TU ELECTRIC

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File # 10010
904.3
Ref. # 10CFR50.71(a)
10CFR2.790(b)

May 28, 1993

William J. Cahill, Jr.
Group Vice President

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

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION (CPSES)
DOCKET NOS. 50-445 AND 50-446
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
REGARDING TOPICAL REPORT RXE-90-006-P, "POWER
DISTRIBUTION CONTROL ANALYSIS AND OVERTEMPERATURE
N-16 AND OVERPOWER N-16 TRIP SETPOINT METHODOLOGY"

REF: TU Electric letter logged TXX-91074, from William J. Cahill, Jr., to the NRC dated February 28, 1991

Gentlemen:

The NRC staff orally requested additional information to support the review of the subject topical report. The NRC staff questions, as well as the TU Electric responses to those questions were discussed in several telephone conference calls. Those responses are documented in Attachment 1. The NRC staff also requested additional comparisons of CPSES Unit 1 measured data to model predictions. This information is presented in Attachment 2.

Siemens Nuclear Power Corporation considers information contained within topical report RXE-90-006-P to be proprietary, and similarly considers the information contained within Attachment 1 to be proprietary. In accordance with the requirements of 10CFR2.790(b) for the withholding of proprietary information from public disclosure, an application for withholding and accompanying affidavit are provided in Attachment 3. Correspondence with respect to the proprietary aspects of the supporting Siemens affidavit should be addressed to Siemens Nuclear Power Corporation, Attention Robert A. Copeland, 2101 Horn Rapids Road, P. O. Box 130, Richland, WA 99352-0130.

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PDR ADOCK 05000445
P PDR

If you should have any questions regarding the attached responses, please contact Bob Dacko at (214) 812-8228 or Steve Maier at (214) 812-8229.

Sincerely,

William J. Cahill, Jr.
Group Vice President, Nuclear

By: D R Woodlan
D. R. Woodlan
Docket Licensing Manager

BSD/grp
Attachments

c - Mr. J. L. Milhoan, Region IV
Resident Inspectors, CPSES (2)
Mr. T. A. Bergman, NRR

Application for Withholding

AFFIDAVIT

STATE OF WASHINGTON)
) ss.
COUNTY OF BENTON)

I, D. E. Hershberger being duly sworn, hereby say and depose:

1. I am Senior Engineer, Product Licensing, for Siemens Power Corporation, ("SPC"), and as such I am authorized to execute this Affidavit.

2. I am familiar with the TU Electric Company responses to NRC question concerning topical report RXE-90-006-P entitled "Power Distribution Control Analysis and Overtemperature N-16 and Overpower N-16 Trip Setpoint Methodology," referred to as "Document." Information contained in this Document has been classified by SPC as proprietary in accordance with policies established by SPC for the control and protection of information.

3. The Document contains information of a proprietary and confidential nature and is of the type customarily held in confidence by SPC and not made available to the public. Based on my experience, I am aware that other companies regard information of the kind contained in the Document as proprietary and confidential.

4. The Document has been made available to the U.S. Nuclear Regulatory Commission in confidence, with the request that the information contained in the Document will not be disclosed or divulged.

5. The Document contains information which is vital to a competitive advantage of SPC and would be helpful to competitors of SPC when competing with SPC.

6. The information contained in the Document is considered to be proprietary by SPC because it reveals certain distinguishing aspects of SPC licensing methodology which secure competitive advantage to SPC for fuel design optimization and marketability, and includes information utilized by SPC in its business which affords SPC an opportunity to obtain a competitive advantage over its competitors who do not or may not know or use the information contained in the Document.

7. The disclosure of the proprietary information contained in the Document to a competitor would permit the competitor to reduce its expenditure of money and manpower and to improve its competitive position by giving it valuable insights into SPC licensing methodology and would result in substantial harm to the competitive position of SPC.

8. The Document contains proprietary information which is held in confidence by SPC and is not available in public sources.

9. In accordance with SPC's policies governing the protection and control of information, proprietary information contained in the Document has been made available, on a limited basis, to others outside SPC only as required and under suitable agreement providing for nondisclosure and limited use of the information.

10. Information in this Document provides insight into SPC licensing methodology developed by SPC. SPC has invested significant resources in developing the methodology as well as the strategy for this application. Assuming a competitor had available the same background data and incentives as SPC, the competitor might, at a minimum, develop the information for the same expenditure of manpower and money as SPC.

THAT the statements made hereinabove are, to the best of my knowledge, information, and belief, truthful and complete.

FURTHER AFFIANT SAYETH NOT.

SUBSCRIBED before me this 26 day of May, 1993.

Susan K. McCoy
NOTARY PUBLIC, STATE OF WASHINGTON
MY COMMISSION EXPIRES: 1/10/96

Question

Provide additional measured versus predicted comparisons for data measured for Comanche Peak Steam Electric Station Unit 1.

Response

Start-up physics parameters for CPSES Unit 1 Cycles 1, 2, and 3 have been calculated using methodologies documented in approved topical reports RXE-89-003-P (Reference 1) and RXE-89-005 (Reference 2). Tables 1, 2, and 3 summarize the comparisons between calculated and measured parameters.

TU Electric has investigated the differences in the predicted versus measured boron letdown comparisons, and has refined the technique for determining the appropriate fuel temperature to be used in the CASMO-3/SIMULATE-3 models for fuel types used at CPSES. The use of a refined fuel temperature remains consistent with the methods presented in approved topical report RXE-89-003-P (Ref. 3). Figures 1, 2 and 3 display the effects of the refined fuel temperature on the boron letdown and provide comparisons with measurement. Differences between TU Electric and fuel vendor boron letdown predictions for Cycle 3 are about 20 ppm at beginning of cycle. There are essentially no differences from mid-cycle on.

Radial power distribution comparisons have been performed between measured data (inferred using Westinghouse theoretical constants) and SIMULATE-3 design calculations. The SIMULATE-3 radial power distributions assume all rods out. Comparisons are displayed in Figures 4 through 6 for Cycle 1, Figures 7 through 10 for Cycle 2, and Figure 11 for Cycle 3. These comparisons document excellent agreement between measurement and TU Electric calculations.

References:

1. Edwards, D.J., et. al. "Steady State Reactor Physics Methodology," RXE-89-003-P, July, 1989.

2. Edwards, D.J., "Control Rod Worth Analysis," RXE-90-005, December, 1990.

Table 1: Startup Test Summary, CPSES Unit 1, Cycle 1

BORON ENDPOINT MEASUREMENTS

BANK POSITION	CALCULATED (PPM)	MEASURED (PPM)	DIFFERENCE (PPM)
ARO	1156	1162	-6
SB-in	1079	1087	-8

DIFFERENTIAL BORON WORTH MEASUREMENTS

CALCULATED (PCM/PPM)	MEASURED (PCM/PPM)	DIFFERENCE (%) *
-11.0	-11.6	-5.2

TEMPERATURE COEFFICIENT MEASUREMENTS

	CALCULATED (PCM/°F)	MEASURED (PCM/°F)	DIFFERENCE (PCM/°F)
ITC	-0.7	-1.0	0.3
MTC	1.2	0.8	0.4

CONTROL ROD WORTH MEASUREMENTS

BANK	CALCULATED (PCM)	MEASURED + (PCM)	DIFFERENCE (%) *	DIFFERENCE (PCM)
A	322	333	-3.3	-11
B	810	817	-0.9	-7
C	802	826	-2.9	-24
D	693	699	-0.9	-6
SA	624	622	0.3	2
SC	461	496	-7.1	-35
SD	461	489	-5.7	-28
SE	363	380	-4.5	-17
REF	850	884	-3.8	-34
TOTAL	5386	5546	-2.9	-160

\+ Corrected for delayed neutron parameters

* [(c - m) / m] * 100

Table 2: Startup Test Summary, CPSES Unit 1, Cycle 2

BORON ENDPOINT MEASUREMENTS

BANK POSITION	CALCULATED (PPM)	MEASURED (PPM)	DIFFERENCE (PPM)
ARO	1428	1433	-5
SB-in	1315	1332	-17

DIFFERENTIAL BORON WORTH MEASUREMENTS

CALCULATED (PCM/PPM)	MEASURED (PCM/PPM)	DIFFERENCE (%) *
-8.9	-9.4	-5.3

TEMPERATURE COEFFICIENT MEASUREMENTS

	CALCULATED (PCM/°F)	MEASURED (PCM/°F)	DIFFERENCE (PCM/°F)
ITC	-1.6	-1.8	0.2
MTC	0.3	0.1	0.2

CONTROL ROD WORTH MEASUREMENTS

BANK	CALCULATED (PCM)	MEASURED (PCM)	DIFFERENCE (%) *	DIFFERENCE (PCM)
A	404	419	-3.6	-15
B	612	580	5.5	32
C	891	885	0.7	6
D	607	621	-2.3	-14
SA	382	376	1.6	6
SC	416	409	1.7	7
SD	411	409	0.5	2
SE	349	337	3.6	12
REF	1008	948	6.3	60
TOTAL	5080	4984	1.9	96

* [(c - m) / m] * 100

Table 3: Startup Test Summary, CPSES Unit 1, Cycle 3

BORON ENDPOINT MEASUREMENTS

BANK POSITION	CALCULATED (PPM)	MEASURED (PPM)	DIFFERENCE (PPM)
ARO	1427	1422	5
C-in	1344	1343	1

DIFFERENTIAL BORON WORTH MEASUREMENTS

CALCULATED (PCM/PPM)	MEASURED (PCM/PPM)	DIFFERENCE (%) *
-8.6	-8.6	0.0

TEMPERATURE COEFFICIENT MEASUREMENTS

	CALCULATED (PCM/°F)	MEASURED (PCM/°F)	DIFFERENCE (PCM/°F)
ITC	-2.0	-3.2	1.2
MTC	0.0	-1.3	1.3

CONTROL ROD WORTH MEASUREMENTS

BANK	CALCULATED (PCM)	MEASURED (PCM)	DIFFERENCE (%) *	DIFFERENCE (PCM)
A	310	297	4.4	13
B	603	583	3.4	20
D	644	625	3.0	19
SA	472	471	0.2	1
SB	715	665	7.5	50
SC	518	503	3.0	15
SD	513	507	1.2	6
SE	404	379	6.6	25
REF	729	686	6.3	43
TOTAL	4908	4716	4.1	192

* [(c - m) / m] * 100

Figure 1: Boron Letdown Comparisons, CPSES Unit 1, Cycle 1

BURNUP (MWD/MTU)	MEASURED (PPM)	ORIGINAL DESIGN (PPM)	REVISED DESIGN (PPM)
0	-	1028	1034
150	-	732	738
1000	761	711	717
2000	744	686	692
3000	704	633	639
4000	641	571	577
5000	571	505	511
6000	511	437	443
7000	443	368	374
8000	365	299	305
9000	280	229	235
10000	207	158	164
11000	130	86	92
12000	54	14	20
12194	38	0	6

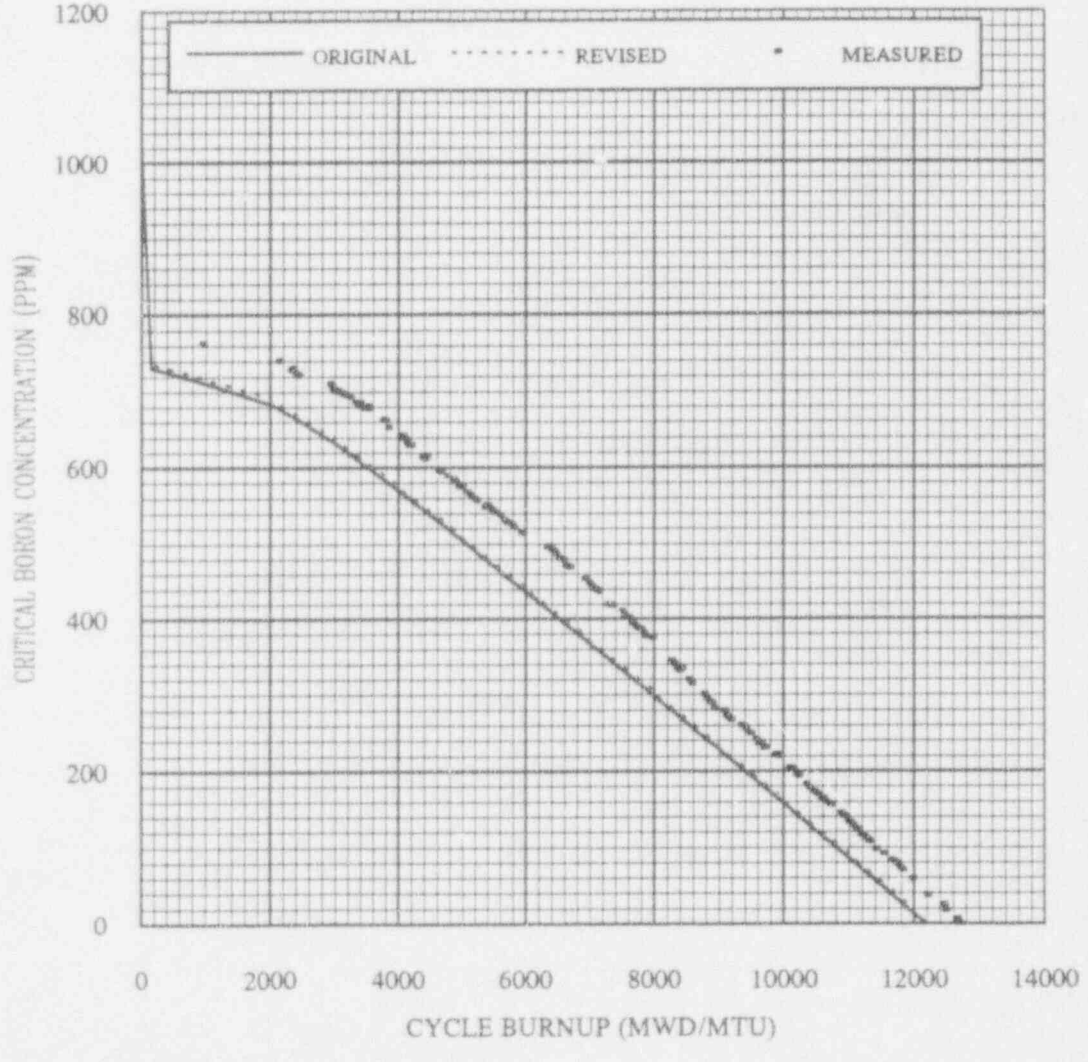

Figure 2: Boron Letdown Comparisons, CPSES Unit 1, Cycle 2

BURNUP (MWD/MTU)	MEASURED (PPM)	ORIGINAL DESIGN (PPM)	REVISED DESIGN (PPM)
0	-	1234	1261
150	-	921	946
1000	860	834	860
2000	791	748	773
3000	712	657	682
4000	628	568	592
5000	538	479	503
6000	452	392	416
7000	360	307	330
8000	274	221	245
9000	187	138	161
10000	96	54	77
10500	53	13	35
10659	39	0	22

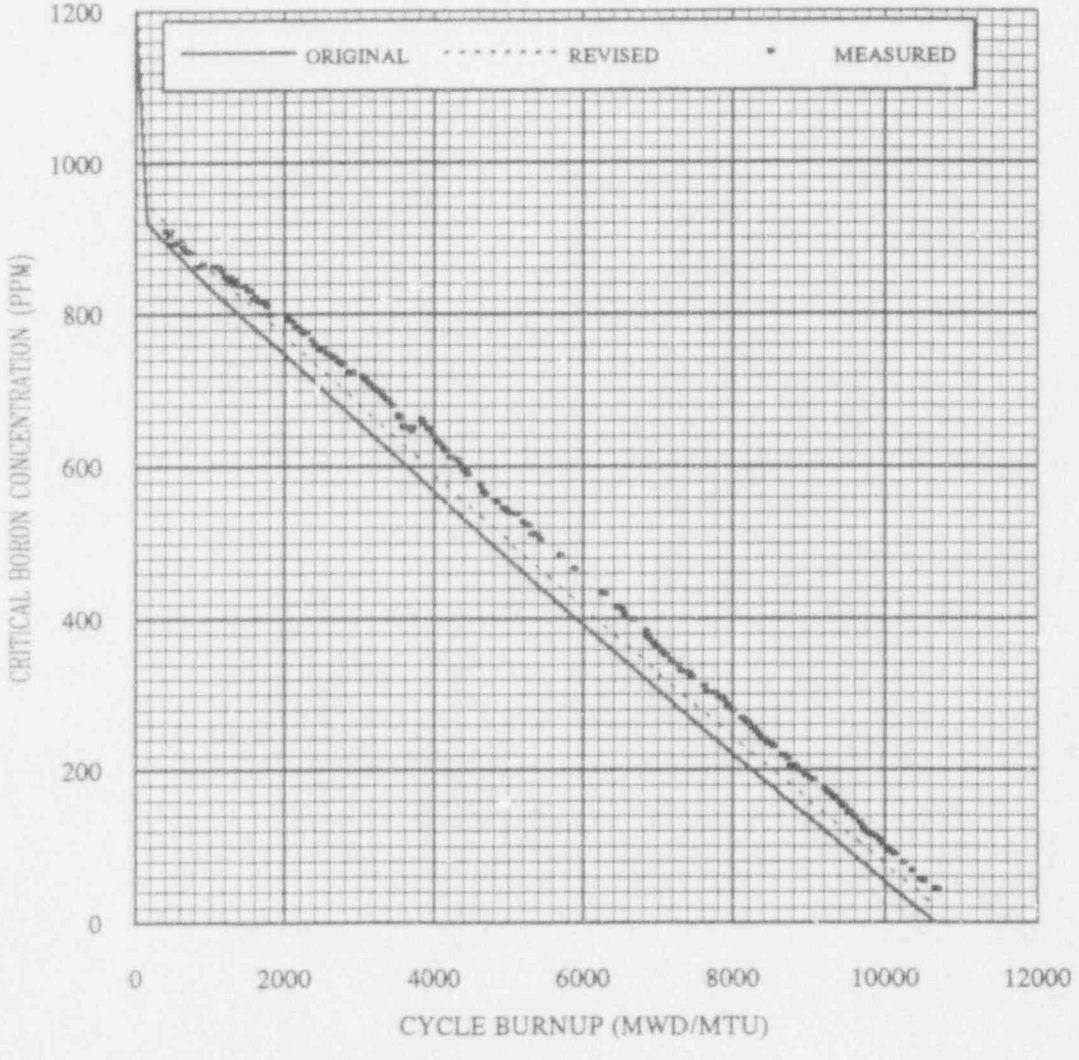

Figure 3: Boron Letdown Comparisons, CPSES Unit 1, Cycle 3

BURNUP (MWD/MTU)	MEASURED (PPM)	DESIGN (PPM)
0	-	1264
150	-	936
1000	832	847
2000	758	757
3000	681	663
4000	589	569
5000	-	477
6000	-	387
7000	-	299
8000	-	211
9000	-	125
10000	-	39
10200	-	23
10465	-	0

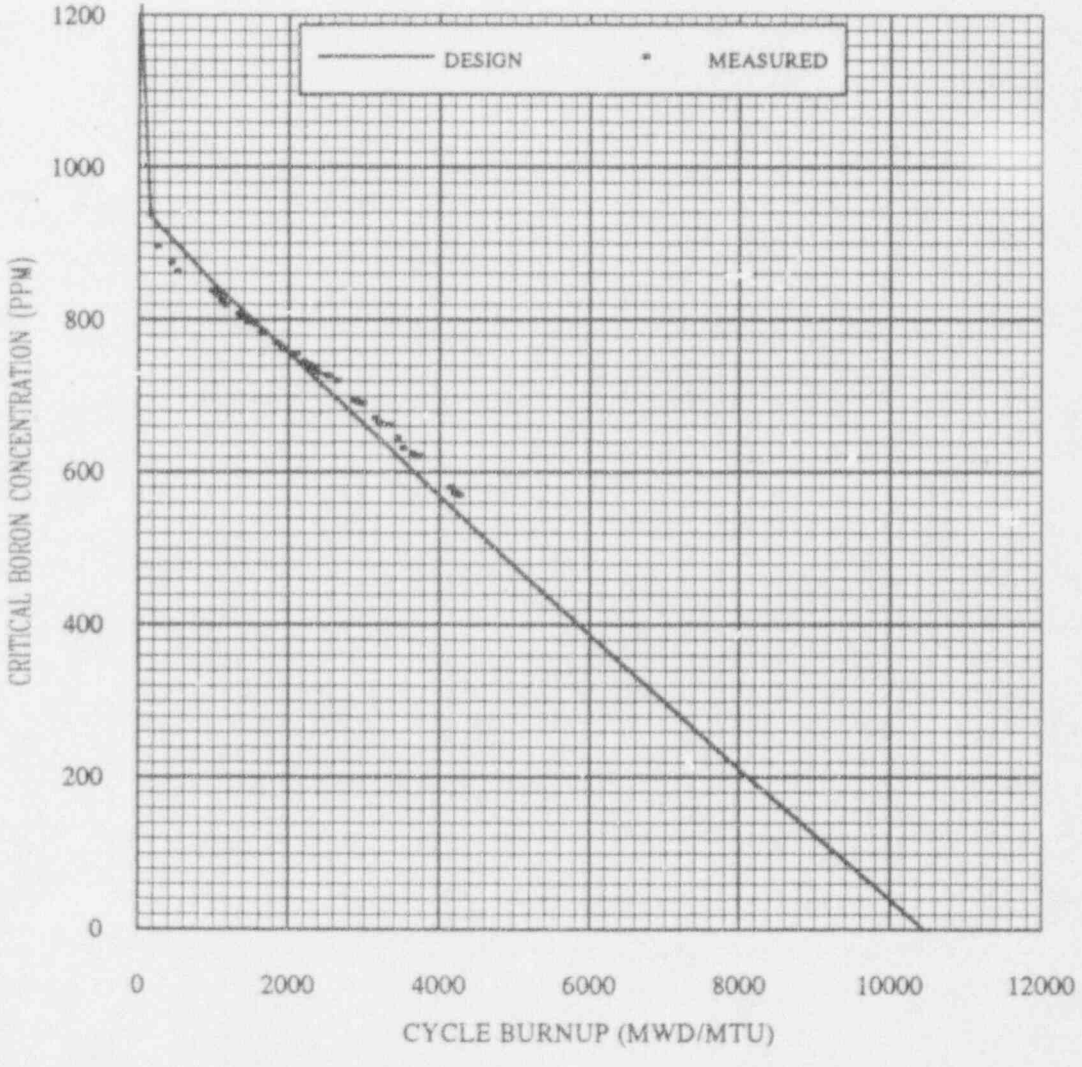

Figure 4: CPSES Unit 1 Cycle 1 Westinghouse Measured vs. SIMULATE-3 ARO Calculated Radial Power Distribution

Burnup(MWD/MTU) 998
Power Level (%RTP) 99.0
Bank D Position 205

	H	G	F	E	D	C
8	1.6w/o -2.7 1.055 1.027					
9	2.4w/o -3.1 1.176 1.140	1.6w/o -2.9 1.100 1.068				
10	1.6w/o -3.0 1.124 1.090	2.4w/o -2.9 1.277 1.240	1.6w/o -1.7 1.123 1.104			
11	2.4w/o -3.2 1.284 1.243	1.6w/o -2.0 1.122 1.100	2.4w/o -1.8 1.248 1.225	1.6w/o -1.5 1.071 1.055		
12	1.6w/o -1.7 1.089 1.071	2.4w/o -1.6 1.225 1.206	1.6w/o -0.9 1.059 1.049	2.4w/o -0.9 1.111 1.101	2.4w/o +0.9 1.157 1.167	
13	2.4w/o -0.7 1.130 1.122	1.6w/o -0.6 1.001 0.995	2.4w/o -0.7 1.203 1.194	1.6w/o +0.0 0.950 0.950	2.4w/o +1.6 0.833 0.846	3.1w/o +4.3 0.988 1.030
14	1.6w/o -0.9 0.871 0.863	3.1w/o +0.0 0.950 0.950	1.6w/o +0.9 0.877 0.885	3.1w/o +1.4 1.043 1.058	3.1w/o +3.9 0.887 0.922	3.1w/o +6.2 0.617 0.655
15	3.1w/o +2.4 0.778 0.797	3.1w/o +3.9 0.786 0.817	3.1w/o +4.9 0.742 0.778	3.1w/o +5.2 0.618 0.650	Fuel Region % Difference West Measured Assembly Power SIMULATE-3 Calculated Assembly Power	

MAXIMUM POWER West Measured..... 1.2840 ROW 11 COLUMN H
SIMULATE-3 ..... 1.2430 ROW 11 COLUMN H
% DIFFERENCE: MAXIMUM..... +6.1588 ROW 14 COLUMN C
AVERAGE..... +0.0902 +/- 2.7284
AVERAGE ABSOLUTE.. +2.2032 +/- 1.5611

Figure 5: CPSES Unit 1 Cycle 1 Westinghouse Measured vs. SIMULATE-3 ARO Calculated Radial Power Distribution

Burnup(MWD/MTU)	6122
Power Level (%RTP)	96.3
Bank D Position	202

	H	G	F	E	D	C
8	1.6w/o +0.9 1.019 1.028					
9	2.4w/o -1.5 1.168 1.150	1.6w/o -.3 1.054 1.040				
10	1.6w/o -2.2 1.068 1.045	2.4w/o -2.1 1.213 1.188	1.6w/o -1.8 1.070 1.051			
11	2.4w/o -2.5 1.218 1.187	1.6w/o -1.2 1.061 1.048	2.4w/o -2.2 1.214 1.187	1.6w/o -2.2 1.069 1.046		
12	1.6w/o -1.5 1.051 1.035	2.4w/o -1.8 1.194 1.172	1.6w/o -1.4 1.047 1.032	2.4w/o -1.2 1.159 1.145	2.4w/o +2.2 1.157 1.183	
13	2.4w/o -1.8 1.151 1.130	1.6w/o -0.7 1.003 0.996	2.4w/o -1.4 1.178 1.161	1.6w/o +0.3 0.973 0.976	2.4w/o +2.4 0.936 0.958	3.1w/o +3.0 1.022 1.053
14	1.6w/o -0.7 0.911 0.905	3.1w/o -0.3 1.028 1.025	1.6w/o +0.7 0.892 0.898	3.1w/o +1.1 1.043 1.054	3.1w/o +3.1 0.889 0.917	3.1w/o +5.2 0.629 0.662
15	3.1w/o +2.0 0.804 0.820	3.1w/o +3.4 0.802 0.829	3.1w/o +4.0 0.752 0.782	3.1w/o +4.9 0.613 0.643	Fuel Region % Difference West Measured Assembly Power SIMULATE-3 Calculated Assembly Power	

MAXIMUM POWER West Measured..... 1.2180 ROW 11 COLUMN H
SIMULATE-3 ..... 1.1880 ROW 10 COLUMN G
% DIFFERENCE: MAXIMUM..... +5.2464 ROW 14 COLUMN C
AVERAGE..... +0.1696 +/- 2.3331
AVERAGE ABSOLUTE.. +1.9714 +/- 1.2072

Figure 6: CPSES Unit 1 Cycle 1 Westinghouse Measured vs. SIMULATE-3 ARO Calculated Radial Power Distribution

Burnup(MWD/MTU) 12227
Power Level (%RTP) 99.96
Bank D Position 217

	H	G	F	E	D	C
8	1.6w/o +0.5 0.986 0.991					
9	2.4w/o -0.9 1.116 1.106	1.6w/o -0.3 0.994 0.991				
10	1.6w/o -0.3 0.994 0.991	2.4w/o -1.3 1.130 1.115	1.6w/o -0.5 1.001 0.996			
11	2.4w/o -1.0 1.129 1.118	1.6w/o +0.3 0.994 0.997	2.4w/o -2.3 1.153 1.127	1.6w/o -2.0 1.039 1.018		
12	1.6w/o +0.6 0.995 1.001	2.4w/o -0.8 1.136 1.127	1.6w/o -1.0 1.018 1.008	2.4w/o -2.4 1.173 1.145	2.4w/o +0.1 1.177 1.178	
13	2.4w/o +0.4 1.124 1.128	1.6w/o +0.5 0.994 0.999	2.4w/o -2.0 1.157 1.134	1.6w/o +0.3 0.993 0.996	2.4w/o +0.8 1.045 1.053	3.1w/o +0.7 1.075 1.083
14	1.6w/o +0.5 0.947 0.952	3.1w/o -0.6 1.114 1.107	1.6w/o -0.2 0.930 0.928	3.1w/o -0.7 1.080 1.072	3.1w/o +2.1 0.917 0.936	3.1w/o +4.2 0.663 0.691
15	3.1w/o +2.5 0.844 0.865	3.1w/o +3.1 0.840 0.866	3.1w/o +2.0 0.801 0.817	3.1w/o +3.4 0.647 0.669	Fuel Region % Difference West Measured Assembly Power SIMULATE-3 Calculated Assembly Power	

MAXIMUM POWER West Measured..... 1.1770 ROW 12 COLUMN D
SIMULATE-3 ..... 1.1780 ROW 12 COLUMN D
% DIFFERENCE: MAXIMUM..... +4.2232 ROW 14 COLUMN C
AVERAGE..... +0.1826 +/- 1.6368
AVERAGE ABSOLUTE.. +1.2349 +/- 1.0667

Figure 7: CPSES Unit 1 Cycle 2 Westinghouse Measured vs. SIMULATE-3 ARO Calculated Radial Power Distribution

Burnup(MWD/MTU) 120
Power Level (%RTP) 78
Bank D Position 183

	H	G	F	E	D	C	B	A
8	1 D +10.6 0.849 0.939	4A +2.6 1.250 1.282	3 M -0.6 1.281 1.273	2 -0.6 0.991 0.985	2 M -1.2 1.025 1.013	3 -1.8 1.287 1.264	3 M -2.6 1.137 1.108	1 +1.1 0.453 0.458
9	4A +2.2 1.255 1.282	2 M +1.0 1.151 1.163	3 -1.1 1.242 1.228	2 M -1.2 1.009 0.997	4A +0.8 1.198 1.207	3 +0.0 1.266 1.266	3 -1.1 1.120 1.108	4B M +2.4 0.737 0.755
10	3 -2.5 1.306 1.273	3 -2.2 1.254 1.226	2 -0.4 1.098 1.094	4A -0.1 1.191 1.190	2 -1.9 1.077 1.056	4A +0.7 1.281 1.290	3 -1.2 1.037 1.025	2 -0.2 0.468 0.467
11	2 M -2.5 1.010 0.985	2 -2.8 1.024 0.995	4A -0.6 1.195 1.188	2 M -0.7 1.045 1.038	4A +2.0 1.237 1.262	2 +0.4 1.036 1.040	4B +0.2 1.134 1.136	1 M +2.0 0.294 0.300
12	2 -3.2 1.046 1.013	4A M -1.2 1.216 1.201	2 -3.0 1.083 1.051	4A +1.7 1.238 1.259	2 D +5.7 0.977 1.033	3 +2.4 1.129 1.156	3 M +1.6 0.767 0.779	
13	3 M -3.4 1.309 1.264	3 -3.8 1.279 1.231	4A -0.1 1.283 1.282	2 +1.0 1.026 1.036	3 +1.9 1.131 1.153	4B +3.6 1.067 1.105	2 +2.9 0.379 0.390	
14	3 -2.1 1.132 1.108	3 -2.3 1.123 1.097	3 M -1.4 1.032 1.018	4B +1.3 1.116 1.131	3 +2.0 0.762 0.777	2 +2.4 0.380 0.389		
15	1 M +1.8 0.450 0.458	4B +2.2 0.735 0.751	2 -0.6 0.467 0.464	1 +2.4 0.292 0.299				

Fuel Region
% Difference
West Measured Assembly Power
SIMULATE-3 Calculated Assembly Power

MAXIMUM POWER West. Measured..... 1.3090 ROW 13 COLUMN H
SIMULATE-3 ..... 1.2900 ROW 10 COLUMN C
% DIFFERENCE: MAXIMUM.....+10.6007 ROW 8 COLUMN H
AVERAGE..... +0.2235 +/- 2.4816
AVERAGE ABSOLUTE.. +1.8758 +/- 1.6207

Figure 8: CPSES Unit 1 Cycle 2 Westinghouse Measured vs. SIMULATE-3 ARO Calculated Radial Power Distribution

Burnup(MWD/MTU) 5550
Power Level (%RTP) 100
Bank D Position 215

	H	G	F	E	D	C	B	A
8	1 D +1.3 0.984 0.997	4A -1.5 1.368 1.347	3 M -2.5 1.266 1.234	2 -1.2 1.016 1.004	2 M -0.4 1.033 1.029	3 -0.3 1.201 1.197	3 M +0.0 1.049 1.049	1 +5.0 0.456 0.479
9	4A -1.5 1.368 1.347	2 M -0.7 1.152 1.144	3 -2.2 1.228 1.201	2 M -1.9 1.050 1.030	4A -0.2 1.287 1.284	3 -0.3 1.211 1.207	3 +0.6 1.046 1.052	4B M +5.0 0.723 0.759
10	3 -2.5 1.266 1.234	3 -2.1 1.226 1.200	2 -0.7 1.117 1.109	4A -1.1 1.313 1.299	2 -1.3 1.100 1.086	4A +0.0 1.296 1.296	3 -0.5 0.997 0.992	2 +2.3 0.478 0.489
11	2 M -1.2 1.016 1.004	2 -1.4 1.045 1.030	4A -1.1 1.313 1.298	2 M -1.0 1.095 1.084	4A -0.5 1.313 1.307	2 -0.2 1.017 1.015	4B -0.2 1.084 1.082	1 M +4.5 0.308 0.322
12	2 -0.4 1.033 1.029	4A M +0.0 1.281 1.281	2 -1.5 1.101 1.085	4A -1.0 1.319 1.306	2 D -0.1 1.020 1.019	3 -0.4 1.091 1.087	3 M +1.9 0.740 0.754	
13	3 M -0.3 1.201 1.197	3 -0.1 1.185 1.184	4A +1.0 1.281 1.294	2 +0.7 1.007 1.014	3 -0.5 1.092 1.086	4B +1.4 1.019 1.033	2 +3.7 0.383 0.397	
14	3 +0.0 1.049 1.049	3 +1.1 1.037 1.048	3 M +1.0 0.980 0.990	4B +1.0 1.071 1.082	3 +1.5 0.743 0.754	2 +3.4 0.384 0.397		
15	1 M +5.0 0.456 0.479	4B +5.6 0.718 0.758	2 +3.8 0.470 0.488	1 +6.6 0.302 0.322				

Fuel Region
% Difference
West Measured Assembly Power
SIMULATE-3 Calculated Assembly Power

MAXIMUM POWER West Measured..... 1.3680 ROW 8 COLUMN G
SIMULATE-3 ..... 1.3470 ROW 8 COLUMN G
% DIFFERENCE: MAXIMUM..... +6.6225 ROW 15 COLUMN E
AVERAGE..... +0.4556 +/- 2.1950
AVERAGE ABSOLUTE.. +1.5600 +/- 1.5973

Figure 9: CPSES Unit 1 Cycle 2 Westinghouse Measured vs. SIMULATE-3 ARO Calculated Radial Power Distribution

Burnup(MWD/MTU) 9992
Power Level (%RTP) 99.5
Bank D Position 221

	H	G	F	E	D	C	B	A
8	1 D +1.6 0.997 1.013	4A -1.2 1.360 1.343	3 M -1.1 1.220 1.206	2 -0.6 1.016 1.010	2 M -0.5 1.039 1.034	3 -0.5 1.178 1.172	3 M -0.6 1.044 1.038	1 +4.1 0.486 0.506
9	4A -1.2 1.360 1.343	2 M +0.6 1.120 1.127	3 -1.0 1.191 1.179	2 M -1.1 1.051 1.039	4A -1.1 1.311 1.297	3 -0.2 1.183 1.181	3 +0.2 1.039 1.041	4B M +4.1 0.747 0.778
10	3 -1.1 1.220 1.206	3 -1.0 1.190 1.178	2 +0.2 1.103 1.105	4A -1.6 1.340 1.318	2 -1.0 1.099 1.088	4A -0.4 1.288 1.283	3 -1.0 0.998 0.988	2 +1.8 0.507 0.516
11	2 M -0.6 1.016 1.010	2 -0.9 1.047 1.038	4A -1.5 1.338 1.318	2 M -0.2 1.093 1.091	4A -0.9 1.315 1.303	2 +0.4 1.005 1.009	4B -0.8 1.076 1.067	1 M +4.5 0.331 0.346
12	2 -0.5 1.039 1.034	4A M -0.8 1.307 1.296	2 -0.6 1.095 1.088	4A -1.1 1.317 1.303	2 D +0.2 1.014 1.016	3 -0.3 1.072 1.069	3 M +1.9 0.747 0.761	
13	3 M -0.5 1.178 1.172	3 -0.1 1.164 1.163	4A -0.1 1.284 1.283	2 +0.5 1.004 1.009	3 -0.9 1.079 1.069	4B +0.9 1.008 1.017	2 +3.7 0.401 0.416	
14	3 -0.6 1.044 1.038	3 +0.6 1.032 1.038	3 M +0.5 0.982 0.987	4B +0.2 1.066 1.068	3 +0.9 0.754 0.761	2 +3.5 0.402 0.416		
15	1 M +4.1 0.486 0.506	4B +4.7 0.743 0.778	2 +3.8 0.496 0.515	1 +6.5 0.325 0.346				

Fuel Region
% Difference
West Measured Assembly Power
SIMULATE-3 Calculated Assembly Power

MAXIMUM POWER West Measured..... 1.3600 ROW 8 COLUMN G
SIMULATE-3 ..... 1.3430 ROW 8 COLUMN G
% DIFFERENCE: MAXIMUM..... +6.4615 ROW 15 COLUMN E
AVERAGE..... +0.4259 +/- 1.9251
AVERAGE ABSOLUTE.. +1.3450 +/- 1.4314

Figure 10: CPSES Unit 1 Cycle 3 Westinghouse Measured vs. SIMULATE-3 ARO Calculated Radial Power Distribution

Burnup(MWD/MTU) 286
Power Level (%RTP) 97.5
Bank D Position 221

	H	G	F	E	D	C	B	A
8	3 -3.2 1.161 1.124	5B -0.7 1.301 1.292	4A -1.0 1.258 1.245	3 +1.7 1.208 1.228	3 -0.9 1.117 1.107	5B +1.0 1.176 1.188	4B -0.9 1.041 1.031	2 -0.8 0.469 0.465
9	5B -0.7 1.301 1.292	3 -1.7 1.246 1.224	4A -0.9 1.21[illegible] 1.203	3 -0.7 1.125 1.117	5B +1.0 1.232 1.244	3 -0.1 1.024 1.023	4A -1.2 0.942 0.931	5C +2.8 0.660 0.678
10	4A -1.0 1.258 1.245	4A -1.[illegible] 1.219 1.206	3 -0.6 1.087 1.080	5B +1.1 1.180 1.193	2 -0.8 1.024 1.016	5B +0.7 1.222 1.231	4A -1.3 0.972 0.960	3 +0.6 0.440 0.443
11	3 +1.7 1.208 1.228	3 -0.7 1.125 1.117	5B +1.0 1.178 1.190	3 -0.1 1.108 1.107	5B +1.2 1.267 1.282	4A -0.3 1.216 1.213	5C +0.5 1.148 1.153	2 +2.2 0.310 0.317
12	3 -0.9 1.117 1.107	5B +1.1 1.222 1.235	2 -0.4 1.014 1.010	5B +1.1 1.266 1.280	3 -0.4 1.072 1.067	4B -0.3 1.202 1.198	4B -0.1 0.842 0.841	
13	5B +1.0 1.176 1.188	3 +0.6 1.003 1.009	5B +1.5 1.207 1.224	4A -0.9 1.222 1.211	4B -1.9 1.221 1.198	5C +0.3 1.096 1.099	3 +1.3 0.399 0.404	
14	4B -0.9 1.041 1.031	4A -0.9 0.943 0.934	4A +0.2 0.958 0.960	5C +0.7 1.142 1.150	4B -1.3 0.849 0.838	3 -0.1 0.398 0.398		
15	2 -0.8 0.469 0.465	5C +2.6 0.662 0.679	3 +1.4 0.432 0.438	2 +3.0 0.304 0.313	Fuel Region % Difference West Measured Assembly Power SIMULATE-3 Calculated Assembly Power			

MAXIMUM POWER West Measured..... 1.3010 ROW 8 COLUMN G
SIMULATE-3 ..... 1.2920 ROW 8 COLUMN G
% DIFFERENCE: MAXIMUM..... -3.1869 ROW 8 COLUMN H
AVERAGE..... +0.0449 +/- 1.2520
AVERAGE ABSOLUTE.. +1.0342 +/- 0.6932