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DUKE POWER

August 29, 1996

U.S. Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Duke Power Company
Catawba Nuclear Station - Unit 1
Docket No. 50 413
NRC Bulletin 96-01 - Outage Test Data
(TAC M95018)

NRC Bulletin 96-01, dated March 8, 1996, requested holders of operating licenses for Westinghouse designed plants to take actions and supply information to the NRC regarding recent control rod insertion problems. The initial Duke Power response to this bulletin was provided by letter dated April 4, 1996 and supplemented with additional information by letters dated April 30, 1996 and June 7, 1996. This letter provides information on Catawba Unit 1 actions taken during the current refueling outage (1EOC9).

Restated below are pertinent sections of the NRC Bulletin 96-01 requiring actions during the current Catawba Unit 1 refueling outage.

Requested Action (3):

(3) Measure and evaluate at each outage of sufficient duration during calendar year 1996 (end of cycle, maintenance, etc.), the control rod drop times and rod recoil data for all control rods. If appropriate plant conditions exist where the vessel head is removed, measure and evaluate drag forces for all rodded fuel assemblies.

a. Rods failing to meet the rod drop time in technical specifications shall be deemed inoperable.

b. Rods failing to bottom or exhibiting high drag forces shall require prompt corrective action in accordance with Appendix B to Part 50 of Title 10 of the Code of Federal Regulations (10 CFR Part 50).

Required Response Item (3):

IE57

(3) Within 30 days after completing Requested Action (3) for each outage, submit a report that documents and summarizes the data obtained. This is also applicable to Requested Action (4) when any abnormal rod behavior is observed.

Catawba Response to Item (3):

Included as Attachments 1 and 2 to this letter is a summary report of the Catawba Unit 1 data for Requested Action (3) obtained during testing performed in conjunction with the Unit 1 End-of-Cycle 9 refueling outage. This testing was completed on July 31, 1996.

Catawba Nuclear Station has no further refueling outages planned for the remainder of 1996. However, if forced outages of sufficient duration occur in 1996, data requested in 96-01 will be collected. Duke Power continues to have 100% successful rod insertions in Mark BW fuel and continues to have substantial margin to the required Technical Specification insertion times. Please direct any questions on this matter to Allen Smith at (803) 831-3952.

I declare, under penalty of perjury, that the statements set forth herein are true and correct to the best of my knowledge.

Very truly yours,

W. R. McCollum Jr.

Attachments

xc: S.D. Ebneter, Regional Administrator, Region II

R.J. Freudenberger, Senior Resident Inspector

P.S. Tam, Senior Project Manager, ONRR

Catawba Nuclear Station
NRC Bulletin 96-01

Attachment 1

Unit 1 EOC-9 Control Rod Drop Testing Results

On June 14, 1996 control rod drop timing was performed in accordance with the requirements of NRC Bulletin 96-01. The following is a summary of the data analysis of the End-of-Cycle (EOC) control rod drop testing results for Catawba Nuclear Station Unit 1.

During the current Unit 1 refueling outage (1EOC9), rod drop timing testing was performed on the control rod drive lines and rod control cluster assemblies (RCCAs). This included a detailed analysis of control rod drop times (see attached Table 1 for drop times) and rod recoil data.

Catawba Nuclear Station has trended control rod drop times from initial plant startup in 1985. The data have been consistent during all testing on both Unit 1 and Unit 2. The test methodology used consisted of selecting a control rod bank, withdrawing the bank to the hard rod stop (231 steps), removing power from both digital rod position indication (DRPI) system data cabinets (Data A and Data B), dropping each individual RCCA by removing its movable gripper (MG) and stationary gripper (SG) fuses, recording the voltage profile induced by the RCCA drive shaft as it dropped through the coils of its associated DRPI detector, restoring power to both DRPI data cabinets, verifying each RCCA completely inserted, and repeating this test method until all 53 control rods had been tested.

The analysis method used consisted of a detailed review of each control rod's time based profile. The individual drop time for each RCCA was determined by analyzing the recorded voltage profile and are shown in Table 1. Four rods, D-14, F-08, H-06, and H-08, were noted as having slightly longer drop times than the other rods. These rods were identified by calculating two standard deviations from the average drop time and comparing the recorded voltage profiles of each rod. The profiles of eight rods were superimposed on each other and compared. The mean profile was used to compare an additional seven rods. This process was repeated until all of the rods were analyzed. The same four control rods exhibited a slight variance in their profiles. All rod drop times were well within the technical specification required time of $\leq$ 2.2 seconds. The average control rod rod drop time was 1.583 seconds, with an average rod bottom time of 2.129 seconds.

The rod drop traces were analyzed for rod recoil (an indication that the rod is fully inserted to rod bottom). All the recorded rod drop traces exhibited rod recoil with a minimum of 2 recoils for each RCCA.

Catawba Unit 1 EOC-9 Control Rod Drop Testing Results

Table 1

	BOC-9 3/21/95				EOC9 6/14/96				EOCvsBOC		
Core	Time to	Time in	Total	Burnup	Time to	Time in	Total	Burnup	Time to	Time in	Total
Loc	DP	DP	Time	MWD/MTU	DP	DP	Time	MWD/MT	DP	DP	Time
H06	1.600	0.541	2.141	26000	1.743	0.639	2.382	42710	0.143	0.098	0.241
H10	1.529	0.501	2.030	25900	1.626	0.542	2.168	42260	0.097	0.041	0.138
F08	1.640	0.631	2.271	25800	1.699	0.656	2.355	42260	0.059	0.025	0.084
K08	1.562	0.542	2.104	25800	1.611	0.563	2.174	42490	0.049	0.021	0.070
H02	1.559	0.544	2.103	19100	1.538	0.568	2.106	35080	-0.021	0.024	0.003
B08	1.527	0.506	2.033	19500	1.547	0.483	2.030	35270	0.020	-0.023	-0.003
H14	1.529	0.565	2.094	19600	1.556	0.539	2.095	35350	0.027	-0.026	0.001
P08	1.603	0.604	2.207	19400	1.566	0.564	2.130	35220	-0.037	-0.040	-0.077
F06	1.529	0.532	2.061	20100	1.632	0.559	2.191	39450	0.103	0.027	0.130
F10	1.525	0.528	2.053	20000	1.570	0.542	2.112	39080	0.045	0.014	0.059
K10	1.632	0.579	2.211	19900	1.600	0.577	2.177	38880	-0.032	-0.002	-0.034
K06	1.516	0.531	2.047	19800	1.597	0.556	2.153	39360	0.081	0.025	0.106
D02	1.714	0.603	2.317	23800	1.641	0.577	2.218	32810	-0.073	-0.026	-0.099
B12	1.646	0.593	2.239	23400	1.585	0.574	2.159	32440	-0.061	-0.019	-0.080
M14	1.735	0.621	2.356	23600	1.652	0.592	2.244	32590	-0.083	-0.029	-0.112
P04	1.639	0.604	2.243	23200	1.562	0.559	2.121	32290	-0.077	-0.045	-0.122
B04	1.589	0.520	2.109	23000	1.599	0.469	2.068	32040	0.010	-0.051	-0.041
D14	1.666	0.536	2.202	23700	1.693	0.557	2.250	32840	0.027	0.021	0.048
P12	1.600	0.563	2.163	23300	1.562	0.542	2.104	32230	-0.038	-0.021	-0.059
M02	1.600	0.560	2.160	23500	1.617	0.542	2.159	32550	0.017	-0.018	-0.001
E03	1.557	0.526	2.083	17000	1.579	0.542	2.121	35220	0.022	0.016	0.038
C11	1.538	0.535	2.073	16500	1.553	0.510	2.063	34820	0.015	-0.025	-0.010
L13	1.567	0.508	2.075	16800	1.553	0.510	2.063	35050	-0.014	0.002	-0.012
N05	1.533	0.519	2.052	17100	1.541	0.542	2.083	35470	0.008	0.023	0.031
C05	1.557	0.533	2.090	17100	1.547	0.542	2.089	35410	-0.010	0.009	-0.000

	BOC-9 3/21/95				EOC9 6/14/96				EOCvsBOC		
Core	Time to	Time in	Total	Burnup	Time to	Time in	Total	Burnup	Time to	Time in	Total
E13	1.568	0.534	2.102	17100	1.576	0.560	2.136	35440	0.008	0.026	0.034
N11	1.546	0.517	2.063	17000	1.535	0.525	2.060	35090	-0.011	0.008	-0.003
L03	1.639	0.595	2.234	16900	1.526	0.642	2.168	35360	-0.113	0.047	-0.066
H04	1.507	0.533	2.040	27100	1.559	0.556	2.115	44430	0.052	0.023	0.075
D08	1.546	0.524	2.070	26700	1.626	0.560	2.186	43910	0.080	0.036	0.116
H12	1.542	0.516	2.058	27100	1.614	0.560	2.174	44030	0.072	0.044	0.116
M08	1.542	0.515	2.057	26800	1.562	0.509	2.071	43870	0.020	-0.006	0.014
F02	1.635	0.614	2.249	16100	1.579	0.592	2.171	32720	-0.056	-0.022	-0.078
B10	1.514	0.555	2.069	16500	1.544	0.524	2.068	33180	0.030	-0.031	-0.000
K14	1.576	0.514	2.090	16100	1.597	0.489	2.086	32830	0.021	-0.025	-0.004
P06	1.541	0.554	2.095	16200	1.553	0.559	2.112	32910	0.012	0.005	0.017
B06	1.520	0.533	2.053	15900	1.559	0.512	2.071	32520	0.039	-0.021	0.018
F14	1.600	0.561	2.161	16100	1.629	0.574	2.203	32950	0.029	0.013	0.042
P10	1.554	0.518	2.072	16200	1.567	0.510	2.077	32790	0.013	-0.008	0.005
K02	1.602	0.548	2.150	16100	1.579	0.527	2.106	33000	-0.023	-0.021	-0.044
D04	1.540	0.531	2.071	19900	1.550	0.542	2.092	37650	0.010	0.011	0.021
M12	1.552	0.534	2.086	19900	1.547	0.542	2.089	37530	-0.005	0.008	0.003
D12	1.562	0.545	2.107	20000	1.582	0.542	2.124	37830	0.020	-0.003	0.017
M04	1.540	0.490	2.030	19700	1.564	0.490	2.054	37540	0.024	-0.000	0.024
H08	1.649	0.596	2.245	30200	1.702	0.592	2.294	44940	0.053	-0.004	0.049
G03	1.628	0.542	2.170	16800	1.564	0.542	2.106	36310	-0.064	-0.000	-0.064
C09	1.530	0.504	2.034	16700	1.544	0.492	2.036	36020	0.014	-0.012	0.002
J13	1.511	0.535	2.046	16600	1.518	0.521	2.039	35900	0.007	-0.014	-0.007
N07	1.530	0.504	2.034	16600	1.503	0.521	2.024	36130	-0.027	0.017	-0.010
C07	1.550	0.525	2.075	16300	1.582	0.539	2.121	35570	0.032	0.014	0.046
G13	1.580	0.516	2.096	16300	1.576	0.528	2.104	35590	-0.004	0.012	0.008
N09	1.556	0.508	2.064	16900	1.588	0.539	2.127	36210	0.032	0.031	0.063
J03	1.510	0.482	1.992	16600	1.526	0.490	2.016	36160	0.016	0.008	0.024
Average	1.573	0.543	2.116	20062	1.583	0.546	2.129	36445	0.011	0.003	0.013

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Attachment 2

Unit 1 EOC-9 RCCA Drag Testing Results

On July 31, 1996 rod control cluster assembly (RCCA) drag testing was performed in accordance with the requirements of NRC Bulletin 96-01. The following is a summary of the data analysis of the end-of-cycle (EOC) RCCA drag testing results for Catawba Nuclear Station Unit 1.

During the current Unit 1 refueling outage (1EOC9), drag testing was performed on the rod control cluster assemblies (RCCAs) in the spent fuel pool after core unload. This included a detailed analysis of RCCA drag data (see attached Table 2 for drag data).

The control rod drag test arrangement consisted of a pancake load cell attached to the Spent Fuel Pool manipulator crane auxiliary hoist. The load cell was attached to the lifting bail of the spent fuel pool RCCA grappling tool. The pancake load cell's analog output was connected to a digital indicator and strip chart recorder. The RCCA grappling tool was then attached to each RCCA. The total measured weight of the RCCA and tool was recorded using the strip chart recorder while withdrawing and inserting each RCCA. Each RCCA was withdrawn 9 feet and then inserted to rod bottom. The spent fuel pool manipulator crane auxiliary hoist was operated at a constant speed of 16 ft/min.

The analysis method used consisted of a detailed review of each RCCA's weight profile. The maximum drag for each RCCA while in the dashpot and guide tube thimble for withdrawal and insertion was determined by analyzing the recorded voltage profile and is shown in Table 2. The weight of the spent fuel pool RCCA grappling tool was 40 lbs. as measured submersed in the pool with no RCCA attached. The average measured weight of an RCCA and the tool was 113 lbs. with the RCCA raised 9 ft and at rest. This weight was used as the reference weight. The recorded maximum drag for each RCCA was calculated by determining the total weight at specific points on the drag traces and subtracting the reference weight (RCCA plus tool). Catawba RCCA drag traces did not reveal any abnormalities of the fuel assemblies tested.

Catawba Unit 1 EOC 9 RCCA Drag Test Results

Table 2

CORE		FUEL	ASSEM.	DASHPOT		GUIDE THIMBLE	
LOCAT.	RCCA	ASSEM.	BURNUP	INSERTION	WITHDRAWAL	INSERTION	WITHDRAWAL
				DRAG	DRAG	DRAG	DRAG
H06	R46	J29	42710	59	52	38	39
H10	R14	J66	42260	40	35	24	22
F08	R172	J52	42260	48	45	26	27
K08	R07	J02	42490	38	27	21	19
H02	R12	K32	35080	25	21	7	3
B08	R53	K61	35270	20	15	6	2
H14	R27	K17	35350	24	17	8	5
P08	R169	K13	35220	29	27	8	10
F06	R01	K29	39450	53	39	33	31
F10	R05	K64	39080	23	22	15	12
K10	R170	K12	38880	51	30	14	14
K06	R08	K27	39360	56	37	29	24
D02	R166	J01	32810	28	25	10	10
B12	R173	J16	32440	28	22	9	8
M14	R174	J26	32590	21	21	7	5
P04	R171	J56	32290	21	20	7	4
B04	R20	J62	32040	29	17	6	3
D14	R108	J69	32840	38	23	16	15
P12	R49	J23	32230	31	22	13	10
M02	R48	J32	32550	28	23	10	9
E03	R03	K55	35220	30	22	7	4
C11	R40	K08	34820	23	27	9	7
L13	R37	K42	35050	23	14	9	4
N05	R29	K23	35470	32	22	4	2
C05	R36	K67	35410	28	20	8	6
E13	R52	K21	35440	43	27	18	12
N11	R42	K39	35090	33	24	10	7
L03	R167	K57	35360	37	27	10	7
H04	R45	J39	44430	38	32	18	15
D08	R22	J38	43910	36	34	19	17
H12	R107	J14	44030	37	37	19	20
M08	R19	J36	43870	30	22	12	8
F02	R165	K03	32720	33	20	8	4

Catawba Unit 1 EOC 9 RCCA Drag Test Results

Table 2

CORE		FUEL	ASSEM.	DASHPOT		GUIDE THIMBLE	
LOCAT.	RCCA	ASSEM.	BURNUP	INSERTION	WITHDRAWAL	INSERTION	WITHDRAWAL
				DRAG	DRAG	DRAG	DRAG
B10	R51	K69	33180	26	19	9	7
K14	R41	K34	32830	21	21	9	4
P06	R06	K28	32910	27	17	9	6
B06	R31	K76	32520	31	21	9	8
F14	R25	K70	32950	33	27	11	11
P10	R38	K20	32790	17	19	7	4
K02	R64	K36	33000	27	18	6	4
D04	R15	K02	37650	37	20	4	5
M12	R39	K62	37530	21	20	13	7
D12	R158	K60	37830	31	27	16	14
M04	R50	K19	37540	31	22	7	5
H08	R161	J67	44940	40	35	21	19
G03	R168	K43	36310	21	26	9	6
C09	R26	K72	36020	17	22	8	4
J13	R16	K71	35900	21	22	10	7
N07	R109	K54	36130	28	20	9	7
C07	R23	K41	35570	31	27	19	14
G13	R47	K50	35590	29	27	15	11
N09	R43	K35	36210	33	20	10	8
J03	R18	K18	36160	33	20	8	4