atlanta, GA 30339-5957

Dr. Bertram Wolfe  
15453 Via Vaquero  
Monte Sereno, CA 95030

Richard A. Ratliff  
Bureau of Radiation Control  
Texas Department of Health  
1100 West 49th Street  
Austin, TX 78756-3189

J. R. Egan, Esquire  
Egan & Associates, P.C.  
2300 N Street, N.W.  
Washington, D.C. 20037

U. S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, D.C. 20555-0001

**Core Map of Control Rod Locations**  
(Common to Both Units)

	R	P	N	M	L	K	J	H	G	F	E	D	C	B	A
1															
2			SA		B		C		B		SA				
3				SD		SB		SB		SC					
4	SA		D				SE				D		SA		
5			SC		A					A		SD			
6		B				C		A		C				B	
7			SB										SB		
8		C		SE		A		D		A		SE		C	
9			SB										SB		
10		B				C		A		C				B	
11			SD		A					A		SC			
12		SA		D				SE				D		SA	
13				SC		SB		SB		SD					
14			SA		B		C		B		SA				
15															

SA - Shutdown Bank A	A - Control Bank A
SB - Shutdown Bank B	B - Control Bank B
SC - Shutdown Bank C	C - Control Bank C
SD - Shutdown Bank D	D - Control Bank D
SE - Shutdown Bank E	

### Unit 1 and Unit 2 Core Design Data

Unit 1 Cycle 7 Fuel Burnup Data								
Core Loc	Fuel ID	B/U BOC	B/U EOC		Core Loc	Fuel ID	B/U BOC	B/U EOC
Cycle B/U →		0.0	16.4*		Cycle B/U →		0.0	16.4*
		(GWD/MTU)	(GWD/MTU)				(GWD/MTU)	(GWD/MTU)
SA					A			
D-2	G04	26.4	37.8		E-5	H34	17.0	35.4
B-12	G13	26.7	37.9		E-11	H31	17.0	35.5
M-14	G11	26.4	37.8		L-11	H35	17.0	35.5
P-4	G21	26.4	37.7		L-5	H30	16.9	35.4
B-4	G28	26.2	37.4		H-6	H45	17.7	36.6
D-14	G03	26.7	38.1		F-8	H46	17.8	36.7
P-12	G09	25.9	37.4		H-10	H48	17.7	36.7
M-2	G34	26.4	37.6		K-8	H47	17.8	36.6
SB					B			
G-3	H08	17.1	34.9		F-2	J40	0.0	20.2
C-9	H05	17.0	34.9		B-10	J45	0.0	20.2
J-13	H12	17.1	34.9		K-14	J42	0.0	20.2
N-7	H09	16.9	34.8		P-6	J41	0.0	20.2
C-7	H10	17.1	34.9		B-6	J46	0.0	20.1
G-13	H07	17.1	35.0		F-14	J43	0.0	20.1
N-9	H11	17.1	35.0		P-10	J44	0.0	20.1
J-3	H06	16.9	34.8		K-2	J38	0.0	20.1
SC					C			
E-3	H13	17.7	35.8		H-2	T57	17.2	34.0
C-11	H28	17.6	35.7		B-8	T59	17.3	34.0
L-13	H18	17.6	35.7		H-14	T60	17.3	34.0
N-5	H24	17.5	35.6		P-8	T58	17.3	34.0
SD					F-6	H32	16.9	35.0
C-5	H23	17.7	35.7		F-10	H29	16.8	34.9
E-13	H15	17.7	35.7		K-10	H36	17.0	35.1
N-11	H16	17.7	35.8		K-6	H33	16.9	35.0
L-3	H25	17.8	35.8		D			
SE					D-4	C34	21.5	37.6
H-4	H01	14.6	32.7		M-12	C14	21.9	38.0
D-8	H02	14.5	32.6		D-12	C24	21.7	37.8
H-12	H04	14.6	32.7		M-4	C16	21.8	37.9
M-8	H03	14.6	32.7		H-8	C62	22.0	36.3

\* EOC burnup assumes no coastdown operations

Unit 1 Cycle 7 Rodded Fuel Assembly Data (14 foot active fuel and 10 grids)	
"C", "G" Region Standard Assemblies	"T", "H", "J" Region V5H Assemblies
Inconel grids	Inconel top/bottom grids, zirconium mid grids
Zirconium guide tubes	Zirconium guide tubes
Stainless steel grid sleeves	Zirconium grid sleeves
Guide tube ID (above dashpot) = 0.450 inches	Guide tube ID (above dashpot) = 0.442 inches
Guide tube ID (dashpot) = 0.397 inches	Guide tube ID (dashpot) = 0.397 inches

### Unit 1 and Unit 2 Core Design Data

Unit 2 Cycle 6 Fuel Burnup Data								
Core Loc	Fuel ID	B/U BOC	B/U EOC*		Core Loc	Fuel ID	B/U BOC	B/U EOC*
Cycle B/U →		0.0	20.2		Cycle B/U →		0.0	20.2
		(GWD/MTU)	(GWD/MTU)				(GWD/MTU)	(GWD/MTU)
SA					A			
D-2	N17	14.1	23.7		E-5	V24	0.0	25.4
B-12	N51	14.1	23.7		E-11	V13	0.0	25.4
M-14	N29	14.1	23.7		L-11	V14	0.0	25.4
P-4	N32	14.1	23.7		L-5	V18	0.0	25.4
B-4	N19	14.1	23.7		H-6	N40	13.8	31.9
D-14	N26	14.1	23.7		F-8	N06	13.8	31.9
P-12	N11	14.1	23.7		H-10	N02	13.8	31.9
M-2	N45	14.1	23.7		K-8	N33	13.8	31.9
SB					B			
G-3	V16	0.0	26.3		F-2	V68	0.0	23.6
C-9	V17	0.0	26.3		B-10	V73	0.0	23.6
J-13	V27	0.0	26.3		K-14	V70	0.0	23.6
N-7	V28	0.0	26.3		P-6	V69	0.0	23.6
C-7	V22	0.0	26.3		B-6	V74	0.0	23.6
G-13	V26	0.0	26.3		F-14	V71	0.0	23.6
N-9	V19	0.0	26.3		P-10	V72	0.0	23.6
J-3	V11	0.0	26.3		K-2	V66	0.0	23.6
SC					C			
E-3	V82	0.0	25.6		H-2	V54	0.0	24.5
C-11	V83	0.0	25.6		B-8	V64	0.0	24.5
L-13	V77	0.0	25.6		H-14	V59	0.0	24.5
N-5	V84	0.0	25.6		P-8	V53	0.0	24.5
SD					F-6	N21	11.5	29.9
C-5	V78	0.0	25.6		F-10	N24	11.5	29.9
E-13	V89	0.0	25.6		K-10	N30	11.5	29.9
N-11	V85	0.0	25.6		K-6	N25	11.5	29.9
L-3	V79	0.0	25.6		D			
SE				<td>D-4</td> <td>N08</td> <td>13.6</td> <td>30.4</td>	D-4	N08	13.6	30.4
H-4	V32	0.0	25.9		M-12	N01	13.6	30.8
D-8	V40	0.0	25.9		D-12	N38	13.6	30.8
H-12	V34	0.0	25.9		M-4	N58	13.6	30.8
M-8	V29	0.0	25.9		H-8	N37	11.7	30.6

\* EOC burnup assumes no coastdown operations

Unit 2 Cycle 6 Rodded Fuel Assembly Data (14 foot active fuel and 10 grids)	
21 x "N" Region Standard Assemblies	36 x "V" Region V5H Assemblies
Inconel grids	Inconel top/bottom grids, zirconium mid grids
Zirconium guide tubes	Zirconium guide tubes
Stainless steel grid sleeves	Zirconium grid sleeves
Guide tube ID (above dashpot) = 0.450 inches	Guide tube ID (above dashpot) = 0.442 inches
Guide tube ID (dashpot) = 0.397 inches	Guide tube ID (dashpot) = 0.397 inches



### Unit 1 Cycle 7 January 25, 1997 Hot Rod Drop Test Results

Rod drop time testing was performed on all 57 control rods. The plant was in Mode 3 with the Reactor Coolant System temperature greater than 561°F and four reactor coolant pumps running. Two rods stopped at 6 steps from rod bottom based on Digital Rod Position Indication (C-9 and K-8)\*, and all other rods fully inserted. These results represent the first observed incomplete rod insertion (IRI) in V5H assemblies at STP. In addition, fuel burnup for the two IRI assemblies was substantially lower than previously observed. The average rod drop time was comparable to previous testing performed this cycle, however, a notable dashpot entry time increase (↑) of 0.1 sec was observed at core location C-7. Test results satisfied all Technical Specification and safety evaluation limits during the test.

Core Loc	Fuel ID	B/U 1/25/97 (GWD/MTU)	DE Time (sec)	Recoils		Core Loc	Fuel ID	B/U 1/25/97 (GWD/MTU)	DE Time (sec)	Recoils
Cycle B/U →		8.29				Cycle B/U →		8.29		
	SA						A			
D-2	G04	32.0	1.587	3		E-5	H34	26.4	1.594	2
B-12	G13	32.2	1.597	3		E-11	H31	26.5	1.581	1
M-14	G11	32.0	1.616	3		L-11	H35	26.5	1.580	1
P-4	G21	32.0	1.587	3		L-5	H30	26.4	1.567	2
B-4	G28	31.7	1.594	4		H-6	H45	27.4	1.647	1
D-14	G03	32.3	1.601	3		F-8	H46	27.5	1.652	0
P-12	G09	31.6	1.597	3		H-10	H48	27.4	1.614	1
M-2	G34	31.9	1.621	3		K-8*	H47	27.4	1.646	0
	SB						B			
G-3	H08	26.2	1.598	3		F-2	J40	10.0	1.590	3
C-9*	H05	26.1	1.634	0		B-10	J45	10.0	1.609	2
J-13	H12	26.2	1.604	2		K-14	J42	10.0	1.604	3
N-7	H09	26.0	1.620	2		P-6	J41	10.0	1.574	4
C-7 ↑	H10	26.2	1.698	0		B-6	J46	9.9	1.604	2
G-13	H07	26.2	1.616	2		F-14	J43	10.0	1.574	3
N-9	H11	26.3	1.567	0		P-10	J44	10.0	1.557	3
J-3	H06	26.1	1.584	2		K-2	J38	9.9	1.602	3
	SC						C			
E-3	H13	26.7	1.603	4		H-2	T57	25.6	1.613	3
C-11	H28	26.6	1.632	2		B-8	T59	25.6	1.614	1
L-13	H18	26.7	1.582	3		H-14	T60	25.7	1.630	2
N-5	H24	26.6	1.618	3		P-8	T58	25.7	1.613	1
	SD					F-6	H32	26.2	1.628	2
C-5	H23	26.7	1.629	2		F-10	H29	26.1	1.614	1
E-13	H15	26.7	1.584	3		K-10	H36	26.3	1.594	2
N-11	H16	26.8	1.596	2		K-6	H33	26.2	1.613	3
L-3	H25	26.8	1.618	3			D			
	SE					D-4	C34	29.6	1.570	2
H-4	H01	23.9	1.588	3		M-12	C14	30.0	1.571	2
D-8	H02	23.8	1.570	1		D-12	C24	29.8	1.598	1
H-12	H04	23.9	1.601	2		M-4	C16	29.9	1.571	2
M-8	H03	23.9	1.568	1		H-8	C62	29.1	1.585	1

### Unit 1 Cycle 7 April 5, 1997 Hot Rod Drop Test Results

Rod drop time testing was performed on all 57 control rods. The plant was in Mode 3 with the Reactor Coolant System temperature greater than 561°F and four reactor coolant pumps running. Four rods stopped at 6 steps from rod bottom based on Digital Rod Position Indication (C-9, C-7, F-8 and K-8)\*, and all other rods fully inserted. The average rod drop time was comparable to previous testing performed this cycle, however, a notable dashpot entry time increase (↑) of 0.06 sec was observed at core location C-7. Test results satisfied all Technical Specification and safety evaluation limits during the test.

Core Loc	Fuel ID	B/U 4/5/97 (GWD/MTU)	DE Time (sec)	Recoils	Core Loc	Fuel ID	B/U 4/5/97 (GWD/MTU)	DE Time (sec)	Recoils
Cycle B/U →		10.75			Cycle B/U →		10.75		
SA					A				
D-2	G04	33.7	1.578	2	E-5	H34	29.2	1.593	1
B-12	G13	33.9	1.584	2	E-11	H31	29.2	1.595	1
M-14	G11	33.7	1.608	3	L-11	H35	29.2	1.590	1
P-4	G21	33.7	1.583	3	L-5	H30	29.1	1.581	1
B-4	G28	33.4	1.592	3	H-6	H45	30.2	1.651	1
D-14	G03	34.0	1.598	3	F-8*	H46	30.3	1.679	0
P-12	G09	33.3	1.589	2	H-10	H48	30.2	1.626	1
M-2	G34	33.6	1.611	2	K-8*	H47	30.2	1.665	0
SB					B				
G-3	H08	28.8	1.583	2	F-2	J40	13.0	1.581	3
C-9*	H05	28.8	1.671	0	B-10	J45	13.1	1.618	2
J-13	H12	28.9	1.609	2	K-14	J42	13.1	1.597	3
N-7	H09	28.7	1.610	1	P-6	J41	13.1	1.566	4
C-7*↑	H10	28.8	1.762	0	B-6	J46	13.0	1.600	2
G-13	H07	28.9	1.619	1	F-14	J43	13.0	1.570	2
N-9	H11	28.9	1.557	0	P-10	J44	13.0	1.552	3
J-3	H06	28.7	1.566	2	K-2	J38	13.0	1.586	2
SC					C				
E-3	H13	29.5	1.591	3	H-2	T57	28.1	1.597	2
C-11	H28	29.4	1.641	1	G-8	T59	28.1	1.601	0
L-13	H18	29.4	1.580	3	A-14	T60	28.2	1.617	2
N-5	H24	29.3	1.611	3	P-8	T58	28.1	1.615	1
SD					F-6	H32	28.9	1.623	2
C-5	H23	29.5	1.614	1	F-10	H29	28.8	1.602	0
E-13	H15	29.5	1.592	2	K-10	H36	28.9	1.578	1
N-11	H16	29.5	1.583	1	K-6	H33	28.9	1.598	2
L-3	H25	29.5	1.612	3	D				
SE					D-4	C34	32.0	1.563	1
H-4	H01	26.5	1.579	2	M-12	C14	32.4	1.565	1
D-8	H02	26.5	1.561	1	D-12	C24	32.2	1.582	1
H-12	H04	26.6	1.607	2	M-4	C16	32.3	1.567	1
M-8	H03	26.6	1.582	0	H-8	C62	31.3	1.566	1



### Unit 2 February 8, 1997 End of Cycle 5, Hot Rod Drop Test Results

Rod drop time testing was performed on all 57 control rods. The plant was in Mode 3 with the Reactor Coolant System temperature greater than 561°F and four reactor coolant pumps running. Four rods stopped at 6 steps from rod bottom based on Digital Rod Position Indication (D-8, E-11, F-6, and H-8)\*, one rod stopped at 12 steps (F-10)\*\*, and all other rods fully inserted. These results represent the first IRI condition observed in Unit 2, the last rod drop test was on January 11, 1996, a cycle burnup delta of approximately 13.7 GWD/MTU. The average rod drop time was slightly higher than previous testing performed this cycle, and the test data showed notable dashpot entry time increases (↑) of 0.1 sec and 0.25 sec at core locations H-6 and M-4, respectively. Test results satisfied all Technical Specification and safety evaluation limits during the test.

Core Loc	Fuel ID	B/U 2/8/97 (GWD/MTU)	DE Time (sec)	Recoils	Core Loc	Fuel ID	B/U 2/8/97 (GWD/MTU)	DE Time (sec)	Recoils
Cycle B/U →		16.0			Cycle B/U →		16.0		
	SA					A			
D-2	S35	44.2	1.585	1	E-5	S19	40.4	1.567	0
B-12	S41	44.2	1.592	1	E-11*	S12	40.4	1.569	0
M-14	S42	44.2	1.603	2	L-11	S05	40.4	1.579	0
P-4	S61	44.2	1.593	2	L-5	S06	40.4	1.627	0
B-4	S59	44.3	1.590	2	H-6 ↑	T53	39.9	1.770	0
D-14	S64	44.3	1.596	1	F-8	T55	39.9	1.679	0
P-12	S49	44.3	1.582	2	H-10	T56	39.9	1.637	0
M-2	S63	44.3	1.583	1	K-8	T54	39.9	1.582	2
	SB					B			
G-3	T26	39.2	1.613	2	F-2	U40	19.4	1.606	3
C-9	T2	39.2	1.663	1	B-10	U37	19.4	1.600	4
J-13	T31	39.2	1.603	2	K-14	U44	19.4	1.573	3
N-7	T28	39.2	1.589	2	P-6	U41	19.4	1.684	2
C-7	T27	39.1	1.607	1	B-6	U42	19.4	1.573	4
G-13	T30	39.1	1.594	2	F-14	U39	19.4	1.601	3
N-9	T20	39.1	1.569	2	P-10	U43	19.4	1.577	4
J-3	T21	39.1	1.601	2	K-2	U38	19.4	1.579	3
	SC					C			
E-3	U21	39.4	1.601	2	H-2	U17	32.0	1.622	3
C-11	U35	39.4	1.593	2	B-8	U19	32.0	1.634	3
L-13	U26	39.4	1.615	2	H-14	U16	32.0	1.578	3
N-5	U30	39.4	1.634	3	P-8	U15	32.0	1.579	3
	SD				F-6*	S21	39.8	1.591	0
C-5	U31	39.4	1.612	3	F-10**	S15	39.8	1.574	0
E-13	U23	39.4	1.613	2	K-10	S23	39.8	1.547	0
N-11	U24	39.4	1.608	1	K-6	S22	39.8	1.618	1
L-3	U33	39.4	1.640	3		D			
	SE				D-4	S70	49.9	1.601	1
H-4	S72	52.7	1.574	1	M-12	S54	49.9	1.591	1
D-8*	S52	52.7	1.575	0	D-12	S30	49.9	1.578	0
H-12	S56	52.7	1.572	1	M-4 ↑	S34	49.9	1.831	0
M-8	S67	52.7	1.646	0	H-8*	R37	47.2	1.610	0

**Unit 2 February 20, 1997 Beginning of Cycle 6, Cold Rod Drop Test Results**

Rod drop time testing was performed on all 57 control rods. The plant was in Mode 6 with the Reactor Coolant System temperature approximately 93°F, no reactor coolant pumps running, and the Reactor Coolant System water level at the vessel flange. All rods fully inserted to rod bottom. Rod drop times were comparable to last cycle's testing performed at this condition. Test results satisfied all Technical Specification and safety evaluation limits during the test.

Core Loc	Fuel ID	B/U 2/20/97 (GWD/MTU)	DE Time (sec)	Recoils		Core Loc	Fuel ID	B/U 2/20/97 (GWD/MTU)	DE Time (sec)	Recoils
Cycle B/U →		0.0				Cycle B/U →		0.0		
	SA						A			
D-2	N17	14.1	1.071	5		E-5	V24	0.0	1.061	5
B-12	N51	14.1	1.056	5		E-11	V13	0.0	1.063	5
M-14	N29	14.1	1.060	5		L-11	V14	0.0	1.059	5
P-4	N32	14.1	1.069	4		L-5	V18	0.0	1.061	5
B-4	N19	14.1	1.064	5		H-6	N40	13.8	1.070	4
D-14	N26	14.1	1.054	4		F-8	N06	13.8	1.056	5
P-12	N11	14.1	1.067	5		H-10	N02	13.8	1.056	4
M-2	N45	14.1	1.070	4		K-8	N33	13.8	1.061	4
	SB						B			
G-3	V16	0.0	1.062	5		F-2	V68	0.0	1.053	5
C-9	V17	0.0	1.056	4		B-10	V73	0.0	1.057	5
J-13	V27	0.0	1.059	5		K-14	V70	0.0	1.056	5
N-7	V28	0.0	1.063	5		P-6	V69	0.0	1.056	5
C-7	V22	0.0	1.059	5		B-6	V74	0.0	1.068	4
G-13	V26	0.0	1.058	5		F-14	V71	0.0	1.064	5
N-9	V19	0.0	1.065	5		P-10	V72	0.0	1.064	4
J-3	V11	0.0	1.067	4		K-2	V66	0.0	1.061	4
	SC						C			
E-3	V82	0.0	1.052	5		H-2	V54	0.0	1.062	5
C-11	V83	0.0	1.053	5		B-8	V64	0.0	1.068	5
L-13	V77	0.0	1.058	5		H-14	V59	0.0	1.059	5
N-5	V84	0.0	1.053	5		P-8	V53	0.0	1.058	4
	SD					F-6	N21	11.5	1.059	4
C-5	V78	0.0	1.065	5		F-10	N24	11.5	1.059	3
E-13	V89	0.0	1.063	5		K-10	N30	11.5	1.068	4
N-11	V85	0.0	1.069	6		K-6	N25	11.5	1.060	4
L-3	V79	0.0	1.068	5			D			
	SE					D-4	N08	13.6	1.069	4
H-4	V32	0.0	1.058	5		M-12	N01	13.6	1.061	5
D-8	V40	0.0	1.058	5		D-12	N38	13.6	1.062	4
H-12	V34	0.0	1.059	4		M-4	N58	13.6	1.058	5
M-8	V29	0.0	1.065	5		H-8	N37	11.7	1.069	4

**Unit 2 February 24, 1997 Beginning of Cycle 6, Hot Rod Drop Test Results**

Rod drop time testing was performed on all 57 control rods. The plant was in Mode 3 with the Reactor Coolant System temperature greater than 561°F and four reactor coolant pumps running. All rods fully inserted to rod bottom. Rod drop times were comparable to last cycle's testing performed at this condition. Test results satisfied all Technical Specification and safety evaluation limits during the test.

Core Loc	Fuel ID	B/U 2/24/97 (GWD/MTU)	DE Time (sec)	Recoils	Core Loc	Fuel ID	B/U 2/24/97 (GWD/MTU)	DE Time (sec)	Recoils
Cycle B/U →		0.0			Cycle B/U →		0.0		
	SA					A			
D-2	N17	14.1	1.624	4	E-5	V24	0.0	1.572	4
B-12	N51	14.1	1.614	5	E-11	V13	0.0	1.567	4
M-14	N29	14.1	1.661	5	L-11	V14	0.0	1.593	6
P-4	N32	14.1	1.605	5	L-5	V18	0.0	1.588	5
B-4	N19	14.1	1.632	5	H-6	N40	13.8	1.623	4
D-14	N26	14.1	1.638	5	F-8	N06	13.8	1.593	4
P-12	N11	14.1	1.616	5	H-10	N02	13.8	1.558	5
M-2	N45	14.1	1.617	5	K-8	N33	13.8	1.566	5
	SB					B			
G-3	V16	0.0	1.594	4	F-2	V68	0.0	1.590	3
C-9	V17	0.0	1.564	4	B-10	V73	0.0	1.589	5
J-13	V27	0.0	1.584	5	K-14	V70	0.0	1.597	5
N-7	V28	0.0	1.567	6	P-6	V69	0.0	1.619	5
C-7	V22	0.0	1.552	5	B-6	V74	0.0	1.587	4
G-13	V26	0.0	1.577	4	F-14	V71	0.0	1.597	5
N-9	V19	0.0	1.570	5	P-10	V72	0.0	1.581	5
J-3	V11	0.0	1.583	4	K-2	V66	0.0	1.591	5
	SC					C			
E-3	V82	0.0	1.592	5	H-2	V54	0.0	1.595	5
C-11	V83	0.0	1.568	5	B-8	V64	0.0	1.579	5
L-13	V77	0.0	1.587	5	H-14	V59	0.0	1.571	5
N-5	V84	0.0	1.585	4	P-8	V53	0.0	1.572	5
	SD				F-6	N21	11.5	1.571	4
C-5	V78	0.0	1.589	5	F-10	N24	11.5	1.565	4
E-13	V89	0.0	1.595	4	K-10	N30	11.5	1.554	5
N-11	V85	0.0	1.569	5	K-6	N25	11.5	1.553	5
L-3	V79	0.0	1.624	5		D			
	SE				D-4	N08	13.6	1.619	5
H-4	V32	0.0	1.558	5	M-12	N01	13.6	1.613	5
D-8	V40	0.0	1.580	5	D-12	N38	13.6	1.577	5
H-12	V34	0.0	1.567	5	M-4	N58	13.6	1.594	5
M-8	V29	0.0	1.558	5	H-8	N37	11.7	1.609	5

### Unit 2 Fuel Assembly Drag Test Results

Drag testing of once-burned Unit 2 Cycle 6 rodded fuel assemblies was performed in the Spent Fuel Pool prior to the 2RE05 refuel outage core reload. These assemblies were selected because they had contained old hafnium control rods, and during removal of these hafnium rods, an overload condition was initially observed on the handling tool. To ensure the overload condition would not affect control rod insertion in the new core, drag testing was performed to evaluate thimble tube drag forces. Drag testing was performed using a dummy control rod with the control rod being inserted and withdrawn in the host assembly while recording drag data from a calibrated load cell. For the assemblies below, there was minimal drag above the dashpot - thimble tube drag forces ranged from 3 to 6 lbf above the dashpot. Only the average dashpot drag values are listed below. The criteria used for excessive drag in the dashpot was 100 lbs, and is based on fuel vendor recommendations.

Unit 2 Thimble Tube Drag Testing in Spent Fuel Pool	
Fuel Assembly	Average Dashpot Drag Force (lbf)
N01	19
N02	11
N05	17
N06	18
N08	24
N11	15
N17	16
N19	19
N21	17
N24	15
N25	21
N26	19
N29	26
N30	18
N32	16
N33	16
N34	21
N36	19
N37	18
N38	18
N40	18
N43	16
N45	18
N51	18
N58	17
V11*	13

\* New V5H assembly as reference

**NRC Bulletin 96-01 Correspondence Table**

DATE	TO	FROM	SUBJECT	LETTER #
March 8, 1996	All Licensees	NRC	NRC Bulletin 96-01 "Control Rod Insertion Problems"	
April 4, 1996	NRC	STP (T. H. Cloninger)	Response to NRC Bulletin 96-01 - Control Rod Insertion Problems	ST-HL-AE-5333
June 5, 1996	STP	NRC	Public Meeting to Discuss Incomplete Control Rod Insertion	
July 3, 1996	NRC	STP (D. A. Leazar)	Results of Control Rod Testing in Response to NRC Bulletin 96-01	ST-HL-AE-5408
November 27, 1996	NRC	STP (D. A. Leazar)	Results of Fuel Assembly Testing In Response To NRC Bulletin 96-01	ST-HL-AE-5518
April 23, 1997	NRC	STP (M. A. McBurnett)	Results of Control Rod Testing In Response To NRC Bulletin 96-01	ST-HL-AE-5605 (This Letter)