NFG 83-206

PSE&G

Public Service Electric and Gas Company P.O. Box 236 Hancocks Bridge, New Jersey 08038

Nuclear Department

August 22, 1983

Doctor Thomas E. Murley
Regional Administrator, Region 1
U. S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

Dear Doctor Murley:

STARTUP TEST REPORT
SALEM NO. 1 CYCLE 5
LICENSE NO. DPR-70
DOCKET NO. 50-272

Attached please find two (2) copies of the Salem No. 1 Cycle 5 Startup Test Report.

Very truly yours,

E. A. Liden
Manager - Nuclear Licensing
and Regulation

cc: Director, Office of Inspection
and Enforcement (36)
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

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SALEM NUCLEAR GENERATING STATION

UNIT 1, CYCLE 5

STARTUP TEST REPORT

PUBLIC SERVICE ELECTRIC AND GAS COMPANY

SALEM NUCLEAR GENERATING STATION

UNIT 1 CYCLE 5

STARTUP TEST REPORT

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Introduction

The fuel shuffle commenced November 18, 1982 and required the removal of 193 fuel assemblies from the core. The core unloading was completed 4 days later on November 21. During the shuffle reactor engineering personnel with the assistance of Q.A. and fuel management group personnel conducted a fuel assembly inspection. This inspection identified fuel pin ruptures on assembly D-20. Assembly D-20 was determined to be not reinsertable and a replacement assembly for it was identified. A lower core plate inspection and loose parts retrieval was conducted. Some small pieces of grid strap were retrieved and believed to be remnants of cycle 1 grid damage, since no grid strap damage was observed during the unload.

The core reload was started on November 28 and was completed on December 1. A total of fifty-two (52) new assemblies were loaded. The new assemblies are located in the core as indicated on the Core Loading Map, Figure 1. Two Secondary source clusters were loaded into locations H-3 and H-13. Forty-four (44) new burnable poison inserts, containing a total of 256 burnable poison rods are located as shown in Figure 2. Two different burnable poison cluster patterns with 4 and 8 rods were utilized.

The startup physics test program was conducted to ensure the reactor, as loaded, was performing in accordance with design expectations and safety limitations. Hot zero power tests were performed on February 14 and February 15, 1983. Power escalation testing was started February 15 but was not completed until May 28, 1983 due to reactor trip breaker problems and required actions.

Appendix A provides a brief description of each test and a summary of test results relative to acceptance criteria.

Table 1 is a sequential listing of all tests that were conducted during the startup.

TABLE 1

STARTUP TESTS

TYPE			
Reactor Startup	1.	Postrefueling Initial Criticality Pull control banks with ICRR Plot Dilute to criticality Reactivity computer checkout	
Zero Power Physics Testing	2.	ARO Boron Endpoint Test	
	3.	ARO Isothermal Temperature Coefficient Measurement	
	4.	ARO Flux Map (#1500)-Flux Map Analysis & Result	
	5.	Rod Swap Reactivity Measurement (Rodworth)	
	6.	SORC Review	
Power Escalation Testing	7.	Heat Balance and NIS Calibration	26% RTP
	8.	Heat Balance and NIS Calibration	47% RTP
	9.	Flux Map #1502	47% RTP
	10.	Flux Maps #1503, 1504	47% RTP
	11.	Excore Calibration	47% RTP
	12.	Power Coefficient Measurement	47% RTP
	13.	Heat Balance and NIS Calibration	75% RTP
	14.	Flux Map #1505	100% RTP
	15.	Flux Map #1506, 1507	100% RTP
	16.	Excore Calibration	100% RTP
	17.	Power Coefficient Measurement	100% RTP
	18.	RCS Flow Measurement	100% RTP

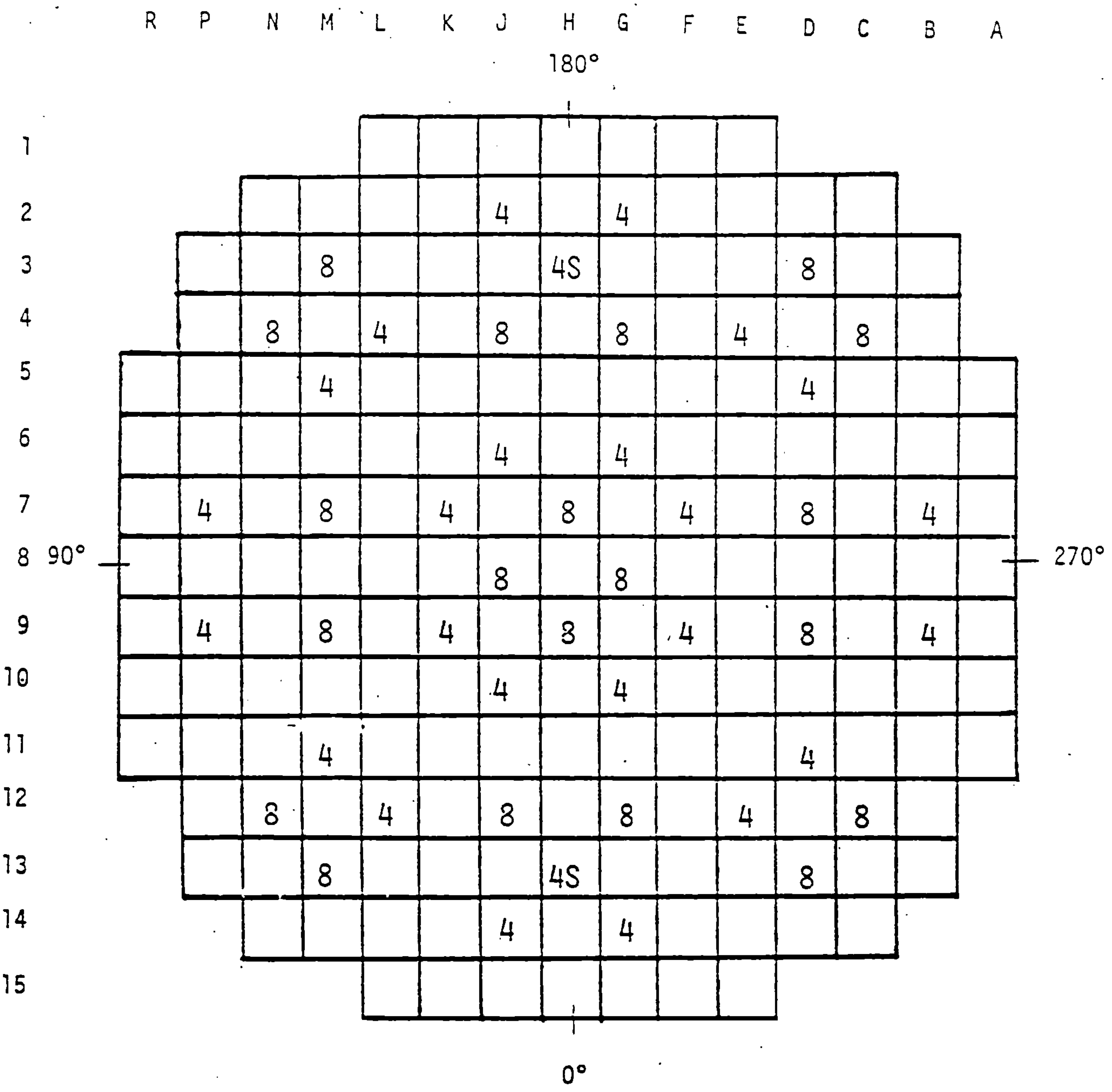
REACTOR CORE MAP
SALEM UNIT 1
DATE: 6/01/83

	R	P	N	M	L	K	J	H	G	F	E	D	C	B	A
1					F03 PD107	G03 PD75	F52 PD7	G21 PD45	F39 PD13	G24 PD23	F07 PD57				
2			F08 PD3	F21 PD4	G38 PD56	D11 R105	G40 4P12	D19 R102	G02 4P22	D25 R54	G49 PD117	F42 PD16	F14 PD58		
3		F27 PD69	E54 R57	G10 8P18	A20 R115	F23 PD94	E30 R35	E56 SS3	E39 R51	F43 PD51	D29 R32	G33 8P14	E63 R137	F28 PD50	
4		F19 PD125	G34 8P17	D31 R127	G29 4P17	D02 PD100	G31 8P3	D36 R30	G20 8P9	D21 PD59	G23 4P11	D08 R14	G01 8P7	F09 PD39	
5	F18 PD109	G37 PD1[illegible]	D27 R16	G18 4P10	D32 PD113	E03 PD2	E44 PD118	F31 PD10	E46 R120	E38 PD121	D40 PDZD5	G12 4P2	D03 R36	G45 PD139	F05 PD10[illegible]
6	G43 PD1	D04 R50	F37 PD22	D22 PD47	E45 PD137	E02 R131	F54 4P4	E08 R112	F06 4P13	E12 R128	E52 PD132	D18 PD36	F34 PD30	D05 R39	G36 PD12[illegible]
7	F47 PD8	G52 4P15	E22 R145	G35 8P1	E34 R132	F33 4P9	E25 PD52	F36 8P16	E10 PD70	F35 4P19	E49 PD112	G32 8P6	E09 R43	G42 4P3	F24 PD63
8	G11 PD46	D17 R53	E53 PD6	D24 R34	F12 PD73	E01 R52	F44 8P10	C55 R122	F50 8P20	E16 R148	F29 PD64	D09 R58	E64 PD131	D07 R49	G47 PD55
9	F10 PD78	G09 4P23	E42 R44	G22 8P4	E48 PD34	F15 4P24	E50 PD85	F30 8P2	E29 PD61	F32 4P21	E13 R133	G41 8P11	E32 R60	G27 4P18	F45 PD26
10	G44 PD27	D13 R26	F49 PD127	D06 PD81	E27 PD126	E04 R4	F46 4P7	E23 R55	F38 4P5	E28 R38	E51 PD31	D14 PD44	F55 PD48	D26 R59	G46 PD66
11	F56 PD119	G51 PD111	D10 R03	G04 4P20	D39 PDZD6	E19 PD19	E43 R41	F51 PD104	E36 PD80	E15 PD97	D30 PD79	G50 4P16	D37 R27	G05 PD93	F48 PD84
12		F13 PD106	G16 8P13	D12 R42	G08 4P8	D28 PD89	G17 8P15	D16 R7	G26 8P19	D33 PD124	G25 4P6	D35 R143	G13 8P8	F20 PD37	
13		F40 PD18	E55 R61	G39 8P5	D15 R45	F16 PD74	E33 R149	E58 SS4	E10 R10	F17 PD115	D01 R107	G30 8P12	E59 R150	F01 PD110	
14			F25 PD21	F22 PD5	G48 PD12	D23 R12	G28 4P14	D34 R56	G14 4P1	D38 R2	G19 PD65	F11 PD20	F53 PD32		
15					F02 PD43	G07 PD101	F41 PD28	G06 PD53	F26 PD11	G15 PD91	F04 PD114				

NORTH ↑

Figure 1

REACTOR CORE MAP
SALEM UNIT 1
DATE: 6/01/83



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

Number Indicates Number of Burnable Poison Rods
256 Fresh BP Rods
S Indicates Secondary Source Rod

Figure 2

BURNABLE POISON LOADING PATTERN

Zero Power Test Results

The zero power test schedule for Cycle 5 was essentially identical to that used during cycle 4. Once again the rod exchange technique was used for measuring the bank rodworth rather than the traditional boron dilution method. Comparisons of swap mode rodworth measurements and design values along with review criteria are shown in Table 2. Comparisons of dilution mode measurements and design values along with acceptance criteria are shown in Table 3.

A Boron end point measurement was conducted with all rods out and was within the ± 50 ppm acceptance criteria. The measured value of 1499 ppm was 16 ppm higher than predicted.

An Isothermal temperature coefficient measurement was performed with all rods out. The value obtained was acceptable, however the moderator temperature coefficient portion was found to be slightly positive, and required action as specified in the Technical Specifications.

Results of the zero power flux map (#1500) are shown in Table 4. A tilt in the power distribution of 3.9% was discovered in the S.E. quadrant and the resulting peaking factors FDH and Fxy exceeded the full power Technical Specification limits, but were below the zero power limits. Consultation with the fuel vendor (Westinghouse) confirmed that the HZP tilt was expected.

TABLE 2

ROD SWAP MODE ROD WORTH RESULTS

ROD BANK	TEST CONDITIONS	MEASURED INTEGRAL WORTH	DESIGN VALUE PSE&G
D	Dil	926.4	956±96
C	Swap	613	593.2±89 pcm
B	Swap	331	341±100 pcm
A	Swap	784	838.8±126 pcm
SD	Swap	269	270±100 pcm
SC	Swap	317	295.6±100 pcm
SB	Swap	769	787±118 pcm
SA	Swap	735	753±113 pcm
TOTAL BANKS	Swap	4744	4835±484 pcm

REVIEW CRITERIA

1. Individual control and shutdown bank worth

$|\Delta\%| \leq 15\%$ for banks ≥ 600 pcm except for reference Bank
$|\Delta\%| \leq 10\%$

$|\Delta| \leq 100$ pcm for banks < 600 pcm

2. Total of all Control and Shutdown Banks

$|\Delta\%| \leq 10\%$

where $$|\Delta\%| = \left|\frac{\text{measured-design}}{\text{design}} \times 100\%\right|$$

$$|\Delta| = |\text{measured-design}|$$

TABLE 3

DILUTION MODE ROD WORTH RESULTS

ROD BANK	TEST CONDITIONS	MEASURED INTEGRAL WORTH (pcm)	VENDOR DESIGN VALUE (pcm)
D	ARO	926	980 ± 147
C	Din	837	835 ± 125
B	D, C in	434	485 ± 100
A	D, C, B in	1008	1105 ± 166
S	D, C, B, A in	3377	3541 ± 506
TOTAL	All Banks	6582	6946 ± 695

ACCEPTANCE CRITERIA

1. Individual control and shutdown bank worth

   $|\Delta\%| \leq 15\%$ for banks ≥ 600 pcm

   $|\Delta| \leq 100$ pcm for banks < 600 pcm

2. Total of all Control and Shutdown Banks

   $|\Delta\%| \leq 10\%$

where $|\Delta\%| = \left|\frac{\text{measured-design}}{\text{design}} \times 100\%\right|$

$|\Delta| = |\text{measured-design}|$

FIGURE 3

```
MEASURED AND PERCENT. DIFF. OF FDHN  SALM INCORE MAP1500,2.5% PWR,BK D@216,1486PPM,OMWD/MTU,PT.2,1
       R       P       N       M       L       K       J       H       G       F       E       D       C       B       A
                                    . . . . . . . . . . . . . . . . . . . . . . . . . . . .
                                    .  .716.   .964.   .993.  1.042.  1.013.   .951.   .708.
1                                   .   3.4.    3.6.    4.6.    5.3.    6.7.    2.2.    2.2.
                    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
                    .  .586.  1.019.  1.368.   .971.  1.412.  1.003.  1.411.   .958.  1.339.   .986.   .626.
2                   .  -4.0.    3.3.    3.4.    3.6.    4.7.    5.3.    4.7.    2.3.    1.1.    -.0.    2.7.
            . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
            .  .583.   .939.  1.217.  1.019.  1.336.  1.055.  1.084.  1.051.  1.320.   .997.  1.247.   .998.   .635.
3           .  -3.3.   -3.4.   -4.0.    3.3.    3.3.    5.3.    5.9.    5.0.    2.2.    1.1.    -.1.    2.7.    5.4.
            . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
            .  .944.  1.216.   .878.  1.160.   .809.  1.216.   .891.  1.205.   .912.  1.288.   .955.  1.294.  1.017.
4           .  -3.2.   -3.4.   -6.0.   -8.0.   -8.0.    5.6.    5.5.    4.6.    3.8.    2.1.    2.3.    2.8.    4.2.
    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
    .  .627.  1.258.   .939.  1.187.   .721.   .809.   .924.  1.210.   .932.   .872.   .778.  1.305.  1.013.  1.361.   .718
5   .  -2.4.   -3.8.   -4.0.   -5.8.   -3.4.   -2.9.    4.7.    5.6.    5.6.    4.6.    4.2.    3.6.    3.9.    4.0.    5.0
    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
    .  .893.   .874.  1.193.   .812.   .789.   .819.  1.102.   .933.  1.124.   .864.   .864.   .895.  1.312.   .949.   .945
6   .  -2.8.   -5.4.   -6.8.   -7.3.   -4.8.    -.9.    3.4.    4.5.    5.4.    4.6.    4.2.    2.2.    2.4.    2.8.    5.0
    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
    .  .910.  1.263.   .924.  1.060.   .855.  1.077.   .954.  1.096.   .985.  1.133.   .932.  1.173.  1.025.  1.369.   .980
7   .  -2.6.   -5.0.   -7.0.   -6.0.   -3.0.     .6.    2.5.    2.6.    5.8.    5.9.    5.7.    2.1.    3.2.    2.9.    5.3
    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
    .  .919.   .864.   .933.   .796.  1.086.   .923.  1.084.  1.074.  1.125.   .973.  1.212.   .874.  1.049.   .931.  1.026
8   .  -6.0.   -6.6.   -8.4.   -6.0.   -5.1.    -.0.    1.0.    1.8.    4.8.    5.3.    5.8.    3.2.    2.9.    2.5.    4.9
    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
    .  .877.  1.240.   .910.  1.096.   .852.  1.041.   .912.  1.067.   .975.  1.127.   .937.  1.209.  1.044.  1.391.   .922
9   .  -6.3.   -6.8.   -8.4.   -4.6.   -3.4.   -2.7.   -2.0.    -.1.    4.7.    5.3.    6.3.    5.3.    5.0.    3.8.    4.8
    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
    .  .823.   .829.  1.153.   .829.   .785.   .785.  1.051.   .916.  1.096.   .867.   .886.   .938.  1.361.   .970.   .965
10. -10.4.  -10.3.   -9.9.   -5.4.   -5.3.   -4.9.   -1.4.     .5.    2.8.    5.0.    6.9.    7.0.    7.8.    5.0.    5.0
    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
    .  .609.  1.165.   .869.  1.192.   .704.   .789.   .858.  1.136.   .887.   .826.   .804.  1.337.  1.053.  1.384.   .723
11. -10.9.  -11.0.  -11.0.   -5.4.   -5.7.   -5.3.   -2.8.    -.8.     .5.    -.8.    7.7.    7.7.    7.8.    5.8.    5.8
    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
            .  .859.  1.098.   .844.  1.169.   .815.  1.125.   .849.  1.156.   .873.  1.252.  1.005.  1.341.  1.035.
12          . -11.9.  -12.8.   -9.5.   -7.3.   -7.3.   -2.4.     .5.     .4.    -.7.    -.8.    7.7.    6.5.    6.1.
            . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
            .  .526.   .848.  1.126.   .907.  1.203.   .945.   .993.  1.011.  1.307.  1.021.  1.321.  1.024.   .642.
13          . -12.8.  -12.8.  -11.2.   -8.0.   -6.9.   -5.6.   -2.9.    1.0.    1.1.    3.5.    4.2.    5.4.    6.5.
            . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
                    .  .532.   .896.  1.227.   .877.  1.330.   .943.  1.388.   .964.  1.370.  1.028.   .643.
14                  . -12.8.   -9.2.   -7.3.   -6.3.   -1.3.    -.9.    3.0.    2.9.    3.6.    4.3.    5.3.
                    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .        . . .
                                    .  .657.   .884.   .941.   .985.   .978.   .957.   .717.                        . MEAS
15                                  .  -5.1.   -5.0.    -.9.    -.5.    3.0.    2.8.    3.6.                        . DIFF
                                    . . . . . . . . . . . . . . . . . . . . . . . . . . . .                         . . .
```

```
                  SALM INCORE MAP1500,2.5% PWR,BK D@216,1486PPM,OMWD/MTU,PT.2,1

         CALCULATED POWER TILTS (NORMALIZED TO 1.000)

            . 1.0198.1.0372 .                        .                         .              .
               .     .     .                         .                              .  1.0285  .
                  .     .                      .9876 . 1.0363                        .          .
            .9557 .  .  . 1.0353                     .                                  .   .
            . . . . . . . . .                . . . . . . . .                 .9387    .    1.0447
            .9218 .  .  . 1.0541                     .                                  .   .
                  .     .                      .9367 . 1.0392                        .          .
               .     .     .                         .                              .  .9880   .
            .  .9517.1.0244 .                        .                         .              .


                POSITIVE -Y- VS. NEGATIVE -Y- TILT
                 1.0120              .9880


                POSITIVE -X- VS. NEGATIVE -X- TILT
                 1.0377              .9623
```

TABLE 4 Flux Map Results Summary

MAP	DATE	POWER	B/U MWD/MTU	BANK D	COMMENT	C_B	QUADRANT TILTS				$F^N_{\Delta H}$		FQ_z		F_{xy} UNROD-TOP		F_{xy} UNROD-BOT.		F_{xy}-ROD.-TOP		F_{xy}-ROD-BOT.		AVE. AXIAL PEAK. FACTOR	AVE AXIAL OFF-SET
							N_W	N_E	S_W	S_E	VALUE	LOC	VALUE	LOC	VALUE	LOC	VALUE	LOC	VALUE	LOC	VALUE	LOC		
* 1500	2/14/83	2.5	10380.6	216	ZERO PWR MAP	1486	0.9878	1.0363	0.9367	1.0392	1.6196	209 B1' DM	2.6088	494 E14 LD	1.7910	708 B11 DL	1.8224	708 B11 DL	N/A	N/A	N/A	N/A	1.5462	29.323
1501	2/24/83	25.94	10387.6	171	FQ, Fxy FΔH	1374	1.0056	1.0249	0.9643	1.0053	1.5864	309 B11 DM	2.3911	708 B11 DL	1.7316	708 B11 DL	1.7611	408 L2 EN	1.6642	213 H3	—	—	1.3894	6.057
1502	5/22/83	47.17	10396.6	185	IN/EX CAL	1294	1.0030	1.0111	0.9800	1.0058	1.4805	511 P3 NE	2.0167	504 B11 DF	1.5868	504 B11 DF	1.6087	374 L2 LN	—	—	—	—	1.2728	0.444
1503	5/23/83	47.2	10405.6	228	IN/EX CAL	1271	1.0051	1.0168	0.9793	0.9987	1.4914	268 J2 EO	2.1836	268 J2 EO	1.5669	374 L2 LN	1.6137	374 L2 LN	—	—	—	—	1.4208	20.99
1504	5/23/83	48.1	10411.6	228	IN/EX CAL	1180	1.0055	1.0119	0.9787	1.0039	1.4930	374 L2 LN	1.9977	374 L2 LN	1.5757	374 L2 LN	1.6000	374 L2 LN	—	—	—	—	1.2850	11.4[illegible]
1505	5/27/83	98.54	10490.6	228	IN/EX CAL	1025	1.0007	1.0164	0.9846	0.9982	1.4602	268 J2 EO	1.8742	374 L2 LN	1.5351	268 J2 EO	1.5816	374 L2 LN	—	—	—	—	1.2038	-0.[illegible]
1506	5/27/83	99.59	10492.6	215	IN/EX CAL	1025	1.0013	1.0149	0.9849	0.9989	1.4568	374 L2 LN	1.8680	374 L2 LN	1.5269	268 J2 EO	1.5753	374 L2 LN	—	—	—	—	1.2132	-0.841
1507	5/28/83	99.34	10520.6	228	IN/EX CAL	1013	1.0008	1.0153	0.9841	0.9999	1.4503	374 L2 LN	1.8215	374 L2 LN	1.5302	504 B11 DF	1.5772	374 L2 LN	—	—	—	—	1.2071	2.634

* ZERO POWER MAP FOR INFO ONLY

Power Escalation Testing

Power was increased to approximately 20% RTP on February 23 and then put on a 3% RTP per hour ramp rate. Several problems occurred during the following day and a flux map at 26% RTP was taken shortly before the reactor failed to trip automatically due to a problem in the undervoltage attachment to both Reactor Trip breakers. The complications and severity of this problem delayed restart of the reactor until mid May.

On May 20 the unit was restarted and reached the 47% RTP testing plateau two days later. During May 22 and 23 three incore flux maps were conducted in order to obtain data for an excore calibration (maps #1502-1504). Peaking factors for the maps obtained at the 47% RTP level were found to meet the full power limits and the quadrant power tilt had diminished to approximately 1.3% in the NE quadrant. The target Delta I was determined to be +11.4% and this value was set into the instrumentation. The power coefficient measurement was conducted and a value of -11.4 pcm/% obtained. The value was compared to the FSAR limiting curves and found to be in the acceptable region.

Preliminary data evaluation at the 47% RTP level was conducted and power escalation at 3%/hr was started on May 24.

Power was stabilized at 75% RTP and a heat balance was obtained for NIS calibration. On May 25 a new target value for Delta I of +2.6% was set. Power was stabilized at ~ 99% RTP and three flux maps (#1505-1507) for an excore calibration were obtained. The peaking factors obtained with these maps were within the full power limits. The quadrant power tilt was approximately 1.5% on these full power maps. The power coefficient measurement was conducted and a value of -12.0 pcm/% was obtained. This value was compared to the FSAR limiting curves and found to be in the acceptable region.

The state point data collection and subsequent RCS flow calculation were completed on May 28 with a measured flow of 386,214 gpm. The measured value exceeds the minimum 100% RTP required flow in the Technical Specification of 349,200 gpm.

FIGURE 4

```
MEASURED AND PERCENT. DIFF. OF FDHN  SALM INCORE MAP1501,25.94% PWR,BK D@171,1374PPM,7MWD/MTU,PT.62,1
        R       P       N       M       L       K       J       H       G       F       E       D       C       B       A
                                   . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  .
                                   .   .678.   .901.   .964.  1.051.   .985.   .942.   .711.
1                                  .     .9.    1.3.    4.8.    8.7.    7.2.    5.9.    5.7.
                   . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  .
                   .   .632.  1.010.  1.306.   .885.  1.372.  1.001.  1.393.   .921.  1.321.   .971.   .628.
2                  .    1.8.    1.8.     .7.    1.9.    4.9.    7.0.    6.5.    6.1.    1.9.   -2.1.    1.1.
           . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  .
           .   .615.   .992.  1.281.   .991.  1.283.  1.046.  1.090.  1.062.  1.340.   .967.  1.258.  1.002.   .641.
3          .     .2.     .1.    -.4.     .3.     .6.    5.2.    6.7.    6.7.    5.1.   -2.1.   -2.3.    1.1.    4.5.
           . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  .
           .   .977.  1.268.   .913.  1.215.   .844.  1.240.   .907.  1.232.   .926.  1.256.   .930.  1.292.  1.026.
4          .    -.4.    -.8.   -4.1.   -5.5.   -5.5.    5.8.    5.2.    5.1.    3.7.   -2.3.   -2.3.    1.1.    4.6.
   . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  .
   .   .678.  1.283.   .970.  1.244.   .758.   .852.   .960.  1.245.   .958.   .890.   .796.  1.256.  1.006.  1.318.   .682.
5  .    2.2.     .1.    -.8.   -3.2.   -1.3.    -.8.    5.4.    5.3.    5.2.    3.7.    3.7.   -2.3.    2.8.    2.8.    2.9.
   . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  .
   .   .900.   .860.  1.233.   .860.   .840.   .860.  1.146.   .978.  1.126.   .858.   .832.   .892.  1.283.   .870.   .904.
6  .    2.5.     .3.   -2.5.   -3.4.   -1.7.     .7.    4.3.    4.3.    2.4.     .4.   -2.7.     .2.    1.5.    1.5.    2.9.
   . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  .
   .   .929.  1.283.   .962.  1.140.   .910.  1.131.   .977.  1.101.   .972.  1.113.   .933.  1.195.  1.012.  1.315.   .939.
7  .    2.5.    -.7.   -2.6.   -2.5.     .1.    2.5.    3.2.    2.9.    2.6.     .9.    2.5.    2.2.    2.5.    1.8.    3.5.
   . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  .
   .   .902.   .872.   .980.   .838.  1.138.   .965.  1.090.  1.001.  1.088.   .972.  1.219.   .888.  1.044.   .924.   .982.
8  .   -5.6.   -4.1.   -3.7.   -3.0.   -3.7.    1.6.    1.3.     .7.    1.1.    2.3.    3.2.    2.9.    2.6.    1.6.    2.8.
   . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  .
   .   .856.  1.235.   .948.  1.149.   .899.  1.088.   .931.  1.050.   .994.  1.155.   .955.  1.216.  1.026.  1.315.   .930.
9  .   -5.7.   -4.4.   -4.0.   -1.7.   -1.1.   -1.4.   -1.7.   -1.8.    4.9.    4.7.    5.0.    4.0.    3.9.    1.9.    2.5.
   . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  .
   .   .828.   .808.  1.195.   .877.   .842.   .836.  1.059.   .903.  1.059.   .859.   .872.   .911.  1.333.   .882.   .904.
10 .   -5.7.   -5.7.   -5.5.   -1.5.   -1.5.   -2.2.   -3.7.   -3.7.   -3.7.     .5.    2.0.    2.3.    5.4.    2.9.    3.0.
   . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  .
   .   .625.  1.206.   .918.  1.266.   .751.   .837.   .878.  1.146.   .889.   .834.   .771.  1.296.  1.030.  1.339.   .694.
11 .   -5.8.   -5.9.   -6.2.   -1.5.   -2.1.   -2.6.   -3.6.   -3.0.   -2.4.   -2.9.     .4.     .9.    5.3.    4.5.    4.6.
   . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  .
           .   .908.  1.167.   .902.  1.240.   .861.  1.143.   .846.  1.149.   .867.  1.243.   .921.  1.343.  1.022.
12         .   -7.4.   -8.6.   -5.3.   -3.6.   -3.6.   -2.5.   -1.9.   -2.0.   -2.9.   -3.3.   -3.3.    5.1.    4.2.
           . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  .
           .   .567.   .914.  1.199.   .944.  1.220.   .970.  1.002.   .965.  1.227.   .961.  1.280.   .986.   .638.
13         .   -7.3.   -7.7.   -6.8.   -4.5.   -4.3.   -2.5.   -2.0.   -3.0.   -3.8.   -2.8.    -.5.    -.5.    4.0.
           . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  .
                   .   .574.   .937.  1.252.   .841.  1.308.   .936.  1.287.   .831.  1.263.   .988.   .618.
14                 .   -7.5.   -5.5.   -3.4.   -3.2.     .0.     .0.   -1.6.   -4.3.   -2.5.    -.4.    -.5.
                   . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  .          . .  .  .
                                   .   .661.   .875.   .936.   .984.   .907.   .848.   .656.                          . MEAS .
15                                 .   -1.6.   -1.6.    1.8.    1.7.   -1.4.   -4.6.   -2.4.                          . DIFF .
                                   . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  . .  .  .                          . .  .  .


                  SALM INCORE MAP1501,25.94% PWR,BK D@171,1374PPM,7MWD/MTU,PT.62,1

         CALCULATED POWER TILTS (NORMALIZED TO 1.000)


 . 1.0225.1.0353 .                        .                         .                 .
    .     .     .                         .                            .  1.0289   .
      .   .   .            1.0056 . 1.0249                               .         .
 .9886 . . . 1.0144                       .                                .     .
 . . . . . . . . .              . . . . . . . . . .                 .9724     .    1.0214
 .9562 . . . 1.0284                       .                                .     .
      .   .   .             .9643 . 1.0053                               .         .
    .     .     .                         .                            .  .9773    .
 .  .9724. .9822 .                        .                         .                 .


              POSITIVE -Y- VS. NEGATIVE -Y- TILT
               1.0152                 .9848


              POSITIVE -X- VS. NEGATIVE -X- TILT
               1.0151                 .9849
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FIGURE 5

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MEASURED AND PERCENT. DIFF. OF FDHN  SALM INCORE MAP1502,47.17% PWR,BK D0185,1294PPM,16MWD/MTU,PT.6,5
        R      P      N      M      L      K      J      H      G      F      E      D      C      B      A
                                .  . . .  . . .  . . .  . . .  . . .  . . .  . . .
                                .  .679.  .896.  .937.  .994.  .974.  .860.  .652.
1                               .   3.8.   3.9.   5.6.   6.7.   9.7.   -.4.   -.5.
                  .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .
                  .  .631.  .964. 1.258.  .902. 1.310.  .970. 1.297.  .865. 1.226.  .954.  .626.
2                 .   5.0.   3.5.   3.7.   4.1.   4.8.   5.3.   3.8.   -.3.   1.1.   2.4.   4.1.
           .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .
           .  .630.  .987. 1.253.  .994. 1.294. 1.040. 1.076. 1.030. 1.241.  .968. 1.221.  .972.  .631.
3          .   5.8.   5.8.   5.0.   3.6.   3.7.   4.2.   4.3.   3.1.   -.5.    .9.   2.3.   4.1.   6.0.
           .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .
           .  .980. 1.256.  .894. 1.099.  .805. 1.210.  .909. 1.194.  .900. 1.242.  .920. 1.220.  .953.
4          .   6.0.   5.8.  -3.5. -12.4. -12.4.   1.8.    .9.    .4.  -2.1.  -1.0.   -.7.   2.7.   3.1.
    .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .
    .  .695. 1.265.  .999. 1.232.  .714.  .812.  .981. 1.239.  .974.  .901.  .779. 1.226.  .973. 1.235.  .682.
5   .   7.1.   5.1.   4.9.  -1.8. -12.4. -12.4.    .7.    .0.   -.0.  -2.8.  -4.4.  -2.2.   2.2.   2.6.   5.0.
    .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .
    .  .907.  .882. 1.248.  .882.  .854.  .861. 1.156. 1.002. 1.172.  .911.  .882.  .906. 1.265.  .881.  .900.
6   .   6.0.   2.8.    .6.  -3.7.  -7.4.  -8.2.  -2.1.  -1.7.   -.7.  -2.8.  -4.4.  -1.1.   2.1.   2.6.   5.2
    .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .
    .  .931. 1.256.  .982. 1.164.  .943. 1.141. 1.012. 1.134. 1.028. 1.166.  .998. 1.212. 1.022. 1.267.  .921.
7   .   5.9.   1.5.  -1.1.  -1.9.  -3.2.  -3.6.  -2.5.  -2.4.   -.9.  -1.6.   2.5.   2.1.   2.9.   2.3.   4.7.
    .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .
    .  .960.  .905. 1.010.  .871. 1.197.  .993. 1.128. 1.054. 1.123.  .999. 1.251.  .915. 1.054.  .919.  .972.
8   .   3.8.   1.0.  -1.8.  -3.5.  -3.3.  -3.6.  -3.4.  -4.7.  -3.9.  -3.0.   1.1.   1.4.   2.5.   2.5.   5.1.
    .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .
    .  .911. 1.251.  .979. 1.131.  .925. 1.126.  .987. 1.100.  .995. 1.147.  .980. 1.198. 1.017. 1.275.  .925.
9   .   3.6.   1.0.  -1.4.  -4.7.  -5.0.  -4.9.  -4.9.  -5.4.  -4.1.  -3.2.    .7.    .9.   2.4.   3.0.   5.2.
    .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .
    .  .866.  .870. 1.256.  .863.  .869.  .879. 1.110.  .959. 1.117.  .900.  .916.  .911. 1.246.  .902.  .898.
10.     1.2.   1.3.   1.4.  -5.8.  -5.8.  -6.2.  -5.9.  -5.9.  -5.4.  -3.9.   -.8.   -.6.    .5.   5.1.   4.9.
    .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .
    .  .655. 1.214.  .959. 1.181.  .773.  .876.  .925. 1.186.  .947.  .919.  .817. 1.258.  .957. 1.249.  .674.
11.      .9.    .8.    .7.  -5.8.  -5.1.  -5.5.  -5.0.  -4.2.  -2.8.   -.9.    .3.    .4.    .4.   3.7.   3.8.
    .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .
           .  .923. 1.174.  .899. 1.209.  .886. 1.142.  .877. 1.158.  .911. 1.243.  .929. 1.208.  .949.
12         .   -.2.  -1.1.  -2.9.  -3.6.  -3.6.  -4.0.  -2.8.  -2.6.   -.9.   -.9.    .4.   1.7.   2.6.
           .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .
           .  .589.  .923. 1.177.  .937. 1.217.  .969. 1.013.  .990. 1.238.  .983. 1.260.  .967.  .606.
13         .  -1.2.  -1.2.  -1.4.  -2.4.  -2.5.  -3.0.  -1.8.   -.8.   -.8.   2.5.   5.6.   3.6.   1.7.
           .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .
                  .  .594.  .931. 1.221.  .866. 1.269.  .938. 1.285.  .864. 1.245.  .985.  .623.
14                .  -1.2.   -.0.    .7.   -.1.   1.5.   1.9.   2.8.   -.4.   2.6.   5.7.   3.7.
                  .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .  . . .    . . . .
                                .  .674.  .867.  .906.  .954.  .915.  .858.  .672.
                                                                                                   . MEAS .
15                              .   2.9.    .4.   2.0.   2.4.   3.0.   -.6.   2.7.                 . DIFF .
                                .  . . .  . . .  . . .  . . .  . . .  . . .  . . .
                                                                                                   . .   . .
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              SALM INCORE MAP1502,47.17% PWR,BK D0185,1294PPM,16MWD/MTU,PT.6,5

       CALCULATED POWER TILTS (NORMALIZED TO 1.000)

          . 1.0051.1.0111 .                      .                        .           .
             .    .    .                         .                          . 1.0081   .
              .   .   .             1.0030 . 1.0111                          .       .
        1.0009 . . . 1.0112                      .                             .   .
           . . . . . . . . .            . . . . . . . . .                .9903  .  1.0107
          .9798 . . . 1.0101                     .                             .   .
              .   .   .              .9800 . 1.0058                          .       .
             .    .    .                         .                          .  .9909   .
          .  .9803.1.0015 .                      .                        .           .


              POSITIVE -Y- VS. NEGATIVE -Y- TILT
               1.0071            .9929


              POSITIVE -X- VS. NEGATIVE -X- TILT
               1.0085            .9915
```

FIGURE 6

```
MEASURED AND PERCENT. DIFF. OF FDHN  SALM INCORE MAP1503,47.2% PWR,BK D0228,1271PPM,25MWD/MTU,PT.5
      R      P      N      M   . .L . . .K . . .J . . .H . . .G . . .F . . .E . .  D      C      B      A
                              .  .697.  .934.  .958. 1.005.  .975.  .912.  .684.
1                             .   4.0.   4.6.   5.5.   6.2.   7.4.   2.1.   2.1.
                 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
                 .  .612.  .966. 1.283.  .962. 1.340.  .981. 1.332.  .940. 1.265.  .956.  .613.
2                .   3.2.   4.0.   4.0.   4.5.   5.0.   5.4.   4.4.   2.1.   2.6.   3.1.   3.3.
          . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
          .  .613.  .959. 1.219.  .998. 1.311. 1.045. 1.074. 1.040. 1.287.  .984. 1.217.  .951.  .609.
3         .   4.2.   4.2.   3.2.   4.0.   4.0.   4.2.   4.2.   3.7.   2.1.   2.6.   3.1.   3.3.   3.6.
          . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
          .  .961. 1.224.  .879. 1.101.  .808. 1.205.  .904. 1.194.  .910. 1.253.  .923. 1.206.  .944.
4         .   4.3.   4.1.  -3.7. -11.0. -11.0.   2.7.   1.8.   1.8.    .3.   1.3.   1.1.  -2.6.   2.4.
   . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
   .  .699. 1.263.  .981. 1.206.  .710.  .807.  .967. 1.222.  .960.  .900.  .789. 1.237.  .973. 1.252.  .687
5  .   5.2.   3.1.   3.0.  -2.5. -11.0. -11.0.   1.4.    .9.    .8.   -.7.  -1.1.    .0.   2.2.   2.3.   3.4
   . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
   .  .943.  .919. 1.242.  .867.  .839.  .857. 1.152.  .998. 1.160.  .909.  .892.  .904. 1.270.  .926.  .916
6  .   6.4.    .9.   -.8.  -4.2.  -7.1.  -6.3.   -.4.   -.3.    .3.   -.7.  -1.1.   -.1.   1.4.   1.6.   3.4
   . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
   .  .957. 1.282.  .980. 1.151.  .932. 1.143. 1.019. 1.156. 1.034. 1.165.  .955. 1.168. 1.008. 1.283.  .930
7  .   6.4.   1.4.  -1.6.  -1.6.  -2.1.  -1.5.   -.8.   -.7.    .6.    .4.    .3.   -.2.   1.1.   1.5.   3.4
   . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
   .  .974.  .918. 1.008.  .868. 1.187.  .997. 1.152. 1.143. 1.161. 1.004. 1.209.  .886. 1.034.  .919.  .966
8  .   3.7.   1.3.  -1.9.  -2.4.  -2.0.  -1.5.  -1.5.  -1.6.   -.8.   -.8.   -.2.   -.4.    .6.   1.4.   3.0
   . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
   .  .930. 1.279.  .984. 1.134.  .922. 1.121.  .990. 1.129. 1.019. 1.151.  .950. 1.165. 1.006. 1.287.  .926
9  .   3.4.   1.2.  -1.3.  -3.1.  -3.1.  -3.4.  -3.6.  -3.0.   -.9.   -.9.   -.2.   -.5.   1.0.   1.9.   2.9
   . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
   .  .882.  .908. 1.257.  .863.  .861.  .869. 1.111.  .969. 1.137.  .902.  .893.  .895. 1.245.  .935.  .909
10.   -.4.   -.4.    .4.  -4.6.  -4.6.  -5.0.  -3.9.  -3.1.  -1.7.  -1.5.  -1.0.  -1.0.   -.5.   2.6.   2.6
   . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
   .  .656. 1.209.  .940. 1.180.  .761.  .862.  .914. 1.173.  .934.  .883.  .790. 1.224.  .969. 1.246.  .682
11.  -1.3.  -1.3.  -1.3.  -4.6.  -4.7.  -5.0.  -4.0.  -3.2.  -2.0.  -2.6.  -1.0.  -1.0.   1.8.   1.8.   2.6
   . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
          .  .901. 1.139.  .881. 1.187.  .870. 1.136.  .870. 1.149.  .884. 1.205.  .935. 1.197.  .938.
12        .  -2.2.  -3.1.  -3.5.  -4.1.  -4.1.  -3.2.  -2.0.  -2.1.  -2.6.  -2.6.   2.5.   1.8.   1.8.
          . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
          .  .569.  .892. 1.144.  .922. 1.224.  .975. 1.014.  .975. 1.226.  .957. 1.210.  .940.  .598.
13        .  -3.1.  -3.1.  -3.1.  -3.9.  -2.9.  -2.7.  -1.6.  -2.8.  -2.8.   -.2.   2.5.   2.1.   1.8.
          . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
                 .  .575.  .911. 1.218.  .911. 1.297.  .949. 1.285.  .894. 1.230.  .951.  .606.
14               .  -3.1.  -1.9.  -1.2.  -1.1.   1.6.   1.9.    .7.  -2.9.   -.2.   2.5.   2.1.
                 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .     . . . .
                              .  .674.  .893.  .925.  .967.  .916.  .867.  .668.                 . MEAS
15                            .    .6.   -.0.   1.9.   2.2.    .9.  -2.9.   -.2.                 . DIFF .
                              . . . . . . . . . . . . . . . . . . . . . . . . .                  . .  . .


                    SALM INCORE MAP1503,47.2% PWR,BK D0228,1271PPM,25MWD/MTU,PT.5

             CALCULATED POWER TILTS (NORMALIZED TO 1.000)


                 . 1.0109.1.0239 .                        .                    .                .
                    .       .                                                    .  1.0174    .
                     .    .    .              1.0051 . 1.0168                   .            .
                 .9993 . . . 1.0098                                                .    .
                 . . . . . . . . .            . . . . . . . . . .            .9894  .  1.0073
                 .9794 . . . 1.0048                       .                        .    .
                     .    .    .               .9793 .  .9987                   .            .
                    .       .                             .                  .   .9860     .
                 .  .9793. .9927 .                        .                .                .


                    POSITIVE -Y- VS. NEGATIVE -Y- TILT
                     1.0110            .9890
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FIGURE 7

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MEASURED AND PERCENT. DIFF. OF FDHN  SALM INCORE MAP1504,48.1% PWR,BK D0228,1180PPM,31MWD/MTU,PT.5
      R       P       N       M   . .L . . .K . . .J . . .H . . .G . . .F . . .E . .   D       C       B       A
                                  .   .698.   .928.   .956.  1.002.   .984.   .891.   .668.
1                                 .   4.2.    3.9.    5.3.    6.0.    8.4.    -.2.    -.2.
                  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
                  .   .618.   .967.  1.285.   .957.  1.335.   .976.  1.321.   .919.  1.239.   .939.   .612.
2                 .    4.2.    4.2.    4.2.    3.9.    4.6.    4.9.    3.5.    -.2.     .5.    1.2.    3.1.
          .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
          .   .617.   .966.  1.231.  1.000.  1.314.  1.046.  1.075.  1.035.  1.258.   .964.  1.196.   .949.   .617.
3         .    5.0.    4.9.    4.2.    4.2.    4.2.    4.4.    4.3.    3.2.    -.2.     .5.    1.2.    3.1.    5.0.
          .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
          .   .967.  1.233.   .883.  1.098.   .805.  1.203.   .901.  1.185.   .898.  1.232.   .913.  1.204.   .949.
4         .    5.0.    4.9.   -3.3.  -11.3.  -11.3.    2.5.    1.5.    1.0.   -1.0.    -.4.     .0.    2.4.    3.1.
  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
  .   .702.  1.273.   .989.  1.213.   .708.   .804.   .977.  1.229.   .965.   .893.   .781.  1.229.   .977.  1.258.   .695
5 .    5.7.    3.9.    3.9.   -1.9.  -11.3.  -11.3.    2.5.    1.4.    1.3.   -1.5.   -2.2.    -.6.    2.6.    2.8.    4.6
  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
  .   .933.   .928.  1.248.   .869.   .838.   .853.  1.155.   .999.  1.164.   .902.   .883.   .902.  1.276.   .931.   .927
6 .    5.3.    1.8.    -.2.   -3.9.   -7.2.   -6.8.    -.1.    -.2.     .6.   -1.5.   -2.2.    -.3.    2.0.    2.2.    4.6
  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
  .   .947.  1.279.   .981.  1.147.   .924.  1.135.  1.021.  1.159.  1.033.  1.148.   .951.  1.166.  1.010.  1.285.   .937
7 .    5.3.    1.2.   -1.5.   -2.0.   -2.9.   -2.2.    -.6.    -.5.     .5.   -1.1.    -.2.    -.4.    1.4.    1.7.    4.2
  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
  .   .963.   .910.  1.002.   .861.  1.176.   .990.  1.150.  1.138.  1.148.   .996.  1.206.   .885.  1.033.   .921.   .975
8 .    2.6.     .3.   -2.4.   -3.2.   -2.9.   -2.2.   -1.7.   -2.0.   -1.9.   -1.6.    -.4.    -.5.     .5.    1.5.    3.9
  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
  .   .920.  1.267.   .975.  1.128.   .918.  1.119.   .991.  1.127.  1.007.  1.142.   .948.  1.161.  1.004.  1.288.   .934
9 .    2.3.     .3.   -2.1.   -3.6.   -3.6.   -3.6.   -3.6.   -3.3.   -2.0.   -1.6.    -.5.    -.8.     .7.    1.9.    3.9
  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
  .   .878.   .904.  1.243.   .863.   .861.   .869.  1.111.   .967.  1.132.   .899.   .894.   .896.  1.224.   .948.   .921
10.    -.9.    -.9.    -.7.   -4.7.   -4.6.   -5.1.   -3.9.   -3.4.   -2.1.   -1.8.   -1.0.   -1.0.   -2.2.    4.0.    4.0
  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
  .   .657.  1.211.   .942.  1.178.   .759.   .860.   .912.  1.178.   .940.   .896.   .790.  1.224.   .976.  1.256.   .691
11.   -1.1.   -1.1.   -1.1.   -4.7.   -4.9.   -5.2.   -4.3.   -2.7.   -1.3.   -1.2.   -1.0.   -1.0.    2.6.    2.6.    4.0
  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
          .   .902.  1.141.   .881.  1.185.   .868.  1.132.   .876.  1.158.   .897.  1.223.   .950.  1.206.   .945.
12        .   -2.0.   -3.0.   -3.5.   -4.3.   -4.4.   -3.5.   -1.3.   -1.3.   -1.2.   -1.2.    4.1.    2.6.    2.6.
          .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
          .   .570.   .893.  1.151.   .925.  1.226.   .973.  1.022.   .987.  1.241.   .970.  1.229.   .951.   .603.
13        .   -3.0.   -3.0.   -2.5.   -3.6.   -2.7.   -2.9.    -.8.   -1.5.   -1.5.    1.1.    4.1.    3.3.    2.6.
          .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
                  .   .575.   .918.  1.232.   .918.  1.299.   .950.  1.293.   .903.  1.247.   .966.   .613.
14                .   -3.0.   -1.1.    -.1.    -.2.    1.8.    2.0.    1.3.   -1.9.    1.1.    4.1.    3.4.
                  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .       .  .  .  .
                                  .   .682.   .899.   .926.   .968.   .921.   .876.   .677.                             . MEAS
15                                .    1.9.     .7.    2.0.    2.3.    1.5.   -1.9.    1.1.                             . DIFF
                                  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .                          .  .  .
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```
          SALM INCORE MAP1504,48.1% PWR,BK D0228,1180PPM,31MWD/MTU,PT.5

     CALCULATED POWER TILTS (NORMALIZED TO 1.000)


        . 1.0117.1.0141 .                          .                             .               .
          .     .     .                            .                                .  1.0129   .
            .     .     .                  1.0055 . 1.0119                            .      .
        .9993 . . . 1.0097                         .                                    .  .
        . . . . . . . . .                 . . . . . . . . .                       .9876 . 1.0081
        .9759 . . . 1.0065                         .                                    .  .
            .     .     .                   .9787 . 1.0039                            .      .
          .     .     .                            .                                .  .9914   .
        .  .9814.1.0013 .                          .                             .               .


             POSITIVE -Y- VS. NEGATIVE -Y- TILT
              1.0087             .9913
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FIGURE 8

```
MEASURED AND PERCENT. DIFF. OF FDHN  SALM INCORE MAP1505,98.54% PWR,BK D@228,1025PPM,110MWD/MTU,PT.5
          R       P       N       M  . .L . . .K . . .J . . .H . . .G . . .F . . .E . .   D       C       B       A
                                    .   .680.   .905.   .933.   .979.   .963.   .892.   .669.
1                                   .    1.5.    1.3.    2.7.    3.6.    6.0.    -.2.    -.2.

                    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
                    .   .588.   .942.  1.252.   .933.  1.312.   .962.  1.313.   .919.  1.221.   .911.   .595.
2                   .    -.9.    1.5.    1.5.    1.3.    2.8.    3.4.    2.9.    -.2.   -1.0.   -1.9.     .3.
            . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
            .   .590.   .923.  1.170.   .973.  1.279.  1.037.  1.072.  1.033.  1.258.   .949.  1.159.   .923.   .602.
3           .     .3.     .2.    -.9.    1.5.    1.5.    3.5.    4.1.    3.0.    -.2.   -1.0.   -1.9.     .3.    2.4.
            . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
            .   .925.  1.178.   .874.  1.141.   .837.  1.211.   .916.  1.200.   .926.  1.245.   .918.  1.179.   .934.
4           .     .4.     .2.   -4.2.   -7.8.   -7.8.    3.2.    3.1.    2.3.    2.0.     .6.     .6.     .2.    1.3.
    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
    .   .675.  1.226.   .953.  1.199.   .736.   .836.   .991.  1.256.   .987.   .936.   .828.  1.260.   .959.  1.234.   .674.
5   .    1.5.     .2.     .1.   -3.1.   -7.8.   -7.8.    4.1.    3.6.    3.6.    3.2.    3.7.    1.9.     .7.     .8.    1.5.
    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
    .   .912.   .910.  1.240.   .876.   .858.   .889.  1.193.  1.031.  1.197.   .945.   .936.   .915.  1.256.   .916.   .899.
6   .    3.0.    -.2.    -.9.   -3.2.   -4.9.   -2.8.    3.1.    3.1.    3.5.    3.2.    3.7.    1.1.     .3.     .4.    1.5.
    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
    .   .926.  1.270.   .986.  1.165.   .951.  1.177.  1.051.  1.192.  1.071.  1.210.   .992.  1.183.  1.008.  1.272.   .915.
7   .    3.0.     .5.   -1.1.    -.5.    -.1.    1.4.    2.3.    2.3.    4.2.    4.3.    4.2.    1.0.    1.2.     .6.    1.7.
    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
    .   .942.   .903.  1.008.   .885.  1.212.  1.026.  1.185.  1.178.  1.203.  1.040.  1.254.   .902.  1.040.   .908.   .944.
8   .     .4.    -.4.   -1.9.    -.5.     .1.    1.4.    1.3.    1.4.    2.8.    2.8.    3.5.    1.5.    1.2.     .1.     .6.
    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
    .   .900.  1.257.   .976.  1.175.   .963.  1.160.  1.016.  1.161.  1.055.  1.191.   .981.  1.193.  1.014.  1.267.   .904.
9   .     .1.    -.5.   -2.0.     .4.    1.2.    -.0.   -1.2.    -.3.    2.7.    2.7.    3.0.    1.9.    1.8.     .3.     .5.
    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
    .   .867.   .892.  1.217.   .914.   .911.   .912.  1.137.   .995.  1.165.   .932.   .920.   .922.  1.272.   .905.   .879.
10. -2.1.   -2.2.   -2.8.    1.0.    1.0.    -.4.   -1.7.    -.6.     .7.    1.9.    2.0.    1.9.    1.7.    -.8.    -.8.
    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
    .   .655.  1.206.   .938.  1.249.   .799.   .900.   .937.  1.193.   .943.   .888.   .812.  1.257.   .968.  1.230.   .660.
11. -1.5.   -1.5.   -1.5.    1.0.     .1.    -.8.   -1.7.   -1.6.   -1.1.   -2.1.    1.7.    1.7.    1.7.     .5.    -.8.
    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
            .   .891.  1.116.   .893.  1.222.   .896.  1.160.   .878.  1.160.   .889.  1.212.   .928.  1.182.   .926.
12          .   -3.3.   -5.1.   -2.2.   -1.2.   -1.3.   -1.1.   -1.1.   -1.2.   -2.1.   -2.1.    1.7.     .5.     .5.
            . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
            .   .558.   .874.  1.135.   .935.  1.221.   .968.   .996.   .972.  1.221.   .932.  1.164.   .917.   .591.
13          .   -5.1.   -5.1.   -3.9.   -2.5.   -3.1.   -3.4.   -3.3.   -3.1.   -3.1.   -2.8.   -1.4.    -.4.     .5.
            . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
                    .   .563.   .902.  1.213.   .896.  1.248.   .913.  1.254.   .882.  1.199.   .915.   .590.
14                  .   -5.1.   -2.8.   -1.6.   -2.7.   -2.2.   -1.9.   -1.7.   -4.2.   -2.8.   -1.4.    -.5.
                    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .        . . . .
                                    .   .667.   .871.   .891.   .931.   .893.   .856.   .651.                      . MEAS .
15                                  .    -.4.   -2.5.   -1.9.   -1.6.   -1.6.   -4.2.   -2.8.
                                                                                                                   . DIFF .
                                    . . . . . . . . . . . . . . . . . . . . . . . . . . . .                        . . . .
```

```
               SALM INCORE MAP1505,98.54% PWR,BK D@228,1025PPM,110MWD/MTU,PT.5

     CALCULATED POWER TILTS (NORMALIZED TO 1.000)


     . 1.0074.1.0183 .                         .                         .              .
        .     .    .                           .                            .  1.0128   .
          .     .    .               1.0007 . 1.0164                         .       .
     .9940 . . . 1.0146                        .                                .  .
     . . . . . . . . . .             . . . . . . . . . .                  .9907   .  1.0125
     .9873 . . . 1.0105                        .                                .  .
          .     .    .                .9846 .  .9982                         .       .
        .     .    .                           .                            .   .9840   .
     .  .9820. .9860 .                         .                         .              .


  POSITIVE -Y- VS. NEGATIVE -Y- TILT
             1.0086             .9914
```

FIGURE 9

```
MEASURED AND PERCENT. DIFF. OF FDHN  SALM INCORE MAP1506,99.59% PWR,BK D0215,1025PPM,117MWD/MTU,PT.6,5
          R      P      N      M      L      K      J      H      G      F      E      D      C      B      A

1                                   .680.  .901.  .927.  .973.  .950.  .879.  .661.
                                     2.3.   1.9.   2.9.   3.3.   5.3.   -.6.   -.6.

2                     .591.  .949. 1.254.  .924. 1.303.  .955. 1.297.  .902. 1.214.  .913.  .596.
                       -.8.   2.1.   2.2.   2.0.   2.8.   3.0.   2.3.   -.5.  -1.1.  -1.7.    .2.

3              .594.  .929. 1.175.  .980. 1.284. 1.035. 1.069. 1.027. 1.248.  .947. 1.164.  .926.  .602.
                 .6.    .5.   -.8.   2.1.   2.2.   3.4.   3.7.   2.6.   -.7.  -1.2.  -1.7.    .2.   2.1.

4              .929. 1.185.  .875. 1.136.  .834. 1.214.  .918. 1.201.  .925. 1.244.  .921. 1.182.  .934.
                 .8.    .5.  -4.6.  -8.5.  -8.5.   3.0.   2.9.   1.9.   1.5.    .2.    .4.    .2.   1.2.

5       .675. 1.227.  .957. 1.202.  .735.  .835.  .998. 1.262.  .992.  .937.  .827. 1.261.  .961. 1.231.  .672.
         2.3.    .7.    .5.  -3.2.  -8.6.  -8.6.   4.0.   3.4.   3.4.   2.6.   2.9.   1.6.    .9.   1.1.   1.8.

6       .906.  .901. 1.242.  .879.  .862.  .891. 1.198. 1.035. 1.200.  .946.  .935.  .917. 1.255.  .905.  .893.
         3.3.    .5.   -.5.  -3.2.  -5.2.  -3.3.   3.0.   2.9.   3.2.   2.6.   2.9.    .9.    .6.    .9.   1.9.

7       .922. 1.265.  .987. 1.168.  .954. 1.180. 1.053. 1.190. 1.072. 1.215.  .995. 1.184. 1.008. 1.268.  .915.
         3.3.    .8.   -.8.   -.6.   -.5.   1.1.   2.1.   2.2.   4.1.   4.1.   3.8.    .8.   1.3.   1.0.   2.4.

8       .941.  .902. 1.010.  .886. 1.215. 1.028. 1.184. 1.164. 1.204. 1.045. 1.258.  .903. 1.041.  .908.  .947.
          .7.   -.2.  -1.8.   -.8.   -.4.   1.0.   1.3.   1.5.   3.0.   2.6.   3.2.   1.1.   1.2.    .5.   1.4.

9       .897. 1.252.  .976. 1.175.  .964. 1.163. 1.017. 1.161. 1.059. 1.197.  .985. 1.194. 1.014. 1.264.  .904.
          .4.   -.3.  -1.9.   -.1.    .6.   -.4.  -1.3.   -.2.   2.8.   2.5.   2.7.   1.6.   1.9.    .7.   1.2.

10.     .865.  .884. 1.217.  .915.  .915.  .916. 1.140.  .999. 1.171.  .938.  .925.  .925. 1.272.  .895.  .875.
        -1.4.  -1.4.  -2.5.    .7.    .7.   -.7.  -2.0.   -.7.    .6.   1.7.   1.8.   1.8.   1.9.   -.1.   -.2.

11.     .656. 1.210.  .945. 1.251.  .801.  .902.  .939. 1.196.  .946.  .891.  .817. 1.264.  .970. 1.227.  .658.
         -.6.   -.7.   -.8.    .7.   -.4.  -1.2.  -2.2.  -1.9.  -1.4.  -2.4.   1.7.   1.8.   1.8.    .7.   -.3.

12             .896. 1.122.  .897. 1.224.  .897. 1.159.  .880. 1.161.  .890. 1.213.  .933. 1.185.  .927.
                -2.8.  -4.9.  -2.2.  -1.4.  -1.5.  -1.6.  -1.4.  -1.5.  -2.3.  -2.3.   1.8.    .5.    .6.

13             .561.  .879. 1.141.  .935. 1.218.  .965.  .996.  .970. 1.218.  .934. 1.169.  .921.  .593.
                -4.9.  -4.9.  -3.7.  -2.5.  -3.1.  -3.6.  -3.4.  -3.1.  -3.1.  -2.6.  -1.3.   -.4.    .5.

14                    .566.  .905. 1.211.  .886. 1.241.  .910. 1.247.  .872. 1.197.  .917.  .593.
                       -4.9.  -2.6.  -1.3.  -2.1.  -2.1.  -1.9.  -1.6.  -3.7.  -2.5.  -1.2.   -.4.

                                    .663.  .865.  .885.  .926.  .888.  .850.  .649.
                                                                                               . MEAS .
15                                                                                             . DIFF .
                                     -.3.  -2.2.  -1.8.  -1.6.  -1.5.  -3.8.  -2.4.
```

```
                SALM INCORE MAP1506,99.59% PWR,BK D0215,1025PPM,117MWD/MTU,PT.6,5

      CALCULATED POWER TILTS (NORMALIZED TO 1.000)


          . 1.0074.1.0151 .                                 .
                                        .                    .    1.0113    .
          .9951 . . . 1.0146        1.0013 . 1.0149
          . . . . . . . . .                                  .
          .9884 . . . 1.0117     . . . . . . . . . .    .9918  .  1.0132

                                  .9849 .  .9989
          . .9814. .9861 .                  .                    .    .9838    .



               POSITIVE -Y- VS. NEGATIVE -Y- TILT
                1.0081             .9919


               POSITIVE -X- VS. NEGATIVE -X- TILT
                1.0069             .9931
```

FIGURE 10

```
MEASURED AND PERCENT. DIFF. OF FDHN  SALM INCORE MAP1507,99.34% PWR,BK D@228,1013PPM,140MWD/MTU,PT.5
          R       P       N       M   . .L . . .K . . .J . . .H . . .G . . .F . . .E . .   D       C       B       A
                                     .   .678.   .905.   .920.   .960.   .921.   .891.   .668.
1                                    .    1.3.    1.4.    1.4.    1.5.    1.5.    -.2.    -.2.

                     . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
                     .   .591.   .940.  1.249.   .933.  1.299.   .950.  1.291.   .919.  1.221.   .912.   .589.
2                    .    -.4.    1.3.    1.3.    1.4.    1.8.    2.1.    1.2.    -.2.   -1.0.   -1.7.    -.6.

             . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
             .   .594.   .929.  1.177.   .971.  1.276.  1.030.  1.066.  1.024.  1.257.   .950.  1.161.   .915.   .590.
3            .    1.0.     .9.    -.4.    1.3.    1.3.    2.7.    3.4.    2.2.    -.2.   -1.0.   -1.7.    -.6.     .5.

             . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
             .   .931.  1.186.   .876.  1.140.   .836.  1.214.   .920.  1.204.   .929.  1.246.   .919.  1.171.   .924.
4            .    1.0.     .8.   -4.0.   -7.9.   -7.9.    3.5.    3.6.    2.6.    2.4.     .7.     .7.    -.4.     .3.
    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
    .    .680.  1.229.   .955.  1.198.   .735.   .835.   .996.  1.263.   .993.   .941.   .830.  1.262.   .959.  1.234.    .675
5   .    2.2.     .4.     .3.   -3.1.   -7.9.   -7.9.    4.5.    4.2.    4.2.    3.8.    3.9.    2.0.     .7.     .8.     1.5
    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
    .    .910.   .904.  1.236.   .874.   .859.   .892.  1.200.  1.038.  1.205.   .950.   .938.   .916.  1.257.   .917.    .899
6   .    2.7.    -.9.   -1.2.   -3.4.   -4.9.   -2.6.    3.8.    3.8.    4.2.    3.8.    3.9.    1.3.     .5.     .5.     1.5
    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
    .    .924.  1.267.   .984.  1.164.   .952.  1.183.  1.057.  1.199.  1.076.  1.215.   .991.  1.180.  1.008.  1.273.    .916
7   .    2.7.     .2.   -1.2.    -.6.     .0.    1.9.    2.9.    2.9.    4.7.    4.7.    4.1.     .8.    1.1.     .7.     1.8
    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
    .    .941.   .903.  1.008.   .886.  1.214.  1.031.  1.192.  1.187.  1.213.  1.047.  1.256.   .902.  1.039.   .908.    .944
8   .     .2.    -.4.   -1.9.    -.4.     .2.    1.9.    1.9.    2.2.    3.7.    3.5.    3.7.    1.4.    1.1.     .2.      .6
    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
    .    .899.  1.236.   .976.  1.177.   .966.  1.165.  1.021.  1.170.  1.064.  1.200.   .986.  1.193.  1.012.  1.266.    .904
9   .    -.1.    -.6.   -2.0.     .6.    1.4.     .4.    -.7.     .5.    3.6.    3.4.    3.6.    1.9.    1.6.     .2.      .5
    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
    .    .860.   .885.  1.215.   .917.   .915.   .916.  1.142.  1.002.  1.174.   .940.   .928.   .930.  1.243.   .904.   .878.
10.     -2.9.   -2.9.   -2.9.    1.3.    1.3.     .0.   -1.2.     .1.    1.6.    2.7.    2.8.    2.8.    -.7.    -.9.    -.9.
    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
    .    .646.  1.189.   .966.  1.253.   .801.   .903.   .940.  1.195.   .943.   .885.   .821.  1.271.   .959.  1.233.    .659
11.     -2.9.   -2.9.    1.5.    1.3.     .3.    -.4.   -1.3.   -1.4.   -1.0.   -2.5.    2.8.    2.8.     .7.     .7.    -.9.
    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
             .   .878.  1.121.   .896.  1.226.   .899.  1.164.   .879.  1.160.   .886.  1.207.   .903.  1.184.   .928.
12           .   -4.7.   -4.7.   -1.8.    -.9.   -1.0.    -.8.   -1.0.   -1.2.   -2.5.   -2.5.   -1.1.     .7.     .7.

             . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
             .   .560.   .877.  1.140.   .939.  1.225.   .971.   .996.   .978.  1.230.   .948.  1.168.   .919.   .592.
13           .   -4.7.   -4.7.   -3.5.   -2.1.   -2.8.   -3.1.   -3.3.   -2.5.   -2.5.   -1.1.   -1.1.    -.2.     .7.

             . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
                     .   .565.   .899.  1.205.   .893.  1.222.   .891.  1.222.   .911.  1.220.   .918.   .592.
14                   .   -4.7.   -3.1.   -2.3.   -3.0.   -4.2.   -4.2.   -4.2.   -1.1.   -1.1.   -1.1.    -.2.

                     . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
                                                                                                                            . . . .
                                     .   .654.   .864.   .869.   .906.   .869.   .883.   .663.                              . MEAS .
15                                   .   -2.4.   -3.3.   -4.2.   -4.2.   -4.2.   -1.1.   -1.1.

                                                                                                                            . DIFF .
                                     . . . . . . . . . . . . . . . . . . . . . . . . . . . . .                              . . . .
```

```
          SALM INCORE MAP1507,99.34% PWR,BK D@228,1013PPM,140MWD/MTU,PT.5

CALCULATED POWER TILTS (NORMALIZED TO 1.000)


     . 1.0065.1.0161 .                        .                       .                .
       .     .     .                          .                         .  1.0113   .
         .    .  .                     1.0008 . 1.0153                    .        .
     .9951 . . . 1.0145                       .                             .   .
     . . . . . . . . .               . . . . . . . . . .               .9916  .  1.0128
     .9880 . . . 1.0112                                                     .   .
         .    .  .                     .9841  .  .9999                    .        .
       .     .     .                          .                         .  .9843   .
     . .9801. .9885 .                         .                       .                .



          POSITIVE -Y- VS. NEGATIVE -Y- TILT
           1.0080             .9920
```

APPENDIX A

STARTUP TEST PROGRAM DESCRIPTION
SALEM UNIT 1 CYCLE 5

The startup program is written such that deviations between measurement and design beyond established tolerances could call for a review of test data, a repeat of the measurement or a review of the safety analysis. Operation is always within FSAR and Technical Specification limits.

STARTUP TEST PROGRAM DESCRIPTION

SALEM UNIT 1 CYCLE 5

Test: Initial Criticality

Initial Conditions:

Mode 3, Tave = 547°F, C_B = 2000 ppm

Shutdown Banks Withdrawn

Control Banks Inserted

Test Description:

Pull control banks to D at 160 steps.

Dilute to criticality.

Checkout reactivity computer.

Acceptance Criteria:

Design:

Reactivity computer readings are within 4% of doubling time measurements.

FSAR/T.S.:

Reactor must achieve criticality with the control banks above the zero power insertion limits.

STARTUP TEST PROGRAM DESCRIPTION
SALEM UNIT 1 CYCLE 5

Test: Flux Mapping

Initial Conditions:

HZP, ARO

Test Description:

Operate Flux Mapping System in accordance with Part 13 of the Reactor Engineering Manual "Incore Flux Mapping System Operation"

Acceptance Criteria:

Design: Assembly Power

Design ± 10% for assembly Power less than 0.9

Design ± 15% for assembly Power greater than 0.9

FSAR/T.S.:

Not applicable below 5% power.

STARTUP TEST PROGRAM DESCRIPTION

SALEM UNIT 1 CYCLE 5

Rod Worth Measurements

Initial Conditions:

HZP

The rod exchange method is used to measure all control bank worths. Based on the results of these measurements, additional measurements using the boron dilution method may be necessary.

Test Description:

Determine the worth of the reference rod bank by using the boron dilution method. Exchange this reference bank with another bank while keeping the reactor critical and constant RCS boron concentration. Using the heights of the rod banks with respect to the reference bank, infer the equivalent boron dilution rod worths using analytical techniques and compare results to acceptance criteria.

Acceptance Criteria:

Design: Design value ± 10% on total banks worth

Design value ± 15% on any individual bank greater than or equal to 600 pcm

Design value ± 100 pcm on any individual bank less than 600 pcm

FSAR/T.S.:

Worth of all rods less most reactive stuck rod must be 1.6% Delta K/K.

STARTUP TEST PROGRAM DESCRIPTION

SALEM UNIT 1 CYCLE 5

Test: Boron Endpoint

Initial Conditions:

HZP

Endpoint is run for the ARO configuration.

Test Description:

Adjust RCS boron to near the just critical endpoint configuration. Move rods to endpoint while measuring additional worth on the reactivity computer.

Acceptance Criteria:

Design:

Design * ± 50 ppm

FSAR/T.S.:

Design ± 100 ppm

*Design values on attached Table.

STARTUP TEST PROGRAM DESCRIPTION

SALEM UNIT 1 CYCLE 5

Test: Isothermal Temperature Coefficient

Initial Conditions:

HZP

The coefficient is measured at the ARO rod configuration.

Test Description:

Starting with Tave = 547°F, cooldown the primary system approx. 5°F.

Heat the primary system back up to 547°F.

The X-Y Recorder will plot reactivity vs. Tave.

Acceptance Criteria:

Design:

ARO: -2.2 ± 3 pcm/°F

FSAR/T.S.:

-2.9×10^{-4} (Delta K/K) /°F less than or equal to MTC* less than or equal to 0

* MTC = ITC - doppler

STARTUP TEST PROGRAM DESCRIPTION

SALEM UNIT 1 CYCLE 5

Test: <u>Power Coefficient</u>

Initial Conditions:

Reactor power is not changing. The Xenon concentration is within 3% of its equilibrium value. This test is run twice during the startup program. First at 47% power, than at 100%.

Test Description:

Take a heat balance. Change turbine power between 2% and 4% with the control rods in manual. The Tave and Delta T recorders will monitor changes in these parameters as a function of time.

Acceptance Criteria:

Design:

Design value* ± 30%

FSAR/T.S.:

Must fall between upper and lower curve assumed in FSAR accident analysis.

*See attached curve (Figure A-1)

SALEM I, CYCLE IV
ACCEPTANCE CRITERIA
SHEET 1
PHYSICS RESULTS

PARAMETER MEASURED	TEST CONDITIONS	MEASURED VALUE	REQUIRED VALUE	REQUIREMENT REFERENCE	COMMENTS
Isothermal Temperature Coefficient	Critical HZP ARO	-1.52	$< 0\times10^{-4}$ AND $> -2.9\times10^{-4}$ k/k/°F -2.2±3	T.S.3.1.1.4 Ref. 2.3	
	Critical, HZP C/B D Inserted	N/A	$< 0\times10^{-4}$ AND $> -2.9\times10^{-4}$ k/k/°F -3.5±3	T.S. 3.1.1.4 Ref. 2.3	
Critical Boron Concentration	Critical HZP, ARO	1499	1483±50ppm	Ref. 2.3	+16ppm Hi
	Critical, HZP C/B D inserted	1384	(Cal. from ARO Boron) 1374 (+)ppm	PART 15 Ref. 2.2	+10ppm Hi
	Critical, HZP C/B C inserted	N/A	N.A.	N.A.	
	Critical, HZP C/B B inserted	N/A	N.A.	N.A.	
	Critical, HZP C/B A inserted	N/A	N.A.	N.A.	
Power Coefficient	47% RTP	-11.4	Figure 1 ± 30%	Ref. 2.3	
			Limits of Figure 2	Ref. 2.4	
	95% RTP	-12.0	Figure 1 ± 30%	Ref. 2.3	
			Limits of Figure 2	Ref. 2.4	
Reactivity Computer Check	Critical HZP, controlling on C/B D		(Double Time Reactivity ± 4%	Ref. 2.3	
		23.0	22.2 ± .89		
		38.4	38.9 ± 1.56		
		66.0	68.2 ± 2.73		

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Reactor Engineer

SALEM I, CYCLE IV
ACCEPTANCE CRITERIA
SHEET 3
FLUX MAP RESULTS

PARAMETER MEASURED	TEST CONDITIONS	MEASURED VALUE	REQUIRED VALUE	REQUIREMENT REFERENCE
$F\Delta H_N$	Critical,HZP ARO Map 1500	-12.8 (MAX) - 12.8 (MAX) (Attached Code Map)	±10% for F/A pwr $\geq$ .9 ±15% for F/A pwr $<$ .9 (for measures Thimbles)	Ref. 2.3
Nuclear Enthalpy Hot Channel Factor	~47% Map 1502	1.4805	$\leq$ 1.55[1.0+0.2(1-P)] 1.714 (47.1%)	T.S. 3.2.3
	~95% Map 1505	1.4602	$\leq$ 1.55[1.0+0.2(1-P)] 1.554 (98.54%)	T.S. 3.2.3
$F_Q(Z)$ Heat Flux Hot Channel Factor	Critical,HZP, ARO Map 1500	2.6088	$\leq$ [4.64][K(z)] 4.64	T.S. 3.2.2 (INFO)
	~47% Map 1502	2.0167	$\leq$ [4.64][K(z)] 4.64	T.S. 3.2.2
	~95% Map 150 5	1.8742	$\leq \frac{[2.32]}{P}$ [K(z)] 2.354 (98.54%)	T.S. 3.2.2

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SALEM I, CYCLE IV
ACCEPTANCE CRITERIA
SHEET 3 (contd)
FLUX MAP RESULTS

PARAMETER MEASURED	TEST CONDITIONS	MEASURED VALUE	REQUIRED VALUE		REQUIREMENT REFERENCE
			$\le F_{xy}^{RTP}$	$\le F_{xy}^{L}$	
F_{XY}^{C} Computed Radial Peaking Factor	Critical,HZP, ARO Map 1500	TOP 1.79 BOT 1.82	1.65 1.67	1.98 2.004	T.S. 3.2.2 (INFO)
	47% Map 1502	TOP 1.5868 BOT 1.6087	1.65 1.67	1.8243 1.8464	T.S. 3.2.2
	95% Map 1505	TOP 1.5351 BOT 1.5826	1.65 1.67	1.6548 1.6749	T.S. 3.2.2

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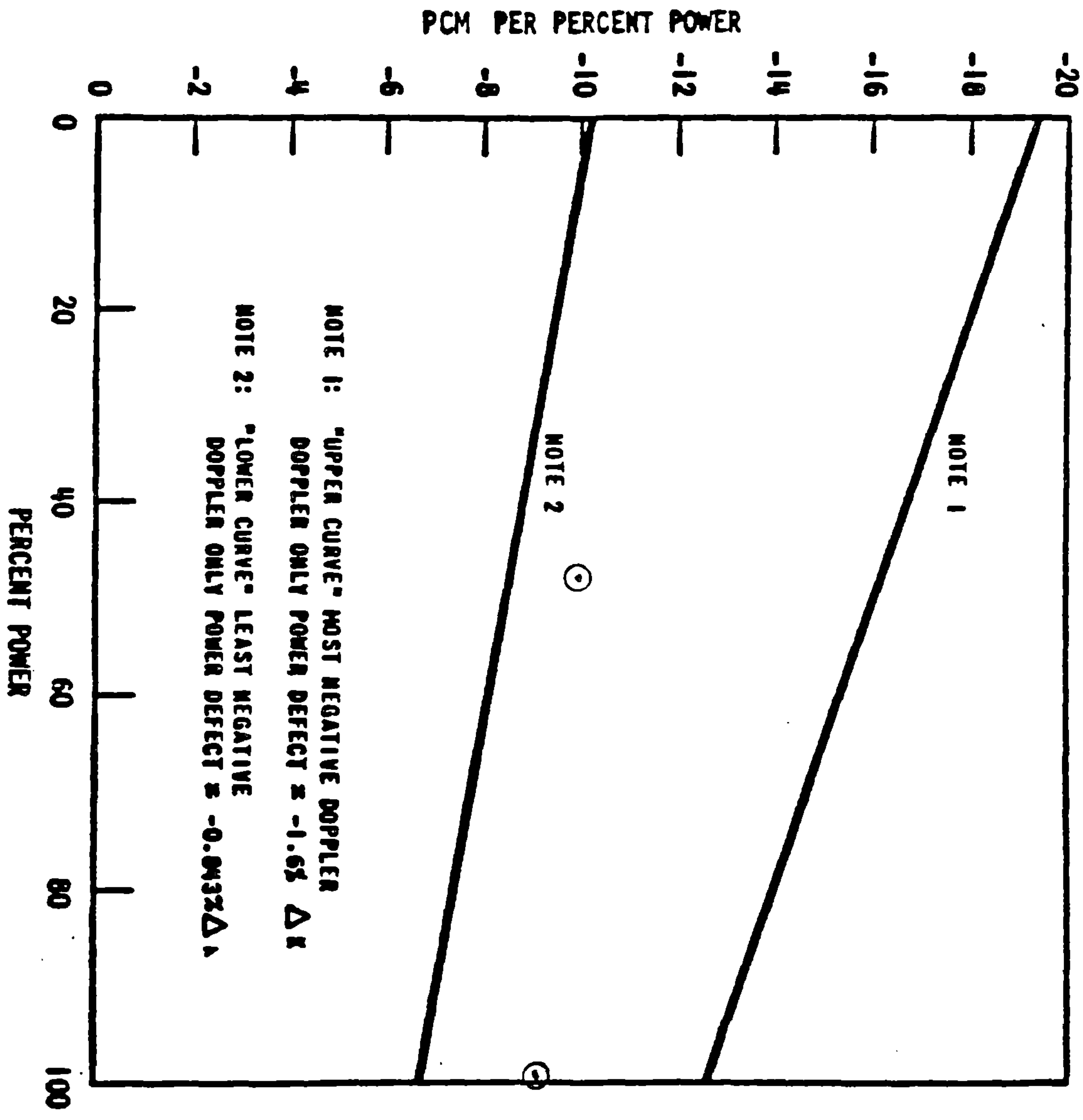
MASTER

FIGURE A-1

(FSAR Fig 14.0-5)



⊙ Doppler only power Coefficient derived from measurements.